VS-606V7 Series

INSTRUCTION MANUAL

COMPACT GENERAL-PURPOSE INVERTER (VOLTAGE VECTOR CONTROL)

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

YASKAWA

MANUAL NO. TOE-S606-11D

PREFACE

YASKAWA's VS-606V7 is a small and simple inverter; as easy as using a contactor. This instruction manual describes installation, maintenance and inspection, troubleshooting, and specifications of the VS-606V7. Read this instruction manual thoroughly before operation.

YASKAWA ELECTRIC CORPORATION

General Precautions

- Some drawings in this manual are shown with the protective cover or shields removed in order to describe detail with more clarity. Make sure all covers and shields are replaced before operating this product.
- This manual may be modified when necessary because of the improvement of the product, modification, or changes in specifications.
  Such modifications are denoted by a revised manual No.
- 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.

NOTES FOR SAFE OPERATION

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the VS-606V7. In this manual, NOTES FOR SAFE OPERATION are classified as "WARNING" or "CAUTION."

⚠ WARNING

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

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel or damage to equipment.
It may also be used to alert against unsafe practices.

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

NOTE : These are steps to be taken to insure proper operation.

WARNINGS FOR UL/cUL MARKING

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

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

WARNINGS FOR CE MARKINGS

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

RECEIVING

⚠ CAUTION	
	(Ref. page)
• Do not install or operate any inverter which is damaged or has missing parts. Failure to observe this caution may result in personal injury or equipment damage.	16

MOUNTING

⚠ CAUTION	
	(Ref. page)
• Lift the cabinet by the cooling fin. When moving the unit, never lift by the plastic case or the terminal covers. Otherwise, the main unit may be dropped causing damage to the unit.	20
• Mount the inverter on nonflammable material (i.e. metal). Failure to observe this caution can result in a fire.	20
• When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 50℃ (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 to the unit.	21
• The VS-606V7 generates heat. For effective cooling, mount it vertically. Refer to the figure in “Mounting Dimensions” on page 21.	

WIRING

⚠ WARNING	
	(Ref. page)
• Only commence wiring after verifying that the power supply is turned OFF. Failure to observe this warning can result in an electric shock or a fire.	24
• Wiring should be performed only by qualified personnel. Failure to observe this warning can result in an electric shock or a fire.	24
• When wiring the emergency stop circuit, check the wiring thoroughly before operation. Failure to observe this warning can result in personal injury.	24
• Make sure to ground the ground terminal ⏚ according to the local grounding code. Failure to observe this warning can result in an electric shock or a fire.	28
• For 400V class, make sure to ground the supply neutral. Failure to observe this warning can result in an electric shock or a fire.	28

⚠ CAUTION

(Ref. page)

- Verify that the inverter rated voltage coincides with the AC power supply voltage.
  Failure to observe this caution can result in personal injury or a fire.
- Do not perform a withstand voltage test of the inverter.
  It may cause semi-conductor elements to be damaged.
- To connect a braking resistor, braking resistor unit or braking unit, follow the procedures described in this manual.
  Improper connection may cause a fire. 28
- Make sure to tighten terminal screws of the main circuit and the control circuit.
  Failure to observe this caution can result in a malfunction, damage or a fire. 24
- Never connect the AC main circuit power supply to output terminals U/T1, V/T2, W/T3.
  The inverter will be damaged and invalidate the guarantee. 24
- Do not connect or disconnect wires or connectors while power is applied to the circuit.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.

OPERATION

⚠ WARNING	
	(Ref. page)
• Only turn ON the input power supply after replacing the digital operator/blank cover (optional). Do not remove the digital operator or the covers while current is flowing. Failure to observe this warning can result in an electric shock.	
• Never operate the digital operator or dip switches when your hand is wet. Failure to observe this warning can result in an electric shock.	
• Never touch the terminals while current is flowing, even during inverter is stopping. Failure to observe this warning can result in an electric shock.	
• When the fault retry function is selected, stand clear of the inverter or the load, since it may restart suddenly after being stopped. (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.	61
• When continuous operation after power recovery is selected, stand clear of the inverter or the load, since it may restart suddenly after being stopped. (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.	56
• Since the digital operator stop button can be disabled by a function setting, install a separate emergency stop switch. Failure to observe this warning can result in personal injury.	
• If an alarm is reset with the operation signal ON, the inverter restarts automatically. Only reset the alarm after verifying that the operation signal is OFF. Failure to observe this warning can result in personal injury.	30

⚠ CAUTION

(Ref. page)

- Never touch the heatsink since the temperature is very high.
  Failure to observe this caution can result in harmful burns to the body.
- Since 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 can result in personal injury and machine damage.
- Install a holding brake separately if necessary.
  Failure to observe this caution can result in personal injury.
- If using an Inverter with an elevator, take safety measures on the elevator to prevent the elevator from dropping.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.
- All the constants of the inverter have been preset at the factory. Do not change the settings unnecessarily.
  The inverter may be damaged. 31

MAINTENANCE AND INSPECTION

⚠ WARNING

- Never touch high-voltage terminals in the inverter.
  Failure to observe this warning can result in an electrical shock
- Disconnect all power before performing maintenance or inspection. Then wait at least one minute after the power supply is disconnected and all LEDs and CHARGE LED are extinguished.
  The capacitors are still charged and can be dangerous.

⚠ WARNING	
	(Ref. page)
• Do not perform withstand voltage test on any part of the VS-606V7. This electronic equipment uses semiconductors and is vulnerable to high voltage.	
• Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement. [Remove all metal objects (watches, bracelets, etc.) before operation.] (Use tools which are insulated against electrical shock.) Failure to observe this warning can result in an electric shock.	127

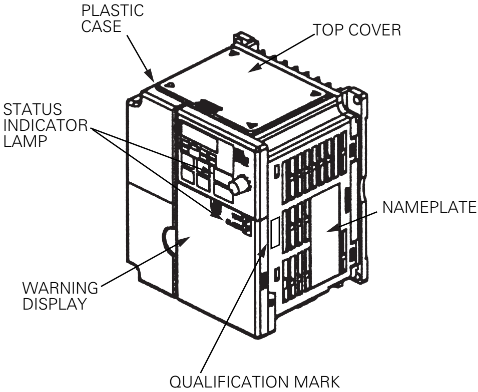
⚠ CAUTION	
	(Ref. page)
• The control PC board employs CMOS ICs. Do not touch the CMOS elements. They are easily damaged by static electricity.	
• Do not connect or disconnect wires, connectors, or cooling fan while power is applied to the circuit. Failure to observe this caution can result in personal injury.	127

Others

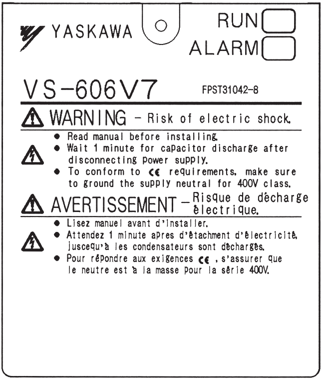
⚠ WARNING
• Never modify the product. Failure to observe this warning can result in an electrical shock or personal injury and will invalidate the guarantee.

WARNING DISPLAY

A warning label is displayed on the front cover of the inverter, as shown below. Follow these instructions when handling the inverter.



Warning Display



CONTENTS

1. RECEIVING

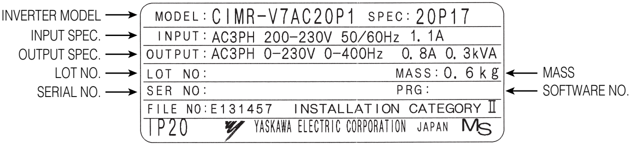
After unpacking the VS-606V7, check the following :

□ Verify that the part numbers match your purchase order or packing slip.
□ Check the unit for physical damage that may have occurred during shipping.

If any part of VS-606V7 is missing or damaged, call for service immediately.

■ Checking the Name Plate

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



MODEL

C I M R — V 7 A C 2 0 P 1

Inverter

VS-606V7 Series

No.	Type
A	With digital operator (with potentiometer)
B	Without digital operator (with blank cover)
C	With digital operator (without potentiometer)

Note: Contact your YASKAWA representatives for the type without heatsink.

	Applicable maximum motor output	
	200V class	400V class
0P1	0.1kW	——
0P2	0.25kW	0.37kW
0P4	0.55kW	0.55kW
0P7	1.1kW	1.1kW
1P5	1.5kW	1.5kW
2P2	2.2kW	2.2kW
3P0	——	3.0kW
4P0	4.0kW	4.0kW

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

No.	Specifications
C	European standards

SPEC

2 0 P 1 0

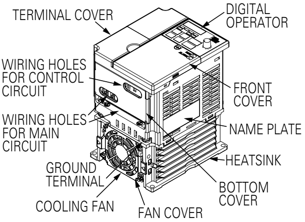
B	Single-phase 200VAC
2	Three-phase 200VAC
4	Three-phase 400VAC

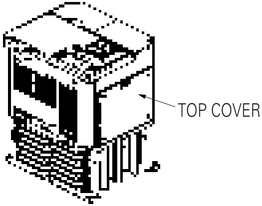
	Applicable maximum motor output	
	200V class	400V class
0P1	0.1kW	——
0P2	0.25kW	0.37kW
0P4	0.55kW	0.55kW
0P7	1.1kW	1.1kW
1P5	1.5kW	1.5kW
2P2	2.2kW	2.2kW
3P0	——	3.0kW
4P0	4.0kW	4.0kW

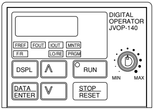
No.	Protective structure
0	Open chassis (IP20)
1	Enclosed wall-mounted*
7	Open chassis (IP20) Top-closed type

* NEMA 1 (TYPE 1) is optional.

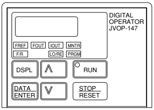
2. IDENTIFYING THE PARTS



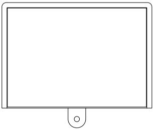




Digital operator
(with potentiometer)
JVOP-140
Used for setting or changing constants. Frequency can be set using potentiometer.

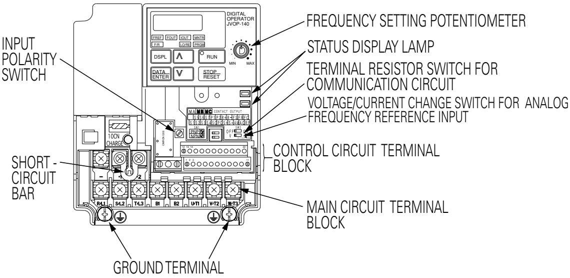


Digital operator
(without potentiometer)
JVOP-147
Used for setting or changing constants.

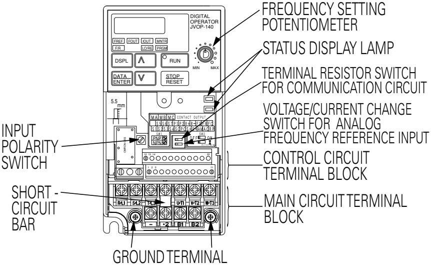


Blank cover
In models without a digital operator, the blank cover is mounted in place of the digital operator.

VS-606V7 inverters with the covers removed



Example of 3-phase (200V class,1.5kW) inverter



Example of 3-phase (200V class,0.1kW) inverter

Main Circuit Terminal Arrangement

Terminal arrangement of the main circuit terminal differs depending on the inverter model.

CIMR-V7*C20P1 to 20P7, B0P1 to B0P4

R/L1	S/L2	T/L3	+1	U/T1	V/T2	W/T3
		−	+2	B1	B2	

CIMR-V7*C21P5, 22P2, B0P7, B1P5, 40P2 to 42P2

−	+1	+2					
R/L1	S/L2	T/L3	B1	B2	U/T1	V/T2	W/T3

CIMR-V7*C24P0, B2P2, 43P0, 44P0

R/L1	S/L2	T/L3	−	+1	+2	B1	B2	U/T1	V/T2	W/T3

CIMR-V7*CB4P0

R/L1	S/L2	−	+1	+2	B1	B2	U/T1	V/T2	W/T3

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 ambient temperature range :

-10 to +50℃ (14 to 122℉) for IP20 (open chassis type),

-10 to +40°C (14 to 105°F) for NEMA 1 (TYPE 1), IP 20 (Top-closed type)

□ Rain, moisture

□ Oil sprays, 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, vibration.

□ Magnetic noise. (Example : welding machines, power devices, etc.)

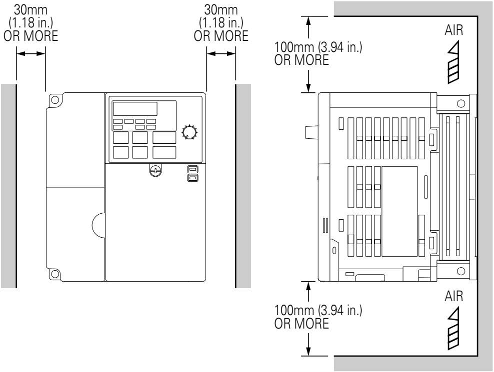
□ High humidity.

□ Radioactive substances.

□ Combustibles : thinner, solvents, etc.

■ Mounting Dimensions

To mount the VS-606V7, dimensions as shown below are required.

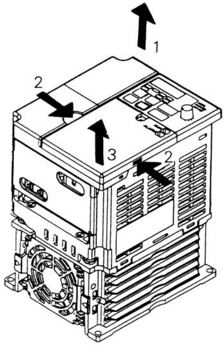


■ Mounting / Removing Components

Removing and Mounting Digital Operator and Covers

• Removing front cover

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

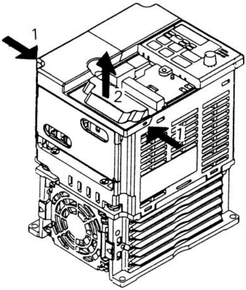


• Mounting front cover

Mount the front cover in the descending order of the above procedure for removal.

• Removing terminal cover

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



• Mounting terminal cover

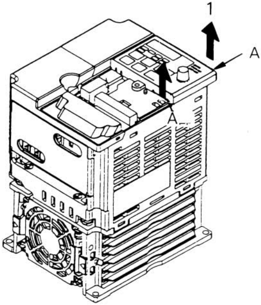
Mount the terminal cover in the descending order of the above procedure for removal.

• Removing digital operator

After removing the front cover, lift the upper and lower sides (section A) of the right side of the digital operator to direction 1.

• Mounting digital operator

Mount the digital operator in the descending order of the above procedure for removal.

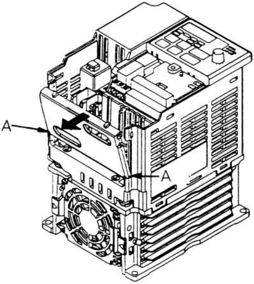


• Removing bottom cover

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

• Mounting bottom cover

Mount the bottom cover in the descending order of the above procedure for removal.



4. WIRING

■ Wiring Instructions

(1) Always connect the power supply (for main circuit inputs) and power input terminals R/L1, S/L2, and T/L3 (R/L1, S/L2 for single-phase) via a molded-case circuit breaker (MCCB) or a fuse. Never connect them to terminals U/T1,V/T2,W/T3, B1, B2, -, +1, or +2. The inverter may be damaged.

Refer to page 148 for Recommended Peripheral Devices.

For single-phase inverters, always use terminal R/L1 and S/L2.

Never connect to terminal T/L3.

Inverter Power Supply Connection Terminals

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

(2) Connect the motor wiring to terminals U/T1, V/T2, W/T3 on the main circuit output side (bottom of the inverter).

(3) 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 67.

(4) Control wiring must be less than 50m (164ft) in length and separate from the power wiring. Use twisted-pair shielded wire when inputting the frequency signal externally.

(5) Tighten the screws on the main circuit and control circuit terminals.

(6) Do not connect or disconnect wiring, or perform signal check while the power supply is turned ON.

(7) For 400V class inverters, make sure to ground the supply neutral to conform to CE requirements.

(8) Only basic insulation to meet the requirements of protection class 1 and overvoltage category II is provided with control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirements.

(9) A closed-loop connector should be used when wiring to the main circuit terminal.

(10) Voltage drop should be considered when determining wire size.

Voltage drop can be calculated using the following equation:

Phase-to phase voltage drop (V)

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

Select a wire size so that voltage drop will be less than 2% of the normal rated voltage.

■ Wire and Terminal Screw Sizes

1. Control Circuit

Model	Terminal Symbol	Screw	Tightening Torque N•m (lb•in)	Wire: Applicable size mm²	Wire: Applicable size AWG	Wire: Recommended size mm²	Wire: Recommended size AWG	Type
Common to all models	MA, MB, MC	M3	0.5 to 0.6 (4.44 to 5.33)	twisted wire 0.5 to 1.25 single 0.5 to 1.25	20 to 16 20 to 16	0.75	18	Shielded wire or equivalent
	S1 to S7,P1,P2,SC,PC,R+,R-S+,S-,FS,FR,FC,AM,AC,RP	M2	0.22 to 0.25 (1.94 to 2.21)	twisted wire 0.5 to 0.75 single 0.5 to 1.25	20 to 18 20 to 16	0.75	18	

2. Main Circuit

200V Class 3-phase Input Series

Model	Terminal Symbol	Screw	Tightening Torque N•m (lb•in)	Wire: Applicable size mm²	Wire: Applicable size AWG	Wire: Recommended size mm²	Wire: Recommended size AWG	Type
CIMR-V7∗C 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	600V vinyl-sheathed wire or equivalent
CIMR-V7∗C 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∗C 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∗C 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∗C 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∗C 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∗C 24P0	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 set for copper wires at 75°C (160°F).

200V Class Single-phase Input Series

Model	Terminal Symbol	Screw	Tightening Torque N • m (lb • in)	Wire				Type
				Applicable size		Recommended size		
				mm²	AWG	mm²	AWG	
CIMR-V7∗C 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	600V vinyl-sheathed wire or equivalent
	⏚							
CIMR-V7∗C 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∗C 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∗C 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∗C 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∗C 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∗C B4P0	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 8			

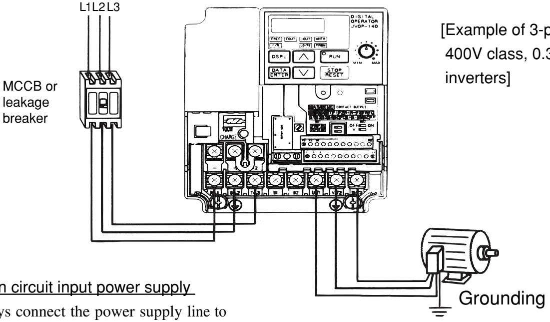
Note : 1. The wire size is set for copper wires at 75°C (160°F).
2. Three-phase input is also available for 0.1 to 1.1kW of single-phase input series.

400V Class 3-phase Input Series

Model	Terminal Symbol	Screw	Tightening Torque N•m (lb•in)	Wire: Applicable size mm²	Wire: Applicable size AWG	Wire: Recommended size mm²	Wire: Recommended size AWG	Type
CIMR-V7∗C 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	600V vinyl-sheathed wire or equivalent
	⏚							
CIMR-V7∗C 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∗C 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∗C 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∗C 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∗C 43P0	R/L1,S/L2,T/L3, –,+1,+2,B1,B2, U/T1,V/T2,W/T3	M4	1.2 to 1.5 (10.65 to 13.31)	2 to 5.5	14 to 10	2	14	
	⏚					3.5	12	
CIMR-V7∗C 44P0	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	

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

■ Wiring the Main Circuit



[Example of 3-phase, 400V class, 0.37kW inverters]

• <u>Main circuit input power supply</u>

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 terminal U/T1,V/T2,W/T3, B1, B2, -, +1, or +2. Otherwise the inverter may be damaged.

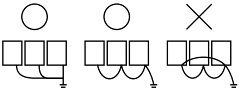
NOTE • For single-phase inverters, always use terminals R/L1 and S/L2. Never connect to terminal T/L3.

• <u>Grounding (Use ground terminal ⏚ .)</u>

Make sure to ground the ground terminal ⏚ according to the local grounding code.

Never ground the VS-606V7 in common with welding machines, motors, or other electrical equipment.

When several VS-606V7 units are used side by side, ground each unit as shown in examples. Do not loop the ground wires.



GOOD GOOD POOR

• <u>Braking resistor connection (optional)</u>

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 which shuts off the power supply, by a thermal relay trip contact.

Use this same procedure when connecting a braking resistor unit.

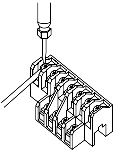
Refer to page 148.

• <u>Inverter output</u>

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

• <u>Wiring the main circuit terminals</u>

Pass the cables through wiring hole and connect. Be sure to mount the cover in its original position.



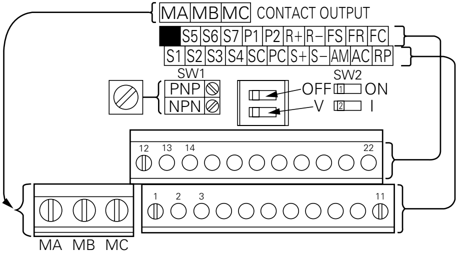
Connect with a Phillips (plus) screwdriver.

■ Wiring the Control Circuit

Only basic insulation is provided for the control circuit terminals. Additional insulation may be necessary in the end product.

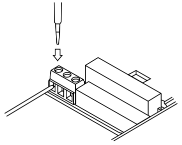
• Control Circuit terminals

Pass the cable through wiring hole and connect. Be sure to mount the covers on the original position.

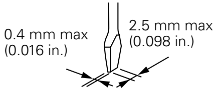


* SW1 can be changed according to sequence input signal (S1 to S7) polarity.
0V common: NPN side (Initial setting)
+24V common: PNP side
Refer to pages 150 and 151 for SW1.
Refer to pages 80 and 90 for SW2.

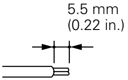
Wiring the control circuit terminals



Screwdriver blade width

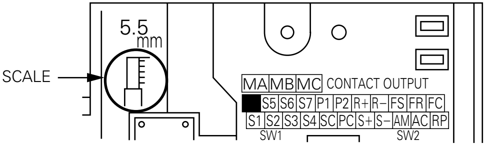


Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver.



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

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



■ Wiring Inspection

After completing wiring, check the following :

□ Wiring is proper.

□ Wire clippings or screws are not left in the unit.

□ Screws are securely tightened.

□ Bare wire in the terminal does not contact other terminals.

NOTE

If the FWD (REV) run command is given during the run command selection (n003=1) from the control circuit terminal, the motor will start automatically after the main circuit input power supply is turned ON.

5. OPERATING THE INVERTER

Initial setting of control mode selection (n002) is set at V/f control mode.

■ Test Run

The inverter operates by setting the frequency (speed).
There are four types of operation modes for the VS-606V7 :

① Run command from the digital operator (potentiometer/digital setting).

② Run command from the control circuit terminal.

③ Run command from communications (MEMOBUS communications).

④ Run command from communication card (optional)

Prior to shipping, the drive is set up to receive run command and frequency reference from the operator. Below are instructions for running the VS-606V7 using the digital operator JVOP-147 (without potentiometer). For instructions on operation, refer to page 40.

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

Name	Constant
Run Command Selection	n003 = 0 --- Enables operator RUN, STOP/RESET = 1 --- Enables control circuit terminal run/stop = 2 --- Enables communications (MEMOBUS communications) = 3 --- Enables communication card (optional)
Frequency Reference Selection	n004 = 0 --- Enables operator potentiometer = 1 --- Enables frequency reference 1 (constant n024) = 2 --- Enables voltage reference (0 to 10V) of control circuit terminal = 3 --- Enables current reference (4 to 20mA) of control circuit terminal = 4 --- Enables current reference (0 to 20mA) of control circuit terminal = 5 --- Enables pulse train reference of control circuit terminal = 6 --- Enables communications (MEMOBUS communications) = 7 --- Enables voltage reference (0 to 10V) of operator circuit terminal = 8 --- Enables current reference (4 to 20mA) of operator circuit terminal = 9 --- Enables communication card (optional)

Operation Steps	Operator Display	LED Display	Status Indicator LED
1. Turn ON the power supply.	6.00	FREF	RUN ◌ ALARM ●
2. Set constant n004 to 1.	1	PRGM	RUN ◌ ALARM ●
3. Set the following constants. n019 : 15.0 (acceleration time) n020 : 5.0 (deceleration time)	 15.0 5.0	PRGM	RUN ◌ ALARM ●
4. Select forward or reverse run by pressing [∧] or [∨] key. NOTE Examine the application. (Never select REV when reverse run is prohibited.)	For (Forward) or rEv (Reverse)	F/R	RUN ◌ ALARM ●
5. Set the reference by pressing [∧] or [∨] key.	60.00	FREF	RUN ☼ ALARM ●
6. Press [RUN].	0.00→60.00	FOUT	RUN ◌ ALARM ●
7. Press [STOP] to stop.	60.00→0.00	FOUT	RUN ⊖ ↓ ◌ ALARM ●

Status indicator lamp ☼ : ON ⊖ : Blinking (Long Blinking) ◌ : Blinking ● : OFF

Operation Check Points

□ Motor rotates smoothly.

□ Motor rotates in the correct direction.

□ Motor does not have abnormal vibration or noise.

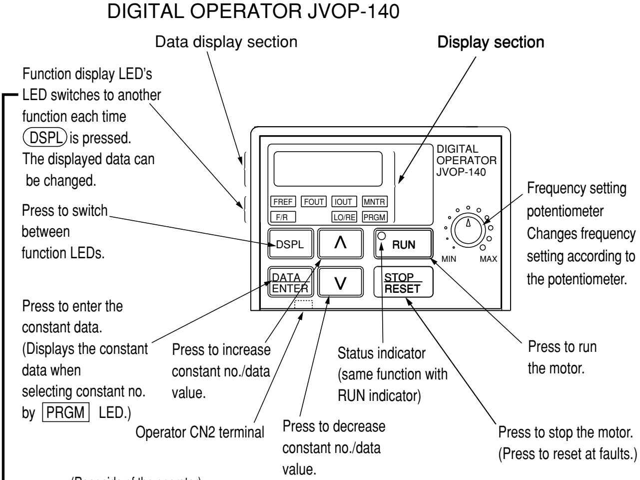
□ Acceleration or deceleration is smooth.

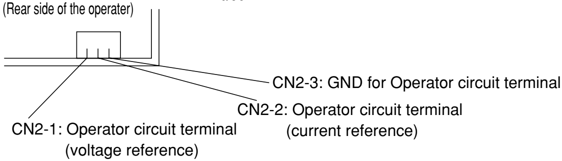
□ Current matching the load flows.

□ Status indicator LED’s and digital operator display are correct.

■ Operating the Digital Operator

All functions of the VS-606V7 are set by the digital operator. Below are descriptions of the display and keypad sections.



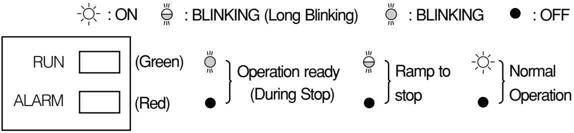


Details of LEDs (Color in parenthesis indicates the color of LED.)

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

Description of Status Indicator LEDs

There are two LEDs on the middle right section of the face of the VS-606V7. The inverter status is indicated by various combinations of ON, BLINKING and OFF LEDs. RUN indicator and status indicator on the RUN button have the same function.



For details on how the status indicator LED's function at inverter faults, refer to Section 8 "FAULT DIAGNOSIS" on page 130. If a fault occurs, the ALARM LED lights.

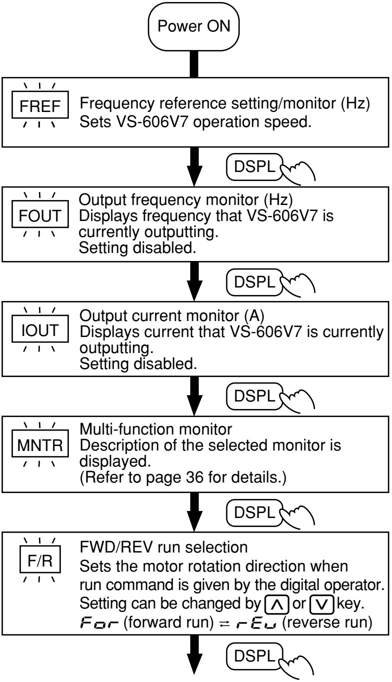
NOTE

The fault can be reset by turning ON the fault reset signal (or pressing 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 by the fault reset signal.

■ LED Description

By pressing (DSPL) on the digital operator, each of the function LEDs can be selected.

The following flowchart describes each function LED.



If the VS-606V7 loses power while in one of these modes, it will return to this 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 No.
U-11: Output power
U-15: Data reception error
U-16: PID feedback
U-17: PID input
U-18: PID output

LO/RE

LOCAL / REMOTE Selection

This function switches the operation; operation using the digital operator including frequency setting with potentiometer, or that using the input terminals or through communications

Setting can be changed by ∧ or ∨ key.

Lo (Local) ⇄ rE (Remote)

DSPL

PRGM

Constant No. / data

Sets and changes data using constant No. (Refer to page 39.)

DSPL

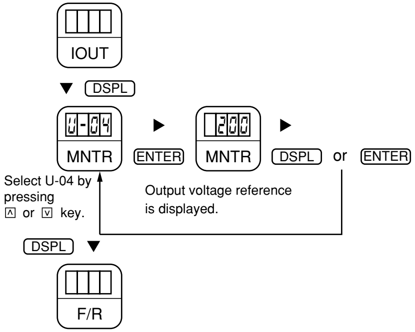
Return to FREF

MNTR Multi-Function monitor

• Selecting monitor

Press DSPL key. When MNTR is ON, data can be displayed by selecting monitor No.

[Example] Monitoring Output Voltage Reference



• Monitoring

Following items can be monitored by U- constants.

Constant No.	Name		Description
U-01	Frequency reference (FREF)*1	Hz	Frequency reference can be monitored. (Same as FREF)
U-02	Output frequency (FOUT)*1	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)	—	Last four fault history is displayed.
U-10	Software No.	—	Software No. can be checked.
U-11	Output power*3	kW	Output power can be monitored.
U-15	Data reception error*4	—	Contents of MEMOBUS communication data reception error can be checked. (contents of transmission register No. 003DH are the same)
U-16	PID feedback*5	%	Input 100(%) / Max. output frequency or equivalent
U-17	PID input*5	%	±100(%)/± Max. output frequecry
U-18	PID output*5	%	±100(%)/± Max. output frequecry

*1 The status indicator LED is not turned ON.

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

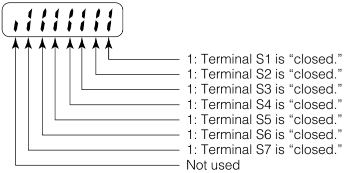
*3 The display range is from -99.9kW to 99.99kW.
When regenerating, the output power will be displayed in units of 0.01kW when -9.99kW or less and in units of 0.1kW when more than -9.99kW.
When in the vector control mode,"----"will be displayed.

*4 Refer to the next page for data reception error.

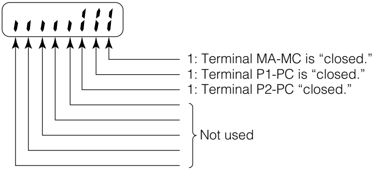
*5 Displayed in units of 0.1% when less than 100% and in units of 1% when 100% or more. The display range is from -999% to 999%.

Input / Output terminal status

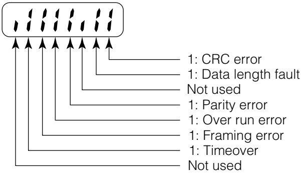
Input terminal status



Output terminal status



Data reception error display



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 latest fault, and 2,3,4, in ascending order of fault occurrence.

(Example)

■□□□ ...... 4-digit numbers

■ : Order of fault (1 to 4)

□□□ : Fault description

"---" is displayed if there is no fault.

(Refer to page 130 for details.)

Switching fault history

Order of the fault history can be changed by ∧ or ∨ key.

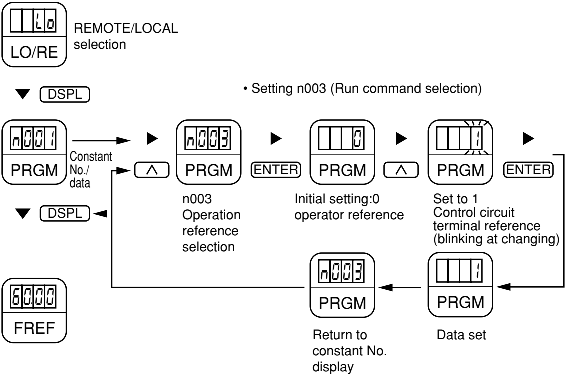
Clearing fault history

Set constant n001 to 6 to clear fault history. Display returns to n001 after completion of 6 setting.

Note: Constant initialize(n001=12,13) clears the fault history.

Setting and referring constants

Following shows how to select and change constants.



■ Simple Data Setting

Digital setting (Refer to 5. OPERATING THE INVERTER) and potentiometer setting are both available for simple accel/decel operation of the VS-606V7.

Digital setting is set at the factory (n004=1). For the model with digital operator (with potentiometer) JVOP-140, factory setting is set by frequency setting potentiometer (n004=0).

Following is an example in which the function LED's are used to set frequency reference, acceleration time, deceleration time, and motor direction.

Data setting by frequency setting potentiometer

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
1. Turn the potentiometer fully to the left. Then, turn the power ON.	0.00	FREF	RUN ☼ ALARM ●
2. F/R blinks. Select FWD/REV run using keys. NOTE Never select REV when reverse run is prohibited.	FOR or REV	F/R	RUN ◍ ALARM ●
3. Press DSPL to blink FREF. Then press RUN.	0.00	FREF	RUN ☼ ALARM ●
4. Operates the motor by turning the potentiometer to the right. (Frequency reference corresponds to the potentiometer position is displayed.) NOTE If the potentiometer is switched rapidly, the motor also accelerates or decelerate rapidly corresponding to the potentiometer movement. Pay attention to load status and switch the potentiometer with the speed not to affect motor movement.	0.00 to 60.00 Minimum output frequency is 1.50Hz	FREF	RUN ☼ ALARM ●

Status indicator lamp ☼ : ON ◍ : Blinking ● : OFF

6. PROGRAMMING FEATURES

Factory settings of the constants are shown as [ ] in the tables.

■ Constant Set-up and Initialization

Constant selection/initialization (n001)

The following table describes the data which can be set or read when n001 is set.
Unused constants among n001 to n179 are not displayed.

n001 Setting	Constant that can be set	Constant that can be referred
0	n001	n001 to n179
1	n001 to n049 *	n001 to n049
2	n001 to n079 *	n001 to n079
3	n001 to n119 *	n001 to n119
4	n001 to n179 *	n001 to n179
5	Not used	
6	Fault history cleared	
7 to 11	Not used	
12	Initialize	
13	Initialize (3-wire sequence) †	

* Excluding setting disabled constants.
† Refer to page 73.

NOTE " Err " appears on the LED display for one second and the set data returns to its initial values in the following cases :

(1) The set values of multi-function input selection 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 42.

(3) If the following conditions are not satisfied in the Jump frequency setting :
Jump frequency 3 (n085) ≦ Jump frequency 2 (n084)
≦ Jump frequency 1 (n083)

(4) If Frequency reference lower limit (n034) ≦ Frequency reference upper limit (n033)

(5) If motor rated current (n036) ≦ 150% of inverter rated current

(6) Constant n018 is set to 1 (accel / decel time unit is 0.01sec.) when n018 is set to 0 and the value exceeding 600.0sec. is set to accel / decel time (n019 to n022).

■ Using V/f Control Mode

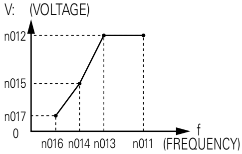
V/f control mode is preset at the factory.
Control mode selection (n002)= 0: V/f control mode (initial setting)
1: Vector control mode

Adjusting torque according to application

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

• V/f pattern setting

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



Be sure to satisfy the following conditions for the setting of n011 to n017.
n016 ≦ n014 < n013 ≦ n011
If n016 = n014 is set, the set value of n015 is disabled.

Constants No.	Name	Unit	Setting range	Initial Setting
n011	Max. output frequency	0.1Hz	50.0 to 400.0Hz	50.0Hz
n012	Max. voltage	1V	1 to 255.0V (0.1 to 510.0V)	200.0V (400.0V)
n013	Max. voltage output frequency (base frequency)	0.1Hz	0.2 to 400.0Hz	50.0Hz
n014	Mid. output frequency	0.1Hz	0.1 to 399.9Hz	1.3Hz
n015	Mid. output frequency voltage	1V	0.1 to 255.0V (0.1 to 510.0V)	12.0V (24.0V)
n016	Min. output frequency	0.1Hz	0.1 to 10.0Hz	1.3Hz
n017	Min. output frequency voltage	1V	1 to 50.0V (0.1 to 100.0V)	12.0V (24.0V)

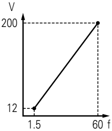
• Typical setting of V/f pattern

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

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

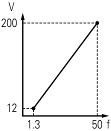
(1) For general-purpose applications

Motor Specification : 60Hz



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

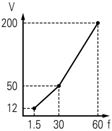
Motor Specification : 50Hz
(Factory setting)



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

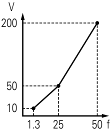
(2) For fans/pumps

Motor Specification : 60Hz



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

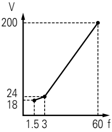
Motor Specification : 50Hz



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

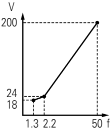
(3) For applications requiring high starting torque

Motor Specification : 60Hz



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 : 50Hz



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

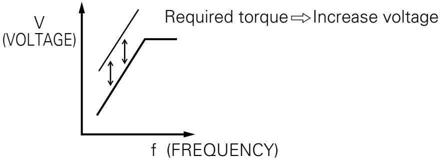
Increasing voltage of V/f pattern increases motor torque, but an excessive increase may cause motor overexcitation, motor overheat or vibration.

Note : n012 is to be set to motor rated voltage.

• Full-range automatic torque boost (when V/f mode is selected; n002=0)
Motor torque requirement changes according to load conditions. Full-range automatic torque boost adjusts voltage of V/f pattern according to the requirement. The VS-606V7 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.

$\boxed{\text{Output voltage}} \propto \boxed{\text{Torque compensation gain (n103)}} \times \boxed{\text{Required torque}}$

Operation



Normally, no adjustment is necessary for 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 torque compensation time constant (n104) and torque compensation iron loss (n105) are normally not required.

Adjust torque compensation time constant under the following conditions:
• Increase the setting when the motor generates vibration.
• Reduce the setting when response is low.

■ Using Vector Control Mode

Setting the control mode selection (n002) can use a vector control mode.

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

1: Vector control mode

○ Precaution for voltage vector control application

Since vector control needs motor constants, the YASKAWA standard motor constants have been set at the factory prior to shipment. Therefore, when an inverter exclusive-use motor is used or when a motor of any other manufacturer is driven the required torque characteristics or speed control characteristics may not be maintained because the constants are not matched. Set the following constants so that they can match the motor constants.

No.	Name	Unit	Setting range	Initial setting
n106	Motor rated slip	0.1Hz	0.0 to 20.0Hz	*
n107	Line to neutral (per phase)	0.001Ω (less than 10Ω) 0.01Ω (10Ω or more)	0.000 to 65.50Ω	*
n036	Motor rated current	0.1A	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 touque compensation gain (n103) and torque compensation time constants (n104) is normally not required.

Adjust torque compensation time constant under the following conditions:

- Increase the setting when the motor generates vibration.
- Reduce the setting when response is low.

To adjust for slip compensation gain (n111), induce load so that motor speed reaches target value. Increase or decrease the value by 0.1.

- When speed is less than target value, increase slip compensation gain.
- When speed is more than target value, reduce slip compensation gain.

Adjustment of slip compensation time constant (n112) is normally not required.

Adjust under the following conditions:

- Reduce the setting when response is low.
- Increase the setting when speed is unstable.

Select slip compensation status during regeneration:

n113 Setting	Slip correction during regenerative operation
0	Disabled
1	Enabled

○ Motor constant calculation

Following show an example of motor constant calculation.

(1) Motor rated slip (n106)

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

(2) Line to neutral (per phase) (n107)

Calculations are based on 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) $\times\ 0.92 \times \frac{1}{2}$

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

(F type insulation) Test report of line-to-line resistance at 115°C (Ω) $\times\ 0.87 \times \frac{1}{2}$

(3) Motor rated current (n036)

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

(4) Motor no-load current (n110)

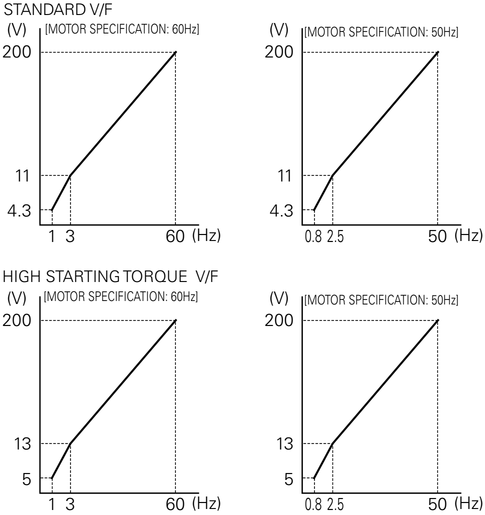
$$= \frac{\text{No-load current (A) at motor rated frequency (Hz)}^{*1}}{\text{Rated current (A) at motor rated frequency (Hz)}^{*1}} \times 100\ (\%)$$

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

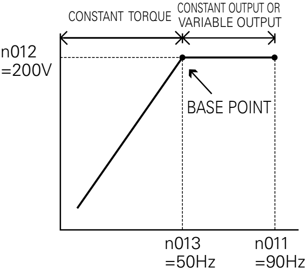
Set n106 (motor rated slip), n036 (motor rated current), n107 (Line to neutral (per phase)) and n110 (motor no-load current) according to the motor test report.
To connect a reactor between the inverter and the motor, set n108 to the value of “n108 (motor leakage inductance) initial value plus externally-mounted 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 V/f pattern as follows during vector control.
The following examples are for 200V class motors. When using 400V class motors, double the voltage settings (n012, n015, n017).



When operating with frequency larger than 60Hz/50Hz, change only max. output frequency (n011).

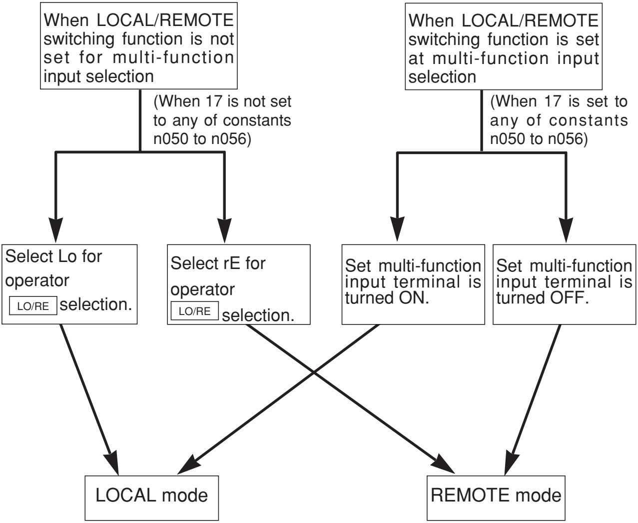


■ Switching LOCAL/REMOTE Modes

The following functions can be selected by switching the LOCAL or REMOTE mode. To select RUN/STOP commands 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. Frequency reference can be set by potentiometer or FREF .
- REMOTE mode: Enables run command selection (n003).

○ How to select LOCAL/REMOTE modes



■ Selecting Run/Stop Commands

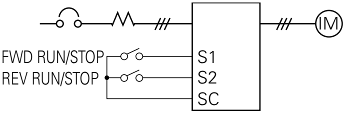
Refer to ■ Switching LOCAL / REMOTE Modes (page 48) to select either the LOCAL mode or REMOTE mode.
Operation method (RUN / STOP commands, FWD / REV run commands) can be selected by the following method.

○ LOCAL mode

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

○ REMOTE mode

- Select remote mode.
  There are following two methods to select remote mode.
  1. Select rE (remote mode) for LO / RE selection.
  2. When the local / remote switching function is selected for multi-function input selection, turn OFF the input terminal to select remote mode.
- Select operation method by setting the constant n003.
  n003=0: Enables the digital operator (same with local mode)
  =1: Enables the multi-function input terminal (see fig. below)
  =2: Enables communications (refer to page 89)
  =3: Enables communication card (optional)
- Example for using the multi-function input terminal as operation reference (two-wire sequence)



n003 : 1 (Initial setting : 0)
n050 : 1 (Initial setting)
n051 : 2 (Initial setting)

For example of three-wire sequence, refer to page 73.

Note: When inverter is operated without the digital operator, always set the constant n010 to 0.

○ Operating (RUN / STOP commands) by communications

Setting constant n003 to 2 in REMOTE mode can give RUN / STOP commands by communication (MEMOBUS communications). For the command by communications, refer to page 89)

■ Selecting Frequency Reference

Frequency reference can be selected by the following methods.

○ Setting by operator

Select REMOTE or LOCAL mode in advance. For the method for selecting the mode, refer to page 48.

LOCAL mode

Select command method by constant n008.

n008=0 : Enables the setting by potentiometer on digital operator.
=1 : Enables the digital setting by digital operator (Initial setting).
Factory setting of the model with digital operator (with potentiometer) JVOP-140 is n008=0.

• Digital setting by digital operator

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

Frequency reference setting is effective when 1 (Initial setting : 0) is set to constant n009 instead of pressing ENTER key.

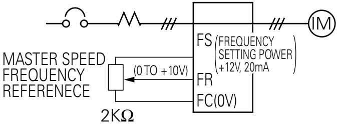
n009=0 : Enables frequency reference setting by ENTER key.
=1 : Disables frequency reference setting by ENTER key.

REMOTE mode

Select command method by constant n004.

n004=0 : Enables frequency reference setting by potentiometer on digital operator.
=1 : Frequency reference 1 (n024) is effective (Initial setting)
Factory setting of the model with digital operator (with potentiometer) JVOP-140 is n004=0.
=2 : Voltage reference (0 to 10V) (See the figure on page 51)
=3 : Current reference (4 to 20mA) (Refer to page 80)
=4 : Current reference (0 to 20mA) (Refer to page 80)
=5 : Pulse train reference (Refer to page 82)
=6 : Communication (Refer to page 89)
=7 : Voltage reference of digital operator circuit terminal (0 to10)
=8 : Current reference of digital operator circuit terminal (4 to 20mA)
=9 : Communication card (optional)

Example of frequency reference by voltage signal



n004 = 2 (initial setting : 1)

■ Setting Operation Conditions

Reverse run prohibit (n006)

"Reverse run prohibit" setting does not accept 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

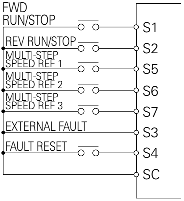
By combining frequency reference and input terminal function selections, up to 16 steps of speed can be set.

8-step speed change

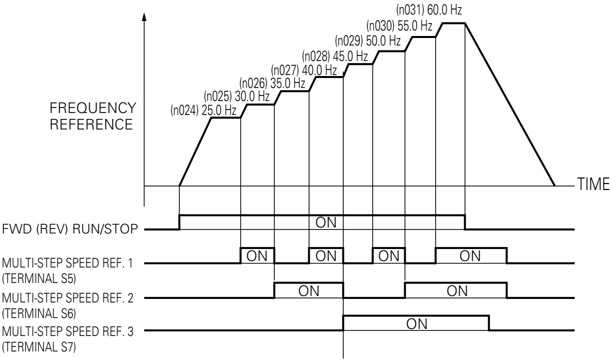
n003=1 (operation mode selection)
n004=1 (Frequency reference selection)
n024=25.0Hz (Frequency reference 1)
n025=30.0Hz (Frequency reference 2)
n026=35.0Hz (Frequency reference 3)
n027=40.0Hz (Frequency reference 4)
n028=45.0Hz (Frequency reference 5)
n029=50.0Hz (Frequency reference 6)
n030=55.0Hz (Frequency reference 7)
n031=60.0Hz (Frequency reference 8)

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

n054=6 (Multi-function contact input terminal 5)
n055=7 (Multi-function contact input terminal 6)
n056=8 (Multi-function contact input terminal 7)
n053=1



n050=1 (Input terminal S1) Initial Setting
n051=2 (Input terminal S2) Initial Setting
n052=3 (Input terminal S3) Initial Setting
n053=5 (Input terminal S4) Initial Setting
n054=6 (Input terminal S5) Initial Setting
n055=7 (Input terminal S6) Initial Setting
n056=10 (Input terminal S7) Change the setting to 8.



16-Step speed operation

Set frequency reference 9-16 to n120-127.

Set input terminal to multi-step speed reference for multi-function input selection.

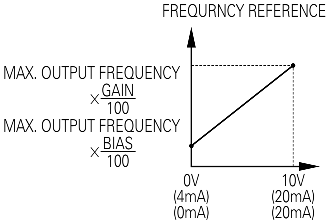
Operating at low speed

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 : 6.00Hz
n050 to n056	Jog reference	Set to “10” for any constant.

Adjusting speed setting signal

To provide frequency reference by analog input of control circuit terminal FR or FC, the relationship between analog input and frequency reference can be set.



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

(a) Analog frequency reference gain (n060)

The frequency reference provided when analog input is 10V (20mA) can be set in units of 1%. (Max. output frequency n011=100%)

* Factory setting : 100%

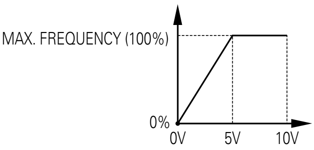
(b) Analog frequency reference bias (n061)

The frequency reference provided when analog input is 0V (4mA or 0mA) can be set in units of 1%. (Max. output frequency n011=100%)

* Factory setting : 0%

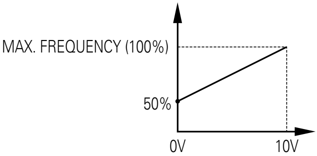
Typical Setting

- To operate the inverter with frequency reference of 0% to 100% at 0 to 5V input



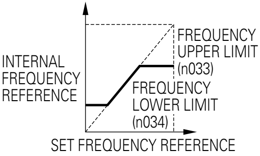
Gain n060 = 200
Bias n061 = 0

• To operate the inverter with frequency reference of 50% to 100% at 0 to 10V input



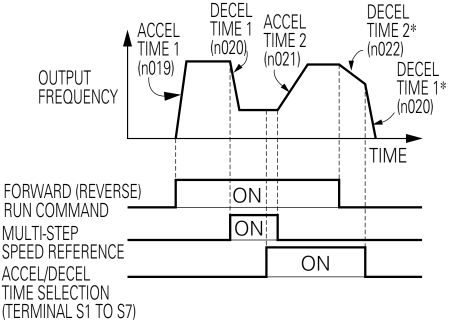
Gain n060 = 100
Bias n061 = 50

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 frequency reference 0, operation is continued at the frequency reference lower limit.
  However, when frequency reference lower limit is set to less than the minimum output frequency (n016), operation is not performed.
  Factory setting: 0%

Using two accel/decel times



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

By setting Multi-function input selection (either of n050 to n056) to "11 (accel/decel time select)", accel/decel time is selected by turning ON/OFF the accel/decel time select (terminal S1 to S7).

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	10.0s
n020	Deceleration time 1			10.0s
n021	Acceleration time 2			10.0s
n022	Deceleration time 2			10.0s

n018 setting

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

Notes: Constant n018 can be set during stop.
If the value exceeding 600.0 s is set for the accel/decel time when n018 = 0 (in units of 0.1 s), "1" cannot be set to n018.

- Accel time
  Set the time needed for output frequency to reach 100% from 0%.
- Decel time
  Set the time needed for output frequency to reach 0% from 100%.

(Max. output frequency n011 = 100%)

Automatic restart after momentary power loss (n081)

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

Setting	Description
0	Continuous operation after momentary power loss not provided
1*	Continuous operation after power recovery within momentary power loss ridethru time 0.5s
2*†	Continuous operation after power recovery (Fault output not provided)

* Hold the operation signal to continue the operation after recovery from a momentary power loss.

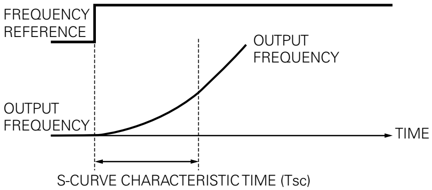
† When 2 is selected, the inverter restarts if power supply voltage recovers while the control power supply is held .
No fault signal is output.

Soft-start characteristics (n023)

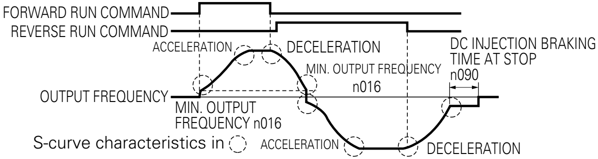
To prevent shock at machine start/stop, accel/decel can be performed in S-curve pattern.

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

Note : S-curve characteristic time is the time from accel/decel rate 0 to a regular accel/decel rate determined by the set accel/decel time.



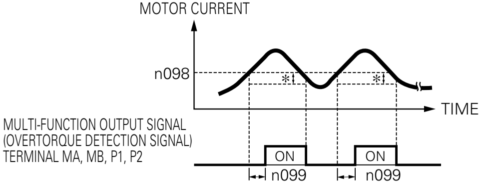
The following time chart shows FWD/REV run switching at deceleration to a stop.



Torque detection

If an excessive load is applied to the machine, output current increase can be detected to output alarm signals to multi-function output terminals MA, MB, P1 and P2.

To output an overtorque detection signal, set output terminal function selection n057 to n059 to "overtorque detection" [Setting:6 (NO contact) or 7 (NC contact)].



* Overtorque detection release width (hysterisis) is set at approx. 5% of inverter rated current.

• Overtorque detection function selection 1 (n096)

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

(1) To detect overtorque at accel/decel, set to 3 or 4.

(2) To continue the operation after overtorque detection, set to 1 or 3. During detection, the operator displays "oL3" alarm (blinking).

(3) To halt the inverter by a fault at overtorque detection, set to 2 or 4. At detection, the operator displays "oL3" fault (ON).

• Overtorque detection level (n098)

Sets the overtorque detection current level in units of 1%. (Inverter rated current = 100%) When detection by torque is selected, motor rated torque becomes 100%.
Factory setting: 160%

• Overtorque detection time (n099)

If the time when motor current exceeds the overtorque detection level (n098) is longer than overtorque detection time (n099), the overtorque detection function operates.
Factory setting : 0.1sec.

• Overtorque detection function selection 2 (n097)

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

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

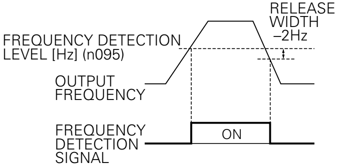
Frequency detection (n095)

Effective when either of output terminal function selections n057, n058 or n059 are set to “frequency detection” (setting: 4 or 5). “Frequency detection” turns ON when output frequency is higher or lower than the setting of frequency detection (n095).

- Frequency detection 1

  Output frequency ≧ Frequency detection level n095

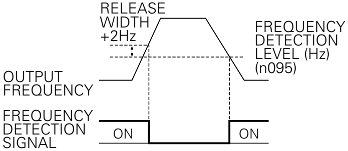
  (Set either of n057, n058 or n059 to “4”.)



- Frequency detection 2

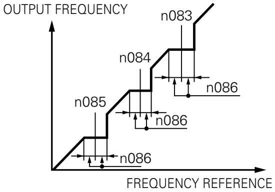
  Output frequency ≦ Frequency detection level n095

  (Set either of n057, n058, 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 machine systems. This function is also used for dead band control. Setting the value to 0.00Hz disables this function.
Set prohibited frequency 1, 2 or 3 as follows :



n083 ≧ n084 ≧ n085

If this condition is not satisfied the inverter displays Err for one second and restores the data to original settings.

Operation is prohibited within jump frequency range.
However, motor operates without jumping during accel/decel.

Continuing operation by automatic fault reset (n082)

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

OC (overcurrent)

OV (overvoltage)

The number of retry attempts are 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) Power supply is turned OFF

Operating coasting motor without trip

To operate coasting motor without trip, use the speed search command or DC injection braking at start.

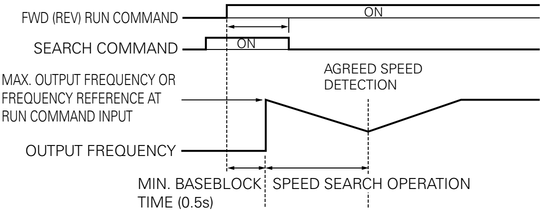
• Speed search command

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

Set 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 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 becomes disabled.

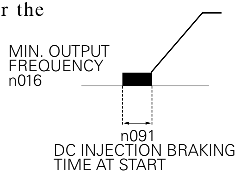
• Time chart at search command input



• DC injection braking at start (n089, n091)

Restarts a coasting motor after stopping it. Set the DC injection braking time at start in n091 in units of 0.1 second. Set 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 the baseblocking for n091 setting time.



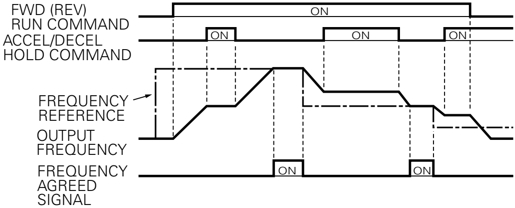
Holding accel/decel temporarily

To hold acceleration or deceleration, input accel/decel hold command. The output frequency is maintained when the accel/decel hold command is input during acceleration or deceleration.

When the stop command is input during accel/decel prohibition command input, accel/decel hold is released and operation ramps to stop.

Set multi-function input selection (n050 to n056) to 16 (accel/decel prohibit).

Time chart at accel/decel hold command input



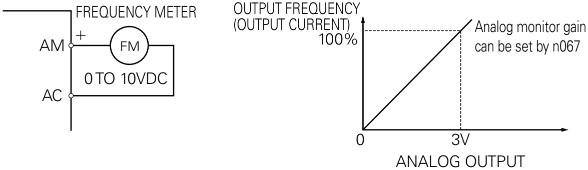
Note : When the FWD (REV) run command is input along with the accel/decel hold command, the motor does not operate. However, when frequency reference lower limit (n034) is set greater than or equal to min. output frequency (n016), the motor operates at frequency reference lower limit (n034).

Using frequency meter or ammeter (n066)

Selects to output either output frequency or output current to analog output terminals AM-AC for monitoring.

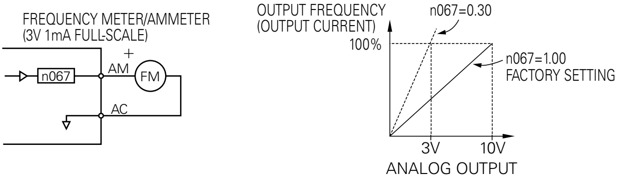
Setting	Description
0	Output frequency
1	Output current
2	Main circuit DC voltage
3	Torque monitor
4	Output power
5	Output voltage reference

In initial setting, analog voltage of approx. 10V is output when output frequency (output current) is 100%.



Calibrating frequency meter or ammeter (n067)

Used to adjust analog output gain.



Set the analog output voltage at 100% of output frequency (output current). Frequency meter displays 0 to 60Hz at 0 to 3V.

$$10V \times \boxed{\begin{matrix}\text{n067 Setting}\\ 0.30\end{matrix}} = 3V$$

Output frequency becomes 100% at this value.

Using analog output(AM-AC) as a pulse train signal output (n065)

Analog output AM-AC can be used as a pulse train output (output frequency monitor). Set n065 to 1 when using pulse train output.

Constant No.	Name	Unit	Setting range	Initial setting
n065	Monitor output type	1	0,1	0

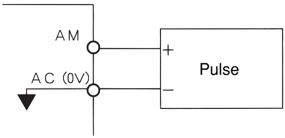
n065 setting

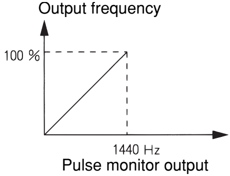
n065 setting	Description
0	Analog monitor output
1	Pulse monitor output (Output frequency monitor)

Pulse train signal can be selected by setting n150.

n150 setting	Description
0	1440Hz / Max. frequency (n011)
1	1F: Output frequency × 1
6	6F: Output frequency × 6
12	12F: Output frequency × 12
24	24F: Output frequency × 24
36	36F: Output frequency × 36

At the factory setting, the pulse of 1440Hz can be output when output frequency is 100%.

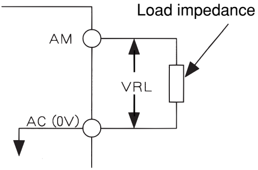




NOTE • Peripheral devices must be connected according to the following load conditions when using pulse monitor output. The machine might damage when the conditions are not satisfied.

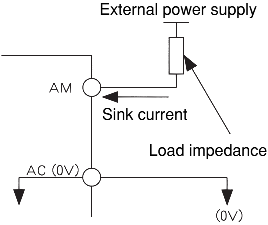
Used as a sourcing output

Output voltage VRL (V)	Load impedance (kΩ)
+5V	1.5 kΩ or more
+8V	3.5 kΩ or more
+10V	10k Ω or more



Used as a sinking input

External power supply (V)	+12VDC ±5%
Sinking current (mA)	16mA or less



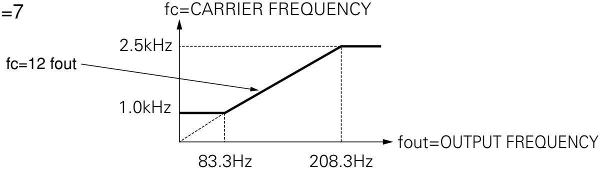
Reducing motor noise or leakage current (n080)

Set inverter output transistor switching frequency (carrier frequency).

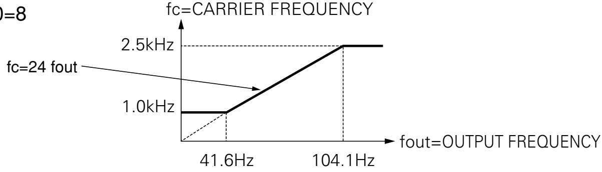
Setting	Carrier Frequency (kHz)	Metallic Noise from Motor	Noise and Current Leakage
7	12 fout (Hz)	Higher ↕ Not audible	Smaller ↕ Larger
8	24 fout (Hz)		
9	36 fout (Hz)		
1	2.5 (kHz)		
2	5.0 (kHz)		
3	7.5 (kHz)		
4	10.0 (kHz)		

Setting values 7, 8, or 9 multiplies output frequency according to output frequency value.

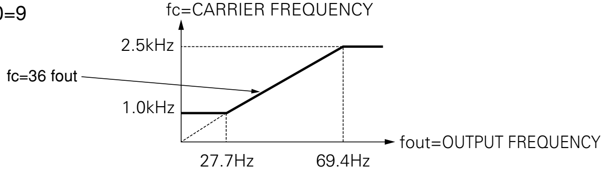
n080=7



n080=8



n080=9



Factory setting varies according to inverter capacity (kVA).

Voltage Class (V)	Capacity (kW)	Initial Setting		Maximum Continuous Output Current (A)	Reduced Current (A)
		Setting	Carrier Frequency		
200 Single-phase 3-phase	0.1	4	10kHz	0.8	—
	0.25	4	10kHz	1.6	
	0.55	4	10kHz	3.0	
	1.1	4	10kHz	5.0	
	1.5	3	7.5kHz	8.0	7.0
	2.2	3	7.5kHz	11.0	10.0
	4.0	3	7.5kHz	17.5	16.5
400 3-phase	0.37	3	7.5kHz	1.2	1.0
	0.55	3	7.5kHz	1.8	1.6
	1.1	3	7.5kHz	3.4	3.0
	1.5	3	7.5kHz	4.8	4.0
	2.2	3	7.5kHz	5.5	4.8
	3.0	3	7.5kHz	7.2	6.3
	4.0	3	7.5kHz	9.2	8.1

NOTE

(1) Reduce continuous output current when changing carrier frequency to 4 (10 kHz) for the 200V class (1.5kW or more) and 400V class inverters. Refer to the table above for the reduced current.

[Operation Condition]

- Input power supply voltage : 3-phase 200 to 230V (200V class)
  Single-phase 200 to 240V (200V class)
  3-phase 380 to 460V (400V 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 50m	Up to 100m	More than 100m
Carrier frequency (n080 setting)	10kHz or less (n080=1,2,3,4, 7,8,9)	5kHz or less (n080=1,2, 7,8,9)	2.5kHz or less (n080=1, 7,8,9,)

(3) Set carrier frequency selection (n080) to either 1, 2, 3, 4 when using vector control mode. Do not set to 7, 8, or 9.

(4) Carrier frequency is automatically reduced to 2.5kHz when Reducing carrier frequency selection at low speed (n175) is set to 1 and the following conditions are satisfied:

Output frequency $\leqq$ 5Hz

Output current $\geqq$ 110%

Factory setting : 0 (Disabled)

Operator stop key selection (n007)

Selects processing when STOP key is pressed during operation either from multi-function input terminal or communications.

Setting	Description
0	STOP key effective when running either from multi-function input terminals or communications. When STOP key is pressed, the inverter stops according to the setting of constant n005. At this time, the digital operator displays “STP” alarm (blinking). This stop command is held in the inverter until both forward and reverse run commands are open, or unitl run command from communications becomes zero.
1	STOP key ineffective when running either from multi-function input terminals or communications.

■ Selecting Stopping Method

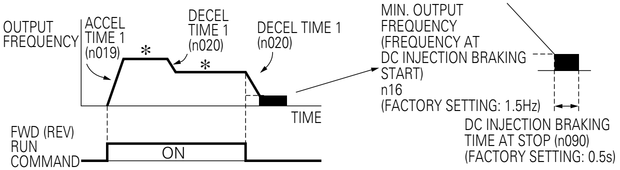
Selecting stopping method (n005)

Selects the stopping method suitable for application.

Setting	Description
0	Deceleration to stop
1	Coast to stop

• Deceleration to stop

Example when accel/decel time 1 is selected



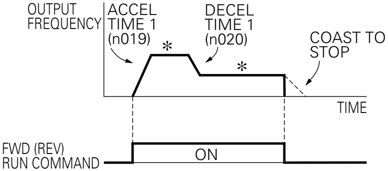
* When frequency reference is changed during running.

Upon termination of the FWD (REV) run command, the motor decelerates at the decel rate determined by the time set to deceleration time 1 (n020) and DC injection braking is applied immediately before stop. DC injection braking is also applied when the motor decelerates by setting frequency reference lower than min. output frequency (n016) with FWD (REV) run command ON. If the decel time is short or the load inertia is large, overvoltage (OV) fault may occur at deceleration. In this case, increase the decel time or install a optional braking resistor.

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

• Coast to stop

Example when accel/decel time 1 is selected



* When frequency reference is changed during running.

Upon removal of the FWD (REV) run command, the motor starts coasting.

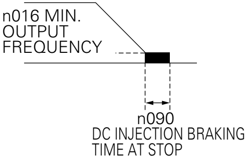
Applying DC injection braking

• DC injection braking current (n089)

Sets 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 inverter output is shut OFF at the timing of DC injection braking start.



When coasting to a stop is specified in stopping method selection (n005), DC injection braking at stop does not operate.

■ Building Interface Circuits with External Devices

Using input signals

Multi-function input terminal S1 to S7 functions can be changed when necessary by setting constants n050 to n056 respectively. The same value cannot be set to different constant settings.

Setting	Name	Description	Ref.
0	FWD/REV run command (3-wire sequence selection)	Setting enabled only for n052	73
1	Forward run (2-wire sequence selection)		49
2	Reverse run (2-wire sequence selection)		49
3	External fault (NO contact input)	Inverter stops by external fault signal input. Digital operator display is "EF□".	-
4	External fault (NC contact input)		-
5	Fault reset	Resets the fault. Fault reset not effective with the run signal ON.	51
6	Multi-step speed reference 1		51
7	Multi-step speed reference 2		51
8	Multi-step speed reference 3		51
9	Multi-step speed reference 4		51
10	JOG command		52
11	Accel/decel time select		55
12	External baseblock (NO contact input)	Motor coast to a stop by this signal input. Digital operator display is "bb".	-
13	External baseblock (NC contact input)		-
14	Search command from maximum frequency	Speed search reference signal	62
15	Search command from set frequency		62
16	Accel/decel hold command		63
17	LOCAL/REMOTE selection		48
18	Communication/ control circuit terminal selection		75
19	Emergency stop fault (NO contact input)	Inverter stops by emergency stop signal input according to stopping method selection (n005). When frequency coasting to a stop (n005 is set to 1) method is selected, inverter coasts to a stop according to decel time setting 2 (n022). Digital operator display is StP. (lit at fault, blinking at alarm)	-
20	Emergency stop alarm (NO contact input)		-
21	Emergency stop fault (NC contact input)		-
22	Emergency stop alarm (NC contact input)		-
23	PID contorol cancel		110
24	PID integral reset		110
25	PID integral hold		110
34	UP/DOWN command	Setting enabled only for n056 (terminal S7)	74
35	Self-test	Setting enabled only for n056 (terminal S7)	100

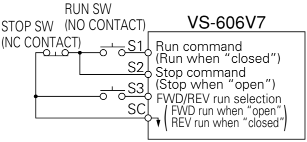
* Numbers 1 to 7 is displayed in □ corresponding to the terminal numbers S1 to S7 respectively.

Initial setting

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

Terminal function at 3-wire sequence selection

When 0 is set at the terminal S3 (n052), terminal S1 becomes run command, terminal S2 becomes stop command, and terminal S3 becomes FWD/REV run command.



• LOCAL/REMOTE selection (setting: 17)

Select operation reference either by the digital operator or by the settings of run command selection (n003) and frequency reference selection (n004). LOCAL/REMOTE select is available only during stop.

Open : Run according to the setting of run command selection (n003) or frequency reference selection (n004).

Closed : Run by frequency reference and run command from the digital operator.

(Example) Set n003 = 1, n004 = 2, n008 = 0.

Open : Run by frequency reference from multi-function input terminal FR and run command from multi-function input terminals S1 to S7.

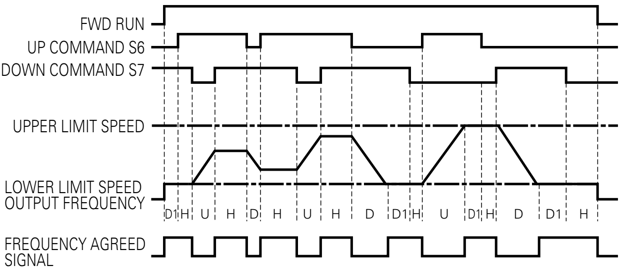
Closed : Run by potentiometer frequency reference and run command from the digital operator.

• UP/DOWN command (setting: n056 = 034)

With the FWD (REV) run command entered, accel/decel is enabled by inputting the UP or DOWN signals to multi-function input terminals S6 and S7 without changing the frequency reference, so that operation can be performed at the desired speed. When UP/DOWN commands are specified by n056, any function set to n055 becomes disabled; terminal S6 becomes an input terminal for the UP command and terminal S7 for the DOWN command.

Multi-function Input Terminal S6 (UP command)	Closed	Open	Open	Closed
Multi-function Input Terminal S7 (DOWN command)	Open	Closed	Open	Closed
Operation Status	Accel	Decel	Hold	Hold

Time Chart at 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 command is selected, the upper limit speed is set regardless of frequency reference.

   Upper limit speed = Maximum output frequency (n011)

   $\times$ Frequency reference upper limit (n033)/100
2. Lower limit value is either minimum output frequency (n016) or 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 an UP/DOWN command.
4. If the jog command is input while running by the UP/DOWN command, the jog command has priority.
5. Multi-step speed reference 1 to 4 is not effective when UP/DOWN command is selected. Multi-step speed reference is effective during running in hold status.
6. When "1" is set for HOLD output frequency memory selection (n100), 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.

• Communication/multi-function input terminal selection input (setting: 18)

Operation can be changed from communication command, or from multi-function input terminal or digital operator command.

Run command from communication and frequency reference are effective when multi-function input terminal for this setting is "closed (register No. 0001H, 0002H)."

Run command in LOCAL/REMOTE mode and frequency reference are effective when "Open."

Using multi-function analog input (n077, n078, n079)

The input analog signal (0 to 10V or 4mA to 20mA) for the CN2 terminal of the JVOP-140 digital operator can be used as an auxiliary function for the main speed frequency reference input to the control circuit terminals (FR or RP). Refer to the block diagram on page111 for details of the input signal.

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

Multi-function input selection (n077)

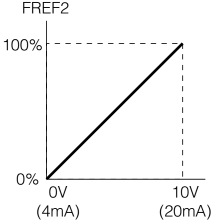
No.	Name	Unit	Setting Range	Initial Setting
n077	Multi-function input selection	–	0 to 4	0

n077 setting

Setting	Function	Description
0	Disabled	The multi-function input is desabled.
1	Auxiliary frequency reference (FREF2)	When frequency reference 2 is selected in multi-step speed reference, the input analog signal for the CN2 terminal becomes the frequency reference. The n025 setting becomes invalid. Note: Set frequency reference gain to n068 or n071, and frequency reference bias to n069 or n072.
2	Frequency reference gain (FGAIN)	Set the FGAIN to constant n060 or n074 and the FBIAS to constant n061 or n075 for the main speed frequency reference. Then, multiply the resulting frequency reference by the FGAIN.
3	Frequency reference bias (FBIAS)	Set the FGAIN to constant n060 or n074 and the FBIAS to constant n061 or n075 for the main speed frequency reference. Then, add the FBIAS to the resulting frequency reference. The amount of the FBIAS to be added is set to n79.
4	Output voltage bias (VBIAS)	Add the VBIAS to the output voltage after V/f conversion.

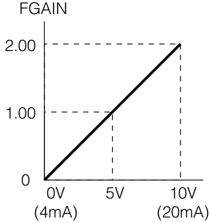
Analog input level

① Auxiliary frequency reference (n077=1)

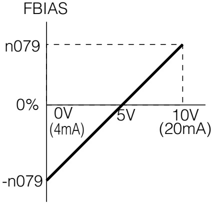


100%=Max. output frequency(n011)

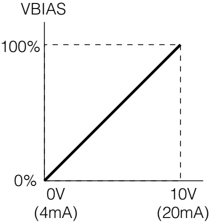
② Frequency reference gain (n077=2)



③ Frequence reference bias (n077=3)



④ Output voltage bias (n077=4)



The VBIAS value to be added is doubled for 400V 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 10V) 1= Digital operator terminal (current 4 to 20mA)	0

Frequency reference bias setting (n079)

Constant No.	Name	Unit	Setting Range	Initial Setting
n079	Frequency reference bias setting	%	0 to 50 100% / Max. output frequency (n011)	10

Using output signals (n057, n058, n059)

Multi-function output terminal MA, MB, P1 and P2 functions can be changed when necessary by setting constants n057, n058, and n059.

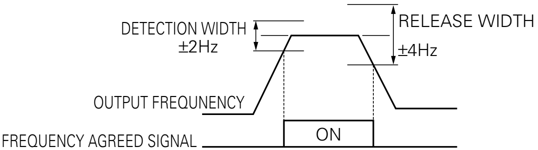
- Terminal MA and MB functions: Set to n057
- Terminal P1 function: Set to n058
- Terminal P2 function: Set to n059

Setting	Name	Description	Ref.page
0	Fault	Closed when inverter fault occurs.	-
1	In operation	Closed when either FWD/REV command is input or voltage is outout from the inverter.	-
2	Agreed frequency	Closed when setting frequency agrees with inverter output frequency.	79
3	Zero speed	Closed when inverter output frequency is less than minimum output frequency.	-
4	Frequency detection 1	Output frequency ≧ frequency detection level (n095)	59
5	Frequency detection 2	Output frequency ≦ frequency detection level (n095)	59
6	Overtorque detection (NO contact output)	—	58
7	Overtorque detection (NC contact output)	—	58
10	Minor fault	Closed when the alarm is indicated.	-
11	Base blocked	Closed when the inverter output is shut off.	-
12	Operation mode	Closed when “LOCAL” is selected by LOCAL/REMOTE selection.	-
13	Inverter operation ready	Closed when inverter fault is not detected, and operation is ready.	-
14	Fault restart	Closed during fault retry	-
15	In UV	Closed when undervoltage is detected.	-
16	In reverse run	Closed during reverse run.	-
17	In speed search	Closed when inverter conducts speed search.	-
18	Data output from communication	Operates multi-function output terminal independently from inverter operation (by MEMOBUS communication)	89
19	PID feedback loss	Closed during PID feedback loss	109

Initial setting of multi-function output terminal

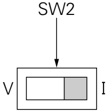
No.	Terminals	Initial Setting
n057	MA, MB	0 (fault)
n058	P1	1 (in operation)
n059	P2	2 (Frequency agreed)

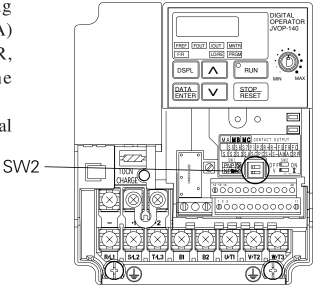
• Frequency agreed signal (setting=2)



■ Setting Frequency by Current Reference Input

When setting frequency by inputting current reference (4-20mA or 0-20mA) from the control circuit terminal FR, switch the DIP switch SW1 on the control circuit board to “I” side.
SW1 is accessed by removing the digital operator.





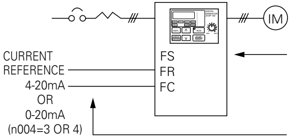
NOTE Never input voltage reference to control circuit terminal FR when DIP switch SW2 is switched to “I” side. The inverter might be damaged.

Current reference selection

After changing DIP switch (V-I switch of SW2) to the "I" side, PRESS PRGM on the digital operator, then set the following constants.

Current reference (4 to 20mA).... constant n004 = 3
Current reference (0 to 20mA).... constant n004 = 4

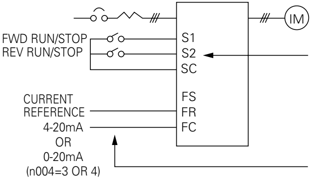
• Setting : n003 = 0



Press the digital operator keys to run or stop the inverter. Switch run and stop direction by setting F/R LED.

Set frequency by the analog current signal [0-100% (max. frequency) / 4-20mA] connected to the control circuit terminal.

• Setting : n003 = 1



Switch run/stop and FWD/REV run with switching device connected to the control circuit terminal.
Multi-function input terminals S1 and S2 are set to Forward run / STOP (n050 = 1) and Reverse run / stop (n051 = 2) respectively.

Set frequency by the analog current signal [0-100% (max. frequency) / 4-20mA] connected to the control circuit terminal.

Frequency reference gain (n060)/bias (n061) can be set even when current reference input is selected. For details, refer to "Adjusting frequency setting signal" on page 53.

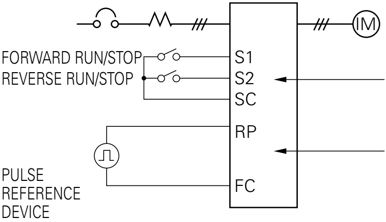
■ Frequency Reference by Pulse Train Input

Frequency reference can be set by pulse train input from the multi-function input terminal.

- Input pulse specifications
  - Low-level voltage: 0.8V or less
  - High-level voltage: 3.5 to 32V
  - H duty: 30 to 70%
  - Pulse frequency: 0 to 33 kHz
- Frequency reference method

  Frequency reference is a value obtained by multiplying the ratio of the maximum input pulse frequency and actual input pulse frequency by the maximum output frequency.

$$\text{Reference frequency} = \frac{\text{Input pulse frequency}}{\text{Maximum pulse train frequency (n149)} \times 10} \times \text{Maximum output frequency (n011)}$$



Run/stop and FWD/REV can be selected by a switch connected to the control circuit terminal.

Frequency setting can be set by pulse train input signal [0 to 100% (maximum frequency)/ 0 to 33kHz] connected to the multi-function input terminal.

Constant No.	Name	Unit	Setting range	Initial setting
n003	Run command selection	1	0 to 3	0
n004	Frequency reference selection	1	0 to 9	1
n149	Pulse train input scaling 1=10Hz	1	100 to 3300 (33kHz)	2500 (25kHz)

■ Preventing Motor from Stalling (Current Limit)

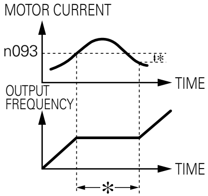
Automatically adjusts the output frequency and output current according to the load to continue operation without stalling the motor.

- 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. During acceleration, if the output current exceeds the value set for n093, acceleration stops and frequency is maintained. When the output current goes down to the value set for n093, acceleration starts.



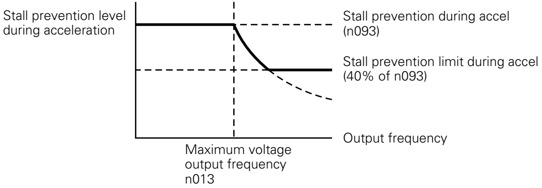
*Stops the acceleration to prevent the motor from stalling.

†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)], following equation automatically decreases the stall prevention (current limit) level during acceleration.

$$\boxed{\begin{array}{l}\text{Stall prevention (current limit) level}\\ \text{during accel in constant output area}\end{array}}$$

$$= \boxed{\begin{array}{l}\text{Stall prevention (current limit)}\\ \text{level during accel (n093)}\end{array}} \times \frac{\boxed{\text{Max. voltage output frequency (n013)}}}{\boxed{\text{Output frequency}}}$$

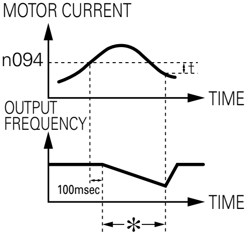


• Stall prevention (current limit) level during running (n094)

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

Factory setting: 160%

A setting of 200% disables the stall prevention (current limit) during running.
If stall prevention action current at agreed speed exceeds the value set for n094 for longer than 100msec, deceleration starts.
When the output current exceeds the value set for n094, deceleration continues. When the output current goes down to the value set for n094, acceleration starts, up to the set frequency.
Stall prevention accel/decel settings during operation are set either by currently-selected acceleration time 1 (n019) and deceleration time 1 (n020), or acceleration time 2 (n021) and deceleration time 2 (n022).



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

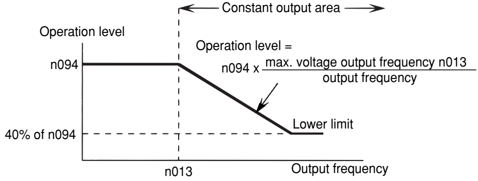
Stall prevention during operation

• Stall Prevention automatic decreace 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 Setting

<table>
<tr><th>Setting</th><th>Function</th></tr>
<tr><td>0</td><td>The stall prevention level becomes the level set for the constant n094 in all frequency areas.</td></tr>
<tr><td>1</td><td>The following shows that 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.

</td></tr>
</table>

• Accel/decel time selection during stall prevention (n116)

With this function, acceleration/deceleration time when moving to prevent stalling during operations can be assigned to the two constants, n021 and n022.

Contest No.	Name	Unit	Setting Range	Initial Setting
n116	Accel/decel time selection during stall prevention	-	0 = Disabled 1 = Enabled	0

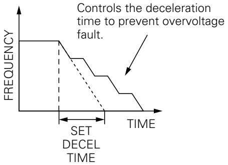
n116 Setting

Setting	Function
0	Accel / decel time is set by accel / decel time 1 or 2.
1	Accel/decel time is fixed at accel/decel 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 (when braking resistor mounted)



■ Decreasing Motor Speed Fluctuation

Slip compensation (When n002 is set to 0)

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

When 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

Constants No.	Name	Unit	Setting range	Initial Setting
n036	Motor rated current	0.1A	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	0.1s	0.0 to 25.5s When 0.0s is set, delay time becomes 2.0s	2.0s
n106	Motor rated slip	0.1Hz	0.0 to 20Hz	*

* Differs depending on inverter capacity.

Notes : 1. Slip compensation is not performed in the following condition:
Output frequency < minimum output frequency (n016)
2. Slip compensation is not performed during regeneration.
3. Slip compensation is not performed when motor rated current (n036) is set to 0.0A.

■ Motor Protection

Motor overload detection

The VS-606V7 protects against motor overload with a built-in electronic thermal overload relay.

• Motor rated current (elctronic thermal reference current, n036)

Set to the rated current value shown on the motor nameplate.

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

• Motor overload protection selection (n037, n038)

n037 Setting	Electronic Thermal Characteristics
0	Applied to general-purpose motor
1	Applied to inverter motor
2	Electronic thermal overload protection not provided

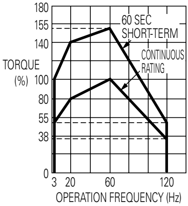
Constants No.	Name	Unit	Setting Range	Initial Setting
n038	Electronic thermal motor protection time constant setting	1min	1 to 60min	8min

The electronic thermal overload function monitors motor temperature, based on inverter output current and time, to protect the motor from overheating. When electronic thermal overload relay is enabled, an "oL 1" error occurs, shutting OFF the inverter output and preventing excessive overheating in the motor. When operating with one inverter connected to one motor, an external thermal relay is not needed. When operating several motors with one inverter, install a thermal relay on each motor.

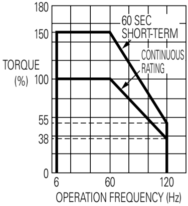
• General-purpose motor and inverter motor

Induction motors are classified as general-purpose motors or inverter motors, based on their cooling capabilities. Therefore, the motor overload function operates differently between these two motor types.

Example of 200V class motor

<table>
<tr><th></th><th>Cooling Effect</th><th>Torque Characteristics</th><th>Electronic Thermal overload</th></tr>
<tr><td>General-purpose Motor</td><td>Effective when operated at 50/60Hz from commercial power supply.</td><td>


Base Frequency 60Hz
(V/f for 60Hz, 220V Input Voltage)

For low-speed operation, torque must be limited in order to stop motor temperature rise.</td><td>"oL 1" error (motor overload protection) occurs when continuously operated at 50/60Hz or less at 100% load.</td></tr>
<tr><td>Inverter Motor</td><td>Effective even when operated at low speed (approx. 6Hz)</td><td>


Base Frequency 60Hz
(V/f for 60Hz, 220V Input Voltage)

Use an inverter motor for continuous operation at low speed.</td><td>Electronic thermal overload protection not activated even when continuously operated at 50/60Hz or less at 100% load.</td></tr>
</table>

■ Selecting Cooling Fan Operation

In order to increase lifetime, the cooling 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 MEMOBUS (MODBUS) Communications

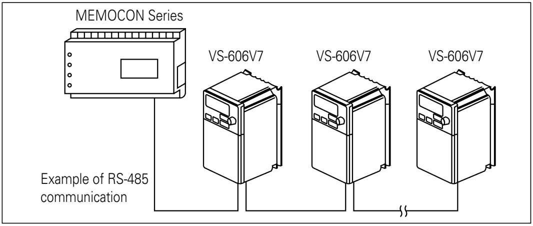
Serial communication is available with VS-606V7 using programmable controller (MEMOCON series) and MEMOBUS. Refer to MEMOBUS Instruction Manual (Manual No.: TOEZ-C736-70.1) for details of communications.

○ MEMOBUS (MODBUS) communications

MEMOBUS system is composed of a single master (PLC) and slaves (1 to 31 VS-606V7 units).

Communication between master and slave (serial communication) is controlled according to the master program with the master initiating communication and the slave responding.

The master sends a signal to one slave at a time. Each slave has a pre-registered address No., and the master specifies the number and conduct signal communications. The slave receives the communications to carry out designated functions and reply to the master.

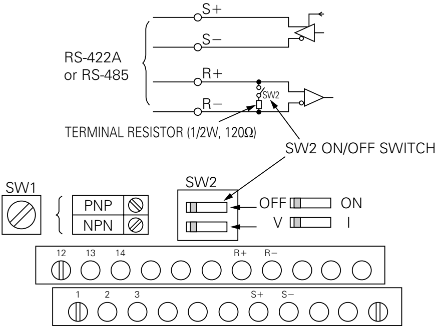


○ Communications specifications

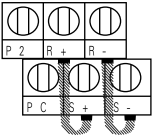
Interface	RS-422, RS-485
Synchronization	Asynchronous (Start-stop synchronization)
Communication parameters	Baud rate : Selected from 2400/4800/9600/19200 bps Data length : 8bit fixed Parity : Selected from even/odd/none Stop bits : 1bit fixed
Communication protocol	MEMOBUS (MODBUS) (RTU mode only)
Max. number of inverters that can be connected	31 units (When using RS-485)

○ Communications connection terminal

Use the following S+, S-, R+ and R- terminals for MEMOBUS communications. Change the termination resistor as shown below.
At RS-422, RS-485 communications: Turn ON SW2 ON/OFF switch of only the inverter at the termination viewed from the PLC.



Notes:
1. Separate the wiring for communication from the main circuit wiring or other power lines.
2. Use shielded cables for communication wiring; connect the shielded sheath to the ground terminal and terminate the other end to prevent it from being connected (to prevent noise malfunction).
3. When communication is performed through RS-485, connect S+ and R+, S- and R- terminals outside the inverter as shown right side.



Procedure for communications with PLC

The following shows the procedure for communications with PLC.

1. Connect the communication cable between the PLC and the VS-606V7 with the power supply turned OFF.
2. Turn the power ON.
3. Set the constants (n151 to n157) required for communication by using the digital operator.
4. Turn the power OFF once to verify that the digital operator displays have been completely erased.
5. Turn the power ON again.
6. Communications with the PLC starts.

○ Setting constants necessary for communication

Communication related constants must be set for PLC communication. Constants n151 to n157 cannot be set by communication. Always set them before performing communication.

Constant	Name	Description	Initial Setting
n003	Run command selection	0 : operator 1 : control circuit terminals 2 : MEMOBUS communication 3 : communication card (optional)	0
n004	Frequency reference selection	0 : potentiometer (digital operator) 1 : frequency reference 1 (n024) 2 : control circuit terminals (voltage 0 to 10V) 3 : control circuit terminals (current 4 to 20mA) 4 : control circuit terminals (current 0 to 20mA) 5 : pulse train 6 : MEMOBUS communication (register No. 0002H) 7 : operator circuit terminals (voltage 0 to 10V) 8 : operator circuit terminals (current 4 to 20mA) 9 : communication card (optional)	0
n151	MEMOBUS timeover detection Monitors transmission time between the receiving the correct data from the PLC. (Timeover:2 sec)	0 : timeover detection (coast to a stop) 1 : timeover detection(decelerates to a stop with speed reduction time 1) 2 : timeover detection(decelerates to a stop with speed reduction time 2) 3 : timeover detection(continuous operation, warning display) 4 : timeover detection not provided	0
n152	MEMOBUS frequency reference and frequency monitor unit	0 : 0.1Hz 1 : 0:0.1Hz 2 : 30000/100% (30000 = max. output frequency) 3 : 0.1%	0
n153	MEMOBUS slave address	Setting range:0 to 32*	0
n154	MEMOBUS BPS selection	0 : 2400 bps 1 : 4800 bps 2 : 9600 bps 3 : 19200 bps	2
n155	MEMOBUS parity selection	0 : even parity 1 : odd parity 2 : no parity	2
n156	Transmission wating time	Setting limit:10 ms to 65 ms setting unit:1ms	10 ms
n157	RTS control	0 : RTS control 1 : no RTS control (RS-422A 1 to 1 communication)	0

* The slave does not respond to the command from the master when set to 0.

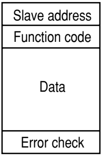
Monitoring run status from the PLC, setting/referencing of constants, fault reset and multi-function input reference can be done regardless of run command or frequency reference selection.

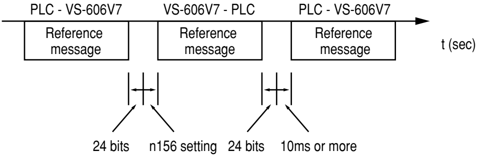
Multi-function input reference from PLC becomes OR with input commands from S1 to S7 multi-function input terminals.

○ Message format

For communications, the master (PLC) sends a command to the slave (VS-606V7) and the slave responds to it. The configuration for sending and receiving is as shown to the right. The length of the data varies according to the contents of commands (functions).

The interval between messages must be maintained at the following amount.





• Slave address: Inverter address (0 to 32)
Setting to 0 indicates simultaneous broadcasting. The inverter does not respond to the command from the master.

• Function code: Command codes (See below.)

Function Code Hexadecimal	Function	Reference Message		Response Message	
		Mnimum (Byte)	Maximum (Byte)	Mnimum (Byte)	Maximum (Byte)
03H	Reading holding register contents	8	8	7	37
08H	Loop back test	8	8	8	8
10H	Write in several holding registers	11	41	8	8

• Data: Composes a series of data by combining holding register numbers (test codes for loop-back numbers) and their data. Data length depends on the contents of the commands.

• Error check: CRC-16 (Calculate the value by the following method.)
1. The default value at calculation of CRC-16 is normally 0. In the MEMOBUS system, change the default to 1 (all 1 to 16-bit).
2. Calculate CRC-16 assuming that the loop address LSB is MSB and the last data MSB is LSB.
3. Also calculate CRC-16 for a response message from the slave and refer it to CRC-16 in the response message.

• Read out holding register contents [03H]

Reads out the contents of the holding registers with the continuous numbers for the specified quantity. The contents of holding register is divided into the upper 8 bits and the lower 8 bits. They become the data items in response message in the order of numbers.

(Example)

Reads out status signal, fault contents, data link status and frequency reference from the VS-606V7 (slave 2).

Reference message (at normal operation)

Slave address		02H
Function code		03H
Start number	Upper	00H
	Lower	20H
Quantity	Upper	00H
	Lower	04H
CRC-16	Upper	45H
	Lower	F0H

(For error code 03H, refer to page 99.)

Response message (at normal operation)

Slave address		02H
Function code		03H
Number of data*		08H
First holding register	Upper	00H
	Lower	65H
Next holding register	Upper	00H
	Lower	00H
Next holding register	Upper	00H
	Lower	00H
Next holding register	Upper	01H
	Lower	F4H
CRC-16	Upper	AFH
	Lower	82H

Reference message (at fault occurrence)

Slave address		02H
Function code		83H
Error code		03H
CRC-16	Upper	F1H
	Lower	31H

* Twice as much as the number of reference message.

• Example of loop-back test [08H]

Command message is returned as a response message without being changed. This function is used to check communication between the master and the slave. Any arbitrary values can be used for test codes or data.

(Example) Loop-back test of slave 1 and VS-606V7

Reference message (at normal operation)

Slave address		01H
Function code		08H
Start number	Upper	00H
	Lower	00H
Quantity	Upper	A5H
	Lower	37H
CRC-16	Upper	DAH
	Lower	8DH

Response message (at normal operation)

Slave address		01H
Function code		08H
Start number	Upper	00H
	Lower	00H
Quantity	Upper	A5H
	Lower	37H
CRC-16	Upper	DAH
	Lower	8DH

Reference message (at fault occurrence)

Slave address		01H
Function code		89H
Error code		01H
CRC-16	Upper	86H
	Lower	50H

• Writing to several holding registers [10H]

Specified data are written into the several specified holding registers from the specified number, respectively. Written data must be arranged in a command message in the order of the holding register numbers: from upper eight bits to lower eight bits.

(Example)

Set forward run at frequency reference 60.0 Hz to slave 1 VS-606V7 from the PLC.

Reference message (at normal operation)

Slave address		01H
Function code		10H
Start number	Upper	00H
	Lower	01H
Quantity	Upper	00H
	Lower	02H
Number of data*		04H
First data	Upper	00H
	Lower	01H
Next data	Upper	02H
	Lower	58H
CRC-16	Upper	63H
	Lower	39H

Response message (at normal operation)

Slave address		01H
Function code		10H
Start number	Upper	00H
	Lower	01H
Quantity	Upper	00H
	Lower	02H
CRC-16	Upper	10H
	Lower	08H

Reference message (at fault occurrence)

Slave address		01H
Function code		90H
Error code		02H
CRC-16	Upper	CDH
	Lower	C1H

* Sets twice as large as the actual number.

Data

• Reference Data (available to read out / write in)

Register No.	bit	Description
0000H		Reserved
0001H	0	Run command 1 : Run 0 : Stop
	1	Reverse run 1 : Reverse run 0 : Forward run
	2	External fault 1 : Fault (EFO)
	3	Fault reset 1 : Reset command
	4	Multi-function input reference 1 (Function selected by n050)
	5	Multi-function input reference 2 (Function selected by n051)
	6	Multi-function input reference 3 (Function selected by n052)
	7	Multi-function input reference 4 (Function selected by n053)
	8	Multi-function input reference 5 (Function selected by n054)
	9	Multi-function input reference 6 (Function selected by n055)
	A	Multi-function input reference 7 (Function selected by n056)
	B - F	(Not used)
0002H		Frequency reference (unit : n152)
0003H		V / f gain (1000 / 100%) Setting range : 2.0 to 200.0%
0004H-0008H		Reserved
0009H	0	Multi-function output reference 1 (1 : MA ON 0 : MA OFF) (Effective when n057=18)
	1	Multi-function output reference 2 (1 : P1 ON 0 : P1 OFF) (Effective when n058=18)
	2	Multi-function output reference 3 (1 : P2 ON 0 : P2 OFF) (Effective when n059=18)
	3 - F	(Not used)
000AH-001FH		Reserved

Note : Write in ”0” for unused bit. Never write in data for the reserved register.

• Simultaneous Broadcasting Data (available only for write in)

Register No.	bit	Description
0001H	0	Run command 1 : Run 0 : Stop
	1	Reverse run 1 : Reverse run 0 : Forward run
	2	(Not used)
	3	(Not used)
	4	External fault 1 : Fault (EFO)
	5	Fault reset 1 : Fault reset command
	6 - F	(Not used)
0002H		30000 / 100% fixed unit (Data is converted into 0.01 Hz inside the inverter, and fractions are rounded off.)

Bit signals not defined as the broadcast operation signals are used as the local station data signals.

• Monitor Data (available only for read out)

Register No.		bit	Description
0020H	Status signal	0	Run command 1 : Run 0 : Stop
		1	Reverse run 1 : Reverse run 0 : Forward run
		2	Inverter operation ready 1 : Ready 0 : Not ready
		3	Fault 1 : Fault
		4	Data setting error 1 : Error
		5	Multi-function output 1 (1 : MA ON 0 : MA OFF)
		6	Multi-function output 2 (1 : P1 ON 0 : OFF)
		7	Multi-function output 3 (1 : P2 ON 0 : OFF)
		8 - F	(Not used)
0021H	Fault description	0	Overcurrent (OC)
		1	Overvoltage (OV)
		2	Inverter overload (OL2)
		3	Inverter overheat (OH)
		4	(Not used)
		5	(Not used)
		6	PID feedback loss (FbL)
		7	External fault (EF, EFO) Emergency stop (STP)
		8	Hardware fault (F××)
		9	Motor overload (OL1)
		A	Overtorque detection (OL3)
		B	(Not used)
		C	Power loss (UV1)
		D	Control power fault (UV2)
		E	MEMOBUS communications timeover (CE)
		F	Operator connection (OPR)
0022H	Data link status	0	Data write in
		1	(Not used)
		2	(Not used)
		3	Upper / lower limit fault
		4	Consistency fault
		5 - F	(Not used)
0023H	Frequency reference (Unit : n152)		
0024H	Output frequency (Unit : n152)		
0025H-026H	(Not used)		
0027H	Output current (10/1A)		
0028H	Output voltage reference (1/1V)		
0029H-002AH	Reserved		
002BH	Sequence input status	0	Terminal S1 1 : Closed 0 : Open
		1	Terminal S2 1 : Closed 0 : Open
		2	Terminal S3 1 : Closed 0 : Open
		3	Terminal S4 1 : Closed 0 : Open
		4	Terminal S5 1 : Closed 0 : Open
		5	Terminal S6 1 : Closed 0 : Open
		6	Terminal S7 1 : Closed 0 : Open
		7 - F	(Not used)

Register No.		bit	Description	
002CH	Inverter status	0	Run	1 : Run
		1	Zero - speed	1 : Zero - speed
		2	Frequency agreed	1 : Agreed
		3	Minor fault (Alarm is indicated)	
		4	Frequency detection 1	1 : Output frequency ≦ (n095)
		5	Frequency detection 2	1 : Output frequency ≧ (n095)
		6	Inverter operation ready	1 : Ready
		7	Undervoltage detection	1 : Undervoltage detection
		8	Baseblock	1 : Inverter output baseblock
		9	Frequency reference mode	1 : Other than communications 0 : Communications
		A	Run command mode	1 : Other than communications 0 : Communications
		B	Overtorque detection	1 : Detection or overtorque fault
		C	(Not used)	
		D	Fault restart	
		E	Fault (Including MEMOBUS communications timeover) 1 : Fault	
		F	MEMOBUS communications timeover 1 : timeover	
002DH		0	MA“ON”	1 : “ON” 0 : “OFF”
		1	P1“ON”	1 : “ON” 0 : “OFF”
		2	P2“ON”	1 : “ON” 0 : “OFF”
		3 - F	(Not used)	
002EH-0030H	Reserved			
0031H	Main circuit DC voltage (1 / 1V)			
0032H	Torque monitor (1 / 1%; 100% / Motor rated torque ; with sign)			
0033H-0036H	(Not used)			
0037H	Output Power (1/1W : with sign)			
0038H	PID feedback value (100% / Input equivalent to max. output frequency; 10 / 1%; without sign)			
0039H	PID input value (±100% / ± Max. output frequency ; 10/1%; with sign)			
003AH	PID output value (±100% / ± Max. output frequency ; 10/1%; with sign)			
003BH-003CH	Reserved			
003DH	Communications error	0	CRC error	
		1	P1 “ON”	
		2	(Not used)	
		3	Parity error	
		4	Overrun error	
		5	Framing error	
		6	Timeover	
		7	(Not used)	
003EH-00FFH	Reserved			

* Communications error contents are saved until fault reset is input.
(Reset is enabled during run.)

○ Storing constants [ENTER command] (can be written only.)

Register Number	Name	Contents	Setting Range	Default
0900H	ENTER command	Write in constant data to non- volatile memory (EEPROM).	0000H to FFFFH	–

When a constant is written from the PLC by communications, the constant is written to the constant data area on the RAM in the VS-606V7. ENTER command is a command to write the constant data on the RAM to the non-volatile memory in the VS-606V7. Writing data (can be undefined) to register number 0900H during stop executes this ENTER command.
Maximum number of writing times of the non-volatile memory used for VS-606V7 is 100,000; do not execute the ENTER command excessively.
When a constant is changed from the digital operator, the constant data on the RAM is written to the non-volatile memory without ENTER command.
Register number 0900H is used only for write-in. If this register is read-out, register number error (error code: 02H) occurs.

Error Codes

Error Code	Contents
01H	Function code error • Function code from PLC is other than 03H, 08H or 10H.
02H	Improper register number • No register numbers to be accessed have been registered. • ENTER command "0900H" that is an exclusive-use register for write-in was read out.
03H	Improper quantity • The number of data items to be read or write-in is not in the range between 1 and 16. • The number of data items in a message is not the value obtained by multiplying the quantity by two in the write-in mode.
21H	Data setting error • A simple upper/lower limit error occurred with control data or constant write-in. • A constant setting error occurred when a constant was written.
22H	Write-in mode error • Attempt to write-in a constant from PLC was made during running.* • Attempt to write-in an ENTER command from PLC was made during running. • Attempt to write-in a constant from PLC was made during UV occurrence. • Attempt to write-in an ENTER command from PLC was made during UV occurrence. • Attempt to write-in a constant other than n001=12, 13 (constant initialization) from PLC was made during "F04" occurrence. • Attempt to write-in a constant from PLC was made while data were being stored. • Attempt to write-in data exclusive for read-out from PLC was made.

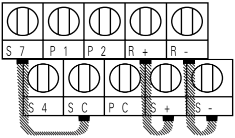
* Refer to the constants list for constants that can be changed during operation.

○ Performing self-test

VS-606V7 is provided with a function to perform self-diagnosis for operation check of the serial communication I/F circuit. This function is called self-test. In the self-test, connect the sending terminal with the receiving terminal in the communication section. It assures if the data received by VS-606V7 is not being changed. It also checks if the data can be received normally.

Carry out the self-test in the following procedure.

1. Turn ON the VS-606V7 power supply. Set constant n056 to 35 (self-test).
2. Turn OFF the VS-606V7 power supply.
3. Make the following wiring with the power supply turned OFF.
4. Turn the power ON.



(Note: Select NPN side for SW1.)

Normal operation: Operator displays frequency reference value.
Faulty operation: Operator displays "CE," fault signal is turned ON and inverter ready signal is turned OFF.

■ Using Energy-saving Control Mode

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

Calculates the voltage for the best motor efficiency when operating in energy-saving control mode. The calculated voltage becomes the output voltage reference. The factory setting is set to the max. applicable motor capacity of 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 to n158. Then, change the setting of the energy-saving coefficient K2 (n140) by 5% so that the output power becomes the smallest.

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

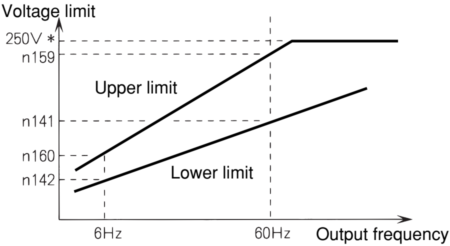
Constant No.	Name	Unit	Setting Range	Initial Setting
n140	Energy-saving control coefficient K2	–	0.0 to 6550	*
n158	Motor code	–	0 to 70	*

*Changes depending on inverter capacity.

• Energy-saving voltage lower / upper limit (n141, n142, n159, n160)

Sets 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 value is output as a voltage reference value. 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 6Hz/60 Hz. For any voltage other than 6Hz/60Hz, set the (value of the) voltage limit according to linear interpolation. The constants are set in % for 200V/400V 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 400V class inverters.

Energy-saving search operation

In the energy-saving control mode, the max. 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 max. applicable voltage may not be emitted. In the search operation, change the voltage slightly so that the max. applicable voltage can be obtained.

• Search operation Voltage Limit (n144)

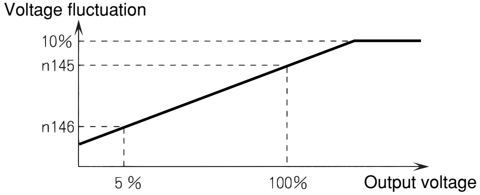
Limits the range where the voltage can be controlled. The constants are set in % for 200V/400V inverters. The search operation is not performed when set to 0.

Constant No.	Name	Unit	Setting Range	Initial Setting
n144	Search operation voltage limit	%	0 to 100	0

• Search Operation Voltage Step (n145, n146)

Sets the voltage fluctuations for one cycle of the search operation. Increase the value and the fluctuation of the rotation speed will also increase. Sets the range. The value calculated by linear interpolation is set for voltage other than above.

Constant No.	Name	Unit	Setting Range	Initial Setting
n145	Search operation voltage step (100%)	%	0.1 to 10.0	0.5
n146	Search operation voltage step (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. Then, the search operation mode is activated. Set the hold width in % of the power which is currently held.

Constant No.	Name	Unit	Setting Range	Initial Setting
n161	Search operation power detection hold width	%	0 to 100	10

• Power detection filter time constant (n162)

Response at load change is improved when this value is small. However, at low frequency, 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 with that motor code (n158).

Motor Type	Voltage Class	Capacity	Motor Code: n158	Energy-saving coefficient K2: n140
YASKAWA General-purpose Motor	200V	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
	400V	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
YASKAWA Inverter Motor	200V	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
	400V	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 of the PID control setting, 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 differential control.	Forward
2	Enabled: feedback signal is subject to differetial control.	
3	Enabled: frequency reference + PID control, and deviation are subject to differential control.	
4	Enabled: frequency reference + PID control, and feedback signal are subject to differential control.	Reverse
5	Enabled: deviation is subject to differential control.	
6	Enabled: feedback signal is subject to differetial control.	
7	Enabled: frequency reference + PID control, and deviation are subject to differential control.	
8	Enabled: frequency reference + PID control, and feedback signal are subject to differential 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 the PID control is enabled.

	Input	Condition
Target Value	The currently selected frequency reference	Determined by the frequency reference selection (n004). When the local mode is selected, the target value is determined by frequency reference selection in local mode (n008). When the multi-step speed reference is selected, the currently selected frequency reference becomes the target value.
Feedback Value	The frequency reference that is set to the PID feedback value selection (n164)	–

n164 setting	Description
0	Control circuit terminal FR (Voltage 0 to 10V)
1	Control circuit terminal (Current 4 to 20 mA)
2	Control circuit terminal (Current 0 to 20 mA)
3	Operator terminal (Voltage 0 to 10V)
4	Operator terminal (Current 4 to 20 mA)
5	Pulse train

Notes: 1.When selecting frequency reference from the control circuit terminal FR as the target or feedback value, the V-I switch of SW2 on the control circuit board must be selected depending on the input method (current or voltage input).

2.Never use the frequency reference from the control circuit terminal FR for both the target and feedback values. The frequency reference for both the target value and the feedback value becomes the same.

(Example)
When the frequency reference from the control circuit terminal FR, with a voltage of 0 to 10 V, is selected as the target value and n004=2, and when at the same time the frequency reference from the control circuit terminal FR, with a current of 4 to 20mA, is selected as the feedback value and n164=1, the feedback value will be set as the frequency reference from the control circuit terminal FR.

3.When using the analog signal(0 to 10V / 4 to 20mA) which inputs to the CN2 terminal of the digital operator JVOP-140 as the target or feedback value of PID control, never use it as a multi-analog input. Constant n077(multi-function analog input) should be set to 0 (disabled).

- Proportional gain (P), Integral time (I), Differential time (D) (n130, n131, n132)

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

Constant No.	Name	Unit	Setting Range	Initial Setting
n130	Proportional gain (P)	Multiples	0.0 to 25.0	1.0
n131	Integral Time (I)	1.0 s	0.0 to 360.0	1.0
n132	Differential Time (D)	1.0 s	0.00 to 2.50	0.00

Optimize the responsiveness by adjusting it 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.

• Integral (I) Limit (n134)

Constant No.	Name	Unit	Setting Range	Initial Setting
n134	Upper limit of integral values	%	0 to 100	100

This constant prevents the calculated value of the integral control from exceeding the fixed 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 set to zero, adjust the inverter output frequency to zero.

• PID Primary Delay Time Constant (n135)

Constant No.	Name	Unit	Setting Range	Initial Setting
n135	Primary delay time constant of 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	Multiples	0.0 to 25.0	1.0

This constant adjusts the output gain.

• PID Feedback Value Adjusting Gain (n129)

Constant No.	Name	Unit	Setting Range	Initial Setting
n129	PID feedback gain	Multiples	0.00 to 10.00	1.00

Constant n129 is the gain that adjusts the feedback value.

• PID Feedback Loss Detection (n136, n137, n138)

Constant No.	Name	Unit	Setting Range	Initial Setting
n136	Selection of PID feedback loss detection	–	0 : No detection of PID feedback loss 1 : Detection of PID feedbak loss (Operation continued: FbL alarm) 2 : Detection of PID feedback loss (Output shut down: 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

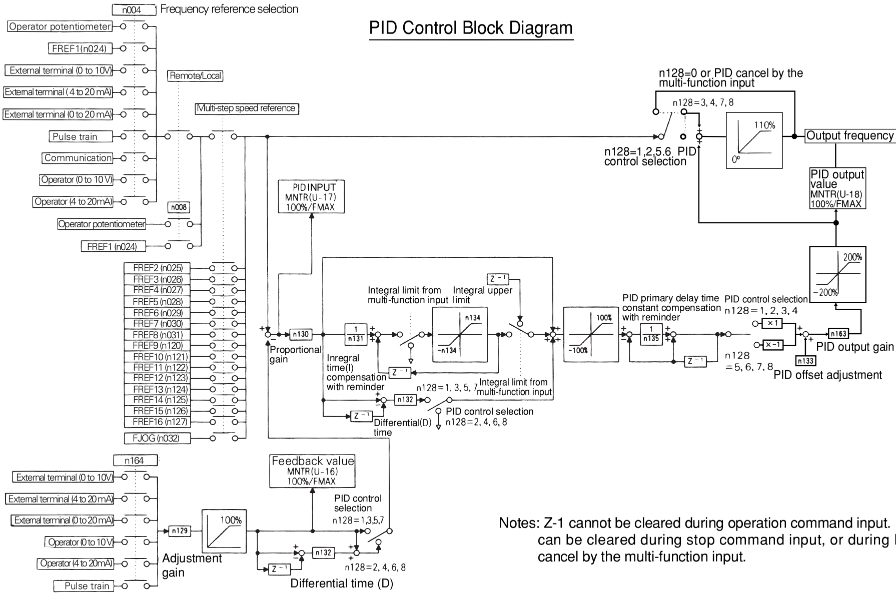
• PID Limit

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

• Prohibition of PID output

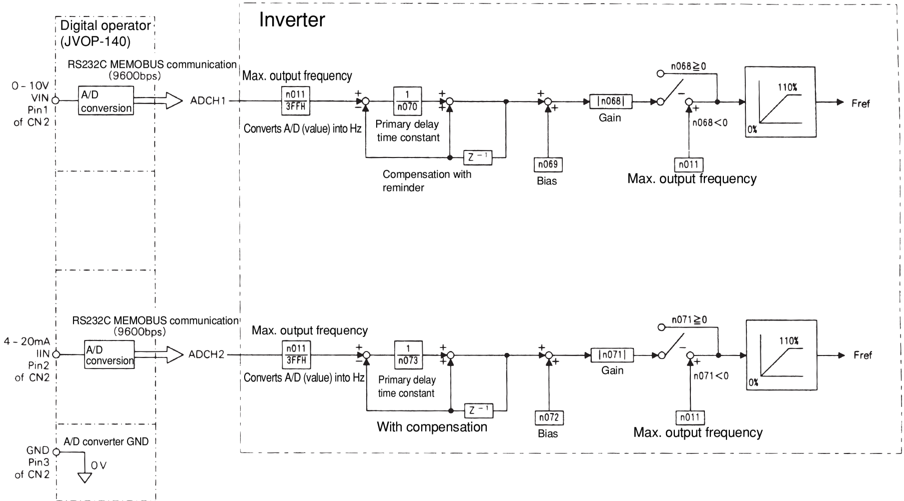
Zero limit occurs when the PID output is negative.

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 VS-606V7 standard digital operator JVOP-140 can store constants for one inverter. A backup power supply is not necessary since EEPROM is used.
Constant copy function is possible only for the inverters with 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 VS-606V7 and VSmini J7 inverters.

The prohibition of the reading of constants from the inverter can be set at n177. The constant data cannot be changed when this constant is set.

If any alarm occurs during constant copy, the PRGM will blink and copying will continue.

• Constant copy function selection (n176)

Depending on the setting of n176 for constant copy function selection, the following functions are available:

(1) Read all the constants from the inverter (READ) and store them in EEPROM in the digital operator.

(2) Copies the constants stored in the digital operator to the inverter (COPY).

(3) Verify that the constants in the digital operator and the constants in theinverter are the same(VERIFY).

(4) Displays the maximum applicable motor capacity and the voltage class of the inverter that has the constants stored in the digital operator.

(5) Displays the software number of the inverter that has the constants 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.

When reading is performed while this constant is set to 0, PrE will blink. Press the 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] Store the constants read out from the inverter, in the EEPROM inside the digital operator.

Explanation		Operator display
• Enable the setting of the constants n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by pressing ∧ or ∨ key. • Press ENTER.	001 (Can be a different constant No.) 1 (Lit) (Can be a different set value.) 4 (Blinks) 4 (Lit for one second.) ↓ n001 (The constant is displayd.)
• Set contant read prohibited selection (n177) to READ enabled. ∗1	• Change the constant No. to n177 by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to 1 by pressing ∧ or ∨ key. • Press ENTER.	n177 0 (Lit) 1 (Blinks) 1 (Lit for one second) ↓ n177 (The constant displayed.)
• Execute read-out (READ) by constant copy Function selection (n176).	• Change the constant No. by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to rEd by pressing ∧ or ∨ key. • Press ENTER. • Press DSPL or ENTER	n176 rEd (Lit) rEd (Lit) rEd (Blinks while executing READ) ↓ End (End is displayed after the execution of READ is completed.) n176 (The constant is displayed.)
• Set Constant read prohibited selection (n177) to READ disabled. ∗2	• Change the constant No.to N177 by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Chage the set value to 0 by pressing ∧ or ∨ key. • Press ENTER.	n177 1 (Lit) 0 (Blinks) 0 (Lit for one second) ↓ n177 (the constant No. is displayed.)

∗1 When READ is enabled (n177=1), this setting is not necessary.

∗2 The setting is not necessary unless the READ prohibition is selected.

COPY function

Writes the constants stored inside the digital operator in batch to the inverter. Write-in is possible only for the inverters with 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 (or vice versa), from V/f control mode to vector control mode (or vice versa), and from VS-606V7 to VSmini J7 are not possible.

Constant Copy Function Selection (n176), Constant Read Selection Prohibit (n177), Fault history (n178), Software version No. (n179), and hold output frequency is not written vAE will appear (blinking) when the capacity of the inverters differs.
Press ENTER to continue writing in (the COPY function).
Press STOP/RESET to stop the COPY function.

Following constants are not written if the inverter capacity is different.

Constant No.	Name	Constant No.	Name
n011 to n017	V/ f setting	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] Write the constants from EEROM inside the degital operator to the inverter

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

A setting range check and matching check for the written-in constants are executed after the constants are written from the digital operator to the inverter. If any 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 blinking.

When a matching error is found, oP □ (□:a number) is indicated by blinking.

VERIFY function

Collates the constants stored in the digital operator with the constant in the inverter. As well as write-in, VERIFY 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 correspond to those in the inverter, vFy is displayed by blinking, then End is displayed.

[Example] Collate the constants stored in EEPROM inside the digital operator with the constants in the inverter

Explanation		Operator display
• Enable the setting for the constans n001 to n179.	• Press DSPL to light [PRGM].	n001 (Can be a different constant No.)
	• Press ENTER to display the set value.	1 (Lit) (Can be a different constant No.)
	• Change the set value to 4 by Pressing ∧ or ∨ key.	4(Bl inks)
	• Press ENTER.	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 ∧ or ∨ key.	n176
	• Press ENTER to display the set value.	rdy (Lit)
	• Change the set value to vFy by pressing ∧ or ∨ key.	vFy (Lit)
	• Press ENTER.	vFy (Blinks while executing VERIFY)
• Display the unmatched constant No.		n011 (Blinks) (When n011 is unmatched)
• Display the constant value in the inverter.	• Press ENTER.	60.0 (Blinks)
• Display the constant value in the digital operator.	• Press ENTER.	50.0 (Blinks)
• Continue the execution of VERIFY.	• Press ∧ key.	vFy (Blinks while executing VERIFY) ↓
	• Press DSPL or ENTER.	End(End is displayed when the execution of VERIFY is completed). n176 (The constant No. is displayed)

While an unmatched constant No. is displayed or a constant value is displayed, pressing STOP/RESET interrupts the execution of VERIFY and End is displayed. Pressing DSPL or ENTER returns to the constant No.

Inverter Capacity Display

The voltage class and maximum applicable motor capacity (whose constants stored in the digital operetor are read out) are displayed.

[Example] Display the voltage class and maximum applicable motor capacity for the inverter whose constants stored in EEPROM inside the digital operator

Explanation		Operator display
• Enable the setting for the constans n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by Pressing ∧ or ∨ key. • Press ENTER.	n001 (Can be a different constant No.) 1 (Lit) (Can be a different constant No.) 4 (Bl inks) 4 (Lit for one second) ↓ n001 (The constant No. is displayed)
• Execute Inverter Capacity Display (vA) by Constant copy function selection (n176)	• Change the constant No. to n176 by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to vA fy by pressing ∧ 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 shows the explanation of Inverter Capacity Display

20.7

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

	Max. applicable motor capacity	
	200V class	400V class
0.1	0.1kW	-
0.2	0.25kW	0.37kW
0.4	0.55kW	0.55kW
0.7	1.1kW	1.1kW
1.5	1.5kW	1.5kW
2.2	2.2kW	2.2kW
3.0	-	3.0kW
4.0	4.0kW	4.0kW

Software No. Display

The software No. (of the inverter whose constants stored in the digital operator are read out) is displayed.

[Example] Display the software No. of the inverter whose constants stored in EEPROM inside the digital operator

Explanation		Operator display
• Enable the setting for the constans n001 to n179.	• Press DSPL to light [PRGM]. • Press ENTER to display the set value. • Change the set value to 4 by Pressing ∧ or ∨ key. • Press ENTER.	n001 (Can be a different constant No.) 1 (Lit) (Can be a different set value.) 4 (Bl inks) 4 (Lit for one second) ↓ n001 (The constant No. is displayed)
• Execute Software No. Display (Sno)∗ by Constant copy function selection (n176).	• Change the constant No. to n176 by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to Sno by pressing ∧ or ∨ key. • Press ENTER. • Press DSPL or ENTER.	n176 rdy (Lit) Sno (Lit) 0013 (Lit) (software version : VSP010013) n176 (The constant No. is displayed)

∗ Displays Lower 4 digits of the software version.

Display List

Operator display	Description	Corrective action
rdy	Lit: Setting for constant copy function selection enabled	-
rEd	Lit: READ selected Blinks: READ under execution	-
CPy	Lit: Writing (COPY) selected Blinks: Writing (COPY) under execution	-
vFy	Lit: VERIFY selected Blinks: VERIFY under execution	-
vA	Lit: Inverter capacity display selected	-
Sno	Lit: Software No. Display selected	-
End	Lit: READ, COPY (writing), or VERIFY completed	-
PrE	Blinks: Attempt 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	Blinks: The constant could not be read properly by 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	Blinks: A sumcheck error occurs in the consant data stored in the digital operator.	The constans stored in the digital operator cannot be used. Re-execute READ to store the constans in the digital operator.
dPS	Blinks: The password for the connected inverter and that for the constant data stored in the digital operator are disagreed. [Ex.]Writing (COPY) from VS-606V7 to VSmini J7	Check if they are the same product series.
ndr	Blinks: No constant data stored in the digital operator.	Execute READ.
CPE	Blinks: Attempt to execute writing (COPY) or VERIFY between different voltage classes or different control modes.	Check each voltage class and control mode.
CyE	Blinks: A main circuit low voltage is detected during writing (COPY) operation.	Confirm that the main circuit power supply voltage is correct, then re-execute writing (COPY).
F04	Lit: A sumcheck error occurs in the constant data stored in the inverter.	Initialize the constans. If an error occurs again, replace the inverter due to a failure of constant memory element (EEPROM) in the inverter.
vAE	Blinks: Attempt 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	Blinks: A communication error occurs between the inverter and the digital operator.	Check the connection between the inverter and the digital operator. If a communication error occurs durring READ operation or writing (COPY) operation, be sure to re-execute READ or COPY.

Note: While rEd, CPy, or vFy is displayed by blinking, key input on the digital operator is disabled.
While rEd, CPy and vFy are not displayed by blinking, pressing DSPL or ENTER redisplays the constant No.

■ Unit selection for Frequency Reference Setting/Display

Constants and monitor display for which selection of unit function is valid

Item	Contents
Frequency reference constants	Frequency reference 1 to 8 (Constants n024 to n031)
	Jog frequency reference (Constant n032)
	Frequency reference 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)

• Function Outline

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

Constant No.	Constant Name	Description	Initial setting
035	Selecting setting/ displaying unit of frequency reference	0: in units of 0.01 Hz (less than 100 Hz) 0.1Hz (100 Hz and more) 1: in units of r/min (set the number of motor poles) 40 to 3999: in any unit	0

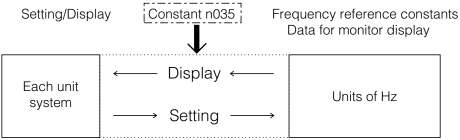
• n035 setting

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), (400Hz ÷ Fmax (n011) 100 % }
2 to 39	•Setting in units of 1 r/min: r/min=120 × Frequency reference (Hz) ÷ n035 (Set the number of motor poles for n035) •Setting range min{120 (Fmax (n011) Frequency reference lower limit (n034) ÷ n035~120 × (Fmax(n011)×Frequency reference upper limit (n033)) n035, 400Hzx120 P, 9999r/min •Set the display value at 100 % of frequency reference (set value of Fmax (n011)) at 1 of n035.

Constant n035 Setting	Description
40 to 3999	• Set the display value at 100% of frequency reference (set value of Fmax(n011)) at 1st to 4th digit of n035. By a number of 4th digit of n035, set the position of decimal point. By 1st to 4th digit of n035, set a 3-digits figure excluding decimal point. Number of 4th digit. Position of decimal point40 to 3999 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-d igits of n035) × Frequency reference upper limit (n033), 400Hz (Lower 3-digits of n035) Fmax(n011), 999} Max. upper limit value: (Set value ÷ (Lower 3-digits of n035)) × Fmax(n011) ≦ 400Hz

Notes:

1. The frequency reference constants and monitor display data for which this selection of unit function is valid, are stored in the inverter in units of Hz.
   The units are converted as follows.



2. The upper limit for each unit is the figure whose fractions below the significant digits are cut off.
   (Example) Where the upper limit value for the unit Hz is 60.00 Hz and n035 = 39, 120×60.00 Hz $\div 39 = 184.9$, accordingly 184 r/min is displayed for the upper limit value.

   For the displays other than upper limit value, the fractions below the significant digits are rounded.

3. To execute VERIFY for constant COPY function, frequency reference constants (in units of Hz) is applied.

■ Using Inverters for Elevating Machines

When using the VS-606V7 for elevating machines such as elevators and cranes, make sure that the brake holds and observe the following precautions for safe operation.

○ Brake ON/OFF Sequence

- For the holding brake's ON/OFF sequence, use the following inverter output signals according to the set control mode.

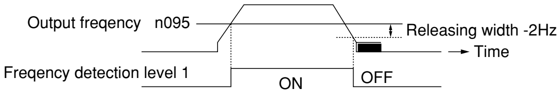
NOTE Do not use "Running (Set value: 1)" for the holding brake's ON/OFF interlock signal.

Control Mode	Brake ON/OFF Signal		Brake ON/OFF Level Adjustment	
	Signal Name	Constant (Note 2)	Signal Name	Constant
V/f Control (Note 1) (n002=0)	Frequency detection 1	n058=4	Frequency detection level	n095=2.50 Hz to 4.00 Hz (Note 3)

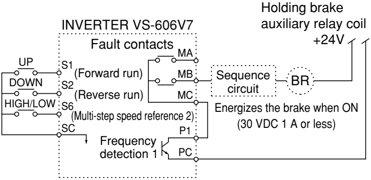
Notes: 1. For Vector control (n002=1), use the same brake ON/OFF sequence with the same signals as for V/F control.

2. Shows the setting when a multi-function photocoupler output terminal (P1-PC) is used.

3. Usually, make the following settings for the frequency detection (n095):
   For V/f control: Motor rated slip frequency + 1 Hz
   For Vector control: 2.5 Hz to 3.0 Hz
   If the set value is too low, the motor torque is insufficient and the load may shift when the brake is applied. Be sure to set n095 to a value larger than that of the minimum output frequency (n016)and larger than that of the brake releasing width shown in the following figure. If the set value is too large, the motor may not run smoothly when it starts running.

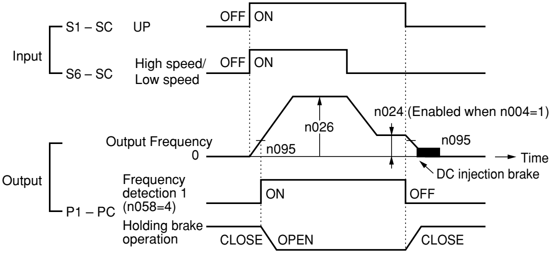


• Sequence Circuit Configuration and Timing Chart Examples



For the AC sequence circuit, connect the signal between P1 and PC to the sequence circuit with a relay.
Design the sequence so that the hoiding brake contact is open when the sequense operation conditions are satisfied and the contact between P1 and PC is closed(ON).
Make sure that the holding brake contact is closed when the emergency stop signal or inverter fault contact output signal is ON.

• For V/f Control and Vector Control



• For a variable speed operation by an analog signal, set the frequency reference selection (n004) to a value from 2 to 4.

○ Stall Prevention During Deceleration

If connecting a braking resistor to discharge regenerative energy, be sure to set the stall prevention during deceleration (n092) to 1.

NOTE If the stall prevention during deceleration (n092) is set to the initial value 0 (Enabled), the motor may not stop within the specified decelerating time.
The stall prevention during acceleration (n093) and the stall prevention level during running (n094) should be set to their initial values to enable these functions.

○ Settings for V/f Pattern and Motor Constants

To set the control mode and the V/f pattern, refer to the instruction manual and the document "Motor Constant Settings for VS-606V7 Vector Control (Document No. F-07-V7-01)". If the Vector control method is used, also set the motor constants.

○ Momentary Power Loss Restart and Fault Restart

Do not use the momentary power loss restart and fault restart functions in applications for elevating machines. Make sure that n081=0 and n082=0. If these functions are used, the motor coasts to a stop with the brake contact open when a momentary power loss or fault occurs during operation, possibly resulting in serious accidents.

○ I/O Open-phase Protection and Overtorque Detection

The I/O open-phase protection is only available for 5.5 kW and 7.5 kW models.
To prevent the machine from falling when the motor is open-phase or similar situation, enable the I/O open-phase protection (n166 to n169) and the overtorque detection (n096 to n099). At the factory, these constants are set so that these functions are disabled.
Also, take safety measures such as protection against falls on the machine.

○ Carrier Frequency

Set the carrier frequency selection (n080) to 5 Hz or more (n080 : 2 to 4) to secure the motor torque even if an overcurrent occurs (the current is limited).

○ External Baseblock Signal

If the external baseblock command (settings 12 and 13 of n050 to n056) is input while the motor is running, the motor will immediately coast to a stop. Do not input the external baseblock command while the motor is running unless necessary.

If using the external baseblock command for an emergency stop or to run start an interlock, make sure that the holding brake operates.

If the external baseblock command is input and immediately reset, the inverter does not output voltage during the minimum baseblock time, which is 0.5 to 0.7 seconds depending on the inverter capacity. Do not use the external baseblock command in an application where the motor is frequently started and stopped.

○ Acceleration/Deceleration Time

If the delay time for the holding brake's mechanical operation is not taken into consideration and the acceleration/deceleration time on the inverter side is set to a time that is too short , an overcurrent or wear on the brakes may occur at starting or the load will shift at stopping because the holding brake does not operate on time. If so, use the S-curve characteristic function or lengthen the acceleration/deceleration time to tune the timing for the holding brake.

○ Contactor on the Inverter's Output-side

Do not install a contactor between the inverter and the motor.

If a contactor must be installed because of local electrical codes or regulations or to operate motors with an inverter, excluding emergencies, open or close the contactor only when the holding brake is fully closed and the inverter is in baseblock status with the baseblock signal ON.

If the contactor is opened or closed while the inverter is controlling the motor or DC injection braking, surge voltage or a current from the motor by full-voltage starting may cause an inverter fault.

When a contactor is installed between the inverter and the motor, enable the I/O open-phase protection (n166 to n169).

For more information on using Inverters exclusively for elevators or cranes, contact your Yaskawa representatives or the nearest Yaskawa sales office.

7. MAINTENANCE AND INSPECTION

■ Periodical 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, unit mounting screws, etc.	Connection hardware is properly seated and securely tightened.	Properly seat and tighten hardware.
Heatsink	Built up dust, dirt, and debris	Blow with dry compressed air : 39.2×10^4 to 58.8×10^4 Pa, 57 to 85 psi (4 to 6kg / cm^2) pressure
Printed circuit board	Accumulation of conductive material or oil mist	Blow with dry compressed air : 39.2×10^4 to 58.8×10^4 Pa, 57 to 85 psi (4 to 6kg / cm^2) pressure If dust or oil cannot be removed, replace the inverter unit.
Power elements and smoothing capacitor	Abnormal odor or discoloration	Replace the inverter unit.
Cooling fan	Abnormal noise or vibration Cumulative operation time exceeding 20,000 hours	Replace the cooling fan.

■ Part Replacement

Inverter's maintenance periods are noted below. Keep them as reference.

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 with new 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

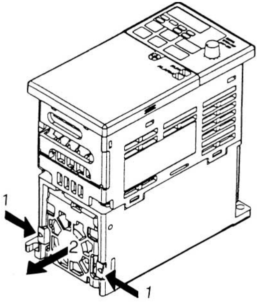
• Inverter of W-dimension (width) 68mm (2.68 inches), 140mm (5.51inches), and 170mm (6.69 inches)

1. Removal

(1) Press the right and left clicks of the fan cover to direction 1, and then pull them to direction 2 to remove the fan cover from the inverter unit.

(2) Pull the wiring to 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.

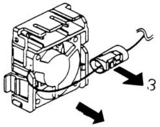


2. Mounting

(1) Mount the cooling fan on the fan cover. The arrow mark to indicate the wind direction of the cooling fan must be in 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. Be sure to mount the right and left clicks of the fan cover on the heatsink.



WIND DIRECTION

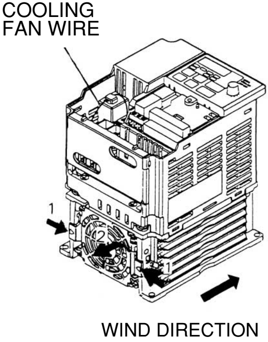
• Inverter of W-dimension (width) 108mm (4.25 inches)

1. Removal

(1) Remove the front cover and terminal cover, and then remove the cooling fan connector (CN10).

(2) Press the right and left clicks of the fan cover to direction 1, and pull the fan cover to direction 2 to remove it from the inverter unit. 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 wind direction must be opposite to the cover.

(2) Mount the fan cover on the inverter. Be sure to mount the right and left clicks of the fan cover on the heatsink. Lead 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.

8. FAULT DIAGNOSIS

■ Protective and Diagnostic Function

This section describes the alarm and fault displays, explanations for fault conditions and corrective actions to be taken if the VS-606V7 malfunctions.

< Corrective actions for models with blank cover >

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

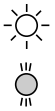
<Corrective Actions of Models with Digital Operator>

☼ : ON   ◌ : BLINKING   ● : OFF

Alarm Display and Contents

Alarm Display Digital Operator	Alarm Display RUN (Green) ALARM (Red)	Inverter Status	Explanation	Causes and Corrective Actions
Uu Blinking	◌ ◌	Warning Fault contacts do not change state.	UV (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the inverter output is OFF. 200V:Main circuit DC voltage drops below approx. 200V. (160V for single-phase) 400V:Main circuit DC voltage drops below approx. 400V. (Control supply fault) Control power supply fault is detected while the inverter output is OFF.	Check the following : • Power supply voltage • Main circuit power supply wiring is connected. • Terminal screws are securely tightened.
ou Blinking			OV (Main circuit overvoltage) Main circuit DC voltage exceeds the overvoltage detection level while the inverter output is OFF. Detection level 200V class : approx 410V or more 400V class : approx 820V or more	Check the power supply voltage.
oH Blinking			OH (Cooling fin overheat) Intake air temperature rises while the inverter output is OFF.	Check the intake air temperature.
CAL Blinking			CAL (MEMOBUS communications waiting) Correct data has not been received from the PLC when the constants n003 (run command selection) is 2 or n004(frequency reference selection) is 6, and power is turned ON.	Check communication devices, and transmission signals.

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oP□		Warning Fault contacts do not change state.	OP□ (Constant setting error when the constant setting is performed through the 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 Blinking			OL 3 (Overtorque detection) Motor current exceeded the preset value in constant n098.	Reduce the load, and expand the accel / decel time.
SEr Blinking			SER (Sequence error) Inverter receives LOCAL / REMOTE select command or communication / control circuit terminal changing signals from the multi-function terminal while the inverter is outputting.	Check the external circuit (sequence).

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
bb Blinking			BB (External baseblock) Baseblock command at multi-function terminal is active, the inverter output is shut OFF (motor coasting). Temporary condition is cleared when input command is removed.	Check the external circuit (sequence).
EF Blinking			EF (Simultaneous FWD/ REV run commands) When FWD and REV run commands are simultaneously input for over 500ms, the inverter stops according to constant n005.	Check the external circuit (sequence).
StP Blinking	 or 	Warning Fault contacts do not change state.	STP (Operator function stop) STOP/RESET is pressed during running by the control circuit terminals FWD / REV command, or by the run command from communications The inverter stops according to constant n005. STP(Emergency stop) Inverter receives emergency stop alarm signal. Inverter stops according to constant n005.	Open FWD/REV command of control circuit terminals . Check the external circuit (sequence).
FAn Blinking			FAN(Cooling fan fault) Cooling fan is locked.	Check the following: • Cooling fan • Cooling fan wiring is not connected.
CE Blinking			CE (MEMOBUS) communications fault	Check the communication devices or communication signals.
FbL Blinking			FBL (PID feedback loss detection) PID feedback value drops 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 Blinking			Option card communications fault. Communication fault has occured in a mode that run command and frequency reference are set from the communication option card.	Check the communication devices or communication signals.

Fault Display and Contents

<table>
<tr><th colspan="2">Fault Display</th><th rowspan="2">Inverter Status</th><th rowspan="2">Explanation</th><th rowspan="2">Causes and Corrective Actions</th></tr>
<tr><th>Digital Operator</th><th>RUN (Green)
ALARM (Red)</th></tr>
<tr><td>oC</td><td rowspan="3">●
☼</td><td rowspan="3">Protective Operation
Output is shut OFF and motor coasts to a stop.</td><td>OC (Overcurrent)
Inverter output current momentarily exceeds approx. 250% of rated current.</td><td>• Short circuit or grounding at inverter output side
• Excessive load GD^2
• Extremely rapid accel/ decel 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 open/closed at the inverter output side</td></tr>
<tr><td>ou</td><td>OV (Main circuit over-voltage)
Main circuit DC voltage exceeds the overvoltage detection level because of excessive regenerative energy from the motor.
Detection level:
200V:Stops at main circuit DC voltage below approx. 410V
400V:Stops at main circuit DC voltage approx. 820V or more</td><td>• Insufficient decel time (constants n020 and n022)
• Lowering of minus load (elevator, etc.)
⇩
• Increase decel time.
• Connect optional braking resistor.</td></tr>
<tr><td>Uu1</td><td>UV1 (Main circuit low voltage)
Main circuit DC voltage drops below the low-voltage detection level while the inverter output is ON.
200V:Stops at main circuit DC voltage below approx. 200V(160V for single-phase)
400V:Stops at main circuit DC voltage approx. 400V or more</td><td>• Reduction of input power supply voltage
• Open phase of input supply
• Occurrence of momentary power loss
⇩
Check the following :
• Power supply voltage
• Main circuit power supply wiring is connected.
• Terminal screws are securely tightened.</td></tr>
</table>

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
UV2			UV2 (Control power supply fault) Voltage fault of control power supply is detected.	Cycle power. If the fault remains, replace the inverter.
oH			OH (Cooling fin overheat) Temperature rise because of inverter overload operation or intake air temperature rise.	• Excessive load • Improper V/f pattern setting • Insufficient accel time if the fault occurs during acceleration • Intake air temperature exceeding 50℃(122˚F) • Cooling fan stops ⇩ Check the following : • Load size • V/f pattern setting (constants n011 to n017) • Intake air temperature.
oL1	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop.	OL1 (Motor overload) Motor overload protection operates 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 by constant n036.
oL2			OL2 (Inverter overload) Inverter overload protection operates 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	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
EF□	● ☼	Protective Operation Output is shut 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 MEMOBUS 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 EF6: External fault input command from control circuit terminal S6 EF7: External fault input command from control circuit terminal S7	Check the external circuit (sequence).
F00			CPF-00 Inverter cannot communicate with the digital operator for 5 sec. or more when power is turned ON.	Cycle power after checking the digital operator is securely mounted. If the fault remains, replace the digital operator or inverter.
F01			CPF-01 Transmission fault occurred for 5 sec. or more when transmission starts with the digital operator.	Cycle power after checking 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 is detected.	• Record all constant data and initialize the constants. (Refer to page 32 for constant initialization.) • Cycle power. If the fault remains, replace the inverter.

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
F05		Protective Operation Output is shut OFF and motor coasts to a stop.	CPF-05 AD converter fault is detected.	Cycle power. If the fault remains, replace the inverter.
F06			CPF-06 • Option card connecting fault • A non-corresponding option card is connected.	Remove power to the inverter. Check the connection of the digital operator . Verify Software version No. (n179).
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.
F21			Communication option card self diagnostic error	Option card fault Replace the option card.
F22			Communication option card model code error	
F23			Communication option card DPRAM error	
oPr			OPR(Operator connecting fault)	Cycle power. If the fault remains, replace the inverter.
CE			CE(MEMOBUS communications fault)	Check the communication devices or communication signals.
STP	or	Stops according to constant	STP(Emergency stop) The inverter stops 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 drops below the detection level. When PID feedback loss is detected, the inverter operartes according to the n136 setting.	Check the mechanical system and correct the cause, or increase the value of n137.

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
bUS	◌ ☼ or ● ☼	Stops according to constant	Option card communications fault Communication fault has occurred in a mode that run command and frequency reference are set from the communication option card.	Check the communication devices or communication signals.
— (OFF)	● ●	Protective Operation Output is shut 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 wiring is connected. • Terminal screws are securely tightened. • Control sequence. Replace the inverter.

For display/clear of fault history, refer to page 39.

■ Troubleshooting

Trouble	Cause	Corrective Actions
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.
	The SW setting for the reference selection is wrong. Example: The reference 4-20mA is input, but the SW is set to " V ".	For analog input, make sure that the frequency reference (n004) and SW settings are correct.
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 n017) 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.

9. SPECIFICATIONS

■ Standard Specifications (200V Class)

Voltage Class		200V single- / 3-phase						
Model CIMR-V7∗C□□□□	3-phase	20P1	20P2	20P4	20P7	21P5	22P2	24P0
	Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B4P0
Max. Applicable Motor Output kW∗		0.1	0.25	0.55	1.1	1.5	2.2	4.0
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 230V (proportional to input voltage) Single-phase, 200 to 240V (proportional to input voltage)						
	Max. Output Frequency(Hz)	400Hz(Programmable)						
Power Supply	Rated Input Voltage and Frequency	3-phase, 200 to 230V, 50/60Hz Single-phase, 200 to 240V, 50/60Hz						
	Allowable Voltage Fluctuation	-15 to + 10%						
	Allowable Frequency Fluctuation	±5%						
Control Characteristics	Control Method	Sine wave PWM (V/f control/vector control selectable)						
	Frequency Control Range	0.1 to 400Hz						
	Frequency Accuracy (Temperature Change)	Digital reference: ± 0.01% (-10 to + 50°C) Analog reference: ± 0.5% (25 ± 10°C)						
	Frequency Setting Resolution	Digital reference: 0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more) Analog reference: 1 / 1000 of max. output frequency						
	Output Frequency Resolution	0.01Hz						
	Overload Capacity	150% rated output current for one minute						
	Frequency Reference Signal	0 to 10VDC (20kΩ), 4 to 20mA (250Ω), 0 to 20mA (250Ω) pulse train input, frequency setting potentiometer (Selectable)						
	Accel/Decel Time	0.00 to 6000 sec. (accel / decel time are independently programmed)						
	Braking Torque	Short-term average deceleration torque † 0.1, 0.25kW (0.13HP, 0.25HP): 150% 0.55, 1.1kW (0.5HP, 1HP): 100% 1.5kW (2HP) : 50% 2.2kW(3HP) or more: 20% Continuous regenerative torgue: Approx. 20% (150% with optional braking resistor, braking transistor built-in)						
	V/f Characteristics	Possible to program any V / f patterm						

∗ Based on a standard 4-pole motor for max. applicable motor output.

† Shows deceleration torque for uncoupled motor decelerating from 60Hz with the shortest possible deceleration time.

Voltage Class			200V single- / 3-phase						
Model CIMR-V7∗C□□□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	24P0
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B4P0
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 410V						
	Undervoltage		Stops when DC bus voltage is approx. 200V or less (approx. 160V or less for single-phase series)						
	Momentary Power Loss		Following items are selectable : Not provided (stops if power loss is 15ms or longer), continuous operation if power loss is approx. 0.5s or shorter, continuous operation						
	Cooling Fin Overheat		Protected by electronic circuit						
	Stall Prevention Level		Can be set individual level during accel / decel, 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 50V or less. RUN lamp stays ON or digital operator LED stays ON.						
Other Functions	Input Signals	Multi-function Input	Seven of the following input signals are selectable: Forward / reverse run (3-wire sequence), fault reset, external fault (NO / NC contact input), multi-step speed operation, Jog command, accel / decel time select, external baseblock (NO / NC contact input), speed search command, accel / decel hold command, LOCAL / REMOTE selection, communication / control circuit terminal selection, emergency stop fault emergency stop alarm UP/DOWN command,self-test,PID control cancel, PID integral reset/hold						
	Output Signals	Multi-function Output	Following output signals are selectable (1 NO / NC contact output, 2 photo-coupler outputs) : ∗ Fault, running, zero speed, at frequency, frequency detection (output frequency ≦ or ≧ set value), during overtorque detection, during undervoltage detection,minor error, during baseblock, operation mode, inverter run ready, during fault retry, during UV, during 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 start/stop frequency reference bias /gain, MEMOBUS communications (RS-485 / 422, max. 19.2K bps), PID control, energy-saving control, constant copy, frequency reference with built-in potentiometer, Unit selection for frequency reference setting / display						

∗ Minimum permissible load: 5VDC, 10mA (as reference value)

Voltage Class			200V single- / 3-phase						
Model CIMR-V7∗C□□□□		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	24P0
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B4P0
Other Functions	Display	Status Indicator LED	RUN and ALARM provided as standard LED's						
		Digital Operator (JVOP-140)	Available to monitor frequency reference, output frequency, output current						
	Terminals		Main circuit: screw terminals Control circuit: plug-in screw terminal						
	Wiring Distance between Inverter and Motor		100m (328ft) or less †						
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: 200V, 0.75kW or larger inverters (3-phase) 200V, 1.5kW 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%RH or less (non-condensing)						
	Storage Temperature		-20 to +60°C (-4 to 140°F)						
	Location		Indoor (free from corrosive gases or dust)						
	Elevation		1000m (3280ft) or less						
	Vibration		Up to 9.8m / S² (1G) at 10 to less than 20Hz, up to 2m / S² (0.2G) at 20 to 50Hz						

∗ Temperature during shipping (for short period)

† For details, refer to “Reducing motor noise or leakage current (n080)” on page 57.

■ Standard Specifications (400V Class)

Voltage Class			400V 3-phase						
Model CIMR-V7∗C□□□□		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	44P0
		Single-phase	—	—	—	—	—	—	—
Max. Applicable Motor Output kW∗			0.37	0.55	1.1	1.5	2.2	3.0	4.0
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 460V (proportional to input voltage)						
	Max. Output Frequency(Hz)		400Hz(Programmable)						
Power Supply	Rated input Voltage and Frequency		3-phase, 380 to 460V, 50/60Hz						
	Allowable Voltage Fluctuation		-15 to + 10%						
	Allowable Frequency Fluctuation		±5%						
Control Characteristics	Control Method		Sine wave PWM (V/f control/vector control selectable)						
	Frequency Control Range		0.1 to 400Hz						
	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: 0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more) Analog reference: 1 / 1000 of max. output frequency						
	Output Frequency Resolution		0.01Hz						
	Overload Capacity		150% rated output current for one minute						
	Frequency Reference Signal		0 to 10VDC (20kΩ), 4 to 20mA (250Ω), 0 to 20mA (250Ω) pulse train input, frequency setting potentiometer (Selectable)						
	Accel/Decel Time		0.00 to 6000 sec. (accel / decel time are independently programmed)						
	Braking Torque		Short-term average deceleration torque† 0.2kW: 150% 0.75kW: 100% 1.5kW (2HP) : 50% 2.2kW(3HP) or more: 20% Continuous regenerative torgue: Approx. 20% (150% with optional braking resistor, braking transistor built-in)						
	V/f Characteristics		Possible to program any V / f patterm						

∗ Based on a standard 4-pole motor for max. applicable motor output.

† Shows deceleration torque for uncoupled motor decelerating from 60Hz with the shortest possible deceleration time.

Voltage Class				400V 3-phase						
Model CIMR-V7∗C□□□□			3-phase	40P2	40P4	40P7	41P5	42P2	43P0	44P0
			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 820V						
	Undervoltage			Stops when DC bus voltage is approx. 400V or less						
	Momentary Power Loss			Following items are selectable : Not provided (stops if power loss is 15ms or longer), continuous operation if power loss is approx. 0.5s or shorter, continuous operation						
	Cooling Fin Overheat			Protected by electronic circuit						
	Stall Prevention Level			Can be set to individual levels during accel / decel, provided / not provided available during coast to a stop						
	Cooling Fan Fault			Protected by electronic circuit (fan look detection)						
	Ground Fault			Protected by electronic circuit (overcurrent level)						
	Power Charge Indication			ON until the DC bus voltage becomes 50V or less.						
Other Functions	Input Signals	Multi-function Input		Seven of the following input signals are selectable: Forward / reverse run (3-wire sequence), fault reset, external fault (NO / NC contact input), multi-step speed operation, Jog command, accel / decel time select, external baseblock (NO / NC contact input), speed search command, accel / decel hold command, LOCAL / REMOTE selection, communication / control circuit terminal selection, emergency stop fault emergency stop alarm, UP/DOWN command, self-test,PID control cancel, PID integral reset / hold						
	Output Signals	Multi-function Output		Following output signals are selectable (1 NO / NC contact output, 2 photo-coupler outputs) : ∗ Fault, running, zero speed, at frequency, frequency detection (output frequency ≦ or ≧ set value), during overtorque detection, during undervoltage detection,minor error, during baseblock, operation mode, inverter run ready, during fault retry, during UV, during 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 start/stop frequency reference bias /gain, MEMOBUS communications (RS-485 / 422, max. 19.2K bps), PID control, energy-saving control, constant copy, frequency reference with built-in potentiometer, Unit selection for frequency reference setting/desplay						

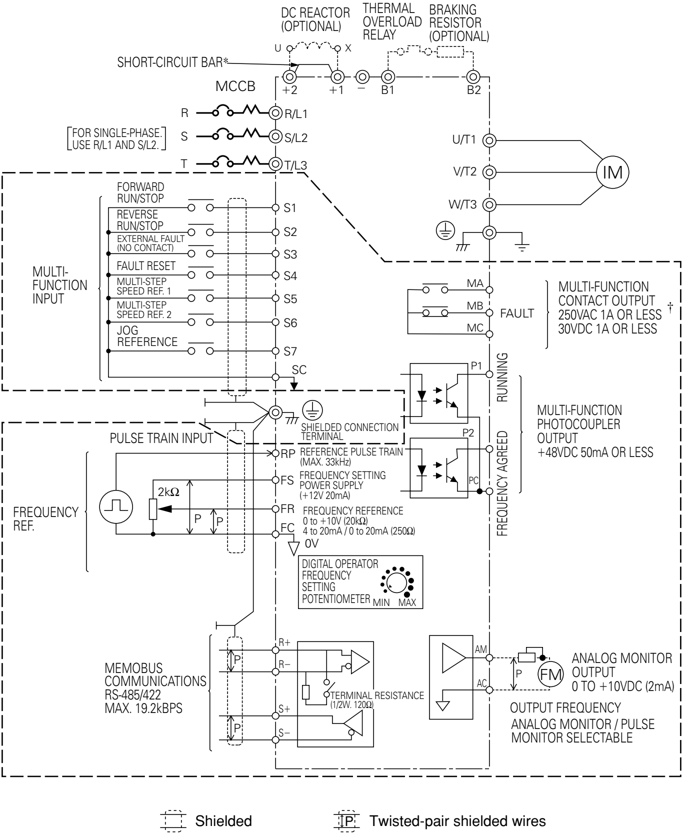
∗ Minimum permissible load: 5VDC, 10mA (as reference value)

<table>
<tr><td colspan="4">Voltage Class</td><td colspan="7">400V 3-phase</td></tr>
<tr><td colspan="3" rowspan="2">Model
CIMR-V7*C□□□□</td><td>3-phase</td><td>40P2</td><td>40P4</td><td>40P7</td><td>41P5</td><td>42P2</td><td>43P0</td><td>44P0</td></tr>
<tr><td>Single-phase</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td rowspan="4">Other Functions</td><td rowspan="2">Display</td><td colspan="2">Status Indicator LED</td><td colspan="7">RUN and ALARM provided as standard LED's</td></tr>
<tr><td colspan="2">Digital Operator (JVOP-140)</td><td colspan="7">Available to monitor frequency reference,
output frequency, output current</td></tr>
<tr><td colspan="3">Terminals</td><td colspan="7">Main circuit: screw terminals
Control circuit: plug-in screw terminal</td></tr>
<tr><td colspan="3">Wiring Distance between Inverter and Motor</td><td colspan="7">100m (328ft) or less †</td></tr>
<tr><td colspan="4">Enclosure</td><td colspan="7">Open chassis IP20, Open chassis IP20 (Top-closed type),
or enclosed wall-mounted NEMA 1 (TYPE 1)</td></tr>
<tr><td colspan="4">Cooling Method</td><td colspan="7">Cooling fan is provided for the following models:
400V, 1.5kW or larger inverters (3-phase)
Other models are self-cooling</td></tr>
<tr><td rowspan="6">Environmental Conditions</td><td colspan="3">Ambient Temperature</td><td colspan="7">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)</td></tr>
<tr><td colspan="3">Humidity</td><td colspan="7">95%RH or less (non-condensing)</td></tr>
<tr><td colspan="3">Storage Temperature *</td><td colspan="7">-20 to +60°C (-4 to 140°F)</td></tr>
<tr><td colspan="3">Location</td><td colspan="7">Indoor (free from corrosive gases or dust)</td></tr>
<tr><td colspan="3">Elevation</td><td colspan="7">1000m (3280ft) or less</td></tr>
<tr><td colspan="3">Vibration</td><td colspan="7">Up to 9.8m / S^2 (1G) at 10 to less than 20Hz,
up to 2m / S^2 (0.2G) at 20 to 50Hz</td></tr>
</table>

* Temperature during shipping (for short period)

† For details, refer to “Reducing motor noise or leakage current (n080) on page 57.

■ Standard Wiring

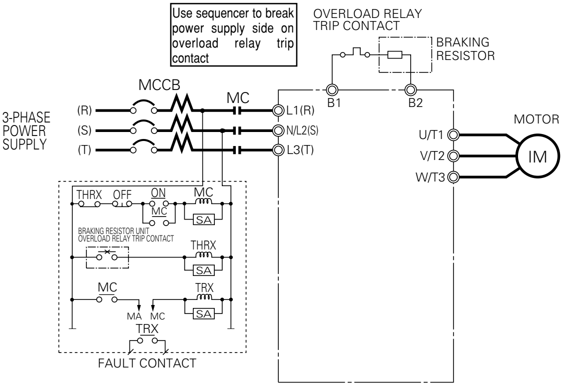


: Only basic insulation (Protective class 1, overvoltage category Ⅱ) is provided for the control circuit terminals. Additional insulation may be necessary in the end product to conform to CE requirerments

* Short-circuit bar should be removed when connecting a DC reactor.

† Minimum permissible load: 5VDC, 10mA (as reference value)

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 Description

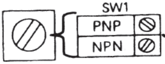
Type			Terminal	Name	Function (Signal Level)	
Main Circuit			R/L1, S/L2, T/L3	AC power supply input	Use main circuit power input. (Use terminals R/L1 and S/L2 for single-phase inverters. Never use terminal T/L3.)	
			U/T1, V/T2, W/T3	Inverter output	Inverter output	
			B1, B2	Braking resistor connection	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) *	
			⏚	Grounding	For grounding (according to the local grounding code)	
Control Circuit	Input	Sequence	S1	Multi-function input selection 1	Factory setting closed: FWD run open: REV run	Photo-coupler insulation, 24VDC, 8mA
			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	
			S5	Multi-function input selection 5	Factory setting: Multi-step speed reference 1	
			S6	Multi-function input selection 6	Factory setting: Multi-step speed reference 2	
			S7	Multi-function input selection 7	Factory setting: Jog reference	
			SC	Multi-function input selection common	For control signal	
		Frequency reference	RP	Master speed reference pulse train input	33kHz max.	
			FS	Power for frequency setting	+12V (permissible current 20mA max.)	
			FR	Master speed frequency reference	0 to +10VDC (20kΩ) or 4 to 20mA (250kΩ) or 0 to 20mA (250Ω) (1/1000 resolution)	
			FC	Frequency reference common	0V	
	Output	Multi-function contact output	MA	NO contact output	Factory setting: fault	Contact capacity 250VAC 1A or less, ‡ 30VDC 1A or less
			MB	NC contact output		
			MC	Contact output common		
			P1	Photo-coupler output 1	Factory setting: Run	Photo-coupler output +48VDC, 50mA or less
			P2	Photo-coupler output 2	Factory setting: Frequency agreed	
			PC	Photo-coupler output common	0V	
			AM	Analog monitor output †	Factory setting: Output frequency 0 to +10V	0 to +10VDC, 2mA or less, 8-bit resolution
			AC	Analog monitor common	0V	
Communication Circuit Terminal		MEMOBUS communications	R+	Communications input (+)	MEMOBUS communication Run through RS-485 or RS-422.	RS-485/422 MEMOBUS protocol, 19.2 kps max.
			R-	Communications input (–)		
			S+	Communications output (+)		
			S-	Communications output (–)		

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

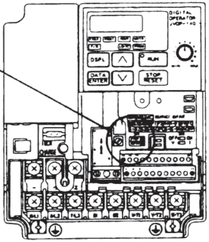
† Can be swiched to pulse monitor output.

‡ Minimum permissible load: 5VDC, 10mA (as reference value)

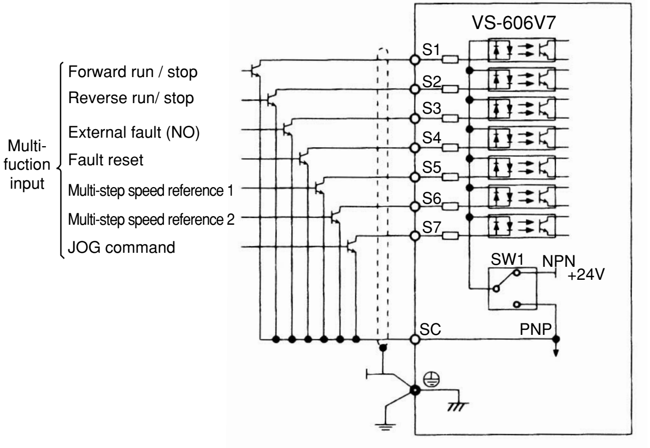
■ Sequence input connection with NPN/PNP transistor



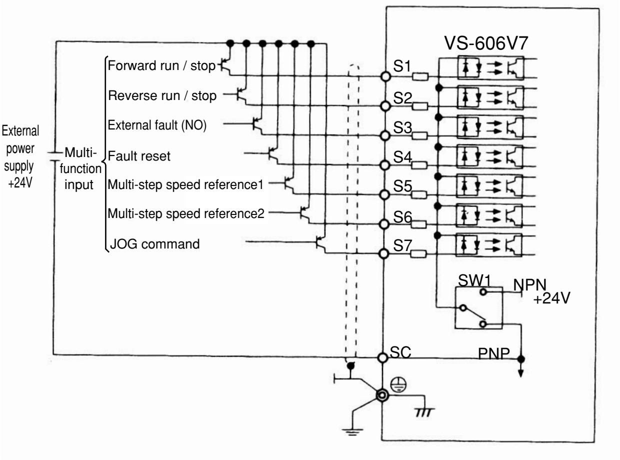
When connecting sequence inputs(S1 to S7) with transistor, turn the rotary switch SW1 depending on the polarity(0V common: NPN side, +24V common: PNP side).
Factory setting: NPN side



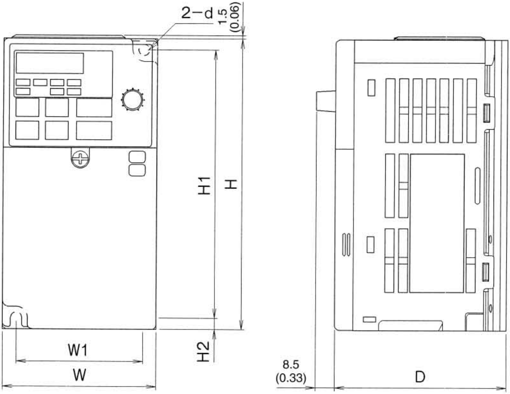
Sequence connection with NPN transistor (0V common)



Sequence connection with PNP transistor (+24V common)



■ Dimensions / Heat Loss



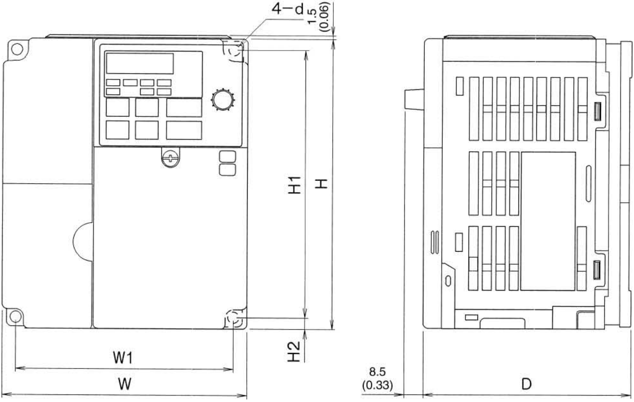


Fig. 2

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) Heatsink	Unit	Total	Fig.
200V 3-phase	0.1	68 (2.68)	128 (5.04)	76 (2.99)	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)	76 (2.99)	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)	108 (4.25)	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)	128 (5.04)	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)	131 (5.16)	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)	140 (5.51)	96 (3.78)	118 (4.65)	5 (0.20)	M4	1.5 (3.3)	60.4	34.4	94.8	2
	4.0	140 (5.51)	128 (5.04)	143 (5.63)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.1 (4.62)	96.7	52.4	149.1	2
200V single-phase	0.1	68 (2.68)	128 (5.04)	76 (2.99)	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)	76 (2.99)	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)	131 (5.16)	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)	140 (5.51)	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)	156 (6.14)	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)	163 (6.42)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.2 (4.84)	64.5	49.1	113.6	2
	4.0	170 (6.69)	128 (5.04)	180 (7.09)	158 (6.22)	118 (4.65)	5 (0.20)	M4	2.9 (6.38)	98.2	78.2	176.4	2
400V 3-phase	0.37	108 (4.25)	128 (5.04)	92 (3.62)	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)	110 (4.43)	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)	140 (5.51)	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)	156 (6.14)	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)	156 (6.14)	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)	143 (5.63)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.1 (4.62)	58.2	37.6	95.8	2
	4.0	140 (5.51)	128 (5.04)	143 (5.63)	128 (5.04)	118 (4.65)	5 (0.20)	M4	2.1 (4.62)	79.9	49.2	129.1	2

■ Recommended Peripheral Devices

It is recommended that the following peripheral devices should be mounted between the AC main circuit power supply and VS-606V7 input terminals R/L1, S/L2, and T/L3.

- MCCB (Molded-case circuit breaker) / fuse :
  Be sure to connect it 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 contactor, and fuse

• 200V 3-phase

VS-606V7 model	V7＊＊ 20P1	V7＊＊ 20P2	V7＊＊ 20P4	V7＊＊ 20P7	V7＊＊ 21P5	V7＊＊ 22P2	V7＊＊ 24P0
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)	5A	5A	5A	10A	20A	20A	30A
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)	5A	5A	5A	10A	20A	20A	30A

• 200V single-phase

VS-606V7 model	V7＊＊ B0P1	V7＊＊ B0P2	V7＊＊ B0P4	V7＊＊ B0P7	V7＊＊ B1P5	V7＊＊ B2P2	V7＊＊ B4P0
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)	5A	5A	10A	20A	20A	40A	50A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-15E	HI-20E	HI-30E
Fuse (UK Class RK5)	5A	5A	10A	20A	20A	40A	50A

• 400V 3-phase

VS-606V7 model	V7＊＊ 40P2	V7＊＊ 40P4	V7＊＊ 40P7	V7＊＊ 41P5	V7＊＊ 42P2	V7＊＊ 43P0	V7＊＊ 44P0
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
MCCB type NF30, NF50 (MITSUBISHI)	5A	5A	5A	10A	10A	20A	20A
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 (UK Class RK5)	5A	5A	5A	10A	10A	20A	20A

Surge suppressors

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

- Ground fault interrupter:

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

  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 (600kVA 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

• Addition of constants accompanied by the upgraded software version

The constants marked with #1 and #2 are applicable for the following upgraded software version Nos.:

#1: Applicable for software version No. VSP 010015 or later

#2: Applicable for software version No. VSP 010020 or later

• Constants that can be changed during operation

The constants whose numbers are in bold can be changed during operation.

First Functions (Constants n001 to n049)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
001	0101H	Password	0 to 4, 6, 12,13	1	1		41
002	0102	Control mode selection (Note 6)	0, 1	1	0 (Note 1) (Note 6)		45
003	0103	Run command selection	0 to 3	1	0		49
004	0104	Frequency reference selection	0 to 9	1	1		50
005	0105	Selecting stopping method	0, 1	1	0		70
006	0106	Selecting reverse run prohibited	0, 1	1	0		51
007	0107	Stop key function	0, 1	1	0		69
008	0108	Selecting frequency reference in local mode	0, 1	1	1 (Note 5)		50
009	0109	Frequency reference setting method from digital operator	0, 1	1	0		50
010	010A	Detecting fault contact of digital operator	0, 1	1	0		49
011	010B	Max. output frequency	50.0 to 400.0Hz	0.1Hz	50.0Hz		42
012	010C	Max. voltage	0.1 to 255.0V (0.2 to 510.0)	0.1V	200.0V (Note 2)		42
013	010D	Max. voltage output frequency (base frequency)	0.2 to 400.0Hz	0.1Hz	50.0Hz		42
014	010E	Mid. output frequency	0.1 to 399.9Hz	0.1Hz	1.3Hz		42
015	010F	Mid. output frequency voltage	0.1 to 255.0V	0.1V	12.0V (Note 2)		42
016	0110	Min. output frequency	0.1 to 10.0Hz	0.1Hz	1.3Hz		42
017	0111	Min. output frequency voltage	0.1 to 50.0V	0.1V	12.0V (Note 2)		42
018	0112	Selecting setting unit of accel/decel time	0, 1	1	0		56
019	0113	Acceleration time 1	0.00 to 6000s	Depend on n018 setting	10.0s		56
020	0114	Deceleration time 1	0.00 to 6000s	Depend on n018 setting	10.0s		56
021	0115	Acceleration time 2	0.00 to 6000s	Depend on n018 setting	10.0s		56
022	0116	Deceleration time 2	0.00 to 6000s	Depend on n018 setting	10.0s		56
023	0117	S-curve selection	0 to 3	1	0		57

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
024	0118	Frequency reference 1 (Master speed frequency reference)	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	6.00Hz		51
025	0119	Frequency reference 2	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
026	011A	Frequency reference 3	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
027	011B	Frequency reference 4	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
028	011C	Frequency reference 5	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
029	011D	Frequency reference 6	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
030	011E	Frequency reference 7	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
031	011F	Frequency reference 8	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
032	0120	Jog frequency	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	6.00Hz		52
033	0121	Frequency reference upper limit	0 to 110%	1%	100%		55
034	0122	Frequency reference lower limit	0 to 110%	1%	0%		55
035	0123	Selecting setting/displaying unit of frequency reference	0 to 3999	1	0		121
036	0124	Motor rated current	0 to 150% of inverter rated current	0.1A	(Note 3)		87
037	0125	Electronic thermal motor protection selection	0 to 2	1	0		87
038	0126	Electronic thermal motor protection time constant setting	1 to 60 min	1min	8min		87
039	0127	Selecting cooling fan operation	0, 1	1	0		89

Second Functions (Constants n050 to n079)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
050	0132	Multi-function input selection 1 (Terminal S1)	1 to 25	1	1		73
051	0133	Multi-function input selection 2 (Terminal S2)	1 to 25	1	2		73
052	0134	Multi-function input selection 3 (Terminal S3)	0 to 25	1	3		73
053	0135	Multi-function input selection 4 (Terminal S4)	1 to 25	1	5		73
054	0136	Multi-function input selection 5 (Terminal S5)	1 to 25	1	6		73
055	0137	Multi-function input selection 6 (Terminal S6)	1 to 25	1	7		73
056	0138	Multi-function input selection 7 (Terminal S7)	1 to25, 34, 35	1	10		73
057	0139	Multi-function output selection 1	0 to 7, 10 to 19	1	0		78
058	013A	Multi-function output selection 2	0 to 7, 10 to 19	1	1		78
059	013B	Multi-function output selection 3	0 to 7, 10 to 19	1	2		78
060	013C	Analog frequency reference gain	0 to 255%	1%	100%		53
061	013D	Analog frequency reference bias	-100 to 100%	1%	0%		53
062	013E	Filter time constant for analog frequency reference constant	0.00 to 2.00s	0.01s	0.10s		–
065	0141	Monitor output type	0,1	1	0		65
066	0142	Multi-function analog output (terminal AM-AC)	0 to 5	1	0		64
067	0143	Analog monitor gain	0.00 to 2.00	0.01	1.00		64
068	0144	Analog frequency reference gain	-255 to 255%1%	1%	100%		–
069	0145	Analog frequency reference bias	-100 to 100%	1%	0%		–
070	0146	Analog frequency reference filter time constant	0.00 to 2.00s	0.01s	0.10s		–
071	0147	Analog frequency reference gain	-255 to 255	1%	100%		–
072	0148	Analog frequency reference bias	-100 to 100%	1%	0%		–

No.	Register No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
073	0149	Analog frequency reference filter time constant	0.00 to 2.00s	0.01s	0.01s		–
074	014A	Pulse train frequency reference gain	0 to 255%	1%	100%		–
075	014B	Pulse train frequency reference bias	-100 to 100%	1%	0%		–
076	014C	Pulse train frequency filter time constant	0.00 to 2.00s	0.01s	0.10s		–
077 #2	014D	Multi-function analog input function	0 to 4	1	0		76
078 #2	014E	Multi-function analog input signal selection	0,1	1	0		76
079 #2	014F	Frequency reference bias(FBIAS) value	0 to 50%	1%	10%		76

Third Functions (Constants n080 to n119)

No.	Register No. for Trans- mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
080	0150	Carrier frequency selection	1 to 4, 7 to 9	1	4 (Note 4)		67
081	0151	Momentary power loss ridethrough method	0 to 2	1	0		56
082	0152	Automatic retry attempts	0 to 10 times	1	0		61
083	0153	Jump frequency 1	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		61
084	0154	Jump frequency 2	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		61
085	0155	Jump frequency 3	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		61
086	0156	Jump frequency range	0.00 to 25.50Hz	0.01Hz	0.00Hz		61
089	0159	DC injection braking current	0 to 100%	1%	50%		62
090	015A	DC injection braking time at stop	0.0 to 25.5%	0.1s	0.5s (note 2)		71

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
091	015B	DC injection braking time at start	0.0 to 25.5%	0.1s	0.0s		62
092	015C	Stall prevention during deceleration	0.1	1	0		85
093	015D	Stall prevention during acceleration	30 to 200%	1%	170%		83
094	015E	Stall prevention during running	30 to 200%	1%	160%		84
095	015F	Frequency detection (multi-function contact output)	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		60
096	0160	Overtorque detection function selection 1	0 to 4	1	0		59
097	0161	Overtorque detection function selection 2	0.1	1	0		59
098	0162	Overtorque detection level	30 to 200%	1%	160%		59
099	0163	Overtorque detection time	0.1 to 10.0s	0.1s	0.1s		59
100	0164	Hold output frequency saving selection	0.1	1	0		75
103	0167	Torque compensation gain	0.0 to 2.5	0.1	1.0		44
104	0168	Torque compensation time constant	0.0 to 25.5s	0.1s	0.3s		44
105	0169	Torque compensation iron loss	0.0 to 6550	0.01W (less than 1000W) / 1W (1000W or more)	(note 3)		44
106	016A	Motor rated slip	0.0 to 20.0Hz	0.1Hz	(note 3)		46
107	016B	Line to neutral (per phase)	0.000 to 65.50Ω	0.001Ω (less than 10Ω) / 0.01Ω (10Ω or more)	(note 3)		46
108	016C	Motor leakage inductance	0.00 to 655.0mH	0.01mH (less than 100mH) / 0.1mH (100mH or more)	(note 3)		46
109	016D	Torque compensation voltage limitter	0 to 250%	1%	150%		–
110	016E	Motor no-load current	0 to 99%	1%	(Note 3)		45
111	016F	Slip compensation gain	0.0 to 2.5	0.1	0.0		86
112	0170	Slip compensation time constant	0.0 to 25.5s	0.1s	2.0s		86
113	0171	Slip correction during regenerative operation	0, 1	1	0		–
115 #2	0173	Stall prevention automatic decrease selection	0, 1	1	0		84
116 #2	0174	Accel / decel time during stall prevention	0, 1	1	0		85

Fourth Functions (Constants n120 to n179)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
120	0178	Frequency reference 9	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
121	0179	Frequency reference 10	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
122	017A	Frequency reference 11	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
123	017B	Frequency reference 12	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
124	017C	Frequency reference 13	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
125	017D	Frequency reference 14	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
126	017E	Frequency reference 15	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
127	017F	Frequency reference 16	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		51
128	0180	PID control selection	0 to 8	1	0		106
129	0181	PID feedback gain	0.00 to 10.00Hz	0.01	1.00		109
130	0182	Proportional gain (P)	0.0 to 25.0	0.1	1.0		107
131	0183	Integral time (I)	0.0 to 360.0s	0.1s	1.0		107
132	0184	Differential time (D)	0.00 to 2.50s	0.01s	0.00		107
133	0185	PID offset adjustment	-100 to 100%	1%	0%		108
134	0186	Upper limit of integral values	0 to 100%	1%	100%		108
135	0187	Primary delay time constant of PID output	0.0 to 10.0	0.1s	0.0		108

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
136	0188	Selection of PID feedback loss detection	0 to 2	1	0		109
137	0189	PID feedback loss detection level	0 to 100%	1%	0%		109
138	018A	PID feedback loss detection time	0.0 to 25.5	0.1s	1.0		109
139	018B	Energy-saving control selection (V/ f control mode)	0, 1	1	0		101
140	018C	Energy-saving coefficient K2	0.0 to 6550	0.1	(Note 7)		101
141	018D	Energy-saving control voltage lower limit (At 60 Hz)	0 to 120%	1%	50%		102
142	018E	Energy-saving control voltage lower limit (At 6 Hz)	0 to 25%	1%	12%		102
143	018F	Power average time	1 to 200	1=24ms	1 (24ms)		103
144	0190	Search operation voltage limit	0 to 100%	1%	0%		103
145	0191	Search operation voltage step (At 100%)	0.1 to 100%	0.1%	0.5%		103
146	0192	Search operation voltage step (At 5%)	0.1 to 10.0%	0.1%	0.2%		103
149	0195	Pulse train input scaling	100 to 3300	1=10 Hz	2500 (25kHz)		82
150	0196	Pulse train output scaling	0,1,6,12, 24,36	–	0		65
151	0197	MEMOBUS timeover detection	0 to 4	1	0		91
152	0198	MEMOBUS frequency reference and frequency monitor unit	0 to 3	1	0		91
153	0199	MEMOBUS slave address	0 to 32	1	0		91
154	019A	MEMOBUS BPS selection	0 to 3	1	2		91
155	019B	MEMOBUS parity selection	0 to 2	1	2		91
156	019C	Transmission waiting time	10 to 65ms	1ms	10ms		91
157	019D	RTS control	0, 1	1	0		91

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
158	019E	Motor code (Energy-saving control)	0 to 70	1	(Note 7)		101
159	019F	Upper voltage limit for energy-saving control (At 60Hz)	0 to 120%	1%	120%		102
160	01A0	Upper voltage limit for energy-saving control (At 6Hz)	0 to 25%	1%	16%		102
161	01A1	Search operation power detection hold width	0 to 100%	1%	10%		104
162	01A2	Time constant of power detection filter	0 to 255	1=4ms	5 (20ms)		104
163	01A3	PID output gain	0.0 to 25.0	0.1	1.0		109
164	01A4	PID feedback value selection	0 to 5	1	0		106
175 #1 #2	01AF	Reducing carrier frequency selection at low speed	0, 1	1	0		68
176	01B0	Constant copy function selection	rdy, rEd, Cpy, vFy, vA, Sno		rdy		113
177	01B1	Constant read selection prohibit	0, 1	1	0		113
178	01B2	Fault history	Stores, displays most recent 4 alarms	Setting disabled	–		39
179	01B3	Software version No.	Displays lower-place 4 digits of software No.	Setting disabled	–		–

Notes:

1. Not initialized by constant initialization.
2. Upper limit of setting range and initial setting are doubled at 400V class.
3. Changes depending on inverter capacity. Refer to the next page.
4. Changes depending on inverter capacity. Refer to page 67.
5. Initial setting of the model with digital operator JVOP-140 (with potentiometer) is 0. Setting can be set to 1 by constant initialization.
6. When control mode selection (n002) is changed, initial setting corresponds to the control mode.

No.	Name	V / f control mode (n002 = 0)	Vector control mode (n002 = 1)
n014	Mid. output frequency	1.3Hz	3.0Hz
n015	Mid. output frequency voltage	12.0V*	11.0V*
n016	Min. output frequency	1.3Hz	1.0Hz
n017	Min. output frequency voltage	12.0V*	4.3V*
n104	Torque compensation time constant	0.3s	0.2s
n111	Slip compensation gain	0.0	1.0
n112	Slip compensation gain time constant	2.0s	0.2s

* Values are doubled with 400V class.

7. Changes depending on inverter capacity. Refer to page 101.

Initial settings that change with the inverter capacity

■ 200V class 3-phase

No.	Name	Unit	Initial Setting							
–	Inverter capacity	kW	0.1kW	0.25kW	0.55kW	1.1kW	1.5kW	2.2kW	–	4.0kW
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

■ 200V class single-phase

No.	Name	Unit	Initial Setting							
–	Inverter capacity	kW	0.1kW	0.25kW	0.55kW	1.1kW	1.5kW	2.2kW	–	4.0kW
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

■ 400V class 3-phase

No.	Name	Unit								
–	Inverter capacity	kW	–	0.37kW	0.55kW	1.1kW	1.5kW	2.2kW	3.0kW	4.0kW
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	2.7	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.