

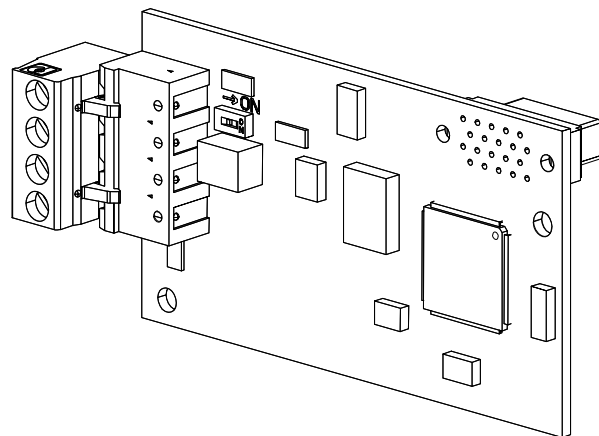
YASKAWA AC Drive Option

Metasys N2 & APOGEE FLN P1

Installation & Technical Manual

Model SI-J3

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

Document	Description
Yaskawa AC Drive Option Metasys N2 & APOGEE FLN P1 SI-J3 Installation and Technical Manual	Read this manual first. The manual provides information about wiring, settings, functions, and troubleshooting. The manual is packaged together with the product.
Yaskawa AC Drive Manuals	Refer to the drive manual to connect with the option. Drive manuals contain basic installation and wiring information in addition to detailed parameter setting, fault diagnostic, and maintenance information. The manuals also include important information about parameter settings and tuning the drive. The Quick Start Guides are packaged with the drive. The most recent versions of these manuals are available for download on our documentation websites: U.S.: http://www.yaskawa.com Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: Check the back cover of these manuals. For questions, contact Yaskawa or a Yaskawa representative.

◆ Glossary

Terms	Definition
Option	YASKAWA AC Drive Option Metasys N2 & APOGEE FLN P1 SI-J3
Keypad	<ul style="list-style-type: none"> • HOA Operator • LCD Operator • LED Operator • HOA Keypad • LCD Keypad • LED Keypad
Hex. (Example: 900 (Hex.))	Identifies a unit for hexadecimal number format.

◆ 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.

⚠ 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 hazard that can cause minor or moderate injuries if you do not prevent it.

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

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.
- Order a replacement from your Yaskawa representative or the nearest Yaskawa sales office if nameplate becomes worn or damaged.

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 Product Overview

The SI-J3 option connects the drive to a Metasys N2 or APOGEE FLN P1 network and facilitates the exchange of data.

This manual explains the handling, installation and specifications of this product. The SI-J3 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 using RS-485 technology and the Metasys N2 or the APOGEE FLN P1 protocol.

Up to 255 drives can communicate on a single network. (Actual maximum number of units depends on total network transceiver load. Refer to EIA-485 standards for details on network hardware specifications).

Applicable Models

The option can be used with the drive models in [Table 2.1](#).

Table 2.1 Applicable Models

Drive	Model	Software Version ^{*1}
P1000	All	VSP908502 and later
iQpump1000	All	VSA908550 and later
iQpump®605	All	VSPA10010 and later

*1 See PRG on the drive nameplate for the software version number.

3 Receiving

Please perform the following tasks once the option is received:

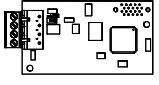


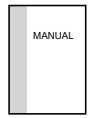
- Make sure that there is no damage to the option and no parts are missing. The Yaskawa warranty does not include damage from shipping. If there is damage to the option or other parts, contact the shipping company immediately.

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. Refer to [Figure 4.1](#) for more information.
- 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

Description	Option PCB PN: UTC00063x	Ground Wire	Screws (M3)	LED Label	Installation								
-				<table border="1"> <tr> <td>NS</td> <td>MS</td> </tr> <tr> <td>TX</td> <td>RX</td> </tr> <tr> <td>MS</td> <td>RX</td> </tr> <tr> <td>NS</td> <td>TX</td> </tr> </table>	NS	MS	TX	RX	MS	RX	NS	TX	
NS	MS												
TX	RX												
MS	RX												
NS	TX												
Quantity	1	1	1	1	1								

◆ Tools Required for Installation

Use the following tools to install the option to the drive:

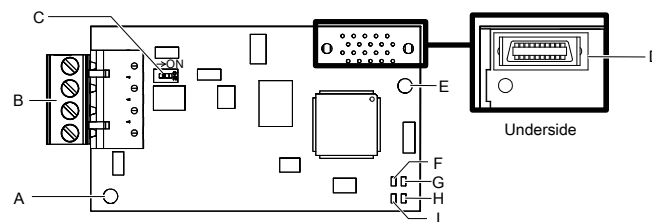
- A Phillips screwdriver or slotted screwdriver (M3 ^{*1})
 - A flat-blade screwdriver (blade depth: 0.4 mm (0.02 in.), width: 2.5 mm (0.1 in.)).
 - A pair of diagonal cutting pliers.
 - A small file or medium-grit sandpaper.
- *1 Phillips screw sizes are different for different drive capacities. Prepare different screwdrivers for different screw sizes.

Note:

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

4 Option Components

◆ SI-J3/Metasys N2 or APOGEE FLN P1 Option



- | | |
|--|--------------|
| A - Ground terminal (FE) and installation hole ^{*1} | F - LED (NS) |
| B - Terminal block TB1 | G - LED (MS) |
| C - Terminating resistor switch S1 | H - LED (RS) |
| D - Connector (CN5) | I - LED (TX) |
| E - Installation hole | |


Figure 4.1 Option (Top View)

*1 Refer to [Option LED Display on page 8](#) for more information about the LEDs.

◆ Terminal Block TB1

Refer to [Table 4.1](#) for details on removable terminal block TB1 terminal descriptions.

Table 4.1 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 bicolor LEDs:

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

Two Network LEDs:

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



A



B

A - 1000-Series

B - iQpump605 *1

*1 LED label has transparent background and white letters. Please make sure that you use the correct label for iQpump605.

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

Table 4.2 Option LED States

LED Name	Display		Operating Status	Description
	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 or Offline	-
	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
TX	-	OFF	No data being sent to the network	This node is not sending any data.
	Green	Flashing	Data is being sent to the network	This node is sending network data.
RX	-	OFF	No data is seen on the network	The option is not physically connected to the network or there is no network activity.
	Green	Flashing	Data is being 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 can take several seconds. After the LEDs complete the diagnostic LED sequence, the option is successfully initialized. The LEDs then assume operational conditions as shown in [Table 4.3](#).

Table 4.3 Power-Up Diagnostic LED Sequence

Sequence	Sequence	Module Status (MS)	Network Status (NS)	Tx	Rx
1	Initial	OFF	OFF	OFF	OFF
2	0.25 seconds	Green	OFF	OFF	OFF
3	0.25 seconds	Red	OFF	OFF	OFF
4	0.25 seconds	OFF	Green	OFF	OFF
5	0.25 seconds	OFF	Red	OFF	OFF
6	0.25 seconds	OFF	OFF	Green	OFF
7	0.25 seconds	OFF	OFF	OFF	Green
8	Run Time	Go to proper state	Go to proper state	Go to proper state	Go to proper state

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
P1000	Procedure A	10
iQpump1000	Procedure A	10
iQpump605	Procedure B	15

◆ Procedure A

This section shows the procedure to install and wire the option on a P1000 or iQpump1000 drive.

■ Prepare the Drive for the Option

Before you install the option on a P1000 or iQpump1000 drive, make sure that the option software version is PRG: 1115 or later.

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.

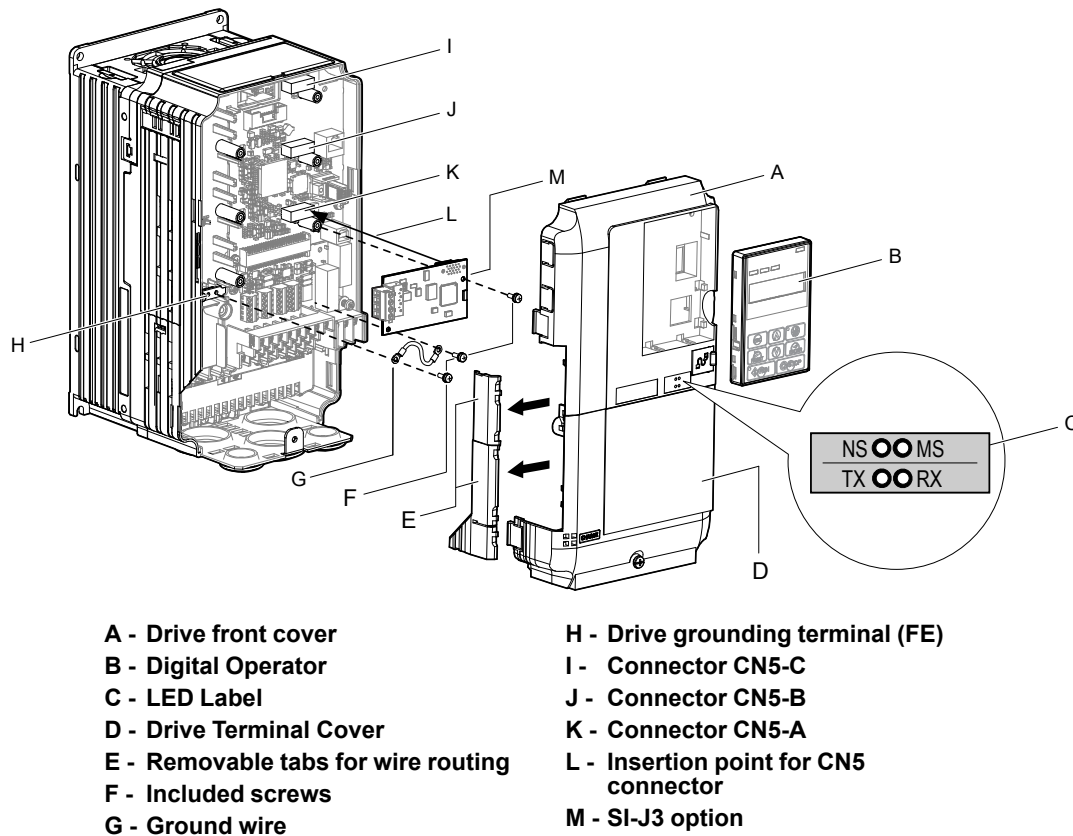


Figure 5.1 Drive Components with Option

■ 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) 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.*

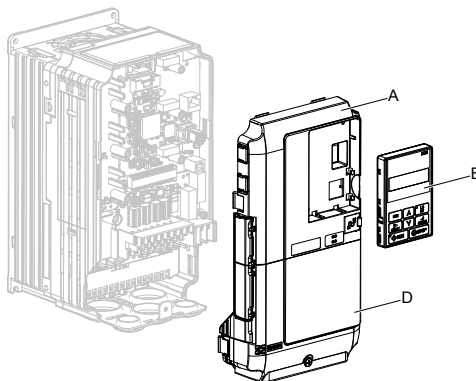


Figure 5.2 Remove the Front Cover and Keypad

2. Put the LED label (C) in the correct position on the drive front cover (A).

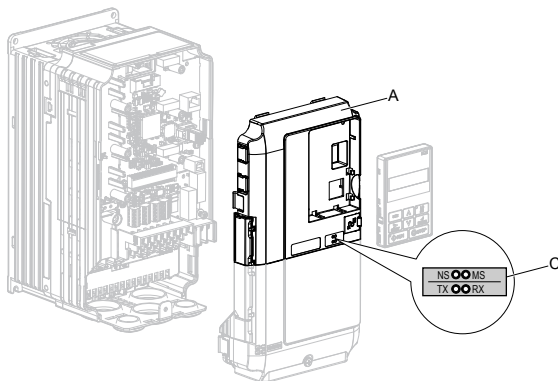


Figure 5.3 Put the LED Label on the Drive Front Cover

3. Insert the option (M) into the CN5-A connector (K) located on the drive and fasten it using one of the included screws (F).

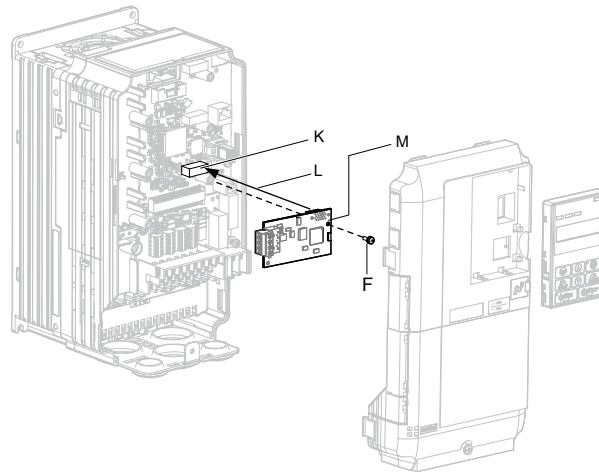
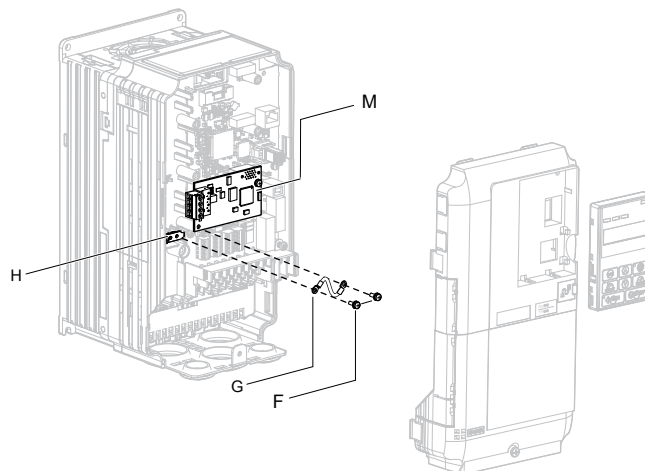


Figure 5.4 Insert the Option

4. Connect the ground wire (G) to the ground terminal (H) using one of the remaining provided screws (F). Connect the other end of the ground wire (G) to the remaining ground terminal and installation hole on the option (M) using the last remaining provided screw (F).
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).



Note:

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

Figure 5.5 Connect the Ground Wire

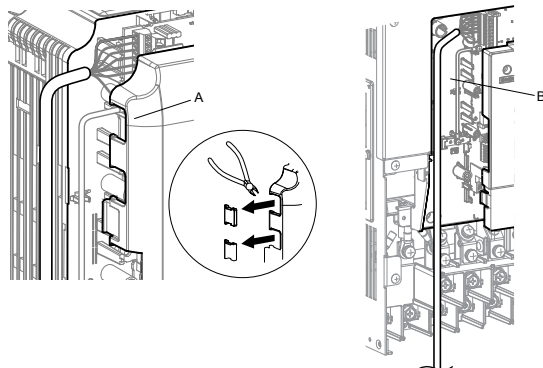
5. Route the option wiring. Depending on the drive model, some drives may require routing the wiring through the side of the front cover to the outside to provide adequate space for the wiring. In these cases, using diagonal cutting pliers, cut out the perforated openings on the left side of the drive 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 5.2](#) to determine the proper wire routing by drive model.

Table 5.2 Communication Wire Routing Selection

Drive	Model	Wire Routing ^{*1}	
		Through Front Cover	Inside Drive
P1000	CIMR-PU2A0004 to 0040; CIMR-PU4A0002 to 0023; CIMR-PU5A0003 to 0011	(A)	-
	CIMR-PU2A0056 and above; CIMR-PU4A0031 and above; CIMR-PU5A0023 and above	-	(B)
iQpump1000	CIMR-PW2A0004 to 0040; CIMR-PW4A0002 to 0023; CIMR-PW5A0003 to 0011	(A)	-
	CIMR-PW2A0056 and above; CIMR-PW4A0031 and above; CIMR-PW5A0023 and above	-	(B)

*1 Refer to [Figure 5.10](#) for examples of the different wire routing techniques.



A – Route wires through the openings provided on the left side of the front cover.

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

Note:

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

Figure 5.6 Wire Routing Examples

6. Connect the network 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.

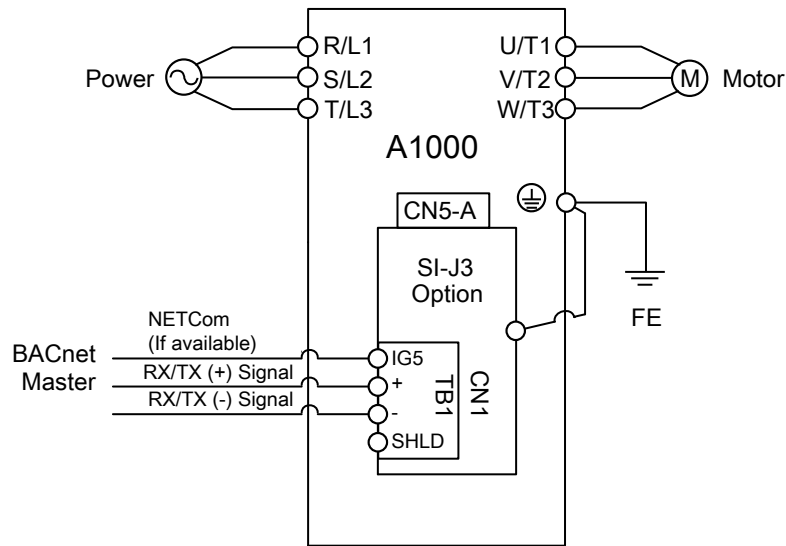


Figure 5.7 Connection Diagram

Figure 5.8 explains the wiring for multiple connections.

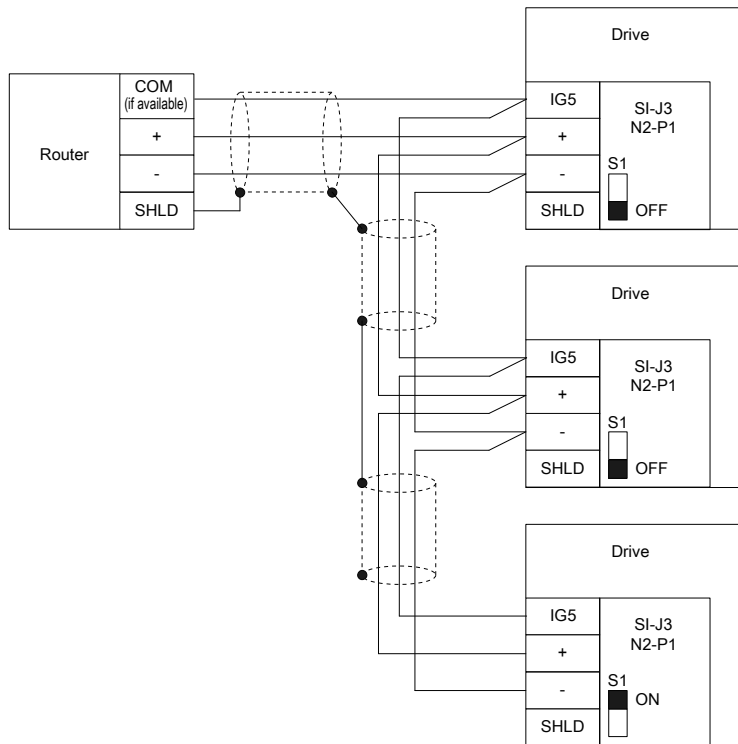


Figure 5.8 Connection Diagram for Multiple Connections

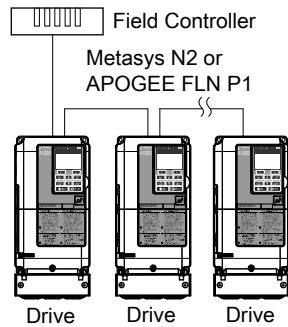


Figure 5.9 Figure 10 System Overview-Connecting Multiple Drives to the Network

The two ends of the network must be terminated with a 120 ohm resistor between the “+” and “-” and signals. The SI-J3 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).

7. Reattach the drive front cover (A,D) and the keypad (B)..

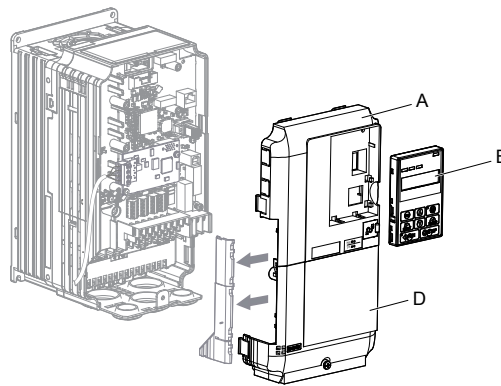


Figure 5.10 Replace the Front Covers and Digital Operator

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.

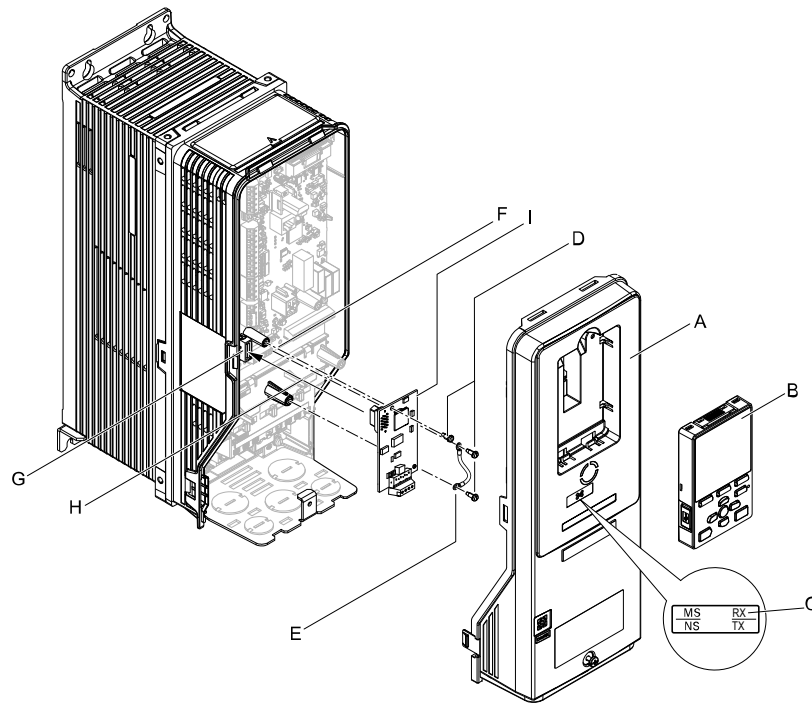
8. Set drive parameters in [Related Drive Parameters on page 22](#) for correct option performance.

◆ Procedure B

This section shows the procedure to install and wire the option on an iQpump605 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 - Drive front cover | F - Drive grounding terminal (FE) |
| B - Keypad | G - Connector CN5-A |
| C - LED label | H - Insertion point for connector CN5-A |
| D - Included screws | I - SI-J3 Option |
| E - Ground wire | |

Figure 5.11 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) and drive 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.*

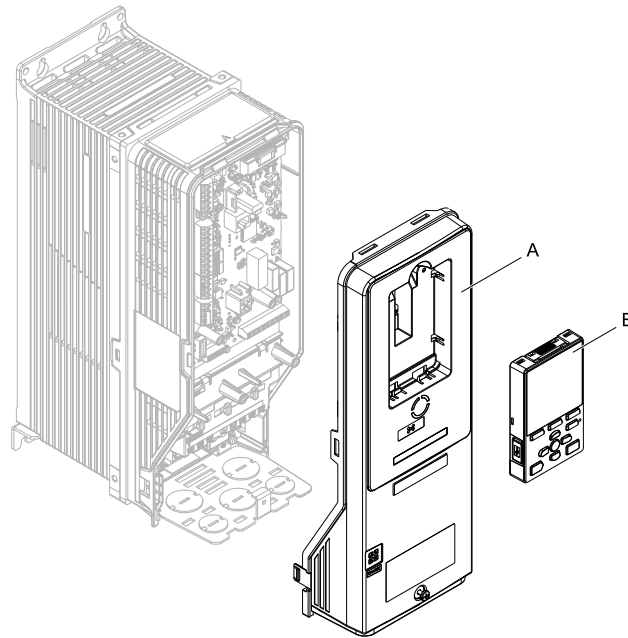


Figure 5.12 Remove the Front Cover and Keypad

2. Put the LED label (C) in the correct position on the drive front cover (A).

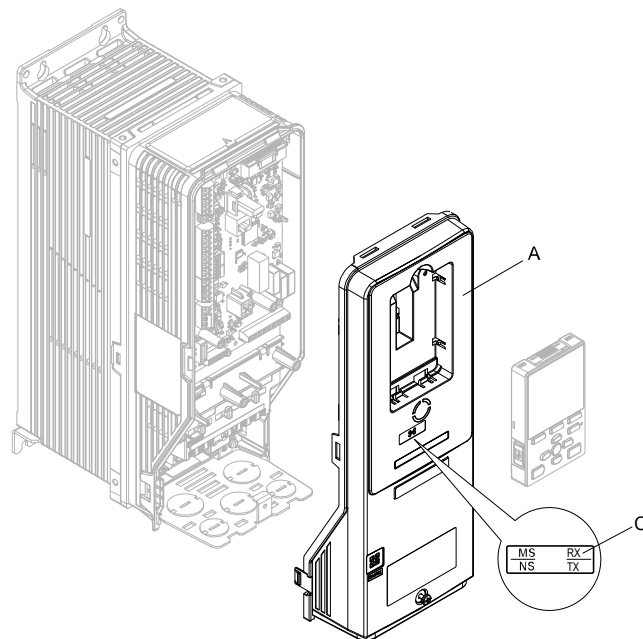


Figure 5.13 Put the LED Label on the Drive Front Cover

Note:

On iQpump605 drive models 2143 to 2396 and 4156 to 4720, attach the LED label after you cut the drive face plate as shown in [Figure 5.14](#).

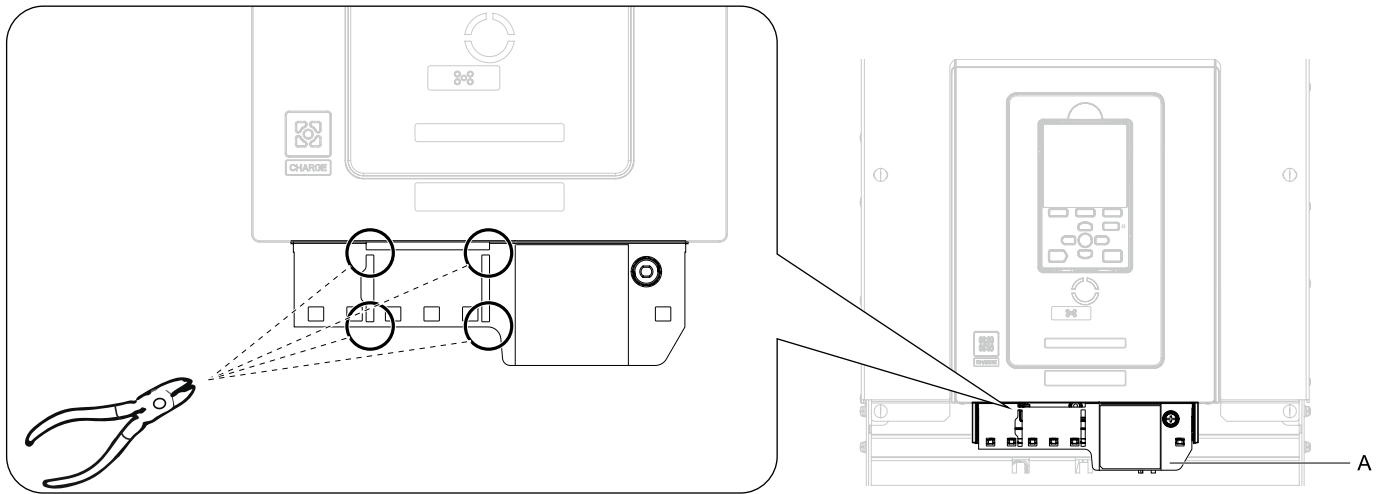


Figure 5.14 Cut the Drive Face Plate on FP605 Models 2143 to 2396 and 4156 to 4720

3. Remove the screw (J) installed in the drive grounding terminal (F).

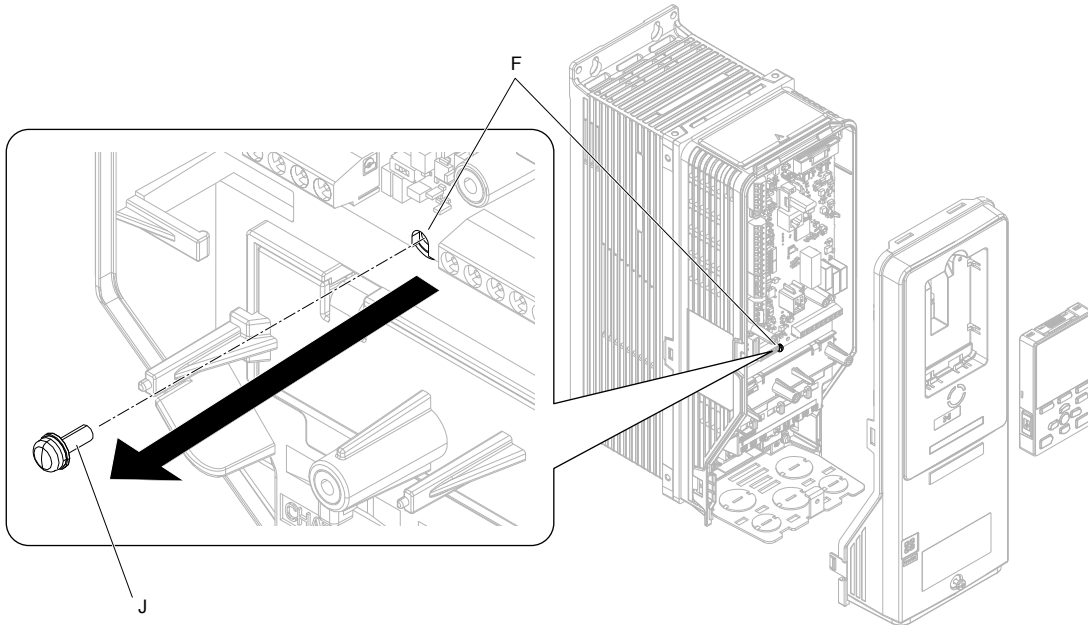


Figure 5.15 Remove the Screw from the Drive Grounding Terminal

4. Use the screw (J) installed in the FE ground terminal of the drive (F) to connect one end of the included ground wire (E) 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 (K).

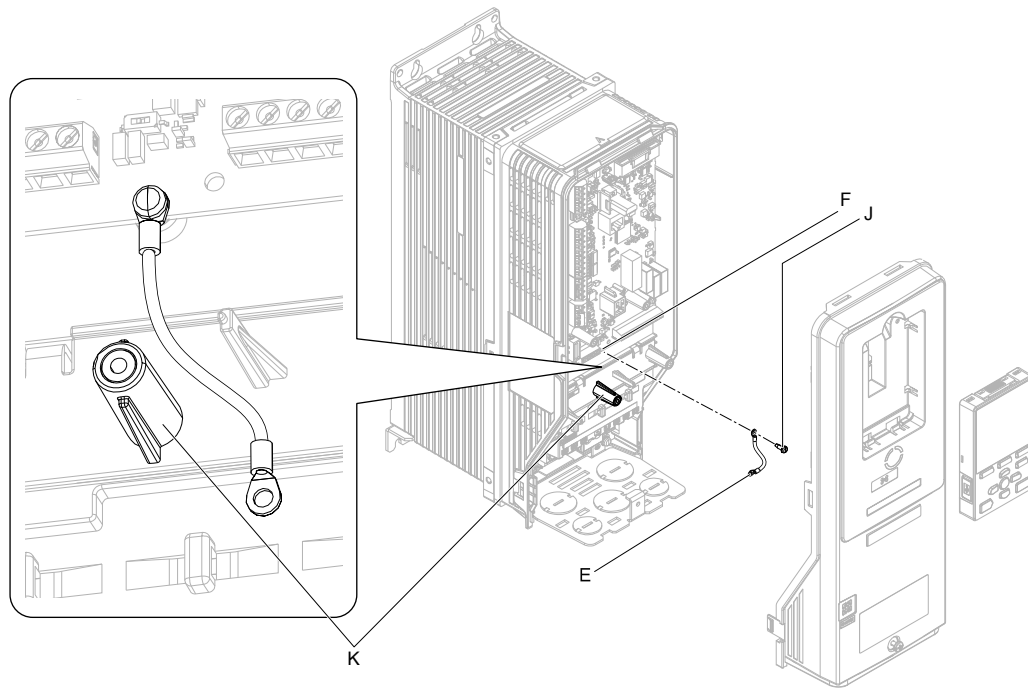


Figure 5.16 Connect the Ground Wire

5. Install the option (I) into the CN5-A connector (G) on the drive and use one of the included screws (D) 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:

1. Only two screws are necessary to install the option on an FP605 drive.
2. The option package contains three screws and one ground wire.

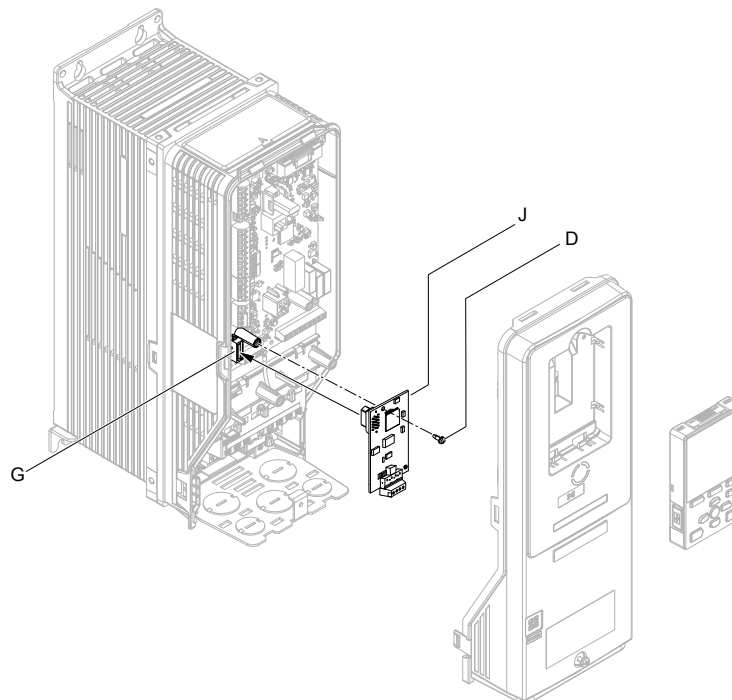


Figure 5.17 Install the Option

6. Use one of the remaining included screws (D) to connect the ground wire (E) 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:

Refer to [Figure 5.18](#) for instructions about crimp terminal (L) orientation and wire routing.

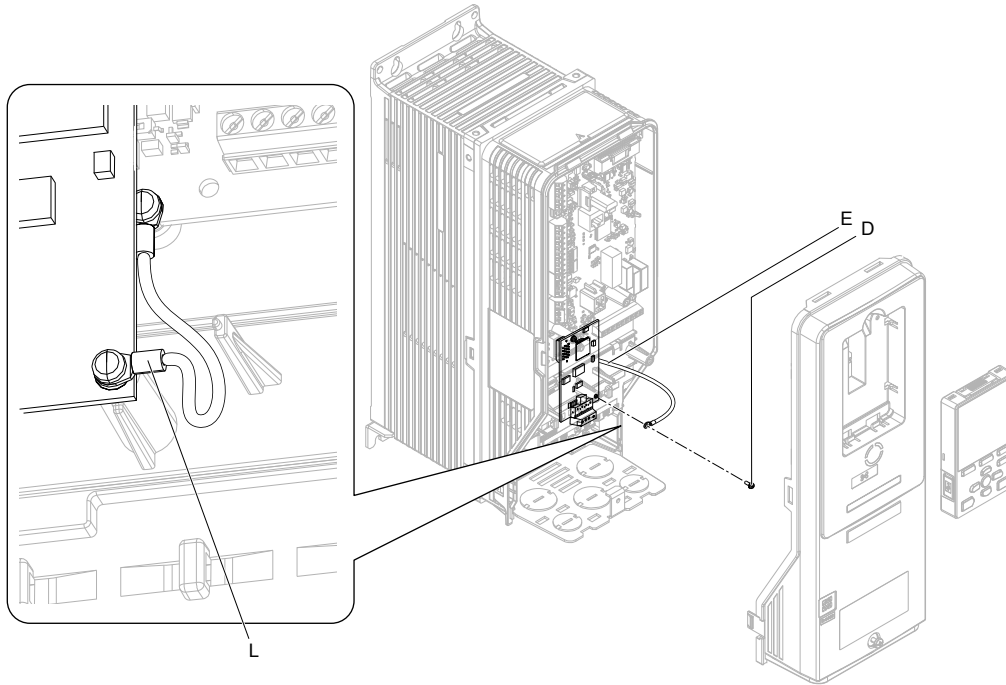


Figure 5.18 Connect the Ground Wire

7. Connect the network communication cables to the option modular connector 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 [Figure 5.19](#) and [Figure 5.20](#) 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.

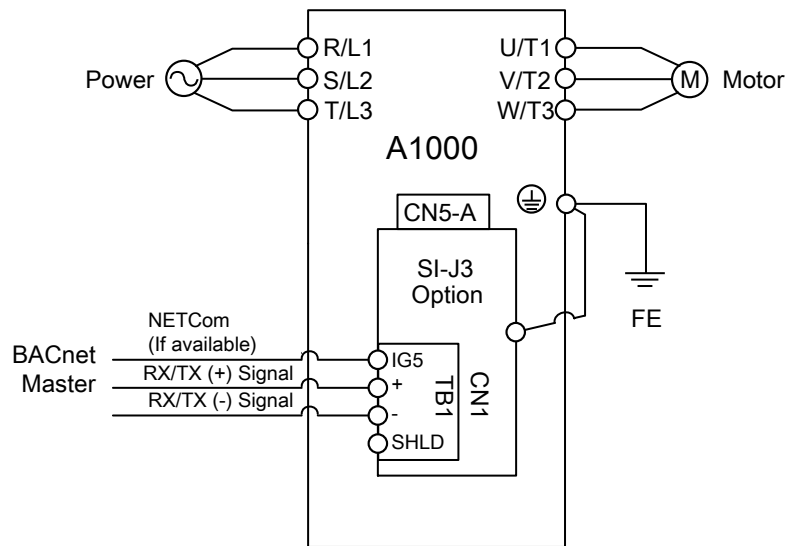


Figure 5.19 Connection Diagram

[Figure 5.20](#) explains the wiring for multiple connections.

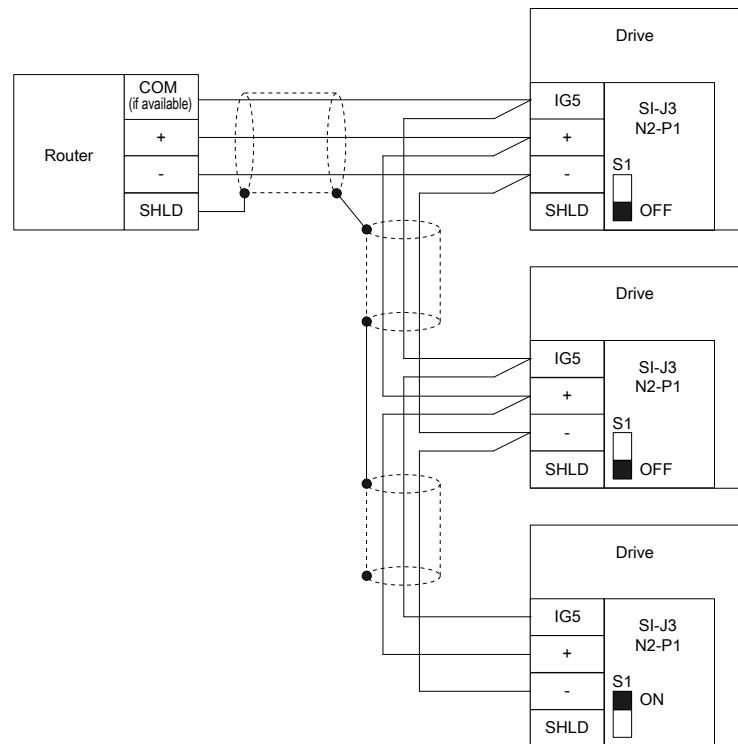
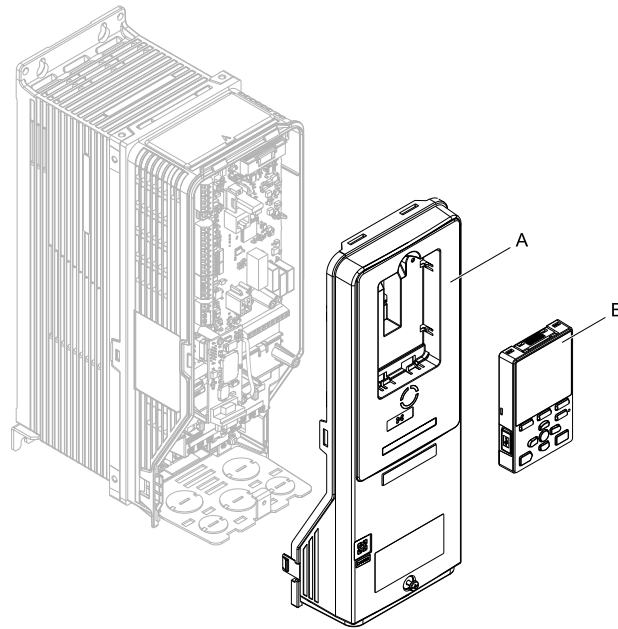


Figure 5.20 Connection Diagram for Multiple Connections

The two ends of the network must be terminated with a 120 ohm resistor between the “+” and “-” and signals. The SI-J3 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).

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 5.21 Replace the Front Cover and Keypad

9. Set drive parameters in [Related Drive Parameters on page 22](#) for correct option performance.

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.	Name	Description	Default (Range)
b1-01	Frequency Reference Selection 1	Selects the input method for frequency reference. 0 : Keypad 1 : Analog Input 2 : Memobus/Modbus Communications 3 : Option PCB 4 : Pulse Train Input	1 (0 - 4) (Set to 3 for Metasys N2 or APOGEE FLN P1)
b1-02	Run Command Selection 1	Sets the input method for the Run command. 0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option PCB	1 (0 - 3) (Set to 3 for Metasys N2 or APOGEE FLN P1)
F6-01 (03A2)	Communication Error Selection	Selects drive response when the drive detects a <i>bUS [Option Communication Error]</i> error during communications with the option. 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 Note: • 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. • Refer to the drive manual to know if settings 4 and 5 are available. • 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.	1 (0 - 5)
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	0 (0, 1)

No.	Name	Description	Default (Range)
		1 : Detected during RUN Only	
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</i> [Option Card External Fault]. 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)
F6-08 (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</i> [Initialize Parameters] 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)
F6-75	P1-N2 Protocol Select	1 : N2 2 : P1	2 (1, 2)
F6-76	P1-N2 Comm Fault Enable	0 : Disabled 1 : Enabled	1 (0, 1)
F6-77 (03A4)	P1-N2 Comm Fault Time	Seconds before declaring Comm Fault.	2.0 (0.0 to 10.0 sec.)
F6-78 (03A4)	P1-N2 Node Address	Network Node Address	1 (0 to 255)
F6-79 (03A4)	P1 Baud Rate Select	2 : 4800 3 : 9600 Note: N2 will always be set at 9600 Baud Rate.	3 (2, 3)
U6-98 (07F8)	First Fault	Shows first option fault. 0 : No Fault 1 : Option Failure 2 : PLC in Idle State 3 : Force Fault 1000 : Network Power Loss 1001 : Connection Timeout 1002 : Duplicate MAC ID 1003 : Bus-off	-
U6-99 (07F9)	Current Fault	Shows current option fault. 0 : No Fault 1 : Option Failure 2 : PLC in Idle State 3 : Force Fault 1000 : Network Power Loss 1001 : Connection Timeout 1002 : Duplicate MAC ID 1003 : Bus-off	-

7 Network Drive Operations

The drive operations that can be performed by Metasys N2 or APOGEE FLN P1 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 network 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 Sx and from network communications are both linked by a logical OR operation.

◆ Controlling the Drive

Select an external reference and adjust the parameters in [Table 7.1](#) accordingly to start and stop the drive or set the frequency reference using Metasys N2 or APOGEE FLN P1 communications.

Table 7.1 Setting Parameters for Drive Control from Metasys N2 or APOGEE FLN P1

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

8 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. Similarly, 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 8.1](#).

Table 8.1 Minimum Wait Time for Sending Messages

Example	Parameter
<ul style="list-style-type: none"> • Control command (Run, Stop) Write parameters • Set inputs/outputs • Read monitors and parameter values 	5 ms

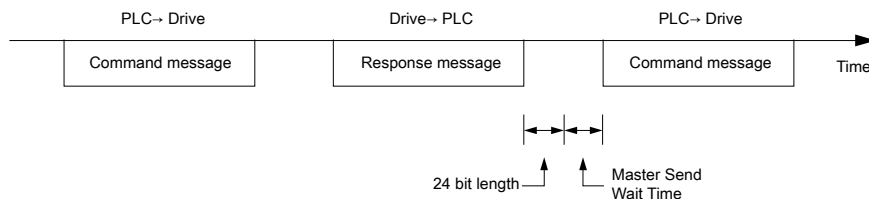


Figure 8.1 Minimum Wait Time for Sending Messages

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

◆ Response Messages from Drive to Master

The drive will process the data received and wait at least 5 ms before it responds if the drive receives a command from the master.

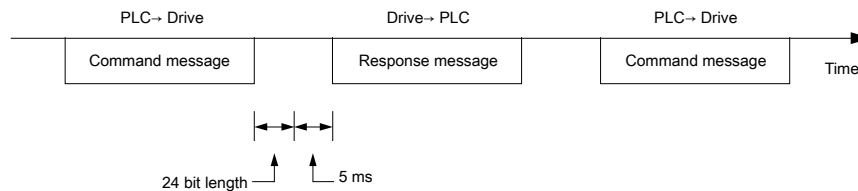


Figure 8.2 Minimum Wait Time for Sending Messages

9 Metasys N2 Communications

◆ Drive Functions

Each of the following functions must be enabled during start-up of the drive:

■ Start and Stop the Drive

Set the Run Forward Command (BO 1) to run the drive in the forward direction. Set the Run Reverse Command (BO 2) to run the drive in the reverse direction. Run/Stop Monitor (BI 1) shows the current run status of the drive. Forward/Reverse Monitor (BI 2) shows the current direction.

NOTICE *Damage to Equipment. Improper drive direction may damage HVAC equipment if parameter b1-04, Reverse Enable, is set to 0 (Enable). Confirm proper motor rotation prior to connecting the load to the motor.*

■ Lock the Drive Panel

Locking the panel prevents the user from using the LOCAL/REMOTE and STOP keys locally at the drive panel. Panel Lock (BO 10) can be commanded to lock and unlock the panel.

■ Digital Inputs

Multi-Function Input S3 (BO 5) through Multi-Function Input S7 (BO 9) are physical digital inputs on the drive. They can be set either by external devices, such as limit or pressure switches, or by the network. Their function depends on how the drive has been programmed. Refer to the drive manual section on Multi-Function Inputs (H1-03 through H1-07) for detailed information on the use and programming of the multi-function inputs. The multi-function input status can be monitored through Multi-Function Input 1 Monitor (BI 14) through Multi-Function Input 5 Monitor (BI 19). The multi-function inputs can be set by both external devices or over the network.

Note:

The multi-function inputs can be set by both external devices or over the network. Use caution when connecting the multi-function inputs to external devices to ensure correct system operation.

■ Loop Gain

PI Proportional Gain (AO 4) and PI Integral Time (AO 5) are the gain and integral time parameters used by the drive. The PI loop is structured differently than the Metasys loop. Refer to the drive manual section on PID for information on how the PI loop functions.

■ Reading and Resetting Faults

The Fault Monitor (BI 4) and Drive Ready Monitor (BI 3) show the current status of the drive. The Fault Code (AI 10) contains the code for the most current fault. The LST Fault Code (AI 19) contains the code for the previous fault. Refer to Drive Fault Trace Register Contents *on page 51* for the purpose of interpreting fault codes. The drive faults can be reset through the Fault Reset Command (BO 4). The Fault Reset Command is only available when the Run Forward Command and the Run Reverse Command are both OFF.

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

◆ Metasys N2 Point Database

This section describes the Metasys N2 point database. This database features logical points:

- Analog Inputs (AI)
- Analog Outputs (AO)
- Binary Inputs (BI)
- Binary Outputs (BO)

These points configure, control, and monitor the operation of the drive.

■ Metasys N2 Analog Input (AI) Summary

Table 9.1 Metasys N2 Analog Input Summary (SI-J3 to Metasys N2)

Object ID	Object Name	Units	Yaskawa Drive Parameter
AI 1	Speed Reference	0.01 Hz	U1-01
AI 2	Output Sped	0.01 Hz	U1-02
AI 3	Output Current	0.01 A	U1-03
AI 4	kWatt Hour Meter	kWh	U4-10
AI 5	Output Power	0.01 kWh	U1-08
AI 6	Drive Temperature	1 °C	U4-08
AI 7	PI Feedback	0.01%	U5-01
AI 8	AC Output Voltage	0.1 Vac	U1-06
AI 9	DC Bus Voltage	1 Vdc	U1-07
AI 10	Fault Code	-	U2-01
AI 11	Elapsed Time - Hours	1 hour	U4-01
AI 12	Elapsed Time - 10K Hours	10K hours	U4-01
AI 13	MWatt Hour meter	MWh	U4-11
AI 14	Drive Rated Current	A	n9-01
AI 15	Communication Error Code	-	-
AI 16	PI Deviation	0.01%	U5-02
AI 17	PI Output Capacity	0.01%	U5-03
AI 18	PI Reference	0.01%	U5-04
AI 19	Last Fault Code	-	U2-02
AI 20	Freq Ref @ Fault	0.01 Hz	U2-03
AI 21	Output Freq @ Fault	0.01 Hz	U2-04
AI 22	Output Current @ Fault	0.1 A	U2-05
AI 23	Out Volt Ref @ Fault	0.1 Vac	U2-07
AI 24	DC Bus Volts @ Fault	1 Vdc	U2-08
AI 25	Output Power @ Fault	0.1 kW	U2-09
AI 26	Input Term Status @ Fault	-	U2-11
AI 27	Output Term Status @ Fault	-	U2-12
AI 28	Operation Status @ Fault	-	U2-13
AI 29	Elapsed Operation Time @ Fault	1 hour	U2-14
AI 30	Most Recent Fault	-	U3-01
AI 31	2nd Most Recent Fault	-	U3-02
AI 32	3rd Most Recent Fault	-	U3-03
AI 33	4th Most Recent Fault	-	U3-04
AI 34	Elapsed Time @ Current Fault	1 hour	U3-11
AI 35	Elapsed Time @ 2nd Fault	1 hour	U3-12
AI 36	Elapsed Time @ 3rd Fault	1 hour	U3-13

Object ID	Object Name	Units	Yaskawa Drive Parameter
AI 37	Elapsed Time @ 4th Fault	1 hour	U3-14
AI 38	Read Parameter Data	-	-

■ Metasys N2 Analog Output (AO) Summary

Table 9.2 Metasys N2 Analog Output Summary (Metasys N2 to SI-J3)

Object ID	Object Name	Units	Default Value	Yaskawa Drive Parameter
AO 1	Speed Command	0.01 Hz	-	-
AO 2	Acceleration Time	seconds	30.0	C1-01
AO 3	Deceleration Time	seconds	30.0	C1-02
AO 4	PI Proportional Gain	-	2.00	b5-02
AO 5	PI Integral Time	seconds	5.0	b5-03
AO 6	Stall Prevention Level – Run	%	120	L3-06
AO 7	Stall Prevention Level – Accel	%	120	L3-02
AO 8	Reference Operation Mode Select	-	1	b1-01
AO 9	Run Operation Mode Select	-	1	b1-02
AO 10	PI Mode Select	-	0	b5-01
AO 11	Frequency Command Upper Limit	% of Max	100.0	d2-01
AO 12	Frequency Command Lower Limit	% of Max	0.0	d2-02
AO 13	Motor Rated Current	A	Motor model dependent	E2-01
AO 14	Jump Frequency 1	0.1 Hz	2.0	d3-01
AO 15	Jump Frequency 2	0.1 Hz	0.00	d3-02
AO 16	Jump Frequency 3	0.01 Hz	0.0	d3-03
AO 17	Jump Frequency Bandwidth	0.1 Hz	1.00 Hz	d3-04
AO 18	Number of Auto Restarts	-	0	L5-01
AO 19	Operator Display Mode	-	0	o1-03
AO 20	Power Loss Ride-Thru	seconds	Drive model dependent	L2-02
AO 21	Cable Loss Timeout	seconds	2.0	F6-77
AO 22	Cable Loss Speed	0.1 Hz	0.00	d1-04
AO 23	PI Integral Limit	0.1%	100.0	b5-04
AO 24	PI Upper Limit Value	0.1	100.0	b5-06
AO 25	PI Offset Adjustment	0.1	0.0	b5-07
AO 26	PI Primary Delay Time	0.01	0.00	b5-08
AO 27	PI Feedback Reference Missing Detection Select	1	0	b5-12
AO 28	PI Feedback Reference Missing Detection Level	1%	0	b5-13
AO 29	PI Feedback Reference Missing Detection Time	0.1 s	1.0	b5-14
AO 30	Read Parameter Number	-	-	-
AO 31	Write Parameter Number	-	-	-
AO 32	Write Parameter Data	-	-	-

■ Metasys N2 Binary Input (BI) Summary

Table 9.3 Metasys N2 Binary Input Summary (SI-J3 to Metasys N2)

Object ID	Object Name	Default	OFF (0) State	ON (1) State
BI 1	Run/Stop Monitor	0	Stopped	Running
BI 2	Forward/Reverse Monitor	0	Forward	Reverse
BI 3	Drive Ready Monitor	0	Not Ready	Ready
BI 4	Fault Monitor	0	Not Faulted	Faulted
BI 5	Zero Speed	0	Not Zero Speed	Zero Speed
BI 6	Speed Agree	0	Not Speed Agree	Speed Agree
BI 7	Minor Fault	0	No Minor Fault	Minor Fault
BI 8	Major Fault	0	No Major Fault	Major Fault
BI 9	Drive Communication Error Monitor	0	No Error	Error
BI 10	Multi-Function Output 1 (H2-01)	0	OFF	ON
BI 11	Multi-Function Output 1 (H2-02)	0	OFF	ON
BI 12	Multi-Function Output 1 (H2-03)	0	OFF	ON
BI 13	Safety Interlock Monitor	0	Safety Clear Terminal 3 Closed	Safety Clear Terminal 3 Open
BI 14	HAND/AUTO Reference Monitor	0	AUTO or OFF	HAND
BI 15	Multi-Function Input S3 Monitor	0	OFF	ON
BI 16	Multi-Function Input S4 Monitor	0	OFF	ON
BI 17	Multi-Function Input S5 Monitor	0	OFF	ON
BI 18	Multi-Function Input S6 Monitor	0	OFF	ON
BI 19	Multi-Function Input S7 Monitor	0	OFF	ON

■ Metasys N2 Binary Output (BO) Summary

Table 9.4 Metasys N2 Binary Output Summary (SI-J3 to Metasys N2)

Object ID	Object Name	Default	OFF (0) State	ON (1) State
BO 1	Run Forward Command	0	Stop	Forward
BO 2	Run Reverse Command	0	Stop	Reverse
BO 3	Serial Fault (EF0) Command	0	No Fault	Fault
BO 4	Fault Reset Command	0	No Reset	Reset
BO 5	Multi-Function Input S3 (H1-03)	0	Off	On
BO 6	Multi-Function Input S4 (H1-04)	0	Off	On
BO 7	Multi-Function Input S5 (H1-05)	0	Off	On
BO 8	Multi-Function Input S6 (H1-06)	0	Off	On
BO 9	Multi-Function Input S7 (H1-07)	0	Off	On
BO 10	Panel Lock	0	LOCAL/REMOTE and Stop/Reset Keys Enabled	LOCAL/REMOTE and Stop/Reset Keys Disabled
BO 11	Communication Fault Enable	0	BUS Fault Not Activated if Cable Loss Occurs	BUS Fault Activated if Cable Loss Occurs

◆ Metasys N2 Cable Loss Configuration and Behavior

This section describes the configurable cable loss feature of the drive. This feature offers a user maximum flexibility in determining drive response to a loss of communication.

■ Drive Behavior at Loss of Communication

The drive can be configured to respond to an interval without receipt of a message in one of the following methods:

- Continue at last speed
- Continue at last speed with alarm
- Continue at preset speed
- Ramp to Stop with EF0 fault
- Coast to Stop with EF0 fault
- Emergency Stop with EF0 fault

■ Metasys N2 I/O

Three Metasys N2 outputs are used to select the desired behavior:

- AO 21 - Cable Loss Timeout
- AO 22 - Cable Loss Speed
- BO 11 - Communication Fault

Table 9.5 Metasys N2 Binary Input Summary (SI-J3 to Metasys N2)

Behavior	F6-01	Cable Loss Timeout (AO 21)	Cable Loss Speed (AO 22)	Communication Fault Enable (BO 11)
Decelerate to stop (stop time in C1-02) BUS fault	0	Timeout Interval	X	On
Coast to stop BUS fault	1	Timeout Interval	X	On
Emergency stop (stop time in C1-09) BUS fault	2	Timeout Interval	X	On
Continue at last speed with alarm	3	0	X	Reset
Alarm and run at d1-04 speed	4	Timeout Interval	Preset Speed	On
Alarm and ramp to stop (C1-02) ^{*1}	5	Timeout Interval	X	On

*1 While the drive will ramp to stop when set to this selection, the drive will resume running when the alarm or BUS fault condition is removed.

Note:

1. Communication must first be established and then lost for these features to function as described. A communications timeout does not occur if a drive is powered-up without a cable connected or with the master controller offline.
2. A run command must have been issued (BO 1=ON or BO 2=ON) prior to loss of communications for modes that describe the drive running after a communications timeout. The drive will not automatically restart from a stopped condition for safety purposes. Additional external wiring is required (consult factory) if a user requires the drive to restart automatically.

A BUS fault will be declared and will remain until communication is restored upon expiration of the communications timeout interval.

■ Continue at Last Speed

Cable Loss Timeout (AO 21) is set to 0, disabling the cable loss feature in this mode. The other two settings Cable Loss Speed (AO 22) and Communication Fault Enable (BO 11) are ignored. The drive simply maintains its last commanded state if communication is lost. The drive will not display an alarm or fault to indicate it has lost communication. This behavior can also be achieved by setting parameter F6-01 to 3. The drive will display an alarm and continue running. The Communication Fault Enable (BO 11) must be enabled and Cable Loss Timeout (AO 21) should be set to a value other than 0 for this specific condition.

■ Continue at Preset Speed

Cable Loss Timeout (AO 21) is set to the desired interval, Cable Loss Speed (AO 22) is set to the desired preset speed and F6-01 is set to 4 in this mode. The drive speed command (AO 1) is set to the Cable Loss Speed (AO 22) and the drive continues running at this new speed if the time between messages exceeds the timeout interval. Communication Fault Enable (BO 11) must be set to ON.

■ Stop with Fault (BUS)

Communication Fault Enable (BO 11) must be set to ON. Cable Loss Timeout (AO 21) is set to the desired interval and parameter F6-01 is set to a value of 0,1 or 2 in this mode. If the time between messages exceeds the timeout

interval, the drive will declare a BUS fault and the drive speed command (AO 1) will be set to 0. The stopping method is determined by the setting of F6-01.

- F6-01=0 selects Ramp to Stop. The deceleration time or the slope of the ramp is determined by the setting of drive parameter C1-02.
- F6-01=1 selects Coast to Stop. The drive does not attempt to control the rate of deceleration.
- F6-01=2 selects Emergency or Fast Stop. The deceleration time is determined by the setting of drive parameter C1-09.

Note:

The behavior of the drive at cable loss is controlled by parameter F6-01. This drive parameter works with the points as described in the table above to determine how the drive will respond to a cable loss. The drive will continue in its last state if the cable loss fault is disabled. The drive will continue to run at the last commanded frequency if running.

◆ Metasys N2 Mailbox Function

■ Reading Drive Parameters

Two points are defined for reading drive parameters:

- AO 30 - Specifies the parameter to be read from the drive.
- AI 38 - Reports the value of the parameter specified in AO 30.

The mailbox retrieves data from the parameter and sends it to the controller when this point is read.

Example: Writing a value of 387 (183 hex) to AO 30 specifies drive parameter b1-04. Reading AI 38 returns the current setting of parameter b1-04 to the controller.

■ Writing Drive Parameters

Two points are defined for writing drive parameters:

- AO 31 - Specifies the parameter to be written to.
- AO 32 - Entry location of the value to be written to the parameter specified in AO 31. The mailbox will write the value to the drive when this point is written. An ENTER or ACCEPT command does not need to be sent for the data to be taken by the drive. The behavior of the write is the same as with the digital operator. There are a limited number of drive parameters that can be written to when the drive is running.

Example: Writing a value of 387 (183 hex) to AO 31 specifies drive parameter b1-04. Writing a value of 1 to AO 32 sets b1-04 to 1 and enables the drive for reverse run.

10 APOGEE FLN P1 Communications

◆ Slope and Intercept Conversion

Several drive parameters are available for monitoring purposes. The available parameters include FREQUENCY OUTPUT (Point 3), SPEED (Point 5), CURRENT (Point 6), TORQUE (Point 7), POWER (Point 8), DRIVE TEMP (Point 9), KWH (Point 10), and RUN TIME (Point 12). These points can be unbundled for monitoring or used in various global control strategies.

◆ Drive Controlled Feedback

The most typical application is Supervisory Control. The sensor for the control variable (e.g., water temperature) is hard-wired to the drive and the control device (fan) is modulated using the PI control loop built into the drive. The setpoint for the control variable (water temperature set point) is unbundled and commanded by the field panel, based on the building control strategy implemented in PPCL.

The point to unbundle and command for the set point is INPUT REF 1 (Point 60) when this strategy is used. The control variable (e.g., water temperature) can be monitored by unbundling PI FEEDBACK (Point 62). These points are provided in units of percent, where 0% and 100% correspond to the range of the sensor being used to measure the control variable. These points have default units in Hz. Unbundle these points with appropriate slopes and intercepts if other units are required. The new intercept will be equal to the lowest value of the desired range. The following formulas allow the user to define a new slope and intercept to convert the unit.

The following formulas allow the user to define a new slope and intercept to convert the unit.

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{(\text{Range of Existing Point})}$$

$$\text{New Slope} = \frac{(60 - 0) \text{ Hz} \times (0.01)}{(100 - 0)\%} = 0.006$$

■ Conversion Example

The most typical application is Supervisory Control. The sensor for the control variable (e.g., water temperature) is hard-wired to the drive and the control device (fan) is modulated using the PI control loop built into the drive. The setpoint for the control variable (water temperature set point) is unbundled and commanded by the field panel, based on the building control strategy implemented in PPCL.

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{(\text{Range of Existing Point})}$$

$$\text{New Slope} = \frac{(60 - 0) \text{ Hz} \times (0.01)}{(100 - 0)\%} = 0.006$$

Note:

1. Desired Range=Range Maximum - Range Minimum
2. Range of Existing Point=Existing Range Maximum - Existing Range Minimum

◆ Field Panel Controlled Feedback

The sensor is connected to the APOGEE FLN network at a remote location and the control loop is executed in PPCL using this strategy. The drive speed command is passed from the field panel to the drive by commanding INPUT REF 1 (Point 60).

NOTICE *Damage to Equipment. Avoid using this strategy. This strategy is not recommended because it means that the loop is being closed over the network. Delays due to processor scan time and network traffic can cause control to be degraded or lost and damage to HVAC equipment may result.*

■ Unbundle the Feedback

Unbundling the feedback (PI FEEDBACK) for monitoring in degrees Fahrenheit:

New Intercept = 30

$$\text{New Slope} = \frac{(\text{Desired Range}) \times (\text{Slope of Existing Point})}{(\text{Range of Existing Point})}$$

$$\text{New Slope} = \frac{(250 - 30) \text{ }^\circ\text{F} \times (0.1)}{(100 - 0)\%} = 0.22$$

Note:

1. Desired Range=Range Maximum - Range Minimum
2. Range of Existing Point=Existing Range Maximum - Existing Range Minimum

◆ Other Functionalities

Enable the following functions during start-up of the drive:

■ Enable the Drive to Run

RUN ENABLE (Point 35) can be commanded to require the drive to have a physical input (Terminal S3) set before the drive can run. This works in conjunction with CMD RUN.STOP (Point 24) or the CMD REV.STOP (Point 22). If RUN ENABLE (Point 35) is commanded ON then terminal S3 needs to be on and CMD RUN.STOP (Point 24) or CMD REV.STOP (Point 22) needs to be commanded ON for the drive to run. New Intercept = 30

Alternately, RUN ENABLE (Point 35) is commanded OFF, then to run the drive CMD RUN.STOP (Point 24) or CMD REV.STOP (Point 22) is the only point that needs to be commanded ON.

■ Start and Stop the Drive

CMD RUN.STOP (Point 24) can be commanded to run the drive in the forward direction.

STOP.RUN (Point 23) shows the current status of the drive.

■ Change Directions

CMD REV.STOP (Point 22) can be commanded to run the drive in the reverse direction.

FWD.REV (Point 21) shows the current direction of the drive rotation.

NOTICE *Damage to Equipment. Improper drive direction may damage HVAC equipment if parameter b1-04, Reverse Enable, is improperly set (b1-04=0). Confirm proper motor rotation prior to connecting the load to the motor.*

■ Lock the Drive Panel

Locking the panel prevents the user from using the LOCAL/REMOTE and STOP keys locally at the drive panel. LOCK PANEL (Point 33) can be commanded to lock and unlock the panel.

■ Digital Outputs

MULTI OUT 1 (Point 40), MULTI OUT 2 (Point 41), and MULTI OUT 3 (Point 42) are physical digital outputs on the drive. Their purpose depends on how the drive has been setup. The drive can be programmed so that these points can display various limits, warnings, and status conditions. Some examples include frequency limit, over current, and motor over temperature fault.

■ Loop Gain

PID P GAIN (Point 63) and PID I TIME (Point 64) are the gain and integral time parameters similar to the P and I gains in the APOGEE FLN Terminal Equipment Controllers. The PI loop of the drive is structured differently than the Siemens loop, so there is not a one-to-one correspondence between the gains.

■ Reading and Resetting Faults

OK.FAULT (Point 93) shows the current status of the drive. FAULT CODE (Point 17) contains the code for the most current fault. LST FLT CODE (Point 66) contains the code for the previous fault. Refer to APOGEE FLN P1 Application 2721 Point Number Summary *on page 39* for descriptions of the fault codes. The drive can be reset back to OK mode by commanding RESET FAULT (Point 94) to RESET. The RESET FAULT command is only available when the CMD RUN.STOP (Point 24) and CMD REV.STOP (Point 22) are both STOP.

◆ APOGEE FLN Point Database

This section shows the APOGEE FLN point database for Application 2721.

■ APOGEE FLN Point List Summary

This database is for APOGEE FLN Application 2721 and features logical points: Logical Analog Inputs (LAI), Logical Analog Outputs (LAO), Logical Digital Inputs (LDI) and Logical Digital Outputs (LDO). These points configure, control or monitor the operation of the drive.

Information to consider when referencing this table:

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in bold type (e.g. **03**) can be unbundled at the field panel.

Table 10.1 APOGEE FLN P1 Application 2721 Point Number Summary

Point No.	Point Type	Point Name	Factory Default (SI Units)	Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Parameter
01	LAO	CTRL ADDRESS	31	-	1	0	-	-	F6-78
02	LAO	APPLICATION	-	-	1	0	-	-	-
03	LAI	FREQ OUTPUT	0	Hz	0.01	0	-	-	U1-02
04	LAI	PCT OUTPUT	0	%	0.01	0	-	-	-
05	LAI	SPEED	0	RPM	1	0	-	-	-
06	LAI	CURRENT	0	A	0.01	0	-	-	U1-03
07	LAI	TORQUE	0	%	0.1	0	-	-	U1-09

Point No.	Point Type	Point Name	Factory Default (SI Units)	Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Parameter
08	LAI	POWER	0	kW	0.1	0	-	-	U1-08
09	LAI	DRIVE TEMP	0	° C/F	1	0	-	-	U4-08
10	LAI	DRIVE KWH	0	kWh	0.1	0	-	-	U4-10
11	LAI	MWH	0	MWh	1	0	-	-	U4-11
12	LAI	RUN TIME	0	h	1	0	-	-	U4-01
13	LAI	DC BUS VOLT	0	V	1	0	-	-	U1-07
14	LAI	AC OUT VOLT	0	V	0.1	0	-	-	U1-06
15	LAI	PAR N9.01	0	A	0.01	0	-	-	n9-01
16	LAI	RUN TIMEX10K	0	10Kh	1	0	-	-	U4-01
17	LAI	FAULT CODE	0	-	1	0	-	-	U2-01
18	LDI	MINOR FLT	NO FLT	-	1	0	FAULT	NO FLT	U1-12 (Bit 6)
19	LDI	MAJOR FLT	NO FLT	-	1	0	FAULT	NO FLT	U1-12 (Bit 7)
20	LAO	OVRD TIME	1	h	1	0	-	-	-
21	LDI	FWD.REV	FWD	-	1	0	REV	FWD	U1-12 (Bit 2)
22	LDO	CMD REV.STOP	STOP	-	1	0	REV	STOP	-
23	LDI	RUN.STOP	STOP	-	1	0	RUN	STOP	U1-12 (Bit 0)
24	LDO	CMD RUN.STOP	STOP	-	1	0	FWD	STOP	-
25	LDI	ZERO SPEED	OFF	-	1	0	ON	OFF	U1-12 (Bit 1)
26	LDI	SPEED AGREE	NO AGR	-	1	0	AGREE	NO AGR	U1-12 (Bit 4)
27	LDI	DRIVE READY	NOTRDY	-	1	0	READY	NOTRDY	U1-12 (Bit 5)
28	LDI	LOC.REM MON	REMOTE	-	1	0	LOCAL	REMOTE	-
29	LDO	DAY.NGT	DAY	-	1	0	NGT	DAY	-
30	LAO	CURRENT LMT	0	A	0.01	0	-	-	E2-01
31	LAO	ACCEL TIME	0	s	0.1	0	-	-	C1-01
32	LAO	DECEL TIME	0	s	0.1	0	-	-	C1-02
33	LDO	LOCK PANEL	UNLOCK	-	1	0	LOCK	UNLOCK	-
35 */	LDO	RUN ENABLE	STOP	-	1	0	ENABLE	DISABLE	-
36	LAO	STALL PRE RN	90	%	1	30	-	-	L3-06
37	LAO	STALL PRE AC	120	%	1	0	-	-	L3-02
38	LAO	FREQ UP LIM	100	%	0.1	0	-	-	d2-01
39	LAO	FREQ LOW LIM	0	%	0.1	0	-	-	d2-02
40	LDI	MULTI OUT 1	OFF	-	1	0	ON	OFF	U1-11 (Bit 0)
41	LDI	MULTI OUT 2	OFF	-	1	0	ON	OFF	U1-11 (Bit 1)
42	LDI	MULTI OUT 3	OFF	-	1	0	ON	OFF	U1-11 (Bit 2)
43	LDI	SAFETY ILOCK	OFF	-	1	0	ON	OFF	U1-10 (Bit 2)
44	LDO	MF INP 1	OFF	-	1	0	ON	OFF	-

10 APOGEE FLN P1 Communications

Point No.	Point Type	Point Name	Factory Default (SI Units)	Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Parameter
45	LDO	MF INP 2	OFF	-	1	0	ON	OFF	-
46	LDO	MF INP 3	OFF	-	1	0	ON	OFF	-
47	LDO	MF INP 4	OFF	-	1	0	ON	OFF	-
48	LDO	MF INP 5	OFF	-	1	0	ON	OFF	-
49	LAO	JUMP FREQ 1	0	Hz	0.1	0	-	-	d3-01
50	LAO	JUMP FREQ 2	0	Hz	0.1	0	-	-	d3-02
51	LAO	JUMP FREQ 3	0	Hz	0.1	0	-	-	d3-03
52	LAO	JUMP FREQ BW	0	Hz	0.1	0	-	-	d3-04
53	LAO	NUM AUTOSTRT	0	-	1	0	-	-	L5-01
54	LAO	POWER LOSS RT	0.1	s	0.1	0	-	-	L2-02
55	LAO	RUN OP MODE	1	-	1	0	-	-	b1-02
56	LAO	REF OP MODE	1	-	1	0	-	-	b1-01
57	LAO	OPER DISP MD	0	-	1	0	-	-	o1-03
58	LDI	MF IN 1 MON	OFF	-	1	0	ON	OFF	U1-10 (Bit 2)
59	LDI	MF IN 2 MON	OFF	-	1	0	ON	OFF	U1-10 (Bit 3)
60	LAO	INPUT REF 1	0	Hz	0.01	0	0	0	-
61	LAO	INPUT REF 2	0	Hz	0.01	0	0	0	d1-02
62	LAI	PID FEEDBACK	0	%	0.01	0	0	0	U5-01
63	LAO	PID P GAIN	2	-	0.01	0	0	0	b5-02
64	LAO	PID I TIM	0.5	s	0.1	0	0	0	b5-03
65	LDO	PID MODE SEL	DISABLE	-	1	0	ENABLE	DISABLE	b5-01
66	LAI	LST FLT CODE	0	-	1	0	-	-	U2-02
67	LAI	FREF.FLT	0	Hz	0.01	0	-	-	U2-03
68	LAI	OUT FREQ FLT	0	Hz	0.01	0	-	-	U2-04
69	LAI	OUT CUR.FLT	0	A	0.01	0	-	-	U2-05
70	LAO	RD PARAM NUM	1	-	1	0	-	-	-
71	LAI	RD PARAM DAT	0	-	1	0	-	-	-
72	LAO	WR PARAM NUM	1	-	1	0	-	-	-
73	LAO	WR PARAM DAT	0	-	1	0	-	-	-
74	LDI	MF IN 3 MON	OFF	-	1	0	ON	OFF	U1-10 (Bit 4)
75	LAI	OUT VOLT.FLT	0	V	0.1	0	-	-	U2-07
76	LAI	DC BUS.FLT	0	V	1	0	-	-	U2-08
77	LAI	OUT PWR.FLT	0	kW	0.1	0	-	-	U2-09
78	LDI	MF IN 4 MON	OFF	-	1	0	ON	OFF	U1-10 (Bit 5)
79	LAI	PID DEVIATE	0	-	0.01	0	-	-	U5-02
80	LAO	PID I LIMIT	100	%	0.1	0	-	-	b5-04
81	LAO	PID UP LIMIT	100	%	0.1	0	-	-	b5-06
82	LAO	PID OFFS ADJ	100	%	0.1	-100	-	-	b5-07
83	LAO	PID PRI DYTM	0	s	0.1	0	-	-	b5-08
84	LAO	PID FB RMDS	0	-	1	0	-	-	b5-12

Point No.	Point Type	Point Name	Factory Default (SI Units)	Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text	Parameter
85	LAO	PID FB RMDL	0	%	1	0	-	-	b5-13
86	LAO	PID FB RMDT	1	s	0.1	0	-	-	b5-14
87	LAI	PID OUT CAP	0	%	0.01	0	-	-	U5-03
88	LAI	PID REF	0	%	0.01	0	-	-	U5-04
89	LAI	COMM ERR CD	0	-	1	0	-	-	U1-19
90	LDO	COMM FLT ENA	ENABLE	-	1	0	ENABLE	DISABLE	F6-76
91	LAO	CBL LOSS FRQ	0	Hz	0.01	0	-	-	d1-04
92	LAO	CBL LOSS TMR	2	s	0.1	0	-	-	F6-77
93	LDI	OK.FAULT	OK	-	1	0	FAULT	OK	U1-12 (Bit 7)
94	LDO	RESET FAULT	NO	-	1	0	RESET	NO	-
95	LDI	DRV COMM ERR	NO FLT	-	1	0	FAULT	NO FLT	-
96	LDO	EXTERNAL FLT	OK	-	1	0	FAULT	OK	-
97	LDI	MF IN 5 MON	OFF	-	1	0	ON	OFF	U1-10 (Bit 6)
99	LAI	ERROR STATUS	0	-	1	0	-	-	-

*1 Set H1-03 to 70 , Drive Enable2, for point 35 to work properly.

◆ APOGEE FLN P1 Cable Loss Configuration and Behavior

This section describes the configurable cable loss feature of the drive. This feature offers a user maximum flexibility in determining the drive response to a loss of communication.

■ Drive Behavior At Loss of Communication

The drive can be configured to respond in one of the following manners after some interval without receipt of a message:

- Continue at last speed
- Continue at last speed with Alarm
- Continue at preset speed
- Ramp to Stop with EF0 fault
- Coast to Stop with EF0 fault
- Emergency Stop with EF0 fault

■ APOGEE FLN P1 Points

Three APOGEE FLN points are used to select the desired behavior:

- POINT 92 - CBL LOSS TMR
- POINT 91 - CBL LOSS FRQ
- POINT 90 - COMM FLT ENA

Table 10.2 Cable Loss Behavior Summary

Behavior	F6-01 Setting	CBL LOSS TMR (Point 92)	CBL LOSS FRQ (Point 91)	COMM FLT ENA (Point 90)
Decelerate to stop (stop time in C1-02) BUS Fault	0	Timeout interval	X	On
Coast to stop BUS Fault	1	Timeout interval	X	On
Fast stop (stop time in C1-09) BUS Fault	2	Timeout interval	X	On
Continue at last speed with alarm	3	Timeout interval	X	On

Behavior	F6-01 Setting	CBL LOSS TMR (Point 92)	CBL LOSS FRQ (Point 91)	COMM FLT ENA (Point 90)
Continue at preset speed with alarm	4	Timeout interval	Preset Speed	On
Alarm and ramp to stop (C1-02) *1	5	Timeout interval	X	On

*1 While the drive will ramp to stop when set to this selection, the drive will resume running when the alarm or BUS fault condition is removed.

Note:

1. Communication must first be established and then lost for these features to function as described. A communications timeout does not occur if a drive is powered-up without a cable connected or with the master controller offline.
2. A Run command must have been issued (RUN ENABLE (Point 35)=ON and either CMD RUN.FWD (Point 22)=ON or CMD RUN.REV (Point 24)=ON) prior to loss of communications for modes which describe the drive running after a communications timeout. The drive will not automatically restart from a stopped condition for safety purposes. Additional external wiring is required to accomplish this (consult factory) if a user requires the drive to restart automatically.

A BUS fault will be declared and will remain until communication is restored upon expiration of the communications timeout interval.

■ Continue at Last Speed

CBL LOSS TMR (POINT 92) is set to 0, disabling the cable loss feature in this mode. The other two settings, CBL LOSS FRQ (POINT 91) and COMM FLT ENA (POINT 90), are ignored. The drive maintains its last commanded state if communication is lost. The drive will not display an alarm or fault to indicate it has lost communication. This behavior can also be achieved by setting parameter F6-01 to 3. The drive will display an alarm and continue running. The COMM FLT ENA (POINT 90) must be enabled and CBL LOSS TMR (POINT 91) should be set to a value other than 0 for this specific condition. A BUS drive alarm will be set.

■ Continue at Preset Speed

CBL LOSS TMR (POINT 92) is set to the desired interval, CBL LOSS FRQ (POINT 91) is set to the desired preset speed and F6-01 is set to 4 in this mode. The drive speed command, INPUT REF 1, (Point 60) is set to the CBL LOSS FRQ (POINT 91) and the drive continues running at this new speed if the time between messages exceeds the timeout interval. COMM FLT ENA (POINT 90) must be set to ON.

■ Stop with Fault (BUS)

COMM FLT ENA (POINT 90) must be set to ON. CBL LOSS TMR (POINT 92) is set to the desired interval and parameter F6-01 is set to a value of 0, 1, or 2 in this mode. The drive will declare a BUS fault and drive's speed command, INPUT REF 1, (Point 60) is set to 0 if the time between messages exceeds the timeout interval. The stopping method is determined by the setting of F6-01.

- F6-01=0 selects Ramp to Stop. The deceleration time or the slope of the ramp is determined by the setting of drive parameter C1-02.
- F6-01=1 selects Coast to Stop. The drive does not attempt to control the rate of deceleration.
- F6-01=2 selects Fast Stop. The deceleration time is determined by the setting of drive parameter C1-09.

Note:

The behavior of the drive at cable loss is controlled by parameter H5-04. This drive parameter works with the points as described in the table above to determine how the drive will respond to a cable loss. The drive will continue in its last state if running, the drive will continue to run at the last commanded frequency if the cable loss fault is disabled.

◆ APOGEE FLN P1 Mailbox Function

■ Reading a Drive Parameter

Two points are defined for reading any drive parameter:

- #70 Specifies the parameter to be read from the drive
- #71 Reports the value of the parameter specified in Point #70

The mailbox retrieves data from the parameter and sends it to the controller when this point is read.

Example: Writing a value of 387 (183H) to Point #70 specifies drive parameter b1-04. Reading Point #71 returns the current setting of parameter b1-04 to the controller.

■ Writing to a Drive Parameter

Two points are defined for writing to any drive parameter:

- #72 Specifies the parameter to be written to
- #73 Entry location of the value to be written to the parameter specified in Point #72

The mailbox will write the value to the drive when this point is written. An ENTER or ACCEPT command does not need to be sent for the data to be taken by the drive. The behavior of the write is the same as with the digital operator. There are a limited number of drive parameters that can be written if the drive is running.

Example: Writing a value of 387 (183H) to Point #72 specifies drive parameter b1-04. Writing a value of 1 to Point #73 enables the drive for reverse run.

11 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. Refer to the drive manual for additional error codes that may appear on the drive digital operator.

■ Faults

Both *bUS* [Option Communication Error] and *EF0* [Option Card External Fault] can appear as a fault. When a fault occurs, the keypad ALM LED stays lit. When an alarm occurs, the ALM LED flashes.

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?
- Is the PLC program working? Is the controller/PLC CPU stopped?
- 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	<ul style="list-style-type: none"> • The option Requested Packet Interval (RPI) timer timed out • Make sure that RPI time is set properly
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 caus. 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.	Connect the option to the correct connector. <ul style="list-style-type: none"> • Use connector CN5-A when you connect the option. To use other options, refer to those option manuals.
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.

Code	Name	Causes	Possible Solutions
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.	Connect the option to the correct connector. <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 Fault (CN5-B)	The option connected to connector CN5-C is not compatible.	Connect the option to the correct connector. <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
CALL	Serial Communication Transmission Error	Communications wiring is faulty, there is a short circuit, the wiring is incorrect, or the connections are poor	<ul style="list-style-type: none"> • Check for wiring errors. • Correct the wiring. • Check for disconnected cables and short circuits. Repair as needed.
		Programming error on the master side.	Check disconnected cables and short circuits and repair as needed
		Communications circuitry is damaged.	<ul style="list-style-type: none"> • 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.

◆ Option Error Codes

■ Option Fault Monitors U6-98 [First Fault] and U6-99 [Current Fault]

The option can declare error/warning conditions via drive monitor parameters on the drive digital operator as shown in [Table 11.1](#).

Table 11.1 Option Fault Monitor Descriptions

Fault Condition	Fault Declared	Status Value (U6-98/ U6-99)	Description
No Fault	-	0	No faults.
Force Fault	EF0	3	Network sent a message to force this node to the fault state.
Communication Loss Fault	bUS Error	1401	Network communication was established and is now lost.

Two drive monitor parameters, *U6-98 [First Fault]* and *U6-99 [Current Fault]*, assist the user in network troubleshooting.

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

Parameter *U6-98* retains the original fault value and *U6-99* stores the new fault status value if another fault occurs while the original fault is still active.

◆ 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 a iQpump605 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 11.2 Option Compatibility

Option	Connector	Number of Options Possible
PG-B3 *1, PG-X3 *1	CN5-B, CN5-C	2 *2
PG-RT3 *1 *3 *4, PG-F3 *1 *3 *4	CN5-C	1
DO-A3, AO-A3	CN5-A, B, C	1
SI-C3, SI-N3, SI-P3, SI-S3, SI-ET3, SI-ES3, SI-B3, SI-M3, SI-W3 *4, SI-EM3 *4, SI-EM3D *4, SI-EN3D *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.

■ Drive Fault Trace Register Contents

Table 11.3 Drive Fault Trace Register Contents

Fault Code	Fault Name	Fault Code	Fault Name
0002H	Undervoltage (Uv1)	002BH	High Slip Braking Overload (oL7)
0003H	Control Power Supply Undervoltage (Uv2)	0030H	Hardware Fault (including oFx)
0004H	Soft Charge Circuit Fault (Uv3)	0036H	Output Current Imbalance (LF2)
0006H	Ground Fault (GF)	0037H	Pullout Detection (Sto)
0007H	Overcurrent (oC)	003BH	Too Many Speed Search Restarts (SEr)
0008H	Overvoltage (ov)	0041H	PI Feedback Loss (FbH)
0009H	Heatsink Overheat (oH)	0042H	External Fault 1, Input Terminal S1 (EF1)
000AH	Heatsink Overheat (oH1)	0043H	External Fault 2, Input Terminal S2 (EF2)
000BH	Motor Overload (oL1)	0046H	Current Offset Fault (CoF)
000CH	Drive Overload (oL2)	0047H	PLC Detection Error 1 (PE1)
000DH	Overtorque Detection 1 (oL3)	0048H	PLC Detection Error 2 (PE2)
0010H	Braking Resistor Overheat (rH)	0052H	Node Setup Fault (nSE)
0011H	External Fault at Input Terminal S3 (EF3)	005AH	Motor Underload Protection (UL6)
0012H	External Fault at Input Terminal S4 (EF4)	0083H	A/D Conversion Error (CPF02)
0013H	External Fault at Input Terminal S5 (EF5)	0084H	PWM Data Fault (CPF03)
0014H	External Fault at Input Terminal S6 (EF6)	0087H	EEPROM Memory Data Error (CPF06)
0015H	External Fault at Input Terminal S7 (EF7)	0088H	Terminal Board Connection Error (CPF07)
001BH	Input Phase Loss (PF)	0089H	EEPROM Serial Communication Fault (CPF08)
001CH	Output Phase Loss (LF)	008CH	RAM Fault (CPF11)
001DH	Motor Overheat (PTC input) (oH3)	008DH	Flash Memory Circuit Exception (CPF12)
001EH	Digital Operator Connection (oPr)	008EH	Watchdog Circuit Exception (CPF13)
001FH	EEPROM Write Error (Err)	008FH	Control Circuit Fault (CPF14)
0020H	Motor Overheat (PTC input) (oH4)	0091H	Clock Fault (CPF16)
0021H	MEMOBUS/Modbus Communication Error (CE)	0092H	Timing Fault (CPF17)
0022H	Option Communication Error (bUS)	0093H	Control Circuit Fault (CPF18)
0027H	Option External Fault (EF0)	0094H	Control Circuit Fault (CPF19)
0028H	PI Feedback Loss (FbL)	0095H	Hardware Fault at Power Up (CPF20)
0029H	Undertorque Detection 1 (UL3)	0096H	Hardware Fault at Communication Start Up (CPF21)

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Fault Code	Fault Name
0097H	A/D Conversion Fault (CPF22)
0098H	PWM Feedback Fault (CPF23)
0099H	Drive Unit Signal Fault (CPF24)
009AH	Terminal Board is Not Properly Connected. (CPF25)
009BH	ASIC BB Circuit Error (CPF26)
009CH	ASIC PWM Setting Register Error (CPF27)
009DH	ASIC PWM Pattern Error (CPF28)
009EH	ASIC On-delay Error (CPF29)
009FH	ASIC BBON Error (CPF30)
00A0H	ASIC Code Error (CPF31)
00A1H	ASIC Start-up Error (CPF32)
00A2H	Watch-dog Error (CPF33)
00A3H	ASIC Power/Clock Error (CPF34)
00A4H	External A/D Converter Error (CPF35)
00A9H	Control Circuit Error (CPF40)
00AAH	Control Circuit Error (CPF41)
00ABH	Control Circuit Error (CPF42)
00ACH	Control Circuit Error (CPF43)
00ADH	Control Circuit Error (CPF44)
00AEH	Control Circuit Error (CPF45)
0101H	Option Compatibility Error (oFA00)
0102H	Option Not Properly Connected (oFA01)
0106H	A/D Conversion Error (oFA05)
0107H	Option Response Error (oFA06)
0111H	Option RAM Fault (oFA10)
0112H	Option Operation Mode Fault (SLMOD)(oFA11)

Fault Code	Fault Name
0113H	Drive Receive CRC Error (oFA12)
0114H	Drive Receive Frame Error (oFA13)
0115H	Drive Receive Abort Error (oFA14)
0116H	Option Receive CRC Error (oFA15)
0117H	Option Receive Frame Error (oFA16)
0118H	Option Receive Abort Error (oFA17)
0131H	Comm. ID Error (oFA30)
0132H	Model Code Error (oFA31)
0133H	Sumcheck Error (oFA32)
0134H	Comm. Option Timeout Waiting for Response (oFA33)
0135H	MEMOBUS Timeout (oFA34)
0136H	Drive Timeout Waiting for Response (oFA35)
0137H	CI Check Error (oFA36)
0138H	Drive Timeout Waiting for Response (oFA37)
0139H	Control Command Selection Error (oFA38)
013AH	Drive Timeout Waiting for Response (oFA39)
013BH	Control Response Selection 1 Error (oFA40)
013CH	Drive Timeout Waiting for Response (oFA41)
013DH	Control Response Selection 2 Error (oFA42)
013EH	Control Response Selection Error (oFA43)
0401H	Time Not Set (TIM)
0402H	Operator Battery Low (bAT)
0403H	Time Data Error (TdE)
0404H	Time Interval Error (TiE)
0405H	Overvoltage 2 (ov2)
0407H	External Fan Fault (Fn1)

12 Specifications

Table 12.1 Option Specifications

Items	Specifications
Model	SI-J3 option
Interface	RS-485
Connector Type	4-pin removable terminal block
Max Number of Drives	Metasys N2: 255 per N2 network segment APOGEE FLN P1: 127 per FLN network segment Note: Actual maximum number of units depends on total network transceiver load. Refer to EIA-485 standards for details on network hardware specifications.
Protocol	Metasys N2 APOGEE FLN P1
Communication Speed	Metasys N2: 9600 Baud APOGEE FLN P1: 4800 or 9600 Baud
Communication Parameters	Data Length: 8-bit Parity: None Stop Bit: 1
Ambient Temperature	-10 to +60 °C

Items	Specifications
Humidity	95% relative humidity (non-condensing)
Storage Temperature	-20 to +85 °C
Area of Use	Indoors and not near: <ul style="list-style-type: none">• Oil mist, corrosive gas, flammable gas, or dust• Radioactive materials or flammable materials, including wood• Dangerous gases or fluids• Salt• Direct sunlight• Falling objects
Altitude	1000 meters or lower With output current and voltage derating: up to 3000 meters

Revision History

Date of Publication	Revision Number	Section	Revised Content
June 2025	<1>	All	Addition: iQpump605 applicable product series
May 2025	-	-	First Edition

YASKAWA AC Drive Option

Metasys N2 & APOGEE FLN P1

Installation & Technical Manual

DRIVE CENTER (INVERTER PLANT)

2-13-1, Nishimiyaichi, Yukuhashi, Fukuoka, 824-8511, Japan
Phone: +81-930-25-2548 Fax: +81-930-25-3431
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
www.yaskawa.co.jp

YASKAWA AMERICA, INC.

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

YASKAWA ELÉTRICO DO BRASIL LTDA.

777, Avenida Piraporinha, Diadema, São Paulo, 09950-000, Brasil
Phone: +55-11-3585-1100 Fax: +55-11-3585-1187
www.yaskawa.com.br

YASKAWA EUROPE GmbH

Hauptstraße 185, 65760 Eschborn, Germany
Phone: +49-6196-569-300 Fax: +49-6196-569-398
E-mail: info@yaskawa.eu.com
www.yaskawa.eu.com

YASKAWA ELECTRIC KOREA CORPORATION

18F, Hi Investment & Securities Building, 66 Yeoui-daero, Yeongdeungpo-gu, Seoul, 07325, Korea
Phone: +82-2-784-7844 Fax: +82-2-784-8495
www.yaskawa.co.kr

YASKAWA ASIA PACIFIC PTE. LTD

30A, Kallang Place, #06-01, 339213, Singapore
Phone: +65-6282-3003 Fax: +65-6289-3003
www.yaskawa.com.sg

YASKAWA ELECTRIC (THAILAND) CO., LTD.

59, 1F-5F, Flourish Building, Soi Ratchadapisek 18, Ratchadapisek Road, Huaykwang, Bangkok, 10310, Thailand
Phone: +66-2-017-0099 Fax: +66-2-017-0799
www.yaskawa.co.th

YASKAWA ELECTRIC (CHINA) CO., LTD.

22F, Link Square 1, No.222, Hubin Road, Shanghai, 200021, China
Phone: +86-21-5385-2200 Fax: +86-21-5385-3299
www.yaskawa.com.cn

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

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

YASKAWA ELECTRIC TAIWAN CORPORATION

12F, No. 207, Section 3, Beishin Road, Shindian District, New Taipei City 23143, Taiwan
Phone: +886-2-8913-1333 Fax: +886-2-8913-1513 or +886-2-8913-1519
www.yaskawa.com.tw

YASKAWA INDIA PRIVATE LIMITED

#17/A, Electronics City, Hosur Road, Bengaluru, 560 100 (Karnataka), India
Phone: +91-80-4244-1900 Fax: +91-80-4244-1901
www.yaskawaindia.in

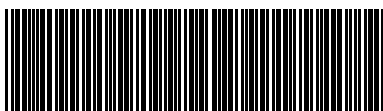
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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and 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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