Varispeed V7

INSTRUCTION MANUAL

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

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

YASKAWA

MANUAL NO. TOEP C710606 00B

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.

: Indicates information to insure proper operation.

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.	18

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.	22
• Mount the Inverter on nonflammable material (i.e., metal). Failure to observe this caution may result in a fire.	22
• 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.	22
• The Varispeed V7 generates heat. For effective cooling, mount it vertically. Refer to the figure in *Mounting Dimensions* on page 23.	23

WIRING

⚠ WARNING

	(Ref. page)
• 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.	26
• Wiring should be performed only by qualified personnel. Failure to observe this warning may Result in an electric shock or a fire.	26
• When wiring the emergency stop circuit, check the wiring thoroughly before operation. Failure to observe this warning may result in injury.	26
• Always ground the ground terminal ⏚. (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.	31
• 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. Failure to observe this warning may result in injury.	36

⚠ 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. 31
  Improper connection may cause a fire.
- Always tighten terminal screws of the main circuit and the control circuits. 26
  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. 26
  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.

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. 107
  (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. 103
  (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. 36
  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. 37
  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. 159
  (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. 159
  Failure to observe this caution may result in injury.

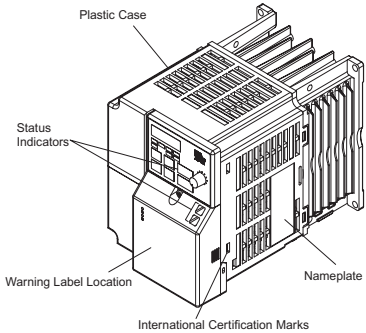
OTHERS

⚠ WARNING

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

WARNING LABEL

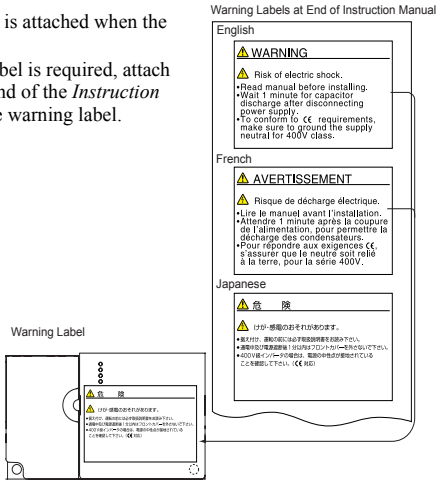
A warning label is provided on the front cover of the Inverter, as shown below. Follow the warnings when handling the Inverter.



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

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■ Recommended Peripheral Devices ---------- 200
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1. Receiving the Product

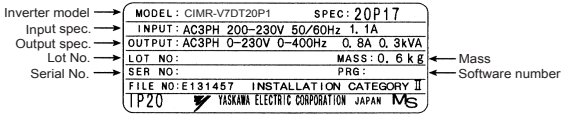
After unpacking the Varispeed V7, check the following.

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

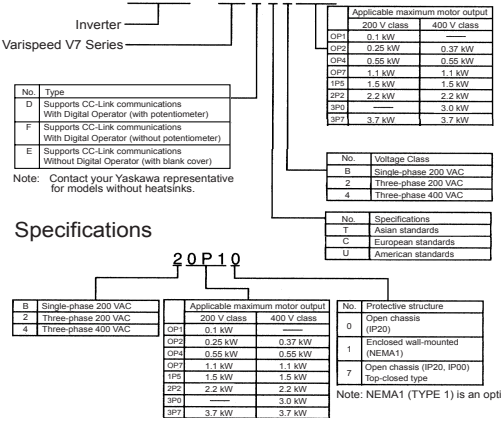
If any part of Varispeed V7 is missing or damaged, call for service immediately.

■ Checking the Nameplate

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



Model



No.	Type
D	Supports CC-Link communications With Digital Operator (with potentiometer)
F	Supports CC-Link communications With Digital Operator (without potentiometer)
E	Supports CC-Link communications Without Digital Operator (with blank cover)

Note: Contact your Yaskawa representative for models without heatsinks.

	Applicable maximum motor output	
	200 V class	400 V class
OP1	0.1 kW	——
OP2	0.25 kW	0.37 kW
OP4	0.55 kW	0.55 kW
OP7	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

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

No.	Specifications
T	Asian standards
C	European standards
U	American standards

Specifications

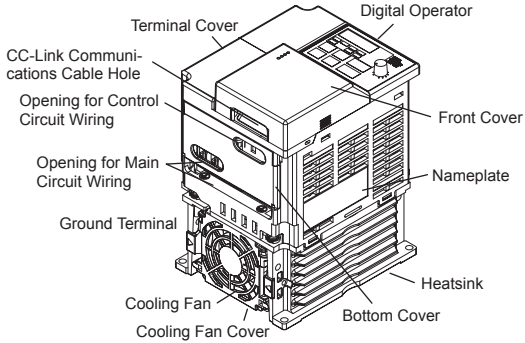
No.	Voltage Class
B	Single-phase 200 VAC
2	Three-phase 200 VAC
4	Three-phase 400 VAC

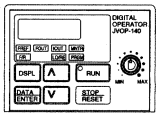
	Applicable maximum motor output	
	200 V class	400 V class
OP1	0.1 kW	——
OP2	0.25 kW	0.37 kW
OP4	0.55 kW	0.55 kW
OP7	1.1 kW	1.1 kW
1P5	1.5 kW	1.5 kW
2P2	2.2 kW	2.2 kW
3P0	——	3.0 kW
3P7	3.7 kW	3.7 kW

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

Note: NEMA1 (TYPE 1) is an option.

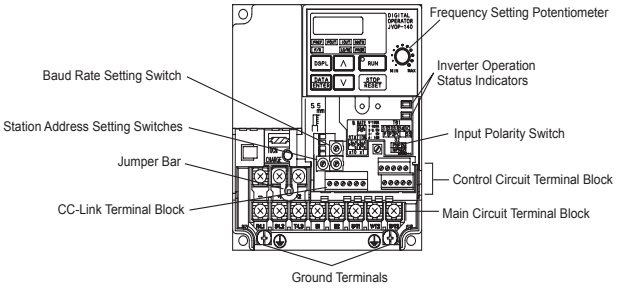
2. Identifying the Parts



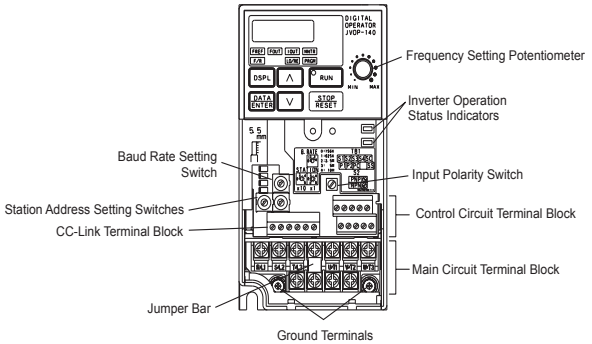


Digital Operator
(with potentiometer)
JVOP-140
Used for setting or
changing constants.
Frequency can be set
using potentiometer.

Varispeed V7 Inverters with the Covers Removed



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

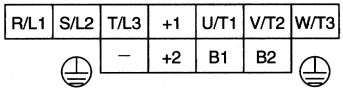


Example for 3-phase (200 V Class, 0.1 kW) Inverter

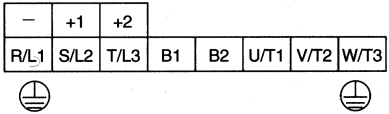
Main Circuit Terminal Arrangement

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

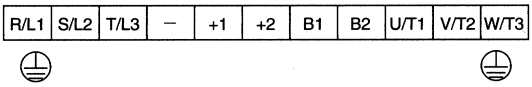
CIMR-V7**20P1 to 20P7, B0P1 to B0P4



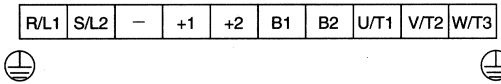
CIMR-V7**21P5, 22P2, B0P7, B1P5, 40P2 to 42P2



CIMR-V7**24P0, B2P2, 43P0, 43P7



CIMR-V7**B3P7



3. Mounting

■ Choosing a Location to Mount the Inverter

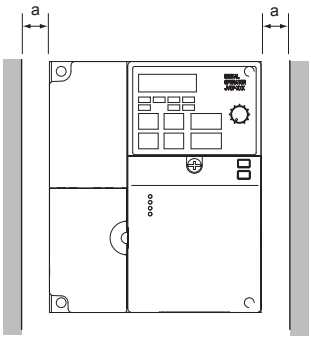
Be sure the Inverter is protected from the following conditions.

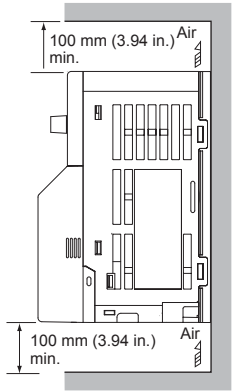
- Extreme cold and heat. Use only within the specified ambient temperature range:

  −10 to 50°C (14 to 122°F) for IP20 (open chassis type),
  −10 to 40°C (14 to 105°F) for NEMA 1 (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.

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).

■ Mounting/Removing Components

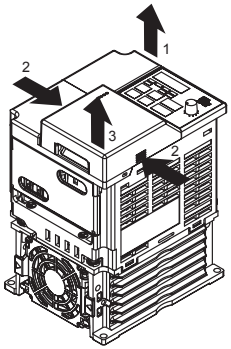
Removing and Mounting the Digital Operator and Covers

- 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.

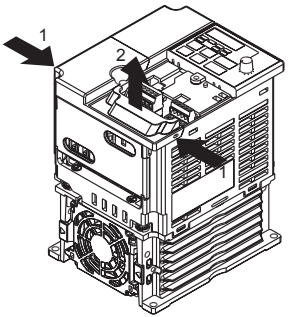


- Removing the Terminal Cover

  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.

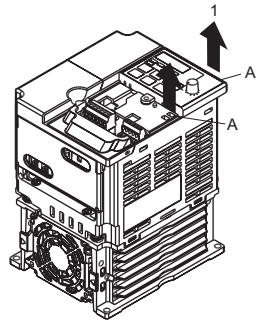


- Removing the Digital Operator

  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.

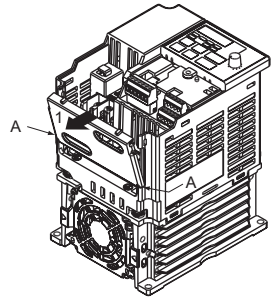


- Removing the Bottom Cover

  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

■ 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 200 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 110. 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. Closed-loop connectors should be used when wiring to the main circuit terminals.
4. 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. CC-Link 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	DA, DB, DG, SLD, FG	M2	0.22 to 0.25	Twisted wires: 0.5	20	0.5	20	Special CC-Link cable

Note: When removing the CC-Link terminal block, hold the control circuit terminal block (TB1).

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				
				Applicable Size		Recommended Size		Type
				mm²	AWG	mm²	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			

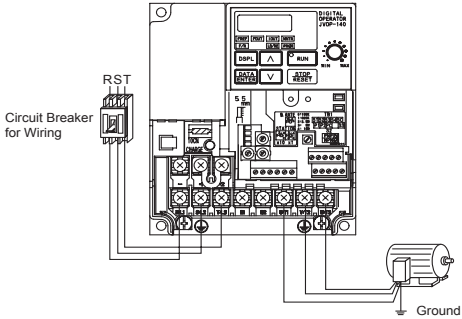
Notes: 1. The wire size is given for copper wire at 75°C (160°F).
2. Three-phase power can also be input for 0.1 to 1.1-kW, Single-phase Input Inverters.

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 3.5	14 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 3.5	14 12	

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.

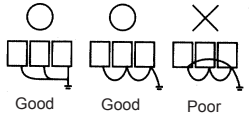
NOTE For single-phase Inverters, always use terminals R/L1 and S/L2. Never connect terminal T/L3.

• Grounding (Use ground terminal ⏚.)

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

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)

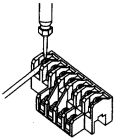
To connect the braking resistor, cut the protector on terminals B1 and B2.
To protect the braking resistor from overheating, install a thermal overload relay between the braking resistor and the Inverter. This provides a sequence that turns OFF the power supply with thermal relay trip contacts.
Use this same procedure when connecting a Braking Resistor Unit.
Refer to page 194.

• Inverter Output

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

• Wiring the Main Circuit Terminals

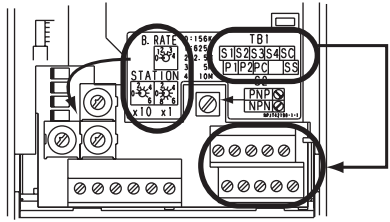
Pass the cables through wiring hole to connect them. Always mount the cover in its original position.



Connect with a Phillips screwdriver.

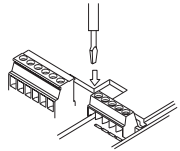
■ Wiring the Control Circuits

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

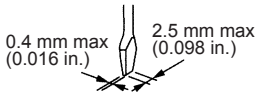


S2 can be changed according to sequence input signal (S1 to S4) polarity.
0 V common: NPN side (Initial setting)
+24 V common: PNP side
Refer to pages 196 and 197 for S2.

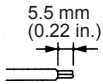
Wiring the Control Circuit Terminals



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.).

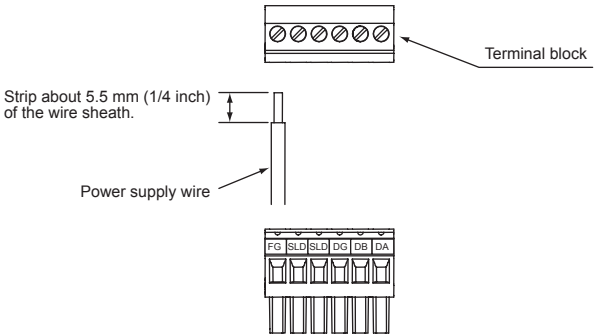
■ Wiring the CC-Link Communications Cable

Use the following procedure to wire the CC-Link communications cable to the terminal block (CN6).

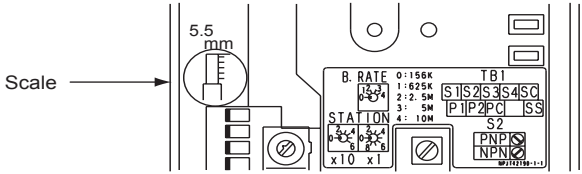
1. Use a thin slotted screwdriver to loosen the terminal screws.
2. Insert the power supply wires into the terminal block from below.
3. Tighten the terminal screws securely so that the power supply wires will not come out of the terminal block.
   Tightening torque: 0.22 to 0.25 N•m

Terminal Block (CN6) Wiring Example

Terminal No.	Name	Description
1	DA	Communication data +
2	DB	Communication data –
3	DG	Signal ground
4	SLD	Shield
5	SLD	Shield
6	FG	Frame ground

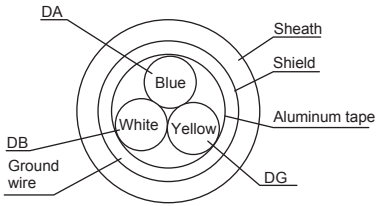


* 1. Route the CC-Link communications cables separately from the main circuit wiring and other power lines.
* 2. There is a 5.5-mm scale on the front of the Inverter just above the terminal block. Use this 5.5-mm scale to confirm the length of exposed wire when stripping wires.



* 3. Connect terminating resistance between terminals DA and DB when the Inverter is connected as the last Unit on the communications line. Use the terminating resistance provided with the Master Unit or commercially available terminating resistance (110 Ω, 1/4 W).
* 4. Always use the recommended communications cables. (See the next table.) Otherwise, CC-Link performance may be adversely affected.

Item	Specifications
Model	FANC-SB 0.5 mm^2 × 3 (manufactured by Kuramo Electric Co., Ltd.)
Conductor cross section	0.5 mm^2
Conductor resistance (20 °C)	37.8 Ω/km or less
Insulation resistance	10,000 MΩ/km or more
Withstand voltage	500 VDC for 1 min.
Electrostatic capacity (1 kHz)	60 nF/km or less
Characteristic impedance	100 ±15 Ω

Item	Specifications
Cross section	
Dimensions	7 mm
Approx. mass	65 kg/km

■ 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.

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.

■ 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 CC-Link communications

Prior to shipping, the Inverter is set up to receive the RUN command and frequency reference from CC-Link communications. Refer to page 49 for details. Instructions for running the Varispeed V7 using the JVOP-140 Digital Operator (with potentiometer) are described on the next page. For other instructions on operation, refer to page 47.

Run command 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 CC-Link 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 CC-Link communications.

Operation Steps	Operator Display	Function Indicators	Status Indicators
1. Turn the potentiometer fully counter-clockwise, and then turn the power ON. 2. Press DPSL to make PRGM flash. 3. Set n003 and n004 to 0 to enable the potentiometer and the RUN/STOP command from the Digital Operator. 4. Press DPSL to make F/R flash. 5. Select forward or reverse run using the ⌃ or ⌄ key. NOTE Never select REV when reverse run is prohibited.	0.00 0 FOR or REV	FREF PRGM F/R	RUN ☼ ALARM ● RUN ☼ ALARM ● RUN ☼ ALARM ●
6. Press DSPL to make FREF flash. 7. Press RUN. 8. Operate the motor by turning the potentiometer clockwise. A frequency reference corresponding to the potentiometer position will be displayed. 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.	0.00 0.00 to 60.00 (Hz) Minimum output frequency is 1.50 Hz	FREF FREF	RUN ☼ ALARM ● RUN ☼ ALARM ●

Status indicators ☼ : ON ☼ : Flashing ● : OFF

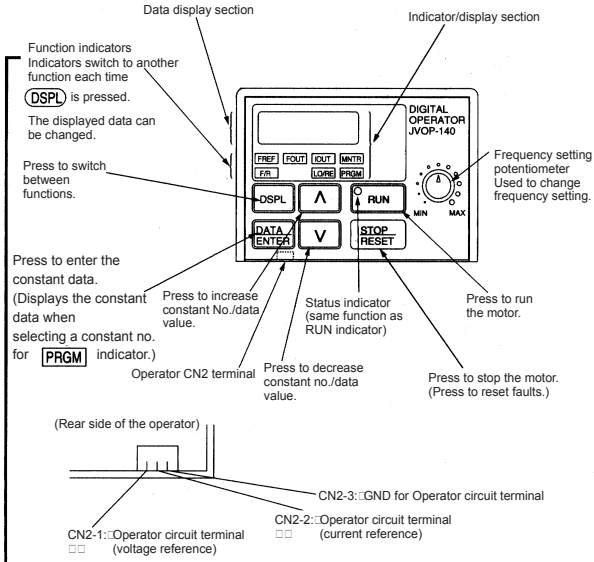
☐ Operation Check Points

- 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. The display and keypad sections are described below.

JVOP-140 Digital Operator

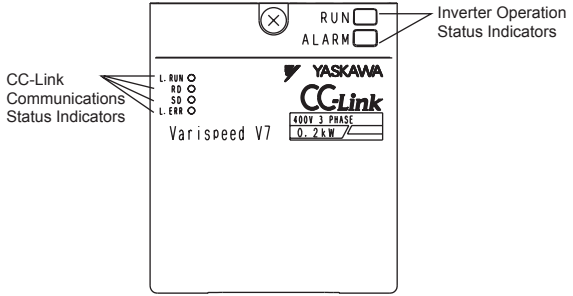


Details of Indicators (Color in parenthesis indicates the color of indicator.)

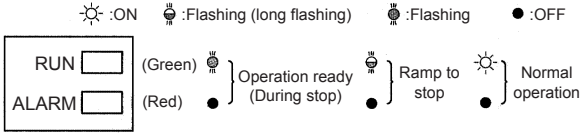
FREF Frequency reference setting/monitoring (GREEN)	FOUT Output frequency monitoring (GREEN)	IOUT Output current monitoring (GREEN)	MNTR Multi-function monitoring (GREEN)
F/R Operator RUN command FWD/REV selection (GREEN)		LO/RE LOCAL/REMOTE Selection (RED)	PRGM Constant no./data (RED)

☐ Description of Status Indicators

The following diagram shows the positions of six status indicators (two Inverter operation status indicators, four CC-Link communications status indicators). The combinations of these indicators indicate the status of the Inverter and CC-Link 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.

CC-Link Communications Status Indicators

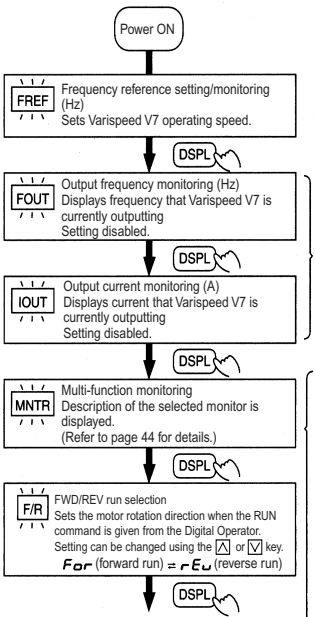
These indicators show the status of CC-Link communications.

Indicator	Color	Name	Descriptions
L.RUN	Green	Communicating	Lit: Receiving refresh data normally Not lit: Timeout
RD	Green	Receiving data	Lit: Detecting carrier Not lit: No carrier detected
SD	Green	Sending data	Lit: Sending data Not lit: No data being sent
L.ERR	Red	Communications error	Not lit: Normal status Lit: CRC error Station address setting error Baud rate setting error Flashing: Station address/baud rate setting switch changed while power is ON.

■ Function Indicator Description

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

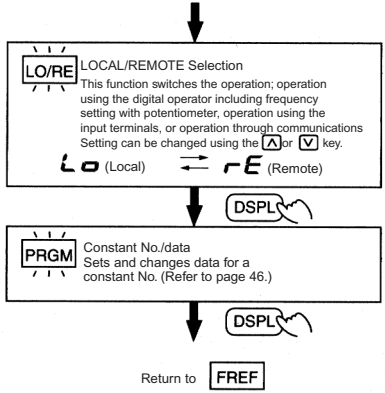
The following flowchart describes each function indicator.



If the Varispeed V7 loses power while in one of these modes, it will return to the same mode once power is restored.

Monitor No.
U-01: Frequency reference (FREF)
U-02: Output frequency (FOUT)
U-03: Output current (IOUT)
U-04: Output voltage reference (Unit: 1V)
U-05: DC voltage (Unit: 1V)
U-06: Input terminal status
U-07: Output terminal status
U-08: Torque monitor
U-09: Fault history
U-10: Software number
U-11: Output power
U-16: PID feedback
U-17: PID input
U-18: PID output
U-63: CC-Link station address (during operation)
U-65: CC-Link baud rate setting (during operation)
U-70: Frequency reference from CC-Link

Note: The unit used for frequency is determined by the value set for constant n035. For details, refer to page 154.

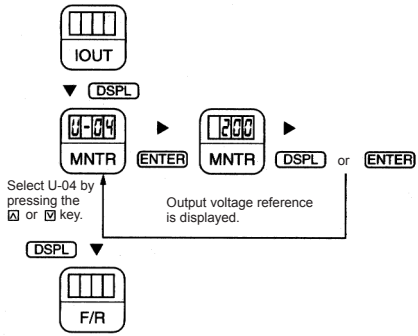


☐ MNTR Multi-function Monitoring

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.

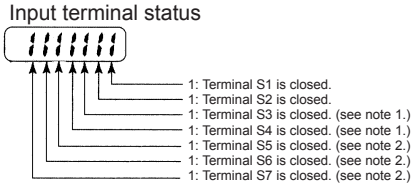
Constant No.	Name	Unit	Description
U-01	Frequency reference (FREF)*1*5	Hz	Frequency reference can be monitored. (Same as FREF)
U-02	Output frequency (FOUT)*1*5	Hz	Output frequency can be monitored. (Same as FOUT)
U-03	Output current (IOUT)*1	A	Output current can be monitored. (Same as IOUT)
U-04	Output 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	Inverter 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-63	CC-Link station address (station address during Operation)	-	1 to 64
U-65	CC-Link baud rate setting (Baud rate during Operation)	-	0: 156 kbps 1: 625 kbps 2: 2.5 Mbps 3: 5 Mbps 4: 10 Mbps
U-70	Frequency reference from CC-Link	Hz	The frequency reference from the CC-Link 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.

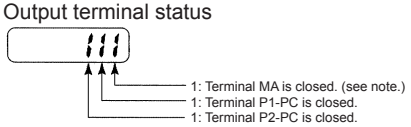
In vector control mode, "---" will be displayed.

* 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 154.

☐ Input/Output Terminal Status



Notes: 1. "1" is also displayed if command input from CC-Link communications or the external control terminal is closed.
2. "1" is displayed if command input from CC-Link communications is closed. There are no external terminals.



Note: This can only be used from CC-Link 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 9. Fault Diagnosis for details.)

Switching Fault History Records

The fault that is displayed can be changed using the ⌃ or ⌄ key.

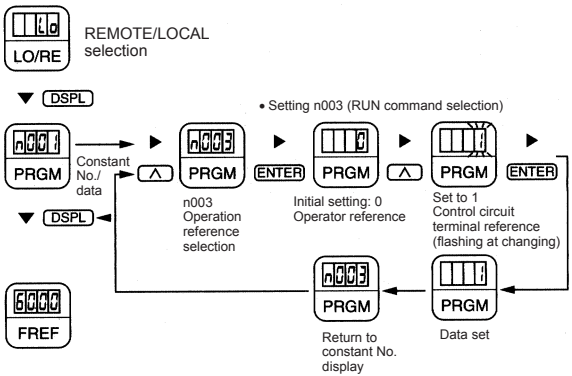
Clearing the Fault History

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 and potentiometer setting (refer to page 38) are both possible for simple acceleration/deceleration operation of the Varispeed V7.

CC-Link 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 60 Hz, acceleration time set to 15 s, and deceleration time set to 5 s. (Refer to page 86 for details on constant settings.)

Operation Steps	Operator Display	Function Indicators	Status Indicators
1. Turn ON the power supply.	0.00	FREF	RUN ☼ ALARM ●
2. Press DSPL to make PRGM flash. 3. Set n003 to 0 and n004 to 1 to enable the frequency reference and the RUN/STOP command from the Digital Operator.	0 1	PRGM	RUN ☼ ALARM ●
4. Set the following constants. n019: 15.0 (Acceleration Time) n020: 5.0 (Deceleration Time)	15.0 5.0	PRGM	RUN ☼ ALARM ●
5. Press DSPL to make F/R flash. 6. Select forward or reverse run by using the ∧ or ∨ key. NOTE Never select REV when reverse run is prohibited.	For (Forward) Or rEv (Reverse)	F/R	RUN ☼ ALARM ●
7. Press DSPL to make FREF flash. 8. Set the frequency reference to 60 Hz by using the ∧ or ∨ key.	60.0	FREF	RUN ☼ ALARM ●
9. Press DSPL to make FOUT flash. 10. Press RUN.	0.00— 60.0	FOUT	RUN ☼ ALARM ●
11. Press STOP to stop.	60.0— 0.00	FOUT	RUN ☼ (ntlp) ↓ (ntlp)

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

6. Operating with CC-Link Communications

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

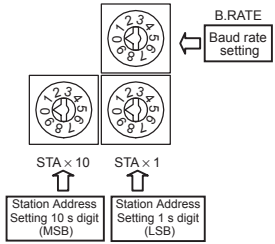
■ Specifications

Item	Specifications
Station type	Remote device station
Number of exclusive stations	1 station
Baud rate setting	156 kbps to 10 Mbps

■ Component Names and Settings

□ Rotary Switches

The rotary switches are used to set the CC-Link baud rate and station 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)

Set-ting	0	1	2	3	4
Baud Rate	156 kbps	625 kbps	2.5 Mbps	5 Mbps	10 Mbps

Note: If the baud rate is set to a setting of 5 or higher, a communications error will occur and the L.ERR indicator will light.

Station Address Setting Switches

1. Set the station address to between 1 and 64.
   The STA × 10 switch sets the 10's digit of the station address.
   The STA × 1 switch sets the 1's digit of the station address.
   Example 1: Setting the station address to 32:
   Set the STA × 10 switch to 3.
   Set the STA × 1 switch to 2.
   Example 2: Setting the station address to 8:
   Set the STA × 10 switch to 0.
   Set the STA × 1 switch to 8.

2. The same station address cannot be assigned to two or more stations. Check that each station has a unique station address.

3. Maximum number of connected Units: 42 (Must satisfy the following conditions)

   $\{(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d)\} \leq 64$
   a: Unit allocated one station b: Unit allocated two stations
   c: Unit allocated three stations d: Unit allocated four stations
   $\{(16 \times A) + (54 \times B) + (88 \times C)\} \leq 2304$
   A: Number of remote I/O stations ≤ 64
   B: Number of remote device stations ≤ 42
   C: Number of local stations ≤ 26

■ CC-Link Functions

The Varispeed V7 Inverter can be used as a remote device station in a CC-Link network to operate, adjust, and monitor using sequence programming. This enables cyclic transmission of word data and bit data, allowing high-speed communications at up to 10 Mbps.

□ Initial Settings

Set the following Inverter constants as required before using CC-Link communications between the Varispeed V7 Inverter and the PLC.

Constant No.	Name	Description	Initial Setting
n003	RUN Command Selection	0: Digital Operator 1: Control circuit terminals 3: CC-Link communications	3
n004	Frequency Reference Selection	0: Digital Operator 1: Frequency Reference 1 (n024) 7: Digital Operator's circuit terminal (0 to 10 V) 8: Digital Operator's circuit terminal (4 to 20 mA) 9: CC-Link communications	9

When using CC-Link communications for RUN/STOP operations, set constant n003 to 3, and set constant n004 to 9 for setting the frequency.

□ Basic Functions

The basic functions that can be operated from the PLC using CC-Link communications functions are described here.

RUN Command and Frequency Reference

The PLC can be used to run/stop the Inverter, and select the Inverter's operating frequency.

When performing these operations from the PLC, the PLC must have the right to execute the RUN command and frequency reference.

- a: Switching Using the Inverter's Constant Settings

  RUN Command Selection n003:
  3, for communications (factory setting: 3)
  Frequency Reference Selection n004:
  9, for communications (factory setting: 9)

- b: Switching Using the Inverter Control Circuit Terminal

  Set 18 (communications/control circuit terminal selection) as the set value for the Multi-function Input Selection for either control circuit terminals S3 or S4 (n052 or n053). By turning ON the terminal's input (communications), the right to execute references can be switched to the PLC. When the control circuit terminal is selected, the reference right depends on the settings of n003 and n004.

  Therefore, if the "a" setting above has already been made, the reference right is always held by communications.

- c: Switching Reference Selection from the PLC

  - c-1: Setting Inverter Constants

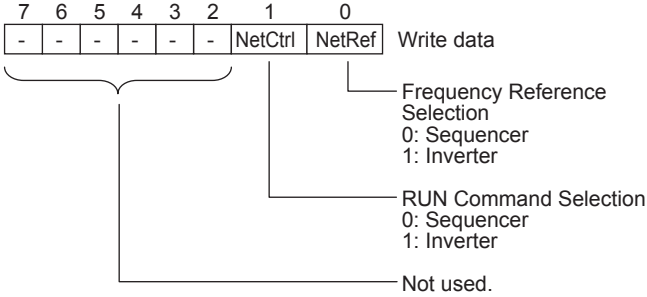
  Send the RUN Command Selection command code: 2103h with the write data set to 3 to the Inverter.

  The setting for Inverter constant n003 will change to 3, and the RUN command right will switch to the PLC.
  Send the Frequency Reference Selection command code 2104h with the write data set to 9 to the Inverter.

  The setting for Inverter constant n004 will change to 9 and the frequency reference right will switch to the PLC.

  - c-2: Switching Reference Selection Using NetRef and NetCtrl

  The RUN command and frequency reference right can be switched using the RW_{W2} command code in the remote register.



If the Inverter power supply turns OFF when this method has been used to switch the reference right, the reference right will return to the original setting when the power is turned ON again. Use this method to temporary switch the reference right.

Command Code	00FBh			
Write Data	00h	01h	02h	03h
Frequency Reference Right	PLC	Inverter	PLC	Inverter
RUN Command Right	PLC	PLC	Inverter	Inverter

The priority used when setting the PLC reference right is given in the following table.

RUN Command Right

Setting	Setting Status				
NetCtrl	0	1	1	1	1
RUN Command Selection n003	-	3	Not 3	Not 3	Not 3
Communications/Control Circuit Terminal Selection	-	-	ON (communications selected)	OFF (control circuit terminal selected)	OFF (control circuit terminal selected)
Remote/Local Mode	-	-	-	Remote	Local
RUN Command Right	PLC (communications)	PLC (communications)	PLC (communications)	Determined by setting in Inverter constant n003	Inverter Digital Operator

Frequency Reference Right

Setting	Setting Status				
NetCtrl	0	1	1	1	1
RUN Command Selection n004	-	9	Not 9	Not 9	Not 9
Communications/Control Circuit Terminal Selection	-	-	ON (communications selected)	OFF (control circuit terminal selected)	OFF (control circuit terminal selected)
Remote/Local Mode	-	-	-	Remote	Local
Frequency Reference Right	PLC (communications)	PLC (communications)	PLC (communications)	Determined by setting in Inverter constant n004	Inverter Digital Operator

Notes: 1. When a multi-step speed reference is input as the multi-function input, the frequency reference is the multi-step speed reference value (n024 to n032).

2. The blank cells in the above table indicate settings unrelated to the set value.

Monitoring

The Inverter's status information can be monitored.
Set the monitor code in RW_{W0}, and turn ON the RYC signal to store the data corresponding to the monitor code in the PLC's buffer memory.
Refer to *List of Monitor Codes and Command Codes* on page 64 for a list of monitor codes and units.

☐ Setting and Reading Constants

The PLC can be used to read and write constants, monitor status information, and reset the Inverter.
By setting the command code in RW_{W2} (set the write data in RW_{W3} as required), and turning ON the RYF (Command Execution Request), the Inverter will execute processing corresponding to the command code and the read data and RXF (Command Execution Completed) will be returned.
For details on command codes, write data units, and setting ranges, refer to *List of Monitor Codes and Command Codes* on page 64.

☐ List of CC-Link Data

The Inverter is allocated an area for one station in the PLC's buffer memory. The following table lists the Inverter I/O as viewed from the PLC.

- Remote I/O

Remote Output (PLC to Inverter)			Remote Input (Inverter to PLC)		
Device No.	Signal Name	Remarks (Initial Setting)	Device No.	Signal Name	Remarks (Initial Setting)
RY0	Forward RUN command		RX0	Forward run	
RY1	Reverse RUN command		RX1	Reverse run	
RY2	Function of multi-function input terminal S3	External fault (n052:3)	RX2	Multi-function output 1*1	Inverter ready (n057:13)
RY3	Function of multi-function input terminal S4	Fault reset (n053: 5)	RX3	Speed agree	

Remote Output (PLC to Inverter)			Remote Input (Inverter to PLC)		
Device No.	Signal Name	Remarks (Initial Setting)	Device No.	Signal Name	Remarks (Initial Setting)
RY4	Function of multi-function input terminal S5 *1	Multi-step speed reference 1 (n054: 6)	RX4	Stall prevention activated	
RY5	Function of multi-function input terminal S6 *1	Multi-step speed reference 2 (n055: 7)	RX5	Not used.	
RY6	Function of multi-function input terminal S7*1	JOG command (n056: 10)	RX6	Terminal P1 multi-function output	Running (n058: 1)
RY7	Not used.		RX7	Terminal P2 multi-function output	Fault (n059: 0)
RY8	Not used.		RX8	Not used.	
RY9	Inverter output OFF		RX9	Not used.	
RYA	External fault (EF0)		RXA	Not used.	
RYB	Not used.		RXB	Not used.	
RYC	Monitor command		RXC	Monitoring	
RYD	Frequency set command 1	RAM write	RXD	Frequency setting completed 1	RAM write
RYE	Frequency set command 2*2	Frequency reference 1 (n024) write	RXE	Frequency setting completed 2	Frequency reference 1 (n024) write
RYF	Command execution request		RXF	Command execution completed	
RY10 to RY18	Not used.		RX10 to RX18	Not used.	

Remote Output (PLC to Inverter)			Remote Input (Inverter to PLC)		
Device No.	Signal Name	Remarks (Initial Setting)	Device No.	Signal Name	Remarks (Initial Setting)
RY19	Multi-function I/O allocation change request		RX19	Multi-function I/O allocations changed	
RY1A	Error reset		RX1A	Error	
RY1B	Not used.		RX1B	Remote station ready	
RY1C	Not used.		RX1C	Not used.	
RY1D	Not used.		RX1D	Not used.	
RY1E	Not used.		RX1E	Not used.	
RY1F	Not used.		RX1F	Not used.	

* 1. This function can be used with communications only (no terminal provided).
* 2. Use Frequency Set Command 1 (RYD) when changing the setting frequently.

- Remote Registers

PLC to Inverter			Inverter to PLC		
Device No.	Name	Execution Request Flag	Device No.	Name	Confirmation Flag
RW_{Wo}	Monitor code	RYC	RW_{Ro}	Monitor data	RXC
RW_{W1}	Set frequency	RYD, RYE	RW_{R1}	Output frequency	RXD, RXE
RW_{W2}	Command code	RYF	RW_{R2}	Response code	RXF
RW_{W3}	Write data		RW_{R3}	Read data	

☐ List of Remote I/O

- Remote I/O

Remote Input (Inverter to PLC)			
Device	Signal Name	Description	Remarks (Initial Setting)
RX0	Forward run	ON: Running forward OFF: Not running forward	
RX1	Reverse run	ON: Running in reverse OFF: Not running in reverse	
RX2	Multi-function output 1	According to constant settings, only communications can be used on the multi-function output.	Inverter ready (n057:13)
RX3	Speed agree	ON when the output frequency is within the set range between the set frequency and the value set in n023.	
RX4	Stall prevention activated	ON when stall prevention is operating.	
RX5	Not used.	-	
RX6	Terminal P1 output	Multi-function photocoupler output 1	Running (n058: 1)
RX7	Terminal P2 output	Multi-function photocoupler output 2	Fault (n059: 0)
RX8 to RXB	Not used.	-	
RXC	Monitoring	ON while monitor data is refreshed.	
RXD	Frequency setting completed 1	ON when data is set as the main speed frequency.	RAM write
RXE	Frequency setting completed 2	ON when data is set for frequency reference 1 (n024). At the same time, the data is set as the main speed frequency.	Frequency reference 1 write
RXF	Command execution completed	ON when the specified command has completed executing.	

Remote Input (Inverter to PLC)			
Device	Signal Name	Description	Remarks (Initial Setting)
RX10 to RX17	Not used.	-	
RX18	Reserved for system use.	-	
RX19	Multi-function I/O allocations changed	ON when the multi-function I/O allocations have been changed.	
RX1A	Error	ON when an Inverter error has occurred.	
RX1B	Remote station ready	ON when the Inverter is in RUN enabled status.	
RX1C to RX1F	Not used.	-	

Remote Output (PLC to Inverter)			
Device	Signal Name	Description	Remarks (Initial Setting)
RY0	Forward RUN command	ON: Forward RUN command OFF: STOP command	
RY1	Reverse RUN command	ON: Reverse RUN command OFF: STOP command	
RY2	Function of multi-function input terminal S3	Multi-function input 3	External fault (n052: 3)
RY3	Function of multi-function input terminal S4	Multi-function input 4	Fault reset (n053: 5)
RY4	Function of multi-function input terminal S5	Multi-function input 5: Enabled from communications only (no terminal)	Multi-step 1 (n054: 6)
RY5	Function of multi-function input terminal S6	Multi-function input 6: Enabled from communications only (no terminal)	Multi-step 2 (n054: 6)
RY6	Function of multi-function input terminal S7	Multi-function input 7: Enabled from communications only (no terminal)	JOG command (n056: 10)
RY7	Not used.	-	
RY8	Not used.	-	
RY9	Inverter output OFF	ON: Motor coasts to a stop OFF: Operation restarts if forward RUN command or reverse RUN command is received.	
RYA	External fault	External fault (EF0) occurs when RYA is ON, motor coasts to a stop, and error output signal turns ON.	
RYB	Not used.	-	
RYC	Monitor command	When ON, the monitor data specified with the monitor code is set in RW_{R1}.	

Remote Output (PLC to Inverter)			
Device	Signal Name	Description	Remarks (Initial Setting)
RYD	Frequency set command 1	Sets the frequency set in RW_{W1} as the main speed frequency.	
RYE	Frequency set command 2*	Sets the frequency set in RW_{W1} in frequency reference 1 (n024) and at the same time setting it as the main speed frequency. The setting here is stored even if the Inverter power is turned OFF. This data will be used for the frequency reference when the power is turned ON.	
RYF	Command execution request	Requests execution of a command code.	
RY10 to RY17	Not used.	-	
RY18	Reserved for system use.	-	
RY19	Multi-function I/O allocation change request	Changes the allocations of multi-function I/O.	
RY1A	Error reset	Resets Inverter faults.	
RY1B to RY1F	Not used.	-	

* Use the frequency set command 1 (RYD) when changing the settings frequently.

RY19 Changing Multi-function I/O Allocations

By turning ON RY19, the Inverter's multi-function I/O allocations will be changed as shown in the following table. To return the multi-function I/O allocations to their initial settings, set constant n001 to 7.

Constant	Name	Initial Setting		RY19: ON	
n052	Multi-function Input Selection 3	3	External Fault (NO contact input)	6	Multi-step speed reference 1
n053	Multi-function Input Selection 4	5	Fault Reset	7	Multi-step speed reference 2
n054	Multi-function Input Selection 5	6	Multi-step speed reference 1	8	Multi-step speed reference 3
n055	Multi-function Input Selection 6	7	Multi-step speed reference 2	10	Inching reference
n056	Multi-function Input Selection 7	10	JOG command	11	Acceleration/deceleration time select
n057	Multi-function Output Selection 1	13	Inveter operation ready	1	Operating
n058	Multi-function Output Selection 2	1	Operating	4	Frequency detection 1
n059	Multi-function Output Selection 3	0	Fault	0	Fault
n095	Frequency detection level	0.00 Hz		6.00 Hz	

- Remote Registers

PLC to Inverter

Remote Register	Name	Description
RW_{Wo}	Monitor code	Sets the monitor code. After setting the code, the monitor value is stored in RW_{R0} while the Monitor Command (RYC) is ON. While RW_{R0} is being refreshed, the Monitoring signal (RXC) is ON.
RW_{W1}	Set frequency	Sets the frequency reference. If RYD is turned ON, the data set here will be set in the Inverter's RAM as the main speed frequency. If RYE is turned ON, the set value will be written in Frequency Reference 1 (n024) and recorded in EEPROM. The data for the set value, however, must be set using the unit set for n035 (Setting/Display Unit Selection for Frequency Reference).
RW_{W2}	Command code	Sets the command code used to execute operations such as reading constants, writing constants , for fault history, and resetting errors. If the Command Execution Request (RYF) is turned ON, the Inverter will perform processing for the command code and execute the command, and then the Command Execution Completed (RXF) will turn ON. Set the write data as required, such as when changing constant settings.
RW_{W3}	Write data	Sets the data required for the command code. After setting the command code and write data, turn ON the Command Execution Request (RYF).

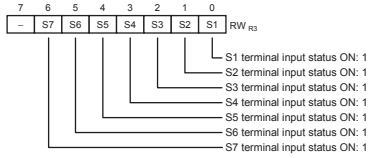
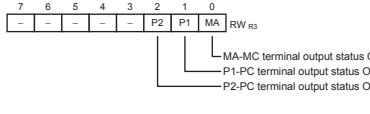
Inverter to PLC

Remote Register	Name	Description
RW_{Ro}	Monitor data	Stores the monitor data corresponding to the RW_{W0} monitor code. While the Monitor Command (RYC) is ON, the data is refreshed and the Monitoring Signal (RXC) is ON.
RW_{R1}	Output frequency	Always stores the present output frequency, but uses the unit set in n035 (Setting/Display Unit Selection for Frequency Reference). For example, if the setting for n035 is 0, the unit is Hz, and if the setting is 4, the unit is r/min.
RW_{R2}	Response code	For normal command codes and write data, 00h is set; for errors, a value between 01h and 03h is set.
RW_{R3}	Read data	The data corresponding to the command code is set.

☐ List of Monitor Codes and Command Codes

- Monitor Codes

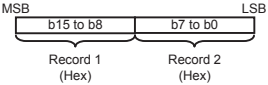
Primary Monitor Codes			
Monitor Code	Name	Unit	Remarks (Initial Setting)
0000h	-	-	
0001h	Output frequency	Set value in n035, as follows: 0: 0.01 Hz 1: 0.1% 2 to 39: r/min (set number of motor poles) 40 to 3999: User settings	The unit changes according to the setting for n035 (Setting/Display Unit Selection for Frequency Reference).
0002h	Output current	0.1 A	
0003	Output voltage	0.1 V	
0004h	-	-	
0005h	Frequency set value	Set value in n035, as follows: 0: 0.01 Hz 1: 0.1% 2 to 39: r/min (set number of motor poles) 40 to 3999: User settings	The unit changes according to the setting for n035 (Setting/Display Unit Selection for Frequency Reference).
0006h	-	-	
0007h	Torque reference*	0.1%	
0008h	Main circuit DC voltage	0.1 V	
0009h to 000Dh	-	-	
000Eh	Output power	1 W	

Primary Monitor Codes			
Monitor Code	Name	Unit	Remarks (Initial Setting)
000Fh	Input terminal status		
0010h	Output terminal status		
0011h	-	-	
0012h	Motor excitation current	0.1%	
0013h	-	-	
0014h	-	-	

* When the Inverter is using V/f control mode, 00h is displayed.

Secondary Monitor Codes			
Monitor Code	Name	Unit	Remarks (Initial Setting)
1001h	Fault 1		
1002h	Fault 2		
1003h	Fault 3		

• Command Codes

Basic Command Codes			
Name	Code Number	Data	Description
RUN Command Selection Read	1103h	0: Digital Operator 1: External terminal 3: CC-Link communications	Sets the present RUN command right in RW_{R3}.
Frequency Reference Selection Read	1104h	0: Digital Operator 1: Frequency reference 1 7: Voltage reference at the Digital Operator 8: Current reference at the Digital Operator 9: CC-Link communications	Sets the present frequency reference right in RW_{R3}.
RUN Command Selection Write	2103h	0: Digital Operator 1: External terminal 3: PLC	Changes the RUN command right.
Frequency Reference Selection Write	2104h	0: Digital Operator 1: Frequency reference 1 7: Voltage reference at the Digital Operator 8: Current reference at the Digital Operator 9: CC-Link communications	Changes the frequency reference right.
Fault History	0074h		Sets the error code as hexadecimal data in RW_{R3}. The upper byte contains history record 1 (most recent history), and the lower byte contains history record 2.
Main Speed Frequency Read	006Dh	Unit depends on setting in constant n035.	Reads the Inverter's set frequency (RAM)
Frequency Reference 1 Read	006Eh	Unit depends on setting in constant n035.	Reads the Inverter's frequency reference 1.

Basic Command Codes			
Name	Code Number	Data	Description
Main Speed Frequency Write	006EDh	Unit depends on setting in constant n035.	Writes the Inverter's main speed frequency.
Frequency Reference 1 Write	00EEh	Unit depends on setting in constant n035.	Writes the Inverter's frequency reference 1.
Network Status	007Bh	Bit 0 0: CC-Link frequency reference enabled. 1: Non-CC-Link frequency reference enabled. Bit 1 0: CC-Link RUN command enabled. 1: Non-CC-Link RUN command enabled. Bit 8 1: Stall prevention function operating.	
Network reference	00FBh	Bit 0 0: CC-Link frequency reference enabled. 1: Frequency reference setting in Inverter enabled. Bit 1 0: CC-Link RUN command enabled. 1: RUN command in Inverter enabled.	
Constant Read	1000h to 11B3h	Set value for each constant (See *Constant List in Chapter 10.*)	Reads constants and monitor data.
Constant Write (RAM)	2000h to 21B3h	Setting range for each constant (See *Constant List in Chapter 10.*)	The set values of the constants are written in the RAM, so the set values will be lost when the Inverter's power supply is turned OFF. To save in the Inverter, execute the command code for saving to the Inverter.

Basic Command Codes			
Name	Code Number	Data	Description
Constant Save	FFFDh	0000h to FFFFh	Saves the presently set constants (saves to non-volatile memory).
Fault History Clear	00F4h	9696h	
Inverter Reset	00FDh	9696h	

• Expansion Command Codes

Code Number		Item	Read Data		Description
Read	Write				
100h	-	Operation signals	Bit 0	Forward RUN command	Inverter runs forward.
			Bit 1	Reverse RUN command	Inverter runs in reverse.
			Bit 2	Terminal 3 input	Multi-function input 3
			Bit 3	Terminal 4 input	Multi-function input 4
			Bit 4	Terminal 5 input	Multi-function input 5 (enabled for communications only)
			Bit 5	Terminal 6 input	Multi-function input 6 (enabled for communications only)
			Bit 6	Terminal 7 input	Multi-function input 7 (enabled for communications only)
			Bit 7	Reserved	
			Bit 8	External fault (EF0)	Inverter stopped due to fault.
			Bit 9	Fault reset	Inverter fault cleared.
			Bit A	Reserved	
			Bit B	Reserved	
			Bit C	Reserved	
			Bit D	Reserved	
			Bit E	Fault history clear	Fault history cleared.
			Bit F	Inverter output OFF	Inverter coasts to a stop.
101h	-	Frequency reference	Unit set in constant n035		Frequency set value set from PLC.

Code Number		Item	Read Data		Description
Read	Write				
102h to 106h	202h to 206h	Reserved	Reserved		
107h	207h	Multi-function output command	Bit 0	Multi-function output 1 command from CC-Link	Output for RX2 of remote input can be turned ON/OFF when constant n057=18.
			Bit 1	Terminal P1 output command from CC-Link.	Output for RX6 of remote input and terminal P1 can be turned ON/OFF when constant n058=18.
			Bit 2	Terminal P2 output command from CC-Link.	Output for RX7 of remote input and terminal P2 can be turned ON/OFF when constant n059=18.
			Bit 3 to F	0 (fixed)	
108h to 10Fh	208h to 20Fh	Not used.			

Code Number		Item	Read Data		Description
Read	Write				
110h	-	Inverter status	Bit 0	Run	ON when Inverter is running.
			Bit 1	Zero-speed	ON when Motor is stopped.
			Bit 2	Reverse run	ON during reverse run.
			Bit 3	RESET signal being input.	ON when reset signal is being input.
			Bit 4	Speed agree	ON when the output frequency and set frequency match.
			Bit 5	Inverter ready for operation	ON when the Inverter is enabled for operation.
			Bit 6	Minor fault	ON when an Inverter alarm occurs.
			Bit 7	Major fault	ON when an Inverter fault occurs.
			Bit 8	OPR fault	ON when a Operator connection fault occurs. Follows the setting in n010.
			Bit 9	Power loss recovery/momentary power loss recovery	ON after recovering from a power loss or momentary power loss.
			Bit A	Remote/local	ON when CC-Link has RUN command right.
			Bit B	Terminal MA, MB output	Output status of terminals MA and MB.
			Bit C	Terminal P1 output	Output status of terminal P1.
			Bit D	Terminal P2 output	Output status of terminal P1.

Code Number		Item	Read Data		Description
Read	Write				
110h	-	Inverter status	Bit E	Reserved	
			Bit F	Reserved	
111h	-	Reserved			
112h	-	Torque monitor	00% to 100.0%		Sets the present motor torque value.
113h	-	Reserved			
114h	-	Run frequency set value	Unit set in constant n035.		Frequency set in Inverter (FREF). When the PLC does not have the frequency reference right, the setting at the Inverter is used.
115h	-	Output frequency	Unit set in constant n035.		Present output frequency (FOUT)
116h	-	Output current	Unit: 0.1 A		Present output current (IOUT)
117h	-	Not used.			
118h	-	Main circuit DC voltage	Unit: 0.1 V		Sets the value for the present main circuit DC voltage.
119h	-	Fault 1	See following table.		
11Ah	-	Fault 2	See following table.		
11Bh	-	Fault 3	See following table.		
11Ch	-	Not used.			
11Dh	-	External terminal input status			Terminals S1 to S7
11Eh	-	Not used.			
11Fh	-	Not used.			

Fault Signals/Present Errors

Fault		Name	Error code
Fault 1 Command code: 119h	Bit 0	-	-
	1	Main circuit undervoltage (UV1)	-
	2	Control power supply fault (UV2)	-
	3	-	-
	4	-	-
	5	-	-
	6	Overcurrent (OC)	16h
	7	Main circuit overvoltage (OV)	15h
	8	Heatsink overheat (OH)	14h
	9	-	-
	A	Motor overload (OL1)	13h
	B	Inverter overload (OL2)	12h
	C	Overtorque detection(OL3)	11h
	D	-	-
	E	-	-
	F	Braking resistor overheat	2Ch

Fault		Name	Error code
Fault 2 Command code: 11Ah	Bit 0	External fault 3 (EF3)	05h
	1	External fault 4 (EF4)	04h
	2	External fault 5 (EF5)	03h
	3	External fault 6 (EF6)	02h
	4	External fault 7 (EF7)	01h
	5	-	-
	6	-	-
	7	-	-
	8	-	-
	9	-	-
	A	Main circuit voltage fault (PF)	2Eh
	B	Output open phase (LF)	2Dh
	C	-	-
	D	Operator connection fault (OPR)	0Dh
	E	-	-
	F	-	-

Fault		Name	Error code
Fault 3 Command code: 11Bh	Bit 0	-	-
	1	CC-Link communications error (BUS)	0Bh
	2	-	-
	3	-	-
	4	-	-
	5	-	-
	6	External fault (EF0)	08h
	7	PID feedback loss dedtection (FbI)	0Ch
	8	Undertorque (UL3)	10h
	9	-	-
	A	-	-
	B	-	-
	C	External fault 1 (EF1)	07h
	D	External fault 2 (EF2)	06h
	E	Emergency stop (STP)	0Eh
	F	Hardware fault (Fxx)	-

Response Code (RW_{R2}) Details
Response codes are sent to the PLC after execution of command codes. Use the response code to determine whether the command code was executed normally.

Error Code	Description	Cause
00h	Normal	• The command code from the PLC was correct and executed normally.
01h	Write mode error	• Attempt to write a constant from the PLC during run mode. • Attempt to write a constant from the PLC during an undervoltage error. • Attempt to write a constant from the master other than n001=8, 9 (initialize) when F04 has occurred. • Attempt to write a constant from the PLC during data storage. • Attempt to write read-only data from the PLC.
02h	Command code error	• Command code is not registered. • Attempt to read the Enter command (0900h), which is a write-only register.
03h	Data setting error	• Simple upper/lower limit error caused by writing constant or control data. • Constant setting error caused by writing constant.

■ Reference and Monitor Command Codes

☐ Reference Data (Read/Write Registers)

Command Code		Description		
Read	Write			
1000h	2000h	Reserved		
1001h	2001h	Operation signals		
		Bit	0	Forward Run command 1: Forward run 0: Stop
			1	Reverse RUN command 1: Reverse run 0: Stop
			2	Multi-function input command 3 (Function selected in n052.)
			3	Multi-function input command 4 (Function selected in n053.)
			4	Multi-function input command 5 (Function selected in n054.)
			5	Multi-function input command 6 (Function selected in n055.)
			6	Multi-function input command 7 (Function selected in n056.)
			7	Not used.
			8	External fault 1: Fault (EF0)
			9	Fault reset 1: RESET command
			A	Not used.
			B to D	
			E	Fault history clear
			F	Output stop (coast to a stop)
1002h	2002h	Frequency reference (Unit set in n035.)		
1003h	2003h	V/f gain (1000/100%) Setting range: 2.0 to 200.0%		

Command Code		Description		
Read	Write			
100Ah to 1008h	2004h to 2008h	Reserved		
1009h	2009h	Output terminal signal		
		Bit	0	Multi-function output command 1 (Enabled when n057 is set to 18.) 1: Multi-function Output 1 (RX2) ON
			1	Multi-function output command 2 (Enabled when n058 is set to 18.) 1: P1 and Multi-function photocoupler output 1 (RX6) ON
			2	Multi-function output command 3 (Enabled when n059 is set to 18.) 1: P2 and Multi-function photocoupler output 2 (RX7) ON
			3 to F	Not used.
100Ah to 101Fh	200Ah to 201Fh	Reserved		

Note: Write 0 to unused bits. Do not write any other data to reserved registers.

☐ Monitor Data (Read-only Registers)

Command Code		Description		
Read	Write			
1020h	-	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.

Command Code		Description		
Read	Write			
1021h	-	Fault contents		
		Bit	0	Overcurrent (OC)
			1	Main circuit overvoltage (OV)
			2	Inverter overload (OL2)
			3	Heatsink overheat (OH)
			4	Not used.
			5	Not used.
			6	PID feedback loss (FbL)
			7	External fault (EFx, EF0), Emergency stop (STP)
			8	Hardware fault (Fxx)
			9	Motor overload (OL1)
			A	Overtorque detection (OL3)
			B	Not used.
			C	Main circuit undervoltage (UV1)
			D	Control power supply fault (UV2)
			E	CC-Link communications error (bUS)
			F	Operator connection fault (OPR)

Command Code		Description		
Read	Write			
1022h	-	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.
1023h	-	Frequency reference (Unit set in n035.)		
1024h	-	Output frequency (Unit set in n035.)		
1025h	-	Output voltage (10/1 V)		
1026h	-	Reserved		
1027h	-	Output power (10/1 kW)		
1028h	-	Output voltage reference (1/1 V)		
1029h	-	Fault contents 2 Bit 2: Main circuit voltage fault (PF) Bit 3: Output open phase (LF) Other bits are not used.		

Command Code		Description		
Read	Write			
102Ah	-	Alarm (Minor fault) Bit 0: Operator function stop (STP) Bit 1: Sequence error (SER) Bit 2: Simultaneous FWD/REV RUN commands (EF) Bit 3: External baseblock (bb) Bit 4: Overtorque detection (OL3) Bit 5: Heatsink overheat (OH) Bit 6: Main circuit overvoltage (OV) Bit 7: Main circuit undervoltage (UV) Bit 8: Cooling fan fault (FAN) Bit 9: Bit A: CC-Link communications error (Bus) Bit B: Undertorque (UL3) Bit C: Inverter overheat alert (OH3) Bit D: PID feedback loss (FbL) Bit E: Emergency stop (STP) Bit F: Waiting to receive data (CAL)		
102Bh	-	External terminal 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.

Command Code		Description		
Read	Write			
102Ch	-	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 2 (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	Undertorque detection (1: Undertorque being detected or undertorque error.)
			D	Fault restart in progress
			E	Fault (1: Fault)
			F	Not used.

Command Code		Description		
Read	Write			
102Dh	-	External terminal 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.
102Eh	-	Inverter status 2 Bit 0: Frequency reference loss Other bits are not used.		
102Fh				
1030h				
1031h	-	Main circuit DC voltage (1/1 V)		
1032h	-	Torque monitor (1/1%; 100%/Rated motor torque; signed)		
1033h to 1036h	-	Not used.		
1037h	-	Output power (1/1 W; signed)		
1038h	-	PID feedback value (100(%)/Input corresponding to max. output frequency; 10/1%; unsigned)		
1039h	-	PID input value (±100(%)/±Max. output frequency; 10/1%; signed)		
103Ah	-	PID output value (±100(%)/±Max. output frequency; 10/1%; signed)		
103Bh	-	Output current (10/1 A)		
103Ch	-	Reserved		

Command Code		Description
Read	Write	
103Dh	-	Reserved
103Eh to 10FFh	-	Reserved

* 1. The transmission error details are held until the fault reset is input. (Reset is possible in run mode.)

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	Initialize only the settings of the multi-function input/output allocations.*3	
8	Initialize	
9	Initialize (3-wire sequence)*2	

* 1. Excluding setting-disabled constants.
* 2. Refer to page 117.
* 3. Refer to page 62.

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 88.

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.

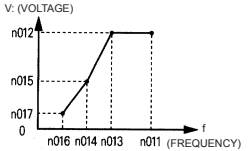
Control Mode Selection (n002) = 0: V/f control mode (initial setting)
1: Vector control mode

□ 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.
$n016 \leq n014 < n013 \leq n0111$
If n016 = n014, the setting of n015 will be disabled.

Constant No.	Name	Unit	Setting Range	Initial 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)

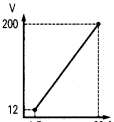
Typical Setting of the V/f Pattern

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.

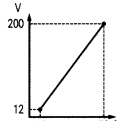
1. For General-purpose Applications

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

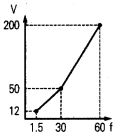
Motor Specification: 50 Hz (Factory setting)



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

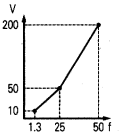
2. For Fans/Pumps

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

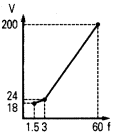
Motor Specification: 50 Hz



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

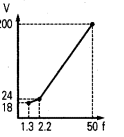
3. For Applications Requiring High Starting Torque

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.

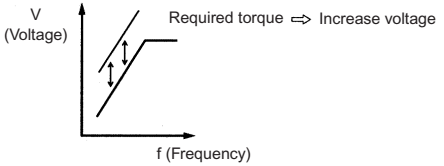
Full-range Automatic Torque Boost (when V/f Mode Is Selected: n002=0)

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 (n103) × 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	Initial 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)

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

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.

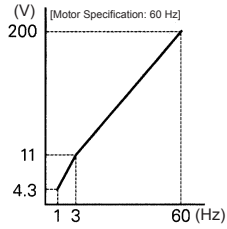
To connect a reactor between the Inverter and the motor, set n108 to the sum of the initial value of n108 (Motor Leakage Inductance) and the externally mounted reactor inductance. Unless a reactor is connected, n108 (Motor Leakage Inductance) does not have to be set according to the motor.

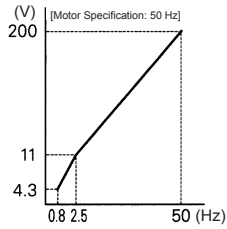
☐ V/f Pattern during Vector Control

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

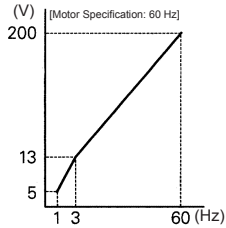
The following examples are for 200 V Class motors. When using 400 V Class motors, double the voltage settings (n012, n015, and n017).

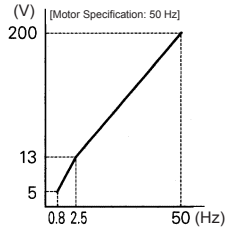
Standard V/F



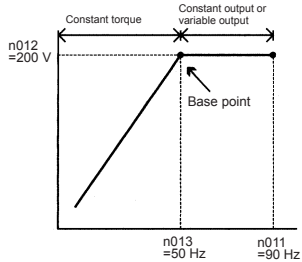


High Starting Torque V/F





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

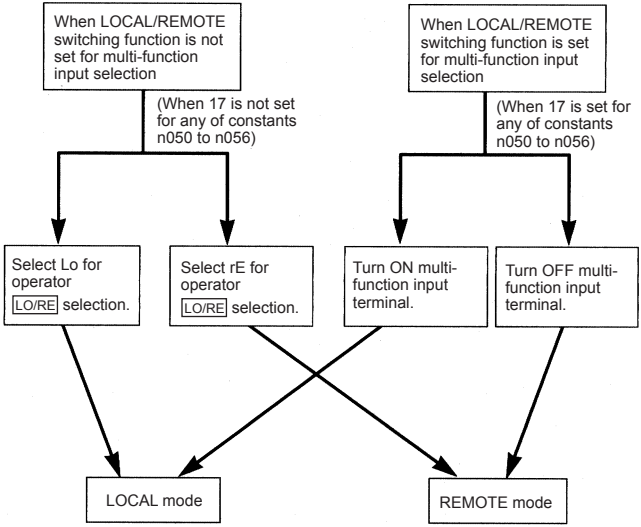


■ Switching LOCAL/REMOTE Mode

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 94) 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).

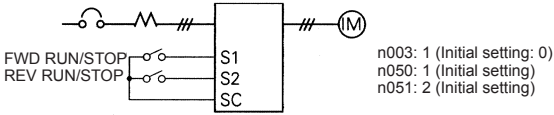
☐ REMOTE Mode

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 CC-Link 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 117.

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

☐ Operating (RUN/STOP Commands) Using CC-Link Communications

Setting constant n003 to 3 in REMOTE mode enables using RUN/STOP commands via CC-Link communications. For commands using CC-Link communications, refer to page 49.

■ Selecting Frequency Reference

Select REMOTE or LOCAL mode in advance. For the method for selecting the mode, refer to page 94.

☐ 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 (initial 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 (Initial 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) (initial 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 CC-Link 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.

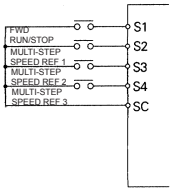
□ Multi-step Speed Selection

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

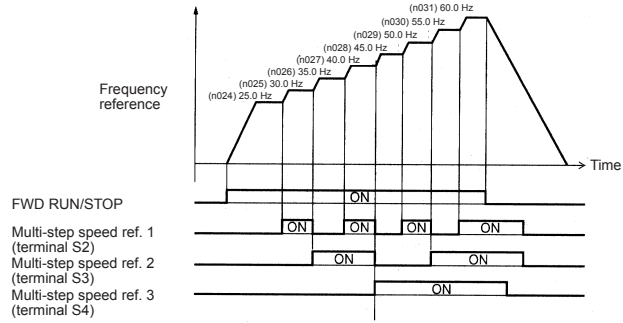
8-step speed change

n003=1 (operation mode selection)
n004=1 (Frequency reference selection)
n024=25.0 Hz (Frequency reference 1)
n025=30.0 Hz (Frequency reference 2)
n026=35.0 Hz (Frequency reference 3)
n027=40.0 Hz (Frequency reference 4)
n028=45.0 Hz (Frequency reference 5)
n029=50.0 Hz (Frequency reference 6)
n030=55.0 Hz (Frequency reference 7)
n031=60.0 Hz (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 CC-Link communications. There are no corresponding external input terminals.

Up to 16 speed steps can be set using CC-Link 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

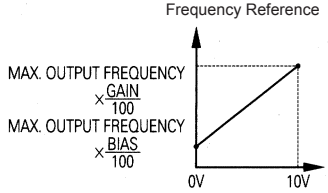
By inputting a JOG command and then a FORWARD (REVERSE) RUN command, operation is enabled at the jog frequency set in n032. When multi-step speed references 1, 2, 3 or 4 are input simultaneously with the JOG command, the JOG command has priority.

Constant No.	Name	Setting
n032	Jog Frequency	Initial setting: 6.00 Hz
n050 to n056	Jog command	Set to 10 for any constant.

Note: Input terminals S1 to S7 can be used only from CC-Link 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%)

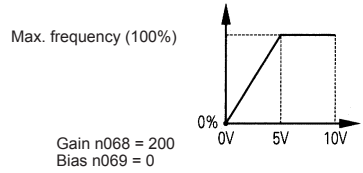
* Factory setting: 100%

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%)

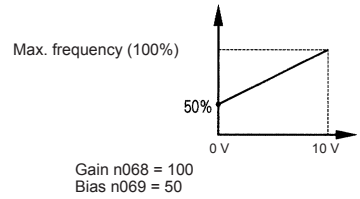
* Factory setting: 0%

Typical Settings

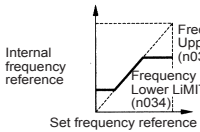
- To operate the Inverter with a frequency reference of 0% to 100% at an input voltage of 0 to 5 V



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



☐ Adjusting Frequency Upper and Lower Limits



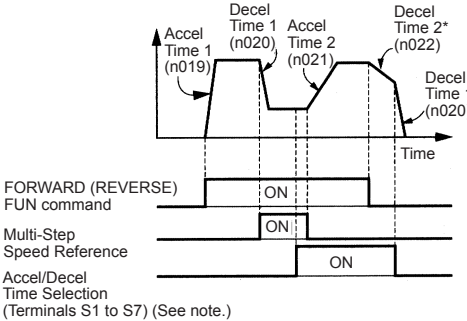
- Frequency Reference Upper Limit (n033)

  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 CC-Link 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	Initial 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)

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.)

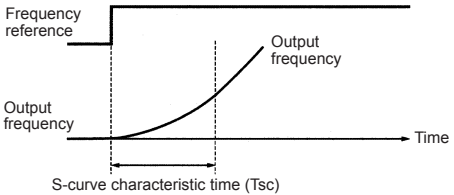
* 1. Hold the operation signal to continue operation after recovery from a momentary power loss.
* 2. When 2 is selected, the Inverter restarts if power supply voltage recovers while the control power supply is held.
No fault signal is output.

☐ S-curve Selection (n023)

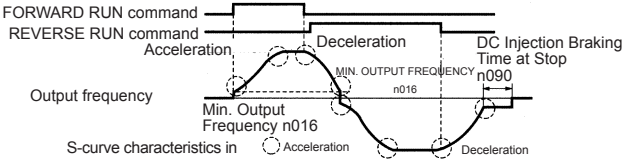
To prevent shock when starting and stopping the machine, acceleration/deceleration can be performed using an S-curve pattern.

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.



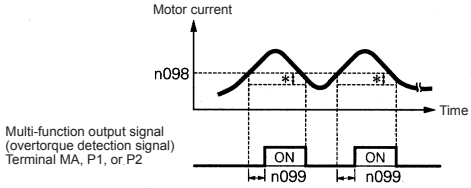
The following time chart shows switching between FWD/REV run when decelerating to a stop.



☐ 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 Detection Function Selection 2 (n097)

When vector control mode is selected, overtorque 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 is detected by the output current.

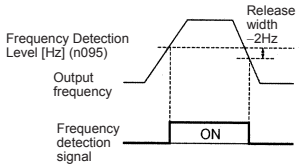
Setting	Description
0	Detected by output torque
1	Detected by output current

☐ 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).

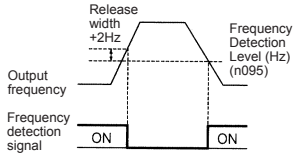
Frequency Detection 1

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



Frequency Detection 2

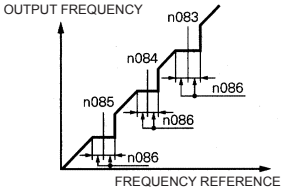
Output frequency ≤ Frequency Detection Level n095
(Set n057, n058 or n059 to 5.)



☐ 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)

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.

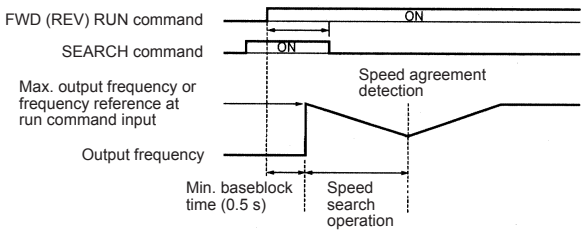
SPEED SEARCH Command

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.

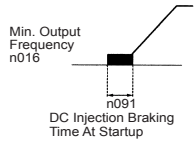
Timechart at SEARCH Command Input



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.



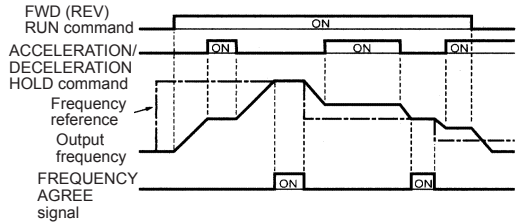
☐ Holding Acceleration/Deceleration Temporarily

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).

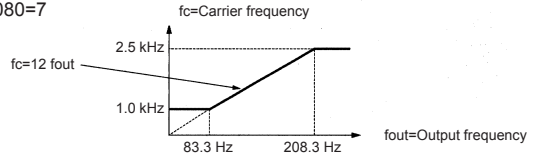
☐ Reducing Motor Noise or Leakage Current Using Carrier Frequency Selection (n080)

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

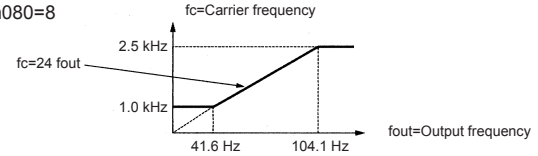
Setting	Carrier Frequency (kHz)	Metallic Noise from Motor	Noise and Current Leakage
7	12 fout (Hz)	Higher ↕ Not audible	Smaller ↕ Larger
8	24 fout (Hz)		
9	36 fout (Hz)		
1	2.5 (kHz)		
2	5.0 (kHz)		
3	7.5 (kHz)		
4	10.0 (kHz)		

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

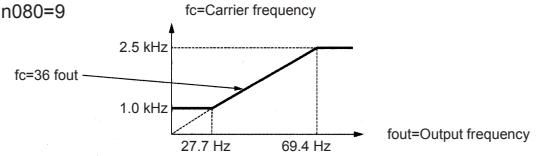
n080=7



n080=8



n080=9



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

Voltage Class (V)	Capacity (kW)	Initial 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
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

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 50 m	Up to 100 m	More than 100 m
Carrier Frequency (n080 setting)	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)

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

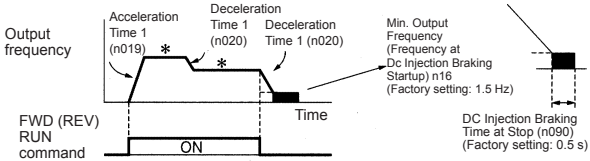
□ Stopping Method Selection (n005)

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

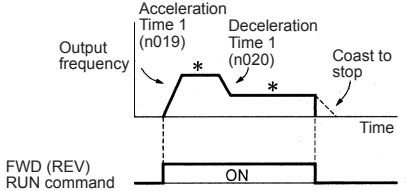
Upon termination of a FWD (REV) RUN command, the motor decelerates at the deceleration rate determined by the time set in Deceleration Time 1 (n020) and DC injection braking is applied immediately before stopping. DC injection braking is also applied when the motor decelerates because the frequency reference 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.

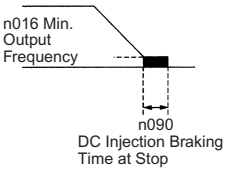
☐ Applying DC Injection Braking

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.	117
1	FORWARD RUN command (2-wire sequence selection)		96
2	REVERSE RUN command (2-wire sequence selection)		96
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		98
7	Multi-step speed reference 2		98
8	Multi-step speed reference 3		98
9	Multi-step speed reference 4		-
10	JOG command		100
11	Acceleration/deceleration time selection 1		102
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		-

Setting	Name	Description	Ref.
14	SEARCH command from maximum frequency	SPEED SEARCH command signal	108
15	SEARCH command from set frequency		108
16	ACCELERATION/ DECELERATION HOLD command		109
17	LOCAL/REMOTE selection		95
18	Communications/control circuit terminal selection		120
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 SrP. (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		143
24	PID integral reset		143
25	PID integral hold		143
26	Inverter overheat alert (OH3 alarm)		-
27	Acceleration/deceleration time selection 2		102
28	Data input from communications		-
34	UP/DOWN commands	Setting enabled only for n053 (terminal S4)	118

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

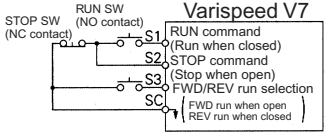
Initial Settings

No.	Terminal	Initial 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 CC-Link 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.



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.

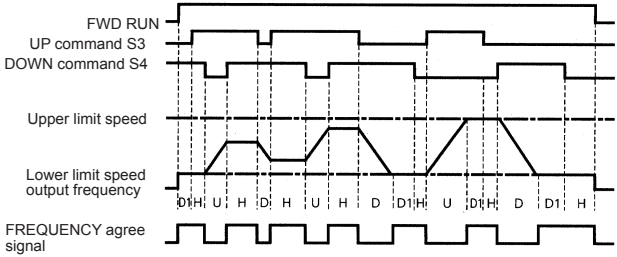
UP/DOWN Commands (Setting: n053 = 034)

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 CC-Link 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

Notes: 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 CC-Link 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 (register No. 0001H, 0002H).

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 143 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 Analog Input Selection (n077)

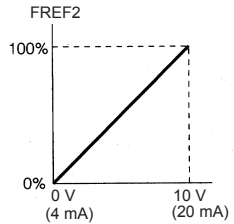
No.	Name	Unit	Setting Range	Initial Setting
n077	Multi-function Analog Input Selection	-	0 to 4	0

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.

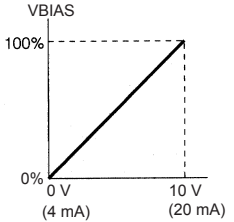
Analog Input Level

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	Initial 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 CC-Link 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.	124
3	Zero speed	Closed when Inverter output frequency is less than minimum output frequency.	-
4	Frequency detection 1	Output frequency ≥ Frequency Detection Level (n095)	106
5	Frequency detection 2	Output frequency ≤ Frequency Detection Level (n095)	106
6	Overtorque detection, NO contact output	-	105
7	Overtorque detection, NC contact output	-	105

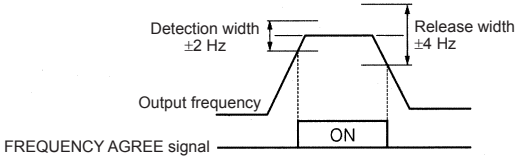
Setting	Name	Description	Ref.
8	Low torque detected, NO output	-	105
9	Low torque detected, NC output	-	105
10	Minor fault	Closed when an alarm has been detected.	-
11	Baseblocked	Closed when the Inverter output is OFF.	-
12	Operating mode	Closed when LOCAL is selected for the LOCAL/REMOTE selection.	-
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	141
20	Frequency reference loss	-	-
21	Inverter overheat alert (OH3)	-	-

Initial Settings

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

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

• FREQUENCY AGREE Signal (setting=2)



■ Preventing the Motor from Stalling (Current Limit)

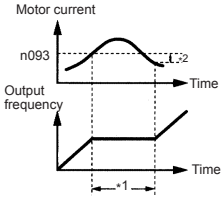
This function automatically adjusts the output frequency and output current according to the load to continue operation without stalling the motor.

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.

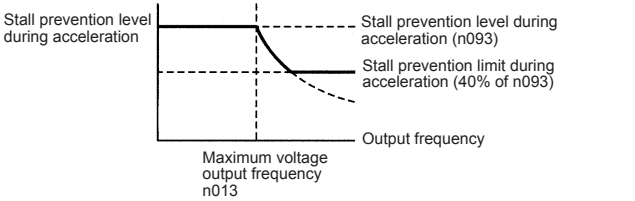


*1: Stops the acceleration to prevent the motor from stalling.
*2: Release width (hysteresis) of stall prevention during accel is approx. 5% of inverter rated current

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.

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%)

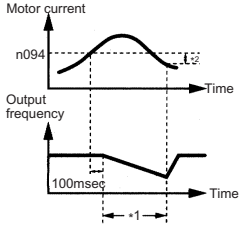
Factory setting: 160%

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 Acceleration 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.

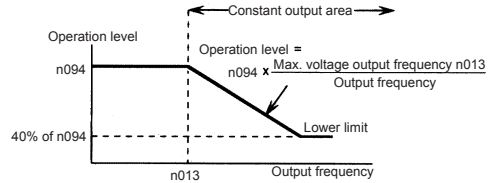
☐ Stall Prevention during Operation

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	Initial 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	Initial Setting
n116	Acceleration/Deceleration Time Selection during Stall Prevention	-	0=Disabled 1=Enabled	0

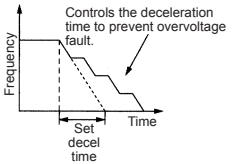
n116 Settings

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	Initial 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.

Notes: 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 electronic 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.

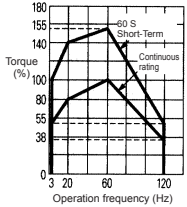
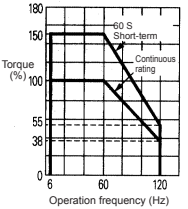
Constant No.	Name	Unit	Setting Range	Initial Setting
n038	Electronic Thermal Motor Protection Time Constant Setting	1 min	1 to 60 min	8 min

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 overload 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 continuous 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 (Initial 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	Initial 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 energy-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.

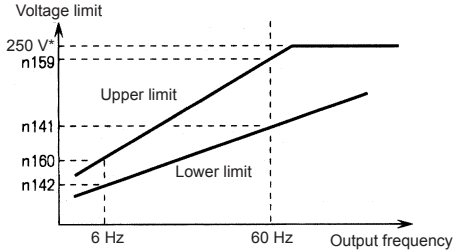
Constant No.	Name	Unit	Setting Range	Initial Setting
n140	Energy-saving Control Coefficient K2	-	0.0 to 6550	*
n158	Motor Code	-	0 to 70	*

* 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	Initial 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.

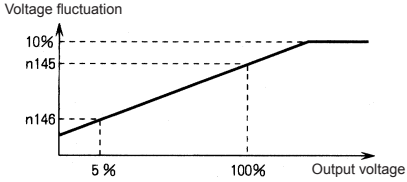
Constant No.	Name	Unit	Setting Range	Initial Setting
n144	Search Operation Voltage Limit	%	0 to 100	0

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	Initial 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	Initial 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	Initial 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
	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

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
	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

■ 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	Initial 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	Initial 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 (mechanical 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	Initial 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	Initial 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	Initial 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	Initial Setting
n163	PID Output Gain	Multi-ples	0.0 to 25.0	1.0

Constant n163 adjusts the output gain.

PID Feedback Gain (n129)

Constant No.	Name	Unit	Setting Range	Initial Setting
n129	PID Feedback Gain	Multi-ples	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	Initial 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

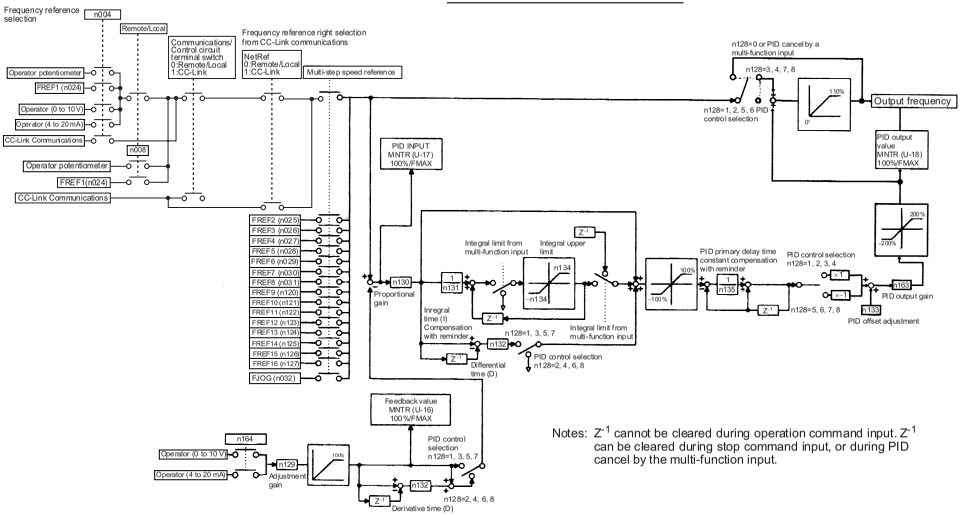
PID Limit

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

Prohibition of PID Output

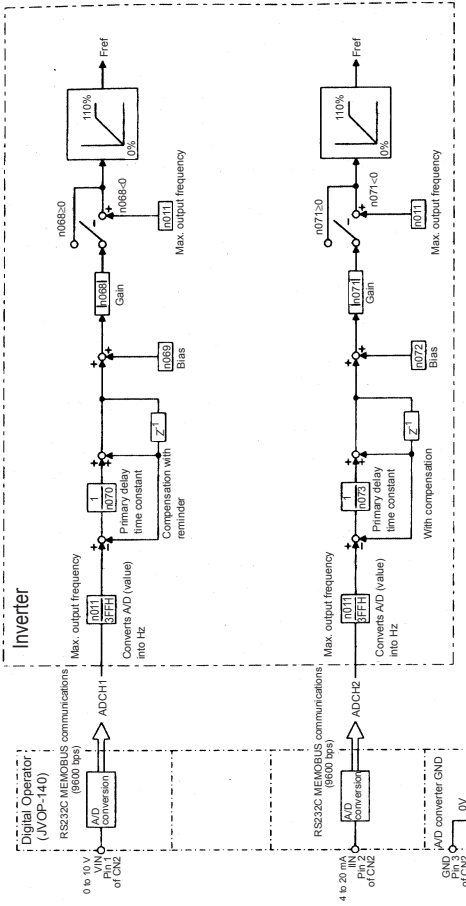
Zero limit occurs when the PID output is negative.

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	Initial 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	Initial 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 Constant 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.	n001 (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 Function 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.)

Notes: 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. • Execute write-in (COPY) using the Constant Copy Function Selection (n176).	• 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. • 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. • Press DSPL or 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 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.)

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.)
• Execute 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.) 60.0 (Flashes) 50.0 (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.

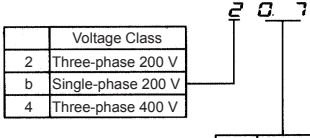
☐ Inverter Capacity Display

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 fy by pressing the ⌃ or ⌄ key. • Press ENTER. • Press DSPL or ENTER.	n176 rdy (Lit) vA (Lit) 20.7 (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

☐ 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) 0200 (Lit) (Software version: VSP030200) 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 constant 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).
F04	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.
vAE	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)
	Frequency Reference Display from CC-Link communications (U-70)

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.

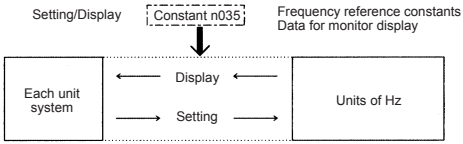
Constant No.	Constant Name	Description	Initial Setting
035	Setting/Displaying Unit Selection for Frequency Reference	0: Units of 0.01 Hz (less than 100 Hz) 0.1 Hz (100 Hz and more) 1: Units of 0.1% 2 to 39: Units of r/min (set the number of motor poles) 40 to 3999: Any unit	0

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

Notes: 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:



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 $\div 39 = 184.9$, 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 Operation after Detecting CC-Link Communications Error

□ CC-Link Timeover Detection Selection (n151)

Select operation method when CC-Link communications error (bUS) occurred.

Constant No.	Name	Unit	Setting Range	Initial Setting
n151	CC-Link Timeover Detection Selection	–	0 to 7	0

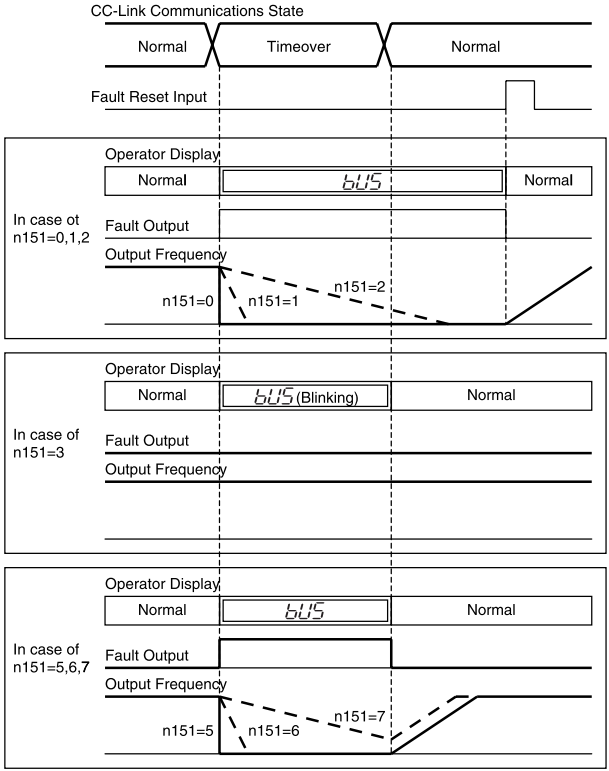
n151 Settings

n151 Setting	Timeover Detection	Stopping Method	Operator Display	Auto Reset
0	Enabled	Coast to a stop	bUS (Lit)	Disabled
1	Enabled	Deceleration to a stop by Deceleration Time 1	bUS (Lit)	Disabled
2	Enabled	Deceleration to a stop by Deceleration Time 2	bUS (Lit)	Disabled
3	Enabled	Continuous operation, warning display	bUS (Blinking)	–
4	Disabled	–	–	–
5*	Enabled	Coast to a stop	bUS (Lit)	Enabled
6*	Enabled	Deceleration to a stop by Deceleration Time 1	bUS (Lit)	Enabled
7*	Enabled	Deceleration to a stop by Deceleration Time 2	bUS (Lit)	Enabled

* These settings are available from software No.VSP030201 (PRG: 0201) or later.

See the next page for detail description of operation.

☐ Details of CC-Link Timeover Detection Selection



NOTE When n151 is set 5, 6, or 7, the inverter reset automatically after recovering CC-Link communications error.

8. Maintenance and Inspection

■ 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:

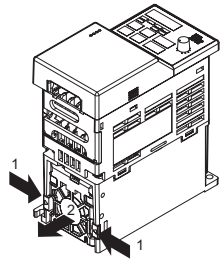
- Ambient temperature: Yearly average of 30°C
- Load factor: 80% max.
- Operating rate: 12 hours max. per day

☐ Replacement of Cooling Fan

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

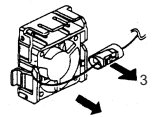
1. Removal

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.

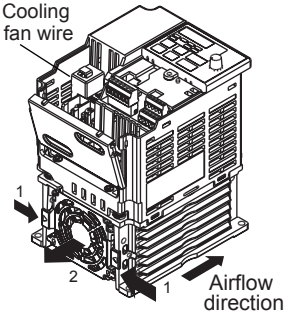


Airflow direction

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.

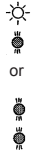
Corrective Actions of Models with Digital Operator

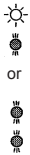
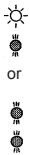
☼ : ON ◍ : Flashing ● : OFF

Alarm Displays and Meaning

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
UU Flashing	◍	Detected as an alarm only. Fault contact output is not activated. Resets when cause is removed.	UV (Main circuit undervoltage) 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 power 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?
OU 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.
CAL Flashing			Waiting to receive data.	Check communications devices.

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. Resets when cause is removed.	Communications error	Baud rate fault: Communications could not be established because the Master's baud rate does not match the Inverter's baud rate. Reset the baud rates of the Master and Inverter to the same value and turn ON the power to the Inverter again.
oP□			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)	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. Resets when cause is removed.	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).
SrP 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. STP (Emergency stop) Inverter received emergency stop alarm signal. Inverter stops according to constant n005.	Check the external circuit (sequence). 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.
ASE			A multi-function input/output allocation request error occurred.	The multi-function input/output allocation change request (RY19) turned ON while running. An alarm will not be output when RY19 turns ON while running if the multi-function allocation has already been changed. Turn ON the multi-function input/output allocation change request (RY19) while stopped.

Alarm Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
CHG		Detected as an alarm only. Fault contact output is not activated. Resets when cause is removed.	Switch changed while power is ON.	An attempt was made to change the switch settings for a station address or baud rate while the power is ON. Turn OFF the power before changing the switch settings. Return the switch settings to the status when power was turned ON.
AEr			Illegal station address setting	The station address switch is not set to a value between 1 and 64. Set the station address switch correctly and turn ON the power again.
bEr			Illegal baud rate setting	The baud rate switch is not set to a value between 0 and 4. Set the baud rate switch correctly and turn ON the power again.
UL3 Flashing			UL3 (undertorque) V/f mode: The output current is less than the undertorque detection level (constant n118). Vector mode: The output current or output torque has reached the undertorque detection level (constants n097, n118). When undertorque is detected, perform operations according to the setting in constant n117.	Check whether the settings in n118 are appropriate. Check the usage conditions of the machine and remove the cause.
oH3 Flashing			OH3 (Inverter overheat alert) The inverter overheat alert (OH3) has been input from a multi-function input terminal (S1 to S7).	Clear the Inverter overheat alert input for the multi-function terminal.

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 undervoltage) 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 (Heatsink 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 DC voltage is fluctuating abnormally not during regeneration.	• Open phase of input power supply • Momentary power loss • Excessive voltage fluctuation of input power supply • Voltage imbalance between lines Check for breaks in main circuit power lines. Check the power supply voltage. Check for loose terminal screws.
LF			LF (Output open phase) An open phase occurred at the Inverter output side.	• Broken output cables • Broken motor windings • Loose output terminal screws Check for breaks in output wiring. Check the motor impedance Check for loose output terminal screws.
UL3			UL3 (undertorque) V/f mode: The output current is less than the undertorque detection level (constant n118). Vector mode: The output current or output torque has reached the undertorque detection level (constants n097, n118). When undertorque is detected, perform operations according to the setting of constant n117.	• Check whether the setting of n118 is appropriate. • Check the usage conditions of the machine 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 CC-Link 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 46 for constant initialization.) • Cycle power. If the fault remains, replace the Inverter.

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

Fault Display		Inverter Status	Description	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
F05	● ☼	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.
F07			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 connection fault)	Cycle power. If the fault remains, replace the Inverter.
SrP	◉ ☼ or ● ☼	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			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 CC-Link Master.	Check the status of the CC-Link 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 46.

☐ Errors Indicated by the CC-Link Communications Indicators

The following table shows the Varispeed V7 indicator displays when a fault occurs, the cause, and the corrective action. Check the following items if communications stop during operation.

- Are the communications cables correctly installed? (Are there any poor contacts or broken wires?)
- Is the PLC's program being executed correctly? Has the PLC's CPU stopped?
- Have data communications stopped due to a momentary power loss?

: ON : Flashing ●: OFF

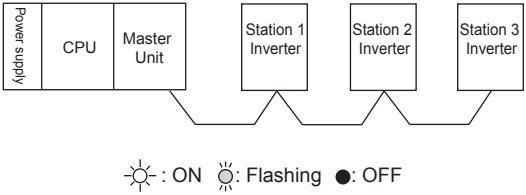
Indicator Status				Cause	Corrective Action
Master Unit	Remote Device Station Varispeed V7				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ● SD * RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ● SD * RD ☼ L.ERR ●	Inverter's station address duplication for Station 1 and Station 3.	After setting the station addresses of the Inverters with the same address correctly and turn ON the power again.
	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ● SD ● RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	Baud rate setting of Inverter at Station 2 is not the same as the setting for the Master Unit.	After setting the baud rate correctly, turn ON the power again.
	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ☼	Setting switch of Inverter at Station 3 was changed after turning ON the power.	Return the Inverter setting switch to the original settings or turn ON the power to the Inverter again.

* Indicates that the indicator is either ON or OFF.

Indicator Status				Cause	Corrective Action
Master Unit	Remote Device Station Varispeed V7				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ● SD ● RD ☼ L.ERR ☼	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	The switch setting of Inverter at Station 1 is out of range (B.RATE: 5 to 9, STA: 65 or higher).	After setting the Inverter's setting switch correctly and turn ON the power again.

Indicator Status				Cause	Corrective Action
Master Unit	Remote Device Station Varispeed V7				
	Station 1	Station 2	Station 3		
TIME ● LINE ● or TIME ○ LINE ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ☼	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	The Inverter at Station 2 is being adversely affected by noise. (The L.RUN indicator may be OFF.)	Check the FG grounding of each Inverter and the Master Unit.
	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ☼	L.RUN ☼ SD ☼ RD ☼ L.ERR ☼	The transmission cable between Inverters at Station 2 and 3 is being adversely affected by noise. (The L.RUN indicator may be OFF.)	Check the SLD connection of the transmission cable. Lay the cable as far away from power lines as possible (100 mm min.).
	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ☼	Terminating resistance is not connected. (The L.RUN indicator may be OFF.)	Check whether terminating resistance is connected.

The following table shows the causes and corrective action that can be determined from the Inverter communications indicator status for the following system configuration when the Master Unit's SW, M/S, and PRM indicators are OFF.



Indicator Status				Cause	Corrective Action
Master Unit	Remote Device Station Varispeed V7				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	Normal	-
	L.RUN ● SD ● RD ● L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	The communications wiring for the Inverter at Station 1 is not correctly installed.	Check the installation and rewire the Inverter correctly
	L.RUN * SD * RD * L.ERR *	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	The Inverter at Station 1 is faulty. (Often, all indicators will be OFF.) An error may be displayed at the Inverter.	Replace the Inverter.

* Indicates that the indicator is either ON or OFF.

Indicator Status				Cause	Corrective Action
Master Unit	Remote Device Station Varispeed V7				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ☼ SD ☼ RD ☼ L.ERR ●	L.RUN ● SD ＊ RD ＊ L.ERR ●	L.RUN ● SD ＊ RD ＊ L.ERR ●	The L.RUN indicators for Station 2 onwards are OFF, indicating a break in the transmission cables between Station 1 and Station 2, or the Stations are disconnected from the terminal block.	Search for the breakage while using the indicator status as reference, and repair the break.
	L.RUN ● SD ＊ RD ＊ L.ERR ●	L.RUN ● SD ＊ RD ＊ L.ERR ●	L.RUN ● SD ＊ RD ＊ L.ERR ●	The communications cable is short-circuited.	Determine which of the three wires in the communications cable is short-circuited, and repair the wire.

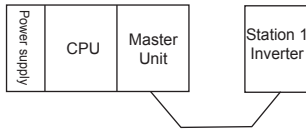
Indicator Status				Cause	Corrective Action
Master Unit	Remote Device Station Varispeed V7				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ● SD ＊ RD ＊ L.ERR ＊	L.RUN ● SD ＊ RD ＊ L.ERR ＊	L.RUN ● SD ＊ RD ＊ L.ERR ＊	The communications cable is not wired correctly.	Check the wiring of the Varispeed V7 terminal block and rewire the incorrectly wired section.

＊ Indicates that the indicator is either ON or OFF.

Checking Errors Using the Indicators

L.RUN: ON when receiving refresh data normally. OFF when communications are interrupted for a specific interval.
SD: ON when send data is 1.
RD: ON when receive data carrier is detected.
L.ERR: ON when there is a CRC or abort error in data for local station

The following table shows the causes and corrective action that can be determined from the Inverter communications indicator status for the following system configuration.



LED ☼ : ON ● : OFF ◌ : Flashing				Cause	Corrective Action
L.RUN	RD	SD	L.ERR		
☼	◌	◌	◌	Communications are normal but an error has occurred.	Remove noise or other interference.
☼	◌	◌	●	Communications are normal.	
☼	●	◌	◌	Hardware fault	Turn ON power again. Replace the Inverter.
☼	●	◌	●	Hardware fault	Turn ON power again. Replace the Inverter.
☼	◌	●	◌	CRC error has occurred in receive data and response is not sent.	Remove noise or other interference.
☼	◌	●	●	Data has not arrived at local station.	Check the PLC program.
☼	●	●	◌	Hardware fault	Turn ON power again. Replace the Inverter.
☼	●	●	●	Hardware fault	Turn ON power again. Replace the Inverter.
●	◌	◌	◌	A polling response is received, but a CRC error occurs while receiving refresh data.	Remove noise or other interference.
●	◌	◌	●	Hardware fault	Turn ON power again. Replace the Inverter.

LED ☼: ON ●: OFF ☼: Flashing				Cause	Corrective Action
L.RUN	RD	SD	L.ERR		
●	●	☼	☼	Hardware fault	Turn ON power again. Replace the Inverter.
●	●	☼	●	Hardware fault	Turn ON power again. Replace the Inverter.
●	☼	●	☼	A CRC error has occurred in the data sent to the local station.	Remove noise or other interference.
●	☼	●	●	Either no data has been sent to the local station or the local station cannot receive data due to noise.	Remove noise or other interference.
●	●	●	☼	Hardware fault	Turn ON power again. Replace the Inverter.
●	●	●	●	Data cannot be received due to broken cables.	Check the wiring.
●	● or ☼	●	☼	Incorrect baud rate or station address setitng.	Set the setting correctly and turn ON the power again.
☼	☼	☼	☼	Baud rate or station address were changed after turning ON the power.	Return to the original settings. Turn ON the power again.

■ Troubleshooting

Trouble	Cause	Corrective Actions
Communications disabled with CC-Link 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 CC-Link master, and turn ON the power supply again.
	Station address is already used by another device.	Change the station address so that it will not be the same as that of any other device, and turn ON the power supply again.
	Terminating resistance is incorrectly connected or not connected on the communications line.	Check that the terminating resistance is connected correctly on the communications line.
	CC-Link master does not operate.	Check that the CC-Link master is always operating correctly.
Although CC-Link communications established, the Inverter does not run when an operation is started by the CC-Link master.	**Incorrect operation method is selected.** Selection of operation Run command selection (n003) is not set to CC-Link communications.	Set Run command selection (n003) to CC-Link 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.
	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 and the base frequency 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.
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∗T□□□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7
		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
Output Characteristics	Inverter Capacity (kVA)		0.3	0.6	1.1	1.9	3.0	4.2	6.7
	Rated Output Current (A)		0.8	1.6	3	5	8	11	17.5
	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∗T□□□□	3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7
	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*T□□□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7
		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∗T□□□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7
Other Functions	Indications	Status Indicators	RUN, ALARM, L.RUN, SD, RD, and L.ERR 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 110.
* 3. There is no corresponding external output terminal.

■ Standard Specifications (400 V Class)

Voltage Class		400 V 3-phase						
Model CIMR-V7∗T□□□□	3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7
	Single-phase	-	-	-	-	-	-	-
Max. Applicable Motor Output kW*1		0.37	0.55	1.1	1.5	2.2	3.0	3.7
Output Characteristics	Inverter Capacity (kVA)	0.9	1.4	2.6	3.7	4.2	5.5	7.0
	Rated Output Current (A)	1.2	1.8	3.4	4.8	5.5	7.2	9.2
	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∗T□□□□	3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7
	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						

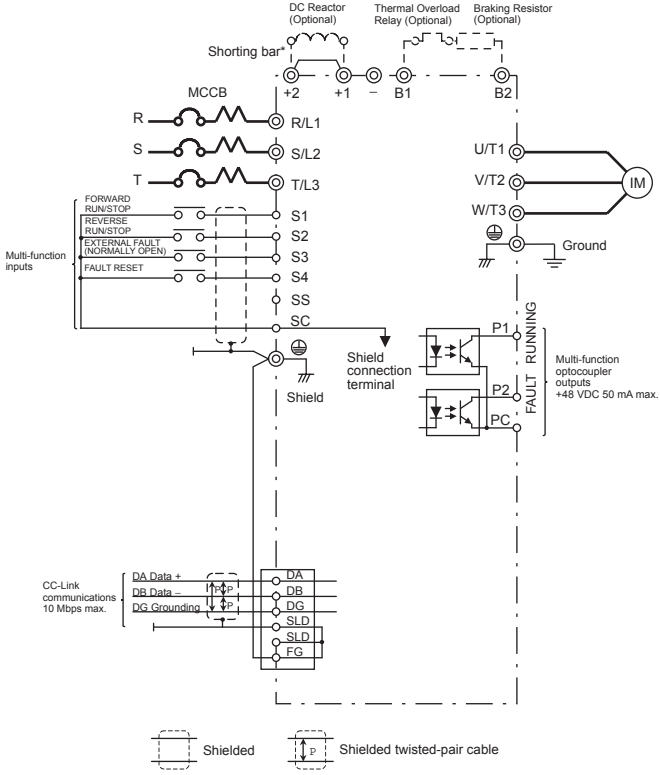
* 1. Based on a standard 4-pole motor for max. applicable motor output.
* 2. Shows deceleration torque for uncoupled motor decelerating from 60 Hz with the shortest possible deceleration time.

Voltage Class			400 V 3-phase						
Model CIMR-V7∗T□□□□		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7
		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∗T□□□□		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7
		Single-phase	-	-	-	-	-	-	-
Other Functions	Indications	Status Indicators	RUN, ALARM, L.RUN, SD, RD, and L.ERR 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: 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						

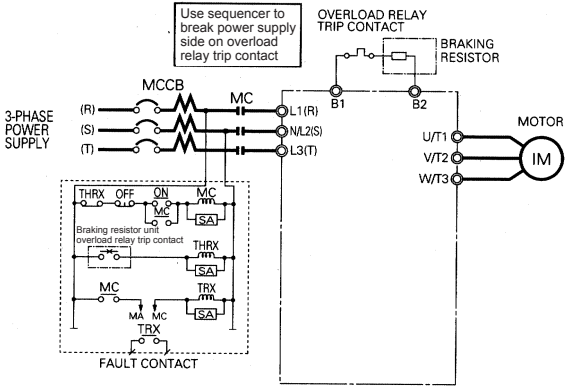
* 1. Temperature during shipping (for short period).
* 2. For details, refer to *Reducing Motor Noise or Leakage Current (n080)* on page 110.
* 3. There is no corresponding external output terminal.

■ Standard Wiring



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

Connection Example of Braking Resistor



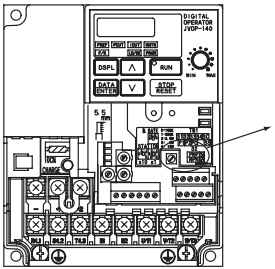
* Disable stall prevention during deceleration by setting n092 to 1 when using a Braking Resistor Unit. The motor may not stop within the deceleration time if this setting is not changed.

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)

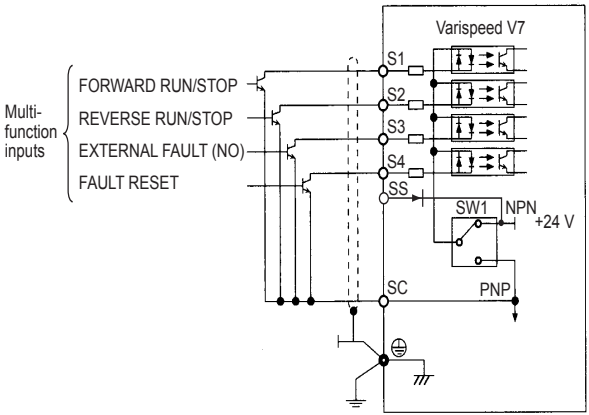
Type		Terminal		Name	Function (Signal Level)	
Control Circuit	Input	Sequence	S1	Multi-function input selection 1	Factory setting closed:FWD run open: REV run	Optocoupler insulation, 24 VDC, 8 mA
			S2	Multi-function input selection 2	Factory setting closed:REV run open: FWD run	
			S3	Multi-function 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	
			SS	Multi-function input selection external power supply	External power supply (+24 V) connection	
	Output	Multi-function output	P1	Optocoupler output 1	Factory setting: Run	Optocoupler output +48 VDC, 50 mA or less
			P2	Optocoupler output 2	Factory setting: Frequency agree	
			PC	Optocoupler output common	0 V	
CC-Link Communications		1		DA	Communication data +	CC-Link communications, up to 10 Mbps
		2		DB	Communication data –	
		3		DG	Signal ground	
		4		SLD	Shield	
		5		SLD	Shield	
		6		FG	Frame Ground	

■ Sequence Input Connection with NPN/PNP Transistor

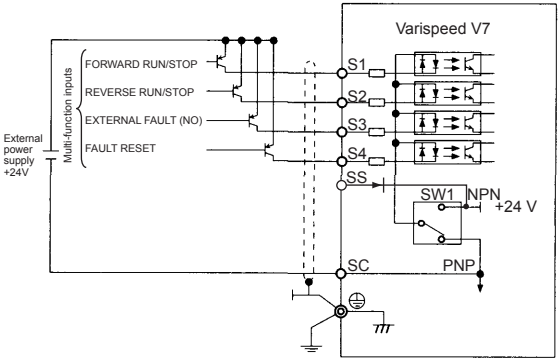


When connecting sequence inputs (S1 to S4) with transistor, turn the rotary switch SW1 depending on the polarity (0 V common: NPN side, +24 V common: PNP side).
Factory setting: NPN side

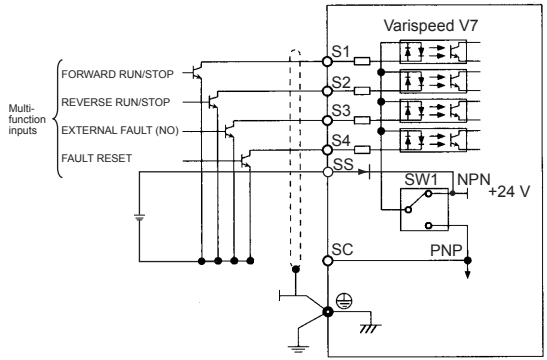
Sequence Connection with NPN Transistor (0 V Common)



Sequence Connection with PNP Transistor (+24 V Common)



Sequence Connection with NPN Transistor (0 V Common, External Power Supply)



■ Dimensions/Heat Loss (Unit: mm)

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

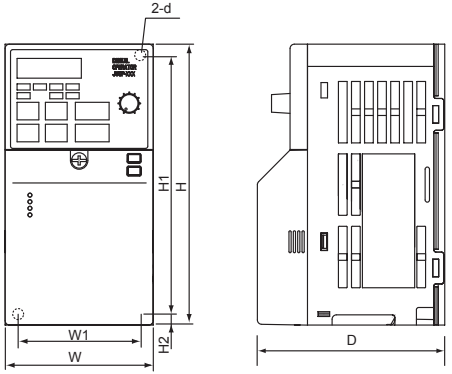


Fig. 1

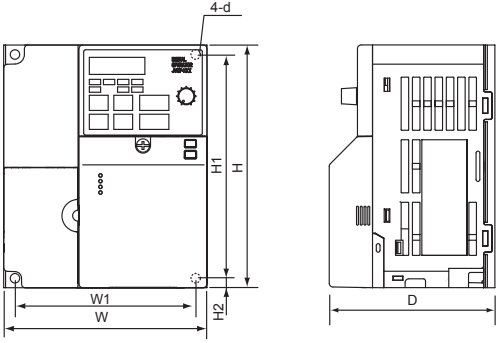


Fig. 2

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.
										Heat-sink	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
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
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

■ 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
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7
Rated Output Current (A)	0.8	1.6	3	5	8	11	17.5
MCCB type NF30 (MITSUBISHI)	5 A	5 A	5 A	10 A	20 A	20 A	30 A
Magnetic contactor type HI (Yaskawa CONTROL)	HI-7E	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-10-2E	HI-20E
Fuse (UL Class RK5)	5 A	5 A	5 A	10 A	20 A	20 A	30 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
MCCB type NF30, NF50 (MITSUBISHI)	5 A	5 A	10 A	20 A	20 A	40 A	50 A

Varispeed V7 Model	V7** B0P1	V7** B0P2	V7** B0P4	V7** B0P7	V7** B1P5	V7** B2P2	V7** B3P7
Magnetic contactor type HI (Yaskawa CONTROL)	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
Capacity (kVA)	0.9	1.4	2.6	3.7	4.2	5.5	6.6
Rated Output Current (A)	1.2	1.8	3.4	4.8	5.5	7.2	8.6
MCCB type NF30, NF50 (MITSUBISHI)	5 A	5 A	5 A	10 A	10 A	20 A	20 A
Magnetic contactor type HI (Yaskawa CONTROL)	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-10-2E	HI-10-2E	HI-10-2E
Fuse (UL Class RK5)	5 A	5 A	5 A	10 A	10 A	20 A	20 A

Surge Suppressors

Surge Suppressors / Coils and Relays		Model DCR2-	Specifications	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

First Functions (Constants n001 to n044)

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
001	1101h	2101h	Constant Selection/Initialization	0 to 4, 6, 8, 9	1	1		86
002	1102h	2102h	Control Mode Selection *6	0, 1	1	0*1		91
003	0103h	2103h	RUN Command Selection	0 to 3	1	3		96
004	1104h	2104h	Frequency Reference Selection	0 to 9	1	9		97
005	1105h	2105h	Stopping Method Selection	0, 1	1	0		113
006	1106h	2106h	Reverse Run Prohibit	0, 1	1	0		98
007	1107h	2107h	Stop Key Selection	0, 1	1	0		112
008	1108h	2108h	Frequency Reference Selection in Local Mode	0, 1	1	1*5		96
009	1109h	2109h	Frequency Reference Setting Method From Digital Operator	0, 1	1	0		97
010	110Ah	210Ah	Detecting Fault Contact Of Digital Operator	0, 1	1	0		96
011	110Bh	210Bh	Max. Output Frequency	50.0 to 400.0 Hz	0.1 Hz	60.0 Hz		88
012	110Ch	210Ch	Max. Voltage	0.1 to 255.0 V*2	0.1 V	200.0 V*2		88
013	110Dh	210Dh	Max. Voltage Output Frequency (Base Frequency)	0.2 to 400.0 Hz	0.1 Hz	60.0 Hz		88
014	110Eh	210Eh	Mid. Output Frequency	0.1 to 399.9 Hz	0.1 Hz	1.5 Hz*6		88
015	110Fh	210Fh	Mid. Output Frequency Voltage	0.1 to 255.0 V*2	0.1 V	12.0 V*2 *6		88
016	1110h	2110h	Min. Output Frequency	0.1 to 10.0 Hz	0.1 Hz	1.5 Hz*6		88
017	1111h	2111h	Min. Output Frequency Voltage	0.1 to 50.0 V*2	0.1 V	12.0 V*2 *6		88
018	1112h	2112h	Selecting Setting Unit for Acceleration/deceleration Time	0, 1	1	0		103
019	1113h	2113h	Acceleration Time 1	0.00 to 6000 s	Depend on n018 setting	10.0 s		102
020	1114h	2114h	Deceleration Time 1	0.00 to 6000 s	Depend on n018 setting	10.0 s		102

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
021	1115h	2115h	Acceleration time 2	0.00 to 6000 s	Depend on n018 setting	10.0 s		102
022	1116h	2116h	Deceleration Time 2	0.00 to 6000 s	Depend on n018 setting	10.0 s		102
023	1117h	2117h	S-curve Selection	0 to 3	1	0		104
024	1118h	2118h	Frequency Reference 1 (Master Speed Frequency Reference)	0.00 to 400.0 Hz	0.01 Hz	6.00 Hz		98
025	1119h	2119h	Frequency Reference 2	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
026	111Ah	211Ah	Frequency Reference 3	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
027	111Bh	211Bh	Frequency Reference 4	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
028	111Ch	211Ch	Frequency Reference 5	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
029	111Dh	211Dh	Frequency Reference 6	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
030	111Eh	211Eh	Frequency Reference 7	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
031	111Fh	211Fh	Frequency Reference 8	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		98
032	1120h	2120h	Jog Frequency	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		100
033	1121h	2121h	Frequency Reference Upper Limit	0% to 100%	1%	100%		101
034	1122h	2122h	Frequency Reference Lower Limit	0% to 100%	1%	0%		101
035	1123h	2123h	Setting/displaying Unit Selection for Frequency Reference	0 to 3999	1	0		154
036	1124h	2124h	Motor Rated Current	0% to 150% of Inverter rated current	0.1 A	*3		130
037	1125h	2125h	Electronic Thermal Motor Protection Selection	0 to 2	1	0		130
038	1126h	2126h	Electronic Thermal Motor Protection Time Constant Setting	1 to 60 min	1 min	8 min		130
039	1127h	2127h	Selecting Cooling Fan Operation	0, 1	1	0		132
040	1128h	2128h	Motor Direction for Forward RUN	0, 1	1	0		---
041	1129h	2129h	Acceleration Time 3	0.00 to 6,000 s	Set in n018.	10.0 s		---

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
042	112Ah	212Ah	Deceleration Time 3	0.00 to 6,000 s	Set in n018.	10.0 s		---
043	112Bh	212Bh	Acceleration Time 4	0.00 to 6,000 s	Set in n018.	10.0 s		---
044	112Ch	212Ch	Deceleration Time 4	0.00 to 6,000 s	Set in n018.	10.0 s		---

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
050	1132h	2132h	Multi-function Input Selection 1 (Terminal S1)	1 to 33	1	1		115
051	1133h	2133h	Multi-function Input Selection 2 (Terminal S2)	1 to 33	1	2		115
052	1134h	2134h	Multi-function Input Selection 3 (Terminal S3)	0 to 33	1	3		115
053	1135h	2135h	Multi-function Input Selection 4 (Terminal S4)	1 to 34	1	5		115
054	1136h	2136h	Multi-function Input Selection 5 (Terminal S5)	1 to 33	1	6		115
055	1137h	2137h	Multi-function Input Selection 6 (Terminal S6)	1 to 33	1	7		115
056	1138h	2138h	Multi-function Input Selection 7 (Terminal S7)	1 to 33	1	10		115
057	1139h	2139h	Multi-function Output Selection 1	0 to 21	1	13		122
058	113Ah	213Ah	Multi-function Output Selection 2	0 to 21	1	1		122
059	113Bh	213Bh	Multi-function Output Selection 3	0 to 21	1	0		122
064	1140h	2140h	Processing During Analog Frequency Reference Loss	0: Processing disabled 1: Processing enabled	1	0		---
068	1144h	2144h	Analog Frequency Reference Gain	−255% to 255%	1%	100%		143
069	1145h	2145h	Analog Frequency Reference Bias	−100% to 100%	1%	0%		143
070	1146h	2146h	Analog Frequency Reference Filter Time Constant	0.00 to 2.00 s	0.01 s	0.10 s		143
071	1147h	2147h	Analog Frequency Reference Gain	−255 to 255	1%	100%		143
072	1148h	2148h	Analog Frequency Reference Bias	−100% to 100%	1%	0%		143
073	1149h	2149h	Analog Frequency Reference Filter Time Constant	0.00 to 2.00 s	0.01 s	0.01 s		143
077	114Dh	214Dh	Multi-function Analog Input Function	0 to 4	1	0		120
078	114Eh	214Eh	Multi-function Analog Input Signal Selection	0, 1	1	0		120
079	114Fh	214Fh	Sequence Input Double Reading Selection	0, 1	1	0		---

Third Functions (Constants n080 to n119)

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
080	1150h	2150h	Carrier Frequency Selection	1 to 4, 7 to 9	1	4*4		110
081	1151h	2151h	Momentary Power Loss Ridethrough Method	0 to 2	1	0		103
082	1152h	2152h	Automatic Retry Attempts	0 to 10 times	1	0		107
083	1153h	2153h	Jump Frequency 1	0.00 to 4.00 Hz	0.01 Hz	0.00 Hz		107
084	1154h	2154h	Jump Frequency 2	0.00 to 4.00 Hz	0.01 Hz	0.00 Hz		107
085	1155h	2155h	Jump Frequency 3	0.00 to 4.00 Hz	0.01 Hz	0.00 Hz		107
086	1156h	2156h	Jump Frequency Range	0.00 to 4.00 Hz	0.01 Hz	0.00 Hz		107
089	1159h	2159h	DC Injection Braking Current	0% to 100%	1%	50%		109
090	115Ah	215Ah	DC Injection Braking Time at Stop	0.0% to 25.5%	0.1s	0.5s		114
091	115Bh	215Bh	DC Injection Braking Time at Startup	0.0% to 25.5%	0.1s	0.0s		109
092	115Ch	215Ch	Stall Prevention During Deceleration	0.1	1	0		128
093	115Dh	215Dh	Stall Prevention Level During Acceleration	30% to 200%	1%	170%		125
094	115Eh	215Eh	Stall Prevention while Running	30% to 200%	1%	160%		126
095	115Fh	215Fh	Frequency Detection Level (Multi-function Contact Output)	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		106
096	1160h	2160h	Overtorque Detection Function Selection 1	0 to 4	1	0		105
097	1161h	2161h	Overtorque Detection Function Selection 2	0.1	1	0		106
098	1162h	2162h	Overtorque Detection Level	30% to 200%	1%	160%		106
099	1163h	2163h	Overtorque Detection Time	0.1 to 10.0 s	0.1 s	0.1 s		106
100	1164h	2164h	Hold Output Frequency Saving Selection	0.1	1	0		119
101	1165h	2165h	Speed Search Deceleration Time	0.1 to 10.0 s	0.1 s	2.0 s		-
102	1166h	2166h	Speed Search Operating Level	0 to 200%	1%	150%		-
103	1167h	2167h	Torque Compensation Gain	0.0 to 2.5	0.1	1.0		90

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
104	1168h	2168h	Torque Compensation Time Constant	0.0 to 25.5 s	0.1 s	*6		90
105	1169h	2169h	Torque Compensation Iron Loss	0.0 to 6550	0.1 W	*3		90
106	116Ah	216Ah	Motor Rated Slip	0.0 to 20.0 Hz	0.1 Hz	*3		92
107	116Bh	216Bh	Line to Neutral (per Phase)	0.000 to 65.50 Ω	0.001 Ω	*3		92
108	116Ch	216Ch	Motor Leakage Inductance	0.00 to 655.0 mH	0.01 mH	*3		93
109	116Dh	216Dh	Torque Limiter	0% to 250%	1%	150%		---
110	116Eh	216Eh	Motor No-load Current	0% to 99%	1%	*3		91
111	116Fh	216Fh	Slip Compensation Gain	0.0 to 2.5	0.1	*6		129
112	1170h	2170h	Slip Compensation Time Constant	0.0 to 25.5 s	0.1 s	*6		---
113	1171h	2171h	Slip Correction During Regenerative Operation	0, 1	1	0		---
115	1173h	2173h	Stall Prevention Automatic Decrease Selection	0, 1	1	0		---
116	1174h	2174h	Acceleration/deceleration Time during Stall Prevention	0, 1	1	0		---
117	1175h	2175h	Low Torque Detection Function Selection	0 to 4	1	0		---
118	1176h	2176h	Low Torque Detection Level	0% to 200%	1%	10%		---
119	1177h	2177h	Low Torque Detection Time	0.1 to 10.0 s	0.1 s	0.1 s		---

Fourth Functions (Constants n120 to n179)

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
120	1178h	2178h	Frequency Reference 9	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
121	1179h	2179h	Frequency Reference 10	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
122	117Ah	217Ah	Frequency Reference 11	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
123	117Bh	217Bh	Frequency Reference 12	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
124	117Ch	217Ch	Frequency Reference 13	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
125	117Dh	217Dh	Frequency Reference 14	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
126	117Eh	217Eh	Frequency Reference 15	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
127	117Fh	217Fh	Frequency Reference 16	0.00 to 400.0 Hz	0.01 Hz	0.00 Hz		99
128	1180h	2180h	PID Control Selection	0 to 8	1	0		137
129	1181h	2181h	PID Feedback Gain	0.00 to 10.00	0.01	1.00		140
130	1182h	2182h	Proportional Gain (P)	0.0 to 25.0	0.1	1.0		139
131	1183h	2183h	Integral Time (I)	0.0 to 360.0 s	0.1 s	1.0		139
132	1184h	2184h	Derivative Time (D)	0.00 to 2.50 s	0.01 s	0.00		139
133	1185h	2185h	PID Offset Adjustment	–100% to 100%	1%	0%		139
134	1186h	2186h	Upper Limit of Integral values	0% to 100%	1%	100%		139
135	1187h	2187h	Primary Delay Time Constant for PID Output	0.0 to 10.0	0.1 s	0.0		140
136	1188h	2188h	Selection of PID Feedback Loss Detection	0 to 2	1	0		141
137	1189h	2189h	PID Feedback Loss Detection Level	0% to 100%	1%	0%		141
138	118Ah	218Ah	PID Feedback Loss Detection Time	0.0 to 25.5	0.1 s	1.0		141
139	118Bh	218Bh	Energy-saving Control Selection (V/f Control Mode)	0, 1	1	0		132
140	118Ch	218Ch	Energy-saving Coefficient K2	0.0 to 6550	0.1	*7		132
141	118Dh	218Dh	Energy-saving Control Voltage Lower Limit at 60 Hz	0% to 120%	1%	50%		133

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
142	118Eh	218Eh	Energy-saving Control Voltage Lower Limit at 6Hz	0% to 25%	1%	12%		133
143	118Fh	218Fh	Power Average Time	1 to 200	1 = 24 ms	1 (24 ms)		134
144	1190h	2190h	Search Operation Voltage Limit	0% to 100%	1%	0%		134
145	1191h	2191h	Search Operation Voltage Step at 100%	0.1% to 100%	0.1%	0.5%		134
146	1192h	2192h	Search Operation Voltage Step at 100%	0.1% to 10.0%	0.1%	0.2%		134
151	1197h	2197h	CC-Link Timeover Detection Selection	0 to 4	1	0		---
152	1198h	2198h	Setting/Displaying Unit Selection for Frequency Reference thru MEMOBUS	0 to 3	1	0		---
158	119Eh	219Eh	Motor Code (Energy-saving Control)	0 to 70	1	*7		132
159	119Fh	219Fh	Upper Voltage Limit for Energy-saving Control at 60 Hz	0% to 120%	1%	120%		133
160	11A0h	21A0h	Upper Voltage Limit for Energy-saving Control at 6 Hz	0% to 25%	1%	16%		133
161	11A1h	21A1h	Search Operation Power Detection Hold Width	0% to 100%	1%	10%		135
162	11A2h	21A2h	Time Constant of Power Detection Filter	0 to 255	1 = 4 ms	5 (20 ms)		135
163	11A3h	21A3h	PID Output Gain	0.0 to 25.0	0.1	1.0		140
164	11A4h	21A4h	PID Feedback Value Selection	0 to 5	1	0		138
166	11A6h	21A6h	Input Open-phase Detection Level	0% to 100%	1%	0%		---
167	11A7h	21A7h	Input Open-phase Detection Time	0 to 255 s	1 s	0 s		---
168	11A8h	21A8h	Output Open-phase Detection Level	0% to 100%	1%	0%		---
169	11A9h	21A9h	Output Open-phase Detection Time	0.0 to 2.0 s	0.1 s	0.0 s		---
173	11ADh	21ADh	DC Injection Braking Proportional Gain	1 to 999	1 = 0.001	83 (0.083)		---
174	11AEh	21AEh	DC Injection Braking Integral Time Constant	1 to 250	1 = 4 ms	25 (100 ms)		---
175	11AFh	21AFh	Reducing Carrier Frequency Selection At Low Speed	0, 1	1	0		112

No.	Command Code		Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
	Read	Write						
176	11B0h	21B0h	Constant Copy Function Selection	rdy, rEd, Cpy, vFy, vA, Sno		rdy		145
177	11B1h	21B1h	Constant Read Selection Prohibit	0, 1	1	0		145
178	11B2h	21B2h	Fault History	Stores, displays most recent 2 alarms	Setting disabled	-		147
179	11B3h	21B3h	Software Version No.	Displays lower-place 4 digits of software No.	Setting disabled	-		147

Notes: 1. Not initialized by constant initialization.
2. Upper limit of setting range and initial setting are doubled for 400 V Class.
3. Depends on Inverter capacity. Refer to page 212.
4. Depends on Inverter capacity. Refer to page 111.
5. Initial setting of the model with JVOP-147 Digital Operator (without potentiometer) is 1. Setting can be set to 0 by constant initialization.
6. When control mode selection (n002) is changed, initial setting corresponds to the control mode. Refer to page 211.
7. Depends on Inverter capacity. Refer to page 136.

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.

Initial Settings That Change with the Inverter Capacity

- 200 V Class 3-phase

No.	Name	Unit	Initial 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

- 200 V Class Single-phase

No.	Name	Unit	Initial 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	Initial 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
n036	Motor Rated Current	A	-	0.6	1.0	1.6	3.1	4.2	7.0	7.0
n105	Torque Compensation Iron Loss	W	-	3.4	4.0	6.1	11.0	11.7	19.3	19.3
n106	Motor Rated Slip	Hz	-	2.5	27	2.6	2.5	3.0	3.2	3.2
n107	Line to Neutral (per Phase)*	Ω	-	41.97	19.08	11.22	5.044	3.244	1.514	1.514
n108	Motor Leakage Inductance	MH	-	224.3	168.8	80.76	53.25	40.03	24.84	24.84
n110	Motor No-load Current	%	-	73	63	52	45	35	33	33

* 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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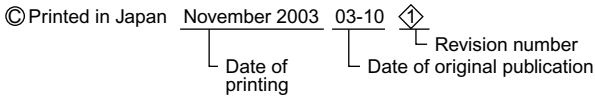

Date of Printing	Rev. No.	Section	Revised Content
October 2003	–	–	First Edition
November 2003	◇1	Chapter 4 to 6	Partly revised
		Chapter 7	Revision: PID control block diagram Addition: Section on Selecting Operation after Detecting CC-Link Communications Error
		Chapter 8 to 10	Partly revised
		Back Cover	Revision: Address
March 2004	◇2	Back Cover	Revision: Address
January 2006	◇3	Back Cover	Revision: Address

Varispeed V7
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