Varispeed V7

INSTRUCTION MANUAL

COMPACT GENERAL-PURPOSE INVERTER
(VOLTAGE VECTOR CONTROL)
FOR DeviceNet COMMUNICATIONS

Upon receipt of the product and prior to initial operation, read these instructions thoroughly and retain them for future reference.

YASKAWA

MANUAL NO. TOE-S606-13C

PREFACE

Yaskawa's Varispeed V7 is a small and simple Inverter; as easy to use as a contactor. This instruction manual describes installation, maintenance, inspection, troubleshooting, and specifications of the Varispeed V7. Read this instruction manual thoroughly before operation.

YASKAWA ELECTRIC CORPORATION

General Precautions

- Some drawings in this manual are shown with protective covers or shields removed in order to show detail with more clarity. Make sure all covers and shields are replaced before operating the product.
- This manual may be modified when necessary because of improvements to the product, modifications, or changes in specifications.
  Such modifications are indicated by revising the manual number.
- To order a copy of this manual, or if your copy has been damaged or lost, contact your Yaskawa representative.
- Yaskawa is not responsible for any modification of the product made by the user, since that will void the guarantee.

NOTATION FOR SAFETY PRECAUTIONS

Read this instruction manual thoroughly before installation, operation, maintenance, or inspection of the Varispeed V7. In this manual, safety precautions are classified as either warnings or cautions and are indicated as shown below.

⚠ WARNING

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

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to equipment.
It may also be used to alert against unsafe practices.
Even items classified as cautions may result in serious accidents in some situations. Always follow these important precautions.

NOTE : Indicates information to insure proper operation.

PRECAUTIONS FOR UL/cUL MARKING

- Do not connect or disconnect wiring, or perform signal checks while the power supply is turned ON.
- The Inverter internal capacitor is still charged even after the power supply is turned OFF. To prevent electric shock, disconnect all power before servicing the Inverter, and then wait at least one minute after the power supply is disconnected. Confirm that all indicators are OFF before proceeding.
- Do not perform a withstand voltage test on any part of the Inverter. The Inverter is an electronic device that uses semiconductors, and is thus vulnerable to high voltage.
- Do not remove the Digital Operator or the blank cover unless the power supply is turned OFF. Never touch the printed circuit board (PCB) while the power supply is turned ON.
- This Inverter is not suitable for use on a circuit capable of delivering more than 18,000 RMS symmetrical amperes, 250 V maximum (200 V Class Inverters) or 18,000 RMS symmetrical amperes, 480 V maximum (400 V Class Inverters).

⚠ CAUTION
• Use 75°C copper wire or equivalent. Low voltage wires must be wired with Class I Wiring.

PRECAUTIONS FOR CE MARKINGS

- Only basic insulation to meet the requirements of protection class 1 and overvoltage category II is provided with control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements.
- For 400 V class Inverters, make sure to ground the supply neutral to conform to CE requirements.
- For conformance to EMC directives, refer to the relevant manuals for the requirements.
  Document No. EZZ008389 for Japanese version,
  Document No. EZZ008390 for English version

RECEIVING THE PRODUCT

⚠ CAUTION	
	(Ref. page)
• Do not install or operate any Inverter that is damaged or has missing parts. Failure to observe this caution may result in injury or equipment damage.	19

MOUNTING

⚠ CAUTION	
	(Ref. page)
• Lift the Inverter by the heatsinks. When moving the Inverter, never lift it by the plastic case or the terminal cover. Otherwise, the main unit may fall and be damaged.	24
• Mount the Inverter on nonflammable material (i.e., metal). Failure to observe this caution may result in a fire.	24
• When mounting Inverters in an enclosure, install a fan or other cooling device to keep the intake air temperature below 50°C (122°F) for IP20 (open chassis type), or below 40°C (105°F) for NEMA 1 (TYPE 1), IP20 (top closed type). Overheating may cause a fire or damage the Inverter.	24
• The Varispeed V7 generates heat. For effective cooling, mount it vertically. Refer to the figure in *Mounting Dimensions* on page 25.	25

WIRING

⚠ WARNING

(Ref. page)

- Only begin wiring after verifying that the power supply is turned OFF. (28)
  Failure to observe this warning may result in an electric shock or a fire.
- Wiring should be performed only by qualified personnel. (28)
  Failure to observe this warning may Result in an electric shock or a fire.
- When wiring the emergency stop circuit, check the wiring thoroughly before operation. (28)
  Failure to observe this warning may result in injury.
- Always ground the ground terminal ⏚. (36)
  (200 V Class: Ground to 100 Ω or less, 400 V Class: Ground to 10 Ω or less)
  Failure to observe this warning may Result in an electric shock or a fire.
- For 400 V class, make sure to ground the supply neutral. (28)
  Failure to observe this warning may result in an electric shock or a fire.
- The motor will start automatically if the power supply is turned ON while the RUN signal is ON. Turn ON the power supply only after confirming that the RUN signal is OFF. (40)
  Failure to observe this warning may result in injury.
- When the 3-wire sequence is set, do not make the wiring for the control circuit unless the multi-function input terminal parameter is set. (159)
  Failure to observe this warning may result in injury.

⚠ CAUTION

(Ref. page)

- Verify that the Inverter rated voltage coincides with the AC power supply voltage.
  Failure to observe this caution may result in personal injury or a fire.
- Do not perform a withstand voltage test on the Inverter.
  Performing withstand voltage tests may damage semiconductor elements.
- To connect a Braking Resistor, Braking Resistor Unit, or Braking Unit, follow the procedure described in this manual. 36
  Improper connection may cause a fire.
- Always tighten terminal screws of the main circuit and the control circuits. 28
  Failure to observe this caution may result in a malfunction, damage, or a fire.
- Never connect the AC main circuit power supply to output terminals U/T1, V/T2, or W/T3. 28
  The Inverter will be damaged and the guarantee will be voided.
- Do not connect or disconnect wires or connectors while power is applied to the circuits.
  Failure to observe this caution may result in injury.
- Do not perform signal checks during operation.
  The machine or the Inverter may be damaged.
- To store the constant with an ENTER command by communications, be sure to take measures for an emergency stop by using the external terminals. 126
  Delayed response may cause injury or damage the machine.

OPERATION

⚠ WARNING

(Ref. page)

- Only turn ON the input power supply after confirming that the Digital Operator or blank cover (optional) are in place. Do not remove the Digital Operator, remove the covers, or set rotary switches while current is flowing.
  Failure to observe this warning may result in an electric shock.
- Never operate the Digital Operator or DIP switches with wet hands.
  Failure to observe this warning may result in an electric shock.
- Never touch the terminals while current is flowing, even if the Inverter is stopping.
  Failure to observe this warning may result in an electric shock.
- When the fault retry function is selected, stand clear of the Inverter or the load. The Inverter may restart suddenly after stopping. 148
  (Construct the system to ensure safety, even if the Inverter should restart.) Failure to observe this warning may result in injury.
- When continuous operation after power recovery is selected, stand clear of the Inverter or the load. The Inverter may restart suddenly after stopping. 144
  (Construct the system to ensure safety, even if the Inverter should restart.) Failure to observe this warning may result in injury.
- The Digital Operator stop button can be disabled by a setting in the Inverter. Install a separate emergency stop switch.
  Failure to observe this warning may result in injury.

⚠ WARNING

(Ref. page)

- If an alarm is reset with the operation signal ON, the Inverter will restart automatically. Reset an alarm only after verifying that the operation signal is OFF. (40)
  Failure to observe this warning may result in injury.
- When the 3-wire sequence is set, do not make the wiring for the control circuit unless the multi-function input terminal parameter is set. (159)
  Failure to observe this warning may result in injury.

⚠ CAUTION

(Ref. page)

- Never touch the heatsinks, which can be extremely hot.
  Failure to observe this caution may result in harmful burns to the body.
- It is easy to change operation speed from low to high. Verify the safe working range of the motor and machine before operation.
  Failure to observe this caution may result in injury and machine damage.
- Install a holding brake separately if necessary.
  Failure to observe this caution may result in injury.
- Do not perform signal checks during operation.
  The machine or the Inverter may be damaged.
- All the constants set in the Inverter have been preset at the factory. Do not change the settings unnecessarily. (41)
  The Inverter may be damaged.

MAINTENANCE AND INSPECTION

⚠ WARNING

(Ref. page)

- Never touch high-voltage terminals on the Inverter.
  Failure to observe this warning may result in an electrical shock.
- Disconnect all power before performing maintenance or inspection, and then wait at least one minute after the power supply is disconnected. Confirm that all indicators are OFF before proceeding.
  If the indicators are not OFF, the capacitors are still charged and can be dangerous.
- Do not perform withstand voltage test on any part of the Varispeed V7.
  The Inverter is an electronic device that uses semiconductors, and is thus vulnerable to high voltage.
- Only authorized personnel should be permitted to perform maintenance, inspection, or parts replacement. 202
  (Remove all metal objects (watches, bracelets, etc.) before starting work.)
  (Use tools which are insulated against electrical shock.)
  Failure to observe these warnings may result in an electric shock.

⚠ CAUTION

(Ref. page)

- The control PCB employs CMOS ICs.
  Do not touch the CMOS elements.
  They are easily damaged by static electricity.
- Do not connect or disconnect wires, connectors, or the cooling fan while power is applied to the circuit. 202
  Failure to observe this caution may result in injury.

OTHERS

⚠ WARNING

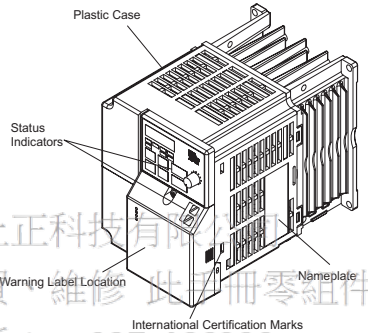
- Never modify the product.
  Failure to observe this warning may result in an electrical shock or injury and will void the guarantee.

⚠ CAUTION

- Do not subject the Inverter to halogen gases, such as fiuorine, chlovine, bromine, and iodine, at any time even during transportation or installation.
  Otherwise, the Inverter can be damaged or interior parts burnt.

WARNING LABEL

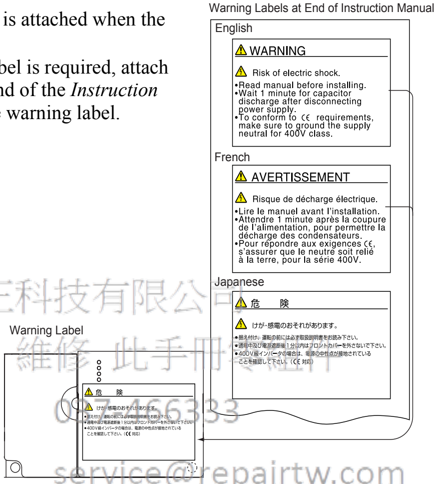
A warning label is provided on the front cover of the Inverter, as shown below. Follow the warnings when handling the Inverter.



English and French Warning Labels

An English warning label is attached when the Varispeed V7 is shipped.

If a Japanese or French label is required, attach the warning label at the end of the *Instruction Manual* over the Japanese warning label.



Example: 3-phase (200 V Class, 1.5 kW) Inverter

WARRANTY INFORMATION

■ Free Warranty Period and Scope

□ Warranty Period

This product is warranted for twelve months after being delivered to Yaskawa's customer or if applicable eighteen months from the date of shipment from Yaskawa's factory, whichever comes first.

□ Scope of Warranty

Inspections

Periodic inspections must be conducted by the customer. However, upon request, Yaskawa or one of Yaskawa's Service Centers can inspect the product for a fee. In this case, if after conferring with the customer, a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, then this fee will be waived and the problem remedied free of charge.

Repairs

If a Yaskawa product is found to be defective due to Yaskawa workmanship or materials and the defect occurs during the warranty period, Yaskawa will provide a replacement, repair the defective product, and provide shipping to and from the site free of charge.

However, if the Yaskawa Authorized Service Center determines that the problem with a Yaskawa product is not due to defects in Yaskawa's workmanship or materials, then the customer will be responsible for the cost of any necessary repairs. Some problems that are outside the scope of this warranty are:

- Problems due to improper maintenance or handling, carelessness, or other reasons where the customer is determined to be responsible.
- Problems due to additions or modifications made to a Yaskawa product without Yaskawa's understanding.
- Problems due to the use of a Yaskawa product under conditions that do not meet the recommended specifications.
- Problems caused by natural disaster or fire.
- Or other problems not due to defects in Yaskawa workmanship or materials.

Warranty service is only applicable within Japan.

However, after-sales service is available for customers outside of Japan for a reasonable fee. Contact your local Yaskawa representative for more information.

■ Exceptions

Any inconvenience to the customer or damage to non-Yaskawa products due to Yaskawa's defective products whether within or outside the warranty period are NOT covered by this warranty.

RESTRICTIONS

- The Varispeed V7 was not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.
- Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic or electric power, or underwater use must contact their Yaskawa representatives or the nearest Yaskawa sales office beforehand.
- This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.

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Revision History

1. Receiving the Product

⚠CAUTION Do not install or operate any Inverter that is damaged or has missing parts.
Failure to observe this caution may result in injury or equipment damage.

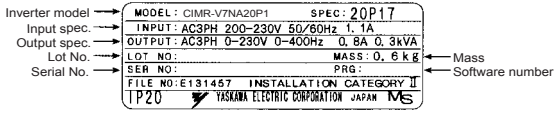
After unpacking the Varispeed V7, check the following.

- Verify that the model number matches your purchase order or packing slip.
- Check the Inverter for physical damage that may have occurred during shipping.

If any part of Varispeed V7 is missing or damaged, call for service immediately.

■ Checking the Nameplate

Example for 3-phase, 200-VAC, 0.1-kW (0.13-HP) Inverter



Model

CIMR — V 7 N A 2 0 P 1

Inverter

Varispeed V7 Series

No.	Type
N	With Digital Operator (with potentiometer)
M	With Digital Operator (without potentiometer)
P	Without Digital Operator

Note: Contact your Yaskawa representatives for models without heatsinks.

	Applicable maximum motor output	
	200 V class	400 V class
0P1	0.1 kW	——
0P2	0.25 kW	0.37 kW
0P4	0.55 kW	0.55 kW
0P7	1.1 kW	1.1 kW
1P5	1.5 kW	1.5 kW
2P2	2.2 kW	2.2 kW
3P0	——	3.0 kW
3P7	3.7 kW	3.7 kW
5P5	5.5 kW	5.5 kW
7P5	7.5 kW	7.5 kW

No.	Voltage Class
B	Single-phase 200 VAC
2	Three-phase 200 VAC
4	Three-phase 400 VAC

No.	Specifications
A	Standard
C	European standards
U	American standards

Specifications

2 0 P 1 0

B	Single-phase 200 VAC
2	Three-phase 200 VAC
4	Three-phase 400 VAC

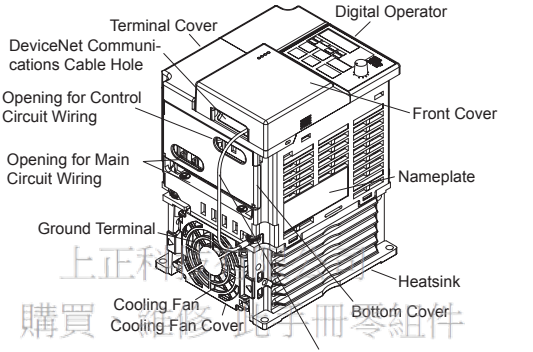
	Applicable maximum motor output	
	200 V class	400 V class
0P1	0.1 kW	——
0P2	0.25 kW	0.37 kW
0P4	0.55 kW	0.55 kW
0P7	1.1 kW	1.1 kW
1P5	1.5 kW	1.5 kW
2P2	2.2 kW	2.2 kW
3P0	——	3.0 kW
3P7	3.7 kW	3.7 kW
5P5	5.5 kW	5.5 kW
7P5	7.5 kW	7.5 kW

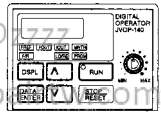
No.	Protective structure
0	Open chassis (IP20)*1
1	Enclosed wall-mounted (NEMA1)*2
7	Open chassis (IP20, IP00)*1 top-closed type

*1 These OP1 to 3P7 Inverters meet IP20 standards. When mounting the 5P5 and 7P5 Inverters in a panel, always remove the top and bottom covers. (In this case, the Inverter meets IP00 standards.)

*2 These OP1 to 3P7 Inverters have the NEMA1 option. The standard 5P5 and 7P5 Inverters meet NEMA1 standards.

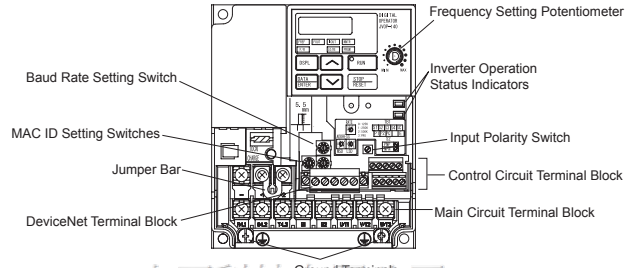
2. Identifying the Parts



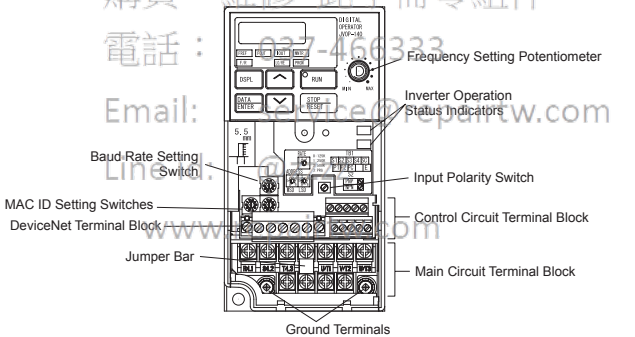


Digital operator
(with potentiometer)
JVOP-140U
sed for setting or
changing constants.
Frequency can be set
using potentiometer.

Varispeed V7 Inverters with the Covers Removed



Example for 3-phase (200 V Class, 1.5 kW) Inverter

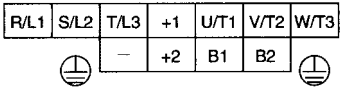


Example for 3-phase (200 V Class, 0.1 kW) Inverter

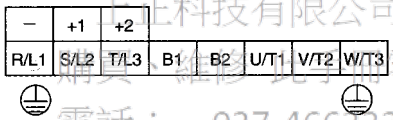
Main Circuit Terminal Arrangement

The terminal arrangement of the main circuit terminals depends on the Inverter model.

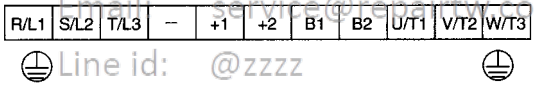
CIMR-V7✱✱20P1 to 20P7, B0P1 to B0P4



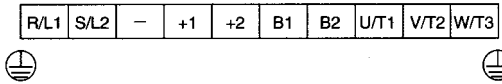
CIMR-V7✱✱21P5, 22P2, B0P7, B1P5, 40P2 to 42P2



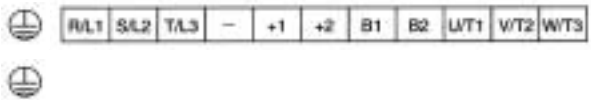
CIMR-V7✱✱24P0, B2P2, 43P0, 43P7



CIMR-V7✱✱B3P7



CIMR-V7✱✱25P5. 27P5. 45P5. 47P5



3. Mounting

■ Choosing a Location to Mount the Inverter

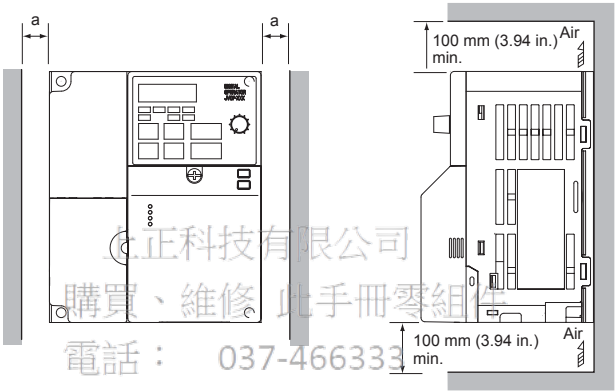
Be sure the Inverter is protected from the following conditions.

- Extreme cold and heat. Use only within the specified ambient temperature range:

  −10 to 50°C (14 to 122°F) for IP20 (open chassis type),
  −10 to 40°C (14 to 105°F) for NEMA 11 (TYPE 1), IP 20 (top closed type)
- Rain and moisture
- Oil sprays and splashes
- Salt spray
- Direct sunlight (Avoid using outdoors.)
- Corrosive gases (e.g., sulfurized gas) or liquids
- Dust or metallic particles in the air
- Physical shock or vibration
- Magnetic noise (Examples: Welding machines, power devices, etc.)
- High humidity
- Radioactive substances
- Combustibles, such as thinner or solvents

■ Mounting Dimensions

To mount the Varispeed V7, the dimensions shown below are required.



Voltage Class	Max. Applicable Motor Capacity	Distance "a"
200 V, Single phase or Three phase 400 V, Three phase	3.7 kW max.	30 mm min.
200 V, Three phase 400 V, Three phase	5.5 kW	50 mm min.
	7.5 kW	

⚠CAUTION

- Lift the Inverter by the heatsinks. When moving the Inverter, never lift it by the plastic case or the terminal cover.
  Otherwise, the main unit may fall and be damaged.
- The Varispeed V7 generates heat. For effective cooling, mount it vertically.

IMPORTANT

- The dimensions shown for the distances on the left/right and top/bottom of the Inverter apply to both mounting within a panel (IP00 and IP20) and enclosed models (NEMA1).
- When operating a 5.5-kW or 7.5-kW Inverter (200 V or 400 V Class) within a panel, always remove the top and bottom covers.

■ Mounting/Removing Components

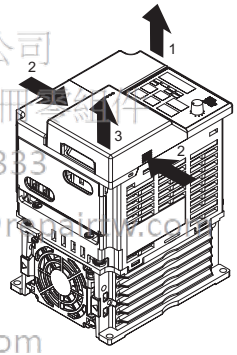
Removing and Mounting the Digital Operator and Covers

- Removing the Front Cover

  Use a screwdriver to loosen the screw on the front cover and then remove it in direction 1. Then press the right and left sides in direction 2 and lift the front cover in direction 3.

- Mounting the Front Cover

  Mount the front cover by reversing the order of the above procedure for removal.

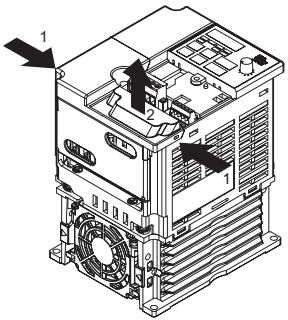


- Removing the Terminal Cover

  After removing the front cover, press the right and left sides of the terminal cover in direction 1 and lift the terminal cover in direction 2.

- Mounting the Terminal Cover

  Mount the terminal cover by reversing the order of the above procedure for removal.

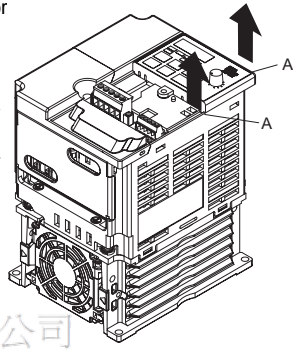


- Removing the Digital Operator

  After removing the front cover, lift the upper and lower sides (section A) of the right side of the Digital Operator in direction 1.

- Mounting the Digital Operator

  Mount the Digital Operator by reversing the order of the above procedure for removal.

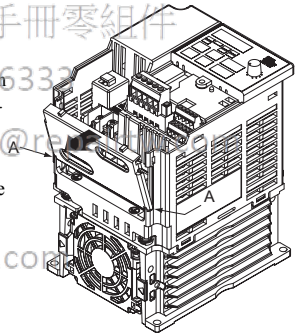


- Removing the Bottom Cover

  After removing the front cover and the terminal cover, tilt the bottom cover in direction 1 with section A as a supporting point.

- Mounting the Bottom Cover

  Mount the bottom cover by reversing the order of the above procedure for removal.



4. Wiring

⚠WARNING

- Only begin wiring after verifying that the power supply is turned OFF.
  Failure to observe this warning may result in an electric shock or a fire.
- Wiring should be performed only by qualified personnel.
  Failure to observe this warning may result in an electric shock or a fire.
- When wiring the emergency stop circuit, check the wiring thoroughly before operation.
  Failure to observe this warning may result in injury.
- For 400 V class, make sure to ground the supply neutral.
  Failure to observe this warning may result in an electric shock or a fire.

⚠CAUTION

- Verify that the Inverter rated voltage coincides with the AC power supply voltage.
  Failure to observe this caution may result in personal injury or a fire.
- Do not perform a withstand voltage test on the Inverter.
  Performing withstand voltage tests may damage semiconductor elements.
- Always tighten terminal screws of the main circuit and the control circuits.
  Failure to observe this caution may result in a malfunction, damage, or a fire.
- Never connect the AC main circuit power supply to output terminals U/T1, V/T2, W/T3, B1, B2, –, +1, or +2.
  The Inverter will be damaged and the guarantee will be voided.
- Do not connect or disconnect wires or connectors while power is applied to the circuits.
  Failure to observe this caution may result in injury.
- Do not perform signal checks during operation.
  The machine or the Inverter may be damaged.
- To store the constant with an ENTER command by communications, be sure to take measures for an

emergency stop by using the external terminals. Delayed response may cause injury or damage the machine.

■ Wiring Instructions

1. Always connect the power supply for the main circuit inputs to the power input terminals R/L1, S/L2, and T/L3 (R/L1, S/L2 for single-phase power) via a molded-case circuit breaker (MCCB) or a fuse. Never connect the power supply to terminals U/T1, V/T2, W/T3, B1, B2, −, +1, or +2. The Inverter may be damaged.
   For 200 V single-phase Inverters, always use terminals R/L1 and S/L2. Never connect terminal T/L3.
   Refer to page 239 for recommended peripheral devices.
   Use a UL class RK5 fuse. For single-phase, 200-V Inverters of 075 kW or less, a 3-phase, 200-V power supply can also be connected.

Inverter Power Supply Connection Terminals

200-V 3-phase Input Power Supply Specification Inverters CIMR-V7□□2□□□	200-V Single Input Power Supply Specification Inverters CIMR-V7□□B□□□	400-V 3-phase Input Power Supply Specification Inverters CIMR-V7□□4□□□
Connect to R/L1, S/L2, and T/L3.	Connect to R/L1 and S/L2.	Connect to R/L1, S/L2, and T/L3.

2. If the wiring distance between Inverter and motor is long, reduce the Inverter carrier frequency. For details, refer to *Reducing Motor Noise or Leakage Current (n080)* on page 151. Control wiring must be less than 50 m (164 ft) in length and must be separated from power wiring. Use shielded twisted-pair cable when inputting the frequency signal externally.
3. For 400 V Class Inverters, always ground the supply neutral to conform to CE requirements.
4. Closed-loop connectors should be used when wiring to the main circuit terminals.

5. Voltage drop should be considered when determining the wire size.

Voltage drop can be calculated using the following equation:

Phase-to-phase voltage drop (V)

$= \sqrt{3} \times$ wire resistance (Ω/km) $\times$ wiring distance (m) $\times$ current (A) $\times 10^{-3}$

Select a wire size so that voltage drop will be less than 2% of the normal rated voltage. Increase the wire size according to the length of the cable if there is a possibility that the voltage may drop.

■ Wire and Terminal Screw Sizes

1. Control Circuits

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				
				Applicable Size		Recommended Size		Type
				mm^2	AWG	mm^2	AWG	
Same for all models	S1 to S4, P1, P2, SC, PC	M2	0.22 to 0.25 (1.94 to 2.21)	Twisted wires: 0.5 to 0.75, Single: 0.5 to 1.25	20 to 18, 20 to 16	0.75	18	Shielded or equivalent

2. DeviceNet Terminal Block (CN6)

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				
				Applicable Size		Recommended Size		Type
				mm^2	AWG	mm^2	AWG	
Same for all models	V–, CAN_L, shield, CAN_H, V+	M3	0.5 to 0.6	Twisted wires: 0.2 to 2.5	24 to 12			Thin DeviceNet cable that meets DeviceNet cable specifications

Note: When removing the DeviceNet terminal block, hold the control circuit terminal block (TB1).

3. Main Circuits

200 V Class 3-phase Input Inverters

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				
				Applicable Size		Recommended Size		Type
				mm^2	AWG	mm^2	AWG	
CIMR-V7**20P1	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	600 V vinyl-sheathed or equivalent
	⏚							
CIMR-V7**20P2	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	
	⏚							
CIMR-V7**20P4	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	
	⏚							
CIMR-V7**20P7	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	
	⏚							
CIMR-V7**21P5	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚					3.5	12	
CIMR-V7**22P2	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	3.5	12	
	⏚							
CIMR-V7**23P7	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	5.5	10	
	⏚							

Note: The wire size is given for copper wire at 75°C (160°F).

200 V Class Single-phase Input Inverters

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				Type
				Applicable Size		Recommended Size		
				mm^2	AWG	mm^2	AWG	
CIMR-V7** B0P1	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	600 V vinyl-sheathed or equivalent
	⏚							
CIMR-V7** B0P2	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	
	⏚							
CIMR-V7** B0P4	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M3.5	0.8 to 1.0 (7.1 to 8.88)	0.75 to 2	18 to 14	2	14	
	⏚							
CIMR-V7** B0P7	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	3.5	12	
	⏚							
CIMR-V7** B1P5	R/L1, S/L2, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	5.5	10	
	⏚							
CIMR-V7** B2P2	R/L1, S/L2, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	5.5	10	
	⏚							
CIMR-V7** B3P7	R/L1, S/L2, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M5	3.0 (26.62)	3.5 to 8	12 to 8	8	8	
	⏚	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 8	14 to 10			

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				
				Applicable Size		Recommended Size		Type
				mm^2	AWG	mm^2	AWG	
CIMR-V7∗A 25P5	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M5	2.5	5.5 to 8	10 to 8	8	8	600 V vinyl-sheathed wire or equivalent
	⏚							
CIMR-V7∗A 27P5	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M5	2.5	5.5 to 8	10 to 8	8	8	
	⏚							

Note: 1. The wire size is given for copper wire at 75°C (160°F).
2. Three-phase power can also be input for 0.1 to 1.1-kW, Single-phase Input Inverters.

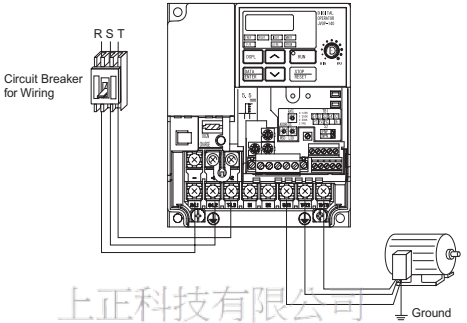
400 V Class 3-phase Input Inverters

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				Type
				Applicable Size		Recommended Size		
				mm^2	AWG	mm^2	AWG	
CIMR-V7** 40P2	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	600 V vinyl-sheathed or equivalent
	⏚							
CIMR-V7** 40P4	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚							
CIMR-V7** 40P7	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚							
CIMR-V7** 41P5	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚							
CIMR-V7** 42P2	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚							
CIMR-V7** 43P0	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚					3.5	12	
CIMR-V7** 43P7	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚					3.5	12	
CIMR-V7*A 45P5	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M4	1.4	3.5 to 5.5	12 to 10	5.5	10	
	⏚							

Model	Terminal Symbols	Screws	Tightening Torque N•m (lb•in)	Wires				
				Applicable Size		Recommended Size		Type
				mm^2	AWG	mm^2	AWG	
CIMR-V7•A 47P5	R/L1, S/L2, T/L3, -, +1, +2, B1, B2, U/T1, V/T2, W/T3	M5	2.5	5.5 to 8	10 to 8	5.5	10	600 V vinyl-sheathed wire or equivalent
	⏚							

Note: The wire size is given for copper wire at 75°C (160°F).

■ Wiring the Main Circuits



• Main Circuit Input Power Supply

Always connect the power supply line to input terminals R/L1, S/L2, and T/L3 (R/L1, S/L2 for single-phase Inverters). Never connect them to terminals U/T1, V/T2, W/T3, B1, B2, –, +1, or +2. The Inverter may be damaged if the wrong terminals are connected.

NOTE For single-phase Inverters, always use terminals R/L1 and S/L2. Never connect terminal T/L3.

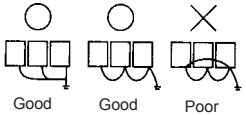
• Grounding (Use ground terminal ⏚.)

⚠WARNING Always ground the ground terminal ⏚ according to local grounding codes.

Failure to observe this warning may result in an electric shock or a fire.

Never ground the Varispeed V7 to the same ground as welding machines, motors, or other electrical equipment.

When several Varispeed V7 Inverters are used side by side, ground each as shown in examples. Do not loop the ground wires.



• Braking Resistor Connection (Optional)

⚠WARNING To connect the braking resistor, cut the protector on terminals B1 and B2.
To protect the braking resistor from overheating, install a thermal overload relay between the braking resistor and the Inverter. This provides a sequence that turns OFF the power supply with thermal relay trip contacts.
Failure to observe this warning may result in a fire.

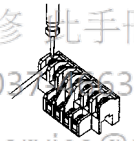
Use this same procedure when connecting a Braking Resistor Unit.
Refer to page 232.

• Inverter Output

Connect the motor terminals to U/T1, V/T2, and W/T3.

• Wiring the Main Circuit Terminals

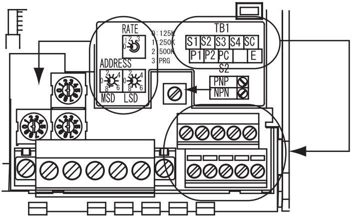
Pass the cables through wiring hole to connect them. Always mount the cover in its original position.



Connect with a Phillips screwdriver.

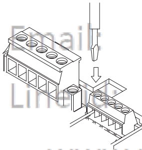
■ Wiring the Control Circuits

Pass the cable through wiring hole to connect it. Always mount the cover in its original position.

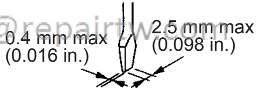


S2 can be changed according to sequence input signal (S1 to S7) polarity.
0 V common: NPN side (Factory setting)
+24 V common: PNP side
Refer to pages 234 and 235 for S2.

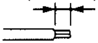
Wiring the Control Circuit Terminals



Screwdriver Blade Width



Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver.



The wire sheath strip length must be 5.5 mm (0.22 in.).

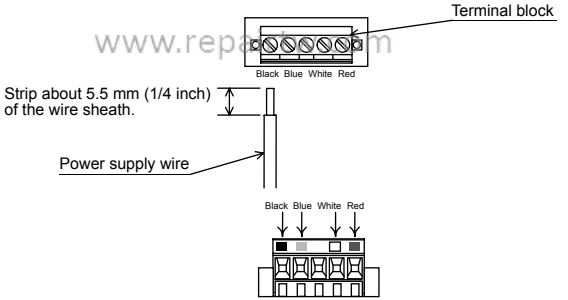
■ Wiring the DeviceNet Communications Cable

Use the following procedure to wire the DeviceNet communications cable to the terminal block (CN6).

1. Use a thin slotted screwdriver to loosen the terminal screws.
2. Insert the power supply wires into the terminal block from below.
3. Tighten the terminal screws securely so that the power supply wires will not come out of the terminal block.

Terminal Block (CN6) Wiring Example

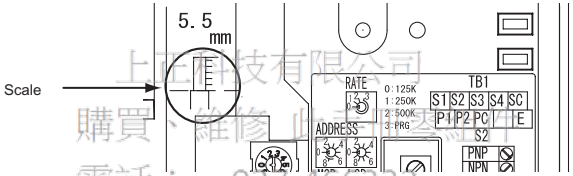
Terminal Color	Name	Wire Color	Description
Black	V–	Black	Communications power supply GND
Blue	CAN_L	Blue	Communications data low
Colorless	Shield	(Shield)	Shield wire
White	CAN_H	White	Communications data high
Red	V+	Red	Communications power supply +24 VDC



* 1. Always use thin DeviceNet cable that meets DeviceNet cable specifications.
* 2. Match the color of the power supply 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.
* 4. There is a 5.5-mm scale on the front of the Inverter just above the terminal block. Use this 5.5-mm scale to confirm the length of exposed wire when stripping wires.
* 5. An external 24-V Power Supply is required for DeviceNet communications.
* 6. Connect terminators (121 Ω, ±1%, 1/4 W) to both ends of the communications line.

Open the front cover and verify that the strip length is 5.5 mm (0.22 in.).



■ Wiring Inspection

After completing wiring, check the following.

- Wiring is proper.
- Wire clippings or screws are not left in the Inverter.
- Screws are securely tightened.
- Bare wires in the terminals do not contact other terminals.

⚠WARNING If the power supply is turned ON during the FWD (or REV) RUN command is given, the motor will start automatically.
Turn the power supply ON after verifying that the RUN signal is OFF.
Failure to observe this warning may result in injury.

NOTE If the FWD (or REV) RUN command is given when the RUN command from the control circuit terminal is selected (n003 = 1), the motor will start automatically after the main circuit input power supply is turned ON.

5. Operating the Inverter

The Control Mode Selection (n002) is initially set to V/f control mode.

⚠WARNING

- Only turn ON the input power supply after confirming that the Digital Operator or blank cover (optional) are in place. Do not remove the Digital Operator or the covers while current is flowing. Failure to observe this warning may result in an electric shock.
- Never operate the Digital Operator or DIP switches with wet hands.
  Failure to observe this warning may result in an electric shock.
- Never touch the terminals while current is flowing, even if the Inverter is stopping.
  Failure to observe this warning may result in an electric shock.

⚠CAUTION

- Never touch the heatsinks, which can be extremely hot.
  Failure to observe this caution may result in harmful burns to the body.
- It is easy to change operation speed from low to high. Verify the safe working range of the motor and machine before operation.
  Failure to observe this caution may result in injury and machine damage.
- Install a holding brake separately if necessary.
  Failure to observe this caution may result in injury.
- Do not perform signal checks during operation.
  The machine or the Inverter may be damaged.
- All the constants set in the Inverter have been preset at the factory. Do not change the settings unnecessarily.
  The Inverter may be damaged.

■ Test Run

The Inverter operates when a frequency (speed) is set.

There are four operating modes for the Varispeed V7:

1. RUN command from the Digital Operator (potentiometer/digital setting)
2. RUN command from the control circuit terminals
3. RUN command from DeviceNet communications

Prior to shipping, the Inverter is set up to receive the RUN command and frequency reference from the Operator. Below are instructions for running the Varispeed V7 using the JVOP-147 Digital Operator (without potentiometer). For instructions on operation, refer to page 53.

Operation reference or frequency reference constants can be selected separately as shown below.

Name	Constant
RUN Command Selection	n003 = 0 --- Enables run, stop, and reset from Digital Operator. = 1 --- Enables run and stop from control circuit terminals. = 3 --- Enables DeviceNet communications.
Frequency Reference Selection	n004 = 0 --- Enables the Digital Operator's potentiometer setting. = 1 --- Enables Frequency Reference 1 (constant n024). = 7 --- Enables a voltage reference (0 to 10 V) at the Digital Operator's circuit terminal. = 8 --- Enables a current reference (4 to 20 mA) at the Digital Operator's circuit terminal. = 9 --- Enables DeviceNet communications.

Operation Steps	Operator Display	Function Indicators	Status Indicators
1. Turn the potentiometer fully counter-clockwise, and then turn the power ON. 2. F/R will flash. Select FWD or REV RUN using the keys.	0 FOR or REV	FREF F/R	RUN ☼ ALARM ● RUN ◎ ALARM ●
NOTE Never select REV when reverse run is prohibited.			
3. Press DSPL to make FREF flash. Then press RUN. 4. Operate the motor by turning the potentiometer clockwise. (A frequency reference corresponding to the potentiometer position will be displayed.)	0 0 to 1800 (r/min) Minimum output frequency is 45 r/min	FREF FREF	RUN ☼ ALARM ● RUN ☼ ALARM ●
NOTE If the potentiometer is switched rapidly, the motor also accelerates or decelerate rapidly in proportion to the potentiometer movement. Pay attention to load status and switch the potentiometer at a speed that will not adversely affect motor movement.			

Status indicators-☼ : ON ◎ : Flashing ● : OFF

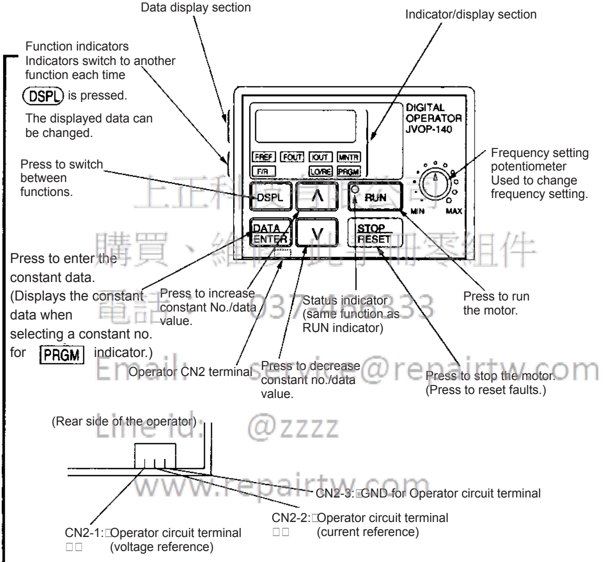
☐ Operation Check Points

- Motor rotates smoothly.
- Motor rotates in the correct direction.
- Motor does not have abnormal vibration or noise.
- Acceleration and deceleration are smooth.
- Current matching the load flows.
- Status indicators and Digital Operator display are correct.

■ Operating the Digital Operator

All functions of the Varispeed V7 are set using the Digital Operator. Below are descriptions of the display and keypad sections.

JVOP-140 Digital Operator

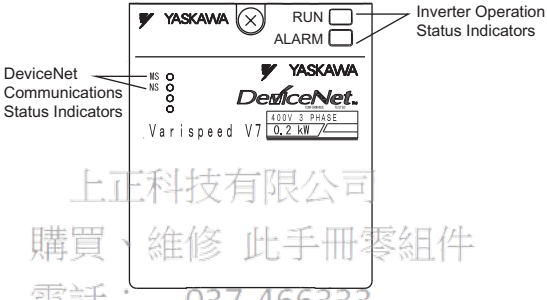


Details of Indicators (Color in parenthesis indicates the color of indicator.)

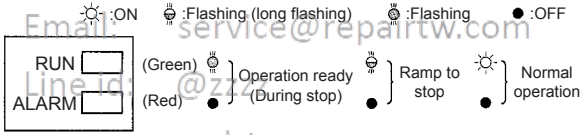
FREF Frequency reference setting/monitoring (GREEN)	FOUT Output frequency monitoring (GREEN)	IOUT Output current monitoring (GREEN)	MNTR Multi-function monitoring (GREEN)
F/R Operator RUN command FWD/REV selection (GREEN)		LO/RE LOCAL/REMOTE Selection (RED)	PRGM Constant no./data (RED)

☐ Description of Status Indicators

The following diagram shows the positions of four status indicators (two Inverter operation status indicators, two DeviceNet communications status indicators). The combinations of these indicators indicate the status of the Inverter and DeviceNet communications (On, flashing, and OFF).



Inverter Operation Status Indicators



For details on how the status indicators function for Inverter faults, refer to *Chapter 9. Fault Diagnosis*. If a fault occurs, the ALARM indicator will light.

NOTE

The fault can be reset by turning ON the FAULT RESET signal (or by pressing the STOP/RESET key on the Digital Operator) with the operation signal OFF, or by turning OFF the power supply. If the operation signal is ON, the fault cannot be reset using the FAULT RESET signal.

DeviceNet Communications Status Indicators

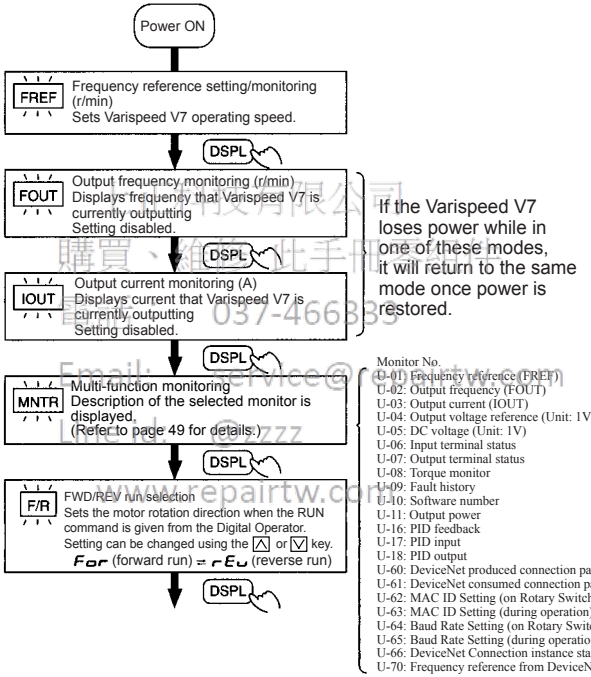
These indicators show the status of DeviceNet communications.

Name	Indication		Operating Status	Remarks
	Color	Status		
MS	Green	ON	Inverter communications operating	The Inverter is operating normally.
	Green	Flashing	Inverter communications 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 Inverter.
	Red	Flashing	Non-fatal error occurred	A non-fatal (recoverable) error occurred.
	---	OFF	Power supply OFF	DeviceNet communications are not online. Network power is not being supplied to the Inverter.
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. • 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 Inverter. The baud rate settings do not agree.

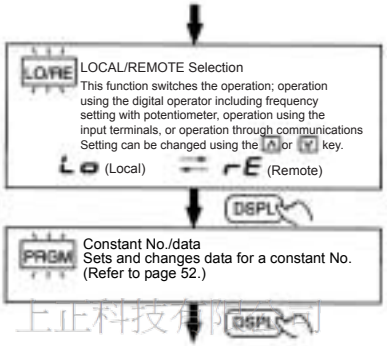
■ Function Indicator Description

By pressing DSPL on the Digital Operator, each of the function indicators can be selected.

The following flowchart describes each function indicator.



Note: The unit used for frequency is determined by the value set for constant n035. For details, refer to page 196.

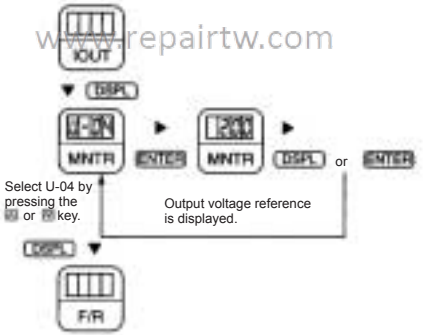


☐ MNTR Multi-function Monitoring

Selecting the Monitor

Press the DSPL key. When MNTR is ON, data can be displayed by selecting the monitor number.

Example: Monitoring the Output Voltage Reference



Monitoring

The following items can be monitored using U constants.

Constant No.	Name	Unit	Description
U-01	Frequency Reference (FREF)*1*5	r/min	Frequency reference can be monitored. (Same as FREF)
U-02	Output Frequency (FOUT)*1*5	r/min	Output frequency can be monitored. (Same as FOUT)
U-03	Output Current (IOUT)*1	A	Output current can be monitored. (Same as IOUT)
U-04	Output Voltage	V	Output voltage can be monitored.
U-05	DC Voltage	V	Main circuit DC voltage can be monitored.
U-06	Input Terminal Status*2	-	Input terminal status of control circuit terminals can be monitored.
U-07	Output Terminal Status*2	-	Output terminal status of control circuit terminals can be monitored.
U-08	Torque Monitor	%	The amount of output torque can be monitored. When V/f control mode is selected, "---" is displayed.
U-09	Fault History (Last 4 Faults)	-	The last four fault history records are displayed.
U-10	Software No.	-	Software number can be checked.
U-11	Output Power*3	kW	Output power can be monitored.
U-16	PID Feedback*4	%	Input 100(%)/Max. output frequency or equivalent
U-17	PID Input*4	%	±100(%)/± Max. output frequency
U-18	PID Output*4	%	±100(%)/± Max. output frequency
U-60	DeviceNet produced Connection Path (Connection Path During Operation)		70: Basic I/O Instance, Response 71: Extended I/O Instance, Response 150: MEMOBUS I/O Instance, Response 151: V7N Control I/O Instance, Response 152: Acceleration/Deceleration Time Control I/O Instance, Response 155: Extended MEMOBUS I/O Instance, Response 156: General-purpose DI/DO Control I/O Instance, Response 20: Basic I/O Instance, Command 21: Extended I/O Instance, Command 100: MEMOBUS I/O Instance, Command 101: V7N Control I/O Instance, Command 102: Acceleration/Deceleration Time Control I/O Instance, Command 105: Extended MEMOBUS I/O Instance, Command 106: General-purpose DI/DO Control I/O Instance, Command

Constant No.	Name	Unit	Description
U-61	DeviceNet consumed Connection Path (Connection Path During Operation)		20: Basic I/O Instance, Command 21: Extended I/O Instance, Command 100: MEMOBUS I/O Instance, Command 101: V7N Control I/O Instance, Command 102: Acceleration/Deceleration Time Control I/O Instance, Command 105: Extended MEMOBUS I/O Instance, Command 106: General-purpose DI/DO Control I/O Instance, Command
U-62	MAC ID Selection (Setting on Rotary Switches)		0 to 63
U-63	MAC ID Setting (MAC ID during Operation)		0 to 63
U-64	Baud Rate Setting (Setting on Rotary Switch)		0: 125 kbps 1: 250 kbps 2: 500 kbps
U-65	Baud Rate Setting (Baud Rate during Operation)		125: 125 kbps 250: 250 kbps 500: 500 kbps
U-66	Status of DeviceNet connection instance		1st digit: Status of explicit instance 0: No instance exists in the network or one is now being prepared. 1: Waiting to be connected to the master while online. 2: Waiting for the connection ID to be written in. 3: Connection completed 4: Time-out 2nd digit: Status of Polled ID instance 0: No instance exists in the network or one is now being prepared. 1: Waiting to be connected to the master while online. 2: Waiting for the connection ID to be written in. 3: Connection completed 4: Time-out
U-70	Frequency reference from DeviceNet	r/min	The frequency reference from the DeviceNet can be monitored.

* 1. The status indicator is not turned ON.

* 2. Refer to the next page for input/output terminal status.

* 3. The display range is from –99.9 to 99.99 kW.

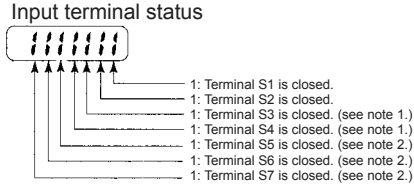
When regenerating, the output power will be displayed in units of 0.01 kW when –9.99 kW or less and in units of 0.1 kW when more than –9.99 kW.

In vector control mode, “---” will be displayed.

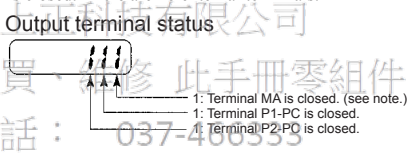
* 4. Displayed in units of 0.1% when less than 100% and in units of 1% when 100% or more. The display range is from –999% to 999%.

* 5. The unit is determined by the value set for constant n035. For details, refer to page 196.

☐ Input/Output Terminal Status



Note: 1. "1" is also displayed if command input from DeviceNet communications or the external control terminal is closed.
2. "1" is displayed if command input from DeviceNet communications is closed. There are no external terminals.



Note: This can only be used from DeviceNet communications. There is no external output terminal.

Fault History Display Method

When U-09 is selected, a four-digit box is displayed. The three digits from the right show the fault description, and the digit on the left shows the order of fault (from one to four). Number 1 represents the most recent fault, and numbers 2, 3, 4 represent the other faults, in ascending order of fault occurrence.

Example:

■□□□ •••••• 4-digit number

■ : Order of fault (1 to 4)

□□□ : Fault description
"---" is displayed if there is no fault.
(Refer to *Chapter 9. Fault Diagnosis* for details.)

Switching Fault History Records

The fault that is displayed can be changed using the ∧ or ∨ key.

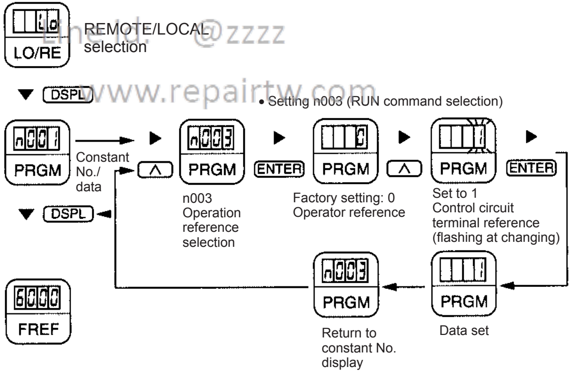
Clearing the Fault History

Set constant n001 to 6 to clear the fault history. The display will return to n001 after 6 is set.

Note: Initializing the constants (n001=12, 13) also clears the fault history.

Setting and Referencing Constants

The following diagram shows how to select and change constants.



■ Simple Data Setting

Digital setting (refer to *5. Operating the Inverter*) and potentiometer setting are both possible for simple acceleration/deceleration operation of the Varispeed V7.

DeviceNet communications are set to enabled at the factory (n004=9).

Simple Operation from the Digital Operator Using Frequency Reference

Following is an example in which forward and reverse run is performed with a standard motor with frequency set to 1,800 r/min, acceleration time set to 15 s, and deceleration time set to 5 s. (Refer to page 127 for details on parameter settings.)

Operation Steps	Operator Display	Function Indicators	Status Indicators
1. Turn ON the power supply.	0	FREF	RUN (Flashing) ALARM (OFF)
2. Set constant n004 to 1. (Enables the potentiometer and RUN/STOP commands from the Digital Operator.)	1	PRGM	RUN (Flashing) ALARM (OFF)
3. Set the following constants. n019: 15.0 (Acceleration Time) n020: 5.0 (Deceleration Time)	15.0 5.0	PRGM	RUN (Flashing) ALARM (OFF)
4. Select forward or reverse run by pressing the [∧] or [∨] key. NOTE: Examine the application. (Never select REV when reverse run is prohibited.)	For (Forward) Or rEv (Reverse)	F/R	RUN (Flashing) ALARM (OFF)
5. Set the reference by pressing the [∧] or [∨] key.	1800	FREF	RUN (ON) ALARM (OFF)
6. Press [RUN].	0—1800	FOUT	RUN (Flashing) ALARM (OFF)
7. Press [STOP] to stop.	1800—0	FOUT	RUN (Flashing (long flashing) → Flashing) ALARM (OFF)

Status indicators ☼ :ON   :Flashing (long flashing)   :Flashing   ● :OFF

6. Operating with DeviceNet Communications

Varispeed V7 Inverters can be connected to a DeviceNet network to communicate with a DeviceNet master. The DeviceNet master can be used for various operations, such as sending RUN/STOP commands, monitoring run status, and setting/referencing of constants.

■ Specifications

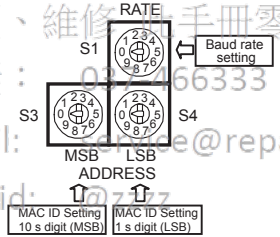
Item	Specifications
DeviceNet Specifications	Conform to release 2.0.
Device Protocol	AC Drive DeviceType = 02
Baud Rate Settings	125, 250, or 500 kbps
Supported Messages	Group 2 Only server. UCMM not supported. Explicit messages or I/O poll messages
I/O Message Communications	Seven kinds of I/O instances are supported: 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. V7 standard control I/O instances (8 input bytes, 8 output bytes) 5. Acceleration/Deceleration time control I/O instances (8 input bytes, 8 output bytes) 6. Extended MEMOBUS I/O instances (8 input bytes, 8 output bytes) 7. General-purpose DI/DO control I/O instances (8 input bytes, 8 output bytes)

Item	Specifications
Explicit Message Communications	Up to 32 bytes of data can be transferred in conformance with the DeviceNet AC/DC drive profile.
Communications Power Supply	11 to 25 VDC (20 mA max.)

■ Component Names and Settings

□ Rotary Switches

The rotary switches are used to set the DeviceNet baud rate and MAC ID (node address). Always turn OFF the Inverter's input power supply before changing the rotary switch settings. The settings will be enabled the next time the power is turned ON.



Baud Rate Setting Switch (S1)

Setting	0	1	2	3 to 9
Baud Rate	125 kbps	250 kbps	500 kbps	Use setting in constant n152.

MAC ID Setting Switches (S3 and S4)

The Inverter's MAC ID is set on the MSB (S3) and LSB (S4) rotary switches.

MAC ID = (MSB setting × 10) + (LSB setting)

The MAC ID setting range is 0 to 63. If a value between 64 and 99 is set, the MAC ID setting in constant n150 will be used.

■ Description of the DeviceNet Functions

DeviceNet-compatible Inverters support the AC Drive Profile defined in DeviceNet specifications. No special settings are needed to operate, adjust, and monitor the Inverters from any DeviceNet master.

DeviceNet-compatible Inverters operate 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.

□ Initial Settings

Always set the following Inverter constants before using DeviceNet communications.

Constant No.	Name	Description
n003	RUN Command Selection	0: Enables the Digital Operator's RUN and STOP Keys. 1: Enables the run/stop control circuit terminals. 3: Enables DeviceNet communications. Set this constant to 3 when sending RUN/STOP commands through DeviceNet communications.

Constant No.	Name	Description
n004	Frequency Reference Selection	0: Enables the Digital Operator's potentiometer setting. 1: Enables Frequency Reference 1 (constant n024). 7: Enables a voltage reference (0 to 10 V) at the Digital Operator's circuit terminal. 8: Enables a current reference (4 to 20 mA) at the Digital Operator's circuit terminal. 9: Enables DeviceNet communications. Set this constant to 9 when setting the frequency through DeviceNet communications.
n035	Selecting Setting/Display Units of Frequency Reference	Always set the number of motor poles (2 to 39). In DeviceNet standards, the motor speed is expressed in units of r/min. The Inverter uses this constant setting to convert the frequency to r/min.

☐ I/O Message Communications

The DeviceNet-compatible Inverters use poll command/response messages for I/O message communications. Select one of the seven supported I/O instances and transfer I/O data with the master. I/O messages are always transferred between the Inverter and master at the fixed communications period whether or not there have been changes to the I/O data.

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 → Inverter) 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.

Data	Name	Contents
Bytes 2 and 3	Speed Reference *3	Sets the Inverter's speed reference. Speed reference data: Frequency reference (r/min) $\times 2^{SS}$ (^{SS}: Speed scale*1) Setting range: 0 to FFFF Hex*2 For example, when setting a reference of 1,800 r/min with a speed scale of 0: Speed reference data = 1,800 $\times 2^0$ = 1,800 = 0708 Hex

* 1. The speed scale can be set with AC/DC Drive object attribute 16 through explicit message communications.
* 2. The speed reference setting cannot exceed the Inverter's Maximum Output Frequency Setting in constant n011.
* 3. When using the speed reference, always set the Number of Motor Poles (2 to 39) in Inverter constant n035 (Selecting Setting/Display Units of Frequency Reference).

- Output (Inverter → 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.

Data	Name	Contents
Byte 0, bit 2	Running 1 (Fwd)	Indicates the Inverter's operating status. 0: Stopped, operating in reverse, or applying DC injection braking (Reverse RUN command ON). 1: Operating forward or applying DC injection braking (Reverse RUN command OFF).
Bytes 2 and 3	Speed Actual	Indicates the Inverter's speed. Monitored speed data: Monitored frequency (r/min) $\times 2^{SS}$ (^{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 r/min.

* 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 n035 (Selecting Setting/Display Units of Frequency Reference).

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 → Inverter) Instance 21 (15 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	---	Net Ref	Net Ctrl	---	---	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 n003 (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 n004 (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 (Inverter → 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)							

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
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, operating in reverse, or applying DC injection braking (Reverse RUN command ON). 1: Operating forward or applying DC injection braking (Reverse RUN command OFF).
Byte 0, bit 3	Running 2 (Rev)	Indicates the Inverter's operating status. 0: Stopped, operating forward, or applying DC injection braking (Reverse RUN command OFF). 1: Operating in reverse or applying DC injection braking (Reverse RUN command ON).
Byte 0, bit 4	Ready	Indicates the Inverter's preparation status. 0: Fault detected or initializing. 1: Preparations for operation completed.

Data	Name	Contents
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 Refer-ence	Indicates that the Inverter's frequency match was detected. 0: Stopped, accelerating, or decelerat-ing. 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.

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.

Always execute the ENTER command when changing constants. See *ENTER Command (Write-only Register)* on page 126 for details.

• Input (Master → Inverter) 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 (Inverter → 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. 00 Hex: Do not execute. 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. Shows "00, 00" if an attempt is made to write the same data to the same address; the WRITE command will not be executed.

V7 Standard Control I/O Instances

V7 Standard control I/O instances are for DeviceNet-compatible Inverters only. All of the Inverter's I/O functions can be used in addition to the functions supported by the Extended I/O Instances.

V7 Standard 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 → Inverter) Instance 101 (65 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	---	Terminal S7*	Terminal S6*	Terminal S5*	Terminal S4	Terminal S3	Run Rev	Run Fwd
1	Terminal P2	Terminal P1	Terminal MA*	---	---	---	Fault Reset	External Fault
2	Speed Reference (Low Byte)							

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3	Speed Reference (High Byte)							
4	---							
5	---							
6	---							
7	---							

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 n052. 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 n053. 0: Terminal S4 function OFF 1: Terminal S4 function ON
Byte 0, bit 4	Terminal S5*	Inputs the function set for Inverter constant n054 (Multi-function Input Selection 5.) 0: Terminal S5 function OFF 1: Terminal S5 function ON

Data	Name	Contents
Byte 0, bit 5	Terminal S6*	Inputs the function set for Inverter constant n055 (Multi-function Input Selection 6.) 0: Terminal S6 function OFF 1: Terminal S6 function ON
Byte 0, bit 6	Terminal S7*	Inputs the function set for Inverter constant n056 (Multi-function Input Selection 7.) 0: Terminal S7 function OFF 1: Terminal S7 function ON

* These terminals can be used only from DeviceNet communications. There are no corresponding external input terminals or output terminals.

Data	Name	Contents
Byte 1, bit 0	External Fault	External fault (EF0) input from communications. 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 MA*	Operates the Inverter's multi-function output terminal MA. This function is enabled only when Inverter constant n057 is set to 18. 0: Terminal MA OFF 1: Terminal MA ON
Byte 1, bit 6	Terminal P1	Operates the Inverter's multi-function output terminal P1. This function is enabled only when Inverter constant n058 is set to 18. 0: Terminal P1 OFF 1: Terminal P1 ON

Data	Name	Contents
Byte 1, bit 7	Terminal P2	Operates the Inverter's multi-function output terminal P2. This function is enabled only when Inverter constant n059 is set to 18. 0: Terminal P2 OFF 1: Terminal P2 ON
Bytes 2 and 3	Speed Reference	Sets the Inverter's speed reference. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

- Output (Inverter → 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 MA*	Local/ Remote	UV	OPE
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	---							
5	---							
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: 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, stopped (Reverse RUN command OFF), or applying DC injection braking (Reverse RUN command OFF). 1: Operating in reverse, stopped (Reverse RUN command ON), or applying DC injection braking (Reverse RUN command ON).
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.

Data	Name	Contents
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 (OP1 to OP5) 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.
Byte 1, bit 3	Terminal MA*	Indicates the output status of Inverter multi-function output terminal MA. 0: Terminal MA OFF 1: Terminal MA 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

Data	Name	Contents
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	Indicates the Inverter's speed. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.
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.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

Acceleration/Deceleration Time Control I/O Instances

Acceleration/Deceleration Time Control I/O Instances are for DeviceNet-compatible Inverters only. They support the functions of the V7 standard control I/O instances and also allow the acceleration/deceleration time to be set and the motor speed (estimated value) to be monitored. Eight bytes are used for input data and eight bytes are used for output data.

• Input (Master → Inverter) Instance 102 (66 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	---	Terminal S7*	Terminal S6*	Terminal S5*	Terminal S4	Terminal S3	Run Rev	Run Fwd
1	Terminal P2	Terminal P1	Terminal MA*	---	---	---	Fault Reset	External Fault
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							
4	Acceleration Time 1 (Low Byte)							
5	Acceleration Time 1 (High Byte)							
6	Deceleration Time 1 (Low Byte)							
7	Deceleration Time 1 (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	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 n052. 0: Terminal S3 function OFF 1: Terminal S3 function ON

Data	Name	Contents
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 n053. 0: Terminal S4 function OFF 1: Terminal S4 function ON
Byte 0, bit 4	Terminal S5*	Inputs the function set for Inverter constant n054 (Multi-function Input Selection 5.) 0: Terminal S5 function OFF 1: Terminal S5 function ON
Byte 0, bit 5	Terminal S6*	Inputs the function set for Inverter constant n055 (Multi-function Input Selection 6.) 0: Terminal S6 function OFF 1: Terminal S6 function ON
Byte 0, bit 6	Terminal S7*	Inputs the function set for Inverter constant n056 (Multi-function Input Selection 7.) 0: Terminal S7 function OFF 1: Terminal S7 function ON
Byte 1, bit 0	External Fault	External fault (EF0) input from communications. 0: --- 1: External fault (EF0)
Byte 1, bit 1	Fault Reset	Resets the Inverter from fault status. 0: --- 1: Reset fault.

Data	Name	Contents
Byte 1, bit 5	Terminal MA*	Operates the Inverter's multi-function output terminal MA. This function is enabled only when Inverter constant n057 is set to 18. 0: Terminal MA OFF 1: Terminal MA ON
Byte 1, bit 6	Terminal P1	Operates the Inverter's multi-function output terminal P1. This function is enabled only when Inverter constant n058 is set to 18. 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 n059 is set to 18. 0: Terminal P2 OFF 1: Terminal P2 ON
Bytes 2 and 3	Frequency Reference	Sets the Inverter's speed reference. This setting is the same as the speed reference in the V7 standard control I/O instance. The units depend on the setting in Inverter constant n035.
Bytes 4 and 5	Acceleration Time 1	Sets the Inverter's acceleration time. The units depend on the setting in Inverter constant n018. (The factory setting is for units of 0.1 s.) The value set here is recorded in EEPROM. The units are not affected by the time scale (TS) setting.

Data	Name	Contents
Bytes 6 and 7	Decelera-tion Time 1	Sets the Inverter's deceleration time. The units depend on the setting in Inverter constant n018. (The factory set-ting is for units of 0.1 s.) The value set here is recorded in EEPROM. The units are not affected by the time scale (TS) setting.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

- Output (Inverter → Master) Instance 152 (98 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Fault-ed	Warn-ing	Ready	At Ref-erence	Reset	Rev Run-ning	ZSP	Run-ning
1	---	---	Termi-nal P2	Termi-nal P1	Termi-nal MA*	Local/ Re-mote	UV	OPE
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	Speed Reference (Low Byte)							
5	Speed Reference (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: Stopped. 1: Operating forward, operating in reverse, or applying DC injection braking.

Data	Name	Contents
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, stopped (Reverse RUN command OFF), or applying DC injection braking (Reverse RUN command OFF). 1: Operating in reverse, stopped (Reverse RUN command ON), or applying DC injection braking (Reverse RUN command ON).
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.

Data	Name	Contents
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 (OP1 to OP5) 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.
Byte 1, bit 3	Terminal MA*	Indicates the output status of Inverter multi-function output terminal MA. 0: Terminal MA OFF 1: Terminal MA 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

Data	Name	Contents
Bytes 2 and 3	Speed Actual	Indicates the Inverter's speed. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.
Bytes 4 and 5	Speed Reference	Indicates the Inverter's speed reference. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.
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.

* These terminals can be used only from DeviceNet communications. There are no corresponding external input or output terminals.

Extended MEMOBUS I/O Instances

Extended MEMOBUS I/O Instances are for DeviceNet-compatible Inverters only.

Extended MEMOBUS 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.

Always execute the ENTER command when changing constants. See *ENTER Command (Write-only Register)* on page 126 for details.

- Input (Master → Inverter) Instance 105 (69 Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	---	Terminal S7*	Terminal S6*	Terminal S5*	Terminal S4	Terminal S3	Run Rev	Run Fwd
1	Terminal P2	Terminal P1	Terminal MA*	---	Fnc. Code 2	Fnc. Code 1	Fault Reset	External Fault
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Register Number (Low Byte)							
5	Register Number (High Byte)							
6	Register Data (Low Byte)							
7	Register Data (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	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 n052. 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 n053. 0: Terminal S4 function OFF 1: Terminal S4 function ON
Byte 0, bit 4	Terminal S5*	Inputs the function set for Inverter constant n054 (Multi-function Input Selection 5.) 0: Terminal S5 function OFF 1: Terminal S5 function ON

Data	Name	Contents
Byte 0, bit 5	Terminal S6*	Inputs the function set for Inverter constant n055 (Multi-function Input Selection 6.) 0: Terminal S6 function OFF 1: Terminal S6 function ON
Byte 0, bit 6	Terminal S7*	Inputs the function set for Inverter constant n056 (Multi-function Input Selection 7.) 0: Terminal S7 function OFF 1: Terminal S7 function ON

* These terminals can be used only from DeviceNet communications. There are no corresponding external input terminals or output terminals.

Data	Name	Contents
Byte 1, bit 0	External Fault	External fault (EF0) input from communications. 0: --- 1: External fault (EF0)
Byte 1, bit 1	Fault Reset	Resets the Inverter from fault status. 0: --- 1: Reset fault.
Byte 1, bit 2	Fnc. Code 1	See the table *MEMOBUS Function Codes* on page 82 for details.
Byte 1, bit 3	Fnc. Code 2	
Byte 1, bit 5	Terminal MA*	Operates the Inverter’s multi-function output terminal MA. This function is enabled only when Inverter constant n057 is set to 18. 0: Terminal MA OFF 1: Terminal MA ON

Data	Name	Contents
Byte 1, bit 6	Terminal P1	Operates the Inverter's multi-function output terminal P1. This function is enabled only when Inverter constant n058 is set to 18. 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 n059 is set to 18. 0: Terminal P2 OFF 1: Terminal P2 ON
Bytes 2 and 3	Speed Reference	Sets the Inverter's speed reference. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.
Bytes 4 and 5	Register Number	Set the Inverter's MEMOBUS register number.
Bytes 6 and 7	Register Data	Set the write data when executing a MEMOBUS WRITE command.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

MEMOBUS Function Codes

Status of Function Code 1 (Byte 1, bit 1)	Status of Function Code 2 (Byte 1, bit 2)	Function
Fnc. Code 1 = 0	Fnc. Code 2 = 0	Nothing will be executed.
Fnc. Code 1 = 0	Fnc. Code 2 = 1	The data will be read from the register specified in bytes 4 and 5.

Status of Function Code 1 (Byte 1, bit 1)	Status of Function Code 2 (Byte 1, bit 2)	Function
Fnc. Code 1 = 1	Fnc. Code 2 = 0	The data specified in bytes 6 and 7 will be written to the register specified in bytes 4 and 5.
Fnc. Code 1 = 1	Fnc. Code 2 = 1	Nothing will be executed.

- Output (Inverter → Master) Instance 155 (9B 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 MA*	Local/Remote	Fnc. Code 2	Fnc. Code 1	UV	OPE
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	Register Number (Low Byte)							
5	Register Number (High Byte)							
6	Register Data (Low Byte)							
7	Register Data (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Running	Indicates the Inverter's operating status. 0: Stopped. 1: Operating forward, operating in reverse, or applying DC injection braking.

Data	Name	Contents
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, stopped (Reverse RUN command OFF), or applying DC injection braking (Reverse RUN command OFF). 1: Operating in reverse, stopped (Reverse RUN command ON), or applying DC injection braking (Reverse RUN command ON).
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.

Data	Name	Contents
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 (OP1 to OP5) detected.
Byte 1, bit 1	UV	Indicates that the Inverter detected an undervoltage error. 0: Normal 1: UV detected.
Byte 1, bit 2	Fnc. State 1	See the table *MEMOBUS Function Status* on page 87 for details.
Byte 1, bit 3	Fnc. State 2	
Byte 1, bit 4	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.
Byte 1, bit 5	Terminal MA*	Indicates the output status of Inverter multi-function output terminal MA. 0: Terminal MA OFF 1: Terminal MA ON
Byte 1, bit 6	Terminal P1	Indicates the output status of Inverter multi-function output terminal P1. 0: Terminal P1 OFF 1: Terminal P1 ON

Data	Name	Contents
Byte 1, bit 7	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	Indicates the Inverter's speed. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.
Bytes 4 and 5	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 6 and 7	Register Data	Indicates the read data when executing a MEMOBUS READ command.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

MEMOBUS Function Status

Status of Function State 1 (Byte 1, bit 1)	Status of Function State 2 (Byte 1, bit 2)	Operational Status
Fnc. State 1 = 0	Fnc. State 2 = 0	Not executed yet.
Fnc. State 1 = 0	Fnc. State 2 = 1	A MEMOBUS command is being executed.
Fnc. State 1 = 1	Fnc. State 2 = 0	A MEMOBUS command execution error occurred.
Fnc. State 1 = 1	Fnc. State 2 = 1	MEMOBUS command execution was completed.

General-purpose DI/DO Control I/O Instances

General-purpose DI/DO Control I/O Instances are for DeviceNet-compatible Inverters only.

General-purpose DI/DO Control I/O Instances can be used for general-purpose I/O through the Inverter's control circuit terminals (S1 to S4, P1, and P2) as well as the functions supported by the standard control I/O instance.

Always execute the ENTER command when changing constants. See *ENTER Command (Write-only Register)* on page 126 for details.

General-purpose DI/DO 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 → Inverter) Instance 106 (6A Hex)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	---	Terminal S7*	Terminal S6*	Terminal S5*	Terminal S4	Terminal S3	Run Rev	Run Fwd
1	Terminal P2	Terminal P1	Terminal MA*	---	---	---	Fault Reset	External Fault
2	Speed Reference (Low Byte)							

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3	Speed Reference (High Byte)							
4	Not used.							
5	Not used.							
6	Not used.							
7	Not used.							

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 n052. 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 n053. 0: Terminal S4 function OFF 1: Terminal S4 function ON
Byte 0, bit 4	Terminal S5*	Inputs the function set for Inverter constant n054 (Multi-function Input Selection 5.) 0: Terminal S5 function OFF 1: Terminal S5 function ON

Data	Name	Contents
Byte 0, bit 5	Terminal S6*	Inputs the function set for Inverter constant n055 (Multi-function Input Selection 6.) 0: Terminal S6 function OFF 1: Terminal S6 function ON
Byte 0, bit 6	Terminal S7*	Inputs the function set for Inverter constant n056 (Multi-function Input Selection 7.) 0: Terminal S7 function OFF 1: Terminal S7 function ON
Byte 1, bit 0	External Fault	External fault (EF0) input from communications. 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 MA*	Operates the Inverter's multi-function output terminal MA. This function is enabled only when Inverter constant n057 is set to 18. 0: Terminal MA OFF 1: Terminal MA ON
Byte 1, bit 6	Terminal P1	Operates the Inverter's multi-function output terminal P1. This function is enabled only when Inverter constant n058 is set to 18. 0: Terminal P1 OFF 1: Terminal P1 ON

Data	Name	Contents
Byte 1, bit 7	Terminal P2	Operates the Inverter's multi-function output terminal P2. This function is enabled only when Inverter constant n059 is set to 18. 0: Terminal P2 OFF 1: Terminal P2 ON
Bytes 2 and 3	Speed Reference	Indicates the Inverter's speed reference. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

- Output (Inverter → Master) Instance 156 (9C 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 MA*	---	Terminal S4	Terminal S3	Terminal S2	Terminal S1
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							
4	---							
5	---							
6	Output Current Monitor (Low Byte)							
7	Output Current Monitor (High Byte)							

Data	Name	Contents
Byte 0, bit 0	Running	Indicates the Inverter's operating status. 0: 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, stopped (Reverse RUN command OFF), or applying DC injection braking (Reverse RUN command OFF). 1: Operating in reverse, stopped (Reverse RUN command ON), or applying DC injection braking (Reverse RUN command ON).
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.

Data	Name	Contents
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	Terminal S1	Indicates the input status of Inverter multi-function input terminal S1. When using this terminal as a general-purpose DI terminal, always set Inverter constant n050 to 28. 0: Terminal S1 OFF 1: Terminal S1 ON
Byte 1, bit 1	Terminal S2	Indicates the input status of Inverter multi-function input terminal S2. When using this terminal as a general-purpose DI terminal, always set Inverter constant n051 to 28. 0: Terminal S2 OFF 1: Terminal S2 ON
Byte 1, bit 2	Terminal S3	Indicates the input status of Inverter multi-function input terminal S3. When using this terminal as a general-purpose DI terminal, always set Inverter constant n052 to 28. 0: Terminal S3 OFF 1: Terminal S3 ON

Data	Name	Contents
Byte 1, bit 3	Terminal S4	Indicates the input status of Inverter multi-function input terminal S4. When using this terminal as a general-purpose DI terminal, always set Inverter constant n053 to 28. 0: Terminal S4 OFF 1: Terminal S4 ON
Byte 1, bit 5	Terminal MA*	Indicates the output status of Inverter multi-function output terminal MA. 0: Terminal MA OFF 1: Terminal MA ON
Byte 1, bit 6	Terminal P1	Indicates the output status of Inverter multi-function output terminal P1. 0: Terminal P1 OFF 1: Terminal P1 ON
Byte 1, bit 7	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	Indicates the Inverter's speed. The units depend on the setting in Inverter constant n035. The units are not affected by the speed scale (SS) setting.
Bytes 6 and 7	Output Current Monitor	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.

* Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

☐ Explicit Message Communications

The DeviceNet-compatible Inverters can 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 communications, which are performed at regular intervals, the explicit messages can be sent from the master at any time and corresponding response messages 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: • 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.

Item	Description
Footer	This value is set automatically, so there is no need to check it.

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 Inverter's communications status.

- Object Contents

Instance	Attribute	Name	Contents	Setting Range	Factory 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. (See note 1.)	---	Depends on product.	OK	---	Word
	04	Revision	Indicates the Inverter's communications software revision.	---	01,01	OK	---	Byte x 2

In-stance	At-tribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	05	Status	Indicates the Inverter's communications status.	---	0001	OK	---	Word
	06	Serial Number	Indicates the serial number of the Inverter communications.	---	Depends on product.	OK	---	Long
	07	Product Name	Indicates the model number. • V7N A □□□□ (See note 2.)	---	Capacity characters (See note 2.)	OK	---	String
	08	State	Indicates the Inverter's status. • 3: Inverter ready. • 4: Inverter error occurred.	---	03	OK	---	Byte

Note: 1. The Product Code depends on the Inverter capacity. For example, the Product Code for the CIMR-V7NA20P2 is 3001.

2. The □□□□ characters contain the capacity portion of the Inverter's model number. For example, if the Inverter is a CIMR-V7NA21P5, the □□□□ characters will contain 21P5.

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 assigned functions 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	Factory Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the Message Router object's software revision.	---	0001	OK	---	Word

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	Factory Setting (Hex)	Read	Write	Size
00	01	Object Software Revision	Indicates the DeviceNet object's software revision.	---	0002	OK	---	Word

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	01	MAC ID	Indicates the setting for the MAC ID. The MAC ID can be set with the rotary switches or constant n150.	0 to 63	00	OK	---	Byte
	02	Baud Rate	Indicates the setting for the baud rate. The baud rate can be set with the rotary switches or constant n150. • 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 x 2

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	Factory 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).	See note 1.	---	OK	OK	Byte x 4
15	03	Data	This function is the same as the Extended I/O Instance (input).	See note 1.	---	OK	OK	Byte x 4
46	03	Data	This function is the same as the Basic I/O Instance (output).	---	---	OK	---	Byte x 4
47	03	Data	This function is the same as the Extended I/O Instance (output).	---	---	OK	---	Byte x 4
64	03	Data	This function is the same as the MEMOBUS I/O Instance (input).	See note 1.	---	OK	OK	Byte x 5
65	03	Data	This function is the same as the V7 Standard Control I/O Instance (input).	See note 1.	---	OK	OK	Byte x 8
69	03	Data	This function is the same as the Extended MEMOBUS I/O Instance (input).	See note 1.	---	OK	OK	Byte x 8
96	03	Data	This function is the same as the MEMOBUS I/O Instance (output).	---	---	OK	---	Byte x 5
97	03	Data	This function is the same as the V7 Standard Control I/O Instance (output).	---	---	OK	---	Byte x 8
9B	03	Data	This function is the same as the Extended MEMOBUS I/O Instance (output).	---	---	OK	---	Byte x 8

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

* 2. 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.

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	Factory 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 Inverter's communications format with a code.	---	83	OK	---	Byte

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	04	Produced connection ID	Indicates the label that is used in the Inverter'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 Inverter's communications format with a code.	---	21	OK	---	Byte
	07	Produced connection size	Indicates the maximum number of bytes for transmissions.	---	0014	OK	---	Word
	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

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	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	---	Byte
	02	Instance type	Indicates the instance type. 00: Explicit message 01: I/O message	---	01	OK	---	Byte
	03	Transport class trigger	Indicates the Inverter's communications format with a code.	---	82	OK	---	Byte
	04	Produced connection ID	Indicates the label that is used in the Inverter'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 Inverter'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 time-out 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

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
02	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

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	Factory 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. 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	0 to 150% of the Inverter's rated current	See note 1.	OK	OK	Word
	07	Rated Voltage	This attribute can be used to set/reference the motor's rated voltage. Setting units: 1 V	0 to 255 V	See note 2.	OK	OK	Word

* 1. The factory setting of the motor rated current depends on the Inverter's capacity.
* 2. The table shows the setting range and factory setting for a 200 V Class Inverter. Double these values when using a 400 V Class Inverter.

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.

Service Code (Hex)	Service Name	Description
10	Set_Attribute_ Single	Changes the contents of the specified attribute.
05	Reset	Resets the Inverter.

- Object Contents

Instance	Attribute	Name	Contents	Setting Range	Factory 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 n003 (RUN Command Selection). 01: Enables the RUN command from DeviceNet (byte 0, bits 0 and 1).	00,01	00	OK	OK	Byte
	06	State	Indicates the Inverter's status. 02: Inverter preparation not completed. 03: Inverter preparation completed (stopped). 04: Operating (normal). 05: Decelerated to a stop (normal). 06: Decelerated to a stop because of serious fault. 07: Stopped because of serious fault.	---	03	OK	---	Byte

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	07	Running 1	Indicates the Inverter's operating status. 00: Stopped, operating in reverse, or applying DC injection braking (Reverse RUN command ON). 01: Operating forward or applying DC injection braking (Reverse RUN command OFF).	---	00	OK	---	Byte
	08	Running 2	Indicates the Inverter's operating status. 00: Stopped, operating forward, or applying DC injection braking (Reverse RUN command OFF). 01: Operating in reverse or applying DC injection braking (Reverse RUN command ON).	---	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. (See note 3.)	---	0000	OK	---	Word

Instance	Attribute	Name	Contents	Setting Range	Factory 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. (See note 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 MEMOBUS Timeover Detection constant (n151) can be used to set the method used to stop the Inverter when a communications error has occurred.
* 3. Fault Code List

- If using software No. 0013 (for Inverters of 4.0 kW or less) or No. 0101 (5.5/7.5 kW)

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
0000	---	Inverter normal
2200	oL2	Inverter overload

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
2300	oC	Overcurrent
2310	oL1	Motor overload
2330	GF*1	Ground fault
2340	SC*1	Load short-circuit
3130	PF	Main circuit voltage fault
	LF	Output open phase
3210	ov	Main circuit overvoltage
3220	Uv1	Main circuit undervoltage
4210	oH	Heatsink overheating
5110	Uv2	Control power supply error
5210	F05	Inverter A/D converter fault
5300	oPr	Operator connecting fault
	F07	Operator control circuit fault
6320	F04	Inverter EEPROM fault
7112	rH*1	Built-in braking resistor overheating
8100	bUS	DeviceNet communications fault
8200	FbL	PID feedback loss
8311	oL3	Overtorque
8321	UL3	Undertorque

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
9000	STP	Emergency stop
	EF3	External fault (input terminal S3)
	EF4	External fault (input terminal S4)
	EF5	External fault (input terminal S5)*2
	EF6	External fault (input terminal S6)*2
	EF7	External fault (input terminal S7)*2
	EF0	External fault from communications

* 1. These faults are not detected in Inverters with a capacity of 4.0 kW or less.

* 2. These faults are displayed only when they have been operated through DeviceNet communications. There are no corresponding external input terminals.

- If using software No.0010 to 0012 (for Inverters of 4.0 kW or less) or No.0100 (5.5/7.5 kW)

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
0000	---	Inverter normal
2200	OL2	Inverter overload
2220	OL1	Motor overload
2221	OL3	Overtorque 1
2300	OC	Overcurrent
3210	OV	Main circuit overvoltage
3220	UV1	Main circuit undervoltage
4200	OH	Heatsink overheating
5110	UV2	Control power supply error

DeviceNet Fault Code (Hex)	Operator Fault Display	Meaning
5300	OPR	Operator not connected
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	External fault from communications

* These faults are displayed only when they have been operated through DeviceNet communications. There are no corresponding external input terminals.

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	Factory 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

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	04	NetRef	Sets the Frequency Reference right. (See note 1.) 00: Use the Frequency Reference input method set in constant n004 (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. (See note 3.) 00: Vector control 01: V/f control	00 to 03	01	OK	OK	Byte
	07	Speed Actual	Indicates the Inverter's speed. (See note 2.) Minimum units: r/min/2^{SS} SS: Speed scale (attribute 16)	---	0000	OK	---	Word
	08	Speed Ref	Sets or references the Inverter's speed reference. (See note 2.) Minimum units: r/min/2^{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 A/2^{CS} CS: Current scale (attribute 17)	---	0000	OK	---	Word
	0F	Power Actual	Indicates the Inverter's output power. Minimum units: W/2^{PS} PS: Power scale (attribute 1A)	---	0000	OK	---	Word

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	10	Input Voltage	Indicates the Inverter's input voltage. Minimum units: V/2^{VS} VS: Voltage scale (attribute 1B)	---	00C8 (200 V) or 0190 (400 V)	OK	---	Word
	11	Output Voltage	Indicates the Inverter's output voltage. Minimum units: V/2^{VS} VS: Voltage scale (attribute 1B)	---	0000	OK	---	Word
	12	Acceleration Time	Sets or references the Inverter's Acceleration Time 1 (n019). Minimum units: ms/2^{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 (n020). Minimum units: ms/2^{TS} TS: Time scale (attribute 1C)	0 to 6,000 s	2710 (10.0 s)	OK	OK	Word
	14	Low Spd Limit	Sets or references the Inverter's Frequency Reference Lower Limit (n034). (See notes 2 and 3.) Minimum units: r/min/2^{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 (n033). (See notes 2 and 3.) Minimum units: r/min/2^{SS} SS: Speed scale (attribute 16)	0 to 110% of the max. frequency	0708 (1,800 r/m)	OK	OK	Word

Instance	Attribute	Name	Contents	Setting Range	Factory Setting (Hex)	Read	Write	Size
01	16	Speed Scale	Sets or references the unit coefficient (n153) for speed-related data. Speed units: 1 (r/min) x $1/2^{SS}$ SS: Speed scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	17	Current Scale	Sets or references the unit coefficient (n154) for current-related data. Current units: 0.1 (A) x $1/2^{CS}$ 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 (W) x $1/2^{PS}$ PS: Power scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	1B	Voltage Scale	Sets or references the unit coefficient (n156) for voltage-related data. Voltage units: 1 (V) x $1/2^{VS}$ VS: Voltage scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	1C	Time Scale	Sets or references the unit coefficient (n157) for time-related data. Time units: 1 (ms) x $1/2^{TS}$ TS: Time scale setting	-15 to 15 (F1 to 0F)	00	OK	OK	Byte
	1D	Ref From Net	Indicates which Frequency Reference input has been selected in the Inverter. (See note 4.) 00: A Frequency Reference input other than DeviceNet is enabled. 01: The Frequency Reference input from DeviceNet is enabled.	---	00	OK	---	Byte

* 1. When a 400 V Class Inverter is being used, the value will be 0190 Hex (400 V).

* 2. Always set the Number of Motor Poles (2 to 39) in Inverter constant n035 when using the Speed Ref, Speed Actual, Low Spd Limit, or High Spd Limit settings.
* 3. The Drive Mode, Low Spd Limit, and High Spd Limit settings cannot be changed while the Inverter is running.
* 4. These settings cannot be changed while the Inverter is running.

■ Error Code Tables

□ Explicit Message Communications Errors

When there is a problem with a request message sent from the master in explicit communications, the Inverter 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.

Error Code	Contents	Cause	Corrective Action
1FFF	Vendor specific error	• 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.	• 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.

☐ 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	Improper register number	• No register number has been registered to specify the register to be accessed. • ENTER command 0900H was executed for a write-only register.

Error Code	Contents	Cause
21 Hex	Data setting error	• 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-in mode error	• 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 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. • Attempted to write a constant other than n01= 8, 9, 10, 11, or 20 (Constant Initialization) from the master during an F04 occurrence. • Attempted to write a constant from the master while data was being stored. • Attempted to write data from the master but the data was read-only.

■ MEMOBUS Register Tables

Reference Data (Read/Write Registers)

Write zeroes in the unused bits. Do not write any data in the reserved registers.

Register Number	Contents		
0000H	Reserved		
0001H	Operation signals		
	Bit	0	RUN command 1: RUN 0: STOP
		1	Reverse RUN command 1: Reverse run 0: Stop
		2	Multi-function input reference 3 (Function selected by n052.)
		3	Multi-function input reference 4 (Function selected by n053.)
		4	Multi-function input reference 5* (Function selected by n054.)
		5	Multi-function input reference 6* (Function selected by n055.)
		6	Multi-function input reference 7* (Function selected by n056.)
		7	Not used.
		8	External fault 1: Fault (EF0)
		9	Fault reset 1: RESET command
		A	Not used.
		B to F	Not used.
0002H	Frequency reference (Units set in n035.)		
0003H	V/f gain (1000/100%) Setting range: 2.0 to 200.0%		
0004H to 0008H	Reserved		

Register Number	Contents		
0009H	Output terminal status		
	Bit	0	Multi-function output reference 1* (Enabled when n057 is set to 18.) 1: MA ON 0: MA OFF
		1	Multi-function output reference 2 (Enabled when n058 is set to 18.) 1: P1 ON 0: P1 OFF
		2	Multi-function output reference 3 (Enabled when n059 is set to 18.) 1: P2 ON 0: P2 OFF
		3 to F	Not used.
000AH to 001FH	Reserved		

* These I/O signals can be used from DeviceNet communications only. There are no corresponding external input or output terminals.

Monitor Data (Read-only Registers)

Register Number	Contents		
0020H	Status signals		
	Bit	0	Forward run 1: Run 0: Stop
		1	Reverse run 1: Reverse run 0: Forward run
		2	Inverter ready for operation
		3	Fault
		4	Data setting error 1: Error
		5	Multi-function output 1 1: MA ON
		6	Multi-function output 2 1: P1 ON
		7	Multi-function output 3 1: P2 ON
		8 to F	Not used.

Register Number	Contents		
0021H	Fault contents		
	Bit	0	Overcurrent (OC)
		1	Overvoltage (OV)
		2	Inverter overload (OL2)
		3	Inverter overheat (OH)
		4	Not used.
		5	Not used.
		6	PID feedback loss (FbL)
		7	External fault (EF, EF0), Emergency stop (STP)
		8	Hardware fault (F□□)
		9	Motor overload (OL1)
		A	Overtorque detected (OL3)
		B	Not used.
		C	Power loss (UV1)
		D	Control power fault (UV2)
		E	Not used.
		F	Operator connection fault (OPR)
0022H	Data link status		
	Bit	0	Writing data
		1	Not used.
		2	Not used.
		3	Upper/lower limit fault
		4	Consistency fault
		5	Not used.
		6	Not used.
		7	Not used.
		8 to F	Not used.

Register Number	Contents		
0023H	Frequency reference (Units set in n035.)		
0024H	Output frequency (Units set in n035.)		
0025H to 0027H	Reserved		
0028H	Output voltage reference (1/1V)		
0029H to 002AH	Reserved		
002BH	Sequence input status		
	Bit	0	Terminal S1 (1: Closed)
		1	Terminal S2 (1: Closed)
		2	Terminal S3 (1: Closed)
		3	Terminal S4 (1: Closed)
		4	Terminal S5* (1: Closed)
		5	Terminal S6* (1: Closed)
		6	Terminal S7* (1: Closed)
		7	Not used.
		8 to F	Not used.

Register Number	Contents		
002CH	Inverter status		
	Bit	0	Run (1: Run)
		1	Zero-speed (1: Zero-speed)
		2	Frequency match (1: Match)
		3	Minor fault (Alarm indicated.)
		4	Frequency detection 1 (1: Output frequency ≤ setting in n095)
		5	Frequency detection 1 (1: Output frequency ≥ setting in n095)
		6	Inverter ready for operation (1: Ready)
		7	Undervoltage detection (1: Undervoltage being detected.)
		8	Baseblock (1: Inverter output baseblock in progress.)
		9	Frequency reference mode 1: Not through communications 0: Through communications
		A	RUN command mode 1: Not through communications 0: Through communications
		B	Overtorque detection (1: Overtorque being detected or overtorque error.)
		C	Reserved.
		D	Fault restart in progress
		E	Fault (1: Fault)
		F	Not used.

* These input signals can be used from DeviceNet communications only. There are no corresponding external input terminals.

Register Number	Contents		
002DH	Output status		
	Bit	0	MA* (1: Closed)
		1	P1 (1: Closed)
		2	P2 (1: Closed)
		3	Not used.
		4	Not used.
		5	Not used.
		6	Not used.
		7	Not used.
		8 to F	Not used.
002EH to 0030H	Reserved.		
0031H	Main circuit DC voltage (1/1 V)		
0032H	Torque monitor (1/1%; 100%/Rated motor torque; signed)		
0033H to 0036H	Not used.		
0037H	Output power (100/1 KW; signed)		
0038H	PID feedback value (100(%)/Input corresponding to max. output frequency;10/1%; unsigned)		
0039H	PID input value (±100(%)/±Max. output frequency; 10/1%; signed)		
003AH	PID output value (±100(%)/±Max. output frequency; 10/1%; signed)		
003BH	Output current (10/1 A)		
003CH to 00FFH	Reserved.		

* The MA output signal can be used from DeviceNet communications only. There is no corresponding external output terminal.

Constant Data

Inverter constants can be set or referenced. For the register numbers of the constants, refer to the list of constants given on page 242.

ENTER Command (Write-only Register)

Register Number	Name	Contents	Setting Range	Factory Setting
0900H	ENTER Command	Writes constant data to non-volatile memory (EEPROM).	0000H to FFFFH	---

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 writes the constant data from RAM to the non-volatile memory in the Inverter. The ENTER command can be executed by writing data to register number 0900H while the Inverter is stopped.

Since the Inverter's EEPROM can be overwritten a limited number of times (100,000 times), do not execute the ENTER command too frequently. When two or more constants are being changed, execute the ENTER command once after changing all of the constants.

CAUTION While the constant is being stored after an ENTER command was issued, response to the commands or data input with the keys on the Digital Operator (JVOP-140) becomes poor. Be sure to take some measures for an emergency stop by using the external terminals (setting the external terminal to run command priority, or setting the multi-function input terminal to external fault, external baseblock or emergency stop).

7. Programming Features

Factory settings of the constants are shaded in the tables.

■ Constant Setup and Initialization

□ Constant Selection/Initialization (n001)

The following table lists the data that can be set or read when n001 is set. Unused constants between n001 and n179 are not displayed.

n001 Setting	Constant That Can Be Set	Constant That Can Be Referenced
0	n001	n001 to n179
1	n001 to n049*1	n001 to n049
2	n001 to n079*1	n001 to n079
3	n001 to n119*1	n001 to n119
4	n001 to n179*1	n001 to n179
5	Not used	
6	Fault history cleared	
7 to 11	Not used	
12	Initialize	
13	Initialize (3-wire sequence)*2	

* 1. Excluding setting-disabled constants.
* 2. Refer to page 159.

NOTE

Err appears on the display for one second and the set data returns to its initial values in the following cases.

1. If the set values of Multi-function Input Selections 1 to 7 (n050 to n056) are the same
2. If the following conditions are not satisfied in the V/f pattern setting:
   Max. Output Frequency (n011) ≥ Max. Voltage Output Frequency (n013) > Mid. Output Frequency (n014) ≥ Min. Output Frequency

(n016)

For details, refer to *Adjusting Torque According to Application* (V/f Pattern Setting) on page 129.

3. If the following conditions are not satisfied in the jump frequency settings:
   Jump Frequency 3 (n085) ≤ Jump Frequency 2 (n084) ≤ Jump Frequency 1 (n083)
4. If the Frequency Reference Lower Limit (n034) ≤ Frequency Reference Upper Limit (n033)
5. If the Motor Rated Current (n036) ≤ 150% of Inverter rated current
6. If constant n018 is set to 1 (Acceleration/Deceleration Time Unit is 0.01 s) when n018 is set to 0 and a value exceeding 600.0 s is set for an Acceleration/Deceleration Time (n019 to n022)

■ Using V/f Control Mode

V/f control mode is preset at the factory.

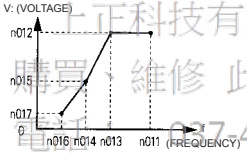
Control Mode Selection (n002) = 0: V/f control mode (factory setting)
1: Vector control mode

☐ Adjusting Torque According to Application

Adjust motor torque by using the V/f pattern and full-range automatic torque boost settings.

V/f Pattern Setting

Set the V/f pattern in n011 to n017 as described below. Set each pattern when using a special motor (e.g., high-speed motor) or when requiring special torque adjustment of the machine.



Be sure to satisfy the following conditions for the settings of n011 to n017.
n016 ≤ n014 < n013 ≤ n0111
If n016 = n014, the setting of n015 will be disabled.

Constant No.	Name	Unit	Setting Range	Factory Setting
n011	Max. Output Frequency	0.1 Hz	50.0 to 400.0 Hz	50.0 Hz
n012	Max. Voltage	1 V	1 to 255.0 V (0.1 to 510.0 V)	200.0 V (400.0 V)
n013	Max. Voltage Output Frequency (Base Frequency)	0.1 Hz	0.2 to 400.0 Hz	50.0 Hz
n014	Mid. Output Frequency	0.1 Hz	0.1 to 399.9 Hz	1.3 Hz
n015	Mid. Output Frequency Voltage	1 V	0.1 to 255.0 V (0.1 to 510.0 V)	12.0 V (24.0 V)
n016	Min. Output Frequency	0.1 Hz	0.1 to 10.0 Hz	1.3 Hz
n017	Min. Output Frequency Voltage	1 V	1 to 50.0 V (0.1 to 100.0 V)	12.0 V (24.0 V)

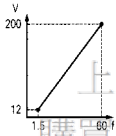
Typical Setting of the V/f Pattern

Set the V/f pattern according to the application as described below. For 400-V Class Inverters, the voltage values (n012, n015, and n017) should be doubled. When running at a frequency exceeding 50/60 Hz, change the Maximum Output Frequency (n011).

Note: Always set the maximum output frequency according to the motor characteristics.

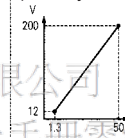
1. For General-purpose Applications

Motor Specification: 60 Hz



Constant	Setting
n011	60.0
n012	200.0
n013	60.0
n014	1.5
n015	12.0
n016	1.5
n017	12.0

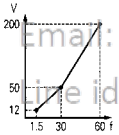
Motor Specification: 50 Hz (Factory setting)



Constant	Setting
n011	50.0
n012	200.0
n013	50.0
n014	1.3
n015	12.0
n016	1.3
n017	12.0

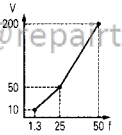
2. For Fans/Pumps

Motor Specification: 60 Hz



Constant	Setting
n011	60.0
n012	200.0
n013	60.0
n014	30.0
n015	50.0
n016	1.5
n017	10.0

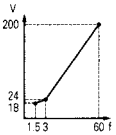
Motor Specification: 50 Hz



Constant	Setting
n011	50.0
n012	200.0
n013	50.0
n014	25.0
n015	50.0
n016	1.3
n017	10.0

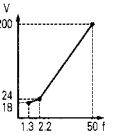
3. For Applications Requiring High Starting Torque

Motor Specification: 60 Hz



Constant	Setting
n011	60.0
n012	200.0
n013	60.0
n014	3.0
n015	24.0
n016	1.5
n017	18.0

Motor Specification: 50 Hz



Constant	Setting
n011	50.0
n012	200.0
n013	50.0
n014	2.5
n015	24.0
n016	1.3
n017	18.0

Increasing the voltage of the V/f pattern increases motor torque, but an excessive increase may cause motor overexcitation, motor overheating, or vibration.

Note: Constant n012 must be set to motor rated voltage.

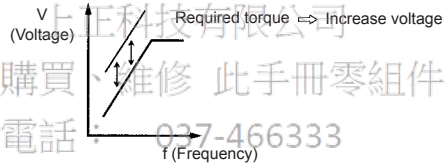
Full-range Automatic Torque Boost (when V/f Mode Is Selected: n002=0)

The motor torque requirement changes according to load conditions. The full-range automatic torque boost adjusts the voltage of the V/f pattern according to requirements. The Varispeed V7 automatically adjusts the voltage during constant-speed operation, as well as during acceleration.

The required torque is calculated by the Inverter.
This ensures tripless operation and energy-saving effects.

Output voltage ∝ Torque compensation gain (n013) × Required torque

Operation



Normally, no adjustment is necessary for the Torque Compensation Gain (n103 factory setting: 1.0). When the wiring distance between the Inverter and the motor is long, or when the motor generates vibration, change the automatic torque boost gain. In these cases, set the V/f pattern (n011 to n017).

Adjustment of the Torque Compensation Time Constant (n104) and the Torque Compensation Iron Loss (n105) are normally not required.

Adjust the torque compensation time constant under the following conditions:

- Increase the setting if the motor generates vibration.
- Reduce the setting if response is slow.

■ Using Vector Control Mode

Set the Control Mode Selection (n002) to use vector control mode.

n002 = 0: V/f control mode (factory setting)
1: Vector control mode

☐ Precautions for Voltage Vector Control Application

Vector control requires motor constants. The Yaskawa standard motor constants have been set at the factory prior to shipment. Therefore, when a motor designed for an Inverter is used or when a motor from any other manufacturer is driven, the required torque characteristics or speed control characteristics may not be maintained because the constants are not suitable. Set the following constants so that they match the required motor constants.

Constant No.	Name	Unit	Setting Range	Factory Setting
n106	Motor Rated Slip	0.1 Hz	0.0 to 20.0 Hz	*
n107	Line to Neutral (per Phase)	0.001 Ω (less than 10 Ω) 0.01 Ω (10 Ω or more)	0.000 to 65.50 Ω	*
n036	Motor Rated Current	0.1 A	0% to 150% of Inverter rated current	*
n110	Motor No-load Current	1%	0% to 99% (100% = motor rated current)	*

* Setting depends on Inverter capacity.

Adjustment of the Torque Compensation Gain (n103) and the Torque Compensation Time Constant (n104) is normally not required.

Adjust the torque compensation time constant under the following conditions:

- Increase the setting if the motor generates vibration.
- Reduce the setting if response is slow.

Adjust the Slip Compensation Gain (n111) while driving the load so that the target speed is reached. Increase or decrease the setting in increments of 0.1.

- If the speed is less than the target value, increase the slip compensation gain.

- If the speed is more than the target value, reduce the slip compensation gain.

Adjustment of the Slip Compensation Time Constant (n112) is normally not required. Adjust it under the following conditions:

- Reduce the setting if response is slow.
- Increase the setting if speed is unstable.

Select slip compensation status during regeneration as follows:

n113 Setting	Slip Correction during Regenerative Operation
0	Disabled
1	Enabled

☐ Motor Constant Calculation

An example of motor constant calculation is shown below.

1. Motor Rated Slip (n106)

$$= \frac{\frac{120 \times \text{motor rated frequency (Hz)}^{*1}}{\text{Number of motor poles}} - \text{Motor rated speed (r/min)}^{*2}}{120/\text{Number of motor poles}}$$

2. Line to Neutral (per Phase) (n107)

Calculations are based on the line-to-line resistance and insulation grade of the motor test report.

E type insulation: Test report of line-to-line resistance at 75°C (Ω) × 0.92 × $\frac{1}{2}$

B type insulation: Test report of line-to-line resistance at 75°C (Ω) × 0.92 × $\frac{1}{2}$

F type insulation: Test report of line-to-line resistance at 115°C (Ω) × 0.92 × $\frac{1}{2}$

3. Motor Rated Current (n036)

= Rated current at motor rated frequency (Hz)*1 (A)

4. Motor No-load Current (n110)

$$= \frac{\text{No-load current (A) at motor rated frequency (Hz)}^{*1}}{\text{Rated current (A) at motor rated frequency (Hz)}^{*1}} \times 100\ (\%)$$

* 1. Base frequency (Hz) during constant output control
* 2. Rated speed (r/min) at base frequency during constant output control

Set n106 (Motor Rated Slip), n036 (Motor Rated Current), n107 (Line to Neutral (per Phase)), and n110 (Motor No-load Current) according to

the motor test report.

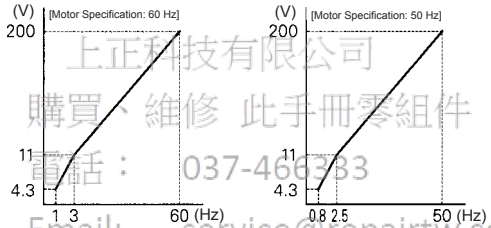
To connect a reactor between the Inverter and the motor, set n108 to the sum of the initial value of n108 (Motor Leakage Inductance) and the externally mounted reactor inductance. Unless a reactor is connected, n108 (Motor Leakage Inductance) does not have to be set according to the motor.

☐ V/f Pattern during Vector Control

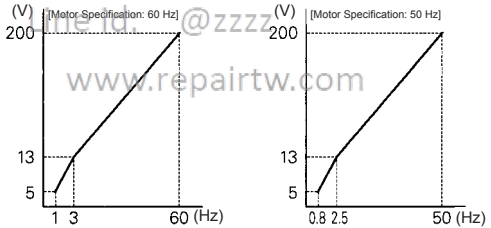
Set the V/f pattern as follows during vector control:

The following examples are for 200 V Class motors. When using 400 V Class motors, double the voltage settings (n012, n015, and n017).

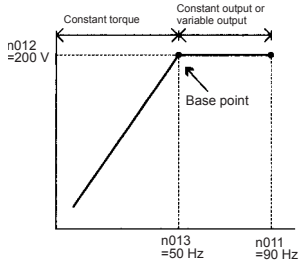
Standard V/F



High Starting Torque V/F



When operating with frequency larger than 60/50 Hz, change only the Max. Output Frequency (n011).

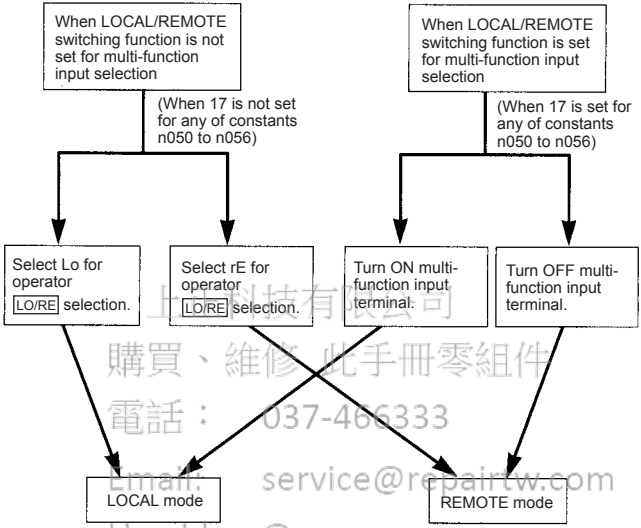


■ Switching LOCAL/REMOTE Mode

The following functions can be selected by switching LOCAL or REMOTE mode. To select the RUN/STOP command or frequency reference, change the mode in advance depending on the following applications.

- LOCAL mode: Enables the Digital Operator for RUN/STOP commands and FWD/REV RUN commands. The frequency reference can be set using the potentiometer or FREF.
- REMOTE mode: Enables RUN Command Selection (n003).

☐ How to Select LOCAL/REMOTE Mode



■ Selecting RUN/STOP Commands

Refer to *Switching LOCAL/REMOTE Modes* (page 135) to select either the LOCAL mode or REMOTE mode.

The operation method (RUN/STOP commands, FWD/REV RUN commands) can be selected using the following method.

☐ LOCAL Mode

When Lo (local mode) is selected for Digital Operator LO/RE ON mode, or when the LOCAL/REMOTE switching function is set and the input terminals are turned ON, run operation is enabled by the STP or RUN on the Digital Operator, and FWD/REV is enabled by the F/R ON mode (using ⌃ or ⌄ key).

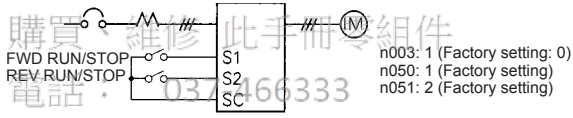
☐ REMOTE Mode

1. Select remote mode.
   There are following two methods to select remote mode.

   - Select rE (remote mode) for the LO / RE selection.
   - When the local/remote switching function is selected for the multi-function input selection, turn OFF the input terminal to select remote mode.

2. Select the operation method by setting constant n003.
   n003=0: Enables the Digital Operator (same with local mode).
   =1: Enables the multi-function input terminal (see fig. below).
   =3: Enables DeviceNet communications.

   - Example when using the multi-function input terminal as operation reference (two-wire sequence)



For an example of three-wire sequence, refer to page 159.

Note: When the Inverter is operated without the Digital Operator, always set constant n010 to 0.

☐ Operating (RUN/STOP Commands) Using DeviceNet Communications

Setting constant n003 to 3 in REMOTE mode enables using RUN/STOP commands via DeviceNet communications. For commands using DeviceNet communications, refer to page 55.

■ Selecting Frequency Reference

Select REMOTE or LOCAL mode in advance. For the method for selecting the mode, refer to page 135.

☐ LOCAL Mode

Select command method using constant n008.
n008=0: Enables using the potentiometer on the Digital Operator.
=1: Enables digital setting on the Digital Operator (factory setting).
The factory setting for models with the Digital Operator with a potentiometer (JVOP-140) is n008=0.

• Digital Setting Using the Digital Operator

Input the frequency while FREF is lit (press ENTER after setting the numeric value).

Frequency reference setting is effective when 1 (Factory setting: 0) is set for constant n009 instead of pressing ENTER.

n009 =0: Enables frequency reference setting using the ENTER key.
=1: Disables frequency reference setting using the ENTER key.

☐ REMOTE Mode

Select the command method in constant n004.

n004 =0: Enables frequency reference setting using the potentiometer on the Digital Operator.
=1: Enables using frequency reference 1 (n024) (factory setting)
Factory setting of models with the Digital Operator with a potentiometer (JVOP-140) is n004=0.
=7: Enables a voltage reference on Digital Operator circuit terminal (0 to 10)
=8: Enables current reference on Digital Operator circuit terminal (4 to 20mA)
=9: Enables DeviceNet communications.

■ Setting Operation Conditions

☐ Reverse Run Prohibit (n006)

The Reverse Run Prohibit setting disables accepting a reverse RUN command from the control circuit terminal or Digital Operator. This setting is used for applications where a reverse RUN command can cause problems.

Setting	Description
0	Reverse run enabled.
1	Reverse run disabled.

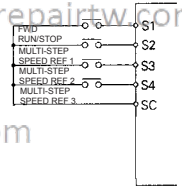
☐ Multi-step Speed Selection

Up to 16 speed steps can be set using DeviceNet communications and the following combinations of frequency reference and input terminal selections.

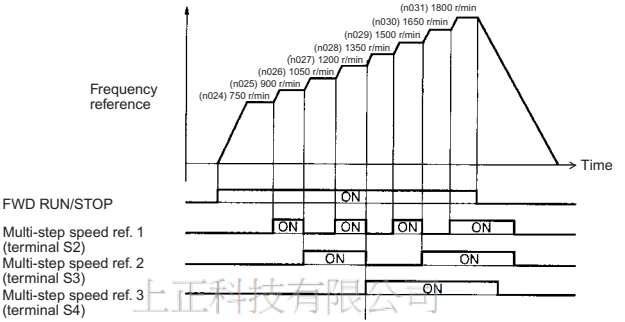
8-step speed change

n003=1 (operation mode selection)
n004=1 (frequency reference selection)
n024=750 r/min (Frequency reference 1)
n025=900 r/min (Frequency reference 2)
n026=1050 r/min (Frequency reference 3)
n027=1200 r/min (Frequency reference 4)
n028=1350 r/min (Frequency reference 5)
n029=1500 r/min (Frequency reference 6)
n030=1650 r/min (Frequency reference 7)
n031=1800 r/min (Frequency reference 8)

n054=1 (Multi-function contact input terminal 2)
n055=2 (Multi-function contact input terminal 3)
n056=3 (Multi-function contact input terminal 4)
Do not set constants n054 through N057 to 6, 7, or 8.



NOTE When all multi-function reference inputs are OFF, the frequency reference selected by constant n004 (frequency reference selection) becomes effective.



n050 = 1 (input terminal S1) (Factory Setting)
n051 = 6 (input terminal S2)
n052 = 7 (input terminal S3)
n053 = 8 (input terminal S4)
n054 = * (input terminal S5) (See note.)
n055 = * (input terminal S6) (See note.)
n056 = * (input terminal S7) (See note.)

* Set a value other than 6, 7, or 8.

Note: Input terminals S5 to S7 can be used only from DeviceNet communications. There are no corresponding external input terminals.

Up to 16 speed steps can be set using DeviceNet communications and the following combinations of frequency reference and input terminal selections.

Set frequency references 9-16 for n120 to n127.

Set the input terminal for a multi-step speed reference using the multi-function input selection.

☐ Operating at Low Speed

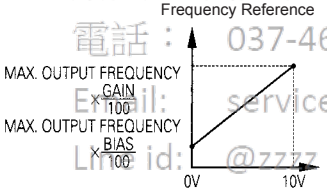
By inputting a JOG command and then a FORWARD (REVERSE) RUN command, operation is enabled at the jog frequency set in n032. When multi-step speed references 1, 2, 3 or 4 are input simultaneously with the JOG command, the JOG command has priority.

Constant No.	Name	Setting
n032	Jog Frequency	Factory setting: 180 r/min
n050 to n056	Jog References	Set to 10 for any constant.

Note: Input terminals S1 to S7 can be used only from DeviceNet communications. There are no corresponding external input terminals.

☐ Adjusting Speed Setting Signal

The relationship between the analog inputs and the frequency reference can be set to provide the frequency reference as analog inputs to Digital Operator terminals CN2-1, CN2-2, and CN2-3.



( ) indicates the value when a current reference input is selected.

1. Analog Frequency Reference Gain (n068 for voltage input, n071 for current input)
   The frequency reference provided when the analog input is 10 V (or 20 mA) can be set in units of 1%. (Max. Output Frequency n011=100%)

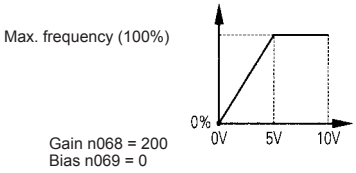
* Factory setting: 100%

2. Analog Frequency Reference Bias (n069 for voltage input, n072 for current input)
   The frequency reference provided when the analog input is 0 V (4 mA or 0 mA) can be set in units of 1%. (Max. Output Frequency n011=100%)

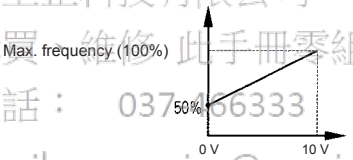
* Factory setting: 0%

Typical Settings

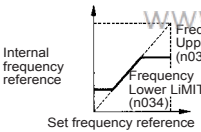
- To operate the Inverter with a frequency reference of 0% to 100% at an input voltage of 0 to 5 V



- To operate the Inverter with a frequency reference of 50% to 100% at an input voltage of 0 to 10 V



☐ Adjusitng Frequency Upper and Lower Limits



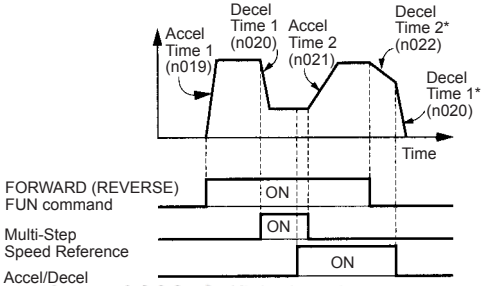
- Frequency Reference Upper Limit (n033)

  Sets the upper limit of the frequency reference in units of 1%.
  (n011: Max. Output Frequency = 100%)
  Factory setting: 100%

- Frequency Reference Lower Limit (n034)

  Sets the lower limit of the frequency reference in units of 1%.
  (n011: Max. Output Frequency = 100%)
  When operating at a frequency reference of 0, operation is continued at the frequency reference lower limit.
  However, if the frequency reference lower limit is set to less than the Minimum Output Frequency (n016), operation is not performed.
  Factory setting: 0%

☐ Using Two Acceleration/Deceleration Times



* When deceleration to a stop is selected (n005 = 0).

By setting a multi-function input selection (either of n050 to n056) to 11 (acceleration/deceleration time select), the acceleration/deceleration time is selected by turning ON/OFF the acceleration/deceleration time selection terminals (terminals S1 to S7).

Note: Input terminals S5 through S7 can be used only from DeviceNet communications. There are no corresponding external input terminals.

At OFF: n019 (Acceleration Time 1)
n020 (Deceleration Time 1)

At ON: n021 (Acceleration Time 2)
n022 (Deceleration Time 2)

No.	Name	Unit	Setting Range	Factory Setting
n019	Acceleration Time 1	Refer to n018 setting	Refer to n018 setting	10.0 s
n020	Deceleration Time 1			10.0 s
n021	Acceleration Time 2			10.0 s
n022	Deceleration Time 2			10.0 s

n018 Settings

No.		Unit	Setting Range
n018	0	0.1 s	0.0 to 999.9 s (999.9 s or less)
		1 s	1000 to 6000 s (1000 s or more)
	1	0.01 s	0.00 to 99.99 s (99.99 s or less)
		0.1 s	100.0 to 600.0 s (100 s or more)

Note: Constant n018 can be set while stopped.
If a value exceeding 600.0 s is set for the acceleration/deceleration time when n018=0 (in units of 0.1 s), 1 cannot be set for n018.

- Acceleration time
  Set the time needed for the output frequency to reach 100% from 0%.
- Deceleration time
  Set the time needed for the output frequency to reach 0% from 100%.
  (Max. Output Frequency n011 = 100%)

□ Momentary Power Loss Ridethrough Method (n081)

⚠WARNING When continuous operation after power recovery is selected, stand clear of the Inverter or the load. The Inverter may restart suddenly after stopping. (Construct the system to ensure safety, even if the Inverter should restart.) Failure to observe this warning may result in injury.

When constant n081 is set to 0 or 1, operation automatically restarts even if a momentary power loss occurs.

Setting	Description
0	Continuous operation after momentary power loss not enabled.
1*1	Continuous operation after power recovery within momentary power loss ridethrough time 0.5 s
2*2	Continuous operation after power recovery (Fault output not produced.)

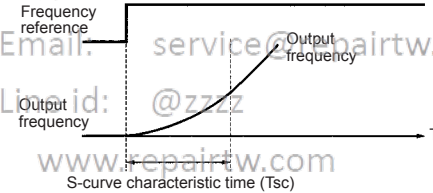
* 1. Hold the operation signal to continue operation after recovery from a momentary power loss.
* 2. When 2 is selected, the Inverter restarts if power supply voltage recovers while the control power supply is held.
No fault signal is output.

☐ S-curve Selection (n023)

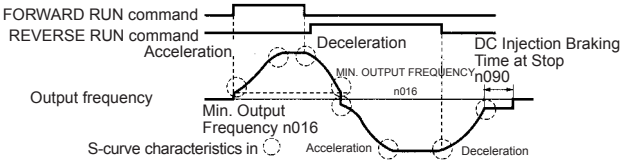
To prevent shock when starting and stopping the machine, acceleration/deceleration can be performed using an S-curve pattern.

Setting	S-curve Selection
0	S-curve characteristic not provided.
1	0.2 s
2	0.5 s
3	1.0 s

Note: The S-curve characteristic time is the time from acceleration/deceleration rate 0 to the normal acceleration/deceleration rate determined by the set acceleration/deceleration time.



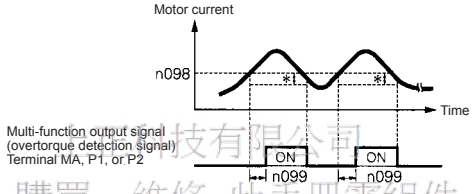
The following time chart shows switching between FWD/REV run when decelerating to a stop.



☐ Torque Detection

If an excessive load is applied to the machine, an increase in the output current can be detected to output an alarm signal to multi-function output terminal MA, P1, or P2.

To output an overtorque detection signal, set one of the output terminal function selections n057 to n059 for overtorque detection (Setting: 6 (NO contact) or 7 (NC contact)).



* The overtorque detection release width (hysteresis) is set at approx. 5% of the Inverter rated current.

Overtorque Detection Function Selection 1 (n096)

Setting	Description
0	Overtorque detection not provided.
1	Detected during constant-speed running. Operation continues after detection.
2	Detected during constant-speed running. Operation stops during detection.
3	Detected during running. Operation continues after detection.
4	Detected during running. Operation stops during detection.

1. To detect overtorque during acceleration/deceleration, set n096 to 3 or 4.
2. To continue operation after overtorque detection, set n096 to 1 or 3. During detection, the operator will display an oL3 alarm (flashing).
3. To stop the Inverter and generate a fault at overtorque detection, set n096 to 2 or 4. At detection, the operator will display an oL3 fault (ON).

Overtorque Detection Level (n098)

Set the overtorque detection current level in units of 1%. (Inverter rated current = 100%) When detection by the output torque is selected, the motor rated torque becomes 100%.

Factory setting: 160%

Overtorque Detection Time (n099)

If the time that the motor current exceeds the Overtorque Detection Level (n098) is longer than Overtorque Detection Time (n099), the overtorque detection function will operate.
Factory setting: 0.1 s

Overtorque/Undertorque Detection Function Selection 2 (n097)

When vector control mode is selected, overtorque/undertorque detection can be performed either by detecting the output current or the output torque.
When V/f control mode is selected, the setting of n097 is invalid, and overtorque/undertorque is detected by the output current.

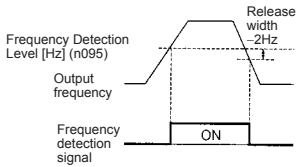
Setting	Description
0	Detected by output torque
1	Detected by output current

☐ Frequency Detection Level (n095)

Effective when one or more of the Multi-function Output Selections n057, n058 and n059 are set for frequency detection (setting: 4 or 5). Frequency detection turns ON when the output frequency is higher or lower than the setting for the Frequency Detection Level (n095).

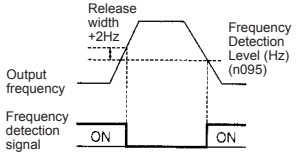
Frequency Detection 1

Output frequency ≥ Frequency Detection Level n095
(Set n057, n058 or n059 to 4.)



Frequency Detection 2

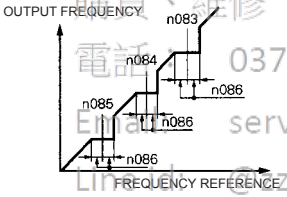
Output frequency ≤ Frequency Detection Level n095
(Set n057, n058 or n059 to 5.)



☐ Jump Frequencies (n083 to n086)

This function allows the prohibition or "jumping" of critical frequencies so that the motor can operate without resonance caused by the machine system. This function is also used for dead band control. Setting the values to 0.00 Hz disables this function.

Set prohibited frequencies 1, 2, and 3 as follows:



n083 ≥ n084 ≥ n085

If this condition is not satisfied, the Inverter will display Err for one second and restore the data to initial settings.

Operation is prohibited within the jump frequency ranges. However, the motor will operate without jumping during acceleration/deceleration.

☐ Continuing Operation Using Automatic Retry Attempts (n082)

⚠WARNING When the fault retry function is selected, stand clear of the Inverter or the load. The Inverter may restart suddenly after stopping.
(Construct the system to ensure safety, even if the Inverter should restart.) Failure to observe this warning may result in injury.

The Inverter can be set to restart and reset fault detection after a fault occurs. The number of self-diagnosis and retry attempts can be set to up to 10 in n082. The Inverter will automatically restart after the following faults occur:

OC (overcurrent)

OV (overvoltage)

The number of retry attempts is cleared to 0 in the following cases:

1. If no other fault occurs within 10 minutes after retry
2. When the FAULT RESET signal is ON after the fault is detected
3. When the power supply is turned OFF

☐ Operating a Coasting Motor without Tripping

To operate a coasting motor without tripping, use the SPEED SEARCH command or DC injection braking at startup.

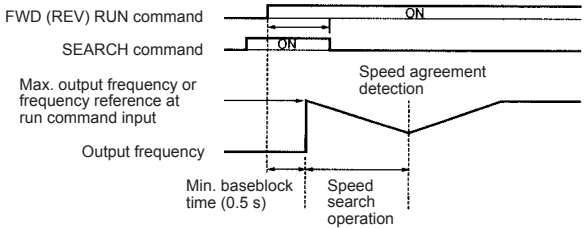
SPEED SEARCH Command

Restarts a coasting motor without stopping it. This function enables smooth switching between motor commercial power supply operation and Inverter operation.

Set a Multi-function Input Selection (n050 to n056) to 14 (SEARCH command from maximum output frequency) or 15 (SEARCH command from set frequency).

Build a sequence so that a FWD (REV) RUN command is input at the same time as the SEARCH command or after the SEARCH command. If the RUN command is input before the SEARCH command, the SEARCH command will be disabled.

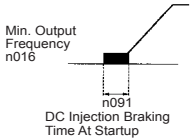
Timechart at SEARCH Command Input



DC Injection Braking at Startup (n089, n091)

Restarts a coasting motor after stopping it. Set the DC injection braking time at startup in n091 in units of 0.1 second. Set the DC Injection Braking Current in n089 in units of 1% (Inverter rated current =100%). When the setting of n091 is 0, DC injection braking is not performed and acceleration starts from the minimum output frequency.

When n089 is set to 0, acceleration starts from the minimum output frequency after baseblocking for the time set in n091.



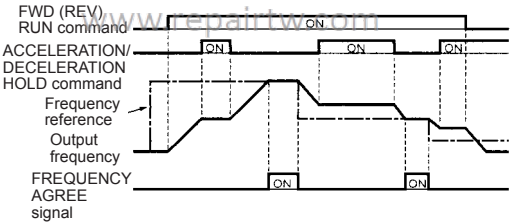
☐ Holding Acceleration/Deceleration Temporarily

To hold acceleration or deceleration, input an ACCELERATION/DECELERATION HOLD command. The output frequency is maintained when an ACCELERATION/DECELERATION HOLD command is input during acceleration or deceleration.

When the STOP command is input while an ACCELERATION/DECELERATION PROHIBITION command is being input, the acceleration/deceleration hold is released and operation ramps to a stop.

Set a Multi-function Input Selection (n050 to n056) to 16 (acceleration/deceleration prohibit).

Time Chart for ACCELERATION/DECELERATION HOLD Command Input



Note: If a FWD (REV) RUN command is input at the same time as an ACCELERATION/DECELERATION HOLD command, the motor will not operate. However, if the Frequency Reference Lower Limit (n034) is set to a value greater than or equal to the Min. Output Frequency (n016), the motor will operate at the Frequency Reference Lower Limit (n034).

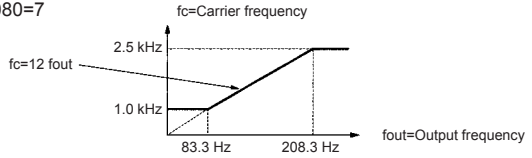
☐ Reducing Motor Noise or Leakage Current Using Carrier Frequency Selection (n080)

Set the Inverter output transistor switching frequency (carrier frequency).

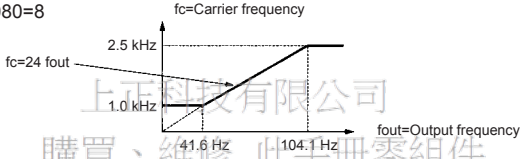
Setting	Carrier Frequency (kHz)	Metallic Noise from Motor	Noise and Current Leakage
7	12 fout (Hz)	Higher ↕ Not audible	Smaller ↕ Larger
8	24 fout (Hz)		
9	36 fout (Hz)		
1	2.5 (kHz)		
2	5.0 (kHz)		
3	7.5 (kHz)		
4	10.0 (kHz)		
5	12.5 (kHz)		
6	14.5 (kHz)		

If the set value is 7, 8, or 9, the carrier frequency will be multiplied by the same factor as the output frequency.

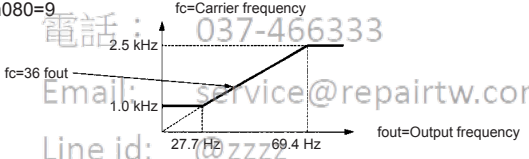
n080=7



n080=8



n080=9



The factory setting depends on the Inverter capacity (kVA).

Voltage Class (V)	Capacity (kW)	Factory Setting		Maximum Continuous Output Current (A)	Reduced Current (A)
		Setting	Carrier Frequency (kHz)		
200 V Single-phase or 3-phase	0.1	4	10	0.8	-
	0.25	4	10	1.6	
	0.55	4	10	3.0	
	1.1	4	10	5.0	
	1.5	3	7.5	8.0	7.0
	2.2	3	7.5	11.0	10.0
	3.7	3	7.5	17.5	16.5
	5.5	3	7.5	25	23
	7.5	3	7.5	33	30

Voltage Class (V)	Capacity (kW)	Factory Setting		Maximum Continuous Output Current (A)	Reduced Current (A)
		Setting	Carrier Frequency (kHz)		
400 V 3-phase	0.37	3	7.5	1.2	1.0
	0.55	3	7.5	1.8	1.6
	1.1	3	7.5	3.4	3.0
	1.5	3	7.5	4.8	4.0
	2.2	3	7.5	5.5	4.8
	3.0	3	7.5	7.2	6.3
	3.7	3	7.5	8.6	8.1
	5.5	3	7.5	14.8	14.8
	7.5	3	7.5	18	17.0

NOTE

1. Reduce the continuous output current when changing the carrier frequency to 4 (10 kHz) for 200 V Class (1.5 kW or more) and 400 V Class Inverters. Refer to the table above for the reduced current.
   Operation Condition
   - Input power supply voltage:
     3-phase 200 to 230 V (200 V Class)
     Single-phase 200 to 240 V (200 V Class)
     3-phase 380 to 460 V (400 V Class)
   - Ambient temperature:
     −10 to 50°C (14 to 122°F)
     (Protection structure: open chassis type IP20)
     −10 to 40°C (14 to 105°F)
     (Protection structure: top closed type IP20, enclosed wall-mounted type NEMA 1 (TYPE 1))
2. If the wiring distance is long, reduce the Inverter carrier frequency as described below.

Wiring Distance between Inverter and Motor	Up to 30 m	Up to 50 m	Up to 100 m	More than 100 m
Carrier Frequency (n080 setting)	14.5 kHz or less (n080=5, 6)	10 kHz or less (n080=1, 2, 3, 4, 7, 8, 9)	5 kHz or less (n080=1, 2, 7, 8, 9)	2.5 kHz or less (n080=1, 7, 8, 9)

3. Set the Carrier Frequency Selection (n080) to 1, 2, 3, or 4 when using vector control mode. Do not set it to 7, 8, or 9.

4. The carrier frequency is automatically reduced to 2.5 kHz when the Reducing Carrier Frequency Selection at Low Speed (n175) is set to 1 and the following conditions are satisfied:

   Output frequency ≤ 5 Hz
   Output current ≥ 110%

   Factory setting: 0 (Disabled)

5. When repeatedly starting and stopping a load that is more than 120% of the Inverter's rated current with a period of less than 10 minutes, set the Reducing Carrier Frequency Selection at Low Speed (n175) to 1.

☐ Operator Stop Key Selection (n007)

⚠WARNING The Digital Operator stop button can be disabled by a setting in the Inverter. Install a separate emergency stop switch.
Failure to observe this warning may result in injury.

Set the processing when the STOP key is "pressed" during operation either from a multi-function input terminal or communications.

Setting	Description
0	The STOP key is effective either from a multi-function input terminal or communications. When the STOP key is pressed, the Inverter stops according to the setting of constant n005. At this time, the Digital Operator displays a **STP** alarm (flashing). This STOP command is held in the Inverter until both forward and reverse RUN commands are open, or until the RUN command from communications goes to zero.
1	The STOP key is ineffective either from multi-function input terminals or communications.

■ Selecting the Stopping Method

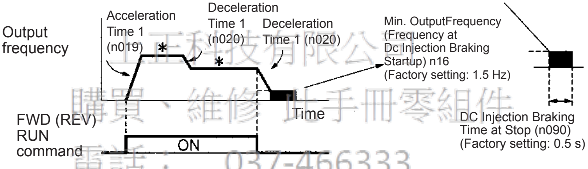
□ Stopping Method Selection (n005)

Select the stopping method suitable for the application.

Setting	Description
0	Deceleration to a stop
1	Coast to a stop

Deceleration to a Stop

Example when Acceleration/deceleration Time 1 is selected



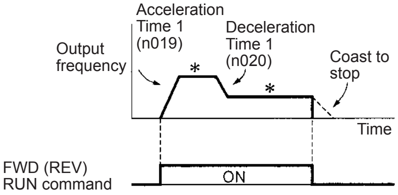
* Changing the Frequency Reference while Running

Upon termination of a FWD (REV) RUN command, the motor decelerates at the deceleration rate determined by the time set in Deceleration Time 1 (n020) and DC injection braking is applied immediately before stopping. DC injection braking is also applied when the motor decelerates because the frequency reference is set lower than the Min. Output Frequency (n016) when the FWD (REV) RUN command is ON. If the deceleration time is short or the load inertia is large, an overvoltage (OV) fault may occur at deceleration. In this case, increase the deceleration time or install a optional Braking Resistor.

Braking torque:	Without braking resistor: Approx. 20% of motor rating
	With braking resistor: Approx. 150% of motor rating

Coast to a Stop

Example when Acceleration/deceleration Time 1 is selected



* Changing the Frequency Reference while Running

Upon termination of the FWD (REV) RUN command, the motor starts coasting.

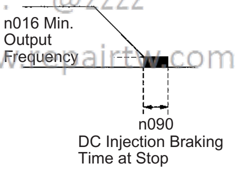
☐ Applying DC Injection Braking

DC Injection Braking Current (n089)

Sets the DC injection braking current in units of 1%. (Inverter rated current=100%)

DC Injection Braking Time at Stop (n090)

Sets the DC injection braking time at stopping in units of 0.1 second. When the setting of n090 is 0, DC injection braking is not performed, but the Inverter output is turned OFF when DC injection braking is started.



When coasting to a stop is specified in the Stopping Method Selection (n005), DC injection braking is not applied when stopping.

■ Building Interface Circuits with External Devices

☐ Using Input Signals

The functions of multi-function input terminals S1 to S7 can be changed as necessary by setting constants n050 to n056. With the exception of the value “28,” the same value cannot be set for more than one of these constants.

The function of terminal S1 is set in constant n50. Likewise, the functions of terminals S2 to S7 are set in constants n51 to n56. The following functions can be set.

Setting	Name	Description	Ref.
0	FWD/REV RUN command (3-wire sequence selection)	Setting possible only for n052.	159
1	FORWARD RUN command (2-wire sequence selection)		137
2	REVERSE RUN command (2-wire sequence selection)		137
3	External fault (NO contact input)	Inverter stops for an external fault signal input. Digital Operator displays EF☐. *	-
4	External fault (NC contact input)		-
5	Fault reset	Resets a fault. Fault reset not effective when the RUN signal is ON.	-
6	Multi-step speed reference 1		139
7	Multi-step speed reference 2		139
8	Multi-step speed reference 3		139
9	Multi-step speed reference 4		139
10	JOG command		141
11	Acceleration/deceleration time selection 1		143
12	External baseblock, NO contact input	Motor coasts to a stop for this signal input. Digital Operator displays bb.	-
13	External baseblock, NC contact input		-

* Numbers 1 to 7 are displayed for ☐ to indicate the terminal numbers S1 to S7.

Setting	Name	Description	Ref.
14	SEARCH command from maximum frequency	SPEED SEARCH command signal	149
15	SEARCH command from set frequency		149
16	ACCELERATION/ DECELERATION HOLD command		150
17	LOCAL/REMOTE selection		136
18	Communications/control circuit terminal selection		162
19	Emergency stop fault, NO contact input	Inverter stops for an emergency stop signal input according to the Stopping Method Selection (n005). When frequency coasting to a stop (n005 is set to 1) is selected, the Inverter coasts to a stop according to Deceleration Time Setting 2 (n022). Digital Operator displays STP. (Lit for fault, flashing for alarm.)	-
20	Emergency stop alarm, NO contact input		-
21	Emergency stop fault, NC contact input		-
22	Emergency stop alarm, NC contact input		-
23	PID control cancel		184
24	PID integral reset		184
25	PID integral hold		184
26	Inverter overheat alert (OH3 alarm)		-
27	Acceleration/deceleration time selection 2		-
28	Data input from communications		92
34	UP/DOWN commands	Setting enabled only for n053 (terminal S4)	160

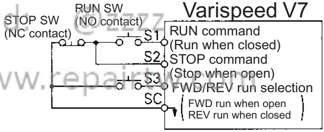
Factory Settings

No.	Terminal	Factory Setting	Function
n050	S1	1	FORWARD RUN command (2-wire sequence)
n051	S2	2	REVERSE RUN command (2-wire sequence)
n052	S3	3	External fault
n053	S4	5	Fault reset
n054	S5 (See note.)	6	Multi-step speed reference 1
n055	S6 (See note.)	7	Multi-step speed reference 2
n056	S7 (See note.)	10	JOG command

Note: Terminals S5 through S7 can be used only from DeviceNet communications. There are no corresponding external terminals.

Terminal Functions for 3-wire Sequence Selection

When 0 is set for terminal S3 (n052), terminal S1 is the RUN command, terminal S2 is the STOP command, and terminal S3 is the FWD/REV RUN command.



WARNING To select the 3-wire sequence, set terminal S3 (n052) to 0.
Failure to observe this warning may result in injury.

LOCAL/REMOTE Selection (Setting: 17)

Select the operation reference from either the Digital Operator or from the settings of the RUN Command Selection (n003) and Frequency Reference Selection (n004). The LOCAL/REMOTE Selection can be used only when stopped.

Open: Run according to the setting of RUN Command Selection (n003) or Frequency Reference Selection (n004).

Closed: Run according to the frequency reference and RUN command from the Digital Operator.

Example: Set n003=1, n004=7, n008=0.

Open: Run according to the frequency reference from Digital Operator terminal CN2-1 and RUN command from multi-function input terminals S1 to S7.

Closed: Run according to the potentiometer frequency reference and RUN command from the Digital Operator.

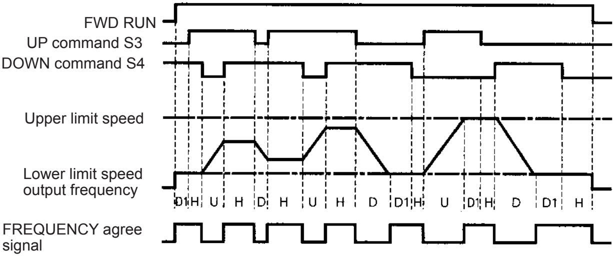
UP/DOWN Commands (Setting: n053 = 034)

When the FWD (REV) RUN command is ON, acceleration/deceleration is enabled by inputting the UP or DOWN signal from multi-function input terminals S3 and S4 without changing the frequency reference. Operation can thus be performed at the desired speed. When UP/DOWN commands are specified in n053, any function set in n052 is disabled, terminal S3 is the input terminal for the UP command, and terminal S4 is the input terminal for the DOWN command.

Multi-function Input Terminal S3 (UP command)	Closed	Open	Open	Closed
Multi-function Input Terminal S4 (DOWN command)	Open	Closed	Open	Closed
Operation Status	Acceleration	Deceleration	Hold	Hold

Note: Terminals S5 through S7 can be used only from DeviceNet communications. There are no corresponding external terminals.

Time Chart for UP/DOWN Command Input



U = UP (accelerating) status
D = DOWN (decelerating) status
H = HOLD (constant speed) status
U1 = UP status, clamping at upper limit speed
D1 = DOWN status, clamping at lower limit speed

Note: 1. When UP/DOWN commands are selected, the upper limit speed is set regardless of frequency reference.
Upper limit speed =Maximum Output Frequency (n011) × Frequency Reference Upper Limit (n033)/100
2. Lower limit value is either the Minimum Output Frequency (n016) or the frequency Reference Lower Limit (n034) (whichever is larger.).
3. When the FWD (REV) RUN command is input, operation starts at the lower limit speed without using the UP/DOWN commands.
4. If the JOG command is input while running for an UP/DOWN command, the JOG command has priority.
5. Multi-step speed references 1 to 4 are not effective when an UP/DOWN command is selected. Multi-step speed references are effective while running in hold status.
6. When 1 is set for the HOLD Output Frequency Memory Selection (n100), the output frequency can be recorded during HOLD.

Setting	Description
0	Output frequency is not recorded during HOLD.
1	When HOLD status is continued for 5 seconds or longer, the output frequency during HOLD is recorded and the Inverter restarts at the recorded frequency.

Communications/Multi-function Input Terminal Selection (Setting: 18)

Operation can be changed from DeviceNet communications commands, or from multi-function input terminal or Digital Operator commands.

RUN commands from communications and the frequency reference are effective when the multi-function input terminal for this setting is closed.

RUN commands in LOCAL/REMOTE mode and the frequency reference are effective when the terminal is open.

☐ Using the Multi-function Analog Inputs (n077, n078)

The input analog signal (0 to 10 V or 4 to 20 mA) for the CN2 terminal of the JVOP-140 Digital Operator can be used as the main speed frequency reference. Refer to the block diagram on page 185 for details on the input signal.

NOTE When using the signal for the CN2 terminal of the JVOP-140 Digital Operator as a multi-function analog input, never use it for the target value or the feedback value of PID control. (PID control is disabled when n128 is set to 0.)

Multi-function Input Selection (n077)

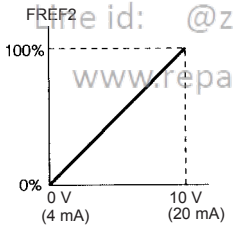
No.	Name	Unit	Setting Range	Factory Setting
n077	Multi-function Input Selection	-	0 to 4	0

n077 Settings

Setting	Function	Description
0	Disabled	The multi-function input is disabled.
1	Auxiliary frequency reference (FREF2)	When frequency reference 2 is selected using the multi-step speed references, the input analog signal for the CN2 terminal will be the frequency reference. The n025 setting will be invalid. Note: Set the Frequency Reference Gain in n068 or n071, and the Frequency Reference Bias in n069 or n072.
2 to 3	Not used	
4	Output voltage bias (VBIAS)	Add the VBIAS to the output voltage after V/f conversion.

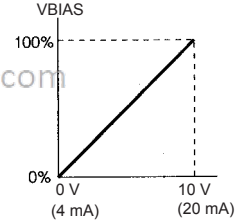
Analog Input Level

1. Auxiliary Frequency Reference (n077=1)



100%=Max. output frequency (n011)

4. Output Voltage Bias (n077=4)



The VBIAS value to be added is doubled for 400 V-Class Inverters.

Multi-function Analog Input Signal Selection (n078)

Constant No.	Name	Unit	Setting Range	Factory Setting
n078	Multi-function Analog Input Signal Selection	1	0=Digital Operator terminal (voltage: 0 to 10 V) 1=Digital Operator terminal (current 4 to 20 mA)	0

☐ Using Output Signals (n057, n058, n059)

The functions of multi-function output terminals MA, P1 and P2 can be changed as necessary by setting constants n057, n058, and n059.

- Terminal MA function: Set in n057
- Terminal P1 function: Set in n058
- Terminal P2 function: Set in n059

Note: Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

Setting	Name	Description	Ref.
0	Fault	Closed when Inverter fault occurs.	-
1	Operating	Closed when either FWD/REV command is input or voltage is output from the Inverter.	-
2	Frequency agree	Closed when the set frequency agrees with Inverter output frequency.	166
3	Zero speed	Closed when Inverter output frequency is less than minimum output frequency.	-
4	Frequency detection 1	Output frequency ≥ Frequency Detection Level (n095)	147
5	Frequency detection 2	Output frequency ≤ Frequency Detection Level (n095)	147
6	Overtorque detection, NO contact output	-	146
7	Overtorque detection, NC contact output	-	146

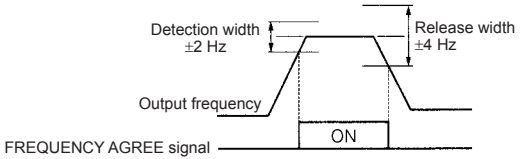
Setting	Name	Description	Ref.
8	Low torque detected, NO output	-	-
9	Low torque detected, NC output	-	-
10	Minor fault	Closed when an alarm has been detected.	-
11	Baseblocked	Closed when the Inverter output is OFF.	-
12	Operating mode	Closed when LOCAL is selected for the LOCAL/REMOTE selection.	-
13	Inverter operation ready	Closed when an Inverter fault is not detected, and operation is ready.	-
14	Fault restart	Closed during fault retries.	-
15	UV	Closed when undervoltage is detected.	-
16	Reverse run	Closed during reverse run.	-
17	Speed search	Closed when Inverter conducts a speed search.	-
18	Data output from communications		-
19	PID feedback loss	Closed during PID feedback loss	183
20	Frequency reference loss	-	-
21	Inverter overheat alert (OH3)	-	-

Factory Settings

No.	Terminal	Factory Setting
n057	MA (See note.)	2 (frequency agree)
n058	P1	1 (operating)
n059	P2	0 (fault)

Note: Terminal MA can be used only from DeviceNet communications. There is no corresponding external output terminal.

• FREQUENCY AGREE Signal (setting=2)



■ Preventing the Motor from Stalling (Current Limit)

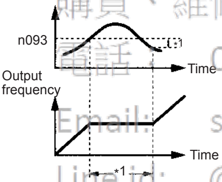
This function automatically adjusts the output frequency and output current according to the load to continue operation without stalling the motor.

Stall Prevention (Current Limit) Level during Acceleration (n093)

Sets the stall prevention (current limit) level during acceleration in units of 1%. (Inverter rated current = 100%)

Factory setting: 170%

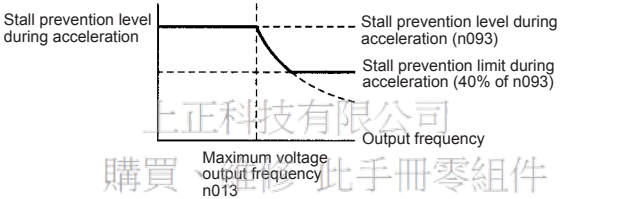
A setting of 200% disables the stall prevention (current limit) during acceleration. If the output current exceeds the value set for n093 during acceleration, acceleration stops and the frequency is maintained. When the output current goes to the value set for n093, acceleration starts.



*1: Stops the acceleration to prevent the motor from stalling.
*2: Release width (hysteresis) of stall prevention during accel is approx. 5% of inverter rated current

In the constant output area (output frequency > Max. Voltage Output Frequency (n013)), the stall prevention (current limit) level during acceleration is automatically decreased using the following equation.

$$\text{Stall prevention (current limit) level during acceleration in constant output area} = \text{Stall prevention (current limit) level during acceleration (n093)} \times \frac{\text{Max. voltage output frequency (n013)}}{\text{Output frequency}}$$



Stall Prevention (Current Limit) Level while Running (n094)

Sets the stall prevention (current limit) level while running in units of 1%. (Inverter rated current = 100%)

Factory setting: 160%

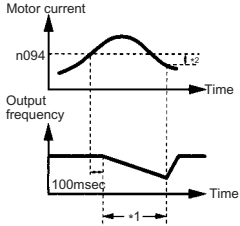
A setting of 200% disables stall prevention (current limit) while running.

If the stall prevention action current at speed agreement exceeds the value set for n094 for longer than 100 ms, deceleration starts.

If the output current exceeds the value set for n094, deceleration continues. If the output current goes to the value set for n094, acceleration to the set frequency starts.

Stall prevention acceleration/deceleration settings during operation are set either for the currently selected Acceleration Time, i.e., for Acceler-

ation Time 1 (n019) and Deceleration Time 1 (n020), or for Acceleration Time 2 (n021) and Deceleration Time 2 (n022).



*1: Decreases frequency to prevent the motor from stalling.
*2: At start of acceleration, the output current hysterisis is approx. 5% of inverter rated current.

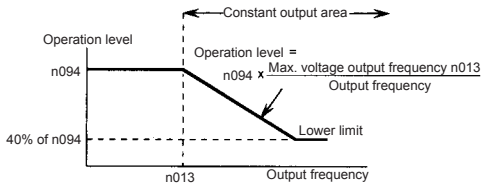
☐ Stall Prevention during Operation

Stall Prevention Automatic Decrease Selection (n115)

The stall prevention level can be decreased automatically in the constant output range.

Constant No.	Name	Unit	Setting Range	Factory Setting
n115	Stall Prevention Automatic Decrease Selection	-	0=Disabled 1=Enabled	0

n115 Settings

Setting	Function
0	The stall prevention level is the level set for constant n094 in all frequency areas.
1	The following figure shows how the stall prevention level is automatically decreased in the constant output range (Max. frequency > Max. voltage output frequency). The lower limit is 40% of the set value of n094. 

Acceleration/Deceleration Time Selection during Stall Prevention (n116)

With this function, Acceleration Time 2 (n021) and Deceleration Time 2 (n022) can be fixed as the acceleration/deceleration time when moving to prevent stalling during operation.

Constant No.	Name	Unit	Setting Range	Factory Setting
n116	Acceleration/Deceleration Time Selection during Stall Prevention	-	0=Disabled 1=Enabled	0

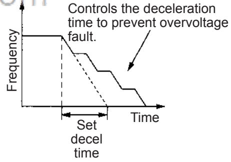
n116 Settings

Setting	Function
0	Acceleration/deceleration time is set to Acceleration/Deceleration Time 1 or 2.
1	Acceleration/deceleration time is fixed at Acceleration/Deceleration Time 2 (n021, n022)

- Stall Prevention during Deceleration (n092)

  To prevent overvoltage during deceleration, the Inverter automatically extends the deceleration time according to the value of main circuit DC voltage. When using an optional braking resistor, set n092 to 1.

Setting	Stall Prevention during Deceleration
0	Provided
1	Not provided (with braking resistor mounted)



■ Decreasing Motor Speed Fluctuation

□ Slip Compensation (n002 = 0)

As the load becomes larger, the motor speed is reduced and the motor slip value is increased. The slip compensating function controls the motor speed at a constant value even if the load varies.

When the Inverter output current is equal to the Motor Rated Current (n036), the compensation frequency is added to the output frequency.

$$\text{Compensation frequency} = \text{Motor rated slip (n106)} \times \frac{\text{Output current} - \text{Motor no-load current (n110)}}{\text{Motor rated current (n036)} - \text{Motor no-load current (n110)}} \times \text{Slip compensation gain (n111)}$$

Related Constants

Constant No.	Name	Unit	Setting Range	Factory Setting
n036	Motor Rated Current	0.1 A	0% to 150% of Inverter rated current	*
n111	Slip Compensation Gain	0.1	0.0 to 2.5	0.0
n110	Motor No-load Current	1%	0% to 99% (100%=Motor Rated Current n036)	*
n112	Slip Compensation Time Constant	0.1 s	0.0 to 25.5 s When 0.0 s is set, delay time is 2.0 s	2.0 s
n106	Motor Rated Slip	0.1 Hz	0.0 to 20 Hz	*

* Depends on Inverter capacity.

Note: 1. Slip compensation is not performed under the following condition: Output frequency < Minimum Output Frequency (n016)
2. Slip compensation is not performed during regeneration.
3. Slip compensation is not performed when the Motor Rated Current (n036) is set to 0.0 A.

■ Motor Protection

□ Motor Overload Detection

The Varispeed V7 protects against motor overload with a built-in electonic thermal overload relay.

Motor Rated Current (Electronic Thermal Reference Current, n036)

Set the rated current value shown on the motor nameplate.

Note: Setting n036 to 0.0 A disables the motor overload protective function.

Motor Overload Protection Selection (n037, n038)

n037 Setting	Electronic Thermal Characteristics
0	For general-purpose motor
1	For Inverter motor
2	Electronic thermal overload protection not provided.

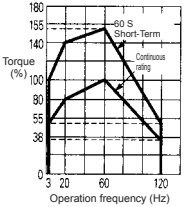
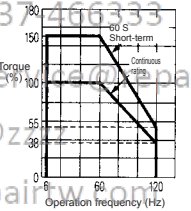
Constant No.	Name	Unit	Setting Range	Factory Setting
n038	Electronic Thermal Motor Protection Time Constant Setting	1 min	1 to 60 min	8 min

The electronic thermal overload function monitors the motor temperature based on Inverter output current and time to protect the motor from overheating. When the electronic thermal overload relay is enabled, an oL 1 error occurs, and the Inverter output is turned OFF to prevent excessive overheating in the motor. When operating with one Inverter connected to one motor, an external thermal relay is not needed. When operating more than one motor with one Inverter, install a thermal relay on each motor.

General-purpose Motors and Inverter Motors

Induction motors are classified as general-purpose motors or Inverter motors based on their cooling capabilities. The motor overoad function operates differently for these two motor types.

Example for 200 V-Class Motors

	Cooling Effect	Torque Characteristics	Electronic Thermal Overload
General-purpose Motor	Effective when operated at 50/60 Hz from commercial power supply.	 Base Frequency 60 Hz (V/f for 60-Hz, 220-V Input Voltage) For low-speed operation, torque must be limited in order to stop motor temperature rise.	An oL 1 error (motor overload protection) occurs when continuously operated at 50/60 Hz or less at 100% load.
Inverter Motor	Effective even when operated at low speed (approx. 6 Hz)	 Base Frequency 60 Hz (V/f for 60-Hz, 220-V Input Voltage) Use an Inverter motor for continuous operation at low speed.	Electronic thermal overload protection is not activated even for continous operation at 50/60 Hz or less at a 100% load.

■ Selecting Cooling Fan Operation

In order to increase the life of the cooling fan, the fan can be set to operate only when Inverter is running

n039 = 0 (Factory setting): Operates only when Inverter is running (Continues operation for 1 minute after Inverter is stopped.)

=1: Operates with power ON

■ Using Energy-saving Control Mode

Verify that the constant n002 is set to 0 (V/f control mode) when performing energy-saving control. Set n139 to 1 to enable the energy-saving control function.

☐ Energy-saving Control Selection (n139)

Constant No.	Name	Unit	Setting Range	Factory Setting
n139	Energy-saving Control Selection	-	0: Disabled 1: Enabled	0

Normally it is not necessary to change this setting. However, if the motor characteristics are different from a Yaskawa standard motor, refer to the description below and change the constant setting accordingly.

Energy-saving Control Mode (n140, n158)

The voltage for the best motor efficiency is calculated when operating in energy-saving control mode. The calculated voltage is used as the output voltage reference. The factory setting is set to the max. applicable motor capacity for a Yaskawa standard motor.

The greater the enegy-saving coefficient is, the greater the output voltage becomes.

When using a motor other than a Yaskawa standard motor, set the motor code corresponding to the voltage and capacity in n158. Then, change the setting of the energy-saving coefficient K2 (n140) by 5% to minimize the output power.

When the motor code is set in n158, the energy-saving coefficient K2, which corresponds to the motor code, must be set in n140.

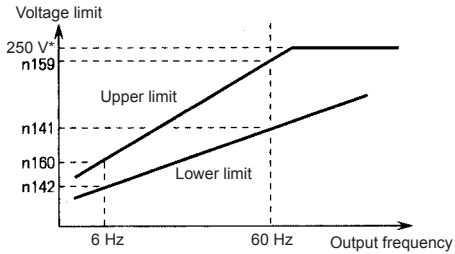
Constant No.	Name	Unit	Setting Range	Factory Setting
n140	Energy-saving Control Coefficient K2	-	0.0 to 6550	*
n158	Motor Code	-	0 to 70	*

* Depends on Inverter capacity.

Energy-saving Voltage Lower/Upper Limits (n141, n142, n159, n160)

Set the upper and lower limits of the output voltage. When the value calculated in the energy-saving control mode is larger than the upper limit (or smaller than the lower limit), the limit value is output as the voltage reference. The upper limit is set to prevent over-excitation, and the lower limit is set to prevent stalls when the load is light. The voltage limit is set for machines using 6 or 60 Hz. For any value other than 6 or 60 Hz, set the voltage limit using linear interpolation. The constants are set in % for 200-V/400-V Inverters.

Constant No.	Name	Unit	Setting Range	Factory Setting
n141	Energy-saving Control Voltage Lower Limit at 60 Hz	%	0 to 120	50
n142	Energy-saving Control Voltage Lower Limit at 6 Hz	%	0 to 25	12
n159	Upper Voltage Limit For Energy-saving Control at 60 Hz	%	0 to 120	120
n160	Upper Voltage Limit For Energy-saving Control at 6 Hz	%	0 to 25	16



* Doubled for the 400 V Class Inverters.

☐ Energy-saving Search Operation

In energy-saving control mode, the maximum applicable voltage is calculated using the output power. However, a temperature change or the use of another manufacturer’s motor will change the fixed constants, and the maximum applicable voltage may not be emitted. In the search operation, change the voltage slightly so that the maximum applicable voltage can be obtained.

Search Operation Voltage Limit (n144)

Limits the range where the voltage is controlled. The constant is set in % for 200-V/400-V Inverters. The search operation is not performed when n144 is set to 0.

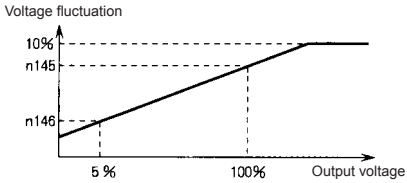
Constant No.	Name	Unit	Setting Range	Factory Setting
n144	Search Operation Voltage Limit	%	0 to 100	0

Search Operation Voltage Steps (n145, n146)

Constants n145 and n146 set the change in voltage for one cycle of the search operation. For 200 V Class Inverters, set the values as percentages of 200 V. For 400 V Class Inverters, set the values as percentages of 400 V. Increase the value and the changes in the rotation speed will also increase.

For 200 V Class Inverters, the range of the change in voltage is determined from the 100% and 5% settings for 200 V. For 400 V Class Inverters, the range of the change in voltage is determined from the 100% and 5% settings for 400 V. The values calculated by linear interpolation are used for voltages other than these.

Constant No.	Name	Unit	Setting Range	Factory Setting
n145	Search Operation Voltage Step at 100%	%	0.1 to 10.0	0.5
n146	Search Operation Voltage Step at 5%	%	0.1 to 10.0	0.2
n143	Power Average Time	×24 ms	1 to 200	1 (24 ms)



Search Operation Power Detection Hold Width (n161)

When the power fluctuation is less than this value, the output voltage is held for 3 seconds, and then, the search operating mode is started. Set the hold width as a percentage of the power that is currently held.

Constant No.	Name	Unit	Setting Range	Factory Setting
n161	Search Operation Power Detection Hold Width	%	0 to 100	10

Time Constant of Power Detection Filter (n162)

Response at load changes is improved when this value is small.
At low frequency, however, unstable rotation will result.

Constant No.	Name	Unit	Setting Range	Factory Setting
n162	Time Constant of Power Detection Filter	×4 ms	0 to 255	5 (20 ms)

☐ Motor Code

The Energy-saving Coefficient K2 (n140) is set to a value that corresponds to the Motor Code (n158).

Motor Type	Voltage Class	Capacity	Motor Code: n158	Energy-saving Coefficient K2: n140
Yaskawa General-purpose Motor	200 V	0.1 kW	0	481.7
		0.2 kW	1	356.9
		0.4 kW	2	288.2
		0.75 kW	3	223.7
		1.5 kW	4	169.4
		2.2 kW	5	156.8
		3.7 kW	7	122.9
		5.5 kW	9	94.8
		7.5 kW	10	72.7
	400 V	0.2 kW	21	713.8
		0.4 kW	22	576.4
		0.75 kW	23	447.4
		1.5 kW	24	338.8
		2.2 kW	25	313.6
		3.0 kW	26	245.8
		3.7 kW	27	245.8
		5.5 kW	29	189.5
		7.5 kW	30	145.4

Motor Type	Voltage Class	Capacity	Motor Code: n158	Energy-saving Coefficient K2: n140
Yaskawa Inverter Motor	200 V	0.1 kW	40	481.7
		0.2 kW	41	356.9
		0.4 kW	42	300.9
		0.75 kW	43	224.7
		1.5 kW	44	160.4
		2.2 kW	45	138.9
		3.7 kW	47	106.9
		5.5 kW	49	84.1
		7.5 kW	50	71.1
	400 V	0.2 kW	61	713.8
		0.4 kW	62	601.8
		0.75 kW	63	449.4
		1.5 kW	64	320.8
		2.2 kW	65	277.8
		3.0 kW	66	213.8
		3.7 kW	67	213.8
		5.5 kW	69	168.3
		7.5 kW	70	143.3

■ Using PID Control Mode

For details on the PID control settings, refer to the block diagram of the Inverter's internal PID control or the block diagram of the Operator analog speed reference.

☐ PID Control Selection (n128)

Constant No.	Name	Unit	Setting Range	Factory Setting
n128	PID Control Selection	–	0 to 8	0

Setting	Function	PID Output Characteristics
0	Disabled.	-
1	Enabled: Deviation is subject to derivative control.	Forward
2	Enabled: Feedback signal is subject to derivative control.	Forward
3	Enabled: Frequency reference + PID output, and deviation are subject to derivative control.	
4	Enabled: Frequency reference + PID output, and feedback signal are subject to derivative control.	
5	Enabled: Deviation is subject to derivative control.	Reverse
6	Enabled: Feedback signal is subject to derivative control.	
7	Enabled: Frequency reference + PID output, and deviation are subject to derivative control.	
8	Enabled: Frequency reference + PID output, and feedback signal are subject to derivative control.	

Set one of the above values when using PID control.
The following table shows how to determine the target value and the feedback value to be input when PID control is enabled.

	Input	Condition
Target Value	The currently selected frequency reference	Determined by the Frequency Reference Selection (n004). When local mode is selected, the target value is determined by the Frequency Reference Selection In Local Mode (n008). When multi-step references are selected, the currently selected frequency reference will be the target value.
Feedback Value	The frequency reference that is set in the PID Feedback Value Selection (n164)	-

n164 Setting	Description
0	Not used.
1	Not used.
2	Not used.

n164 Setting	Description
3	Operator terminal: Voltage 0 to 10 V
4	Operator terminal: Current 4 to 20 mA

Note: When using an analog signal (0 to 10 V/4 to 20 mA) input to the CN2 terminal of the JVOP-140 Digital Operator as the target or feedback value of PID control, do not use it as a multi-analog input. Constant n077 (Multi-function Analog Input Function) must be set to 0 (disabled in this case).

Proportional Gain (P), Integral Time (I), Derivative Time (D) (n130, n131, n132)

Adjust the response of the PID control with the proportional gain (P), integral time (I), and derivative time (D).

Constant No.	Name	Unit	Setting Range	Factory Setting
n130	Proportional Gain (P)	Multi-ples	0.0 to 25.0	1.0
n131	Integral Time (I)	1.0 s	0.0 to 360.0	1.0
n132	Derivative Time (D)	1.0 s	0.00 to 2.50	0.00

Optimize the responsiveness by adjusting the constants while operating an actual load (machanical system). Any control (P, I, or D) that is set to zero (0.0, 0.00) will not operate.

Upper Limit of Integral (I) Values (n134)

Constant No.	Name	Unit	Setting Range	Factory Setting
n134	Upper Limit of Integral Values	%	0 to 100	100

Constant n134 prevents the calculated value of integral control from exceeding a specific amount. There is normally no need to change the setting.

Reduce the setting if there is a risk of load damage, or of the motor going out of step by the Inverter's response when the load suddenly changes. If the setting is reduced too much, the target value and the feedback value will not match.

Set this constant as a percentage of the maximum output frequency with the maximum frequency as 100%.

PID Offset Adjustment (n133)

Constant No.	Name	Unit	Setting Range	Factory Setting
n133	PID Offset Adjustment	%	-100 to 100	0

Constant n133 adjusts the PID control offset.

If both the target value and the feedback values are zero, adjust n133 so that the Inverter output frequency is zero.

Primary Delay Time Constant for PID Output (n135)

Constant No.	Name	Unit	Setting Range	Factory Setting
n135	Primary Delay Time Constant for PID Output	0.1 s	0.0 to 10.0	0.0

Constant n135 is the low-pass filter setting for PID control outputs.

There is normally no need to change the setting.

If the viscous friction of the mechanical system is high or if the rigidity is low causing the mechanical system to resonate, increase the setting so that it is higher than the resonance frequency period.

PID Output Gain (n163)

Constant No.	Name	Unit	Setting Range	Factory Setting
n163	PID Output Gain	Multiples	0.0 to 25.0	1.0

Constant n163 adjusts the output gain.

PID Feedback Gain (n129)

Constant No.	Name	Unit	Setting Range	Factory Setting
n129	PID Feedback Gain	Multiples	0.00 to 10.00	1.00

Constant n129 is the gain that adjusts the feedback value.

PID Feedback Loss Detection (n136, n137, n138)

Constant No.	Name	Unit	Setting Range	Factory Setting
n136	Selection for PID Feedback Loss Detection	-	0: No detection of PID feedback loss 1: Detection of PID feedback loss, operation continued: FbL alarm 2: Detection of PID feedback loss, output turned OFF: Fault	0
n137	PID Feedback Loss Detection Level	%	0 to 100 100% = Max. output frequency	0
n138	PID Feedback Loss Detection Time	%	0.0 to 25.5	1.0

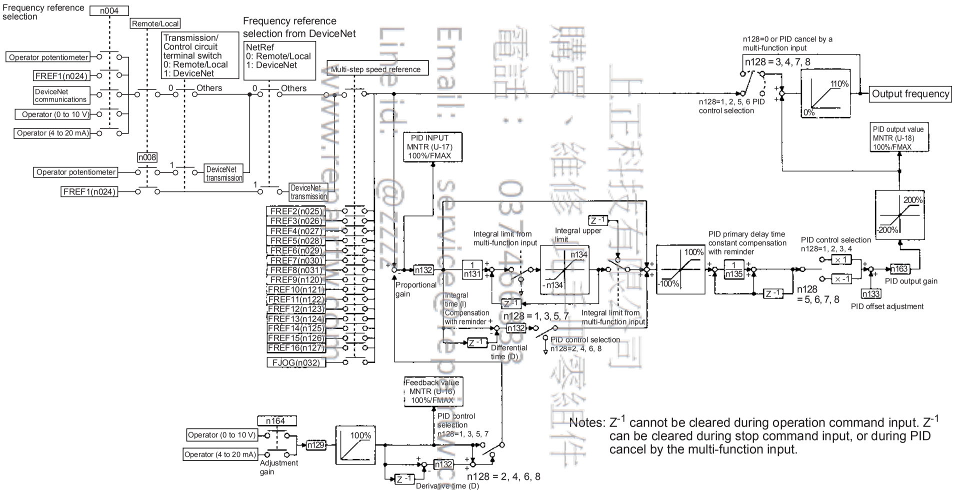
PID Limit

Sets the limit after PID control as a percentage of the maximum output frequency.

Prohibition of PID Output

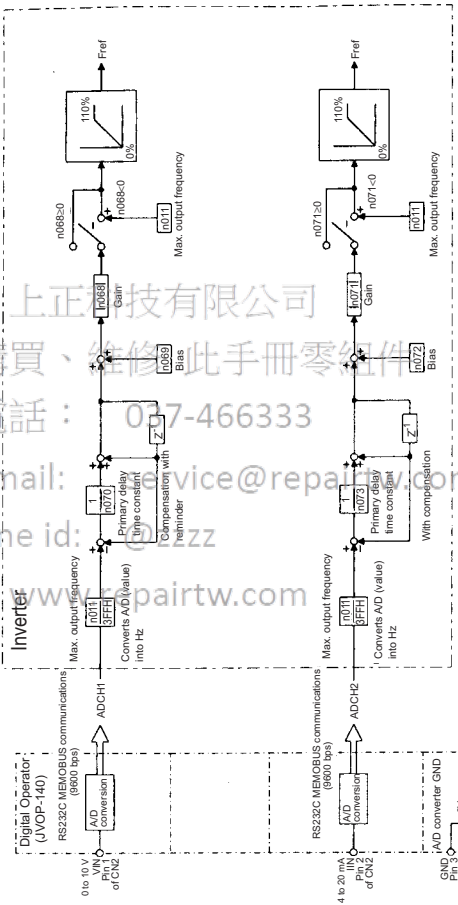
Zero limit occurs when the PID output is negative.

PID Control Block Diagram



Notes: Z^{-1} cannot be cleared during operation command input. Z^{-1} can be cleared during stop command input, or during PID cancel by the multi-function input.

Operator Analog Speed Reference Block Diagram



■ Using Constant Copy Function

□ Constant Copy Function

The Varispeed V7 standard JVOP-140 Digital Operator can store constants for one Inverter. A backup power supply is not necessary because EEPROM is used.

The constant copy function is possible only for the Inverters with the same product series, power supply specifications, and control mode (V/f control or vector control). However, some constants may not be copied. It is also impossible to copy constants between Varispeed V7 and VSmini J7 Inverters.

Prohibiting reading constants from the Inverter can be set in n177. The constant data cannot be changed when this constant is set.

If an alarm occurs when copying constants, PRGM will flash and copying will continue.

Constant Copy Function Selection (n176)

Depending on the setting of n176 (Constant Copy Function Selection), the following functions can be used.

1. Reading all the constants from the Inverter (READ) and storing them in EEPROM in the Digital Operator
2. Copying the constants stored in the Digital Operator to the Inverter (COPY)
3. Verifying that the constants in the Digital Operator and the constants in the Inverter are the same (VERIFY)
4. Displaying the maximum applicable motor capacity and the voltage class of the Inverter for which constants are stored in the Digital Operator
5. Displaying the software number of the Inverter for which constants are stored in the Digital Operator

Constant No.	Name	Unit	Setting Range	Factory Setting
n176	Constant Copy Function Selection	-	rdy: READY rEd: READ CPy: COPY vFy: VERIFY vA: Inverter capacity display Sno: Software No. display	rdy

Prohibiting Constant Read Selection (n177)

Select this function to prevent accidentally overwriting the constants stored in EEPROM or in the Digital Operator. Reading is not possible when this constant is set to 0.

The constant data stored in the Digital Operator are safe from accidental overwriting.

If reading is attempted while this constant is set to 0, PrE will flash. Press DSPL or ENTER and return to the constant No. display.

Constant No.	Name	Unit	Setting Range	Factory Setting
n177	Constant Read Selection Prohibit	1	0: READ prohibited 1: READ allowed	0

☐ READ Function

Reads out the constants in batch from the Inverter and stores them in EEPROM inside the Digital Operator. When the read-out is executed, the previously stored constants data in the EEPROM are cleared and replaced with the newly entered constants.

Example: Storing Constants from Inverter in EEPROM in Operator.

Explanation		Operator Display
• Enable the setting of constants n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by pressing the ▲ or ▼ key. • Press ENTER.	n001 (May be a different constant No.) 1 (Lit) (May be a different set value.) 4 (Blinks) 4 (Lit for one second.) ↓
• Set Contant Read Prohibited Selection (n177) to read-enabled. *1	• Change the constant No. to n177 by pressing the ▲ or ▼ key. • Press ENTER to display the set value. • Change the set value to 1 by pressing the ▲ or ▼ key. • Press ENTER.	n177 (The constant is displayed.) n177 0 (Lit) 1 (Blinks) 1 (Lit for one second.) ↓ n177 (The constant is displayed.)
• Execute read-out (READ) using the Constant Copy Furiction Selection (n176).	• Change the constant No. by pressing the ▲ or ▼ key. • Press ENTER to display the set value. • Change the set value to rEd by pressing the ▲ or ▼ key. • Press ENTER.	n176 rEd (Lit) rEd (Lit) rEd (Flashes while executing the read) ↓ End (End is displayed after the read has been completed.) n176 (The constant is displayed.)
• Set Constant Read Prohibited Selection (n177) to read-disabled. *2	• Press DSPL or ENTER. • Change the constant No. to N177 by pressing the ▲ or ▼ key. • Press ENTER to display the set value. • Change the set value to 0 by pressing the ▲ or ▼ key. • Press ENTER.	n177 1 (Lit) 0 (Flashes) 0 (Lit for one second.) ↓ n177 (The constant No. is displayed.)

Note: 1. When reading is enabled (n177=1), this setting is not necessary.

2. This setting is not necessary unless read-prohibition is selected.

☐ COPY Function

This function writes the constants stored inside the Digital Operator in batch to the Inverter. Write-in is possible only for Inverters with the same product series, power supply specifications, and control mode (V/f control or vector control).

Therefore, writing from 200 V Class to 400 V Class Inverters (or vice versa), from V/f control mode to vector control mode Inverters (or vice versa), or from Varispeed V7 to VSmini J7 Inverters is not possible.

The Constant Copy Function Selection (n176), Constant Read Selection Prohibit (n177), Fault History (n178), Software Version No. (n179), and hold output frequency are not written. vAE will appear (flashing) if the capacities of the Inverters differ.

Press ENTER to continue writing (the COPY function).

Press STOP/RESET to stop the COPY function.

The following constants are not written if the Inverter capacities differ.

Constant No.	Name	Constant No.	Name
n011 to n017	V/f Settings	n108	Motor Leakage Inductance
n036	Motor Rated Current	n109	Torque Compensation Voltage Limiter
n080	Carrier Frequency Selection	n110	Motor No-load Current
n105	Torque Compensation Iron Loss	n140	Energy-saving Coefficient K2
n106	Motor Rated Slip	n158	Motor Code
n107	Line to Neutral (per Phase)		

Example: Writing Constants from EEPROM in Operator to Inverter

Explanation		Operator Display
• Enable the settings for constants n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by pressing the ∧ or ∨ key. • Press ENTER.	n001 (May be a different constant No.) 1 (Lit) (May be a different set value.) 4 (Flashes)
• Execute write-in (COPY) using the Constant Copy Function Selection (n176).	• Change the constant No. to n176 by pressing the ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to CPy by pressing the ∧ or ∨ key. • Press ENTER.	4 (Lit for one second.) ↓ n001 (The constant is displayed.) n176 rdy (Lit) CPy (Lit) CPy (Flashes while executing the copy.) ↓ End (End is displayed after the copy has been completed.) n176 (The constant No. is displayed.)
	• Press DSPL or ENTER	

A setting range check and matching check for the written constants are executed after the constants are written from the Digital Operator to the Inverter. If a constant error is found, the written constants are discarded and the constants stored before writing are restored.

When a setting range error is found, the constant No. where an error occurs is indicated by flashing.

When an inconsistency in the settings is found, oP □ (□: a number) is indicated by flashing.

□ VERIFY Function

This function compares the constants stored in the Digital Operator with the constant in the Inverter. Verification is possible only for the Inverters with same product series, power supply specifications, and control mode (V/f control or vector control).

When the constants stored in the Digital Operator are the same as those in the Inverter, vFy will flash, and then End will be displayed.

Example: Comparing Constants Stored in EEPROM in Operator with Constants in Inverter

Explanation		Operator Display
• Enable the settings for constants n001 to n179.	• Press DSPL to light [PRGM] • Press ENTER to display the set value. • Change the set value to 4 by pressing the ▲ or ▼ key. • Press ENTER.	n001 (May be a different constant No.) 1 (Lit) (May be a different constant No.) 4 (Flashes) 4 (Lit for one second.) ↓ n001 (The constant No. is displayed.)
• Excute VERIFY by Constant Copy Function Selection (n176).	• Change the constant No. to n176 by pressing the ▲ or ▼ key. • Press ENTER to display the set value. • Change the set value to vFy by pressing the ▲ or ▼ key. • Press ENTER.	n176 rdY (Lit) vFY (Lit) vFY (Flashes while executing VERIFY)
• Display the unmatched constant No. • Display the constant value in the Inverter. • Display the constant value in the Digital Operator. • Continue the execution of VERIFY.	• Press ENTER. • Press ENTER. • Press the ▲ key. • Press DSPL or ENTER.	n011 (Flashes) (When n011 is different.) 600 (Flashes) 500 (Flashes) vFY (Flashes while executing the verification) ↓ End (End is displayed when the verification has been completed.) n176 (The constant No. is displayed.)

While a constant No. that is not the same is displayed or a constant value is displayed, press STOP/RESET to interrupt the execution of the verification. End will be displayed. Press DSPL or ENTER to return to the constant No.

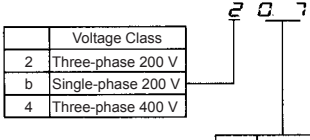
☐ Inverter Capacity Display

The voltage class and maximum applicable motor capacity for which constants are stored in the Digital Operator are displayed.

Example: Displaying Voltage Class and Maximum Applicable Motor Capacity for Inverter whose Constants are in EEPROM in Operator

Explanation		Operator Display
• Enable the setting for constants n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by pressing the ▲ or ▼ key. • Press ENTER.	n001 (May be a different constant No.) 1 (Lit) (May be a different constant No.) 4 (Flashes) 4 (Lit for one second.) ↓ n001 1 (The constant No. is displayed.)
• Execute Inverter Capacity Display (vA) using the Constant Copy Function Selection (n176).	• Change the constant No. to n176 by pressing the ▲ or ▼ key. • Press ENTER to display the set value. • Change the set value to vA by pressing the ▲ or ▼ key. • Press ENTER. • Press DSPL or ENTER.	n176 rdy (Lit) vA (Lit) 20P7 (Lit) (For 20P7)* n176 (The constant No. is displayed.)

The following figure shows the Inverter Capacity Display



	Voltage Class
2	Three-phase 200 V
b	Single-phase 200 V
4	Three-phase 400 V

	Max. Applicable Motor Capacity	
	200 V Class	400 V Class
0.1	0.1 kW	-
0.2	0.25 kW	0.37 kW
0.4	0.55 kW	0.55 kW
0.7	1.1 kW	1.1 kW
1.5	1.5 kW	1.5 kW
2.2	2.2 kW	2.2 kW
3.0	-	3.0 kW
3.7	3.7 kW	3.7 kW
5.5	5.5 kW	5.5 kW
7.5	7.5 kW	7.5 kW

☐ Software No. Display

The software number of the Inverter for which constants are stored in the Digital Operator is displayed.

Example: Displaying Software No. of Inverter for which Constants Are Stored in EEPROM in Operator

Explanation		Operator Display
• Enable the setting for constants n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by pressing the ▲ or ▼ key. • Press ENTER.	n001 (May be a different constant No.) 1 (Lit) (May be a different set value.) 4 (Flashes) 4 (Lit for one second.) ↓ n001 (The constant No. is displayed.)
• Execute Software No. Display (Sno)* using the Constant Copy Function Selection (n176).	• Change the constant No. to n176 by pressing the ▲ or ▼ key. • Press ENTER to display the set value. • Change the set value to Sno by pressing the ▲ or ▼ key. • Press ENTER. • Press DSPL or ENTER.	n176 rdy (Lit) Sno (Lit) 0010 (Lit) (Software version: VSP030010) n176 (The constant No. is displayed.)

* Displays the lower 4 digits of the software version.

☐ Display List

Operator Display	Description	Corrective Action
rdy	Lit: Constant copy function selection enabled.	-
rEd	Lit: READ selected. Flashes: READ under execution.	-
CPy	Lit: Writing (COPY) selected. Flashes: Writing (COPY) under execution.	-
vFy	Lit: VERIFY selected. Flashes: VERIFY under execution.	-
vA	Lit: Inverter capacity display selected.	-
Sno	Lit: Software No. display selected.	-

Operator Display	Description	Corrective Action
End	Lit: READ, COPY (writing), VERIFY completed.	-
PrE	Flashes: Attempt made to execute READ while Constant Read Selection Prohibit (n177) is set to 0.	Confirm the necessity to execute READ, then set Constant Read Selection Prohibit (n177) to 1 to execute READ.
rdE	Flashes: The constant could not be read properly for READ operation. Or, a main circuit low voltage is detected during READ operation.	Confirm that the main circuit power supply voltage is correct, then re-execute READ.
CSE	Flashes: A checksum error occurred in the constant data stored in the Digital Operator.	The constants stored in the Digital Operator cannot be used. Re-execute READ to store the constans in the Digital Operator.
dPS	Flashes: The password for the connected Inverter and that for the constant data stored in the Digital Operator disagree. Example: Writing (COPY) from Varispeed V7 to VSmini J7	Check if the Inverters are the same product series.
ndr	Flashes: No constant data stored in the Digital Operator.	Execute READ.
CPE	Flashes: Attempt made to execute writing (COPY) or VERIFY between different voltage classes or different control modes.	Check each voltage class and control mode.
CYE	Flashes: A main circuit low voltage was detected during writing (COPY) operation.	Confirm that the main circuit power supply voltage is correct, then re-execute writing (COPY).
FO4	Lit: A checksum error occurred in the constant data stored in the Inverter.	Initialize the constants. If an error occurs again, replace the Inverter due to a failure of constant memory element (EEPROM) in the Inverter.
uAE	Flashes: Attempt made to execute COPY or VERIFY between different Inverters of different capacities.	Press ENTER to continue the execution of COPY or VERIFY. Press STOP to interrupt the execution of COPY or VERIFY.
iFE	Flashes: A communications error occurred between the Inverter and the Digital Operator.	Check the connection between the Inverter and Digital Operator. If a communications error occurs during the READ operation or writing (COPY) operation, always re-execute the READ or COPY.

Note: While rEd, CPy, or vFy is flashing, key input on the Digital Operator is disabled. While rEd, CPy and vFy are not flashing, pressing DSPL or ENTER redisplays the constant No.

■ Unit Selection for Frequency Reference Setting/ Display

Constants and Monitor Displays for Which Selection of Unit Function Is Valid

Item	Contents
Frequency reference constants	Frequency References 1 to 8 (Constants n024 to n031)
	Jog Frequency Reference (Constant n032)
	Frequency References 9 to 16 (Constants n120 to n127)
Monitor display	Frequency Reference Display (FREF)
	Output Frequency Display (FOUT)
	Frequency Reference Display (U-01)
	Output Frequency Display (U-02)

Setting/Displaying Unit Selection for Frequency Reference (n035)

The frequency reference, output frequency, and the numeric data of frequency reference constants can be displayed in %, r/min, or m/min according to the set value of constant n035.

With DeviceNet communications, set the number of motor poles and display the frequency reference constant in r/min.

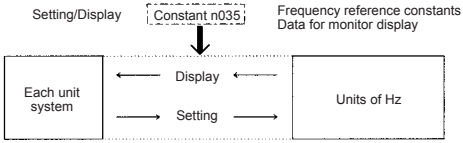
Constant No.	Constant Name	Description	Factory Setting
035	Setting/Displaying Unit Selection for Frequency Reference	0: Units of 0.01 Hz (less than 100 Hz) 0.1 Hz (100 Hz and more) 1: Units of r/min (set the number of motor poles) 40 to 3999: Any unit	4

n035 Settings

Setting	Description
0	• Setting unit: 0.01 Hz (less than 100 Hz), 0.1 Hz (100 Hz and more) • Setting range min {Fmax (n011) × Frequency Reference Lower Limit (n034) to Fmax (n011) × Frequency Reference Upper Limit (n033), 400 Hz}
1	• Setting in units of 0.1%: 100.0%/Fmax (n011) • Setting range Min. {Frequency Reference Lower Limit (n034) to Frequency Reference Upper Limit (n033), (400 Hz ÷ Fmax. (n011)) 100%} Max. Upper Limit Value: Fmax. (n011) × Set value (%) ≤ 400 Hz
2 to 39	• Setting in units of 1 r/min: r/min=120 × Frequency reference (Hz) ÷ n035 (Set the number of motor poles in n035) • Setting range Min. {120 (Fmax (n011) Frequency Reference Lower Limit (n034) ÷ n035 to 120 × (Fmax (n011) × Frequency Reference Upper Limit (n033)) n035, 400 Hz × 120 P, 9999r/min • Max. Upper Limit Value: N × P ÷ 120 ≤ 400 Hz
40 to 3999	• Set the display value at 100% of frequency reference (set value of Fmax (n011)) at 1st to 4th digits of n035. In the 4th digit of n035, set the position of decimal point. In the 1st to 4th digits of n035, set a 3-digit figure excluding the decimal point. 4th digit Position of decimal point 0 □ □ □ 1 □ □. □ 2 □. □ □ 3 0. □ □ □ Example: To display 20.0 at 100% of frequency reference, set n035 to 1200. • Setting range Min. {Lower 3-digits of n035) × Frequency Reference Lower Limit (n034) to (Lower 3-digits of n035) × Frequency Reference Upper Limit (n033), 400 Hz (Lower 3-digits of n035) × Fmax (n011), 999} Max. Upper Limit Value: (Set value ÷ (Lower 3 digits of n035)) × Fmax(011) ≤ 400 Hz

Note: 1. The frequency reference constants and monitor display data for

which this selection of the unit is valid are stored in the Inverter in units of Hz.
The units are converted as shown below:
The initial value is 4.



2. The upper limit for each unit is the value with decimal places below the significant digits truncated.
   Example: Where the upper limit for the unit Hz is as follows for 60.00 Hz and n035 = 39:
   120 × 60.00 Hz ÷ 39 = 184.9, thus 184 r/min is displayed as the upper limit.
   For displays other than for the upper limit, the decimal places below the significant digits are rounded off.
3. When verifying constants for the copy function, frequency reference constants (units of Hz) are used.

■ Selecting Processing for Frequency Reference Loss (n064)

Use this setting to select the processing performed if the level of the frequency reference signal from the operator circuit terminals suddenly drops.

n064 Setting	Description
0	Processing for frequency reference loss disabled.
1*	Processing for frequency reference loss enabled.

* Detected in REMOTE mode (drive mode) when analog reference (except potentiometer on Digital Operator) or pulse train reference is selected in the Frequency Reference Selection (n004).

Processing Method When 1 is Selected

If the level of the frequency reference signal drops by 90 % within 400 ms, operation continues at 80 % of the signal level before the level drop.

■ Input/Output Open-phase Detection

Constant No.	Name	Unit	Setting Range	Factory Setting
n166	Input Open-phase Detection Level	1 %	0 to 100 %*1 400.0 V/100 % (200 V Class) 800.0 V/100 % (400 V Class)	0 %
n167	Input Open-phase Detection Time	1 s	0 to 255 s*2	0 s
n168	Output Open-phase Detection Level	1 %	0 to 100 %*1 Inveter's rated output current/100 %	0 %
n169	Output Open-phase Detection Time	0.1 s	0.0 to 2.0 s*2	0.0 s

* 1. Not detected when set to 0 %.
* 2. Not detected when set to 0.0 s.

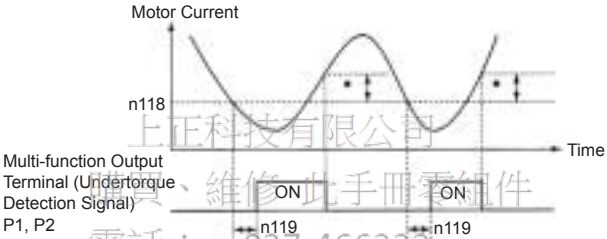
The recommended settings for input open-phase detection are n166=7 % and n167=10 s.
(Open-phase cannot be detected correctly depending on the load status.)

The recommended settings for output open-phase detection are n168=5 % and n169=0.2 s.

■ Undertorque Detection

An alarm signal can be output to a multi-function output terminal (P1 or P2) when the load on the machine side suddenly becomes lighter (i.e., when an undertorque occurs).

To output an undertorque detection signal, set the output terminal funciton selection in n057, n058, or n059 to 8 (undertorque detected, NO contact) or 9 (undertorque detected, NC contact).



* Undertorque detection release width (hysteresis) is set at approx. 5 % of the Inverter's rated current.

Undertorque Detection Function Selection (n177)

Setting	Description
0	Undertorque detection not provided.
1	Detected during constant-speed running. Operation continues after detection.
2	Detected during constant-speed running. Operation stops.
3	Detected during running. Operation continues after detection.
4	Detected during running. Operation stops.

1. To detect undertorques during acceleration, set to 3 or 4.
2. To continue operation after undertorque detection, set to 1 or 3. During detection, the operation displays the "UL3" alarm (flashing).
3. To halt the Inverter by a fault at undertorque detection, set to 2 or 4. At detection, the Operation displays the "UL3" fault (continuously lit).

Undertorque Detection Level (n118)

Sets the undertorque detection current level in units of 1 %. (Inverter rated current=100 %) When detected by torque is selected, motor rated torque becomes 100 %.

Factory setting=10 %

Undertorque Detection Time (n119)

If the time for which the motor current is less than the undertorque detection level (n118) is longer than the undertorque detection time (n119), the undertorque detection function operates.

Factory setting=0.1 s

Overtorque/Undertorque Detection Function Selection 2 (n097)

When vector control mode is selected, it is possible to select whether overtorque/undertorque detection is performed by output current or output torque.

When V/f control mode is selected, the n097 setting becomes invalid, and overtorque/undertorque is detected by output current.

Setting	Description
0	Overtorque/undertorque detected by output torque.
1	Overtorque/undertorque detected by output current.

8. Maintenance and Inspection

⚠WARNING

- Never touch high-voltage terminals on the Inverter. Failure to observe this warning may result in an electrical shock.
- Disconnect all power before performing maintenance or inspection, and then wait at least one minute after the power supply is disconnected. Confirm that all indicators are OFF before proceeding. If the indicators are not OFF, the capacitors are still charged and can be dangerous.
- Do not perform withstand voltage test on any part of the Varispeed V7.
  The Inverter is an electronic device that uses semiconductors, and is thus vulnerable to high voltage.
- Only authorized personnel should be permitted to perform maintenance, inspection, or parts replacement.
  (Remove all metal objects (watches, bracelets, etc.) before starting work.)
  (Use tools which are insulated against electrical shock.)
  Failure to observe these warnings may result in an electric shock.

⚠CAUTION

- The control PCB employs CMOS ICs.
  Do not touch the CMOS elements.
  They are easily damaged by static electricity.
- Do not connect or disconnect wires, connectors, or the cooling fan while power is applied to the circuit. Failure to observe this caution may result in injury.

■ Periodic Inspection

Periodically inspect the Inverter as described in the following table to prevent accidents and to ensure high performance with high reliability.

Location to Check	Check for	Solution
Terminals, Inverter mounting screws, etc.	Improper seating or loose connections in hardware.	Properly seat and tighten hardware.
Heatsinks	Buildup of dust, dirt, and debris	Blow with dry compressed air at a pressure of 39.2×10^4 to 58.8×10^4 Pa, 57 to 85 psi (4 to 6kg/cm^2).
Printed circuit boards	Accumulation of conductive material or oil mist	Blow with dry compressed air at a pressure of 39.2×10^4 to 58.8×10^4 Pa, 57 to 85 psi (4 to 6kg/cm^2). If dust or oil cannot be removed, replace the Inverter.
Power elements and smoothing capacitor	Abnormal odor or discoloration	Replace the Inverter.
Cooling fan	Abnormal noise or vibration Cumulative operation time exceeding 20,000 hours	Replace the cooling fan.

■ Part Replacement

Inverter's maintenance periods are given below. Keep them as guidelines.

Part Replacement Guidelines

Part	Standard Replacement Period	Replacement Method
Cooling fan	2 to 3 years	Replace with new part.
Smoothing capacitor	5 years	Replace with new part. (Determine need by inspection.)
Breaker relays	-	Determine need by inspection.
Fuses	10 years	Replace with new part.
Aluminum capacitors on PCBs	5 years	Replace board. (Determine need by inspection.)

Note: Usage conditions are as follows:

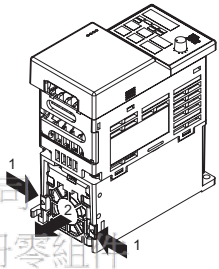
- Ambient temperature: Yearly average of 30°C
- Load factor: 80% max.
- Operating rate: 12 hours max. per day

☐ Replacement of Cooling Fan

Inverters with Width of 68 mm (2.68 inches), 140 mm (5.51 inches), or 170 mm (6.69 inches)

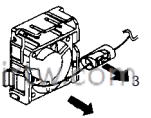
1. Removal

1. Press the right and left catches on the fan cover in direction 1, and then pull them in direction 2 to remove the fan cover from the Inverter.
2. Pull the wiring in direction 3 from the fan cover rear face, and remove the protective tube and connector.
3. Open the left and right sides of the fan cover to remove the cooling fan from the cover.



2. Mounting

1. Mount the cooling fan on the fan cover. The arrow mark to indicate the airflow direction of the cooling fan must be on the opposite side to the cover.
2. Connect the connector and mount the protective tube firmly. Mount the connector joint section on the fan cover rear face.
3. Mount the fan cover on the Inverter. Always mount the right and left catches on the fan cover on the heatsinks.

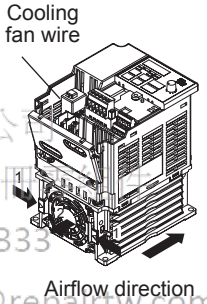


Airflow direction

Inverters with Width of 108 mm (4.25 inches)

1. Removal

1. Remove the front cover and terminal cover, and then remove the cooling fan connector (CN10).
2. Press the right and left catches on the fan cover in direction 1, and pull the fan cover in direction 2 to remove it from the Inverter. Pull out the wiring from the cable lead-in hole at the bottom of the plastic case.
3. Open the right and left sides of the fan cover to remove the cover from the cooling fan.



2. Mounting

1. Mount the cooling fan on the fan cover. The arrow mark to indicate the airflow direction must be opposite to the cover.
2. Mount the fan cover on the Inverter. Always mount the right and left catches on the fan cover on the heatsinks. Thread in the wiring from the cable lead-in hole at the bottom of the plastic case to the inside of the Inverter.
3. Connect the wiring to the cooling fan connector (CN10) and mount the front cover and the terminal cover.

9. Fault Diagnosis

■ Protective and Diagnostic Functions

This section describes the alarm and fault displays, the fault conditions, and the corrective actions to be taken if the Varispeed V7 malfunctions.

Inverter alarms are classified into alarm display and fault display.

Alarm display: When a minor fault occurs in the Inverter, the Digital Operator flashes the display. In this case, the operation is continued, and restored automatically as soon as the cause is removed. Multi-function output can output the minor fault status to external devices.

Fault display: When a major fault occurs in the Inverter, the protective function operates, and the Digital Operator lights the display and shuts off the output to stop the Inverter. The fault can be output as a fault output to the external devices by multi-function output.

To reset the fault, turn ON the reset signal with the run command OFF or cycle the power after taking the corrective action.

* Selecting "always ON" mode at fan operation selection, the power must be cycled to release the alarm display.

□ Corrective Actions of Models with Blank Cover

1. Input fault reset or cycle the power supply OFF and ON.
2. When a fault cannot be corrected:
   (1) Turn the power supply OFF and check the wiring and external circuit (sequence).
   (2) Turn the power supply OFF and replacce the blank cover with the Digital Operator to display faults. The faults are displayes after turning the power ON.

☐ Corrective Actions of Models with Digital Operator

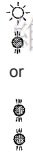
☼: ON ◍: Flashing ●: OFF

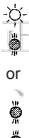
Alarm Displays and Meaning

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
Uv Flashing	◍	Detected as an alarm only. Fault contact output is not activated.	UV (Main circuit low voltage) Main circuit DC voltage dropped below the low-voltage detection level while the Inverter output is OFF. 200 V: Main circuit DC voltage drops below approx. 200 V (160 V for single-phase) 400 V: Main circuit DC voltage dropped below approx. 400 V. (Control supply fault) Control power supply fault is detected while the Inverter output is OFF.	Check the following: • Power supply voltage • Main circuit power supply connection. • Terminal screws: Loose?
ov Flashing	◍		OV (Main circuit overvoltage) Main circuit DC voltage exceeded the overvoltage detection level while the Inverter output is OFF. Detection level 200 V Class: approx 410 V or more 400 V Class: approx 820 V or more	Check the power supply voltage.
oH Flashing			OH (Heatsink overheat) Intake air temperature increased while the Inverter output is OFF.	Check the intake air temperature.

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
CAL Flashing		Detected as an alarm only. Fault contact output is not activated.	Waiting to receive data.	Check communications devices.
			Communications error	• Baud rate setting error Communications are not established because the baud rate of the master and the Inverter are not the same. ⇓ Correct the baud rate setting of either the master or the Inverter so that the rates will be same. • MAC ID duplicated Check whether the MAC ID is duplicated in another device in the DeviceNet network. ⇓ Correct the MAC ID setting so that it is not the same as that of another device and turn ON the Inverter's power again.
dE1 Flashing			dE1(I/O message length disagreement) Inverter is not operating correctly because the I/O data was not sent correctly from the master.	The length of the polled I/O message registered in the master and the length of the connection path set in n148 and n149 do not match. ⇓ Change the settings so that the length of the polled I/O registered in the master will be the same as the length of the connection path set in n148 and n149.
rUn Flashing			If the Run command is ON when a fault is reset, "rUn" will flash. "rUn" stops flashing if the Run command is turned OFF. Inverter will not operate while "rUn" is flashing.	

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oP□		Detected as an alarm only. Fault contact output is not activated.	OP□ (Constant setting error when constants are set through MEMOBUS communications) OP1: Two or more values are set for multi-function input selection. (constants n050 to n056) OP2: Relationship among V/f constants is not correct. (constants n011, n013, n014, n016) OP3: Setting value of motor rated current exceeds 150% of Inverter Rated Current. (constant n036) OP4: Upper/lower limit of frequency reference is reversed. (constants n033, n034) OP5: (constants n083 to n085) OP6: Multi-function Analog Inputs (n077) and PID Control Selection (n128) are both set to a value other than 0.	Check the setting values.
oL3 Flashing			OL3 (Overtorque detection) Motor current exceeded the preset value in constant n098.	Reduce the load, and increase the acceleration/deceleration time.
SEr Flashing			SER (Sequence error) Inverter received LOCAL/REMOTE command or communications/control circuit terminal changing signals from the multi-function terminal while the Inverter output is ON.	Check the external circuit (sequence).

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
bb Flashing		Detected as an alarm only. Fault contact output is not activated.	BB (External baseblock) BASEBLOCK command at multi-function terminal is ON and the Inverter output is OFF (motor coasting). Condition is cleared when input command is removed.	Check the external circuit (sequence).
EF Flashing			EF (Simultaneous FWD/REV RUN commands) When FWD and REV RUN commands are simultaneously input for over 500 ms, the Inverter stops according to constant n005.	Check the external circuit (sequence).
STP Flashing			STP (Operator function stop) STOP/RESET was pressed during running via a control circuit terminal FWD/REV command, or by a RUN command from communications. The Inverter stops according to constant n005.	Check the external circuit (sequence).
			STP (Emergency stop) Inverter received emergency stop alarm signal. Inverter stops according to constant n005.	Check the external circuit (sequence).
FAn Flashing			FAN (Cooling fan fault) Cooling fan is locked.	Check the following: • Cooling fan • Cooling fan connection
FbL Flashing			FBL (PID feedback loss detection) PID feedback value dropped below the detection level. When PID feedback loss is detected, the Inverter operates according to the n136 setting.	Check the mechanical system and correct the cause, or increase the value of n137.
bUS Flashing			A communications fault occurred.	Check communications signals.

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
UL3 Flashing		Detected as an alarm only. Fault contact output is not activated.	UL3 (Undertorque detection) When V/f mode is selected: The Inverter's output current was less than the undertorque detection level (n118). When vector mode is selected: The output current or output torque was less than the detection level (n097 or n118). Operation when undertorque is detected will be determined by the setting in n117.	• Check the setting in n118. • Check the operating conditions, and remove the cause.
oH3 Flashing			OH3 (Inverter overheat alarm) The Inverter overheat alarm (OH3) was input from a multi-function input terminal (S1 and S7).	• Clear the multi-function input terminal's Inverter overheat alert input.

Fault Displays and Meanings

Fault Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
ou		Protective Operation Output is turned OFF and motor coasts to a stop.	OV (Main circuit overvoltage) Main circuit DC voltage exceeded the overvoltage detection level because of excessive regenerative energy from the motor. Detection level: 200 V: Stop at main circuit DC voltage below approx. 410 V 400 V: Stops at main circuit DC voltage of approx. 820 V or more	• Insufficient Deceleration Time (constants n020 and n022) • Lowering of negative load (e.g., elevator) ⇓ • Increase deceleration time. • Connect optional braking resistor.
uv1	●		UV1 (Main circuit low voltage) Main circuit DC voltage dropped below the low-voltage detection level while the Inverter output is ON. 200 V: Stops at main circuit DC voltage below approx. 200 V (160 V for single-phase) 400 V: Stops at main circuit DC voltage of approx. 400 V or more	• Reduction of input power supply voltage • Open phase of input supply • Momentary power loss ⇓ Check the following: • Power supply voltage • Main circuit power supply connections • Terminal screws: Loose?
uv2			UV2 (Control power supply fault) Voltage fault of control power supply was detected.	Cycle power. If the fault remains, replace the Inverter.
oH			OH (Cooling fin overheat) Temperature increased because of Inverter overload operation or intake air temperature rise.	• Excessive load • Improper V/f pattern setting • Insufficient acceleration time if the fault occurs during acceleration • Intake air temperature exceeding 50°C (122°F) • Cooling fan stops. ⇓ Check the following: • Load size • V/f pattern setting (constants n011 to n017) • Intake air temperature.

Fault Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oC	● ☼	Protective Operation Output is turned OFF and motor coasts to a stop.	OC (Overcurrent) Inverter output current momentarily exceeded approx. 250% of rated current.	• Short circuit or grounding at Inverter output side • Excessive load GD^2 • Extremely rapid Acceleration/ Deceleration Time (constants n019 to n022) • Special motor used • Starting motor during coasting • Motor of a capacity greater than the Inverter rating has been started. • Magnetic contactor opened/closed at the Inverter output side
oL1			OL1 (Motor overload) Motor overload protection operated by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (constants n011 to n017). • Set the motor rated current shown on the nameplate in constant n036.
oL2			OL2 (Inverter overload) Inverter overload protection operated by built-in electronic thermal overload relay.	• Check the load size or V/f pattern setting (constants n011 to n017). • Check the Inverter capacity.
oL3			OL3 (Overtorque detection) V/f mode: Inverter output current exceeded the preset value in constant n098. Vector mode: Motor current or torque exceeded the preset value in constants n097 and n098. When overtorque is detected, Inverter performs operation according to the preset setting of constant n096.	Check the driven machine and correct the cause of the fault, or increase the value of constant n098 up to the highest value allowed for the machine.

Fault Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
PF		Protective Operation Output is turned OFF and motor coasts to a stop.	PF (Main circuit voltage fault) The main circuit's DC voltage oscillated in an irregular way when not in regenerative operation.	• Open phase of input supply • Momentary power loss • Excessive fluctuation in input supply voltage • Unbalanced line voltage ⇓ Check the following: • Main circuit power supply connections • Power supply voltage • Terminal screws: Loose?
LF	☼		LF (Output open phase) An open phase occurred in Inverter output.	• Disconnection in output cable • Disconnection in motor windings • Loose output terminal screws ⇓ Check the following: • Disconnection in output wirings • Motor impedance • Terminal screws: Loose?
UL3			UL3 (Undertorque detection) When V/f mode is selected: The Inverter's output current was less than the Undertorque Detection Level (n118). When vector mode is selected: The output current or output torque was less than the detection level (n097 to n118). Operation when undertorque is detected will be determined by the setting in n117.	• Check the setting in n118. • Check the operating conditions, and remove the cause.

Fault Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
EF□		Protective Operation Output is turned OFF and motor coasts to a stop.	EF□ (External fault) Inverter receives an external fault input from control circuit terminal. EF0: External fault reference through DeviceNet communications EF1: External fault input command from control circuit terminal S1 EF2: External fault input command from control circuit terminal S2 EF3: External fault input command from control circuit terminal S3 EF4: External fault input command from control circuit terminal S4 EF5: External fault input command from control circuit terminal S5 (See note.) EF6: External fault input command from control circuit terminal S6(See note.) EF7: External fault input command from control circuit terminal S7(See note.)	Check the external circuit (sequence).
F00			CPF-00 Inverter cannot communicate with the Digital Operator for 5 s or more when power is turned ON.	Cycle power after confirming that the Digital Operator is securely mounted. If the fault remains, replace the Digital Operator or Inverter.
F01			CPF-01 Transmission fault occurred for 5 s or more when transmission starts with the Digital Operator.	Cycle power after confirming that the Digital Operator is securely mounted. If the fault remains, replace the Digital Operator or Inverter.
F04			CPF-04 EEPROM fault of Inverter control circuit was detected.	• Record all constant data and initialize the constants. (Refer to page 52 for constant initialization.) • Cycle power. If the fault remains, replace the Inverter.

Note: These terminals can be used only from DeviceNet communications. There are no corresponding external input terminals.

Fault Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
FOS		Protective Operation Output is turned OFF and motor coasts to a stop.	CPF-05 AD converter fault was detected.	Cycle power. If the fault remains, replace the Inverter.
FO6	●		CPF-06 • Option card connection fault • A non-corresponding option card is connected.	Remove power to the Inverter. Check the connection of the Digital Operator. Verify Software Version No. (n179).
FO7	☼		CPF-07 Operator control circuit (EEPROM or AD converter) fault	Cycle power after checking the Digital Operator is securely mounted. If the fault remains, replace the Digital Operator or Inverter.
oPr			OPR (Operator connecting fault)	Cycle power. If the fault remains, replace the Inverter.
StP		Stops according to constant	STP (Emergency stop) The Inverter stopped according to constant n005 after receiving the emergency stop fault signal.	Check the external circuit (sequence).
FbL	☼ or ● ☼		FBL (PID feedback loss detection) PID feedback value dropped below the detection level. When PID feedback loss is detected, the Inverter operates according to the n136 setting.	Check the mechanical system and correct the cause, or increase the value of n137.
bUS			Communications have not been established with the DeviceNet Master.	Check the status of the DeviceNet communications indicators.
— (OFF)	●	Protective Operation Output is turned OFF and motor coasts to a stop.	• Insufficient power supply voltage • Control power supply fault • Hardware fault	Check the following: • Power supply voltage • Main circuit power supply connections • Terminal screws: Loose? • Control sequence. • Replace the Inverter.

Note: To display or clear the fault history, refer to page 52.

☐ Errors Indicated by the DeviceNet Communications Indicators

The following table shows the errors indicated by the MS and NS indicators on the Inverter, the likely causes of the errors, and the recommended corrective actions.

Indicator Status		Meaning	Cause	Corrective Action
MS	NS			
●	●	Power supply OFF	Power is not being supplied to the Inverter.	Check the Inverter's main circuit wiring and turn ON the power.
Green	-	Initializing communications	There is an incorrect baud rate setting or there is a MAC ID duplication.	Correct the baud rate or MAC ID setting and turn ON the Inverter's power again. Replace the Inverter if the problem recurs.
Red	-	Recoverable (non-fatal) error	There was a non-fatal error.	Replace the Inverter if the problem recurs.
Red	●	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 or Red	Red	Communications timeout	A communications timeout occurred with the Master.	• 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.

Indicator Status		Meaning	Cause	Corrective Action
MS	NS			
Green or Red	Red	Communications error	An error occurred that disables communications.	• 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	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	Normal status (Data communications established)	Normal communications have been established.	-

■ Troubleshooting

Trouble	Cause	Corrective Actions
Communications disabled with DeviceNet master.	**Communications cable is incorrectly connected.**	Check if the connector is incorrectly connected or disconnected. Make sure that the communications cable is correctly connected.
	Baud rate is incorrectly set.	Set the baud rate to the same value as that of the DeviceNet master, and turn ON the power supply again.
	MAC ID is already used by another device.	Change the MAC ID so that it will not be the same as that of any other device, and turn ON the power supply again.
	Terminator is incorrectly connected or not connected on the communications line.	Check that the terminator is connected correctly on the communications line.
	DeviceNet master does not operate.	Check that the DeviceNet master is always operating correctly.
Although DeviceNet communications established, the Inverter does not run when an operation is started by the DeviceNet master.	**Incorrect operation method is selected.** Selection of operation Run command selection (n003) is not set to DeviceNet communications.	Set Run command selection (n003) to DeviceNet communications.
The motor does not operate when an external operation signal is input.	**The operation method selection is wrong.** The run command (n003) is not set to Control Circuit Terminal.	Set the run command (n003) to Control Circuit Terminal.
	A 3-wire sequence is in effect. The multi-function input method (n052) is set to 3-wire sequence, and the S2 control terminal is not closed.	To use a 3-wire sequence, make the wiring so that the S2 control terminal is closed. To use a 2-wire sequence, set the multi-function input (n052) to a value other than 3-wire sequence.
	The frequency reference is too low. The input frequency reference is lower than the setting for the min.output frequency (n016).	Input a frequency reference greater than the min. output frequency (n016).
	Local mode is in effect.	Set the LO/RE selection of the digital operator to RE.

Trouble	Cause	Corrective Actions
The motor stops. The torque is not output.	**The stall prevention level during acceleration is too low.** Because the stall prevention level during acceleration (n093) is set too low, the output current reaches the set level, the output frequency is stopped, and the acceleration time is lengthened.	Check if the stall prevention level during acceleration (n093) is set to an appropriate value.
	The stall prevention level during running is too low. Because the stall prevention level during running (n094) is set too low, the output current reaches the set level, and the speed drops.	Check if the stall prevention level during running (n094) is set to an appropriate value.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	• Lengthen the set acceleration time (n019). • Reduce the load.
	When the maximum frequency was changed, the maximum voltage frequency was also changed.	To increase the speed of a general-purpose motor, only change the maximum frequency (n011).
	The V/f set value is too low.	Set the V/f (n011 to n017) according to the load characteristics.

Trouble	Cause	Corrective Actions
The motor speed is unstable. The motor speed fluctuates when operating with a light load.	**The stall prevention level during running is too low.** Because the stall prevention level during running (n094) is too low, the output current reaches the set level and the speed drops.	Check if the stall prevention level during running (n094) is set to an appropriate value.
	The load is too heavy. If the load is too heavy, stall prevention is activated, the output frequency is stopped, and the acceleration time is lengthened.	Reduce the load.
	The carrier frequency is too high. If operating the motor with a light load, a high carrier frequency may cause the motor speed to fluctuate.	Decrease the carrier frequency (n080).
	The V/f set value is too high for a low speed operation. Because the set value for the V/f is too high, over-excitation occurs at low speeds.	Set the V/f (n011 to 017) according to the load characteristics.
	The maximum frequency and base frequency were incorrectly adjusted. Example: To operate a 60 Hz motor at 40 Hz or less, the maximum frequency and base frequency are set to 40 Hz.	Set the maximum frequency (n011) and the base frequency (n013) according to the motor specifications.
	The inverter is used for an operation at 1.5 Hz or less.	Do not use the V7 inverter for an operation that runs at 1.5 Hz or less. For an operation at 1.5 Hz or less, use a different inverter model.
	The analog reference input is unstable and has noise interference.	Increase the set value for the filter time constant (n070).
The digital operator does not turn ON.	**The power is not being supplied.** The breaker or other component on the power input side is not turned ON, and the power is being not supplied.	Check if the power is being supplied.
	The digital operator is not correctly mounted. Because the digital operator is not correctly mounted, the display does not appear.	Mount the digiral operator correctly.

10. Specifications

■ Standard Specifications (200 V Class)

Voltage Class		200 V single-/3-phase								
Model CIMR-V7*1C□□□□	3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
	Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Max. Applicable Motor Output kW*1		0.1	0.25	0.55	1.1	1.5	2.2	3.7	5.5	7.5
Output Characteristics	Inverter Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13
	Rated Output Current (A)	0.8	1.6	3	5	8	11	17.5	25	33
	Max. Output Voltage (V)	3-phase, 200 to 230 V (proportional to input voltage) Single-phase, 200 to 240 V (proportional to input voltage)								
	Max. Output Frequency (Hz)	400 Hz (Programmable)								
Power Supply	Rated Input Voltage and Frequency	3-phase, 200 to 230 V, 50/60 Hz Single-phase, 200 to 240 V, 50/60 Hz								
	Allowable Voltage Fluctuation	−15 to +10%								
	Allowable Frequency Fluctuation	±5%								

Voltage Class		200 V single-/3-phase								
Model CIMR-V7*1C□□□□	3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
	Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Control Characteristics	Control Method	Sine wave PWM (V/f control/vector control selectable)								
	Frequency Control Range	0.1 to 400 Hz								
	Frequency Accuracy (Temperature Change)	Digital reference: ±0.01% (–10 to 50°C) Analog reference: ±0.5% (25 ±10°C)								
	Frequency Setting Resolution	Digital reference: 0.01 Hz (less than 100 Hz)/0.1 Hz (100 Hz or more) Analog reference: 1/1000 of max. output frequency								
	Output Frequency Resolution	0.01 Hz								
	Overload Capacity	150% rated output current for one minute								
	Frequency Reference Signal	0 to 10 VDC (20 kΩ), 4 to 20 mA (250 Ω), frequency setting potentiometer (Selectable)								
	Acceleration/Deceleration Time	0.00 to 6000 s (Acceleration/deceleration time are independently programmed.)								
	Braking Torque	Short-term average deceleration torque*2 0.1, 0.25 kW (0.13 HP, 0.25 HP): 150% 0.55, 1.1 kW (0.5 HP, 1 HP): 100% 1.5 kW (2 HP): 50% 2.2 kW (3 HP) or more: 20% Continuous regenerative torque: Approx. 20% (150% with optional braking resistor, braking transistor built-in)								
	V/f Characteristics	Possible to program any V/f pattern								

* 1. Based on a standard 4-pole motor for max. applicable motor output.
* 2. Shows deceleration torque for uncoupled motor decelerating from 60 Hz with the shortest possible deceleration time.

Voltage Class			200 V single-/3-phase								
Model CIMR-V7*1C□□□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Protective Functions		Motor Overload Protection	Electronic thermal overload relay								
		Instantaneous Overcurrent	Motor coasts to a stop at approx. 250% of Inverter rated current								
		Overload	Motor coasts to a stop after 1 minute at 150% of Inverter rated output current								
		Overvoltage	Motor coasts to a stop if DC bus voltage exceed 410 V								
		Undervoltage	Stops when DC bus voltage is approx. 200 V or less (approx. 160 V or less for single-phase series).								
		Momentary Power Loss	Following items are selectable: Not provided (stops if power loss is 15 ms or longer), continuous operation if power loss is approx. 0.5 s or shorter, continuous operation.								
		Heatsink Overheat	Protected by electronic circuit.								
		Stall Prevention Level	Can be set individual level during acceleration/deceleration, provided/not provided available during coast to a stop.								
		Cooling Fan Fault	Protected by electronic circuit (fan lock detection).								
		Ground Fault	Protected by electronic circuit (overcurrent level).								
		Power Charge Indication	ON until the DC bus voltage becomes 50 V or less. RUN indicator stays ON or Digital Operator indicator stays ON.								
Output Functions	Input Signals	Multi-function Input	Seven of the following input signals are selectable: Forward/reverse run (3-wire sequence), fault reset, external fault (MA contact input), multi-step speed operation, JOG command, acceleration/deceleration time select, external baseblock (MA contact input), SPEED SEARCH command, ACCELERATION/DECELERATION HOLD command, LOCAL/REMOTE selection, communication/control circuit terminal selection, emergency stop fault, emergency stop alarm, UP/DOWN command, PID control cancel, PID integral reset/hold								
	Output Signals	Multi-function Output	Following output signals are selectable (1 MA contact output (See note 3.), 2 photocoupler outputs): Fault, running, zero speed, frequency agree, frequency detection (output frequency ≤ or ≥ set value), overtorque detection, undervoltage detection, minor error, baseblock, operating mode, Inverter run ready, fault retry, UV, speed search, PID feedback loss detection								
	Standard Functions		Voltage vector control, full-range automatic torque boost, slip compensation, DC injection braking current/time at startup/stop frequency reference bias/gain, PID control, energy-saving control, constant copy, frequency reference with built-in potentiometer, unit selection for frequency reference setting/display								

Voltage Class			200 V single-/3-phase								
Model CIMR-V7*1C□ □□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Other Functions	Indications	Status Indicators	RUN, ALARM, MS, and NS provided as standard indicators								
		Digital Operator (JVOP-140)	Provided for monitor frequency reference, output frequency, output current								
	Terminals		Main circuit: screw terminals Control circuit: plug-in screw terminal								
	Wiring Distance between Inverter and Motor		100 m (328 ft) or less*2								
Enclosure			Open chassis IP20, Open chassis IP20 (top closed type), or enclosed wall-mounted NEMA 1 (TYPE 1)								
Cooling Method			Cooling fan is provided for the following models: 200 V, 0.75 kW or larger Inverters (3-phase) 200 V, 1.5 kW or larger Inverters (single-phase) Other models are self-cooling.								
Environmental Conditions	Ambient Temperature		Open chassis IP20: –10 to 50°C (14 to 122°F) Open chassis IP20 (top closed type) and enclosed wall-mounted NEMA 1 (TYPE 1): –10 to 40°C (14 to 105°F) (not frozen)								
	Humidity		95% or less (non-condensing)								
	Storage Temperature		–20 to 60°C (–4 to 140°F)								
	Location		Indoor (free from corrosive gases or dust)								
	Elevation		1,000 m (3,280 ft) or less								
	Vibration		Up to 9.8 m/S^2 (1G) at 10 to less than 20 Hz, up to 2 m/S^2 (0.2G) at 20 to 50 Hz								

* 1. Temperature during shipping (for short period).
* 2. For details, refer to *Reducing Motor Noise or Leakage Current (n080)* on page 151.
* 3. There is no corresponding external output terminal.

■ Standard Specifications (400 V Class)

Voltage Class			400 V 3-phase								
Model CIMR-V7*1C□□□□		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7	45P5	47P5
		Single-phase	-	-	-	-	-	-	-	-	-
Max. Applicable Motor Output kW*1			0.37	0.55	1.1	1.5	2.2	3.0	3.7	5.5	7.5
Output Characteristics	Inverter Capacity (kVA)		0.9	1.4	2.6	3.7	4.2	5.5	7.0	11	14
	Rated Output Current (A)		1.2	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18
	Max. Output Voltage (V)		3-phase, 380 to 460 V (proportional to input voltage)								
	Max. Output Frequency (Hz)		400 Hz (Programmable)								
Power Supply	Rated Input Voltage and Frequency		3-phase, 380 to 460 V, 50/60 Hz								
	Allowable Voltage Fluctuation		−15 to +10%								
	Allowable Frequency Fluctuation		±5%								

Voltage Class		400 V 3-phase								
Model CIMR-V7*1□□□□	3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7	45P5	47P5
	Single-phase	-	-	-	-	-	-	-	-	-
Control Characteristics	Control Method	Sine wave PWM (V/f control/vector control selectable)								
	Frequency Control Range	0.1 to 400 Hz								
	Frequency Accuracy (Temperature Change)	Digital reference: ±0.01%, –10 to 50°C (14 to 122°F) Analog reference: ±0.5%, 25±10°C (59 to 95°F)								
	Frequency Setting Resolution	Digital reference: 0.01 Hz (less than 100 Hz)/0.1 Hz (100 Hz or more) Analog reference: 1/1000 of max. output frequency								
	Output Frequency Resolution	0.01 Hz								
	Overload Capacity	150% rated output current for one minute								
	Frequency Reference Signal	0 to 10 VDC (20 kΩ), 4 to 20 mA (250 Ω), frequency setting potentiometer (Selectable)								
	Acceleration/Deceleration Time	0.00 to 6000 s (Acceleration/deceleration time are independently programmed.)								
	Braking Torque	Short-term average deceleration torque*2 0.2 kW: 150% 0.75 kW: 100% 1.5 kW (2 HP): 50% 2.2 kW (3 HP) or more: 20% Continuous regenerative torque: Approx. 20% (150% with optional braking resistor, braking transistor built-in)								
	V/f Characteristics	Possible to program any V/f pattern								

* 1. Based on a standard 4-pole motor for max. applicable motor output.
* 2. Shows deceleration torque for uncoupled motor decelerating from 60 Hz with the shortest possible deceleration time.

Voltage Class		400 V 3-phase								
Model CIMR-V7*1C□□□	3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7	45P5	47P5
	Single-phase	-	-	-	-	-	-	-	-	-
Protective Functions	Motor Overload Protection	Electronic thermal overload relay								
	Instantaneous Overcurrent	Motor coasts to a stop at approx. 250% of Inverter rated current								
	Overload	Motor coasts to a stop after 1 minute at 150% of Inverter rated output current								
	Overvoltage	Motor coasts to a stop if DC bus voltage exceed 820 V								
	Undervoltage	Stop when DC bus voltage is approx. 400 V or less								
	Momentary Power Loss	Following items are selectable: Not provided (stops if power loss is 15 ms or longer), continuous operation if power loss is approx. 0.5 s or shorter, continuous operation.								
	Heatsink Overheat	Protected by electronic circuit.								
	Stall Prevention Level	Can be set individual levels during acceleration/deceleration, provided/not provided available during coast to a stop.								
	Cooling Fan Fault	Protected by electronic circuit (fan lock detection).								
	Ground Fault	Protected by electronic circuit (overcurrent level).								
	Power Charge Indication	ON until the DC bus voltage becomes 50 V or less.								
Output Functions	Input Signals: Multi-function Input	Seven of the following input signals are selectable: Forward/reverse run (3-wire sequence), fault reset, external fault (MA contact input), multi-step speed operation, JOG command, acceleration/deceleration time select, external baseblock (MA contact input), SPEED SEARCH command, ACCELERATION/DECELERATION HOLD command, LOCAL/REMOTE selection, communication/control circuit terminal selection, emergency stop fault, emergency stop alarm, UP/DOWN command, PID control cancel, PID integral reset/hold								
	Output Signals: Multi-function Output	Following output signals are selectable (1 MA contact output (See note 3.), 2 photocoupler outputs): Fault, running, zero speed, frequency agree, frequency detection (output frequency ≤ or ≥ set value), overtorque detection, undervoltage detection, minor error, baseblock, operating mode, Inverter run ready, fault retry, UV, speed search, data output through communication, PID feedback loss detection								
	Standard Functions	Voltage vector control, full-range automatic torque boost, slip compensation, DC injection braking current/time at startup/stop frequency reference bias/gain, PID control, energy-saving control, constant copy, frequency reference with built-in potentiometer, unit selection for frequency reference setting/display								

Voltage Class			400 V 3-phase								
Model CIMR-V7[*1]C□ □□□		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7	45P5	47P5
		Single-phase	-	-	-	-	-	-	-	-	-
Other Functions	Indications	Status Indica-tors	RUN, ALARM, MS, and NS provided as standard indicators								
		Digital Opera-tor (JVOP-140)	Provided for monitor frequency reference, output frequency, output current								
	Terminals		Main circuit: screw terminals Control circuit: plug-in screw terminal								
	Wiring Distance between Inverter and Motor		100 m (328 ft) or less[*2]								
Enclosure			Open chassis IP20, Open chassis IP20 (top closed type), or enclosed wall-mounted NEMA 1 (TYPE 1)								
Cooling Method			Cooling fan is provided for the following models: 400 V, 1.5 kW or larger Inverters (3-phase) Other models are self-cooling.								
Environmental Conditions	Ambient Temperature		Open chassis IP20: –10 to 50°C (14 to 122°F) Open chassis IP20 (top closed type) and enclosed wall-mounted NEMA 1 (TYPE 1): –10 to 40°C (14 to 105°F) (not frozen)								
	Humidity		95% or less (non-condensing)								
	Storage Temperature		–20 to 60°C (–4 to 140°F)								
	Location		Indoor (free from corrosive gases or dust)								
	Elevation		1,000 m (3,280 ft) or less								
	Vibration		Up to 9.8 m/S^2 (1G) at 10 to less than 20 Hz, up to 2 m/S^2 (0.2G) at 20 to 50 Hz								

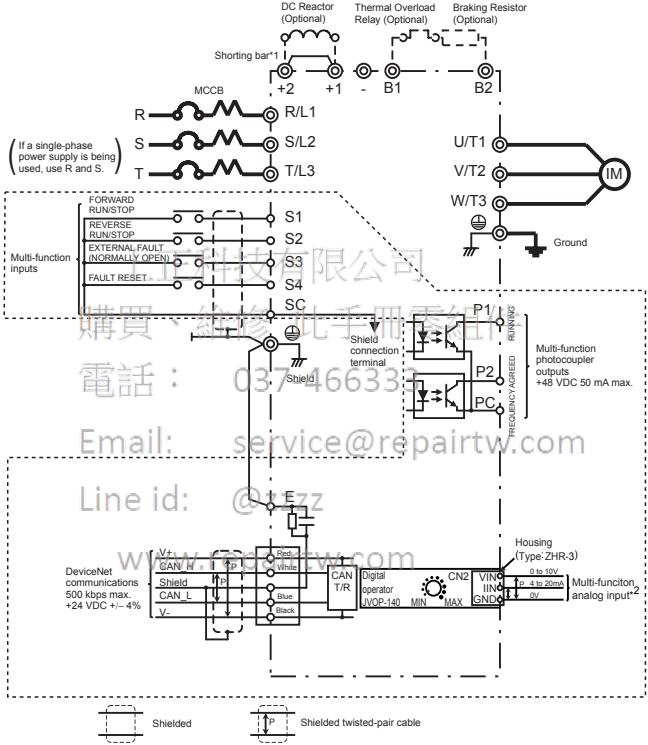
* 1. Temperature during shipping (for short period).

* 2. For details, refer to *Reducing Motor Noise or Leakage Current (n080)* on page 151.

* 3. There is no corresponding external output terminal.

■ Standard Wiring

Example of a model with Digital Operator and analog volume

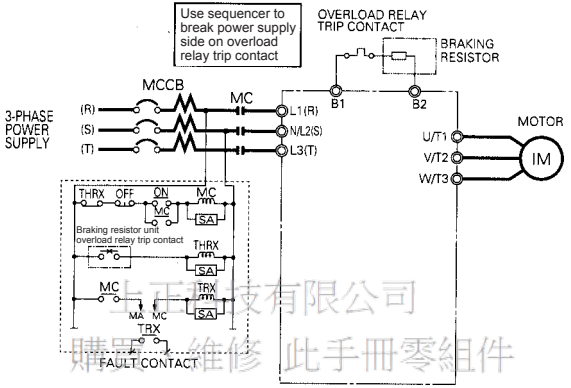


*1 Shorting bar must be removed when connecting a DC reactor.

*2: A housing is required when using the CN2 terminal on the back side of the digital operator. 1m analog input cable (code no. WV201) is available for housing on request.

: Only basic insulation (protective class 1, overvoltage category II) is provided for the control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements.

Connection Example of Braking Resistor



* Disable stall prevention during deceleration by setting n092 to 1 when using a Braking Resistor Unit. The motor may not stop within the deceleration time if this setting is not changed.

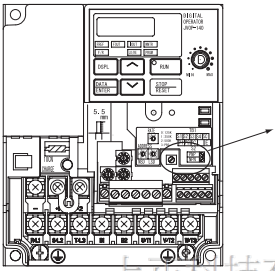
Terminal Descriptions

Type	Terminal	Name	Function (Signal Level)
Main Circuit	R/L1, S/L2, T/L3	AC power supply input	Use main circuit power input. (Use terminals R/L1 and S/L2 for single-phase Inverters. Never use terminal T/L3.)
	U/T1, V/T2, W/T3	Inverter output	Inverter output
	B1, B2	Braking resistor connection	Braking resistor connection
	+2, +1	DC reactor connection	When connecting optional DC reactor, remove the main circuit short-circuit bar between +2 and +1.
	+1, -	DC power supply input	DC power supply input (+1: positive –: negative)*1
	⏚	Grounding	For grounding (according to the local grounding codes)

Type		Terminal		Name	Function (Signal Level)	
Control Circuit	Input	Sequence	S1	Multi-function input selection 1	Factory setting closed:FWD run open: REV run	Photo-coupler insulation, 24 VDC, 8 mA
			S2	Multi-function input selection 2	Factory setting closed:REV run open: FWD run	
			S3	Multi-function input selection 3	Factory setting: External fault (NO contact)	
			S4	Multi-function input selection 4	Factory setting: Fault reset	
			SC	Multi-function input selection common	For control signal	
	Output	Multi-function contact output	P1	Photocoupler out-put 1	Factory setting: Run	Photo-coupler output +48 VDC, 50 mA or less
			P2	Photocoupler out-put 2	Factory setting: Frequency agree	
			PC	Photocoupler out-put common	0 V	
	E *			Shield ground terminal	Connect to ground terminal ⏚.	
DeviceNet Communications	Red			V+	DeviceNet communications power supply +24 VDC	DeviceNet communica-tions, 24 VDC ±4%, up to 500 kbps
	White			CAN H	DeviceNet communications data high	
	Colorless			Shield	Shield wire	
	Blue			CAN L	DeviceNet communications data low	
	Black			V-	DeviceNet communications power supply GND	

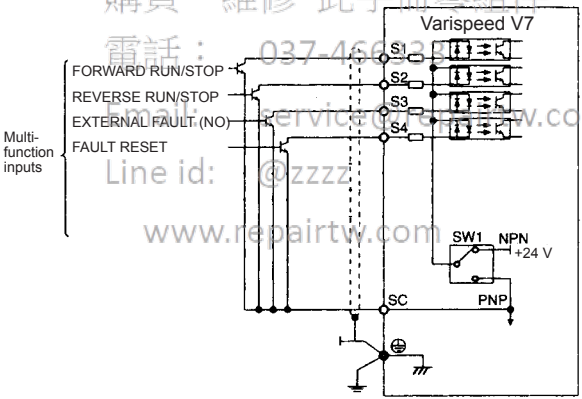
* DC power supply input terminal is not applied to CE/UL standard.

■ Sequence Input Connection with NPN/PNP Transistor

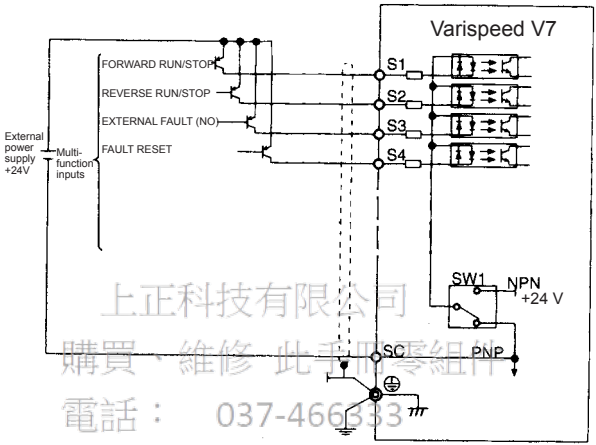


When connecting sequence inputs (S1 to S4) with transistor, turn the rotary switch SW1 depending on the polarity (0 V common: NPN side, +24 V common: PNP side).
Factory setting: NPN side

Sequence Connection with NPN Transistor (0 V Common)



Sequence Connection with PNP Transistor (+24 V Common)



■ Dimensions/Heat Loss (Unit: mm)

The following diagram shows the external dimensions and heat loss of the open-chassis type (IP20).

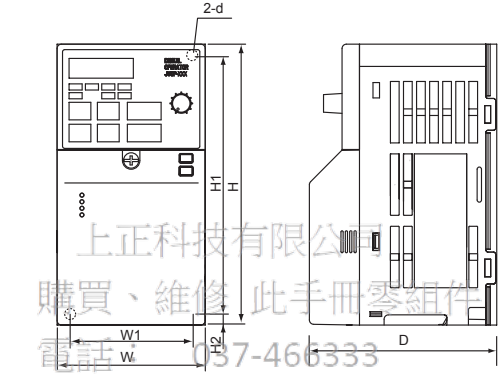


Fig. 1

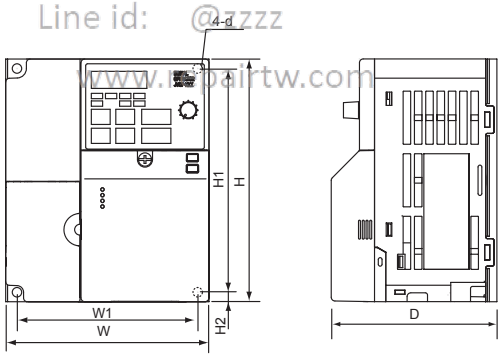


Fig. 2

Dimensions in mm (Inches)/Mass in kg (lb)/Heat Loss (W)

Voltage class	Capacity (kW)	W	H	D	W1	H1	H2	d	Mass	Heat Loss (W)			Fig.
										Heatsink	Unit	Total	
200 V 3-phase	0.1	68 (2.68)	128 (5.04)	91 (3.58)	56 (2.20)	118 (4.65)	5 (0.20)	M4	0.6 (1.32)	3.7	9.3	13.0	1
	0.25	68 (2.68)	128 (5.04)	91 (3.58)	56 (2.20)	118 (4.65)	5 (0.20)	M4	0.6 (1.32)	7.7	10.3	18.0	1
	0.55	68 (2.68)	128 (5.04)	123 (4.84)	56 (2.20)	118 (4.65)	5 (0.20)	M4	0.9 (1.98)	15.8	12.3	28.1	1
	1.1	68 (2.68)	128 (5.04)	143 (5.63)	56 (2.20)	118 (4.65)	5 (0.20)	M4	1.1 (2.43)	28.4	16.7	45.1	1
	1.5	108 (4.25)	128 (5.04)	146 (5.75)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.4 (3.09)	53.7	19.1	72.8	2
	2.2	108 (4.25)	128 (5.04)	155 (6.10)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.3)	60.4	34.4	94.8	2
	3.7	140 (5.51)	128 (5.04)	158 (6.22)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.1 (4.62)	96.7	52.4	149.1	2
	5.5	180 (7.08)	260 (10.23)	185 (7.28)	164 (6.46)	244 (9.60)	8 (0.31)	M5	4.6 (10.14)	170.4	79.4	249.8	2
	7.5	180 (7.08)	260 (10.23)	185 (7.28)	164 (6.46)	244 (9.60)	8 (0.31)	M5	4.8 (10.58)	219.2	98.9	318.1	2
200 V single-phase	0.1	68 (2.68)	128 (5.04)	91 (3.58)	56 (2.20)	118 (4.65)	5 (0.20)	M4	0.6 (1.32)	3.7	10.4	14.1	1
	0.25	68 (2.68)	128 (5.04)	91 (3.58)	56 (2.20)	118 (4.65)	5 (0.20)	M4	0.7 (1.54)	7.7	12.3	20.0	1
	0.55	68 (2.68)	128 (5.04)	146 (5.75)	56 (2.20)	118 (4.65)	5 (0.20)	M4	1.0 (2.20)	15.8	16.1	31.9	1
	1.1	108 (4.25)	128 (5.04)	155 (6.10)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.31)	28.4	23.0	51.4	2
	1.5	108 (4.25)	128 (5.04)	171 (6.73)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.31)	53.7	29.1	82.8	2
	2.2	**140 (5.51)**	128 (5.04)	178 (7.01)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.2 (4.84)	64.5	49.1	113.6	2
	3.7	170 (6.69)	128 (5.04)	195 (7.68)	158 (6.22)	118 (4.65)	5 (0.20)	M4	2.9 (6.38)	98.2	78.2	176.4	2

Voltage class	Capacity (kW)	W	H	D	W1	H1	H2	d	Mass	Heat Loss (W)			Fig.
										Heat-sink	Unit	Total	
400 V 3-phase	0.37	108 (4.25)	128 (5.04)	107 (4.21)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.0 (2.20)	9.4	13.7	23.1	2
	0.55	108 (4.25)	128 (5.04)	125 (4.92)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.1 (2.43)	15.1	15.0	30.1	2
	1.1	108 (4.25)	128 (5.04)	155 (6.10)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.31)	30.3	24.6	54.9	2
	1.5	108 (4.25)	128 (5.04)	171 (6.73)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.31)	45.8	29.9	75.7	2
	2.2	108 (4.25)	128 (5.04)	171 (6.73)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.31)	50.5	32.5	83.0	2
	3.0	**140 (5.51)**	128 (5.04)	158 (6.22)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.1 (4.62)	58.2	37.6	95.8	2
	3.7	**140 (5.51)**	128 (5.04)	158 (6.22)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.1 (4.62)	73.4	44.5	117.9	2
	5.5	180 (7.08)	260 (10.23)	185 (7.28)	164 (6.46)	244 (9.60)	8 (0.31)	M5	4.8 (10.58)	168.8	87.7	256.5	2
	7.5	180 (7.08)	260 (10.23)	185 (7.28)	164 (6.46)	244 (9.60)	8 (0.31)	M5	4.8 (10.58)	209.6	99.3	308.9	2

Note: When using a 5.5-kW or 7.5-kW Inverter (200 V or 400 V Class), the Inverter can be used as an IP00 device if the top and bottom covers are removed.

■ Recommended Peripheral Devices

It is recommended that the following peripheral devices be mounted between the AC main circuit power supply and Varispeed V7 input terminals R/L1, S/L2, and T/L3.

- MCCB (Molded-case Circuit Breaker)/Fuse:

  Always connect for wiring protection.

- Magnetic Contactor:

  Mount a surge suppressor on the coil. (Refer to the table shown below.) When using a magnetic contactor to start and stop the Inverter, do not exceed one start per hour.

Recommended MCCB, Magnetic Contactors and Fuses

- 200 V 3-phase

Varispeed V7 Model	V7** 20P1	V7** 20P2	V7** 20P4	V7** 20P7	V7** 21P5	V7** 22P2	V7** 23P7	V7** 25P5	V7** 27P5
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13.0
Rated Output Current (A)	0.8	1.6	3	5	8	11	17.5	25.0	33.0
MCCB type NE30 (MITSUBISHI)	5 A	5 A	5 A	10 A	20 A	20 A	30 A	50 A	60 A
Magnetic contactor (Fuji Electric FA Components & Systems)	HI-7E	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-10-2E	HI-20E	HI-30E	HI-50E
Fuse (UL Class RK5)	5 A	5 A	5 A	10 A	20 A	20 A	30 A	50 A	60 A

- 200 V Single-phase

Varispeed V7 Model	V7** B0P1	V7** B0P2	V7** B0P4	V7** B0P7	V7** B1P5	V7** B2P2	V7** B3P7
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7
Rated Output Current (A)	0.8	1.5	3	5	8	11	17.5

Varispeed V7 Model	V7** B0P1	V7** B0P2	V7** B0P4	V7** B0P7	V7** B1P5	V7** B2P2	V7** B3P7
MCCB type NF30, NF50 (MITSUBISHI)	5 A	5 A	10 A	20 A	20 A	40 A	50 A
Magnetic contactor (Fuji Electric FA Components & Systems)	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-15E	HI-20E	HI-30E
Fuse (UL Class RK5)	5 A	5 A	10 A	20 A	20 A	40 A	50 A

• 400 A 3-phase

Varispeed V7 Model	V7** 40P2	V7** 40P4	V7** 40P7	V7** 41P5	V7** 42P2	V7** 43P0	V7** 43P7	V7** 45P5	V7** 47P5
Capacity (kVA)	0.9	1.4	2.6	3.7	4.2	5.5	6.6	11.0	14.0
Rated Output Current (A)	1.2	1.8	3.4	4.8	5.5	7.2	8.6	14.8	18.0
MCCB type NF30, NF50 (MITSUB-ISHI)	5 A	5 A	5 A	10 A	10 A	20 A	20 A	30 A	30 A
Magnetic contactor (Fuji Electric FA Compo-nents & Systems)	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-10-2E	HI-10-2E	HI-10-2E	HI-20E	HI-20E
Fuse (UL Class RK5)	5 A	5 A	5 A	10 A	10 A	20 A	20 A	30 A	30 A

Surge Suppressors

Coils and Relays \ Surge Suppressors		Model DCR2-	Specifica-tions	Code No.
200 V to 230 V	Large size magnetic contactors	50A22E	250 VAC 0.5 μF 200 Ω	C002417
	Control relays MY-2, -3 (OMRON) HH-22, -23 (FUJI) MM-2, -4 (OMRON)	10A25C	250 VAC 0.1 μF 100 Ω	C002482

- Ground Fault Interrupter:

  Select a ground fault interrupter not affected by high frequencies. To prevent malfunctions, the current should be 200 mA or higher and the operating time 0.1 s or longer.

  Example:

  - NV series by Mitsubishi Electric Co., Ltd. (manufactured in 1988 and after)
  - EGSG series by Fuji Electric Co., Ltd. (manufactured in 1984 and after)

- AC and DC Reactor:

  Install an AC reactor to connect to a power supply transformer of large capacity (600 kVA or more) or to improve power factor on the power supply side.

- Noise Filter:

  Use a noise filter exclusively for Inverter if radio noise generated from the Inverter causes other control devices to malfunction.

NOTE

1. Never connect a general LC/RC noise filter to the Inverter output circuit.
2. Do not connect a phase-advancing capacitor to the I/O sides and/or a surge suppressor to the output side.
3. When a magnetic contactor is installed between the Inverter and the motor, do not turn it ON/OFF during operation.

   For the details of the peripheral devices, refer to the catalog.

■ Constants List

- Constants That Can Be Changed during Operation

  The constants whose numbers are shaded can be changed during operation.

First Functions (Constants n001 to n044)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
001	0101H	Constant Selection/Ini-tialization	0 to 4, 6, 8, 9	1	1		127
002	0102	Control Mode Selection (Note 6)	0, 1	1	0 (Note 1) (Note 6)		132
003	0103	RUN Comm and Selec-tion	0 to 3	1	3		137
004	0104	Frequency Reference Selection	0 to 9	1	9		138
005	0105	Stopping Method Selec-tion	0, 1	1	0		155
006	0106	Reverse Run Prohibit	0, 1	1	0		139
007	0107	Stop Key Selection	0, 1	1	0		154
008	0108	Frequency Reference Selection in Local Mode	0, 1	1	1 (Note 5)		137
009	0109	Frequency Reference Setting Method From Digital Operator	0, 1	1	0		138
010	010A	Detecting Fault Contact Of Digital Operator	0, 1	1	0		137
011	010B	Max. Output Frequency	50.0 to 400.0 Hz	0.1 Hz	50.0 Hz		129
012	010C	Max. Voltage	0.1 to 255.0 V (0.2 to 510.0)	0.1 V	200.0 V (Note 2)		129
013	010D	Max. Voltage Output Frequency (Base Fre-quency)	0.2 to 400.0 Hz	0.1 Hz	50.0 Hz		129
014	010E	Mid. Output Frequency	0.1 to 399.9 Hz	0.1 Hz	1.5 Hz (Note 8)		129
015	010F	Mid. Output Frequency Voltage	0.1 to 255.0 V	0.1 V	12.0 V (Note 2) (Note 8)		129
016	0110	Min. Output Frequency	0.1 to 10.0 Hz	0.1 Hz	1.5 Hz (Note 8)		129
017	0111	Min. Output Frequency Voltage	0.1 to 50.0 V (Note 2)	0.1 V	12.0 V (Note 2) (Note 8)		129

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
018	0112	Selecting Setting Unit for Acceleration/decelera-tion Time	0, 1	1	0		144
019	0113	Acceleration Time 1	0.00 to 6000 s	Depend on n018 setting	10.0 s		143
020	0114	Deceleration Time 1	0.00 to 6000 s	Depend on n018 setting	10.0 s		143
021	0115	Acceleration Time 2	0.00 to 6000 s	Depend on n018 setting	10.0 s		143
022	0116	Deceleration Time 2	0.00 to 6000 s	Depend on n018 setting	10.0 s		143
023	0117	S-curve Selection	0 to 3	1	0		145
024	0118	Frequency Reference 1 (Master Speed Fre-quency Reference) (Note 6)	0 to 9999 r/min	1 r/min	180 r/min		139
025	0119	Frequency Reference 2 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
026	011A	Frequency Reference 3 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
027	011B	Frequency Reference 4 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
028	011C	Frequency Reference 5 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
029	011D	Frequency Reference 6 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
030	011E	Frequency Reference 7 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
031	011F	Frequency Reference 8 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		139
032	0120	Jog Frequency (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		141
033	0121	Frequency Reference Upper Limit (Note 6)	0% to 110%	1%	100%		142
034	0122	Frequency Reference Lower Limit (Note 6)	0% to 110%	1%	0%		142
035	0123	Setting/displaying Unit Selection for Frequency Reference	0 to 3999	1	4		196
036	0124	Motor Rated Current	0% to 150% of Inverter rated cur-rent	0.1 A	(Note 3)		172
037	0125	Electronic Thermal Mo-tor Protection Selection	0 to 2	1	0		172
038	0126	Electronic Thermal Mo-tor Protection Time Con-stant Setting	1 to 60 min	1 min	8 min		172

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
039	0127	Selecting Cooling Fan Operation	0, 1	1	0		174
041	0129	Acceleration Time 3	0.00 to 6,000 s	Set in n018.	10.0 s	-	---
042	012AH	Deceleration Time 3	0.00 to 6,000 s	Set in n018.	10.0 s	-	---
043	012BH	Acceleration Time 4	0.00 to 6,000 s	Set in n018.	10.0 s	-	---
044	012CH	Deceleration Time 4	0.00 to 6,000 s	Set in n018.	10.0 s	-	---

Second Functions (Constants n050 to n079)

No.	Register No. for Transmission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
050	0132	Multi-function Input Selection 1 (Terminal S1)	1 to 28	1	1		159
051	0133	Multi-function Input Selection 2 (Terminal S2)	1 to 28	1	2		159
052	0134	Multi-function Input Selection 3 (Terminal S3)	0 to 28	1	3		159
053	0135	Multi-function Input Selection 4 (Terminal S4)	1 to 28, 34	1	5		159
054	0136	Multi-function Input Selection 5 (Terminal S5)	1 to 28	1	6		159
055	0137	Multi-function Input Selection 6 (Terminal S6)	1 to 28	1	7		159
056	0138	Multi-function Input Selection 7 (Terminal S7)	1 to 28	1	10		159
057	0139	Multi-function Output Selection 1	0 to 21	1	1		164
058	013A	Multi-function Output Selection 2	0 to 21	1	1		164
059	013B	Multi-function Output Selection 3	0 to 21	1	0		164
064	0140	Processing During Analog Frequency Reference Loss	0: Processing disabled 1: Processing enabled	1	0		---
068	0144	Analog Frequency Reference Gain	−255% to 255%	1%	100%		---
069	0145	Analog Frequency Reference Bias	−100% to 100%	1%	0%		---
070	0146	Analog Frequency Reference Filter Time Constant	0.00 to 2.00 s	0.01 s	0.10 s		---
071	0147	Analog Frequency Reference Gain	−255 to 255	1%	100%		---
072	0148	Analog Frequency Reference Bias	−100% to 100%	1%	0%		---
073	0149	Analog Frequency Reference Filter Time Constant	0.00 to 2.00 s	0.01 s	0.01 s		---
077	014D	Multi-function Analog Input Function	0 to 4	1	0		162
078	014E	Multi-function Analog Input Signal Selection	0, 1	1	0		164
079	014F	Sequence Input Double Reading Selection	0, 1	1	0		---

Third Functions (Constants n080 to n119)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
080	0150	Carrier Frequency Se-lection	1 to 4, 7 to 9	1	4 (Note 4)		151
081	0151	Momentary Power Loss Ridethrough Method	0 to 2	1	0		144
082	0152	Automatic Retry At-tempts	0 to 10 times	1	0		148
083	0153	Jump Frequency 1	0.00 to 400.0 Hz	0.01 Hz (less than 100 Hz)/ 0.1 Hz (100 Hz or more)	0.00 Hz		148
084	0154	Jump Frequency 2	0.00 to 400.0 Hz	0.01 Hz (less than 100 Hz)/ 0.1 Hz (100 Hz or more)	0.00 Hz		148
085	0155	Jump Frequency 3	0.00 to 400.0 Hz	0.01 Hz (less than 100 Hz)/ 0.1 Hz (100 Hz or more)	0.00 Hz		148
086	0156	Jump Frequency Range	0.00 to 25.50 Hz	0.01 Hz	0.00 Hz		148
089	0159	DC Injection Braking Current	0% to 100%	1%	50%		150
090	015A	DC Injection Braking Time at Stop	0.0% to 25.5%	0.1s	0.5s (Note 2)		156
091	015B	DC Injection Braking Time at Startup	0.0% to 25.5%	0.1s	0.0s		150
092	015C	Stall Prevention During Deceleration	0.1	1	0		170
093	015D	Stall Prevention Level During Acceleration	30% to 200%	1%	170%		167
094	015E	Stall Prevention while Running	30% to 200%	1%	160%		168
095	015F	Frequency Detection Level (Multi-function Contact Output)	0.00 to 400.0 Hz	0.01 Hz (less than 100 Hz)/ 0.1 Hz (100 Hz or more)	0.00 Hz		147
096	0160	Overtorque Detection Function Selection 1	0 to 4	1	0		146
097	0161	Overtorque Detection Function Selection 2	0.1	1	0		147
098	0162	Overtorque Detection Level	30% to 200%	1%	160%		147
099	0163	Overtorque Detection Time	0.1 to 10.0 s	0.1 s	0.1 s		147
100	0164	Hold Output Frequency Saving Selection	0.1	1	0		161
103	0167	Torque Compensation Gain	0.0 to 2.5	0.1	1.0		131

No.	Register No. for Trans- mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
104	0168	Torque Compensation Time Constant	0.0 to 25.5 s	0.1 s	0.3 s (Note 8)		131
105	0169	Torque Compensation Iron Loss	0.0 to 6550	0.01 W (less than 1000 W)/ 1 W (1000 W or more)	(Note 3)		131
106	016A	Motor Rated Slip	0.0 to 20.0 Hz	0.1 Hz	(Note 3)		132
107	016B	Line to Neutral (per Phase)	0.000 to 65.50 Ω	0.001 Ω (less than 10 Ω)/ 0.01 Ω (10 Ω or more)	(Note 3)		132
108	016C	Motor Leakage Induc- tance	0.00 to 655.0 mH	0.01 mH (less than 100 mH)/ 0.1 mH (100 mH or more)	(Note 3)		134
109	016D	Torque Compensation Voltage Limiter	0% to 250%	1%	150%		---
110	016E	Motor No-load Current	0% to 99%	1%	(Note 3)		132
111	016F	Slip Compensation Gain	0.0 to 2.5	0.1	0.0 (Note 8)		171
112	0170	Slip Compensation Time Constant	0.0 to 25.5 s	0.1 s	2.0 s (Note 8)		171
113	0171	Slip Correction During Regenerative Operation	0, 1	1	0		133
115	0173	Stall Prevention Auto- matic Decrease Selec- tion	0, 1	1	0		169
116	0174	Acceleration/decelera- tion Time during Stall Prevention	0, 1	1	0		170
117	0175	Undertorque Detection Function Selection	0 to 4	1	0		---
118	0176	Undertorque Detection Level	0% to 200%	1%	10%		---
119	0177	Undertorque Detection Time	0.1 to 10.0 s	0.1 s	0.1 s		---

Fourth Functions (Constants n120 to n179)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
120	0178	Frequency Reference 9 (Note 6)	0 to 9999 r/min	1 r/min	180 r/min		140
121	0179	Frequency Reference 10 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
122	017A	Frequency Reference 11 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
123	017B	Frequency Reference 12 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
124	017C	Frequency Reference 13 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
125	017D	Frequency Reference 14 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
126	017E	Frequency Reference 15 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
127	017F	Frequency Reference 16 (Note 6)	0 to 9999 r/min	1 r/min	0 r/min		140
128	0180	PID Control Selection	0 to 8	1	0		179
129	0181	PID Feedback Gain	0.00 to 10.00 Hz	0.01	1.00		182
130	0182	Proportional Gain (P)	0.0 to 25.0	0.1	1.0		181
131	0183	Integral Time (I)	0.0 to 360.0 s	0.1 s	1.0		181
132	0184	Derivative Time (D)	0.00 to 2.50 s	0.01 s	0.00		181
133	0185	PID Offset Adjustment	–100% to 100%	1%	0%		182
134	0186	Upper Limit of Integral values	0% to 100%	1%	100%		181
135	0187	Primary Delay Time Constant for PID Output	0.0 to 10.0	0.1 s	0.0		182
136	0188	Selection of PID Feed-back Loss Detection	0 to 2	1	0		183
137	0189	PID Feedback Loss De-tection Level	0% to 100%	1%	0%		183
138	018A	PID Feedback Loss De-tection Time	0.0 to 25.5	0.1 s	1.0		183
139	018B	Energy-saving Control Selection (V/f Control Mode)	0, 1	1	0		174
140	018C	Energy-saving Coeffi-cient K2	0.0 to 6550	0.1	(Note 7)		174
141	018D	Energy-saving Control Voltage Lower Limit at 60 Hz	0% to 120%	1%	50%		175

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
142	018E	Energy-saving Control Voltage Lower Limit at 6Hz	0% to 25%	1%	12%		175
143	018F	Power Average Time	1 to 200	1 = 24 ms	1 (24 ms)		176
144	0190	Search Operation Volt-age Limit	0% to 100%	1%	0%		176
145	0191	Search Operation Volt-age Step at 100%	0.1% to 100%	0.1%	0.5%		176
146	0192	Search Operation Volt-age Step at 100%	0.1% to 10.0%	0.1%	0.2%		176
148	0194	DeviceNet I/O Produced Connection Path	020 to 156	-	021		---
149	0195	DeviceNet I/O Con-sumed Connection Path	020 to 106	-	63		---
150	0196	MAC ID Setting	0 to 63	1	0		---
151	0197	DeviceNet Timeover De-tection Selection	0 to 4	1	0		---
152	0198	Baud Rate Setting	0 to 2	1	0		---
153	0199	DeviceNet Speed Scale	–15 to 15	1	0		---
154	019A	DeviceNet Current Scale	–15 to 15	1	0		---
155	019B	DeviceNet Power Scale	–15 to 15	1	0		---
156	019C	DeviceNet Voltage Scale	–15 to 15	1	0		---
157	019D	DeviceNet Time Scale	–15 to 15	1	0		---
158	019E	Motor Code (Energy-saving Control)	0 to 70	1	(Note 7)		174
159	019F	Upper Voltage Limit for Energy-saving Control at 60 Hz	0% to 120%	1%	120%		175
160	01A0	Upper Voltage Limit for Energy-saving Control at 6 Hz	0% to 25%	1%	16%		175
161	01A1	Search Operation Pow-er Detection Hold Width	0% to 100%	1%	10%		177
162	01A2	Time Constant of Power Detection Filter	0 to 255	1 = 4 ms	5 (20 ms)		177
163	01A3	PID Output Gain	0.0 to 25.0	0.1	1.0		182
164	01A4	PID Feedback Value Se-lection	0 to 5	1	0		180
166	01A6	Input Open-phase De-tection Level	0% to 100%	1%	0%		---
167	01A7	Input Open-phase De-tection Time	0 to 255 s	1 s	0 s		---
168	01A8	Output Open-phase De-tection Level	0% to 100%	1%	0%		---

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Factory Setting	User Setting	Ref. Page
169	01A9	Output Open-phase De-tection Time	0 to 255 s	1 s	0 s		---
173	01AD	DC Injection Braking Proportional Gain	1 to 999	1 = 0.001	83 (0.083)		---
174	01AE	DC Injection Braking In-tegral Time Constant	1 to 250	1 = 4 ms	25 (100 ms)		---
175	01AF	Reducing Carrier Fre-quency Selection At Low Speed	0, 1	1	0		154
176	01B0	Constant Copy Function Selection	rdy, rEd, Cpy, vFy, vA, Sno		rdy		186
177	01B1	Constant Read Selection Prohibit	0, 1	1	0		187
178	01B2	Fault History	Stores, dis-plays most recent 4 alarms	Setting dis-abled	-		52
179	01B3	Software Version No.	Displays lower-place 4 digits of software No.	Setting dis-abled	-		49

Note: 1. Not initialized by constant initialization.
2. Upper limit of setting range and factory setting are doubled for 400 V Class.
3. Depends on Inverter capacity. Refer to the next page.
4. Depends on Inverter capacity. Refer to page 152.
5. Factory setting of the model with JVOP-140 Digital Operator (with potentiometer) is 0. Setting can be set to 1 by constant initialization.
6. The unit is determined by the value set for constant n035. For details, refer to page 196. The unit is fixed to 0.01 Hz when inputting the frequency reference using DeviceNet.
7. Depends on Inverter capacity. Refer to page 178.
8. When control mode selection (n002) is changed, factory setting corresponds to the control mode. Refer to page 251.

No.	Name	V/f Control Mode (n002 = 0)	Vector Control Mode (n002 = 1)
n014	Mid. Output Frequency	1.5 Hz	3.0 Hz
n015	Mid. Output Frequency Voltage	12.0 V*	11.0 V*
n016	Min. Output Frequency	1.5 Hz	1.0 Hz
n017	Min. Output Frequency Voltage	12.0 V*	4.3 V*
n104	Torque Compensation Time Constant	0.3 s	0.2 s
n111	Slip Compensation Gain	0.0	1.0
n112	Slip Compensation Gain Time Constant	2.0 s	0.2 s

* Values are doubled for 400 V Class.

Factory Settings That Change with the Inverter Capacity

- 200 V Class 3-phase

No.	Name	Unit	Factory Setting									
-	Inverter Capacity	kW	0.1 kW	0.25 kW	0.55 kW	1.1 kW	1.5 kW	2.2 kW	-	3.7 kW	5.5 kW	7.5 kW
n036	Motor Rated Current	A	0.6	1.1	1.9	3.3	6.2	8.5	-	14.1	19.6	26.6
n105	Torque Compensation Iron Loss	W	1.7	3.4	4.2	6.5	11.1	11.8	-	19	28.8	43.9
n106	Motor Rated Slip	Hz	2.5	2.6	2.9	2.5	2.6	2.9	-	3.3	1.5	1.3
n107	Line to Neutral (per Phase)*	Ω	17.99	10.28	4.573	2.575	1.233	0.8	-	0.385	0.199	0.111
n108	Motor Leakage Inductance	MH	110.4	56.08	42.21	19.07	13.4	9.81	-	6.34	4.22	2.65
n110	Motor No-load Current	%	72	73	62	55	45	35	-	32	26	30

• 200 V Class Single-phase

No.	Name	Unit	Factory Setting							
-	Inverter Capacity	kW	0.1 kW	0.25 kW	0.55 kW	1.1 kW	1.5 kW	2.2 kW	-	3.7 kW
n036	Motor Rated Current	A	0.6	1.1	1.9	3.3	6.2	8.5	-	14.1
n105	Torque Compensation Iron Loss	W	1.7	3.4	4.2	6.5	11.1	11.8	-	19
n106	Motor Rated Slip	Hz	2.5	2.6	2.9	2.5	2.6	2.9	-	3.3
n107	Line to Neutral (per Phase)*	Ω	17.99	10.28	4.573	2.575	1.233	0.8	-	0.385
n108	Motor Leakage Inductance	MH	110.4	56.08	42.21	19.07	13.4	9.81	-	6.34
n110	Motor No-load Current	%	72	73	62	55	45	35	-	32

• 400 V Class 3-phase

No.	Name	Unit	Factory Setting								
-	Inverter Capacity	kW	-	0.37 kW	0.55 kW	1.1 kW	1.5 kW	2.2 kW	3.0 kW	3.7 kW	5.5 kW	7.5 kW
n036	Motor Rated Current	A	-	0.6	1.0	1.6	3.1	4.2	7.0	7.0	9.8	13.3
n105	Torque Compensation Iron Loss	W	-	3.4	4.0	6.1	11.0	11.7	19.3	19.3	28.8	43.9
n106	Motor Rated Slip	Hz	-	2.5	2.7	2.6	2.5	3.0	3.2	3.2	1.5	1.3
n107	Line to Neutral (per Phase)*	Ω	-	41.97	19.08	11.22	5.044	3.244	1.514	1.514	0.797	0.443
n108	Motor Leakage Inductance	MH	-	224.3	168.8	80.76	53.25	40.03	24.84	24.84	16.87	10.59
n110	Motor No-load Current	%	-	73	63	52	45	35	33	33	26	30

* Sets the value of the motor resistance for one phase.

Revision History

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

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September 2003	◇1	Preface	Addition: Precautions for CE markings
		Chapter 5	Addition: Monitor items U-66, U-70
		Chapter 9	Addition: Troubleshooting
January 2005	◇2	Preface	Addition: · Safety precautions · Precaution about grounding the supply neutral in the WIRING section · Precaution about using the 3-wire sequence in the WIRING and OPERATION section · Precaution about storing a constant with the ENTER command by communications · Warranty Information
		Chapter 5	Partly revised
		Chapter 6	Revision: “*3. Fault Code List” of “Control Supervisor Object (Class 29 Hex)”

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January 2005	②	Chapter 7	Addition: ・Selecting Processing for Frequency Reference Loss (n064) ・Input/Output Open-phase Detection ・Undertorque Detection Revision: PID control block diagram
		Chapter 9	Addition: Alarm and fault display descriptions ・Alarm: CAL, dE1, rUn, UL3, oH3 ・Fault: PF, LF, UL3
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