

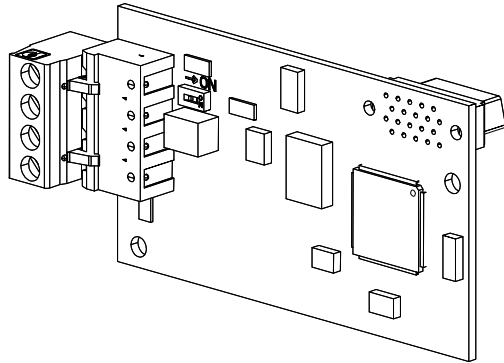
YASKAWA AC Drive Option

BACnet MS/TP

Installation & Technical Manual

Model SI-B3

To correctly use the product, read this manual thoroughly and keep it for easy reference, inspection, and maintenance. Make sure that the end user receives this manual.



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1 Preface and Safety

YASKAWA Electric supplies component parts for use in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer 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 products designed to incorporate a component part 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 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

These manuals are available for the option:

Document	Description
YASKAWA AC Drive Option BACnet MS/TP Installation & Technical Manual (This book)	<p>Read this manual first.</p> <p>The manual provides information about wiring, setting, functions, troubleshooting. The manual is packaged together with the product.</p>
YASKAWA AC Drive Manuals	<p>Refer to the drive manual to connect with the option.</p> <p>Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information.</p> <p>The manuals also include important information about parameter settings and tuning the drive.</p> <p>The Quick Start Guides are packaged with the drive.</p> <p>The most recent versions of these manuals are available for download on our documentation websites:</p> <p>U.S.: http://www.yaskawa.com</p> <p>Europe: http://www.yaskawa.eu.com</p> <p>Japan: http://www.e-mechatronics.com</p> <p>Other areas: Check the back cover of these manuals.</p> <p>For questions, contact Yaskawa or a Yaskawa representative.</p>

◆ **Glossary**

Terms	Definition
Option	YASKAWA AC Drive Option SI-B3 BACnet MS/TP
Keypad	<ul style="list-style-type: none">• LCD Operator• LED Operator• LCD Keypad• LED Keypad
Hex. (Example: 900 (Hex.))	Identifies a unit for hexadecimal number format.

◆ **Registered Trademarks**

Trademarks are the property of their respective owners.

◆ **Supplemental Safety Information**

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

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

▲ DANGER This signal word identifies a hazard that will cause serious injury or death if you do not prevent it.

▲ WARNING This signal word identifies a hazard that can cause death or serious injuries if you do not prevent it.

▲ CAUTION This signal word identifies a hazardous situation, which, if not avoided, can cause minor or moderate injury.

NOTICE This signal word identifies a property damage message that is not related to personal injury.

■ Section Safety

General Precautions

- The diagrams in this section may include options and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option should be used according to the instructions described in this manual.
- The diagrams in this manual are provided as examples only and may not pertain to all products covered by this manual.
- 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.
- Contact Yaskawa or a Yaskawa representative and provide the manual number shown on the front cover to order new copies of the manual.

▲ DANGER *Do not ignore the safety messages in this manual. If you ignore the safety messages in this manual, it will cause serious injury or death. The manufacturer is not responsible for injuries or damage to equipment.*

▲ WARNING *Electrical Shock Hazard. Do not modify the drive or option circuitry. Failure to obey can cause serious injury or death, or cause damage to the drive or option and will void warranty. Yaskawa is not responsible for modifications of the product made by the user.*

NOTICE *Damage to Equipment. Do not use steam or other disinfectants to fumigate wood for packaging the drive. Use alternative methods, for example heat treatment, before you package the components. Gas from wood packaging fumigated with halogen disinfectants, for example fluorine, chlorine, bromine, iodine or DOP gas (phthalic acid ester), can cause damage to the drive.*

2 Overview

◆ About This Option

The BACnet MS/TP Communication Option (Model SI-B3) connects a Yaskawa drive to a Building Automation and Control network (BACnet) network and facilitates the exchange of data.

When you install the option to the drive, you can use the BACnet protocol to do these operations:

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

Up to 127 drives can communicate on a single BACnet MS/TP network. Applications requiring more drives or BACnet devices require a BACnet router to allow another MS/TP network to be available with up to another 127 drives. Actual maximum number of units depends on total network transceiver load. Refer to EIA-485 standards for more information about network hardware specifications.

◆ Compatible Products

You can use the option with these products:

Table 2.1 Compatible Products

Drive	Model	Drive Software Versions ^{*/}
A1000	CIMR-Ax2Axxxx	≥ 1017
	CIMR-Ax4A0002 - 4A0675	
	CIMR-Ax4A0930, 4A1200	≥ 3015
	CIMR-Ax5Axxxx	≥ 5045 ≥ 1017
P1000 ^{*2}	CIMR-PU2Axxxx	≥ 8500
	CIMR-PU4A0002 - 4A0675	
	CIMR-PU5Axxxx	
	CIMR-PU4A0930, 4A1200	≥ 3700
iQpump1000 ^{*2}	CIMR-PW2Axxxx	≥ 8550
	CIMR-PW4A0002 - 4A0675	
	CIMR-PW5Axxxx	
	CIMR-PW4A0930, 4A1200	≥ 3750
U1000 ^{*2}	CIMR-UUxAxxxx	≥ 1014
FP605	CIPR-FP65xxxxx	≥ 1010

^{*1} Refer to "PRG" on the drive nameplate for the drive software version number.

^{*2} Available for option card software versions VST800265 and later. Refer to the option package labeling in the field designated "PRG (four digit number)" or the option labeling in the field designated "C/N (S + four digit number)" to identify the option software version.

3 Receiving

After receiving the option package:

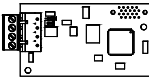




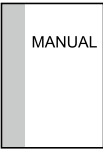
- Make sure that the option is not damaged and no parts are missing. Contact your sales outlet if there is damage to the option or other parts. Contact your sales outlet if there is damage to the option or other parts.

NOTICE *Damage to Equipment. Do not use damaged parts to connect the drive and the option. Failure to comply could damage the drive and option.*

- Make sure that the model number on the option nameplate and the model number on the purchase order are the same.
- Contact the distributor where you purchased the option or contact Yaskawa or a Yaskawa representative about any problems with the option.

◆ Option Package Contents

Table 3.1 Contents of Package

Option Contents		Quantity
Option		1
Ground Wire		1
Screws (M3)		3 ^{*1}
LED Labels	1000-Series 	1
	FP605 ^{*2} 	1
Manuals		1

*1 FP605 drives use two screws only.

*2 LED label has transparent background. Please make sure that you use the correct label for FP605.

◆ Installation Tools

You can use these tools to install the option to the drive:

- A Phillips screwdriver or slotted screwdriver (blade depth: 0.4 mm (0.02 in), width: 2.5 mm (0.1 in)) ^{*1}.
- A flat-blade screwdriver (blade depth: 0.4 mm (0.02 in.), width: 2.5 mm (0.1 in.)).
- A pair of diagonal cutting pliers.
- A small file or medium-grit sandpaper.

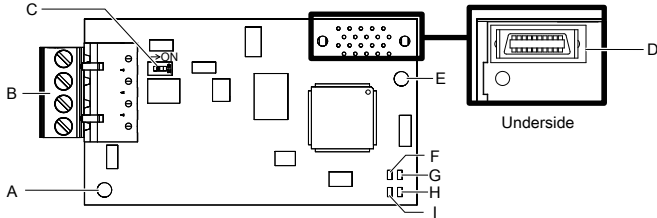
- *1 Phillips screw sizes are different for different drive capacities. Prepare different screwdrivers for different screw sizes.

Note:

If you create a connector on the communication cable side, a separate tool is necessary.

4 Option Components

◆ Option



- A - Ground terminal (FE) and installation hole *2
- B - Terminal block TB1
- C - Terminating resistor switch S1
- D - Connector (CN5)
- E - Installation hole

- F - LED (NS) *1
- G - LED (MS) *1
- H - LED (RX) *1
- I - LED (TX) *1

Figure 4.1 Option


*1 Refer to *Option LED States on page 11* for more information about the LEDs.

*2 Connect the included ground wire during installation. The ground wire is not necessary for installation on GA800 drives.

◆ Terminal block TB1

The communication connector on the option is a pluggable terminal block designated TB1. You can remove the communication connector from the circuit board.

Table 4.1 Terminal Descriptions

Terminal	Terminal No.	Name	Description
	1	IG5	Isolated supply ground reference
	2	+	RX/TX (+) signal
	3	-	RX/TX (-) signal
	4	SHLD	Shield Ground

◆ Option LED States

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 status of the option LEDs after the power-up diagnostic LED sequence is complete are described in [Table 4.2](#). Wait at least 2 seconds for the power-up diagnostic process to complete before verifying LED states.

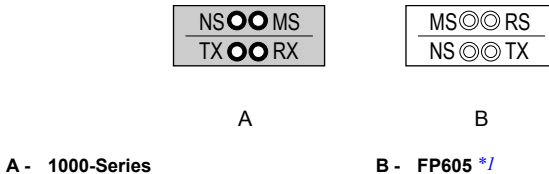


Figure 4.2 Option LED Labels

*1 LED label has transparent background. Please make sure that you use the correct label for FP605.

Table 4.2 Option LED States

LED Name	Indication		Operating State	Description
	Color	Display		
MS	-	OFF	Power supply OFF	No power to the drive.
	Green	ON	Normal operation	The option is operating normally and initialization is complete.
	Green	Flashing	Standby/Initializing	The option is configuring or waiting for configuration information.
	Red	Flashing	Minor fault	The option detected a recoverable minor fault.
	Red	ON	Major fault	The option detected an unrecoverable major fault.
	Green/Red	Flashing	Option self-test	The option is in self-test mode.
NS	-	OFF	Power supply OFF	-

LED Name	Indication		Operating State	Description
	Color	Display		
	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	The option detected a recoverable minor fault.
	Red	ON	Major fault	The option detected an unrecoverable major network fault.
	Green/ Red	Flashing	Network test	Power-up sequence and testing
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.

5 Installation Procedure

◆ Section Safety

⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

⚠ WARNING *Electrical Shock Hazard. Do not operate the drive when covers are missing. Replace covers and shields before you operate the drive. Use the drive only as specified by the instructions. Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive. If personnel are not approved, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Do not remove covers or touch circuit boards while the drive is energized. If you touch the internal components of an energized drive, it can cause serious injury or death.*

⚠ WARNING *Electrical Shock Hazard. Do not use damaged wires, put too much force on the wiring, or cause damage to the wire insulation. Damaged wires can cause serious injury or death.*

⚠ WARNING *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*

NOTICE *Damage to Equipment. Do not de-energize the drive while the drive is outputting voltage. Incorrect equipment sequencing can cause damage to the drive.*

NOTICE *Do not operate a drive or connected equipment that has damaged or missing parts. You can cause damage to the drive and connected equipment.*

NOTICE *Use Yaskawa connection cables or recommended cables only. Incorrect cables can cause the drive or option to function incorrectly.*

NOTICE *Damage to Equipment. Correctly connect the connectors. Incorrect connections can cause malfunction or damage to the equipment.*

NOTICE *Damage to Equipment. Make sure that all connections are correct after you install the drive and connecting peripheral devices. Incorrect connections can cause damage to the option.*

◆ Procedures to Install and Wire Options on a Drive

Procedures to install and wire the option are different for different drive models.

Refer to the following table to check the procedures to install and wire the option on a drive.

Table 5.1 Procedures to Install and Wire Options on a Drive

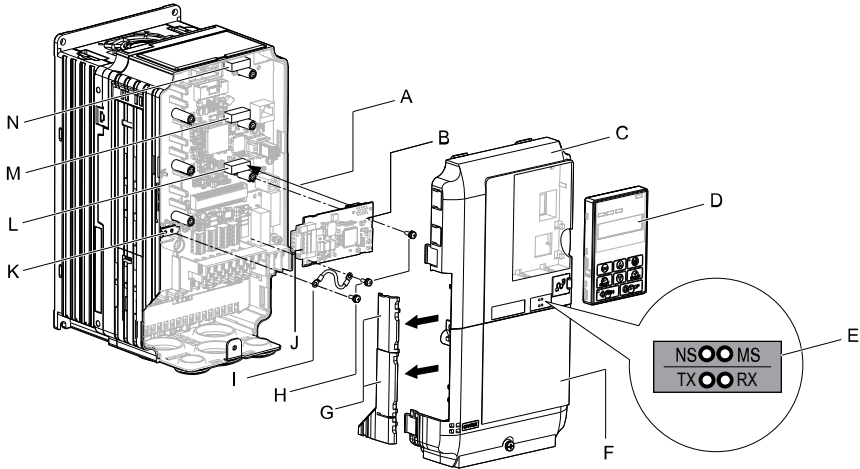
Drive	Procedures to Install and Wire Options on a Drive	Reference Page
A1000	Procedure A	13
P1000	Procedure A	13
iQpump1000	Procedure A	13
U1000	Procedure A	13
FP605	Procedure B	20

■ Procedure A

This section shows the procedure to install and wire the option on a 1000-series drive.

Prepare the Drive for the Option

Correctly wire the drive as specified by the manual packaged with the drive. Make sure that the drive functions correctly. Refer to the drive manuals for more information.



- | | |
|--|---|
| A - Insertion point for CN5 connector | H - Included screws |
| B - Option | I - Ground wire |
| C - Drive front cover | J - Terminal block (TB1) |
| D - Keypad | K - Drive grounding terminal (FE) |
| E - LED label | L - Connector CN5-A |
| F - Drive terminal cover | M - Connector CN5-B (Not available for communication option installation.) |
| G - Removable tabs for wire routing | N - Connector CN5-C (Not available for communication option installation.) |

Figure 5.1 Drive Components with Option

Install the Option

Use this procedure to install the option.

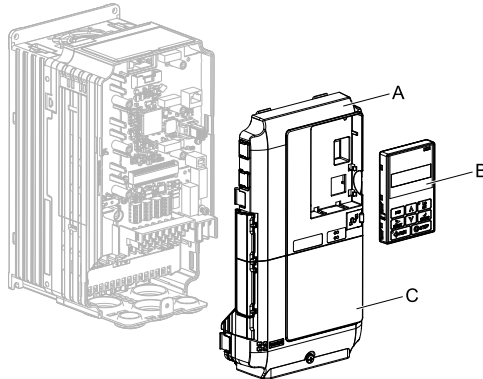
⚠ DANGER *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, measure for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

1. Remove the keypad (B), front cover (A), and terminal cover (C).

Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is not illuminated, then remove the keypad and front cover. Refer to the drive manuals for more information.

You can only install this option into the CN5-A connector on the drive control board.

NOTICE *Damage to Equipment.* When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.



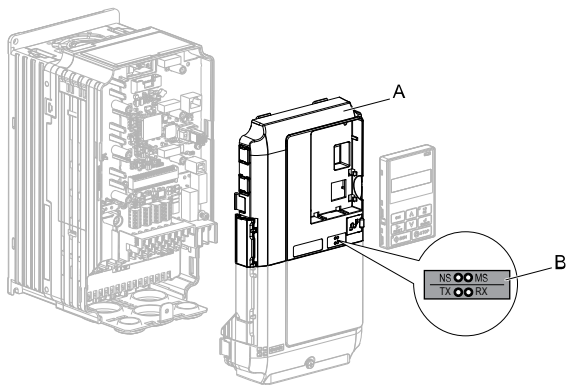
A - Drive front cover

C - Drive terminal cover

B - Keypad

Figure 5.2 Remove the Keypad, Front Cover, and Terminal Cover

- Put the LED label (B) in the correct position on the drive front cover (A).

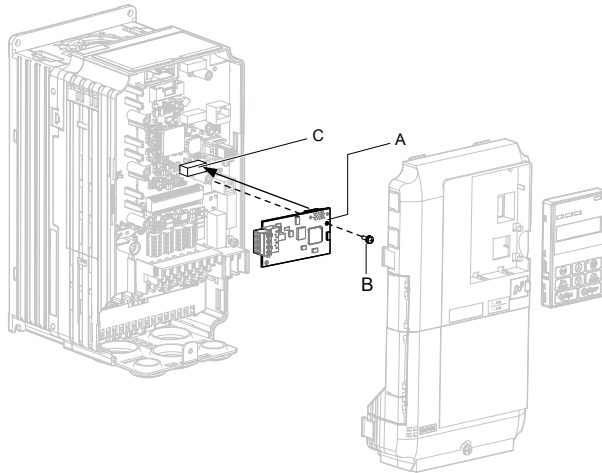


A - Drive front cover

B - LED label

Figure 5.3 Put the LED Label on the Drive Front Cover

3. Install the option (A) into the CN5-A connector (C) on the drive and use one of the included screws (B) to put it in place.



A - Option

B - Included screw

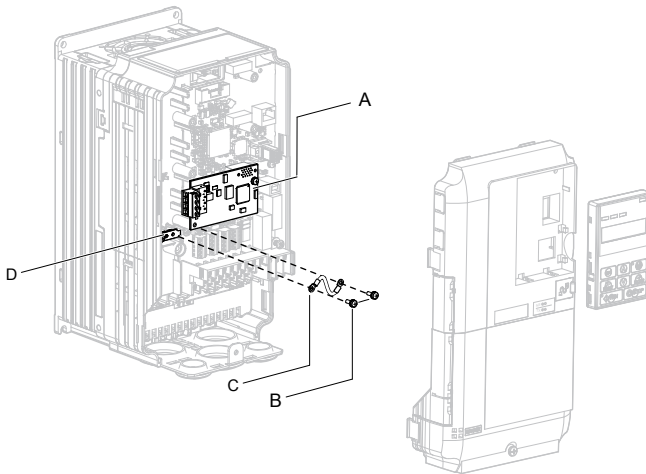
C - Connector CN5-A

Figure 5.4 Install the Option

4. Use one of the remaining included screws (B) to connect one end of the ground wire (C) to the ground terminal (A). Use the last remaining included screw (B) to connect the other end of the ground wire (C) to the remaining ground terminal and installation hole on the option (A).

Tighten the screws to a correct tightening torque:

- 0.5 to 0.6 N•m (4.4 to 5.3 in•lb)



A - Option

B - Included screws

C - Ground wire

D - Drive grounding terminal (FE)

Figure 5.5 Connect the Ground Wire

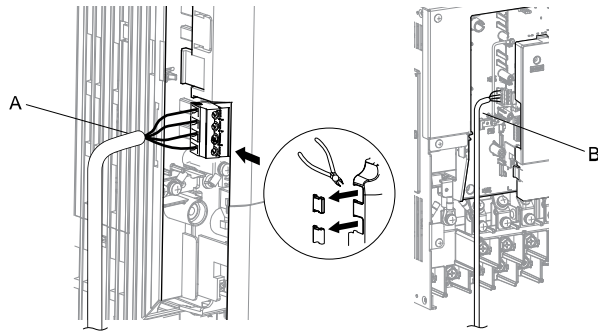
Note:

The drive has only two ground terminal screw holes. When you connect three options, two options will share one ground terminal.

5. Route the option wiring.
Procedures to wire the option are different for different drive models.
 - You can route the option wiring through openings on the front cover of some models. Remove the perforated tabs on the left side of the front cover as shown in [Figure 5.6-A](#) to create the necessary openings on these models. To prevent damage to the cable from the cut end, treat the cut surface with sandpaper.
 - Route the option wiring inside the enclosure as shown in [Figure 5.6-B](#). Refer to the drive manuals for more information.

Note:

Isolate communication cables from main circuit wiring and other electrical and power lines.



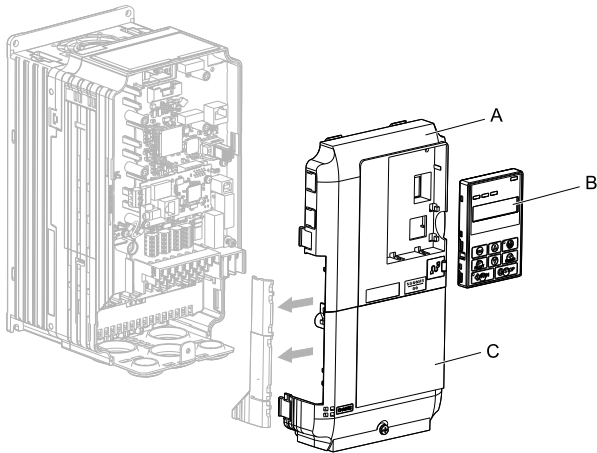
A - Route wires through the openings provided on the left side of the front cover. *1

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

Figure 5.6 Wire Routing Examples

- *1 If there is wiring outside the enclosure, the drive will not meet Enclosed wall-mounted type (IP20/UL Type 1) requirements.
6. Firmly connect the BACnet communication cable to terminal block (TB1). Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. Refer to [Communication Cable Topology on page 30](#) for more information.
 7. Reattach the front cover (A), terminal cover (C), and keypad (B). Refer to the drive manuals for more information.

NOTICE Do not pinch cables between the front covers and the drive. Failure to comply could cause erroneous operation.



A - Drive front cover

B - Keypad

C - Drive terminal cover

Figure 5.7 Replace the Front Cover, Terminal Cover, and Keypad

8. Set drive parameters in [Related Drive Parameters on page 32](#) for correct option performance.

■ Procedure B

This section shows the procedure to install and wire the option on an FP605 drive.

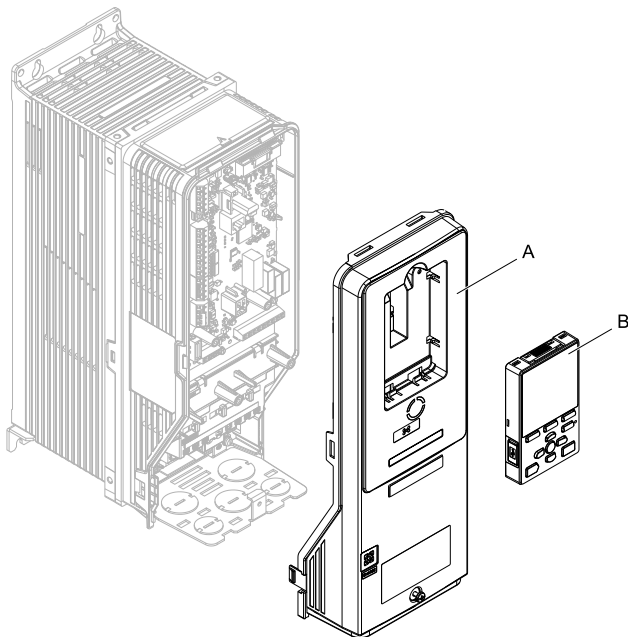
Prepare the Drive for the Option

Correctly wire the drive as specified by the manual packaged with the drive. Make sure that the drive functions correctly. Refer to the drive manuals for more information.

1. Remove the keypad (B) and front cover (A).

Shut off power to the drive and wait for the time specified on the drive warning label at a minimum. Make sure that the charge indicator LED is unlit, then remove the keypad and front cover. Refer to the drive manuals for more information.

NOTICE *Damage to Equipment. When you touch the option, make sure that you observe correct electrostatic discharge (ESD) procedures. If you do not follow procedures, it can cause ESD damage to the drive circuitry.*



A - Drive front cover

B - Keypad

Figure 5.9 Remove the Front Cover and Keypad

- Put the LED label (B) in the correct position on the drive front cover (A).

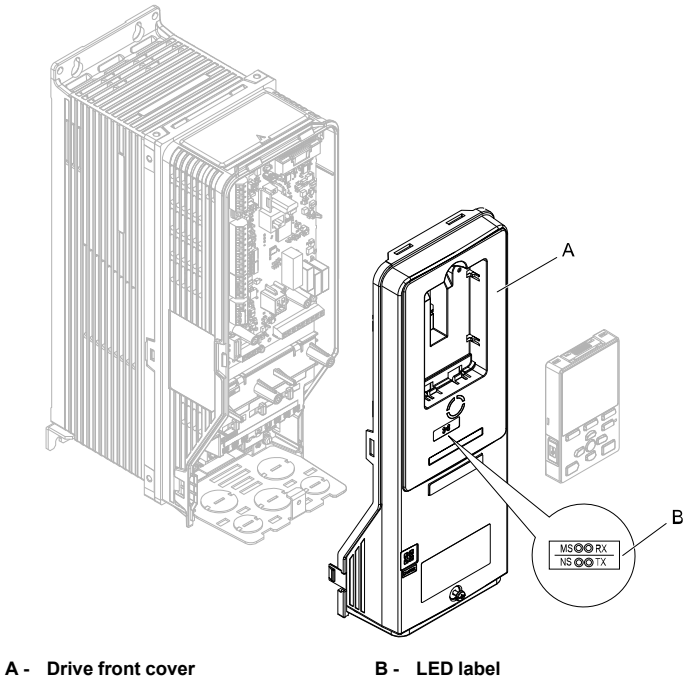


Figure 5.10 Put the LED Label on the Drive Front Cover

3. Remove the screw (B) installed in the drive grounding terminal (A).

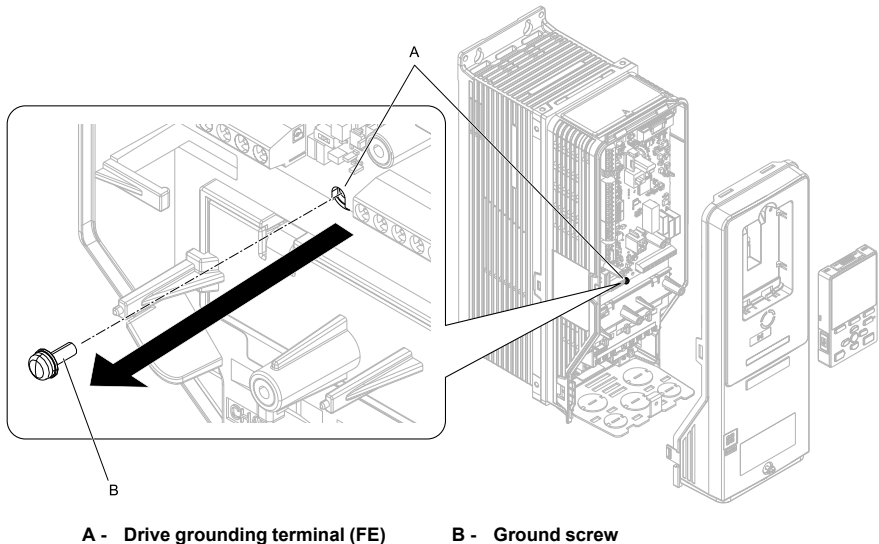
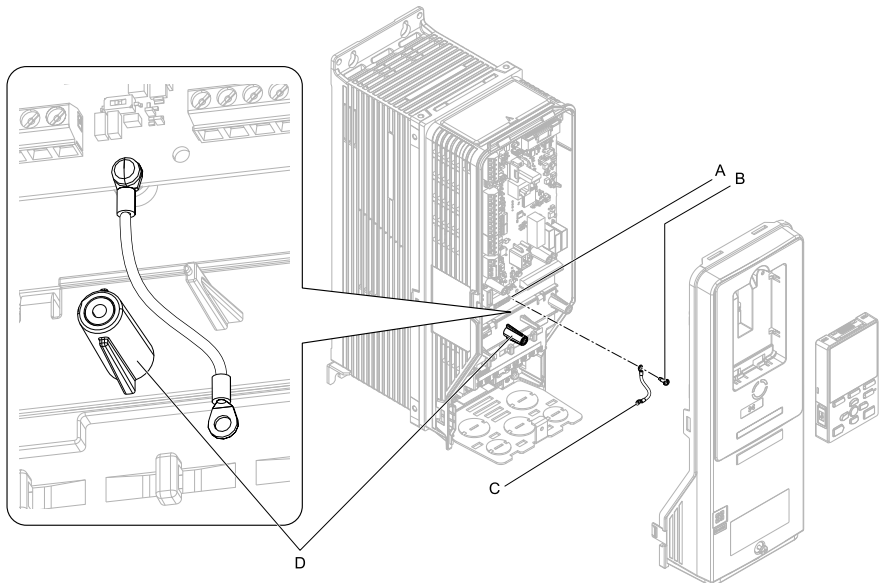


Figure 5.11 Remove the Screw from the Drive Grounding Terminal

4. Use the screw (B) installed in the FE ground terminal of the drive (A) to connect one end of the included ground wire (C) to the ground terminal on the drive.
Tighten the screw to a correct tightening torque:
 - 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

Route ground wire on the right side of the stud (D).



A - Drive grounding terminal (FE)
B - Ground screw

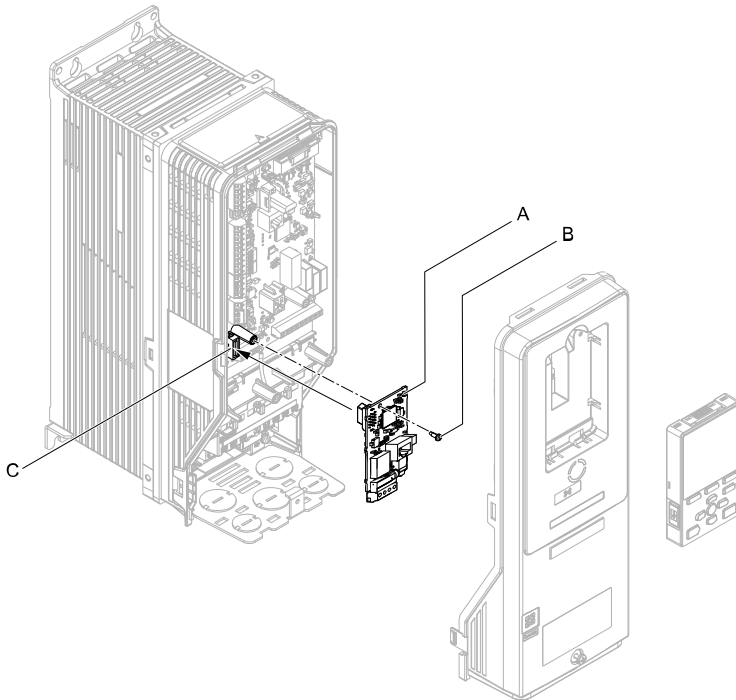
C - Ground wire
D - Stud

Figure 5.12 Connect the Ground Wire

5. Install the option (A) into the connector (C) (FP605: CN5-A) on the drive and use the included screws (B) to put it in place.
 Tighten the screw to a correct tightening torque:
 - 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

Only two screws are necessary to install the option on FP605 drives.



A - Option

B - Included screw

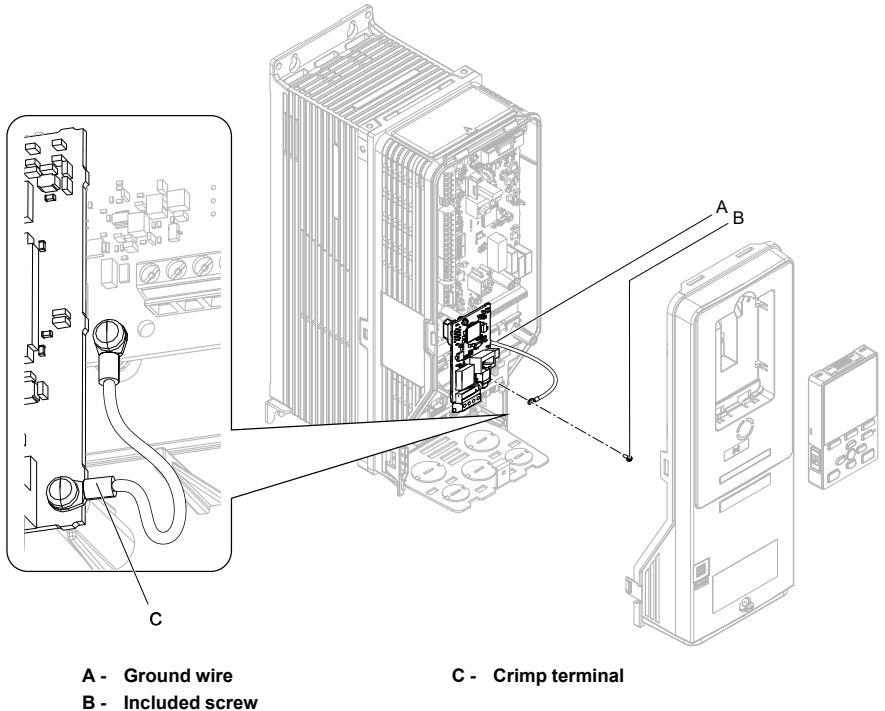
C - Connector CN5

Figure 5.13 Install the Option

6. Use one of the remaining included screws (B) to connect the ground wire (A) to the ground terminal and installation hole on the option.
Tighten the screw to a correct tightening torque:
 - 0.5 N·m to 0.6 N·m (4.4 in·lb to 5.3 in·lb)

Note:

Wire the ground wire as specified by [Figure 5.14](#).



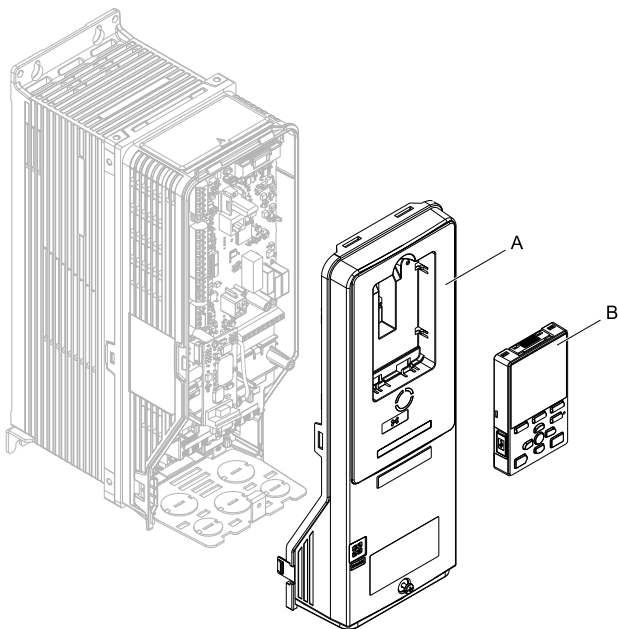
A - Ground wire
B - Included screw

C - Crimp terminal

Figure 5.14 Connect the Ground Wire

7. Firmly connect the BACnet communication cable to terminal block (TB1). Isolate communication cables from main circuit wiring and other electrical and power lines. Make sure that you firmly connect the cable end. Refer to [Communication Cable Topology on page 30](#) for more information.
8. Reattach the drive front cover (A) and the keypad (B). Refer to the drive manuals for more information.

NOTICE Do not pinch cables between the front covers and the drive. Failure to comply could cause erroneous operation.



A - Drive front cover

B - Keypad

Figure 5.15 Replace the Front Cover and Keypad

9. Set drive parameters in [Related Drive Parameters on page 32](#) for correct option performance.

◆ Option Connection Diagram

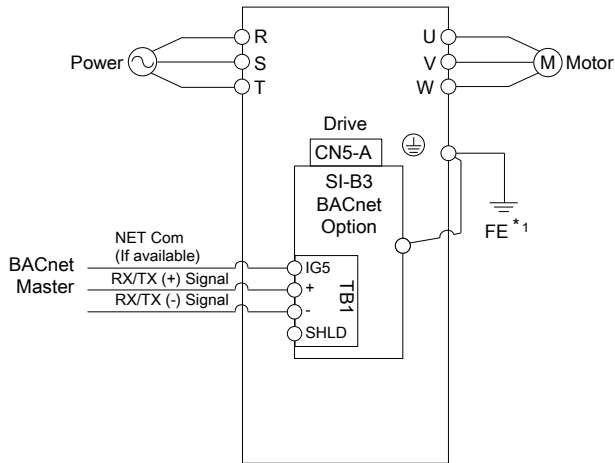


Figure 5.16 Option Connection Diagram

*1 Connect the included ground wire for installations on 1000-series, and FP605 drives.

Refer to [Figure 5.17](#) when wiring multiple connections using BACnet communication.

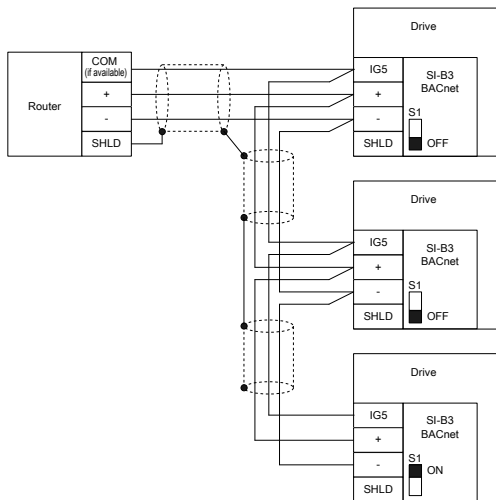


Figure 5.17 Connection Diagram for Multiple Connections

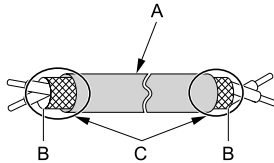
The two ends of the BACnet network must be terminated with a 120 ohm resistor between the “+” and “-” and signals. The SI-B3 has a built in termination resistor that can be enabled or disabled using DIP switch S1. If a drive is located at the end of a network line, enable the termination resistor by 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).

◆ **Communication Cable Topology**

Use only a dedicated BACnet communication cable.

Route the option wiring as specified by these procedures.

1. Prepare the communication cables as shown in [Figure 5.18](#).



A - Sheath

B - Shield

C - Use electrical tape or shrink tubing to insulate the cable.

Figure 5.18 Prepare Ends of Shielded Cable

2. Connect the communication cables to the terminal block as shown in [Figure 5.19](#). Make sure that the terminal block TB1 is firmly fixed when you connect the terminal block TB1 to the circuit board. Tighten the screws to a correct tightening torque:
 - 0.22 to 0.25 N·m (0.0 to 0.0 in·lb)
3. Make sure that you correctly connect the wires and that you did not accidentally pinch wire insulation in the terminals. Trim any frayed wires.

WARNING *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

NOTICE *Do not let wire shields touch other signal lines or equipment. Insulate the wire shields with electrical tape or shrink tubing. If you do not insulate the wire shields, it can cause a short circuit and damage the drive.*

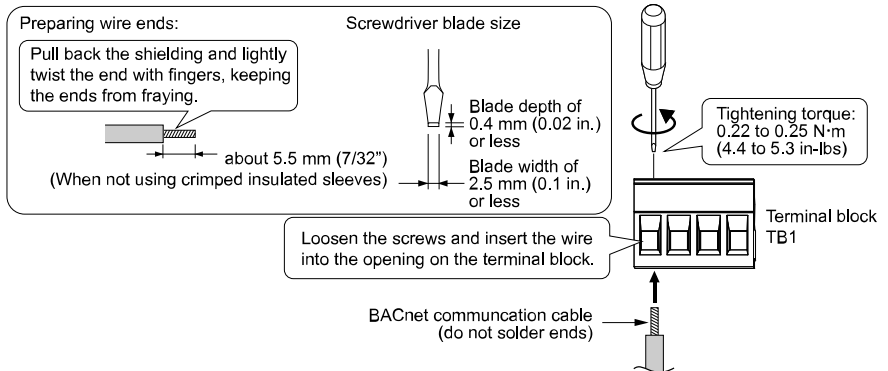


Figure 5.19 Prepare and Connect Communication Cable Wiring

◆ BACnet Node Addressing

You can use *F6-45* to set the BACnet node address. This defines the physical address of the drive on the MS/TP network. You can also set the Device Object Instance Identifier [*F6-48 and F6-49*] and the Device Object Name (via BACnet network). These allow the drive to have a virtual address and simplify the controller configuration.

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

◆ Electronic Protocol Implementation Conformance Statement (EPICS) Files

For easy network implementation of drives equipped with the SI-B3 option, you can get an EPICS file from:

U.S.: <https://www.yaskawa.com>

Other areas: Contact a Yaskawa representative.

Refer to *BACnet Protocol Implementation Conformance Statement on page 56* for the SI-B3 PICS.

6 Related Drive Parameters

These parameters set the drive for operation with the option. Make sure that the parameter settings in this table are correct before you start network communications.

Note:

Hex.: MEMOBUS addresses that you can use to change parameters over network communication are represented in hexadecimal numbers.

No. (Hex.)	Name	Description	Default (Range)
b1-01 (0180)	Frequency Reference Selection 1	<p>Selects the input method for frequency reference.</p> <p>0 : Keypad 1 : Analog Input 2 : Memobus/Modbus Communications 3 : Option PCB 4 : Pulse Train Input</p> <p>Note:</p> <ul style="list-style-type: none"> To start and stop the drive with the BACnet master device using serial communications, set <i>b1-02 = 3 [Run Command Selection 1 = Option PCB]</i> or set the Net Control bit in the assemblies or Control Supervisor Object. To control the frequency reference of the drive via the master device, set <i>b1-01 = 3</i> or set the Net Reference bit in the assemblies or AC/DC object. The default setting is different for different drives. Refer to the instruction manual of your specific drive for more information. 	1 (0 - 4)
b1-02 (0181)	Run Command Selection 1	<p>Sets the input method for the Run command.</p> <p>0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option PCB</p> <p>Note:</p> <p>To start and stop the drive with the BACnet master device using serial communications, set <i>b1-02 = 3</i> or set the Net Control bit in the assemblies or Control Supervisor Object. To control the frequency reference of the drive via the master device, set <i>b1-01 = 3 [Frequency Reference Selection 1 = Option PCB]</i> or set the Net Reference bit in the assemblies or AC/DC object.</p>	1 (0 - 3)
F6-01 (03A2)	Communication Error Selection	<p>Selects drive response when the drive detects a <i>bUS [Option Communication Error]</i> error during communications with the option.</p> <p>0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Alarm (Run at d1-04) 5 : Alarm - Ramp Stop</p> <p>Note:</p> <ul style="list-style-type: none"> When you set this parameter to 3 or 4, the drive will continue operation after it detects a fault. Separately prepare safety protection equipment and systems, for example fast-stop switches. 	1 (0 - 5)

6 Related Drive Parameters

No. (Hex.)	Name	Description	Default (Range)
		<ul style="list-style-type: none"> • Refer to the drive manual to know if settings 4 and 5 are available. Settings 4 and 5 are available in A1000 software versions PRG: 1021 and later. • The setting range for 1000-Series drives is different for different software versions. Refer to the Peripheral Devices & Options section of the drive instruction manual for more information. 	
F6-02 (03A3)	Comm External Fault (EF0) Detect	Selects the conditions at which <i>EF0 [Option Card External Fault]</i> is detected. 0 : Always Detected 1 : Detected during RUN Only	0 (0, 1)
F6-03 (03A4)	Comm External Fault (EF0) Select	Sets the method to stop the motor or let the motor continue operating when the drive detects an <i>EF0 [Option Card External Fault]</i> . 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only Note: When you set this parameter to 3, the drive will continue operation after it detects a fault. If you set this parameter to 3, make sure that you install an emergency stop switch.	1 (0 - 3)
F6-04 (03A5)	bUS Error Detection Time	Sets the delay time for error detection if a <i>bUS</i> error occurs. Note: Available for option card software versions VST800265 and later.	2.0 s (0.0 - 5.0)
F6-07 (03A8)	Multi-Step Ref @ NetRef/ ComRef	0 : Disable Multi-Step References 1 : Enable Multi-Step References	0 (0, 1)
F6-08 (036A)	Comm Parameter Reset @Initialize	Selects whether communication-related parameters <i>F6-xx</i> and <i>F7-xx</i> are set back to original default values when you use parameter <i>A1-03 [Initialize Parameters]</i> to initialize the drive. 0 : No Reset - Parameters Retained 1 : Reset - Back to Factory Default Note: When you set <i>F6-08</i> to 1 and you then use <i>A1-03</i> to initialize the drive, the drive will not change this setting value.	0 (0, 1)
F6-14 (03BB)	bUS Error Auto Reset	Sets the drive to automatically reset from a <i>bUS</i> error after reestablishing communications. 0 : Disabled 1 : Enabled	0 (0, 1)

No. (Hex.)	Name	Description	Default (Range)
		<p>Note: Available for option card software versions VST800265 and later.</p>	
F6-45 (02FB)	Drive Node Address	Sets the BACnet MS/TP MAC address (physical node address).	1 (0 - 127)
F6-46 (02FC)	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	3 (0 - 8)
F6-47 (02FD)	Drive Transmit Wait Time	Sets the time the drive waits to send response data after it receives data from the master.	5 ms (5 - 65 ms)
F6-48 (02FE)	BACnet Device Object Identifier 0	Sets the Instance Identifier of the BACnet Device Object, where the <i>F6-48</i> value is the least significant word. Note: This parameter and <i>F6-49</i> set the Instance Identifier of the BACnet Device Object. Example 1: Set the Device Object Instance Identifier to 1234. 1234 decimal is equal to 4D2H (hexadecimal). Set <i>F6-48</i> = 4D2H and <i>F6-49</i> = 0. Example 2: Set the Device Object Instance Identifier to 1234567. 1234567 decimal is equal to 12D687H. Set <i>F6-48</i> = D687H and <i>F6-49</i> = 12H.	1 (0 - FFFFH)

No. (Hex.)	Name	Description	Default (Range)
F6-49 (02FF)	BACnet Device Object Identifier 1	<p>Sets the Instance Identifier of the BACnet Device Object, where the <i>F6-49</i> value is the most significant word.</p> <p>Note:</p> <p>This parameter and <i>F6-48</i> set the Instance Identifier of the BACnet Device Object.</p> <p>Example 1: Set the Device Object Instance Identifier to <i>1234</i>. 1234 decimal is equal to 4D2H (hexadecimal). Set <i>F6-48 = 4D2H</i> and <i>F6-49 = 0</i>.</p> <p>Example 2: Set the Device Object Instance Identifier to <i>1234567</i>. 1234567 decimal is equal to 12D687H. Set <i>F6-48 = D687H</i> and <i>F6-49 = 12H</i>.</p>	0 (0 - 3FH)
F7-16 (03F4)	Communication Loss Time Out	<p>Sets the time out value for communication loss detection in tenths of a second.</p> <p>Note:</p> <p>Available for option card software versions VST800265 and later.</p>	0.0 s (0.0 - 30.0 s)

7 BACnet Objects Supported

◆ Present Value Access

The Present Value (PV) of BACnet objects can always be read. Some PVs can also be written or commanded. A commandable PV is almost the same as the writable PV, but the value is actually written into a priority array. The value that has the highest priority in the array will be used by the drive.

Table 7.1 Present Value Access Types and Descriptions

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 7.2 Object Properties

Property	Object Type						
	Device	Analog Input (AI)	Analog Output (AO)	Analog Value (AV)	Binary Input (BI)	Binary Output (BO)	Binary Value (BV)
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	-	-	-	-	-	-
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

Property	Object Type						
	Device	Analog Input (AI)	Analog Output (AO)	Analog Value (AV)	Binary Input (BI)	Binary Output (BO)	Binary Value (BV)
Status_Flags	-	Yes	Yes	Yes	Yes	Yes	Yes
Event_State	-	-	-	-	-	-	-
Reliability	-	Yes	Yes	Yes	Yes	Yes	Yes
Out_Of_Service	-	Yes	Yes	Yes	Yes	Yes	Yes
Units	-	Yes	Yes	Yes	-	-	-
Priority_Array	-	-	Yes */	Yes */	-	Yes */	Yes */
Relinquish_Default	-	-	Yes */	Yes */	-	Yes */	Yes */
Polarity	-	-	-	-	Yes	Yes	-
Inactive_Text	-	-	-	-	Yes	Yes	Yes
Active_Text	-	-	-	-	Yes	Yes	Yes

*1 For Commandable Object Instances only.

◆ Analog Input Objects

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
AI1	Analog Input 1 Level (Drv Analog In 1 Level)	004E	xxxx . x	-	%	R
AI2	Analog Input 2 Level (Drv Analog In 2 Level)	004F	xxxx . x	-	%	R
AI3	Not Used AI3 (Not Used AI003)	-	-	-	-	-
AI4	Not Used AI4 (Not Used AI004)	-	-	-	-	-
AI5	Not Used AI5 (Not Used AI005)	-	-	-	-	-
AI6	Display Format o1-03 (Display Format o1-03)	0502	xxxxx	-	-	R

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
AI7	Scale Format b5-20 (Scale Format b5-20)	01E2	xxxxx	-	-	R
AI8	Inverter Model o2-04 (Inverter Model o2-04)	0508	xxxxx	-	-	R
AI9	Rated Current n9-01 (Rated Current n9-01)	05D0	xxxx . x (for drives rated higher than 11 kVA) xxx . x (for drives rated 11 kVA or lower)	-	A	R

◆ Analog Output Objects

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
AO1	Analog Output 1 Level (Drv Anlg Out1 Level)	0007	xxxx . x	0 - 100.0	%	C
AO2	Analog Output 2 Level (Drv Anlg Out2 Level)	0008	xxxx . x	0 - 100.0	%	C

◆ Analog Value Objects

Table 7.3 Analog Value Objects

Object ID	Object Name (<i>Network Display</i>)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
AV1	Operation Cmd (Bitmapped) (<i>Operation Cmd</i>) <ul style="list-style-type: none"> • bit 0: Run Fwd • bit 1: Run Rev • bit 2: External Fault (EF0) • bit 3: Fault Reset • bit 4: Multi-Function Input 1 (ComRef when <i>H1-01</i> = 40) • bit 5: Multi-Function Input 2 (ComCtrl when <i>H1-02</i> = 41) • bit 6: Multi-Function Input 3 • bit 7: Multi-Function Input 4 • bit 8: Multi-Function Input 5 • bit 9: Multi-Function Input 6 • bit A: Multi-Function Input 7 • bit B to F: Reserved <p>Note: When you use AV1, you must not use BV1 to BV11 or AV5.</p>	0001	-	0 - 2047	Bitmap ped	C
AV2	Frequency Command (<i>Frequency Cmd</i>)	0002	xxx . xx Determined by o1-03	0.00 - 600.00	Determined by o1-03	C
AV3	PID Setpoint (<i>PI Setpoint Cmd</i>)	0006	xxx . xx	0.00 - 100.00	%	C
AV4	MF Output Cmd (Bitmapped) (<i>MF Output Cmd</i>) <ul style="list-style-type: none"> • bit 0: Multi-Function Digital Output 1 (terminal M1-M2) • bit 1: Multi-Function Digital Output 2 (terminal M3-M4) • bit 2: Multi-Function Digital Output 3 (terminal M5-M6) • bit 3: Reserved • bit 4: Reserved • bit 5: Reserved • bit 6: Enables the function in bit 7 	0009	-	0 - 257	Bitmap ped	C

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
	<ul style="list-style-type: none"> bit 7: Fault Contact Output (terminal MA-MB-MC) bit 8 to F: Reserved <p>Note: When using AV4, do not use BO1 to BO3 or BV12.</p>					
AV5	Reference Select Cmd (Bitmapped) <i>(Reference Select Cmd)</i> <ul style="list-style-type: none"> bit 0: Reserved bit 1: PID Setpoint Input bit 2: Reserved bit 3: Reserved bit 4: PI2 Target Input bit 5 to B: Reserved bit C: Multi-Function Input 5 bit D: Multi-Function Input 6 bit E: Multi-Function Input 7 bit F: Reserved <p>Note: When you use AV5, you must not use AV1, BO4, or BV9 to BV11.</p>	000F	-	0 - 32767	Bitmapped	C
AV6	Drive Status (Bitmapped) <i>(Drive Status)</i> <ul style="list-style-type: none"> bit 0: During Run bit 1: During Reverse bit 2: Drive Ready bit 3: Drive Faulted bit 4: Data Setting Error bit 5: Multi-Function Digital Output 1 (terminal M1-M2) bit 6: Multi-Function Digital Output 2 (terminal M3-M4) bit 7: Multi-Function Digital Output 3 (terminal M5-M6) bit 8 to D: Reserved bit E: ComRef status bit F: ComCtrl status 	0020	-	0 - 65535	Bitmapped	R
AV7	Fault Details (Bitmapped) <i>(Fault Details)</i>	0021	-	0 - 65535	Bitmapped	R

7 BACnet Objects Supported

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
	<ul style="list-style-type: none"> • bit 0: oC [Overcurrent], GF [Ground Fault] • bit 1: ov [Overvoltage] • bit 2: oL2 [Drive Overload] • bit 3: oH1 [Heatsink Overheat], oH2 [External Overheat (H1-XX=B)] • bit 4 to 6: Reserved • bit 7: EF to EF7 [External Fault] • bit 8: CPFxx [Hardware Fault] (includes oFAxx) • bit 9: oL1 [Motor Overload], oL3 [Overtorque Detection 1], UL3 [Undertorque Detection 1] • bit A: Reserved • bit B: Uv [DC Bus Undervoltage] • bit C: Uv1 [DC Bus Undervoltage], Uv2 [Control Power Undervoltage], Uv3 [Soft Charge Answerback Fault] • bit D: LF [Output Phase Loss], PF [Input Phase Loss] • bit E: CE [Modbus Communication Error], bUS [Option Communication Error] • bit F: oPr [Keypad Connection Fault] 					
AV8	Data Link Status (Bitmapped) (Data Link Status) <ul style="list-style-type: none"> • bit 0: Writing Data • bit 1: Reserved • bit 2: Reserved • bit 3: Upper or lower limit error • bit 4: Data conformity error • bit 5: Writing to EEPROM • bit 6 to F: Reserved 	0022	-	0 - 63	Bitmap ped	R
AV9	Frequency Reference (Frequency Reference)	0040	xxx . xx Determined by o1-03	-	Deter mined by o1-03	R

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
AV10	Output Frequency (Output Frequency)	0041	xxx . xx Determined by o1-03	-	Determined by o1-03	R
AV11	Output Voltage (Output Voltage)	0045	xxxx . x	-	V	R
AV12	Output Current (Output Current)	0026	xxxx . x (for drives rated higher than 11 kVA) xxx . xx (for drives rated 11 kVA or lower)	-	A	R
AV13	Output Power (Output Power)	0047	xxxx . x (for drives rated higher than 11 kVA) xxx . xx (for drives rated 11 kVA or lower)	-	kW	R
AV14	Torque Reference (Torque Reference)	0048	xxxx . x	-	%	R
AV15	MF Input Status (MF Input Status)	002B	-	0 - 127	Bitmap ped	R
AV16	Drive Status 2 (Drive Status 2)	002C	-	1 - 65535	Bitmap ped	R
AV17	MF Output Status (MF Output Status)	002D	-	0 - 135	Bitmap ped	R
AV18	DC Bus Voltage (DC Bus Voltage)	0031	xxxx . x	-	V	R
AV19	PID Feedback Level (PI Feedback Level)	0038	xxxx . x	-	%	R
AV20	PID Input Level (PI Input Level)	0039	xxxx . x	-	%	R
AV21	PID Output Level (PI Output Level)	003A	xxxx . x	-	%	R
AV22	CPU Software (CPU Software)	004D	xxxxxx	-	-	R
AV23	Flash Number (Flash Number)	005B	xxxxxx	-	-	R

7 BACnet Objects Supported

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
AV24	Comm Error Detail (Comm Error Detail)	003D	-	0 - 127	Bitmapped	R
AV25	kVA Setting (kVA Setting)	0508	xxxxx	-	-	R
AV26	Control Method (Control Method)	0102	xxxxx	-	-	R
AV27	Accel Time (Accel Time)	0200	xxxx . x	0.1 - 6000.0	s	W
AV28	Decel Time (Decel Time)	0201	xxxx . x	0.1 - 6000.0	s	W
AV29 *1	Param Number (Parameter Number)	-	xxxxx	0 - FFFF	-	W
AV30 *1	Param Data (Parameter Data)	-	xxxxx	0 - FFFF	-	W
AV31 *2	Not Used AV31 (Not Used AV031)	08F5	-	-	-	R
AV32 *2	Not Used AV32 (Not Used AV032)	08F5	-	-	-	R
AV33 *2 (A1000, P1000, iQpum p1000, FP605)	Drive kWh (Drive kWh)	005C - 005D	xxxxxxxx.x	0.0 to 32767999.9	-	R
AV33 *2 (U1000)	Drive kWh Consumed (kWh Consumed)	0820 - 0822	xxxxxxxx.x	0.0 to 32767999.9	kWh	R
AV34 *2 (A1000, P1000, iQpum p1000, FP605)	Not Used AV34 (Not Used AV034)	08F5	-	-	-	R
AV34 *2 (U1000)	Drive kWh Produced (kWh Produced)	0823 - 0825	xxxxxxxx.x	0.0 to 32767999.9	kWh	R
AV35 *3	Drive Run Time	004C	-	-	h	R

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Precision	Range	Units	PV Access
	(Drive Run Time)					
AV36 *3	Out Freq in % (Output Freq in %)	003F	-	-	%	R
AV37 *3	Out Freq in RPM (Output Freq in RPM)	003E	-	-	RPM	R
AV38 *3	Torque Iq (U6-01) (Torque IQ (U6-01))	0051	-	-	%	R
AV39 *3 *4 (A1000, FP605)	Drive HOA Status (Drive HOA Status)	07DD	-	-	-	R
AV39 *3 *4 (U1000, P1000, iQpum p1000)	Drive Control Status (Drive Ctrl Status)	07DD	-	-	-	R
AV40 *3	Last Drive Fault (Last Drive Fault)	0081	-	-	-	R
AV41 *3	Not Used AV41 (Not Used AV041)	08F5	-	-	-	R
AV42 *3	Current Sys Fault (Current Sys Flt)	0080	-	-	-	R

*1 Refer to [Accessing Drive Parameters and the Enter Command on page 51](#) for an explanation of how to read and write drive parameters not listed in the analog or binary objects.

*2 Available for option card software versions VST800265 and later.

*3 Available for option card software versions VST800266 and later.

*4 Does not function on iQpump1000 or FP605 drives.

◆ Binary Input Objects

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BI1	Drive Input Terminal 1 (Input Terminal 1)	002B: bit 0	ON	OFF	R
BI2	Drive Input Terminal 2	002B: bit 1	ON	OFF	R

7 BACnet Objects Supported

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
	(Input Terminal 2)				
BI3	Drive Input Terminal 3 (Input Terminal 3)	002B: bit 2	ON	OFF	R
BI4	Drive Input Terminal 4 (Input Terminal 4)	002B: bit 3	ON	OFF	R
BI5	Drive Input Terminal 5 (Input Terminal 5)	002B: bit 4	ON	OFF	R
BI6	Drive Input Terminal 6 (Input Terminal 6)	002B: bit 5	ON	OFF	R
BI7	Drive Input Terminal 7 (Input Terminal 7)	002B: bit 6	ON	OFF	R
BI8	Drive Multi-Function Out 1 (Multi Function Out 1)	0020: bit 5	ON	OFF	R
BI9	Drive Multi-Function Out 2 (Multi Function Out 2)	0020: bit 6	ON	OFF	R
BI10 to BI27 *1	Not Used BI10 (Not Used BI10)	-	-	-	-
BI28 *1	Drive Fault Status (Drive Fault Status)	004B: bit 7	ON	OFF	R
BI29 *1	Drive Alarm Status (Drive Alarm Status)	004B: bit 6	ON	OFF	R
BI30 *1	Not Used BI30 (Not Used BI30)	-	-	-	-

*1 Available for option card software versions VST800266 and later.

◆ Binary Output Objects

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BO1	MF Output M1-M2 (MF Output, M1 - M2)	0009: bit 0	ON	OFF	C
BO2	MF Output M3-M4 (MF Output, M3 - M4)	0009: bit 1	ON	OFF	C
BO3	MF Output M5-M6 (MF Output, M5 - M6)	0009: bit 2	ON	OFF	C
BO4	Ref Sel: PID Setpoint (Ref Sel: PI Setpoint)	000F: bit 1	ON	OFF	C
BO5	Ref Sel: Term S5 IN (Ref Sel: Term S5 In)	0001: bit 8	ON	OFF	C
BO6	Ref Sel: Term S6 IN (Ref Sel: Term S6 In)	0001: bit 9	ON	OFF	C
BO7	Ref Sel: Term S7 IN (Ref Sel: Term S7 In)	0001: bit 10	ON	OFF	C

◆ Binary Value Objects

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BV1	RUN FWD (Run FWD Cmd)	0001: bit 0	RUN	OFF	C
BV2	RUN REV (Run REV Cmd)	0001: bit 1	REV	OFF	C
BV3	EXT FAULT (Ext Fault Cmd)	0001: bit 2	FAULT	OFF	C
BV4	FAULT RESET (Fault Reset Cmd)	0001: bit 3	RESET	OFF	C
BV5	COM NET (Com Net Cmd)	Internal	COM	LOCAL	C

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BV6	COM CNTRL (Com Cntrl Cmd)	Internal	COM	LOCAL	C
BV7	MF Input 3 Cmd (MF Input 3 Cmd)	0001: bit 6	ON	OFF	C
BV8	MF Input 4 Cmd (MF Input 4 Cmd)	0001: bit 7	ON	OFF	C
BV9	MF Input 5 Cmd (MF Input 5 Cmd)	0001: bit 8	ON	OFF	C
BV10	MF Input 6 Cmd (MF Input 6 Cmd)	0001: bit 9	ON	OFF	C
BV11	MF Input 7 Cmd (MF Input 7 Cmd)	0001: bit 10	ON	OFF	C
BV12	Set Fault Contact Cmd (Set Flt Contact Cmd)	0009: bit 6	ENABLE	OFF	C
BV13	RUN-STOP (RUN-STOP)	0020: bit 0	RUN	OFF	R
BV14	REV-FWD (REV-FWD)	0020: bit 1	REV	FWD	R
BV15	READY (READY)	0020: bit 2	READY	OFF	R
BV16	FAULT (FAULT)	0020: bit 3	FAULTED	OFF	R
BV17	Data Set Error (Data Set Error)	0020: bit 4	ERROR	OFF	R
BV18	Overcurrent - Ground Fault (OverCurrent- Gnd Flt)	0021: bit 0	OC-GF	OFF	R
BV19	Main Circuit Overvoltage (Main Ckt OverVoltage)	0021: bit 1	OV	OFF	R
BV20	Drive Overload (Drive OverLoad)	0021: bit 2	OL2	OFF	R
BV21	Drive Overheat (Drive OverHeat)	0021: bit 3	OH1-OH2	OFF	R

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BV22	Fuse Blown (Fuse Blown)	0021: bit 5	PUF	OFF	R
BV23	PID Feedback Loss (PI Feedback Loss)	0021: bit 6	FBL	OFF	R
BV24	External Fault (External Fault)	0021: bit 7	EF0-EF	OFF	R
BV25	Hardware Error (Hardware Error)	0021: bit 8	CPF	OFF	R
BV26	Mtr Ovrld-OvrTorque (Mtr OvrLd-OvrTorque)	0021: bit 9	OL1-OL3	OFF	R
BV27	Overspeed (OverSpeed)	0021: bit 10	OS-DEV	OFF	R
BV28	Main CKT Undervoltage (Main Ckt UndrVoltage)	0021: bit 11	UV	OFF	R
BV29	MCU, Cntl Pwr Sy Err (MCU Cntrl Pwr Sy Err)	0021: bit 12	UV1-2-3	OFF	R
BV30	Output Phase Loss (Output Phase Loss)	0021: bit 13	LF	OFF	R
BV31	Communication Error (Communication Error)	0021: bit 14	CE	OFF	R
BV32	Operator Disconnect (Operator Disconnect)	0021: bit 15	OPR	OFF	R
BV33	Operating (Operating)	002C: bit 0	OPERATING	OFF	R
BV34	Zero Speed (Zero Speed)	002C: bit 1	ON	OFF	R
BV35	Frequency Agree (Frequency Agree)	002C: bit 2	ON	OFF	R
BV36	Desired Frequency Agree (Desired Freq Agree)	002C: bit 3	ON	OFF	R
BV37	Frequency Detect 1 (Frequency Detect 1)	002C: bit 4	ON	OFF	R

7 BACnet Objects Supported

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BV38	Frequency Detect 2 (Frequency Detect 2)	002C: bit 5	ON	OFF	R
BV39	Drive Startup Complete (Drv Startup Complete)	002C: bit 6	ON	OFF	R
BV40	Low Voltage Detect (Low Voltage Detect)	002C: bit 7	ON	OFF	R
BV41	Base Block (Base Block)	002C: bit 8	ON	OFF	R
BV42	Frequency Reference Mode (Frequency Ref Mode)	002C: bit 9	LOCAL	COM	R
BV43	Run Command Mode (Run Command Mode)	002C: bit 10	LOCAL	COM	R
BV44	Overtorque Detect (Over Torque Detect)	002C: bit 11	ON	OFF	R
BV45	Frequency Refer Lost (Frequency Ref Loss)	002C: bit 12	ON	OFF	R
BV46	Retry Error (Retry Error)	002C: bit 13	ON	OFF	R
BV47	Modbus Comms Error (Modbus Comms Error)	002C: bit 14	ON	OFF	R
BV48	Modbus Timeout Error (Modbus Timeout Error)	002C: bit 15	ON	OFF	R
BV49	CRC Error (CRC Error)	003D: bit 0	ON	OFF	R
BV50	Invalid Data Length (Invalid Data Length)	003D: bit 1	ON	OFF	R
BV51	Parity Error (Parity Error)	003D: bit 3	ON	OFF	R
BV52	Overrun Error (Overrun Error)	003D: bit 4	ON	OFF	R
BV53	Framing Error (Framing Error)	003D: bit 5	ON	OFF	R

Object ID	Object Name (Network Display)	Modbus Address (Hex.)	Active Text	Inactive Text	PV Access
BV54	Timeout Error (Timeout Error)	003D: bit 6	ON	OFF	R
BV55 *1 *2	Parameter Accept (Parameter Accept)	Internal	ON	OFF	W
BV56 *1	Parameter Enter (Parameter Enter)	Internal	ON	OFF	W

*1 Refer to *Accessing Drive Parameters and the Enter Command on page 51* for an explanation of how to read and write drive parameters not listed in the analog or binary objects.

*2 Does not function on FP605 drives.

◆ Device Object

The Device Object is the BACnet device to the network in this manual. The Device Object Instance ID and the Device Object Name are configurable. Refer to [Table 7.4](#) for more information.

Table 7.4 Instance ID and Name of the Device Object

Item	Description	Data Type
Device Object Instance ID	A unique internetwork-wide numerical value. To set this ID, set H5-14 [BACnet Device Obj ID LOW BITS] and H5-15 [BACnet Device Obj ID HIGH BITS].	22-bit value Range: 0 - 4, 194, 302
Device Object Name	A unique internetwork-wide character string that is writable from the BACnet network.	20-character strings

Note:

Any changes to the parameter settings and any new string written will not take effect until you de-energize the drive.

8 Accessing Drive Parameters and the Enter Command

◆ Read Drive Parameters

To read the drive parameters that are not listed in the analog or digital objects, use AV29 and AV30 as shown in this procedure:

1. Write the desired Modbus register to AV29 in decimal value.
2. Read the decimal value at the given register from AV30.

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

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

Set AV29 to “649.”

Read AV30 to get the value.

◆ Write Drive Parameters

To write the drive parameters that are not listed in the analog or digital objects, use AV29, AV30, and BV55 or BV56 as shown in this procedure:

1. In AV29, write the desired Modbus register number in decimal format.
2. In AV30, write the value that you want to put into the register set in AV29 in decimal format.

At this point the value is written to the drive, but the location is pending.

If necessary, write in more values this way, the drive will accept these settings by one of two methods:

- 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 *o4-12 [kWh Monitor Initialization]*.

Parameter *o4-12* is located at Modbus register 0512 (Hex.), which is decimal 1298.

Set AV29 to “1298.”

Set AV30 to “1.”

Set BV55 to “ON.”

◆ Enter Command

Enter Commands are only necessary to use AV29 and AV30 to access drive parameters. Enter commands are not necessary to read or write to the other BACnet objects.

This section gives information about the Enter command.

■ Types of Enter Commands

The drive supports two Enter commands shown in [Table 8.1](#).

Table 8.1 Types of Enter Commands

BACnet Object	Modbus Address (Hex.)	Description
BV55 (Write "ON")	0910 (Write 0)	This updates the data on the RAM, but does not write data to the EEPROM. This process saves the parameter changes until you de-energize the drive.
BV56 (Write "ON")	0900 (Write 0)	When you write parameter data to the EEPROM, you will enable the data on the RAM at the same time. This process saves the parameter changes through a power-cycle of the drive

Note:

You can write the EEPROM to the drive a maximum of 100,000 times. Do not frequently execute the Enter command (0900 (Hex.)) that is written to EEPROM. The Enter command registers 0900 (Hex.) and 0910 (Hex.) are write-only. If these registers are read, the register address will not be applicable, but BACnet objects BV55 and BV56 can be read without error.

9 Troubleshooting

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive keypad. *Faults on page 53* lists causes of the errors and possible corrective actions. Refer to the drive Technical Manual for additional error codes that can appear on the drive keypad.

■ Faults

Both *bUS [Option Communication Error]* and *EF0 [Option Card External Fault]* can appear as a fault. When a fault occurs, the digital characters shown on the keypad does not flash but stay lit. The keypad ALM LED also stays lit. When an alarm occurs, the ALM LED flashes.

Note:

Normally, $o2-24 = 2$ [*LED Light Function Selection = Keypad LED Light Disable*] is set as a factory default, so the ALM LED does not light.

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

- Is the option properly installed?
- Is the communication line properly connected to the option? Is it loose?
- Did a momentary power loss interrupt communications?

Code	Name	Causes	Possible Solutions
bUS	Option Communication Error	The drive did not receive a signal from the controller.	<ul style="list-style-type: none"> • Check for wiring errors. • Correct the wiring.
		The communications cable wiring is incorrect.	
		An existing short circuit or communications disconnection	Check disconnected cables and short circuits and repair as needed
		A data error occurred due to electric interference	<ul style="list-style-type: none"> • Prevent noise in the control circuit, main circuit, and ground wiring. • If you identify a magnetic contactor as a source of noise, install a surge absorber to the contactor coil. • 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. • Counteract noise in the master controller (PLC).
		Option is damaged	If there are no problems with the wiring and the error continues to occur, replace the option.
	Connection Time-out	<p>The option cannot pass the MS/TP token to another device on the BACnet MS/TP network (sole master).</p> <ul style="list-style-type: none"> • Make sure that the option MAC ID is set correctly. • Make sure that the <i>bUS</i> fault time parameters are set correctly [<i>F6-04</i> and <i>F7-16</i>]. 	
EF0	Option Card External Fault	The option received an external fault from the controller.	<ol style="list-style-type: none"> 1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input from the controller.
		A programming error occurred on the controller side.	Examine the operation of the controller program.
oFA00	Option Not Compatible with Port	The option connected to connector CN5-A is not compatible.	<p>Connect the option to the correct connector.</p> <ul style="list-style-type: none"> • Use connector CN5-A when you connect the option. <p>To use other options, refer to those option manuals.</p>

Code	Name	Causes	Possible Solutions
oFA01	Option Card Fault (CN5-A)	The option connected to option port CN5-A was changed during run.	<ol style="list-style-type: none"> 1. De-energize the drive. 2. Connect the option to the correct option port.
oFA03, oFA04	Option Card Error (CN5-A)	A fault occurred in the option.	<ol style="list-style-type: none"> 1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.
oFA30 to oFA43	Option Card Connection Error (CN5-A)	A fault occurred in the option.	<ol style="list-style-type: none"> 1. De-energize the drive. 2. Make sure that the option is correctly connected to the connector. 3. If the problem continues, replace the option.
oFb00	Option Not Compatible with Port	The option connected to connector CN5-B is not compatible.	<p>Connect the option to the correct connector.</p> <ul style="list-style-type: none"> • Use connector CN5-A when you connect the option. To use other options, refer to those option manuals.
oFb02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.
oFC00	Option Not Compatible with Port or Option Fault (CN5-C)	The option connected to connector CN5-C is not compatible.	<p>Connect the option to the correct connector.</p> <ul style="list-style-type: none"> • Use connector CN5-A when you connect the option. To use other options, refer to those option manuals.
oFC02	Option Fault	An option of the same type is already installed in option port CN5-A, CN5-B, or CN5-C.	Connect the option to the correct option port.

■ Minor Faults and Alarms

Code	Name	Causes	Possible Solutions
CyPo	Cycle Power to Active Parameters	Comm. Option Parameter Not Upgraded	Re-energize the drive to update the communication option parameters.

◆ Option Compatibility

You can connect a maximum of 3 options at the same time depending on the type of option.

Note:

- You can connect two options to an FP605 drive. Connect the communication option to the CN5-A connector.

- Compatible communication options are different for different models. Refer to the drive manuals for more information.

Table 9.1 Option Compatibility

Option	Connector	Number of Options Possible
PG-B3 *1, PG-X3 *1	CN5-B, C	2 *2
PG-RT3 *1 *3 *4, PG-F3 *1 *3 *4	CN5-C	1
DO-A3, AO-A3	CN5-A, B, and C	1
SI-C3, SI-N3, SI-P3, SI-S3, SI-T3, SI-ET3, SI-ES3, SI-B3, SI-M3, SI-W3 *4, SI-EM3 *4, SI-EN3 *4, SI-EP3, JOHB-SMP3, AI-A3 *5, DI-A3 *5	CN5-A	1

- *1 Not available for FP605 drives.
- *2 To connect two PG options, use the CN5-C and CN5-B connectors. To connect only one PG option, use the CN5-C connector.
- *3 If you use the motor switching function, you cannot use this option.
- *4 Not available for 1000-Series drive models with capacities between 450 and 630 kW (650 to 1000 HP).
- *5 To use AI-A3 and DI-A3 input statuses as monitors, connect the options to CN5-A, CN5-B, or CN5-C.

10 BACnet Protocol Implementation Conformance Statement

Date: 06/01/2016

Vendor Name: Yaskawa

Product Name: AC Motor Controller

Product Model Number: SI-B3

Application Software Version: VST80026x Firmware Revision: 1.8 BACnet Protocol

Revision: 4

Product Description: The Yaskawa SI-B3 BACnet option connects a 1000-series drive to a

standard BACnet MS/TP network. The drive 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

11 Specifications

◆ Specifications

Table 11.1 Option Specifications

Items	Specifications
Model	SI-B3
Interface	MS/TP (Master-Slave/Token-Passing) RS-485
Option Conformance	BTL certified
Connector Type	4-pin removable terminal block
Maximum Number of Drives	128 addresses available per MS/TP network segment. Actual maximum number of units depends on total network transceiver load. Refer to EIA-485 standards for details on network hardware specifications.

Items	Specifications
Protocol	BACnet MS/TP
Communication Speed	1200, 2400, 4800, 9600,19200, 38400, 57600, 76800, 115200 bps
Ambient Temperature	-10 °C - +50 °C (14 °F - +122 °F)
Humidity	Up to 95% RH (no condensation)
Storage Temperature	-20 °C - +60 °C (-4 °F - +140 °F) allowed for short-term transport of the product
Area of Use	Indoors and free from: <ul style="list-style-type: none"> • Oil mist, corrosive gas, flammable gas, and dust • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight • Falling foreign objects
Altitude	Up to 1000 m (3280 ft)

12 Disposal

◆ Disposal Instructions

Correctly dispose of the product and packing material as specified by applicable regional, local, and municipal laws and regulations.

◆ WEEE Directive



The wheeled bin symbol on this product, its manual, or its packaging identifies that you must recycle it at the end of its product life.

You must discard the product at an applicable collection point for electrical and electronic equipment (EEE). Do not discard the product with usual waste.

Revision History

Date of Publication	Revision Number	Section	Revised Content
February 2022	-	-	First Edition This manual is created based on TOEP YEACOM 08.



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

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

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