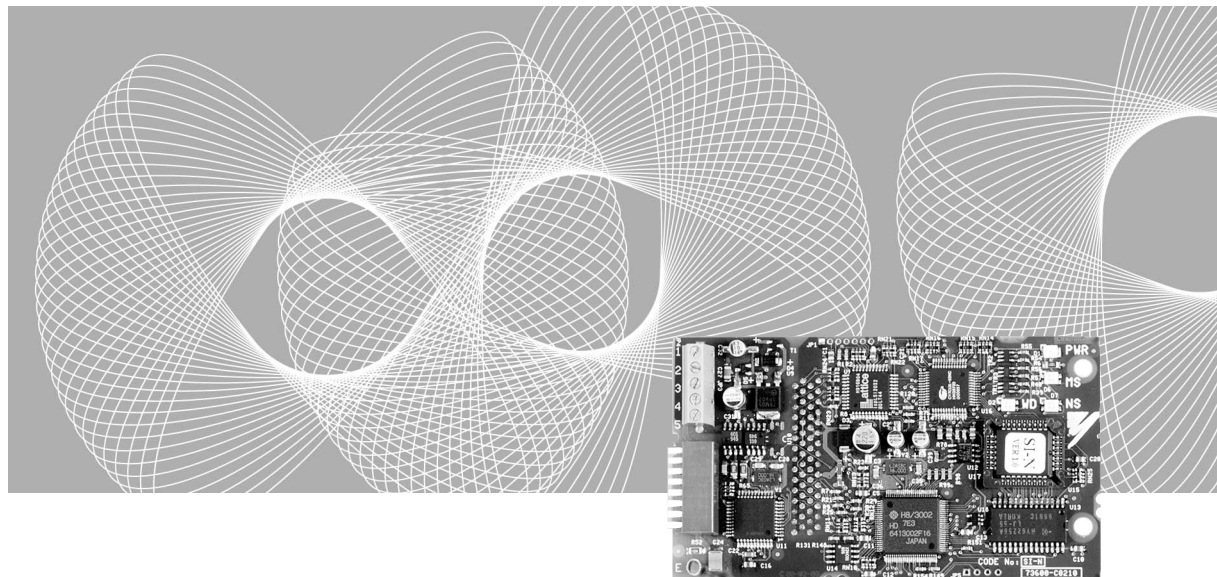


Varispeed SERIES OPTION CARD DeviceNet COMMUNICATION INTERFACE CARD USER'S MANUAL

Model: SI-N1



YASKAWA

MANUAL NO. SIBP C730600 01B

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INTRODUCTION

This User's Manual describes the operations and specifications of the DeviceNet Communication Interface Card (hereafter called the SI-N1 card). The SI-N1 card transfers the data between the Varispeed series Current Vector Control General-purpose Inverter and the Open Field Network DeviceNet (hereafter called the DeviceNet). Read this manual carefully and be sure you understand the information provided before attempting any operations.

For the operation of the Inverter, refer to the Varispeed Instruction Manual

F7 series: TOE-S616-55.1

G7 series: TOE-S616-60.1

F7S series: EZZ009387

General Precautions

- Some drawings in this manual are shown with the protective cover or shields removed, in order to describe the detail with more clarity. Make sure all covers and shields are replaced before operating this product, and operate it in accordance with the instructions in this manual.
- This manual may be modified when necessary because of improvement of the product, modification, or changes in specifications.
- A new version of the manual will be released under a revised manual number when any changes are made.
- Contact your Yaskawa representative or a Yaskawa office listed on the back of this manual to order a new manual if this manual is damaged or lost. Please provide the document number listed on the front cover of this manual when ordering.
- Yaskawa cannot guarantee the quality of any products which have been modified. Yaskawa assumes no responsibility for any injury or damage caused by a modified product.

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.



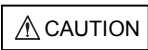
WARNING

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



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment.

Even items described in  may result in a vital accident in some situations. In either case, follow these important notes.



Indicates important information that should be memorized.

Safety Precautions

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the DeviceNet Communication Interface Card SI-N1. In this manual, NOTES FOR SAFE OPERATION are classified as “WARNING” and “CAUTION.”

■ Receiving

CAUTION

- Do not use any option card which is damaged or has missing parts.
Failure to observe this caution may result in injury.

■ Installation and Wiring

WARNING

- Never touch the inside of the Inverter.
Failure to observe this warning may result in electric shock.
- Disconnect all power before mounting or removing the option card or wiring. Then wait at least the specified time (specified on the front cover) after the power supply is disconnected and all LEDs and CHARGE LED are extinguished.
Failure to observe this warning may result in electric shock.
- Do not damage or apply excessive stress to the cables. Do not place heavy objects on the cables or place the cables between other objects.
Failure to observe this warning may result in electric shock, malfunction or damage of the equipment.

CAUTION

- Do not touch the elements of the option card with bare hands.
Failure to observe this caution may result in equipment damage caused by static electricity.
- Insert the connectors firmly.
Failure to observe this caution may result in malfunction or damage of the equipment.

■ Setting

CAUTION

- Be careful when changing Inverter settings. The Inverter is factory set to suitable settings.
Failure to observe this caution may result in damage of the equipment.

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1 OUTLINE

The SI-N1 card is an interface card for data communications with the DeviceNet master, for connecting the Varispeed series Current Vector Control Inverter to the Open Field Network DeviceNet.

By mounting the SI-N1 card on a Varispeed series Inverter, you can monitor operation status, including running and stopping, and change or read the settings of the Inverter constants from the DeviceNet master, which can be used for various types of applications.

The SI-N1 card can be mounted on the following Varispeed models:

- Varispeed F7 standard series
(Compatible with Inverter software versions S1010 or later)
- Varispeed G7 standard series
(Compatible with Inverter software versions S1010 or later)
- Varispeed F7S standard series
(Compatible with Inverter software versions S1033 or later and SI-N1 software versions 2.4A or later)

2 RECEIVING

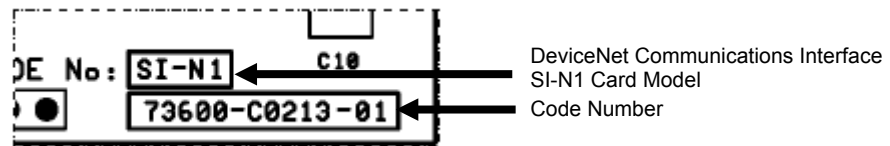
Check the following items as soon as the product is delivered.

Item	Method
Has the correct model of the SI-N1 card been delivered?	Confirm the model code number in the lower right of the SI-N1 card. (Refer to 2.1.)
Is the SI-N1 card damaged in any way?	Inspect the entire exterior of the SI-N1 card to see if there are any scratches or any other damage resulting from shipping.

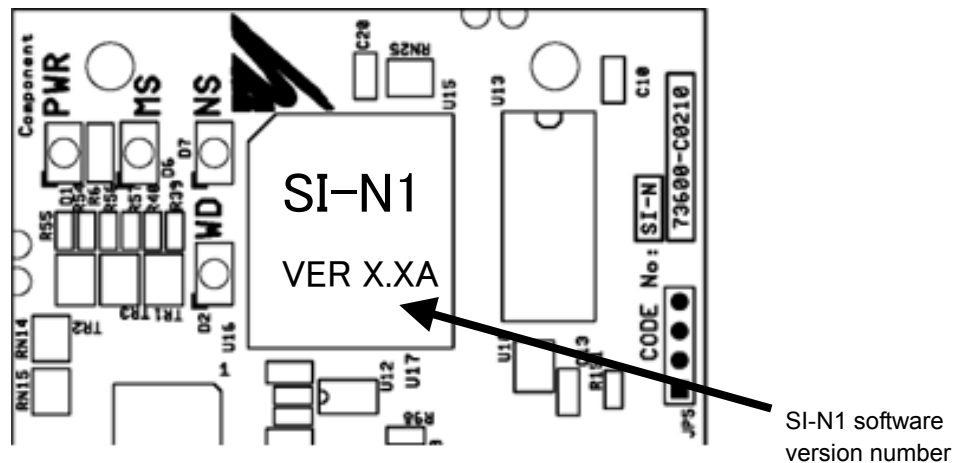
If you find any irregularities, contact the agency from which you purchased the Inverter or your Yaskawa representative immediately.

2.1 Model and Code Number

The model and code numbers in the lower right of the SI-N1 card are as follows. The 11 digits of the code number are also the product's revision number.



The SI-N1 card of version 73600-C0211-01 or later is compatible with the Varispeed series.

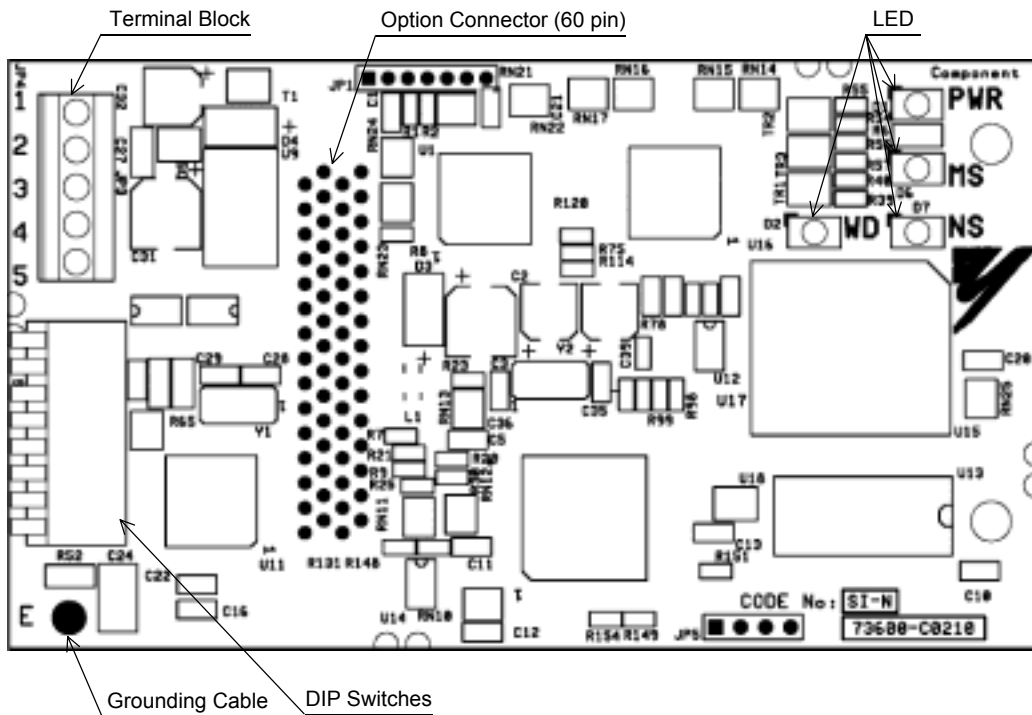


Note: F7S-series Inverters support SI-N1 software versions 2.4A or later.

3 NOMENCLATURE AND SETTING

3.1 Components

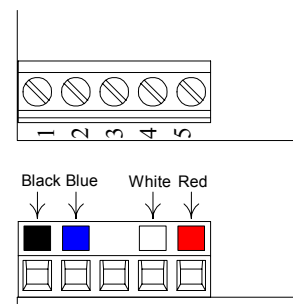
The names of components on the SI-N1 card are shown in the following figure.



3.2 Terminal Block

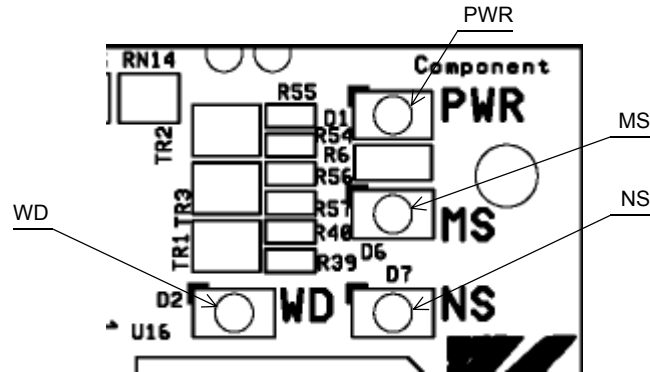
This terminal block connects the SI-N1 card to the DeviceNet communications line.

Terminal No.	Terminal Color	Name	Wiring Color	Meaning
1	Black	V-	Black	Communications power supply
2	Blue	CAN_L	Blue	Low side communications data
3	—	Shield	(Shield)	Shielded wire
4	White	CAN_H	White	High side communications data
5	Red	V+	Red	Communications DC+24 V



3.3 LED

These LED indicator lamps indicate the status of the DeviceNet or the SI-N1 card.

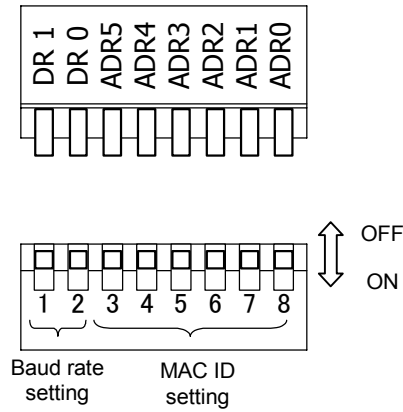


Name	Indication		Operating Status	Remarks
	Color	Status		
PWR	Green	ON	Power supply ON	Power is supplied to the SI-N1 card from the Inverter.
	–	OFF	Power supply OFF	Power is not being supplied to the Inverter. Incorrect connection of the SI-N1 card does not supply power to the SI-N1 card.
MS	Green	ON	SI-N1 card operating	The SI-N1 card is operating normally.
	Green	Flashing	SI-N1 card initializing	There is an incorrect baud rate setting or there is a MAC ID duplication.
	Red	ON	Fatal error occurred	A fatal (irrecoverable) error occurred in the SI-N1 card.
	Red	Flashing	Non-fatal error occurred	A non-fatal (recoverable) error occurred.
	–	OFF	Power supply OFF	Power is not being supplied to the Inverter. Incorrect connection of the SI-N1 card does not supply power to the SI-N1 card.
NS	Green	ON	Online communications established.	DeviceNet communications are operating normally.
	Green	Flashing	Online communications not established.	DeviceNet communications are operating normally, but communications have not been established with the Master.
	Red	ON	Communications error	An error occurred that disables DeviceNet communications. <ul style="list-style-type: none"> • MAC ID duplication • Bus Off detected
	Red	Flashing	Communications timeout	A communications timeout occurred with the Master.
	–	OFF	Offline or Power supply OFF	DeviceNet communications are not online. Power is not being supplied to the SI-N1 card. The baud rate settings do not agree.
WD	Green	Flashing	CPU operating	The CPU of the SI-N1 card is operating normally.
	Red	ON	CPU error	The CPU of the SI-N1 card is initializing or error.
	–	OFF	Power supply OFF	Power is not being supplied to the Inverter. Incorrect connection of the SI-N1 card does not supply power to the SI-N1 card.

* Both MS and NS will be ON when the baud rate setting (DIP switch: DR1, DR0) is ON.

3.4 DIP Switch

These switches set the baud rate and MAC ID of the DeviceNet.



3.4.1 Baud Rate Setting Switch

Switch	500 kbps	250 kbps	125 kbps	Prohibited Setting
DR1	ON	OFF	OFF	ON
DR0	OFF	ON	OFF	ON

* Both MS and NS will be ON when the baud rate setting (DIP switch: DR1, DR0) is ON.

3.4.2 MAC ID Setting Switch

Switch	MAC ID											
	0	1	2	3	4	5	6	7	8	62	63
ADR5	-	-	-	-	-	-	-	-	-	○	○
ADR4	-	-	-	-	-	-	-	-	-	○	○
ADR3	-	-	-	-	-	-	-	-	○	○	○
ADR2	-	-	-	-	○	○	○	○	-	○	○
ADR1	-	-	○	○	-	-	○	○	-	○	○
ADR0	-	○	-	○	-	○	-	○	-	-	○

* ○: ON
 -: OFF

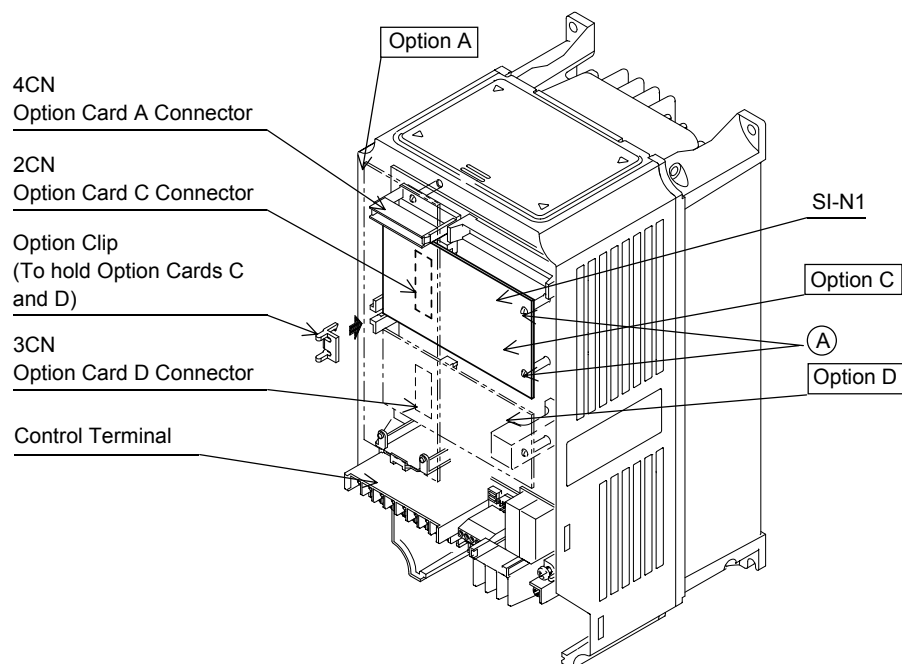
4 INSTALLATION AND WIRING

4.1 Installing the SI-N1 Card

The SI-N1 card must be installed on the control board inside the Inverter. Remove the Digital Operator and the front cover of the Inverter.

Use the following procedure to install the SI-N1 card.

1. Turn off the Inverter's power supply. Wait the specified time, as shown on the front cover of the Inverter, and then remove the Digital Operator and the front cover of the Inverter. Confirm that the CHARGE indicator is turned off.
2. Remove the option clip that prevents option cards C and D from rising.
3. Connect the SI-N1 card to the 60-pin 2CN connector on the Inverter's control board. Insert two spacers (marked as **A** in the diagram) into the spacer holes on the SI-N1 card. Press it firmly until you hear it snap into place.
4. Reattach the clip in its original position.
5. Connect the grounding cable of the SI-N1 card to terminal E(G) for the control circuit on the Inverter's control board.
6. Connect the communications cable, and set the DIP switch to the correct setting.
7. Reattach the Digital Operator and the front cover of the Inverter.

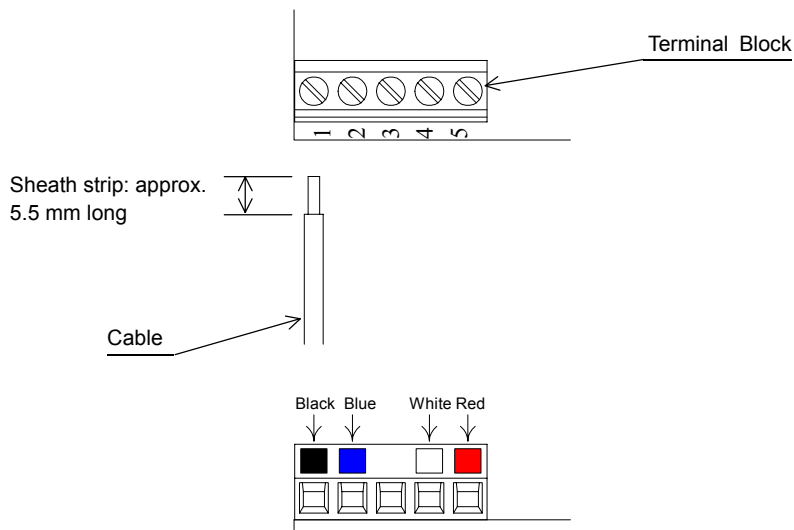


How to Install the SI-N1 card

4.2 Wiring of the Communications Cable

Use the following procedure to wire the DeviceNet master to the terminal block of the SI-N1 card.

1. Use a thin flat screwdriver to loosen the terminal screw.
2. Insert the wires from under the terminal block.
3. Tighten the terminal screws firmly.
(Tightening torque: 0.5 to 0.6 [N•m])



- *1. Always use thin DeviceNet cable that meets DeviceNet cable specifications.
Recommended Cable: TDN24U (By SHOWA ELECTRIC WIRE & CABLE Co., LTD.)
- *2. Match the color of the wires with the color of the terminal block terminals when wiring.
- *3. Route the DeviceNet communications cables separately from the main circuit wiring and other power lines.

5 FUNCTIONS

The SI-N1 card supports the AC Drive Profile defined in DeviceNet specifications. No special settings are needed to operate, adjust, and monitor the Inverters from any DeviceNet master.

The SI-N1 card operates as Group 2 Only servers (DeviceNet slaves) in the DeviceNet network. Two kinds of communications are possible with the master: I/O messages and explicit messages.

5.1 EDS Files

An EDS file is needed for setting and monitoring the SI-N1 card with the DeviceNet setting tool (configurator). By writing an EDS file into the setting tool, you enable the setting and reading of the Inverter constants from the setting tool. EDS file depends on the type and capacity of the Inverter.

Contact your Yaskawa representative for more information how to get a EDS file.

5.2 Initial Settings

Always set the following Inverter constants before using DeviceNet communications.

Constant No.	Name	Description	Factory Setting	Inverter	
	Display * ¹			F7	G7
o1-03	Frequency units of reference setting and monitor	Always set the number of motor poles (2 to 39). In DeviceNet standards, the motor speed is expressed in units of min ⁻¹ . The SI-N1 uses this constant (o1-03) setting to convert the frequency to min ⁻¹ .	0	○	○
	Display Scaling				
b1-01	Reference selection * ²	Set the inputting method for frequency reference. 0: Digital Operator 1: Control circuit terminals (analog inputs) 2: MEMOBUS transmission (Uses SI-K2) 3: Option Card 4: Pulse train input Set to 3 (Option Card) to validate the frequency reference from the SI-N1 card.	1	○	○
	Reference Source				
b1-02	Operation method selection * ²	Set the operation method. 0: Digital Operator 1: Control circuit terminals (sequence inputs) 2: MEMOBUS communication (Uses SI-K2) 3: Option Card Set to 3 (Option Card) to validate the run command from the SI-N1 card.	1	○	○
	Run Source				

(cont'd)

Constant No.	Name	Description	Factory Setting	Inverter	
	Display			F7	G7
F6-01	Operation selection after communications error	Set the stopping method for BUS communication errors. 0: Deceleration stop using the setting in C1-02 1: Coast to stop 2: Emergency stop using the setting in C1-09 3: Continue operation ^{*3}	1	○	○
	BUS Fault Sel				
F6-02	Input level of external fault from Communications Option Card	Set the detection range for the external fault (EF0). 0: Always detect 1: Detect during operation	0	○	○
	EF0 Detection				
F6-03	Stopping method for external fault from Communications Option Card	Set the stopping method for external fault. 0: Deceleration stop using the setting in C1-02. 1: Coast to stop 2: Emergency stop using the setting in C1-09. 3: Continue operation ^{*3}	1	○	○
	EF0 Fault Action				
F6-06	Torque reference/torque limit from Communications Option Card ^{*4 *5}	0: Torque reference/torque limit from Option Card disabled 1: Torque reference/torque limit from Option Card enabled	0	×	○
	Torque Ref/Lmt Sel				

*1. This refers to G7 series Inverters only.

*2. The changed setting takes effect in the option card when the Inverter is turned OFF and ON again.

*3. Selecting "Continue operation" will allow the operation with the Inverter to continue when a fault occurs.

Provide other measures such as an emergency stop switch for safe operation.

*4. Enabled when A1-02 (Control method selection) is set to 3 (Flux vector) or 4 (Open loop vector). In this case, the d5-01 (Torque control selection) setting can be used to select the torque reference or the torque limit.

d5-01 = 0 (Speed control): Torque limit setting

d5-01 = 1 (Torque control): Torque reference setting

*5. When F6-06 is set to 1, the motor may not rotate unless the torque reference or the torque limit is set from the DeviceNet master.

5.3 I/O Message Communications

The DeviceNet Communications Interface Card uses poll command/response messages for I/O communications. Select one of the four I/O instances, and transfer I/O data to the master. I/O messages are always transferred between the Inverter and the master regardless of changes to the I/O data.

■ I/O Instance Switch

The SI-N1 card uses the following four I/O instances.

Instance Name	Instance ID (Data)	
	Input (Inverter to Master)	Output (Master to Inverter)
Basic I/O	46 Hex (70 Dec)	14 Hex (20 Dec)
Extended I/O (Factory Setting)	47 Hex (71 Dec)	15 Hex (21 Dec)
MEMOBUS I/O	96 Hex (150 Dec)	64 Hex (100 Dec)
Control I/O	97 Hex (151 Dec)	65 Hex (101 Dec)

To change the I/O instance, use an Explicit message in the path shown in the following table to write the instance ID (data) of the desired I/O instance. After writing the data, turn off the Inverter's power supply and then turn it on again to validate the change.

For more details on the Explicit messages, refer to 5.4 *Explicit message Communications*.

Name	Class	Instance	Attribute	Data (factory setting)
Produced Connection Path	65 Hex	01 Hex	01 Hex	47 Hex
Consumed Connection Path	65 Hex	01 Hex	02 Hex	15 Hex

If the I/O instance is changed, the number of allocated bytes in the I/O buffer that are registered to the host PLC (DeviceNet Master) must be changed to the following settings.

Refer to the relevant PLC manual for information on how to change the number of allocated bytes in the I/O buffer.

Instance Name	No. of Allocated Bytes
Basic I/O	4 Bytes
Extended I/O (Factory Setting)	4 Bytes
MEMOBUS I/O	5 Bytes
Control I/O	8 Bytes

5.3.1 Basic I/O Instances

This is a standard I/O instance type defined in DeviceNet's AC Drive Profile. Four bytes are used for input data and four bytes are used for output data.

■ Input (Master to SI-N1) Instance 20 (14 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	–	–	–	–	–	Fault Reset	–	Run Fwd
1	–	–	–	–	–	–	–	–
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Run Fwd	Runs the Inverter forward. 0: Stop. 1: Run forward.
Byte 0, bit 2	Fault Reset	Resets the Inverter from fault status. 0: – 1: Reset fault.
Bytes 2 and 3	Speed Reference ^{*3}	Sets the Inverter's speed reference. Speed reference data: Frequency reference (min^{-1}) $\times 2^{\text{SS}}$ (^{SS} : Speed scale ^{*1}) Setting range: 0 to FFFF Hex ^{*2} For example, when setting a reference of $1,800 \text{ min}^{-1}$ with a speed scale of 0: Speed reference data = $1,800 \times 2^0 = 1,800 = 0708 \text{ Hex}$

- *1. The speed scale can be set with AC/DC Drive object attribute 16 through explicit message communications.
- *2. If the speed is set to a value greater than that of the Inverter's Maximum Output Frequency setting in E1-04, the setting of E1-04 will be the maximum output frequency.
- *3. When using the speed reference, always set the Number of Motor Poles (2 to 39) in Inverter constant o1-03 (Selecting Setting/Display Units of Frequency Reference). When changing the setting, be sure to turn the Inverter power supply OFF and turn ON again after the display of the Digital Operator is OFF.

■ Output (SI-N1 to Master) Instance 70 (46 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	–	–	–	–	–	Running 1 (Fwd)	–	Faulted
1	–	–	–	–	–	–	–	–
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Faulted	Indicates that the Inverter detected a fault. 0: Normal 1: Fault detected.
Byte 0, bit 2	Running 1 (Fwd)	Indicates the Inverter's operating status. 0: Stopped or operating in reverse. 1: Operating forward or applying DC injection braking.
Bytes 2 and 3	Speed Actual	Indicates the Inverter's speed. Monitored speed data: Monitored frequency (min^{-1}) $\times 2^{\text{SS}}$ (^{SS} : Speed scale ^{*1}) For example, when the monitored speed data is 03E8 Hex and the speed scale is 0: Monitored frequency = 03E8 Hex / $2^0 = 1,000 / 2^0 = 1,000 \text{ min}^{-1}$

- *1. The speed scale can be set with AC/DC Drive object attribute 16 through explicit message communications.
- *2. When using the Speed Actual monitor, always set the Number of Motor Poles (2 to 39) in Inverter constant o1-03 (Selecting Setting/Display Units of Frequency Reference). When changing the setting, be sure to turn the Inverter power supply OFF and turn ON again after the display of the Digital Operator is OFF.
- *3. The frequency monitor value depends on the setting of the Inverter constant A1-02 (Control method selection) as shown in the table below.

Control Method Selection (A1-02)	Frequency Monitor Value
0	U1-02 (Output frequency)
1	U1-05 (Motor speed)
2	U1-02 (Output frequency)
3	U1-05 (Motor speed)
4	U1-02 (Output frequency)
5	U1-02 (Output frequency)
6	U1-05 (Motor speed)
7	U1-02 (Output frequency)

5.3.2 Extended I/O Instance (Factory Setting)

This is a standard I/O instance type defined in DeviceNet's AC Drive Profile and it is the initial factory setting for I/O instances. Four bytes are used for input data and four bytes are used for output data.

■ Input (Master to SI-N1) Instance 21 (15 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	–	NetRef	NetCtrl	–	–	Fault Reset	Run Rev	Run Fwd
1	–	–	–	–	–	–	–	–
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Run Fwd	Runs the Inverter forward. 0: Stop. 1: Run forward.
Byte 0, bit 1	Run Rev	Runs the Inverter in reverse. 0: Stop. 1: Run in reverse.
Byte 0, bit 2	Fault Reset	Resets the Inverter from fault status. 0: – 1: Reset fault.
Byte 0, bit 5	NetCtrl	Sets the RUN command right. 0: Use the RUN Command Input Method set in constant b1-02 (RUN Command Selection). 1: Enables the RUN command from DeviceNet (byte 0, bits 0 and 1).
Byte 0, bit 6	NetRef	Sets the Frequency Reference right. 0: Use the Frequency Reference Input Method set in constant b1-01 (Frequency Reference Selection). 1: Enables the Frequency Reference from DeviceNet (bytes 2 and 3).
Bytes 2 and 3	Speed Reference	Sets the Inverter's speed reference. The speed reference is exactly the same as it is in a Basic I/O Instances.

■ Output (SI-N1 to Master) Instance 71 (47 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference	Ref From Net	Ctrl From Net	Ready	Running 2 (Rev)	Running 1 (Fwd)	Warning	Faulted
1	–	–	–	–	–	–	–	–
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Faulted	Indicates that the Inverter detected a fault. 0: Normal 1: Fault detected.
Byte 0, bit 1	Warning	Indicates that the Inverter detected a warning. 0: Normal 1: Warning detected.
Byte 0, bit 2	Running 1 (Fwd)	Indicates the Inverter's operating status. 0: Stopped or operating in reverse. 1: Operating forward or applying DC injection braking.
Byte 0, bit 3	Running 2 (Rev)	Indicates the Inverter's operating status. 0: Stopped, operating forward, or applying DC injection braking. 1: Operating in reverse.
Byte 0, bit 4	Ready	Indicates the Inverter's preparation status. 0: Fault detected or initializing. 1: Preparations for operation completed.
Byte 0, bit 5	Ctrl From Net	Indicates which RUN command input has been selected in the Inverter. 0: A RUN command input other than DeviceNet is enabled. 1: The RUN command input from DeviceNet is enabled.
Byte 0, bit 6	Ref From Net	Indicates which Frequency Reference input has been selected in the Inverter. 0: A Frequency Reference input other than DeviceNet is enabled. 1: The Frequency Reference input from DeviceNet is enabled.
Byte 0, bit 7	At Reference	Indicates that the Inverter's frequency match was detected. 0: Stopped, accelerating, or decelerating. 1: Frequency matches.
Bytes 2 and 3	Speed Actual	Indicates the Inverter's speed. The speed data is exactly the same as it is in the Basic I/O Instances.

5.3.3 MEMOBUS I/O Instances

All of the Inverter's constants can be referenced and set with a MEMOBUS I/O instance. MEMOBUS I/O instances can be used with Yaskawa Inverters only. They cannot be used with other companies' DeviceNet-compatible Inverters.

Five bytes are used for input data and five bytes are used for output data.

■ Input (Master to SI-N1) Instance 100 (64 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Function Code							
1	Register Number (High Byte)							
2	Register Number (Low Byte)							
3	Register Data (High Byte)							
4	Register Data (Low Byte)							

Data	Name	Contents
Byte 0	Function Code	Set the MEMOBUS (command message) function code. 03 Hex: Read 10 Hex: Write 00 Hex: Do not execute.
Bytes 1 and 2	Register Number	Set the Inverter's MEMOBUS register number *.
Bytes 3 and 4	Register Data	Set the write data when executing a MEMOBUS WRITE command.

■ Output (SI-N1 to Master) Instance 150 (96 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Function Code							
1	Register Number (High Byte)							
2	Register Number (Low Byte)							
3	Register Data (High Byte)							
4	Register Data (Low Byte)							

Data	Name	Contents
Byte 0	Function Code	Indicates the MEMOBUS (response message) function code. 03 Hex: Normal read 10 Hex: Normal write 83 Hex: Read error 90 Hex: Write error
Bytes 1 and 2	Register Number	Indicates the MEMOBUS register number * in the executed process. These bytes will contain the MEMOBUS error code if a read or write error occurred.
Bytes 3 and 4	Register Data	Indicates the read data when executing a MEMOBUS READ command.

* Refer to the Varispeed series INSTRUCTIONS (F7 series: TOE-S616-55.1, G7 series: TOE-S616-60.1, F7S series: EZZ009387) for the MEMOBUS register number.

■ ENTER Command (Write-only Register)

Register Number	Name	Contents	Setting Range	Initial Setting
0900H	ENTER Command	Writes constant data to non-volatile memory (EEPROM).	0000H	–
0910H	ENTER Command	Do not write constant data to non-volatile memory (EEPROM).	0000H	–

When writing a constant from the master through communications, always execute the ENTER command after changing the constant. When a constant is changed, the new value is written to the constant data area in the Inverter's RAM. The ENTER command that writes to the non-volatile memory writes the constant data from RAM to the non-volatile memory in the Inverter. As this ENTER command writes the constant data to the non-volatile memory, the data will be retained after the power is turned off. Since the Inverter's EEPROM can be overwritten a limited number of times (100,000 times), do not execute the ENTER command too frequently. Because the ENTER command that does not write to the non-volatile memory does not write the constant data to the non-volatile memory, the data is lost if the power is turned off. When changing the constant temporarily, use this command. When two or more constants are being changed, execute the ENTER command once after changing all of the constants.

The register numbers of the ENTER command (0900H and 0910H) are for writing only. If reading this register, the error code 02H occurs.

5.3.4 Control I/O Instances

Control I/O Instances are for Varispeed series Inverters only. All of the Varispeed series' I/O functions can be used in addition to the functions supported by the Extended I/O Instances.

Control I/O Instances can be used with Yaskawa Inverters only. They cannot be used with other companies' DeviceNet-compatible Inverters.

Eight bytes are used for input data and eight bytes are used for output data.

■ Input (Master to SI-N1) Instance 101 (65 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Terminal S8*1	Terminal S7	Terminal S6	Terminal S5	Terminal S4	Terminal S3	Run Rev	Run Fwd
1	Terminal P2	Terminal P1	Terminal M1	–	–	–	Fault Reset	External Fault
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							
4	Torque Reference / Torque Limit (Low Byte) *2							
5	Torque Reference / Torque Limit (High Byte) *2							
6	Torque Compensation (Low Byte) *2							
7	Torque Compensation (High Byte) *2							

Data	Name	Contents
Byte 0, bit 0	Run Fwd	Runs the Inverter forward. 0: Stop. 1: Run forward.
Byte 0, bit 1	Run Rev	Runs the Inverter in reverse. 0: Stop. 1: Run in reverse.
Byte 0, bit 2	Terminal S3	Inputs the function set for the Inverter's multi-function input terminal S3. Set the function of multi-function input terminal S3 with Inverter constant H1-01. 0: Terminal S3 function OFF 1: Terminal S3 function ON
Byte 0, bit 3	Terminal S4	Inputs the function set for the Inverter's multi-function input terminal S4. Set the function of multi-function input terminal S4 with Inverter constant H1-02. 0: Terminal S4 function OFF 1: Terminal S4 function ON
Byte 0, bit 4	Terminal S5	Inputs the function set for the Inverter's multi-function input terminal S5. Set the function of multi-function input terminal S5 with Inverter constant H1-03. 0: Terminal S5 function OFF 1: Terminal S5 function ON
Byte 0, bit 5	Terminal S6	Inputs the function set for the Inverter's multi-function input terminal S6. Set the function of multi-function input terminal S6 with Inverter constant H1-04. 0: Terminal S6 function OFF 1: Terminal S6 function ON

(cont'd)

Data	Name	Contents
Byte 0, bit 6	Terminal S7	Inputs the function set for the Inverter's multi-function input terminal S7. Set the function of multi-function input terminal S7 with Inverter constant H1-05. 0: Terminal S7 function OFF 1: Terminal S7 function ON
Byte 0, bit 7	Terminal S8 ^{*1}	Inputs the function set for the Inverter's multi-function input terminal S8. Set the function of multi-function input terminal S8 with Inverter constant H1-05. 0: Terminal S8 function OFF 1: Terminal S8 function ON
Byte 1, bit 0	External Fault	External fault (EF0) input from option. 0: – 1: External fault (EF0)
Byte 1, bit 1	Fault Reset	Resets the Inverter from fault status. 0: – 1: Reset fault.
Byte 1, bit 5	Terminal M1	Operates the Inverter's multi-function output terminal M1-M2. This function is enabled only when Inverter constant H2-01 is set to F. 0: Terminal M1-M2 OFF 1: Terminal M1-M2 ON
Byte 1, bit 6	Terminal P1	Operates the Inverter's multi-function output terminal P1. This function is enabled only when Inverter constant H2-02 is set to F. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, bit 7	Terminal P2	Operates the Inverter's multi-function output terminal P2. This function is enabled only when Inverter constant H2-03 is set to F. 0: Terminal P2 OFF 1: Terminal P2 ON
Bytes 2 and 3	Speed Reference	Sets the Inverter's speed reference. The units are not affected by the speed scale (SS) setting.
Bytes 4 and 5	Torque Reference Torque Limit ^{*2}	Sets the Inverter's torque reference/torque limit. The units are fixed at 0.1%. Operates as the torque reference when the Inverter is torque control (d5-01=1) and as the torque limit when speed control (d5-01=0). Disabled when the constant F6-06 is 0.
Bytes 6 and 7	Torque Compensation ^{*2}	Sets the Inverter's torque compensation. The units are fixed at 0.1%.

*1. This terminal can be used only when the Inverter is G7 series.
Do not use with F7 and F7S series.

*2. These terminals can be used only when the Inverter is designed for torque control.

■ Output (SI-N1 to Master) Instance 151 (97 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Faulted	Warning	Ready	At Reference	Reset	Rev Running	ZSP	Running
1	–	–	Terminal P2	Terminal P1	Terminal M1	Local/Remote	UV	OPE
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	Torque Reference Monitor (Low Byte) *							
5	Torque Reference Monitor (High Byte) *							
6	Output Current (Low Byte)							
7	Output Current (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Running	Indicates the Inverter's operating status. 0: Operating forward or stopped. 1: Operating forward, operating in reverse, or applying DC injection braking.
Byte 0, bit 1	ZSP	Indicates the Inverter's operating status. 0: Operating forward or in reverse. 1: Stopped or applying DC injection braking.
Byte 0, bit 2	Rev Running	Indicates the Inverter's operating status. 0: Operating forward or stopped. 1: Operating in reverse or inputting reverse RUN command.
Byte 0, bit 3	Reset	Indicates the input status of the Inverter's RESET signal. 0: – 1: RESET signal being input.
Byte 0, bit 4	At Reference	Indicates that the Inverter's frequency match was detected. 0: Stopped, accelerating, or decelerating. 1: Frequency matches.
Byte 0, bit 5	Ready	Indicates the Inverter's preparation status. 0: Fault detected or initializing. 1: Preparations for operation completed.
Byte 0, bit 6	Warning	Indicates that the Inverter detected a warning. 0: Normal 1: Warning detected.
Byte 0, bit 7	Faulted	Indicates that the Inverter detected a fault. 0: Normal 1: Fault detected.
Byte 1, bit 0	oPE	Indicates that the Inverter detected a MEMOBUS constant setting error (oPE). 0: Normal 1: oPE (oPE01 to oPE11) detected.
Byte 1, bit 1	UV	Indicates that the Inverter detected an undervoltage error. 0: Normal 1: UV detected.
Byte 1, bit 2	Local/Remote	Indicates which RUN command input has been selected in the Inverter. 0: A RUN command input other than DeviceNet is enabled. 1: The RUN command input from DeviceNet is enabled.

(cont'd)

Data	Name	Contents
Byte 1, bit 3	Terminal M1	Indicates the output status of Inverter multi-function output terminal M1-M2. 0: Terminal M1-M2 OFF 1: Terminal M1-M2 ON
Byte 1, bit 4	Terminal P1	Indicates the output status of Inverter multi-function output terminal P1. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, bit 5	Terminal P2	Indicates the output status of Inverter multi-function output terminal P2. 0: Terminal P2 OFF 1: Terminal P2 ON
Bytes 2 and 3	Speed Actual *2	Indicates the Inverter's speed. The units are not affected by the speed scale (SS) setting.
Bytes 4 and 5	Torque Reference Monitor *1	Indicates the Inverter's torque reference. The units are fixed at 0.1%.
Bytes 6 and 7	Output Current	Indicates the Inverter's output current. The units are fixed at 0.1 A. The units are not affected by the current scale (CS) setting.

*1. This terminal can be used only when the Inverter corresponds to the torque control.

*2. Speed Actual value depends on the setting of the Inverter constant A1-02 (Control method selection) as shown in the table below.

Unlike the Speed Actual for basic I/O instance and extended I/O instance, the value will not be limited by the value of speed scale SS.

Control Method Selection (A1-02)	Speed Actual Value
0	U1-02 (Output frequency)
1	U1-05 (Motor speed)
2	U1-02 (Output frequency)
3	U1-05 (Motor speed)
4	U1-02 (Output frequency)
5	U1-02 (Output frequency)
6	U1-05 (Motor speed)
7	U1-02 (Output frequency)

5.4 Explicit Message Communications

The SI-N1 card can be used to transfer explicit messages (defined in DeviceNet specifications) to and from a DeviceNet master. Various kinds of data can be set and referenced from the master, ranging from DeviceNet-related settings to the Inverter's control data. Unlike I/O message that are transmitted in a fixed cycle, explicit messages can be sent from the master at any time and corresponding responses will be returned.

■ Format of Explicit Messages

Header	MAC ID	Service Code	Class	Instance	Attribute	Data	Footer
--------	--------	--------------	-------	----------	-----------	------	--------

Item	Description
Header	This value is set automatically, so there is no need to check it.
MAC ID	Contains the MAC ID of the master or slave that is the other node involved in the data transfer.
Service Code	In a request message, the service code specifies the requested operation such as reading or writing data. In a normal response, bit 15 (the most significant bit) of the request service code will be turned ON in the response. If an error occurred, the code 94 will be returned. Examples: <ul style="list-style-type: none"> • 0E: Read request • 8E: Normal read response • 10: Write request • 90: Normal write response • 94: Error response
Class	Each DeviceNet function is divided into these 3 codes. When specifying data, specify it with these 3 codes.
Instance	
Attribute	
Data	Request: Contains the write data. Response: Contains the read data or error code.
Footer	This value is set automatically, so there is no need to check it.

5.4.1 Identity Object (Class 01 Hex)

The Identity object stores the DeviceNet product information. All of the attributes are read-only.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
05	Reset	Resets (initializes) the SI-N1 card's status.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the Identity object's software revision.	---	0001	OK	---	Word
01	01	Vendor ID	Indicates the manufacturer's code. • 44 (2C Hex): Yaskawa Electric	---	002C	OK	---	Word
	02	Device Type	Indicates the DeviceNet device profile. This product implements the AC Drive profile. • 2: AC Drive	---	0002	OK	---	Word
	03	Product Code	Indicates the product code assigned by the manufacturer.	---	*1	OK	---	Word
	04	Revision	Indicates the SI-N1 card's software revision.	---	*2	OK	---	Byte×2
	05	Status	Indicates the SI-N1 card's communications status.	---	0000	OK	---	Word
	06	Serial Number	Indicates the serial number of the SI-N1 card's communications.	---	Depends on product.	OK	---	Long
	07	Product Name	Indicates the model number. • F7 SI-N • G7 SI-N • F7S SI-N	---	Capacity. • F7 SI-N • G7 SI-N • F7S SI-N	OK	---	String
	08	State	Indicates the Inverter's status. • 3: Inverter ready.	---	03	OK	---	Byte

*1. The Product Code depends on the Inverter type and capacity.

*2. The Revision depends on the option card software. If the software version is 2.4A, the revision is "02, 04".

5.4.2 Message Router Object (Class 02 Hex)

The Message Router object has a function that separates the DeviceNet communications information. Both explicit messages and I/O messages are always allocated to each function through this object. The Message Router object itself performs only internal processes and it does not have data that is exchanged externally.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the Message Router object's software revision.	---	0001	OK	---	Word

5.4.3 DeviceNet Object (Class 03 Hex)

The DeviceNet object is the object that manages information and functions related to DeviceNet communications. The processing is performed automatically when communications are connected, so there are no particular functions or data used.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the DeviceNet object's software revision.	---	0002	OK	---	Word
01	01	MAC ID	Indicates the setting for the MAC ID. The MAC ID can be set with DIP switches.	0 to 63	00	OK	---	Byte
	02	Baud Rate	Indicates the setting for the baud rate. The baud rate can be set with the DIP switches. <ul style="list-style-type: none"> • 0: 125 kbps • 1: 250 kbps • 2: 500 kbps 	0 to 2	00	OK	---	Byte
	05	Allocation Information	Indicates the DeviceNet communications connection information.	---	00,00	OK	---	Byte × 2

5.4.4 Assembly Object (Class 04 Hex)

The Assembly object is the object related to the I/O message function. The I/O message function is configured by this object for communications.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the Assembly object's software revision.	---	0002	OK	---	Word
14	03	Data	This function is the same as the Basic I/O Instance (input).	*	---	OK	OK	Byte×4
15	03	Data	This function is the same as the Extended I/O Instance (input).	*	---	OK	OK	Byte×4
46	03	Data	This function is the same as the Basic I/O Instance (output).	---	---	OK	---	Byte×4
47	03	Data	This function is the same as the Extended I/O Instance (output).	---	---	OK	---	Byte×4
64	03	Data	This function is the same as the MEMOBUS I/O Instance (input).	*	---	OK	OK	Byte×5
65	03	Data	This function is the same as the Varispeed series Standard Control I/O Instance (input).	*	---	OK	OK	Byte×8
96	03	Data	This function is the same as the MEMOBUS I/O Instance (output).	---	---	OK	---	Byte×5
97	03	Data	This function is the same as the Varispeed series Standard Control I/O Instance (output).	---	---	OK	---	Byte×8

* The setting ranges are the same as the ranges for the corresponding I/O message functions.

Note: When I/O message communications are enabled, the data set here will be overwritten by the I/O message data. Do not use this object when I/O message communications are enabled.

5.4.5 DeviceNet Connection Object (Class 05 Hex)

The DeviceNet object is the object that manages information and functions related to DeviceNet communications connections. This object's information and functions are used when connecting and initializing communications with the master.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the DeviceNet Connection object's software revision.	---	0001	OK	---	Word
01	01	State	Indicates the instance status. 00: Does not exist in network or initializing. 01: Online and waiting for connection from master. 02: Waiting for connection ID to be written. 03: Connection completed. 04: Timeout	---	03	OK	---	Byte
	02	Instance type	Indicates the instance type. 00: Explicit message 01: I/O message	---	00	OK	---	Byte
	03	Transport class trigger	Indicates the SI-N1 card's communications format with a code.	---	83	OK	---	Byte
	04	Produced connection ID	Indicates the label that is used in the SI-N1 card's communications header. These values are set when the communications connection is completed.	---	---	OK	---	Word
	05	Consumed connection ID		---	---	OK	---	Word
	06	Initial comm characteristics	Indicates the SI-N1 card's communications format with a code.	---	21	OK	---	Byte
	07	Produced connection size	Indicates the maximum number of bytes for transmissions.	---	0014	OK	---	Word

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
01	08	Consumed connection size	Indicates the maximum number of bytes for receptions.	---	0014	OK	---	Word
	09	Expected packet rate	Indicates the timeout time for internal processing after a communications request was received. (Set in multiples of 10 ms.)	0 to 65,535 ms	09C4 (2, 500 ms)	OK	OK	Word
	0C	Watchdog timeout action	Indicates the action to take when a timeout occurred during internal processing related to communications. 00: Maintain until reset or disconnected. 01: Disconnect automatically. 02: Perform the operation again while connected	---	01	OK	---	Byte
	0D	Produced connection path length	Indicates the transmission connection path's number of bytes.	---	0000	OK	---	Word
	0E	Produced connection path	Indicates the application object that transmits data from the instance.	---	---	OK	---	Array
	0F	Consumed connection path length	Indicates the reception connection path's number of bytes.	---	0000	OK	---	Word
	10	Consumed connection path	Indicates the application object that receives data from the instance.	---	---	OK	---	Array
	02	01	State	Indicates the instance status. 00: Does not exist in network or initializing. 01: Online and waiting for connection from master. 02: Waiting for connection ID to be written. 03: Connection completed. 04: Timeout	---	03	OK	---
02		Instance type	Indicates the instance type. 00: Explicit message 01: I/O message	---	01	OK	---	Byte
03		Transport class trigger	Indicates the SI-N1 card's communications format with a code.	---	83	OK	---	Byte

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
02	04	Produced connection ID	Indicates the label that is used in the SI-N1 card's communications header. These values are set when the communications connection is completed.	---	---	OK	---	Word
	05	Consumed connection ID		---	---	OK	---	Word
	06	Initial comm characteristics	Indicates the SI-N1 card's communications format with a code.	---	01	OK	---	Byte
	07	Produced connection size	Indicates the maximum number of bytes for transmissions.	---	0004	OK	---	Word
	08	Consumed connection size	Indicates the maximum number of bytes for receptions.	---	0004	OK	---	Word
	09	Expected packet rate	Indicates the timeout time for internal processing after a communications request was received. (Set in multiples of 10 ms.)	0 to 65, 535 ms	0000 (0 ms)	OK	OK	Word
	0C	Watchdog timeout action	Indicates the action to take when a timeout occurred during internal processing related to communications. 00: Maintain until reset or disconnected. 01: Disconnect automatically. 02: Perform the operation again while connected.	---	00	OK	---	Byte
	0D	Produced connection path length	Indicates the transmission connection path's number of bytes.	---	0003	OK	---	Word
	0E	Produced connection path	Indicates the application object that transmits data from the instance.	---	62, 34, 37	OK	---	Array
	0F	Consumed connection path length	Indicates the reception connection path's number of bytes.	---	0003	OK	---	Word
10	Consumed connection path	Indicates the application object that receives data from the instance.	---	62, 31, 35	OK	---	Array	

5.4.6 Motor Data Object (Class 28 Hex)

The Motor Data object is the object that manages information and functions related to the motor connected to the Inverter. The motor's rated current and rated voltage can be set or referenced with this object.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the Motor Data object's software revision.	---	0001	OK	---	Word
01	03	Motor Type	Indicates the type of motor being used. 3: Permanent magnet motor 7: Squirrel-cage induction motor	---	07	OK	---	Byte
	06	Rated Current	This attribute can be used to set/reference the motor's rated current. Setting units: 0.1 A* ³	10 to 200% of the Inverter's rated current	* ¹	OK	OK	Word
	07	Rated Voltage	This attribute can be used to set/reference the motor's rated voltage. Setting units: 1V	0 to 255 V* ²	00C8* ²	OK	OK	Word

*1. The initial setting of the motor rated current depends on the Inverter's capacity.

*2. The table shows the setting range and initial setting for a 200 V Class Inverter. Double these values when using a 400 V Class Inverter.

*3. When the Maximum applicable servomotor capacity of the Inverter is 7.5 kW or less, the units are 0.01A.

5.4.7 Control Supervisor Object (Class 29 Hex)

The Control Supervisor object is the object that manages information and functions related to the Inverter's control I/O. Basic control I/O functions are assigned to this object, such as the Inverter's Run, Stop, and Fault Detect controls.

The Control Supervisor object's functions are shared with the I/O message communications functions. When an I/O message communications connection is established, the values set with this object will be overwritten by the values set by I/O messages.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.
05	Reset	Resets the Inverter.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the Control Supervisor object's software revision.	---	0001	OK	---	Word
01	03	Run1	Runs the Inverter forward. 00: Stop. 01: Run forward.	00, 01	00	OK	OK	Byte
	04	Run Rev	Runs the Inverter in reverse. 00: Stop. 01: Run in reverse.	00, 01	00	OK	OK	Byte
	05	NetCtrl	Sets the RUN command right. 00: Use the RUN command input method set in constant b1-02 (RUN Command Selection). 01: Enables the RUN command from DeviceNet (byte 0, bits 0 and 1).	00, 01	00	OK	OK	Byte

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
01	06	State	Indicates the Inverter's status. 02: Inverter preparation not completed. 03: Inverter preparation completed (stopped). 04: Operating (normal). 05: Stopped (normal). 06: Decelerated to a stop because of serious fault. 07: Stopped because of serious fault.	---	03	OK	---	Byte
	07	Running 1	Indicates the Inverter's operating status. 00: Stopped or operating in reverse. 01: Operating forward or applying DC injection braking.	---	00	OK	---	Byte
	08	Running 2	Indicates the Inverter's operating status. 00: Stopped, operating forward, or applying DC injection braking. 01: Operating in reverse.	---	00	OK	---	Byte
	09	Ready	Indicates the Inverter's preparation status. 00: Fault detected or initializing. 01: Preparations for operation completed.	---	00	OK	---	Byte
	0A	Faulted	Indicates that the Inverter detected a fault. 00: Normal 01: Fault detected.	---	00	OK	---	Byte
	0B	Warning	Indicates that the Inverter detected a warning. 00: Normal 01: Warning detected.	---	00	OK	---	Byte
	0C	Fault Reset	Resets the Inverter from fault status. 00: --- 01: Reset fault.	00,01	00	OK	OK	Byte
	0D	Fault Code	The fault code indicates which fault was detected by the Inverter.*3	---	0000	OK	---	Word

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
01	0F	Ctrl From Net	Indicates which RUN command input has been selected in the Inverter. 00: A RUN command input other than DeviceNet is enabled. 01: The RUN command input from DeviceNet is enabled.	---	00	OK	---	Byte
	10	DN Fault Mode	Indicates the operation selected when a DeviceNet fault occurs.*2 02: Specific to the manufacturer	---	02	OK	---	Byte
	11	Force Fault	Inputs the external fault (EF0). 00: --- 01: External fault (EF0)	00,01	00	OK	OK	Byte
	12	Force Status	Indicates the input status of the external fault (EF0). 00: --- 01: External fault (EF0) being input.	---	00	OK	---	Byte

*1. This setting cannot be changed while the Inverter is running.

*2. This object cannot be used to change the operation performed when a DeviceNet communications error occurs. The Inverter will detect the error and stop if a DeviceNet communications error has occurred. The selecting operation after detecting transmission option error (F6-01) can be used to set the method used to stop the Inverter when a communications error has occurred.

*3. Fault Code List

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
0000	---	Inverter normal
2120	GF	Ground fault
2200	oL2	Inverter overload
2220	oL1	Motor overload
2221	oL3	Overtorque 1
2222	oL4	Overtorque 2
2300	oC	Overcurrent
3130	PF	Main circuit voltage fault
	LF	Output open-phase

(cont'd)

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
3210	oV	Main circuit overvoltage
3220	Uv1	Main circuit undervoltage
3222	Uv3	Inrush prevention circuit fault
4200	oH	Heatsink overheating
4210	oH1	Heatsink overheating
5110	Uv2	Control power supply error
5120	PUF	Fuse blown
5300	oPr	Operator not connected
6320	Err	EEPROM write error
7110	rr	Internal braking transistor fault
7112	rH	Installed braking resistor overheating
7301	PGo	PG disconnection detected
7310	oS	Overspeed
	dEv	Excessive speed deviation
7500	bUS	Inverter communications error
9000	EF3	External fault (input terminal S3)
	EF4	External fault (input terminal S4)
	EF5	External fault (input terminal S5)
	EF6	External fault (input terminal S6)
	EF7	External fault (input terminal S7)
	EF0	Option External fault

5.4.8 AC/DC Drive Object (Class 2A Hex)

The AC/DC Drive object is the object that manages information and functions related to the Inverter operation. This object is used for operations such as setting the speed reference, monitoring various values, and changing the settings.

The AC/DC Drive object's functions are shared with the I/O message communications functions. When an I/O message communications connection is established, the values set with this object will be overwritten by the values set by I/O messages.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the AC/DC Drive object's software revision.	---	0001	OK	---	Word
01	03	At Reference	Indicates that the Inverter's frequency detection level was detected. 00: Stopped, accelerating, or decelerating. 01: Frequency matches.	---	00	OK	---	Byte
	04	NetRef	Sets the Frequency Reference right. ^{*1} 00: Use the Frequency Reference input method set in constant b1-01(Frequency Reference Selection). 01: Enables the Frequency Reference from DeviceNet (bytes 2 and 3).	00,01	00	OK	OK	Byte
	06	Drive Mode	Sets the Inverter's control mode. ^{*3 *4} 00: Open loop vector 01: V/f control 02: V/f with PG feedback 03: Flux vector	F7: 00 to 02 G7: 00 to 03	F7: 01 G7: 00 F7S: 00	OK	OK ^{*4}	Byte

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
01	07	Speed Actual	Indicates the Inverter's speed. *2 Minimum units: $\text{min}^{-1}/2^{\text{SS}}$ SS: Speed scale (attribute 16)	---	0000	OK	---	Word
	08	Speed Ref	Sets or references the Inverter's speed reference. *2 Minimum units: $\text{min}^{-1}/2^{\text{SS}}$ SS: Speed scale (attribute 16)	0 to max. frequency	0000	OK	OK	Word
	09	Current Actual	Indicates the Inverter's output current. Minimum units: $0.1 \text{ A}/2^{\text{CS}}$ CS: Current scale (attribute 17)	---	0000	OK	---	Word
	0F	Power Actual	Indicates the Inverter's output power. Minimum units: $\text{W}/2^{\text{PS}}$ PS: Power scale (attribute 1A)	---	0000	OK	---	Word
	10	Input Voltage	Indicates the Inverter's input voltage. Minimum units: $\text{V}/2^{\text{VS}}$ VS: Voltage scale (attribute 1B)	---	0000	OK	---	Word
	11	Output Voltage	Indicates the Inverter's output voltage. Minimum units: $\text{V}/2^{\text{VS}}$ VS: Voltage scale (attribute 1B)	---	0000	OK	---	Word
	12	Acceleration Time	Sets or references the Inverter's Acceleration Time 1. Minimum units: $\text{ms}/2^{\text{TS}}$ TS: Time scale (attribute 1C)	0 to 6,000 s	2710 (10.0 s)	OK	OK	Word
	13	Deceleration Time	Sets or references the Inverter's Deceleration Time 1. Minimum units: $\text{ms}/2^{\text{TS}}$ TS: Time scale (attribute 1C)	0 to 6,000 s	2710 (10.0 s)	OK	OK	Word

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
01	14	Low Spd Limit	Sets or references the Inverter's Frequency Reference Lower Limit. *2 *3 Minimum units: $\text{min}^{-1}/2^{\text{SS}}$ SS: Speed scale (attribute 16)	0 to 110% of the max. frequency	0000	OK	OK	Word
	15	High Spd Limit	Sets or references the Inverter's Frequency Reference Upper Limit. *2 *3 Minimum units: $\text{min}^{-1}/2^{\text{SS}}$ SS: Speed scale (attribute 16)	0 to 110% of the max. frequency	0708 (1,800 r/m)	OK	OK	Word
	16	Speed Scale	Sets or references the unit coefficient for speed-related data. Speed units: $1 (\text{min}^{-1}) \times 1/2^{\text{SS}}$ SS: Speed scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	17	Current Scale	Sets or references the unit coefficient for current-related data. Current units: $0.1 (\text{A}) \times 1/2^{\text{CS}}$ CS: Current scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	1A	Power Scale	Sets or references the unit Coefficient (n155) for power-related data. Power units: $1 (\text{W}) \times 1/2^{\text{PS}}$ PS: Power scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	1B	Voltage Scale	Sets or references the unit coefficient for voltage-related data. Voltage units: $1 (\text{V}) \times 1/2^{\text{VS}}$ VS: Voltage scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	1C	Time Scale	Sets or references the unit coefficient for time-related data. Time units: $1 (\text{ms}) \times 1/2^{\text{TS}}$ TS: Time scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte

(cont'd)

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
01	ID	Ref From Net	Indicates which Frequency Reference input has been selected in the Inverter. *1 00: A Frequency Reference input other than DeviceNet is enabled. 01: The Frequency Reference input from DeviceNet is enabled.	---	00	OK	---	Byte

- *1. These settings cannot be changed while the Inverter is running.
- *2. Always set the Number of Motor Poles (2 to 39) in Inverter constant o1-03 when using the Speed Ref, Speed Actual, Low Spd Limit, or High Spd Limit settings. When changing the setting, be sure to turn the Inverter power supply OFF and turn ON again after the display of the Digital Operator is OFF.
The Speed Actual (2A/1/7) value depends on the setting of the Inverter constant A1-02 (Control method selection) in the same way as for I/O message communications (basic I/O instance and extended I/O instance). When A1-02 is set to 0, 2, 4, 5, or 7 (without PG), U1-02 (Output frequency) will be read, and when A1-02 is set to 1, 3, or 6 (with PG), U1-05 (Motor speed) will be read.
- *3. The Drive Mode, Low Spd Limit, and High Spd Limit settings cannot be changed while the Inverter is running.
- *4. The Drive Mode (2A/1/6) is read out as shown in the table below, depending on the setting of the Inverter constant A1-02.
Note that settings 4 through 7 of A1-02 cannot be written by DeviceNet master.
Use the Digital Operator to change the setting of A1-02 to 4, 5, 6, or 7.
After the setting of A1-02 (Control method selection) is changed, be sure to initialize the constants with the constant A1-03 (Initialize).

Control Method Selection (A1-02)	2A/1/6 Read Value	2A/1/6 Write Value
0	1: V/f control	1: V/f control
1	2: V/f control with PG feedback	2: V/f control with PG feedback
2	0: Open loop vector control	0: Open loop vector control
3	3: Flux vector control	3: Flux vector control
4	0: Open loop vector control	Impossible to write
5	0: Open loop vector control	Impossible to write
6	3: Flux vector control	Impossible to write
7	0: Open loop vector control	Impossible to write

5.4.9 Inverter Parameter Object (Class 64 Hex)

The Inverter Parameter object is the Inverter constant related object.

Setting a MEMOBUS register number in the instance and attribute enables the DeviceNet master to set and read the corresponding register.

This object can be used with Yaskawa's Inverters only.

This object is not compatible with DeviceNet-compatible Inverters manufactured by other companies.

■ Supported Services

Service Code (Hex)	Service Name	Description
0E	Get_Attribute_Single	Returns the contents of the specified attribute.
10	Set_Attribute_Single	Changes the contents of the specified attribute.

■ Object Contents

Instance	Attribute	Name	Contents	Setting Range	Initial Setting (Hex)	Read	Write	Size
*1	*1	Inverter Parameter (constant)	Sets or reads the specified Inverter constant.	–	*2	OK	OK	Word

- *1. Set the upper bytes of the MEMOBUS register number in the instance, and set the lower bytes in the attribute.

Example For Inverter constant b1-01 (MEMOBUS register number 0180Hex), set 01 Hex in the instance and 80Hex in the attribute.



00Hex cannot be set in the instance. Inverter constants where the upper byte of the MEMOBUS register number is 00Hex cannot be set.

- *2. Depends on the Inverter constant.

Refer to the relevant Inverter instruction manual for details on MEMOBUS register numbers.

F7 series: TOE-S616-55.1

G7 series: TOE-S616-60.1

F7S series: EZZ009387

6 TROUBLESHOOTING

6.1 Inverter Errors




















The following table outlines the faults displayed in the Inverter's operator and their causes and corrective actions.

Refer to the Instruction Manuals for any faults displayed in the operator other than those described below.













Display	Meaning	Cause	Corrective Action
bUS Option Com Err	Option card Transmission Error	Communications are not established between the DeviceNet master and the Inverter.	Confirm the DeviceNet communications LED display.
EF0 Opt External Flt	External fault from option card	External fault is input from the DeviceNet master.	Turn OFF the external fault input.
CPF06 Option Error	Option card connection error	The Inverter and the SI-N1 card are not connected correctly.	Turn OFF the Inverter power supply. Confirm and correct the connection between the SI-N1 card and the Inverter. Then turn ON the power supply again. Replace the Option card if the fault occurs again.
CPF21 Option CPU down	Communications Option card self diagnostic error	SI-N1 card fault	Turn ON the Inverter power supply again. Replace the Option card if the fault occurs again.
CPF22 Option Type Err	Communications Option card model code error		
CPF23 Option DPRAM Err	Communications Option card DPRAM error		

6.2 Errors Indicated by the DeviceNet Communications Indicators

The following table shows the faults, causes and corrective actions to be displayed in the LED on the SI-N1 card.

Indicator Status				Meaning	Cause	Corrective Action
PWR	MS	NS	WD			
●	●	●	●	Power supply OFF	Power is not supplied to the Inverter. SI-N1 card is not connected properly so that power is not supplied to the SI-N1 card.	Check the Inverter main circuit wiring and turn ON the power supply. Turn OFF the Inverter power supply and check the SI-N1 card and Inverter connection. Then turn ON the power supply again.
 Green	–	–	 Red	CPU error	SI-N1 card CPU is initializing or defective.	Turn ON the Inverter power supply again. If the fault occurs again, replace the SI-N1 card.
 Green	 Green	–	 Green	Initializing SI-N1 card	There is an incorrect baud rate setting or there is a MAC ID duplication.	Turn ON the Inverter's power again. Replace the Inverter if the problem recurs.
 Green	 Red	–	 Green	Recoverable (non-fatal) error	There was a non-fatal error.	Confirm the baud rate setting (DIP switch: DR1, DR0). Replace the Inverter if the problem recurs.
 Green	 Red	●	 Green	Irrecoverable (fatal) error	A fatal error related to communications occurred.	Turn ON the Inverter's power again. Replace the Inverter if the problem recurs.
 Green	 Red	 Red	 Green	Baud rate setting error	DR1 and DR0 of the baud rate are ON.	Set the baud rate correctly. Turn ON the Inverter's power again.
 Green	 Green	 Red	 Green	Communications timeout	A communications timeout occurred with the Master.	<ul style="list-style-type: none"> • Check that the terminators are properly connected to the communications line. • Check that the communications lines are properly connected. (Check for cable damage and bad connections.) • Check that the communications lines are separated from the main circuit wiring.

(cont'd)

Indicator Status				Meaning	Cause	Corrective Action
PWR	MS	NS	WD			
 Green	 Green	 Red	 Green	Communications error	An error occurred that disables communications.	<ul style="list-style-type: none"> • Check whether the MAC ID is duplicated in another device in the DeviceNet network. • Check that the Master is operating properly. • Check that the terminators are properly connected to the communications line. • Check that the communications lines are properly connected. (Check for cable damage and bad connections.) • Check that the communications lines are separated from the main circuit wiring.
 Green	 Green	 Green	 Green	Normal status (No data communications)	No error occurred, but communications have not been established with the Master.	When necessary, send Explicit message or I/O message communications from the Master.
 Green	 Green	 Green	 Green	Normal status (Data communications established)	Normal communications have been established.	—

*  : Lights  : Blinks ● : Not lit —: Not applicable

6.3 Error Code Table

When there is a problem with a request message sent from the master in explicit communications, the SI-N1 card will return a response message with 94 as the service code well as one of the following error codes as the data.

Error Code	Contents	Cause	Corrective Action
08FF	Service not supported	The service code is incorrect.	Correct the service code.
09FF	Invalid attribute value	The attribute is incorrect.	Correct the attribute.
0CFF	Object state conflict	Attempted to change an Inverter constant that cannot be changed while the Inverter is running.	Stop the Inverter.
0EFF	Attribute not settable	Attempted to change a read-only attribute.	Correct the service code or attribute setting.
13FF	Not enough data	The data size is incorrect.	Correct the data size.
14FF	Attribute not supported	Attempted to execute a service that is not defined for the attribute.	Correct the service code or attribute setting.
15FF	Too much data	The data size is incorrect.	Correct the data size.
16FF	Object does not exist	An unsupported object was specified.	Correct the class or instance setting.
1FFF	Vendor specific error	<ul style="list-style-type: none"> • Attempted to change an Inverter constant that cannot be changed while the Inverter is running. • Attempted to change an Inverter constant to a value outside of the setting range. 	<ul style="list-style-type: none"> • Stop the Inverter. • Specify a value that is within the setting range.
20FF	Invalid parameter	Attempted to change to a data value outside of the setting range.	Specify a data value that is within the setting range.

6.4 MEMOBUS I/O Instance Error Table

The following errors can occur when using the MEMOBUS I/O Instance to set or reference Inverter constants.

Error Code	Contents	Cause
01 Hex	Function code error	A function code other than 00 Hex, 03 Hex, or 10 Hex was sent from the master.
02 Hex	Invalid register number error	<ul style="list-style-type: none"> • No register number has been registered to specify the register to be accessed. • ENTER command 0900H was executed for a write-only register.
21 Hex	Data setting error	<ul style="list-style-type: none"> • A simple upper/lower limit error occurred with control data or constant write operation. • A constant setting error occurred when a constant was written.
22 Hex	Write mode error	<ul style="list-style-type: none"> • Attempted to write a constant from the master while Inverter was running. • Attempted to write a constant from the master with the ENTER command while Inverter was running. • Attempted to write a constant other than A1-00 to -05, E1-03, 02-04 from the master during an CPF03 occurrence. • Attempted to write data from the master but the data was read-only.
23 Hex	Writing during main circuit undervoltage (UV) error	<ul style="list-style-type: none"> • Attempted to write a constant from the master during a UV (undervoltage) occurrence. • Attempted to write a constant from the master with the ENTER command during a UV (undervoltage) occurrence.
24 Hex	Writing error during constants processing	<ul style="list-style-type: none"> • Attempted to write a constant from the master while data was being stored.

7 SPECIFICATIONS

Item	Specifications	
Model	SI-N1	
I/O Message Communications	Four kinds of I/O instances are supported: <ol style="list-style-type: none"> 1. Basic I/O instances (4 input bytes, 4 output bytes) 2. Extended I/O instances (4 input bytes, 4 output bytes) 3. MEMOBUS I/O instances (5 input bytes, 5 output bytes) 4. Control I/O instances (8 input bytes, 8 output bytes) 	
Explicit Message Communications	Up to 32 bytes of data can be transferred in conformance with the DeviceNet AC/DC drive profile.	
Communications Speed	125/250/500 (kbps)	
Communications Distance	Communications Speed	Max. wiring length
	125 kbps	500 m (1,640 ft)
	250 kbps	250 m (820 ft)
	500 kbps	100 m (328 ft)
Max. Number of Communications Nodes	64	
Communications Power Supply	External power supply DC 11 V to 25 V (20 mA or less)	
Operation Power Supply	DC 4.75 V to 5.25 V (from the Inverter)	
Ambient Temperature	-10°C to + 45°C (14°F to 113°F)	
Humidity	90%RH or less (non-condensing)	
Storage Temperature	-20°C to + 60°C (-4°F to 140°F)	
Location	Indoor (free from corrosive gases or dust)	
Altitude	1000 m (3,280 ft) or less	

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