YASKAWA

A World of Automation Solutions™

VS-606V7 Series
Instruction Manual

COMPACT GENERAL-PURPOSE INVERTER
(VOLTAGE VECTOR CONTROL)

PREFACE

YASKAWA's VS-606V7 is such a small and simple inverter; as easy as using a contactor. This instruction manual describes installation, maintenance, 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 covers and 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 improvement to the product, modification, or changes in specifications.
  Such modifications are denoted by a revised manual No.
- To order a copy of this manual, if your copy has been damaged or lost, contact you YASKAWA representative.
- YASKAWA is not responsible for any modification of the product made by the user, doing so will void the warranty.

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 and 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 ensure 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 turned 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 indicators 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.
- The 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
(Ref. page)
Low voltage wires shall be wired with Class I Wiring. 22

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 14-16

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. 18
• Mount the inverter on nonflammable material (i.e., metal). Failure to observe this caution can result in a fire. 18
• When mounting units in an enclosure, install a fan or other cooling device (open chassis to keep the intake air temperature below 122°F (50°C). Overheating may cause a fire or damage to the unit. 19
• The VS mini generates heat. For effective cooling, mount it vertically. Refer to the figure in “Mounting Dimensions” on page 18.

WIRING

⚠ WARNING

(Ref. page)

- Start wiring only after verifying that the power supply is turned OFF.
  Failure to observe this warning can result in electric shock or fire. 22
- Wiring should be performed only by qualified personnel.
  Failure to observe this warning can result in electric shock or fire. 22
- When wiring the emergency stop circuit, check the wiring thoroughly before operation.
  Failure to observe this warning can result in personal injury. 22

⚠ WARNING

(Ref. page)

- Make sure to ground the ground terminal ⏚ according to the local grounding code.
  Failure to observe this warning can result in electric shock or fire. 25
- For 400V class, to conform to CE requirements, make certain to ground the supply neutral.
  Failure to observe this warning can result in electric shock or fire. 25

⚠ 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 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.. 25
- 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. 22
- Never connect the AC main circuit power supply to output terminals U, V and W.
  The inverter will be damaged and void the warranty. 22
- 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 electric shock.
- Never operate the digital operator or dip switches when your hand is wet.
  Failure to observe this warning can result in electric shock.
- Never touch the terminals while current is flowing, even during inverter stopping.
  Failure to observe this warning can result in 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. 60
- 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. 55
- 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. 27

OPERATION (Cont.)

⚠ CAUTION

(Ref. page)

- Never touch the heatsink or braking resistor, 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 speed, 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.
- Do not change signals during operation.
  The machine or the inverter may be damaged.
- All the parameters of the inverter have been preset at the factory. Do not change the settings unnecessarily.
  The inverter may be damaged. 28

MAINTENANCE AND INSPECTION

⚠ WARNING

(Ref. page)

- Never touch high-voltage terminals in the inverter.
  Failure to observe this warning can result in an electrical shock. 127
- 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. 127

⚠ 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. . . . . 127 • 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 electrical shock. 127

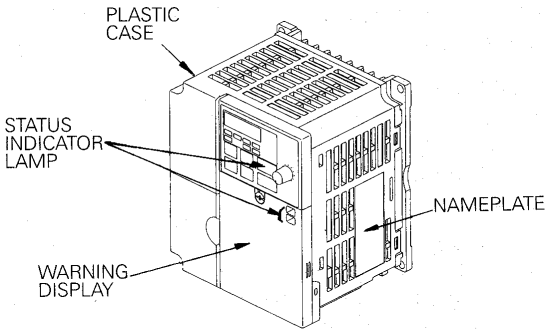
⚠ CAUTION
(Ref. page)
• The control PC board employs CMOS ICs. Do not touch the CMOS elements. They are easily damaged by static electricity. • Do not connect or disconnect wires, digital operator, connectors, or cooling fan while power is applied to the circuit. Failure to observe this caution can result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

Others

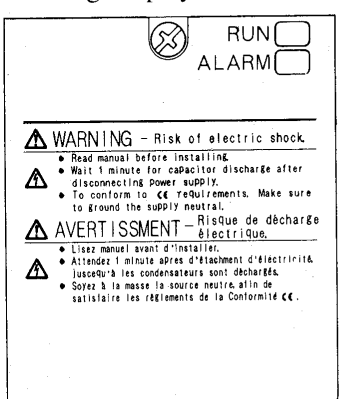
⚠ WARNING
(Ref. page)
• Never modify the product. Failure to observe this warning can result in an electrical shock or personal injury and will void the warranty.

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

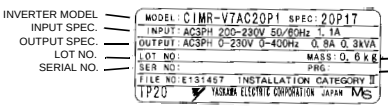
After unpacking the VS-606V7, check the following:

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

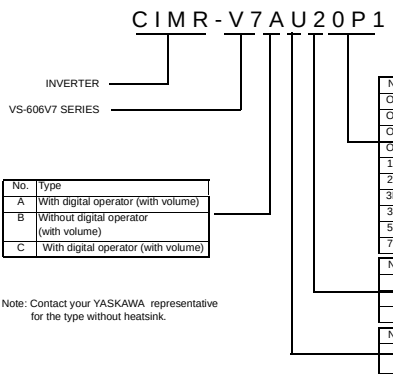
If any part of VS-606V7 is missing or damaged, call for service immediately.

• Checking the Name Plate

U.S. and Canadian Safety Standards for Types of 3-phase, 200VAC, 0.13HP (0.1kW)



MODEL



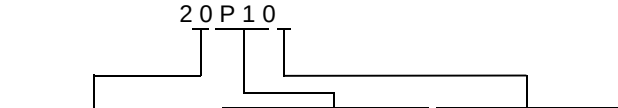
No.	Type
A	With digital operator (with volume)
B	Without digital operator (with volume)
C	With digital operator (with volume)

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

No.	Applicable maximum motor output
OP1	0.13 HP (0.1kW)
OP2	0.25 HP (0.2kW)
OP4	0.5 HP (0.4kW)
OP7	1 HP (0.75kW)
1P5	2 HP (1.5kW)
2P2	3 HP (2.2kW)
3PO	4 HP (3.0kW)
3P7	5 HP (3.7kW)
5P5	7.5 HP (5.5kW)
7P5	10 HP (7.5kW)

No.	Voltage Class
B	0.13 HP (0.1kW)
2	0.25 HP (0.2kW)
4	0.5 HP (0.4kW)

No.	Specifications
U	UL Specification (U.S. Specification)



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

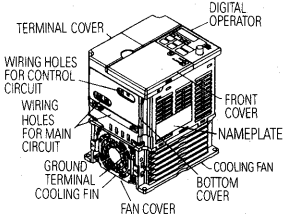
No.	Applicable maximum motor output
OP1	0.13 HP (0.1kW)
OP2	0.25 HP (0.2kW)
OP4	0.5 HP (0.4kW)
OP7	1 HP (0.75kW)
1P5	2 HP (1.5kW)
2P2	3 HP (2.2kW)
3PO	4 HP (3.0kW)
3P7	5 HP (3.7kW)
5P5	7.5 HP (5.5kW)
7P5	10 HP (7.5kW)

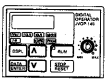
No.	Protective structure
0	Open chassis (IP20, IP00) *1
1	Enclosed wall-mounted (NEMA 1) *2
7	Open chassis (IP20) Top-closed type

*1 Code No.s OP1 to 3P7 are IP20.
Always remove both top and bottom covers when using the 5P5 and 7P5 inverters as open chassis types IP00.

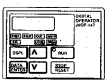
*2 NEMA 1 “OP1” to “3P7” are optional.
NEMA 1 “5P5” and “7P5” are standard.

2. IDENTIFYING THE PARTS

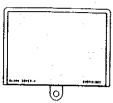




Digital operator(with volume)
JVOP-140
Used for setting or changing constants.
Frequency can be set using volume.

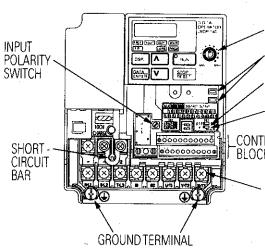


Digital operator(without volume)
JVOP-147
Used for setting or changing constants.

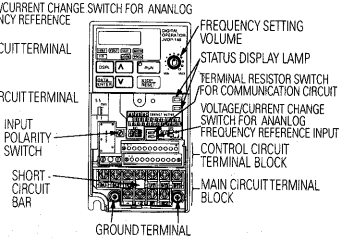


Blank cover(optional)
In models with blank cover, the blank cover is mounted in place of the digital oprator.

Opening the covers



CIMR-V7**40P2, 40P4, 40P7, 41P5, 42P2
21P5, B0P7, B1P5

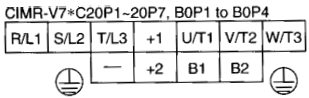


CIMR-V7**20P1, 20P2, 20P4, 20P7
B0P1 B0P2

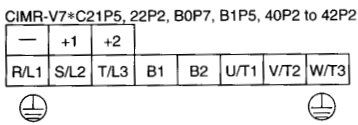
Main Circuit Terminal Arrangement

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

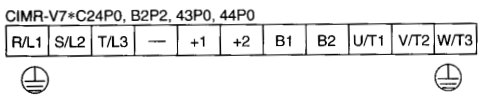
CIMR-V7*C20P1~20P7, B0P1 to B0P4



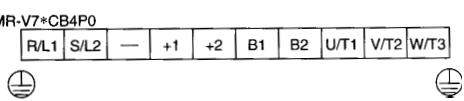
CIMR-V7*C21P5, 22P2, B0P7, B1P5, 40P2 to 42P2



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

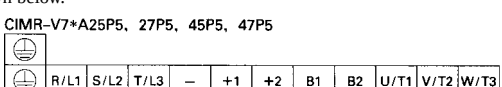


CIMR-V7*CB4P0



The terminal arrangement for200/400V, 3-Phase input series 7.5/10 HP (5.5/7.5Kw) is shown below.

CIMR-V7*A25P5、27P5、45P5、47P5

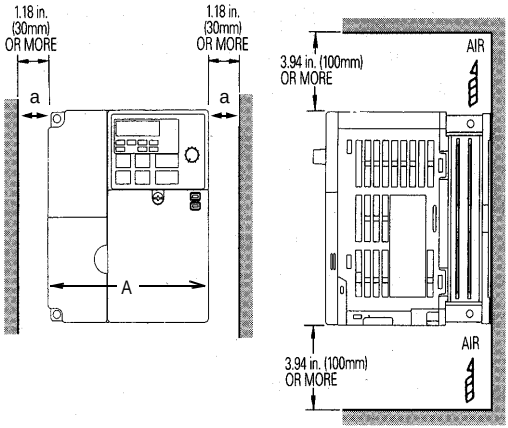


3. MOUNTING

• Choosing a Location to Mount the Inverter

Be sure the inverter is protected from the following conditions:

- Extreme cold and heat. Use only within the ambient temperature range (for open chassis type): 14 to 122°F (-10 to +50°C).
- 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 606 V7, dimensions as shown below are required.

Voltage	Max. Applicable Motor Output HP (Kw)	Length of A
200V Single - phase 3 - phase 400V 3 - phase	Less than 5 HP (3.7 Kw)	More than 1.18in (30mm)
200V 3 - phase	7.5 HP (5.5 Kw)	More than 1.97in (50mm)
400V 3 - phase	10 HP (7.5 Kw)	

Caution!

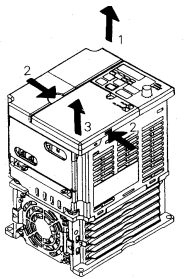
1. The above dimensions are common for both open chassis type (IP00, IP20) and NEMA 1 type.
2. Always remove both top and bottom covers when using 200/400V, 5.5/7.5Kw (7.5/10 HP) as open chassis type.

• Mounting/Removing Components

Removing and Mounting Digital Operator and Covers

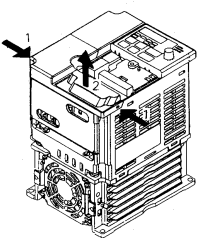
NOTE: Mount the inverter after removing the front cover, digital operator and terminal cover.

- **Removing front cover**
  Use a screwdriver 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 reverse order of the above procedure for removal.

- **Removing terminal cover when "W" (Width) dimensions are 4.25" (108mm), 5.51" (140mm), or 6.69" (170mm)**
  After removing the front cover, press the right and left sides to direction 1 and lift the terminal cover to direction 2.



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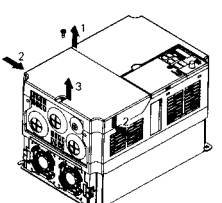
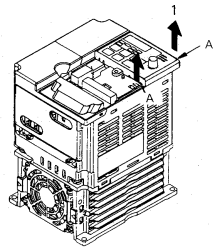
- **Removing terminal cover when "W" (Width) dimensions are 7.09" (180mm)**
  Use a Screwdriver to loosen the screw on the terminal cover surface to direction 1 to remove it. Then press the right and left sides to direction 2 and lift the terminal cover to direction 3.



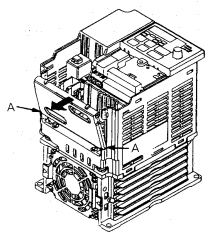
- **Mounting terminal cover**
  Mount the terminal cover in the descending order of the above procedure for removal.

- **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 reverse order of the above procedure for removal.

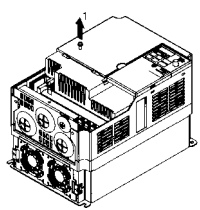


- **Removing bottom cover when "W" (Width) dimensions are 4.25" (108mm), 5.51" (140mm), or 6.69" (170mm)**
  After removing the front cover and the terminal cover, tilt the bottom cover to direction 1 with section A as a supporting point.



- **Removing terminal cover when "W" (Width) dimensions are 7.09" (180mm)**
  After removing the terminal cover use a screwdriver to loosen the fastening screw to loosen the fastening screw to direction 1 to remove it.

- **Mounting bottom cover**
  Mount the bottom cover in the reverse order of the above procedure for removal.



4. WIRING

• Wiring Instructions

(1) Always connect the power input terminals R/L1, S/L2, and T/L3 (R/L1, S/L2 for single-phase) and power supply via a molded-case circuit breaker (MCCB). Never connect them to U/T1, V/T2, W/T3.

The single-phase (200V class) inverter can be connected to a 200V 3-phase input. However, when terminal T/L3 is connected to single-phase, never use the terminal for other purposes.

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, V, and W 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 (n46)” on page 68.

(4) Control wiring must be less than 164ft(50m) 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) A closed-loop connector should be used when wiring to the main circuit terminal.

(9) 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) x wiring distance (m) x current (A) x 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 lb • in (N • m)	Wire				Type
				Applicable size		Recommend size		
				mm^2	AWG	mm^2	AWG	
Common to all models	MA, MB, MC	M3	4.44 to 5.33 (0.5 to 0.6)	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	1.94 to 2.21 (0.22 to 0.25)	twisted wire 0.5 to 0.75 single 0.5 to 1.25	20 to 18 20 to 16	0.75	18	Shielded wire or equivalent

2. Main Circuit

200V Class 3-phase Input Series

Model	Terminal Symbol	Screw	Tightening Torque lb • in (N • m)	Wire				Type
				Applicable size		Recommended size		
				mm^2	AWG	mm^2	AWG	
CIMR-V7AA20P1	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	600V vinyl-sheathed wire or equivalent
CIMR-V7AA20P2	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
CIMR-V7AA20P4	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
CIMR-V7AA20P7	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
CIMR-V7AA21P5	R/L1,S/L2,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
CIMR-V7AA22P2	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	3.5	12	
CIMR-V7AA24PO	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	5.5	10	
CIMR-V7*A25P5	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M5	22.19 (2.5)	5.5 to 8	10 to 8	8	8	
CIMR-V7*A27P5	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M5	22.19 (2.5)	5.5 to 8	10 to 8	8	8	

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

200V Class Single-phase Input Series

Model	Terminal Symbol	Screw	Tightening Torque lb • in (N • m)	Wire				Type
				Applicable size		Recommended size		
				mm^2	AWG	mm^2	AWG	
CIMR-V7AAB0P1	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	600V vinyl-sheathed wire or equivalent
CIMR-V7AAB0P2	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
CIMR-V7AAB0P4	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M3.5	7.1 to 8.88 (0.8 to 1.0)	0.75 to 2	18 to 14	2	14	
CIMR-V7AAB0P7	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	18 to 14	3.5	12	
CIMR-V7AAB1P5	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	5.5	10	
						3.5	12	
CIMR-V7AAB2P2	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	5.5	10	
CIMRV7AAB4PO	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3	M5	26.62 (3.0)	3.5 to 8	12 to 8	8	8	
	⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 8	14 to 8	5.5	10	

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

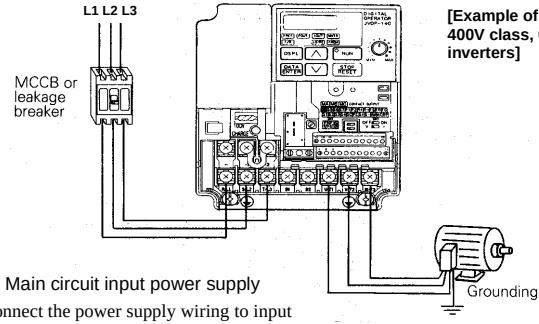
Note: Three-phase input is also available for 0.1 to 0.75kw of single-phase input series.

400V Class 3-phase Input Series

Model	Terminal Symbol	Screw	Tightening Torque lb • in (N • m)	Wire				Type
				Applicable size		Recommended size		
				mm^2	AWG	mm^2	AWG	
CIMR-V7AA40P2	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	600V vinyl-sheathed wire or equivalent
CIMR-V7AA40P4	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
CIMR-V7AA40P7	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
CIMR-V7AA41P5	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
CIMR-V7AA42P2	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
CIMR-V7AA43P0	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
	⏚					3.5	12	
CIMR-V7AA44PO	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3	M4	10.65 to 13.31 (1.2 to 1.5)	2 to 5.5	14 to 10	2	14	
	⏚					3.5	12	
CIMR-V7*A45P5	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3 ⏚	M4	12.43 (1.4)	3.5 to 5.5	12 to 10	5.5	10	
CIMR-V7*A47P5	R/L1,S/L2,T/L3,-,+1,+2,B1,B2,U/T1,V/T2,W/T3	M5	22.19 (2.5)	5.5 to 8	12 to 10	5.5	10	
	⏚							

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

• Wiring the Main Circuit



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

• Main circuit input power supply

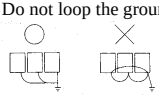
Connect the power supply wiring to input terminals L1 (R), N/L2(S) and L3(T) [L1(R), N/L2(S) for single-phase specifications]. Never connect them to U/T1, V/T2, W/T3, B1, B2, -, +1, or +2. Otherwise the inverter may be damaged. Single-phase voltage may be connected to inverter but do not use terminal T/L3 for any other purposes.

NOTE Single-phase (200V class, 0.75kW or less) voltage may be connected to terminal T/L3. Never use the terminal with other purposes.

• Grounding (Use ground terminal ⏚.)

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.



• Braking resistor connection (optional).

To connect the braking resistor, cut the protector on terminals B1 and B2.

To protect the braking resistor from overheating, install a thermal overload relay between the braking resistor and the inverter. This provides a sequence which shuts off the power supply, by a thermal relay trip contact.

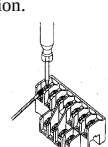
Use this same procedure when connecting a braking resistor unit. Refer to page 104.

• Inverter output

Connect the motor terminals to U, V, W.

Wiring the main circuit terminals

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



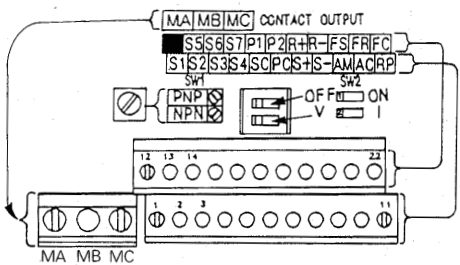
• Wiring the Control Circuit

Only basic insulation is provided for the control circuit terminals.

Additional insulation may be necessary in the end product.

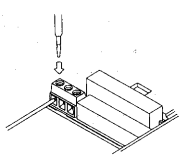
- Control Circuit terminals

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

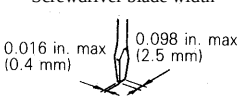


* SW1 can be changed according to sequence input signal (S1 to S7) polarity.
0V common: NPN side (factory setting)
24 common: PNP side
Refer to pages 67 and 76 for SW2

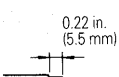
Wiring the control circuit terminals



Screwdriver blade width

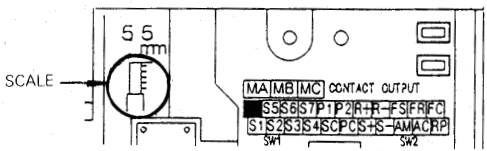


Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver.



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

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



• Wiring Inspection

After completing wiring, check the following:

- Wiring is properly connected.
- Wire clippings or screws are not left inside the unit.
- Screws are securely tightened.
- Bare wires in the terminal do not come in contact with other terminals.

NOTE If the FWD (REV) run command is given during the operation reference 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 three types of operation modes for the VS-606V7:

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

2. Run command from the control circuit terminal.

3. Run command from communications (MEMOBUS communications).

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-140 (with local potentiometer) or optional JVOP-147 (without local potentiometer. For instructions on operation, refer to page 37.

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

Name	parameter
Operation Reference 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 digital operator potentiometer = 1 --- Enables frequency reference 1 (parameter 024) = 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 line 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 20 mA) of operator circuit terminal = 9 --- Enables communication card (optional)

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
1. Turn ON the power supply.	6.00	FREF	RUN ☼ ALARM ●
2. Set parameter n004 to 1.	1	PRGM	RUN ☼ ALARM ●
3. Set the following parameters. n019 : 15.0 (acceleration time) n020 : 5.0 (deceleration time)	15.0 5.0	PRGM	RUN ☼ ALARM ●
4. F/R blinks. Select Forward or reverse run by pressing [Λ] or [V] 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 [Λ] or [V] key.	60.00	FREF	RUN ☀ ALARM ●
6. Press [RUN]	0.00 → 60.0	FOUT	RUN ☼ ALARM ●
7. Press [STOP] to stop.	60.0 → 00.0	FOUT	RUN ☼ ▼ ☼ ALARM ●

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

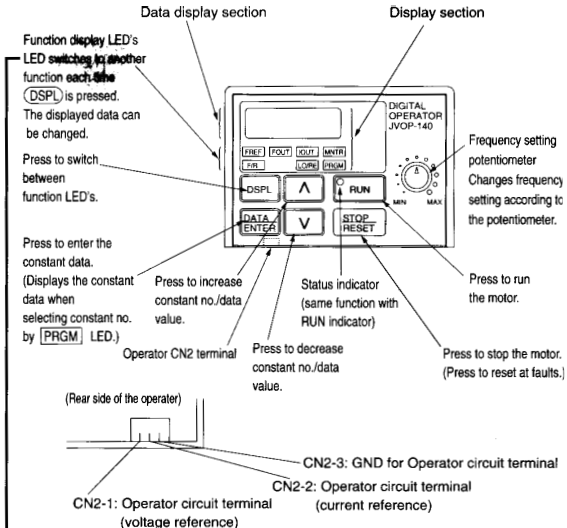
Operation Check Points

- 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.

Digital Operator JVOP-140

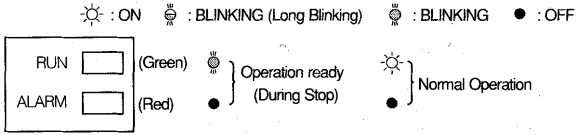


Details of LEDs (Color in parenthesis indicates the color of LED.)

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 LED's

There are two LED's 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 LED's. RUN indicator and status indicator of the RUN button have the same functions.



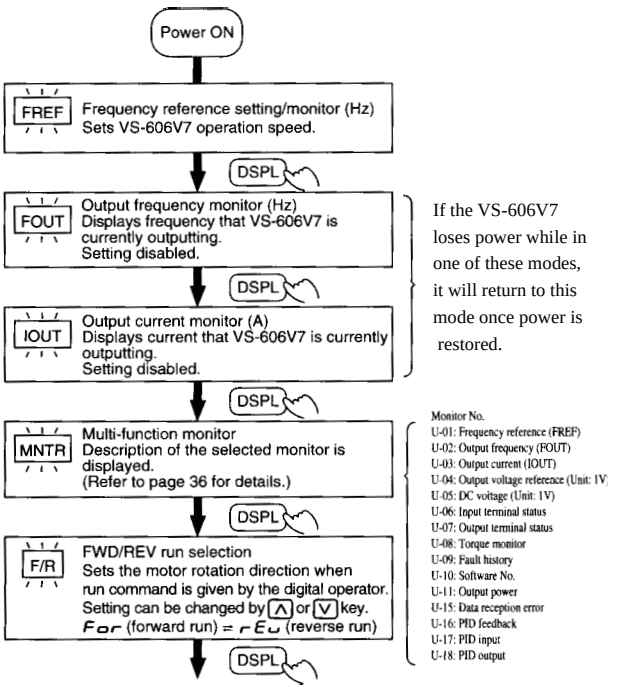
For details on how the status indicator LED's function at inverter faults, refer to Section 8 "FAULT DIAGNOSIS AND CORRECTIVE ACTIONS" on page 126. If a fault occurs, the ALARM LED lights.

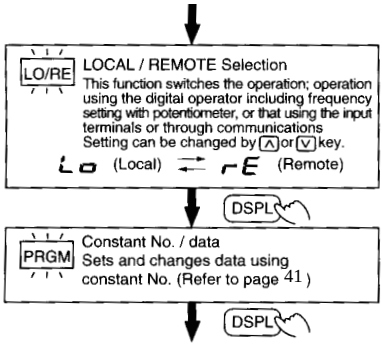
NOTE The fault can be reset by turning ON the fault reset signal (or pressing STOP/RESET on the digital operator) with the operation signal OFF or by turning OFF the power supply. If the operation signal is ON, the fault cannot be reset by the fault reset signal.

• LED Description

By pressing (DSPL)gital operator, each of the function LED's can be selected.

The following flowchart describes each function LED.





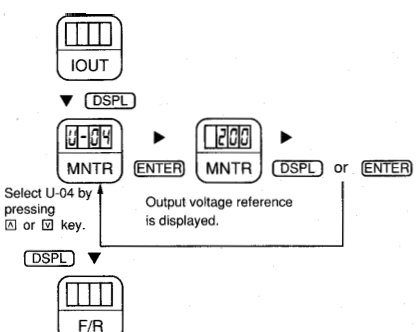
Return to FREF

MNTR Multi-Function monitor

- **Selecting monitor**

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

  [Example] Monitoring Output Voltage Reference



- **Monitoring**

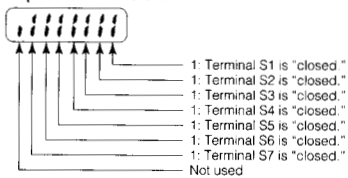
Following items can be monitored by U-parameter

parameter 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	Hz	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-13	Cumulative operation time*4	x10H	Cumulative operation time can be monitored in units of 10H
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 frequency
U-18	PID output*5	%	± 100(%) /± Max. output frequency

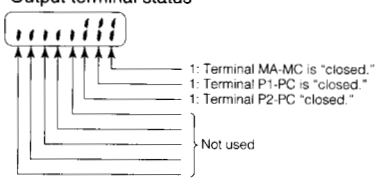
*1 The status indicator LED is not turned ON.
*2 Refer to the next page for input / output terminal status.
*3 The display range is from -99.9kW to 99.99kW.
When regenerating. the output power will be displayed in units of 0.01kW when -9.99kW or less and in units of 0.1kW when more than -9.99kW.
When in the vector control mode, "----" will be displayed.
*4 This function only applies to 200/400V class 7.5/10hp (5.5/7.5kW) inverters.
*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

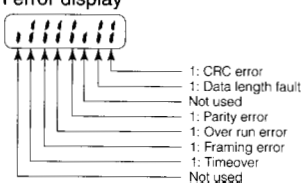
Input terminal status



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.

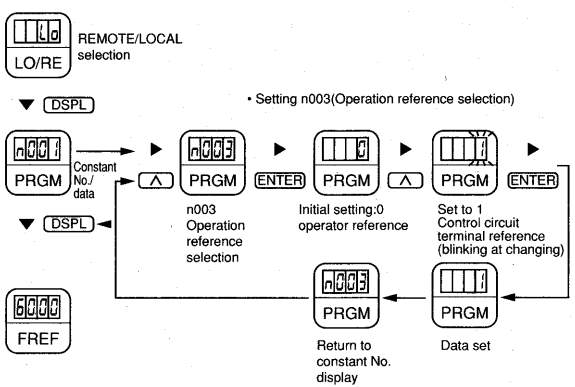
(Example)

■□□□ ····· 4-digit numbers
■ : Order of fault (1 to 4)
□□□ : Fault description
"---" is desplayed if there is no fault.

(Refer to page 126 for details.)

- Switching fault history
  Order of the fault history can be changed by ^ v.
- Clearing fault history
  Set parameter n001 to 6 to clear fault history. Display returns to n001 after completion of 6 setting.
  Note: parameter initialize (n001 = 10, 11) clears the fault history.

Setting and referring parameters



• 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.

Frequency reference by analog voltage is set with initial setting (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 decelerates rapidly corresponding to the potentiometer movement. Pay attention to load status and switch the potentiometer movement.	00.0 to 60.00 Minimum output frequency is 1.50Hz	FREF	RUN ☼ ALARM ●

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

Notes

6. PROGRAMMING FEATURES

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

• Parameter Set-up and Initialization

Parameter selection/initialization (n001)

The following table describes the data which can be set or read when n001 is set.

Unused parameters among n001 to n179 are not displayed.

n001 Setting	Parameter that can be set	Parameter 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	
8,9,12,13	Not used	
10	Initialize	
11	Initialize (3-wire sequence)=	

* Excluding setting disabled parameters.

= Refer to page 70.

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 input terminal function selection 1 to 7 (n050 to n056) are the same.

(2) 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 38.

(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) When n018 = 0 and n019 ~ n022 is set to a value greater than 600.0 sec, parameter n018 will automatically be set to 1.

• Using V/f Control Mode

Vector control mode is preset at the factory.

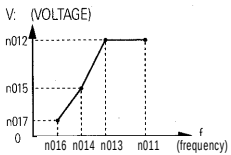
Control mode selection (n002): 0: V/f control mode (initial setting)

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.

Parameters No.	Name	Unit	Setting range	Initial Setting
n011	Max. output frequency	0.1Hz	50.0 to 400.0Hz	60.0Hz
n012	Max. voltage	1V	1 to 255.0V (0.1 to 510.0V)	230.0V (460.0V)
n013	Max. voltage output frequency (base frequency)	0.1Hz	0.2 to 400.0Hz	60.0Hz
n014	Mid. output frequency	0.1Hz	0.1 to 399.9Hz	1.5Hz
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	1.5Hz
n017	Min. output frequency voltage	1V	1 to 50.0V (0.1 to 100.0V)	4.3V * (8.6V)

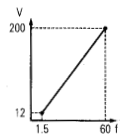
* 10.0V for 200V class 7.5/10hp (5.5/7.5kW)
  20.0V for 400V class 7.5/10hp (5.5/7.5kW)
NOTE: Values with parentheses indicate 400V class.

- 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

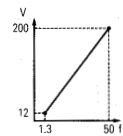
(1) For general-purpose applications

Motor Specification : 60Hz
(Factory setting)



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

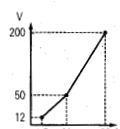
Motor Specification : 50Hz
(Factory setting)



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

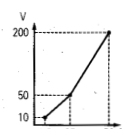
(2) For fans/pumps

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

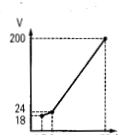
Motor Specification : 50Hz



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

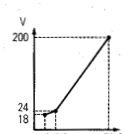
(3) For applications requiring high starting torque

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

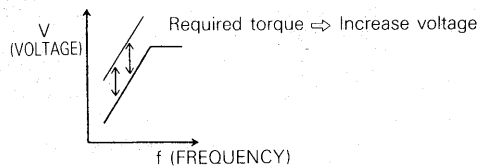
Increasing voltage of V/f pattern increases motor torque, but excessive increase may cause motor over excitation, motor overheat, or vibration.

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 parameter-speed operation as well as during acceleration.
  The required torque is calculated by the inverter.
  This ensures tripless operation and energy-saving effects.

Output voltage	∝	Torque compensation gain (n103)	×	Required torque

- Operation



Normally, no adjustment is necessary for torque compensation gain (n103 factory setting: 1.0). An excessively high setting of torque compensation gain will result in motor over excitation, and possible inverter faults. If adjustments are necessary, adjust n103 in increments/decrements of 0.1 for optimization. When wiring distance between the inverter and the motor are long it may be necessary to increase the setting of n103. When motor generates vibration, decrease the setting of n103.

Adjustment of torque compensation time parameter (n104) and torque iron loss compensation parameter (n105) are normally not required.

Adjust torque compensation parameter under the following conditions:

- Increase setting when the motor generates vibration.
- Reduce setting when motor 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 parameters, the YASKAWA standard motor parameters 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 parameters are not matched. Set the following parameters so that they can match the motor parameters.

No.	Name	Unit	Setting range	Initial Setting
n106	Motor rated slip	0.1Hz	0.0 to 20.0Hz	*
n107	Motor resistance per phase=	0.001Ω (less than 10Ω) 0.01Ω (10Ω or more)	0.000 to 65.5Ω	*
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)	150

* Setting depends on inverter capacity.

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 gain time parameter (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 Compensation during Regeneration
0	Disabled
1	Enabled

- **Motor parameter calculation**

The following shows an example of motor parameter calculation:

(1) Motor rated slip (n106)

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

(2) Motor resistance for one 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) x 0.92 x 1/2

(B type insulation) Test report of line-to-line resistance at 75°C (Ω) x 0.92 x 1/2

(F type insulation) Test report of line-to-line resistance at 115°C (Ω) x 0.87 x 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 rated output current.
*2 Rated speed (r/min) at base frequency during rated output current.

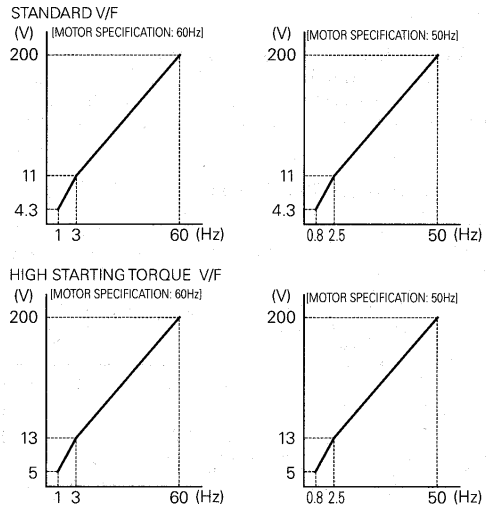
Set n106 (motor rated slip), n036 (motor rated current), n107 (motor resistance per phase) and n110 (motor no-load current) according to the motor test report.

When connecting a reactor between the inverter and the motor, set n108 to the value of n108 (motor leaking inductance) initial value + externally-mounted reactor inductance. Initial setting should be used unless a reactor is installed.

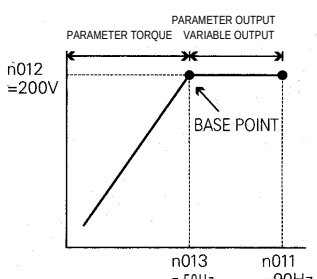
Unless a reactor is connected, n108 (motor leakage inductance) does not have to be set according to the motor.

- **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 voltage settings (n012, n015, n017).



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

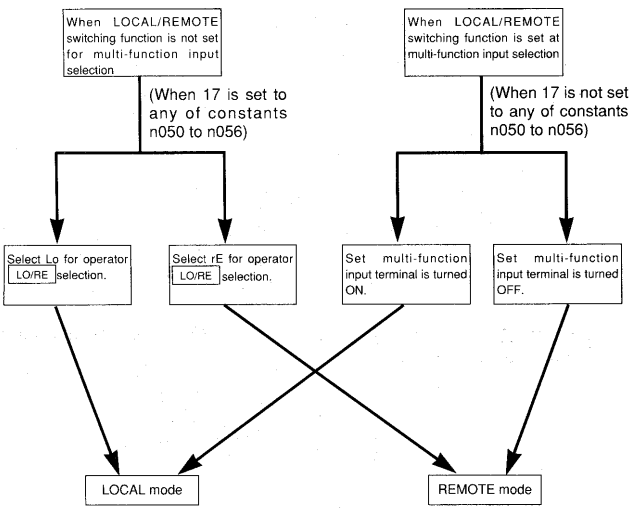


• Switching LOCAL/REMOTE Modes

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 local potentiometer or FREF.
- REMOTE mode: Enables operation reference selection (n003).

• How to select LOCAL/REMOTE modes



• Selecting Run/Stop Commands

Refer to Switching LOCAL/REMOTE Modes (Page 44) 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 by digital operator [LO / RE] ON mode, or when the LOCAL / REMOTE switching function is set and the input terminals are turned ON, run operation is enabled by the [STP] or [RUN] of the digital operator, and FWD/REV run is selected by [F / R] ON mode (using [^] or [v] key).

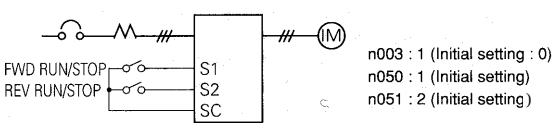
• REMOTE mode

- Select remote mode.
  The following two methods are used to select remote mode:

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

- Select operation method by setting the parameter n003.
  n003 =0: Enables the digital operator (same with local mode)
  =1: Enables the multi-function input terminal (see fig. below)
  =2: Enables communications
  =3: Enables communication card (optional)
- Example for using the multi-function input terminal as operation reference (two-wire sequence)

Below shows the example of three-wire sequence, (Refer to page 70.)



For example of three-wire sequence, refer to page 70

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

- **Operating (RUN /STOP commands) by communications**

Setting parameter n003 to 2 in REMOTE mode can give RUN / STOP commands by communication (MEMOBUS communications). For the command by transmission, 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 of selecting the mode, refer to page 44.

LOCAL mode

Select command method by parameter 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 parameter n009 instead of pressing ENTER key.

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

=1 : Disable frequency reference setting by ENTER key.

REMOTE mode

Select command method by parameter 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 47)

=3 : Current reference (4 to 20mA) (Refer to page 81)

=4 : Current reference (0 to 20mA) (Refer to page 81)

=5 : Pulse train reference (Refer to page 82)

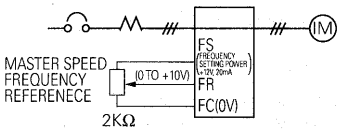
=6 : Communication (Refer to page 90)

=7 : Voltage reference of digital operator circuit terminal (0-10)

=8 : Current reference of digital operator circuit terminal (4-20mA)

=9 : Communication card (optional)

Example of frequency reference by voltage signal



n004 : 2 (factory 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.

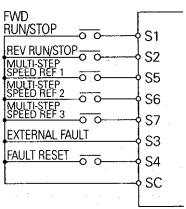
8-step speed change

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)

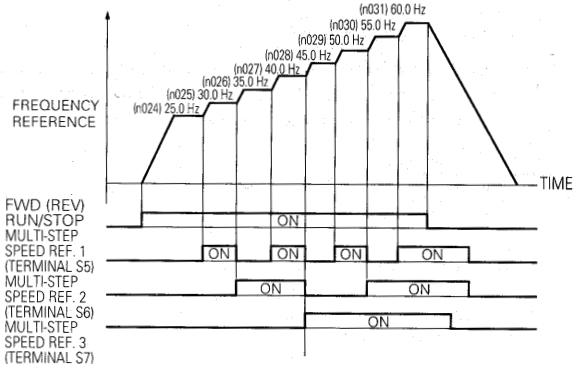
NOTE When all multi-step speed inputs are open, frequency reference selected by parameter n004 (frequency reference selection) becomes effective.

Only when multi-step speed input ref. 1 is closed and n077=1, the effective frequency reference becomes the CN2 analog input signal.

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



Additional settings for 16-Step speed operation

Set n120 ~ n127 to frequency reference 9-16.

A multi-function input must be set to multi-step speed reference 4 (n050 ~ n056 = 9).

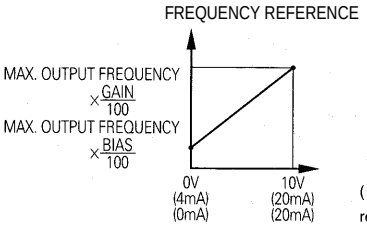
Operating at low speed

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 inputted simultaneously with the jog command, the jog command has priority.

Parameter No.	Name	Setting
n032	Jog frequency reference	Factory setting : 6.00Hz
n050 to n056	Jog command	Set to "10" for any parameter.

- **Adjusting speed setting signal**

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



(a) Analog frequency reference gain (n060)

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

* Factory setting : 100%

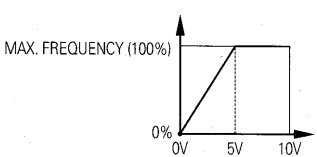
(b) Analog frequency reference bias (n061)

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

* Factory setting : 0%

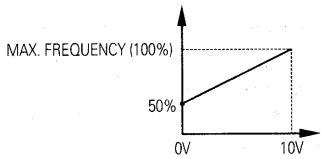
Typical setting

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



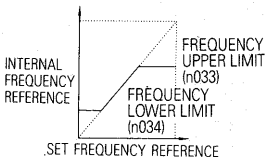
Gain n060 = 200
Bias n061 = 0

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



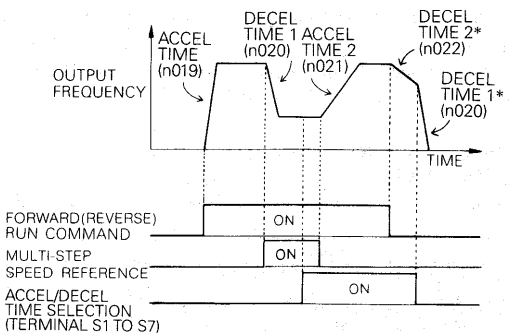
Gain n060 = 100
Bias n061 = 50

Adjusting frequency upper and lower limits



- Frequency reference upper limit (n033)
  Sets the upper limit of the frequency reference in units of 1%.
  (n011: Maximum output frequency = 100%)
  Factory setting: 100%
- Frequency reference lower limit (n034)
  Sets the lower limit of the frequency reference in units of 1%.
  (n011: Maximum 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 “Multifunction 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 (accel time 1)
n020 (decel time 1)

At ON : n021 (accel time 2)
n022 (decel time 2)

No.	Name	Unit	Setting Range	Initial setting
n019	Accel time 1	Refer to n018 setting	Refer to n018 setting	10.0s
n020	Decel time 1			10.0s
n021	Accel time 2			10.0s
n022	Decel 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: Parameter n018 can be set during stop.
If the numeric value exceeded 600.0 sec. is set for the accel/decel time when n018 = 0 (in units of 0.1 sec.). “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%.

(Maximum output frequency n011 = 100%)

Automatic restart after momentary power loss (n081)

When parameter n081 is set to 1 or 2, 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 ride thru time 0.5s.
2*=	Continuous operation after power recovery (Fault output not provided)

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

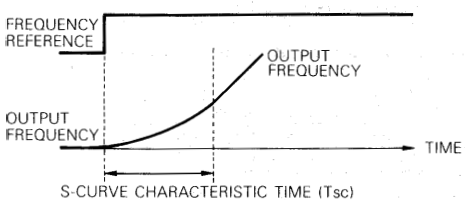
= When 2 is selected, the inverter restarts if power supply voltage recovers while the control power supply is held.
No fault signal is output.

Soft-start characteristics (n023)

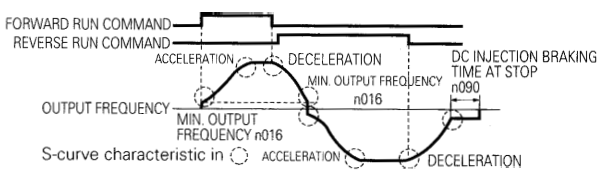
To prevent shock at machine start/stop, accel/decel can be performed in S-curve pattern.

Setting	S-curve characteristic time
0	S-curve characteristic not provided
1	0.2 second
2	0.5 second
3	1.0 second

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



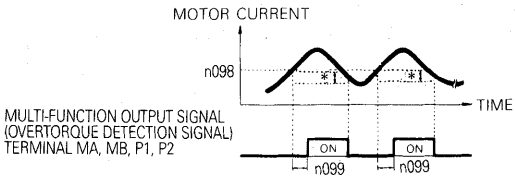
The following time chart shows FWD/REV run switching at deceleration to a stop.



Torque detection

If an excessive load is applied to the machine, the resultant output current increase can be compared to the threshold setting of parameter n098, then 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 parameter-speed running, and operation continues after detection.
2	Detected during parameter-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 "oL 3" alarm (blinking).

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

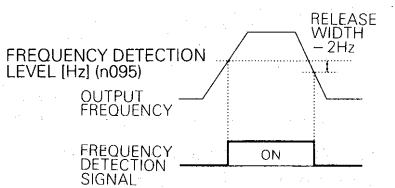
Setting	Description
0	Detected by output torque
1	Detected by output current

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 frequency detection level (n095).

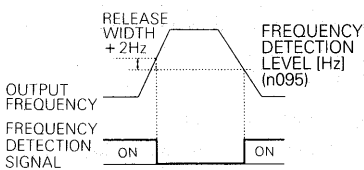
- Frequency detection1

  Output frequency $\geq$ Frequency detection level n095
  (Set either of n057, n058 or n059 to “4”.)



- Frequency detection2

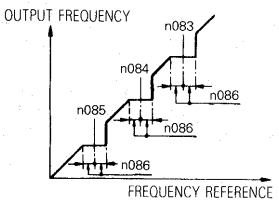
  Output frequency $\leq$ Frequency detection level n095
  (Set either of n057, n058 or n059 to “5”.)



Jump frequencies (n083 to n086)

This function allows the prohibition or “jumping” of critical frequencies so that the motor can operate without resonance caused by 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 smoothly (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 (over current)
- OV (over voltage)

The number of retry attempts are cleared to 0 during 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

- **Cumulative Operation Time Selection (n087)**

Setting	Description
0	Inverter power-on time (Counts the elapsed time that there is an inverter output)
1	Inverter running time (Counts the elapsed time that there is an inverter output.)

Cumulative operation time setting.

Inverter operating time set with parameter n087 is accumulated by the unit of 10H.

Accumulation starts from the time set with parameter n088.

Parameter No.	Name	Unit	Setting Range	Initial Setting
n088	Cumulative operation	1 = 10H	0 to 6550 (65500H)	0 (H)

- **Installed Braking Resistor Overheating protection Selection (n165) Set "0" when braking resistor is not connected.**

Setting	Description
0	Overheating protection is not provided
1	Overheating protection is provided

- **Input / Output Open Phase Protection**

Parameters No.	Name	Unit	Setting Range	Initial Setting
n166	Input open-phase detection level	1%	0 to 100% *1 400.0V/100% (for 200V class) 800.0V/100% (for 400V class)	0%
n167	Input open-phase detection time	1 sec.	0 to 255 sec. *2	0 sec.
n168	Output open-phase detection level	1%	0 to 100% *1 Inverter rated output current value/100%	0%
n169	Output open-phase detection time	0.1 sec.	0.0 to 2.0 sec *2	0.0 sec.

*1 0% setting - no detection

*2 0.0 sec setting - no detection

- Recommended set values: 7% for n166
  10sec. for n167
  5% for n168
  0.2sec. for n169

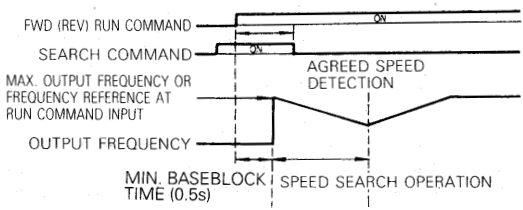
- **Speed search command**

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

  Set input terminal function 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**



Set declaration time during a speed search at parameter n101. Speed search starts when inverter output current $\geq$ speed search operation level.
This function applies to the 200/400V class 7.5/10hp inverters.

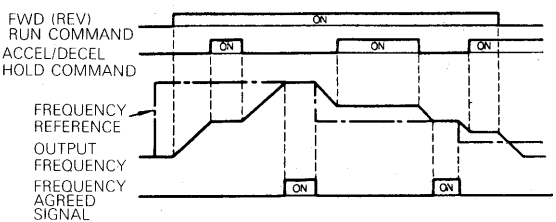
Holding accel/decel temporarily

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 terminal selection (n050 to n056) to 16 (accel/decel hold command).

Time chart at accel/decel hold command input

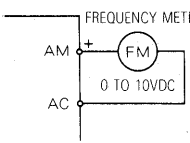


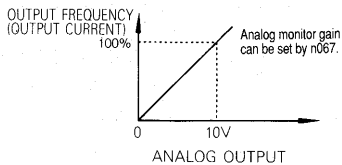
Using frequency meter or ammeter (n066)

Selects the function to be monitored at analog output terminals AM-AC.

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

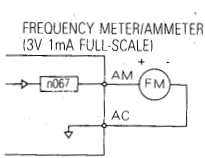
In initial setting, analog voltage of approx. 10V is output when output frequency (output current) is 100%.

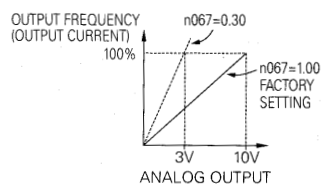




Calibrating frequency meter or ammeter (n067)

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.

$$10V \times \frac{\text{n067 Setting}}{0.30} = 3V$$

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.

Parameters No.	Name	Unit	Setting range	Initial Setting
n065	Monitor output type selection	1	0,1	0

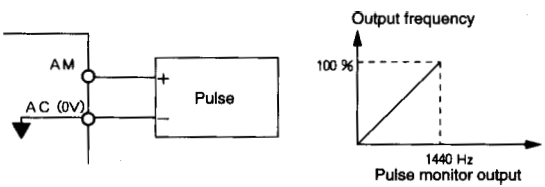
n065 setting

n065 Setting	
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 x 1
6	6F: Output frequency x 6
12	12F: Output frequency x 12
24	24F: Output frequency x 24
36	36F: Output frequency x36

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

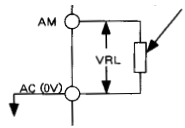


Pulse monitor output can be adjusted with the parameter n067.

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

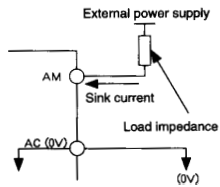
Used as a sourcing output

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



Used as a sinking input

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

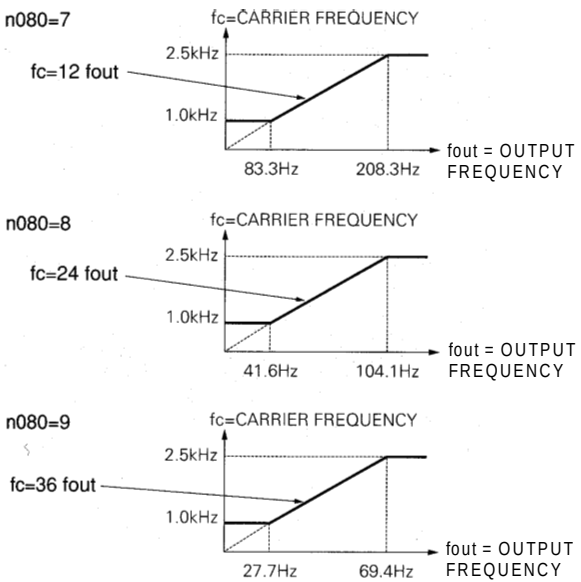


Reducing motor noise leakage current (n080)

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 ↑	Smaller ↑
8	24 fout	(Hz)		
9	36 fout	(Hz)		
1	2.5	(kHz)		
2	5.0	(kHz)		
3	7.5	(kHz)	↓ Not audible	↓ Larger
4	10.0	(kHz)		

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



Reducing Motor Noise or Leakage Current (n080)

Frequency 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	–
	0.2	4	10kHz	1.6	
	0.4	4	10kHz	3.0	
	0.7	4	10kHz	5.0	
	1.5	3	7.5kHz	8.0	7.0
	2.2	3	7.5kHz	11.0	10.0
	3.7	3	7.5kHz	17.5	16.5
	5.5	3	7.5kHz	25	23
	7.5	3	7.5kHz	33	30
400 3-phase	0.2	3	7.5kHz	1.2	1.0
	0.4	3	7.5kHz	1.8	1.6
	0.7	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
	3.7	3	7.5kHz	8.6	8.1
	5.5	3	7.5kHz	14.8	*
	7.5	3	7.5kHz	18	17

(1) Reduce continuous output current when changing carrier frequency to 4 (10kHz) for the 200V class (1.5 W 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 230 V (200V class)
Single-Phase 200 to 240V (200V class)
3-Phase 380 to 460V (400V class)

•Ambient temperature: 14 to 122ºF (-10 to +50ºC)
(Protection structure: open chassis type IP20)

(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 (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 $\leqq$ 5 Hz

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.

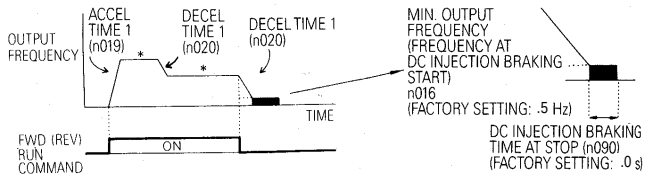
Setting	Description
0	STOP key effective when running either from multi-function input terminals or communications. When STOP key is pressed, the inverter stops according to the setting of the parameter n005. At this time, the digital operator displays "STP" alarm (blinking). This stop command is held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

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



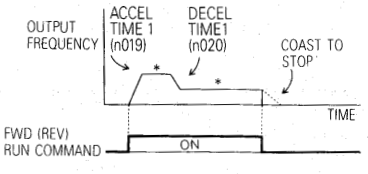
* When frequency reference is changed during running.

Upon termination of the FWD (REV) run command, the motor decelerates at the decel rate determined by the time set to decel 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 minimum output frequency (n016) with FWD (REV) run command ON.

If the decel time is short or the load inertia is large, over voltage (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

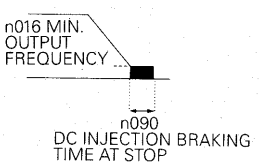


* When frequency reference is changed during running.

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 parameters n051 or n052 respectively. The same value cannot be set to different parameter settings.

Setting	Name	Description	Ref.
0	FWD/REV run command (3 wire sequence selection)	Setting enabled only for n052	74
1	Forward run (2 wire sequence selection)		45
2	Reverse run (2 wire sequence selection)		45
3	External fault (NO contact input)	Inverter stops by external fault signal input Digital operator display is "EF 0 " .*	–
4	External fault (NC contact input)		–
5	Fault Reset	Resets the fault. Fault reset not effective with the run signal ON.	50
6	Multi-step speed reference 1		50
7	Multi-step speed reference 2		50
8	Multi-step speed reference 3		50
9	Multi-step speed reference 4		50
10	JOG command		51
11	Accel/Decel time select		54
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	63
15	Search command from set frequency		63
16	Accel/decel hold command		64
17	LOCAL/REMOTE selection		46
18	Communication/control circuit terminal selection		78
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 SRP (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 Control cancel		114
24	PID integral reset		114
26	Inverter overheat prediction OH3	" oH3 " (Blinking) is displayed on the digital operator by signal input	
25	PID intregal hold		114
34	UP/DOWN command	Setting enabled only for n056 (terminal S7)	75
35	Self-test	Setting enabled only for n056 (terminal S7)	114

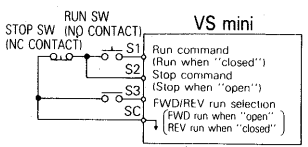
* Numbers 1 to 7 are displayed in ❑ corresponding to the terminal number S1 to S7 respectively.

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 select (setting: 17)
  Select operation reference either by the digital operator or by the settings of operation method 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.

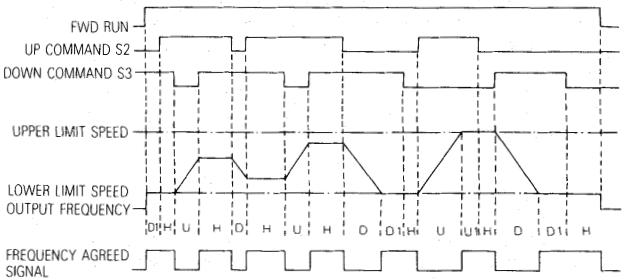
Open: Run by frequency reference from multi-function input terminal FR and run command from multi-function input terminals S1 to S7.

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)
x Frequency reference upper limit (n033)/100

(2) Lower limit value is either minimum output frequency (n016) or frequency reference lower limit (n034) (whichever is greater).

(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 page 111 for details of the input signal.

NOTE When using the signal for the CN2 terminal of the JVOP-140 digital operator’s a multi-function analog input, never use it or 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)

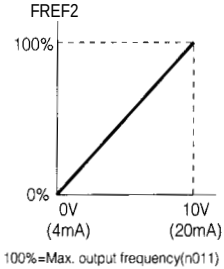
No.	Name	Unit	Setting Range	Initial Setting
n077	Multi-function input selection	–	0 to 4	0

n077 setting

Setting	Name	Description
0	Disabled	The multi-function input is disabled
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 no72.
2	Frequency reference gain (FGAIN)	Provides gain to main frequency reference.
3	Frequency reference (FBIAS)	Set the FGAIN to parameter n60 or n074 and the FBIAS to parameter 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	Frequency detection	Add the VBIAS to the output voltage after V/f conversion.

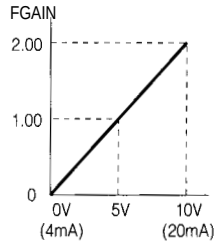
Analog input level

① Auxiliary frequency reference (n077=1)

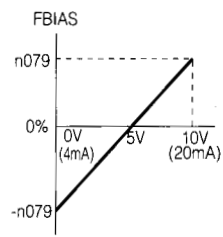


100%=Max. output frequency(n011)

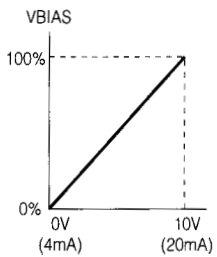
② Frequency reference gain (n077=2)



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)

Parameter No.	Name	Unit	Setting Range	Initial Setting
n078	Multi-function analog input signal selection	–	0 = Digital operator terminal (voltage: 0 to 10V) 1 = Digital operator terminal (current: 4 to 20mA)	0

Frequency reference bias setting (n079)

Parameter 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 parameters n057, n058, and n059.

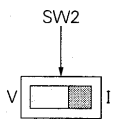
- Terminal MA and MB functions: Set to n057
- Terminal P1 function: Set to n058
- Terminal P2 function: Set to n059

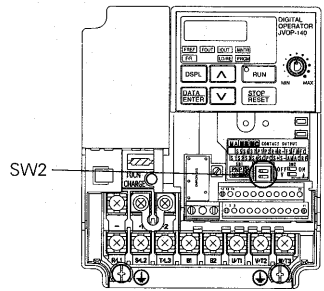
Setting	Name	Description	Ref page
0	Fault	Closed when inverter fault occurs.	–
1	In operation	Closed when either FWD/REV command is input or voltage is output from the inverter.	–
2	Agreed frequency	Closed when setting frequency agrees with inverter output frequency.	79
3	Zero speed	Closed when inverter output frequency is less than minimum output frequency.	–
4	Frequency detection	Output frequency ≥ frequency detection level (n095)	56
5	Frequency detection	Output frequency ≤ frequency detection level (n095)	56
6	Overtorque detection (NO contact output)	—	55
7	Overtorque detection (NC contact output)	—	55
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
20	Frequency reference is missing	Closed when frequency reference is missing	–
21	Inverter overheat prediction OH3	Closed when overheat prediction is input. Digital operator display is “OH3 (blinking).”	–

• 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.



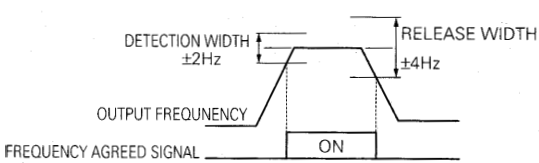


NOTE Never input voltage reference to control circuit terminal FR when DIP switch SW2 is switched to “I” side. This could damage the inverter.

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)



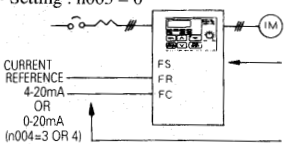
Current reference selection

After changing DIP switch (V/I switch of SW2) to the “I” side, PRESS PRGM on the digital operator, then set the following parameters.

Current reference (4-20mA) parameter n004=3

Current reference (0-20mA) parameter n004=4

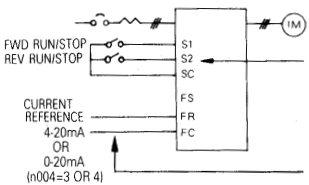
• Setting : n003 = 0



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



Set 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.

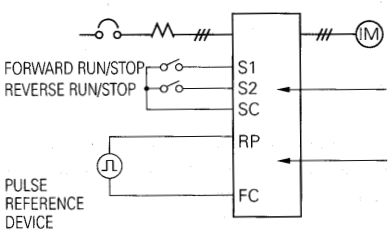
Frequency reference gain (n060)/bias (n061) can be set even when current reference input is selected. For details, refer to “Adjusting frequency setting signal” on page 81.

• 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
  - Duty Cycle: 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.

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



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.

Parameter No.	Name	Unit	Setting range	Initial Setting
n003	Run command selection	1	0 to 2	0
n004	Frequency reference selection	1	0 to 6	0
n149	Pulse train input scaling 1=10Hz	1	100 to 3300 (33kHz)	2500 (25kHz)

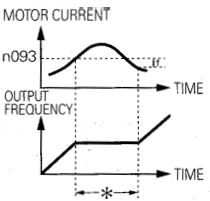
Preventing Motor from Stalling (Current Limit)

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.

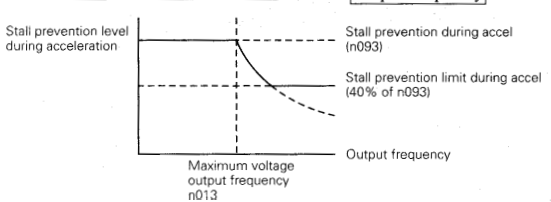


* Stops the acceleration to prevent the motor from stalling.

† Release width (hysteresis) of stall prevention during accel is approx. 5% of inverter rated current.

In the constant horsepower area [output frequency > max. voltage output frequency (n013)], the following equation automatically decreases the stall prevention (current limit) level during acceleration, but the stall prevention level will never go below 40% of n093.

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



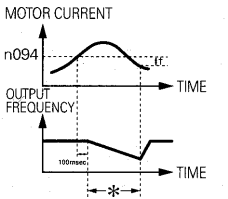
- Stall prevention (current limit) level during running (n094)
  Sets the stall prevention (current limit) level during running in units of 1% (Inverter current = 100%).
- Factory setting: 160%

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

If the inverter is at speed agree and output current exceeds the value set for n094 for longer than 100msec, deceleration starts.

Deceleration continues until the output current falls below the value set for n094. When this occurs, the inverter will accelerate back up to the set frequency.

Stall prevention accel/decel settings during operation are set either by accel time 1 (n019) and decel time 1 (n020), or accel time 2 (n021) and decel time 2 (n022).



* Decreases frequency to prevent the motor from stalling.

† At acceleration start, output hysteresis is approx. 5% of inverter rated current.

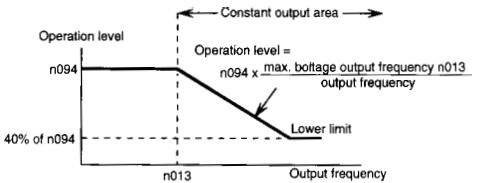
Stall prevention during operation

- Stall prevention automatic decrease selection (n115)

  The stall prevention level can be increased automatically in the parameter output range.

Parameter No.	Name	Unit	Setting Range	Initial Setting
n115	Stall prevention automatic decrease selection	-	0=Disabled 1=Enabled	0

n115 setting

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

- 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 parameters, n021 and n022.

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

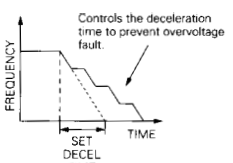
n116 setting

Setting	Function
0	Accel/decel time is set by accel/decel time 1or 2.
1	Accel/decel time is fixed at accel/decel time 2(n021, n022)

- Stall prevention (current limit) function during acceleration (n092)

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

Setting	Stall prevention (current limit) during deceleration
0	Provided
1	Not provided (when braking resistor is mounted



• Decreasing Motor Speed Fluctuation

Slip compensation (When V/f control mode n002=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 parameter 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.

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

Related Parameters

Parameters 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 primary delay time	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 (electronic 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).

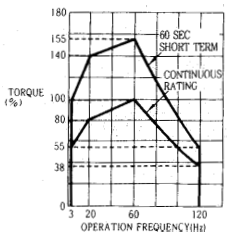
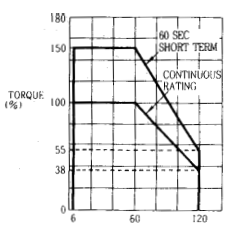
n037 Setting	Electronic Thermal Characteristics
0	Applied to general-purpose motor
1	Applied to inverter duty motor
2	Electronic thermal overload protection not provided

Parameters No.	Name	Unit	Setting Range	Initial Setting
n038	Protection parameter selection	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 duty 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

	Cooling Effect	Torque Characteristics	Electronic Thermal overload
General-purpose Motor	Effective when operated at 50/60Hz from commercial power supply	 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.	oL 1 error (motor overload protection) occurs when continuously operated at 50/60Hz or less at 100% load.
Inverter Motor	Effective even when operated at low speed (approx. 6Hz)	 Base Frequency 60Hz (V/f for 60Hz, 220V Input Voltage) Use an inverter motor for continuous operation at low speed.	Electronic thermal overload protection not activated even when continuously operated at 50/60Hz or less at 100% load.

• Selecting Cooling Fan Operation

In order to increase lifetime, the cooling fan can be set to operate only when inverter is running.

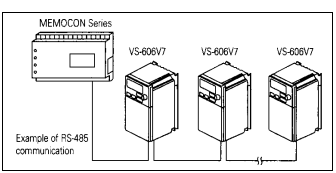
n039 = 0 (factory setting)	:	Operates only when inverter is running. (Continuous operation for 1 minute after inverter is stopped.)
1	:	Operates with power ON.

• Using MEMOBUS (MODBUS) Communications

Serial transmission is available with VS-606V7 using programmable controller (MEMOCON series) and MEMOBUS.

• 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 conducts signal communication. The slave receives the communications to carry out designated functions and reply to the master.



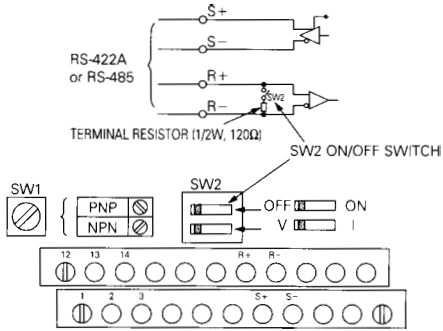
• Communications specifications

Interface	RS-422, RS485
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

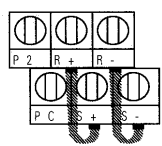
• Communications connection terminal

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 parameters (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 necessary parameters for communication

Communication related parameters must be set for PLC communication. parameters n151 to n157 cannot be set during communication. Always set them prior to performing communication.

Parameter	Name	Description	Initial Setting
n003	Run command selection	0 : operator 1 : control circuit terminals 2 : communication 3 : communication card (optional)	0
n004	Frequency reference selection	0 : Local potentiometer (digital operator) 1 : frequency ref. 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. 000211) 7 : operator circuit terminals (voltage 0 to 10V) 8 : operator circuit terminals (current 4 to 20mA) 9 : communication card (optional)	0
n151	Timeover detection selection Monitors transmission time between the receiving the correct data from the PLC (Timeover: 2 sec)	0 : timeover detection (free run stop) 1 : timeover detection (coasting to a stop with speed reduction time 1) 2 : timeover detection (coasting to a stop with speed reduction time 2) 3 : timeover detection (continuous operation, warning display) 4 : timeover detection not provided	0
n152	Communication frequency Reference monitor unit selection	0 : 0.1Hz 1 : 0:0.1Hz 2 : 30000/100% (30000 = max. output frequency) 3 : 0.1%	0
n153	Slave address	Setting range: 0 to 32*	0
n154	Baud rate selection	0 : 2400 bps 1 : 4800 bps 2 : 9600 bps 3 : 19200 bps	2
n155	Parity selection	0 : even parity 1 : odd parity 2 : no parity	0
n156	Sending waiting time	Setting limit: 10 ms to 65 ms setting unit: 1 ms	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 parameters, fault reset and multi-function input reference can be done regardless of run command or frequency reference selection.

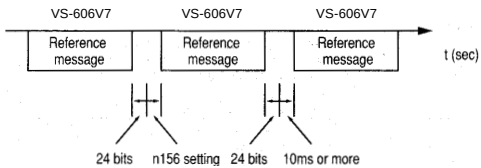
Multi-function input reference from PLC becomes OR with input commands from S1 to S7 multi-function input terminals.

• 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).

Slave address
Function code
Data
Error Check

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	Function	Reference Message		Response Message	
		Minimum (Byte)	Maximum (Byte)	Minimum (Byte)	Maximum (Byte)
01H	Reading holding resistor contents	8	8	7	37
08H	Loop back test	8	8	8	8
10H	Write in several holding resistors	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 resistor	Upper	00H
	Lower	65H
Next holding resistor	Upper	00H
	Lower	00H
Next holding resistor	Upper	00H
	Lower	00H
Next holding resistor	Upper	1H
	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 transmission 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		89H
Error code		01H
CRC-16	Upper	86H
	Lower	50H

* 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% ~ 200.0%	
0004H-0008H		Reserved			
0009H		0	Multi-function output reference 1 (Effective when n057=18)	(1 : MA “ON” 0 = MA “OFF”)	
		1	Multi-function output reference 2 (Effective when n058=18)	(1 : P1 “ON” 0 = MA “OFF”)	
		2	Multi-function output reference 3 (Effective when n059=18)	(1 : P2 “ON” 0 = MA “OFF”)	
		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	Over current (OC)		
		1	Over voltage (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 (Fxx)		
		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	Fault contents	0	Load short circuit (SC)		
		1	Ground fault (GF)		
		2	Input open phase (PF)		
		3	Output open phase (LF)		
		4	Installed type braking resistor overheat		
		5	Braking transistor fault (RR)		
		6-F	Not used		

Register No.		bit	Description	
002AH	Alarm Contents	0	Operator stop (STP)	
		1	Sequence error (SER)	
		2	FWD - REV command simulation input (EF)	
		3	External baseblock (BB)	
		4	Overtorque detection (OL3)	
		5	Cooling fin overheat (OH)	
		6	Main circuit overvoltage (OV)	
		7	Main circuit undervoltage	
		8	Cooling fan fault (FAN)	
		9	Communication error	
		A	Option card communication error (BUS)	
		B	Not used	
		C	Inverter overheat prediction (OH3)	
		D	PID feedback loss (FBL)	
		E	Emergency stop (STP)	
		F	Communication waiting (CALL)	
002BH	Sequence input	0	Terminal S1 1 : Closed O : Open	
		1	Terminal S2 1 : Closed O : Open	
		2	Terminal S3 1 : Closed O : Open	
		3	Terminal S4 1 : Closed O : Open	
		4	Terminal S5 1 : Closed O : Open	
		5	Terminal S6 1 : Closed O : Open	
		6	Terminal S7 1 : Closed O : Open	
		7-F	(Not Used)	
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 : Under Voltage detection
		8	Baseblock	1 : Inverter output base block
		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 : Closed 0 : Open
		1	P1 “ON”	1 : Closed 0 : Open
		2	P2 “ON”	1 : Closed 0 : Open
		3-F	(Not used)	

Register No.		bit	Description
02EH	Inverter Status	0	Frequency ref. loss
		1	Not used
		2	Not used
		3	Not used
		4	Not used
		5	Not used
		6	Not used
		7	Not used
		8 - F	Not used
002FH-0030H		Reserved	
0031H		Main circuit DC voltage (1/1V)	
0032H		Torque monitor	
0033H-0034H		Not used	
0035H		Cumulative operation time (I/IH)	
0036H		Not used	

Register No.		bit	Description	
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 parameters [Enter command] (can be written only.)**

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

When a parameter is written from the PLC by communications, the parameter is written to the parameter data area on the RAM in the VS-606V7. ENTER command is a command to write the parameter 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 parameter is changed from the digital operator, the parameter 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 readout, 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 parameter write-in. • A parameter setting error occurred when a parameter was written.
22H	Write-in mode error • Attempt to write-in a parameter from PLC was made during running. • Attempt to write-in an ENTER command from PLC was made during running. • Attempt to write-in a parameter 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 parameter other than n001=12,13 (initialization) from PLC was made during “F04” occurrence. • Attempt to write-in a parameter 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 parameters list for parameters that can be changed during operation.

• Performing self-test

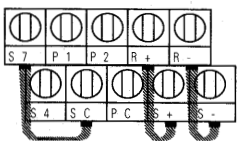
VS-606V7 is provided with a function to perform self-diagnosis for operation check of the serial communication I/F circuit. This function is called self-test. In the self-test, connect the sending terminal with the receiving terminal in the communication section. It assures if the data received by VS-606V7 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 mini power supply. Set parameter n056 to 35 (self-test).

(2) Turn OFF the VS-606V7 mini 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 parameter 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)

Parameters 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 parameter 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 n140.

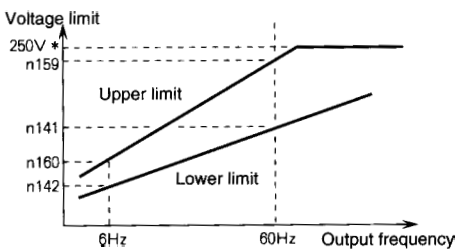
Parameter No.	Name	Unit	Setting Range	Initial Setting
n140	Energy-saving control coefficient K2	-	0.0 to 6550	*
n158	Motor Code	-	0 to 70	*

* Setting depends 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 parameters are set in % for 200V/400V inverters.

Parameters No.	Name	Unit	Setting Range	Initial Setting
n141	Energy-saving voltage lower limit (60 Hz)	%	0 to 120	50
n142	Energy-saving voltage lower limit (6 Hz)	%	0 to 25	12
n159	Energy-saving voltage upper limit (60 Hz)	%	0 to 120	120
n160	Energy-saving voltage upper limit (6 Hz)	%	0 to 25	16



*Doubled for the 400V class inverters.

Energy-saving search operation

In the energy 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 parameters, 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)**

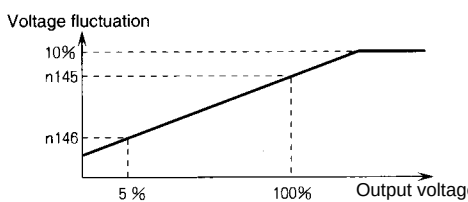
  Limits the range where the voltage can be controlled. The parameters are set in % for 200V/400V inverters. The search operation is not performed when set to 0.

Parameters 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.

Parameters 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 (100%)	%	0.1 to 10.0	0.2
n143	Search operation control cycle	x24 ms	1 to 2000	1 (24ms)



• 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.

Parameter No.	Name	Unit	Setting Range	Initial Setting
n161	Search operation voltage limit	%	0 to 100	0

• Power Detection Filter Time Parameter (n162)

Response at load change is improved when this value is small. However, at low frequency, unstable rotation will result.

Parameter No.	Name	Unit	Setting Range	Initial Setting
n162	Power detection filter time parameter	x 4 ms	0 to 255	5 (20 ms)

Parameter No.	Name	Unit	Setting Range	Initial Setting
n162	Power detection filter time parameter	x 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
		5.5 kW	9	94.8
		7.5 kW	10	72.7
	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
		5.5 kW	29	189.5
		7.5 kW	30	145.4
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
		5.5 kW	49	84.1
		7.5 kW	50	71.7
	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
		5.5 kW	69	168.3
		7.5 kW	70	143.3

• 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

Parameter No.	Name	Unit	Setting Range	Initial Setting
n128	PID control selection	-	0 to 8	0

n128 Settings

Setting	Function	PID Output Characteristics
0	Disabled.	Forward
1	Enabled: deviation is subject to differential control.	
2	Enabled: feedback signal is subject to differential 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.	
5	Enabled: deviation is subject to differential control.	Reverse
6	Enabled: feedback signal is subject to differential 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 20 mA, 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. Parameter 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), intregal time (I), and differential time (D).

Parameter No.	Name	Unit	Setting Range	Initial Setting
n130	Proportional gain (P)	Multiples	0.0 to 25.0	1.0
n131	Intregal Time	1.0s	0.0 to 360.0	1.0
n132	Differential Time (D)	1.0s	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.

• Intregal (I) Limit (n134)

Parameter No.	Name	Unit	Setting Range	Initial Setting
n134	Intregal (I) limit	%	0 to 100	100

This parameter 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 parameter as a percentage of the maximum output frequency with the maximum frequency as 100%.

• PID Offset Adjustment (n133)

Parameter No.	Name	Unit	Setting Range	Initial Setting
n133	PID Offset adjustment	%	-100 to 10.0	0

Parameter 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 Parameter (n135)

Parameter No.	Name	Unit	Setting Range	Initial Setting
n135	PID primary delay time parameter	Seconds	0.0 to 10.0	0.0

Parameter 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)**

Parameter No.	Name	Unit	Setting Range	Initial Setting
n163	PID Output gain	Multiples	0.0 to 25.0	1.0

This parameter adjusts the output gain.

- **PID Feedback Value Adjusting Gain (n129)**

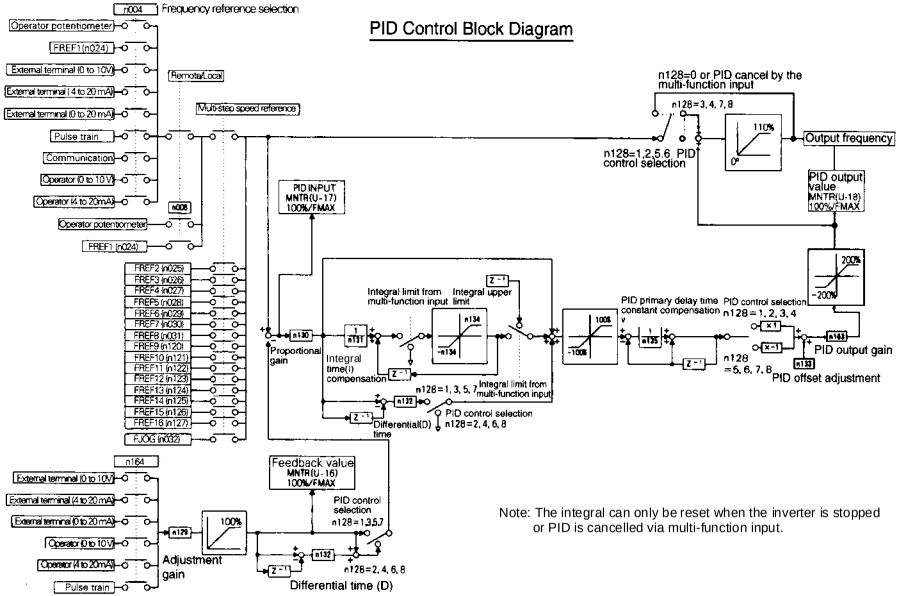
Parameter No.	Name	Unit	Setting Range	Initial Setting
n129	PID feedback value adjusting gain	Multiples	0.0 to 10.0	1.00

Parameter n129 is the gain that adjusts the feedback value.

- **PID Feedback Loss Detection (n136, n137, n138)**

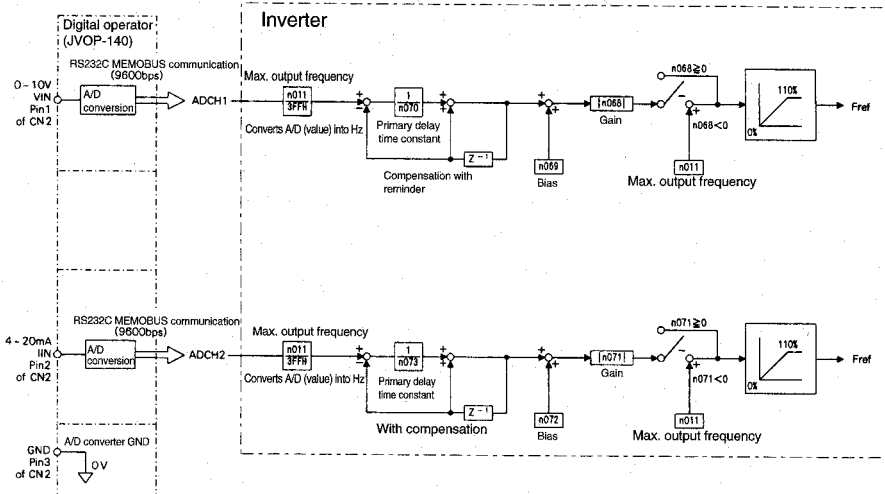
Parameter No.	Name	Unit	Setting Range	Initial Setting
n136	Selection of PID feedback loss detection	-	0: No detection of PID feedback loss 1: Detection of PID feedback loss (Operation continued: FbL alarm) 2: Detection of PID feedback loss (Output shut down: fault)	0
n137	PID feedback loss detection level	%	0 to 100 100%/Max. output frequency	0
n138	PID feedback loss detection time	%	0.0 to 25.5	1.0

PID Control Block Diagram



Note: The integral can only be reset when the inverter is stopped or PID is cancelled via multi-function input.

Operator Analog Speed Reference Block Diagram



• Using Parameter Copy Function

Parameter copy function

The VS-606V7 standard digital operator JVOP-140 can store parameters for one inverter. A backup power supply is not necessary since EEPROM is used.

Parameter copy function is possible only for the inverters with the same product series, power supply specifications and control mode (V/f control or vector control).

However, some parameters may not be copied. It is also impossible to copy parameters between VS-606V7 and VSmini J7 inverters.

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

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

• Parameter Copy Function Selection (n176)

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

1. Read all the parameters from the inverter (READ) and store them in EEPROM in the digital operator.
2. Copies the parameters stored in the digital operator to the inverter (COPY).
3. Verify that the parameters in the digital operator and the parameters in the inverter are the same (VERIFY).
4. Displays the maximum applicable motor capacity and the voltage class of the inverter that has the parameters stored in the digital operator.
5. Displays the software number of the inverter that has the parameters stored in the digital operator.

Parameter No.	Name	Unit	Setting Range	Initial Setting
n176	Parameter copy function selection	-	rdy: READY rEd: READ CPy: COPY vFy: Verify vA: Inverter capacity display Sno: Software number display	rdy

- **Prohibiting Parameter Read Selection (n177)**

Select this function to prevent accidentally overwriting the parameters stored in EEPROM or in the digital operator. Reading is not possible when this parameter is set to 0.

The parameter data is stored in the digital operator are safe from accidental overwriting.

When reading is performed while this parameter is set to 0, PrE will blink. Press the DSPL or ENTER and return to the parameter No. display.

Parameter No.	Name	Unit	Setting Range	Initial Setting
n177	Prohibiting parameter read selection	1	0: READ prohibited 1: READ allowed	0

Read function

Reads out the parameters in batch from the inverter and stores them in EEPROM inside the digital operator. When the read-out is executed, the previously stored parameters data in the EEPROM are cleared and replaced with the newly entered parameters.

[Example] Store the parameters read out from the inverter, in the EEPROM inside the digital operator.

Explanation		Operator display
• Enable the setting of the parameters 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 parameter No.) 0 (Lit) (Can be a different set value.) 0 (Blinks) 4 (Lit for one second.) n001 (The parameter is displayed)
• Set parameter read prohibited selection (n177) to read enabled. *1	• Change the parameter 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 parameter displayed)
• Execute read-out (READ) by parameter copy function selection (n176).	• Change the parameter 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 parameter is displayed.)
• Set Parameter read prohibited selection (n177) to READ disabled. *2.	• Change the parameter No. to n177by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to 0 by pressing ∧ or ∨ key. • Press ENTER.	n177 1 (Lit) 0 (Blinks) 0 (Lit for one minute) n177 (The parameter 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 parameters stored inside the digital operator in batch to the inverter. Write-in is possible only for the inverters with the same product series, power supply specifications and control mode (V/f control or vector control).

Therefore, writing from 200 V class to 400 V class (or visa versa), from VS-606V7 to VSmini J7 are not possible.

Parameter Copy Function Selection (n176), Parameter Read Prohibited Selection (n177), Fault history (n178), Inverter Software No. (n179), and hold output frequency are not written.

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

Parameter No.	Name	Parameter No.	Name
n011 to n017	V/f setting	n108	Motor leakage inductance
n036	Motor rated current	n109	Torque compensation voltage limiter
n080	Carrier frequency	n110	Motor no-load current
n105	Torque compensation iron loss	n140	Energy-saving coefficient K2
n106	Motor rated slip	n158	Motor code
n107	Motor resistance for one phase		

[Example] Write the parameters from EEROM inside the digital operator to the inverter

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

A setting range check and matching check for the written-in parameters are executed after the parameters are written from the digital operator to the inverter. If any parameter error is found, the written parameters are discarded and the parameters stored before writing are restored.

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

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

VERIFY function

Collates the parameters stored in the digital operator with the parameters 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 parameters stored in the digital operator correspond to those in the inverter, vFy is displayed by blinking, then End is displayed.

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

Explanation		Operator display
• Enable the setting of the parameters 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 parameter No.) 4 (Lit) (Can be a different set value.) (Blinks) (Lit for one second.) n001 (The parameter is displayed)
• Execute VERIFY by Parameter Copy Function selection (n176)	• Change the parameter No. to n176 by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to vFY by pressing ∧ or ∨ key. • Press ENTER.	n176 rdy (Lit) uFY (Lit) uFY (Blinks while executing VERIFY)
• Display the unmatched parameter No. • Display the parameter value in the inverter. • Display the parameter value in the digital operator. • Continue the execution of VERIFY.	• Press ENTER. • Press ENTER. • Press ∧ key. • Press DSPL or ENTER	n001 (Blinks) (When n001 is unmatched) 60.0 (Blinks) 50.0 (Blinks) uFY (Blinks while executing VERIFY End (End is displayed after the execution of VERIFY is completed.) n176 (The parameter No. is displayed.)

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

Inverter Capacity Display

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

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

Explanation		Operator display
• Enable the setting of the parameters 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 parameter No.) 1 (Lit) (Can be a different set value.) (Blinks) (Lit for one second.) (The parameter is displayed)
• Execute Inverter Capacity Display (vA) by parameter copy function selection (n176)	• Change the parameter No. to n176 by pressing ∧ or ∨ key. • Press ENTER to display the set value. • Change the set value to vA by pressing ∧ or ∨ key. • Press ENTER. • Press DSPL or ENTER.	n176 rdy (Lit) vA (Lit) 20.7 (Lit) (For20P7)* n176 (The parameter No. is displayed.)

The following shows the explanation of Inverter Capacity Display

2 0.7

	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 parameters stored in the digital operator are read out) is displayed.

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

Explanation		Operator display
• Enable the setting of the parameters 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 parameter No.) 1 (Lit) (Can be a different set value.) (Blinks) (Lit for one second.) (The parameter is displayed)
• Execute Software No. Display (Sno)* by Parameter copy function selection (n176)	• Change the parameter 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 (software version: VSP010013) n176 (The parameter No. is displayed)

* Displays Lower 4 digits of the software version.

Display List

Operator display	Description	Corrective action
rdy	Lit: Setting for parameter copy function selection enabled	-
rEd	Lit: READ selected Flashed: READ under execution	-
CPy	Lit: Writing (COPY) selected Blinks: Writing (COPY) under execution	-
vFy	Lit: VERIFY selected Flashed: VERIFY under execution	-
UA	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 Parameter Read Prohibited Selection (n177) is set to 0.	Confirm the necessity to execute READ, then set parameter Read Prohibited selection (n177) to 1 to execute READ.
rdE	Blinks: The parameter 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 parameter data stored in the digital operator.	The parameter stored in the digital operator cannot be used. Re-execute READ to store the parameters in the digital operator.
dPS	Blinks: The password for the connected inverter and that for the parameter data stored in the digital operator do not agree. [EX.]Writing (Copy) from VS-606V7 to Vsmini J7	Check if they are the same product series
ndr	Blinks: No parameter 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 parameter data stored in the inverter.	Initialize the parameters. If an error occurs again, replace the inverter due to a failure of parameter memory element (EEPROM) in the inverter.
vAE	Blinks: Attempt to execute VERIFY between different inverter capacities.	Press ENTER to continue the execution of VERIFY. Press STOP to interupt the execution of 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 during 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 parameter No.

• Unit selection for Frequency Reference Setting/ Display

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

Item	Contents
Frequency reference parameters	Frequency reference 1 to 8 (Parameters n024 to n031)
	Jog frequency reference (Parameters n032)
	Frequency reference 9 to 16 (parameters 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 parameters can be displayed in %, r/min, m/min according to the set value of parameter n035.

Parameter No.	Parameter Name	Description	Initial Setting
035	Unit Selection for frequency Reference Setting / Display	0: in units of 0.01 Hz (less than 100 Hz) 0.1Hz (100 Hz and more) (Lit) 1: in units of r/min (set the number of motor poles) 40 to 3999: in any unit	0

• n035 setting

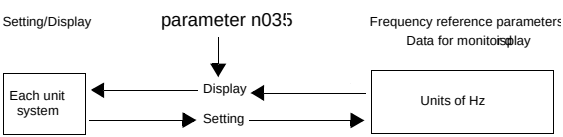
Setting	Description
0 (Initial value)	• Setting unit: 0.01 Hz (less than 100 Hz), 0.1 Hz (100 Hz and more) • Setting range min{Fmax (n011) x Frequency reference lower limit (n034) to Fmax (n011) Frequency reference upper limit (n033), 400 Hz}
1	• Setting in units of 0.1% : 100.0 % / Fmax (n011) • Setting range min{Frequency reference lower limit (n034) to Frequency reference upper limit (n033), (400 Hz ÷ Fmax (n011) 100%}
2 to 39	• Setting in units of 1 r/min = 120 x Frequency reference (Hz) ÷ n035 (Set the number of motor poles for n035) • Setting range min{120 (Fma x (n011) Frequency reference lower limit (n034) ÷ n035~120x Fmax(n011) x 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.

Parameter 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-digit figure excluding decimal point. Number of 4th digit. Position of decimal point 40 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) x Frequency reference lower limit (n034) to (Lower 3-digits of n035) x Frequency reference upper limit (n033), 400Hz (Lower 3-digits of n035) to Fmax(n011), 999} Max. upper limit value: (Set value ÷ (Lower 3-digits of n035)) x Fmax(n011)< 400Hz

Notes:

1. The frequency reference parameters 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 x 60.00 Hz ÷ 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 parameter COPY function, frequency reference parameters (in units of Hz) is applied.

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
Terminal, unit mounting screws, etc.	Connection hardware is properly seated and securely tightened.	Properly seat and tighten hardware.
Cooling fins	Built up dust, dirt, and debris	Blow with dry compressed air: 39.2 X 10^4 to 58.8 X 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 X 10^4 to 58.8 X 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) 2.68 inches (68mm), 5.51 inches (140mm), 6.69 inches (170mm), and 7.09 inches (180mm).

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 cover.

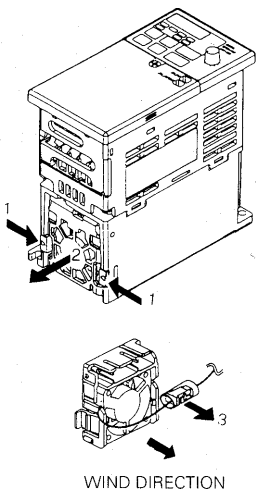
2. Mounting

(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.

(4)



8. Fault Diagnosis and Corrective Actions

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 >

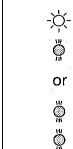
☼ : ON ◎ : Blinking ● : OFF

Alarm Display and Contents

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
UV 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: Stops at main circuit DC voltage below approx. 200V (160V for single phase) 400V:Stops at main circuit DC voltage 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 over voltage) Main circuit DC voltage exceeds the over voltage 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.
OH3 Blinking	◎		OH3(Inverter overheating pre-alarm)* signal is input.	Release the input of inverter overheating pre-alarm signal.
CAL Blinking	◎		CAL (MEMOBUS communications waiting) Correct data has not been received from the PLC when the parameters n003 (operation command selection) is 2 or n004 (frequency reference selection) is 6, and power is turned ON.	Check communication devices and transmission signals.

*Display only applies to 200/400V class. 7.5/10hp(5.5/7.5kW) inverters.

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oP□ Blinking		Warning Fault contacts do not change state.	OP□(parameter setting error when the parameter setting is performed through the MEMOBUS communications) OP1: Two or more values are set for multi-function input selection. (parameters n050 to n056) OP2: Relationship among V / f parameters is not correct. (parameters n011, n013, n014, n016) OP3: Setting value of motor rated current exceeds 150% of inverter rated current. (parameter n036) OP4: Upper/lower limit of frequency reference is reversed. (parameters n033, n034) OP5: (parameters n083 to n085)	Check the setting values.
oL3 Blinking			OL 3 (Over torque detection) Motor current exceeded the preset value in parameter 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		Warning Fault contacts do not change state.	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 parameter n005.	Check the external circuit (sequence).
SrP Blinking			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 parameter n005. STP (Emergency stop) Inverter receives emergency stop alarm signal. Inverter stops according to parameter 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 occurred in a mode that run command and frequency reference are set from the communication option card.	Check the communication devices or communication signals.

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oC	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop.	OC (Over current) Inverter output current momentarily exceeds approx. 250% of rated current.	• Short circuit or grounding at inverter output side. • Excessive load WK^2 • Extremely rapid accel/decel time (parameters 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.
			(Load Short-circuit)* The Inverter output or load was short circuited.	A short-circuit or ground fault. ⇓ Reset the fault correcting its cause.
			(Ground Fault)* The ground fault current at the Inverter output exceeded approximately 50% of the Inverter rated output current.	A ground fault occurred at the Inverter output. ⇓ Reset the fault after correcting its cause.
ou			OV (Main circuit over voltage) Main circuit DC voltage exceeds the overfatigue 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	• Insufficient decel time (parameters n020 and n022) • Lowering of minus load (elevator, etc.) ⇓ • Increase decel time. • Connect optional braking resistor.
Uu1			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	• 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.

* Display only applies to 200/400V class,7.5/10Hp, 5.5/7.5 kW inverters.

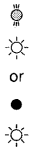
Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
UV2	●	Protective Operation Output is shut OFF and motor coasts to a stop.	UV2 (Control power supply fault) Voltage fault of control power supply is detected.	Cycle power. If the fault remains, replace the inverter.
			(Main Circuit Voltage Fault)* The main circuit DC voltage oscillates unusually (not when regenerating).	• An open-phase occurred in the input power supply. • A momentary power loss occurred. • The voltage fluctuations in the input power supply are too large. • The line voltage balance is bad. ⇓ Check the following: • Main circuit power supply wiring is connected. • Power supply voltage. • Terminal screws are securely tightned.
	☼		(Output Open-Phase)* An open-phase occurred at the Inverter output.	• There is a broken wire in the output cable. • There is a broken wire in the motor winding. • The output terminals are loose. ⇓ • Output wiring is connected. • Motor impendance. • Output terminal screws are securely tightened.
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 axel time if the fault occurs during acceleration • Intake air temperature exceeding 122°F (50°C) • Cooling fan stops ⇓ Check the following: • Load size • V/f pattern setting (parameters n011 to n017) • Intake air temperature

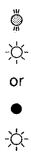
* Display only applies to 200/400V class,7.5/10Hp, 5.5/7.5 kW inverters.

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
			RH (Installed type braking resistor overheating) The protection function has operated.	• The declaration time is too short. • The regenerative energy from the motor is too large. ⇓ • Increase the deceleration time. • Reduce the regenerative load.
			(Internal Braking Transistor Fault) The braking transistor is not operating properly.	• Replace the Inverter
oL 1	● ☼	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 (parameters n011 to n017) • Set the motor rated current shown on the nameplate by parameter 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 (parameters n011 to n017) • Check the inverter capacity
oL3			OL3 (Over torque detection) V/f mode: Inverter output current exceeded the preset value in parameter n098. Vector mode: Motor current or torque exceeded the preset value in parameters n097 and n098. When over torque is detected, inverter performs operation according to the preset setting of parameter n096.	Check the driven machine and correct the cause of the fault, or increase the value of parameter n098 up to the highest value allowed for the machine.

Alarm 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 parameter data and initialize the parameters. (Refer to page 32 for parameter initialization) • Cycle power. If the fault remains, replace the inverter.

Alarm 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 inverter software number (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.

Alarm Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN(Green) ALARM(RED)			
SrP		Stops according to parameter.	STP (Emergency stop) The inverter stops according to parameter 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 operates 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			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 communications devices or communication signals.
– (OFF)			• 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.

9. Specifications

• Standard Specifications (200V Class)

Voltage Class			200V single- / 3-phase								
Model CIMR-V7*C❑❑❑❑		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Max. Applicable Motor Output kW*			0.1	0.25	0.55	1.1	1.5	2.2	3.7	5.5	7.5
Output Characteristics	Inverter Capacity (kVA)		0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13
	Rated Output Current (A)		0.8	1.6	3	5	8	11	17.5	25	33
	Max. Output Voltage (V)		3-phase, 200 to 230V (proportional to input voltage) Single-phase, 200 to 240V (proportional to input voltage)								
	Max. Output Frequency (Hz)		400 Hz (Programmable)								
Input Current (A)	(3-Phase)		1.1	1.9	3.9	6.4	11.0	15.1	24.0	33.0	39.6
	(Single-Phase)		1.8	3.7	7.4	12.8	20.5	24.0	40.0	-	-
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/voltage 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 (0.5 HP, 1HP): 100% 1.5kW (2HP): 50% 2.2kW(3HP) or more: 20% Continuous regenerative torque: Approx. 20% (150% with optional braking resistor, braking transistor built-in)								
	V/f Characteristics		Possible to program any V/f pattern								

* 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	23P7	25P5	27P5
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Protective Functions	Motor Overload Protection		Electronic thermal overload relay								
	Instantaneous Overcurrent		Motor coasts to a stop at approx. 250% of inverter rated current								
	Overload		Motor coasts to a stop after 1 minute at 150% of inverter rated output current								
	Overvoltage		Motor coasts to a stop if DC bus voltage exceed 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 over torque 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, parameter copy, frequency reference with built-in potentiometer Unit selection for frequency reference setting/display								

Voltage Class			200V single- / 3-phase								
Model CIMR-V7*C❑❑❑❑		3-phase	20P1	20P2	20P4	20P7	21P5	22P2	23P7	25P5	27P5
		Single-phase	B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7	-	-
Other Functions	Display	Status Indicator LED	RUN and ALARM provided as standard LEDs								
		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		328ft (100m) or less#								
Enclosure			Open chassis IP20, Open chassis IP20 (Top-closed type), or enclosed wall-mounted NEMA 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) Others models are self-cooling								
Environmental Conditions	Ambient Temperature		Open chassis IP20 : 14 to 122°F (-10 to +50°C) Open chassis IP20 (Top-closed type) and enclosed wall mounted NEMI1. : 14 to 105°F (-10 to +40°C) (not frozen)								
	Humidity		95% RH or less (non-condensing)								
	Storage Temperature		-4 to 140°F (-20 to +60°C)								
	Location		Indoor (free from corrosive gases or dust)								
	Elevation		3280ft (1000m) or less								
	Vibration		Up to 9.8m / S^2 (1G) at less than 20Hz, up to 2m / S^2 (0.2G) at less than 20 to 50Hz								

* Temperature during shipping (for short period)

For details, refer to “Reducing motor noise or leakage current (n080)” on page 68.

• Standard Specifications (400V Class)

Voltage Class		400V 3-phase								
Model CIMR-V7*C❑❑❑❑	3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7	45P5	47P5
	Single-phase	–	–	–	–	–	–	–	–	–
Max. Applicable Motor Output HP (kW)*		0.5 (0.2)	0.75 (0.4)	2 (0.75)	3 (1.5)	3 (2.2)	3 (3.0)	5 (3.7)	7.5 (5.5)	10 (7.5)
Output Characteristics	Inverter Capacity (kVA)	0.9	1.4	2.6	3.7	4.2	5.5	7.0	11	14
	Rated Output Current (A)	1.2	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18
	Max. Output Voltage (V)	3-phase, 380 to 460V (proportional to input voltage)								
	Max. Output Frequency (Hz)	400 Hz (Programmable)								
Input Current (A)	(3-Phase)	1.6	2.4	4.7	7.0	8.1	10.6	12.0	19.6	23.8
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/voltage control selectable)								
	Frequency Control Range	0.1 to 400Hz								
	Frequency Accuracy (Temperature Change)	Digital reference: ±0.01%, 14 to 122°F (-10 to +50°C) Analog reference: ±0.5%, 59 to 95°F (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‡ 0.2kW: 150% 0.75kW: 100% 2HP (1.5kW): 50% 3HP (2.2kW) or more: 20% Continuous regenerative torque: Approx. 20% (150% with optional braking resistor, braking transistor built-in)								
	V/f Characteristics	Possible to program any V / f pattern								

* 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	43P7	45P5	47P5
		Single-phase	–	–	–	–	–	–	–	–	–
Protective Functions	Motor Overload Protection		Electronic thermal overload relay								
	Instantaneous Over Current		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								
	Over Voltage		Motor coasts to a stop if DC bus voltage exceed 820V								
	Under Voltage		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 lock detection)								
	Ground Fault		Protected by electronic circuit (over current 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 intregal 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 over torque detection, during under voltage 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, parameter copy, frequency reference with built-in potentiometer, Unit selection for frequency reference setting/display								

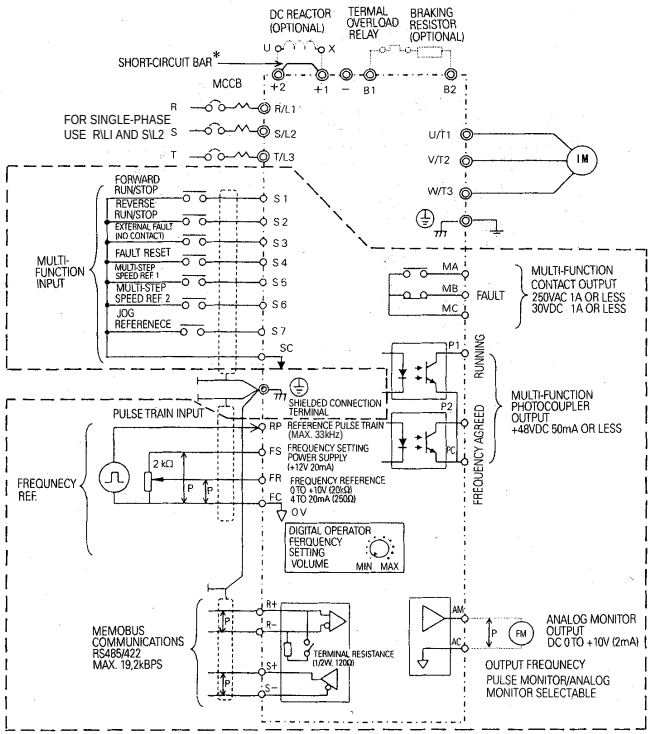
* The protection functions at approximately 50% of inverter rated output current.

Voltage Class			400V 3-phase								
Model CIMR-V7*C❑❑❑❑		3-phase	40P2	40P4	40P7	41P5	42P2	43P0	43P7	45P5	47P5
		Single-phase	–	–	–	–	–	–	–	–	–
Other Functions	Display	Status Indicator LED	RUN and ALARM provided as standard LEDs								
		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		328ft (100m) or less#								
Enclosure			Open chassis IP20, Open chassis IP20 (Top-closed type), or enclosed wall-mounted NEMA 1								
Cooling Method			Cooling fan is provided for the following models: 400V, 1.5kW or larger inverters (3-Phase) Others 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 NEMA1. : -10 to +40°C (14 to 105°F) (not frozen)								
	Humidity		95% RH or less (non-condensing)								
	Storage Temperature*		-4 to 140°F (-20 to +60°C)								
	Location		Indoor (free from corrosive gases or dust)								
	Elevation		3280ft (1000m) or less								
	Vibration		Up to 9.8m / S^2 (1G) at less than 20Hz, up to 2m / S^2 (0.2G) at less than 20 to 50Hz								

* Temperature during shipping (for short period)

For details, refer to “Reducing motor noise or leakage current (n080)” on page 68.

• Standard Wiring

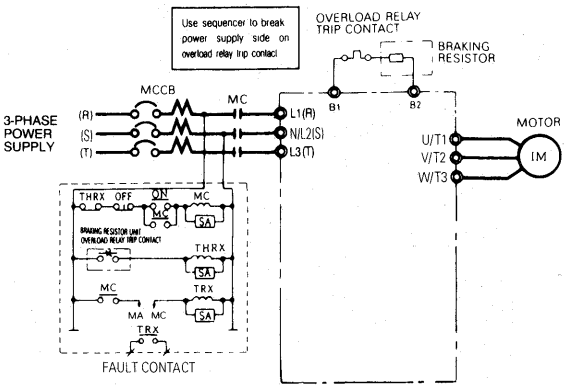


Shielded Twisted-pair wires

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

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

Connection Example of Braking Resistor



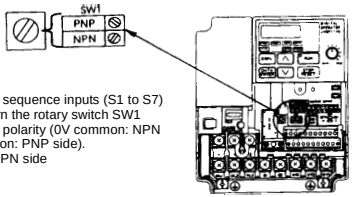
Terminal Description

Type			Terminal	Name	Function (Signal Level)	
Main Circuit			R/L1, S/L2, T/L3	AC power supply input	Always use terminal R/L1, S/L2 for single-phase inverters. Never connect to 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	Grounding 200V: ground to local grounding codes 400V: ground to local grounding codes	
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 capability 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	+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.

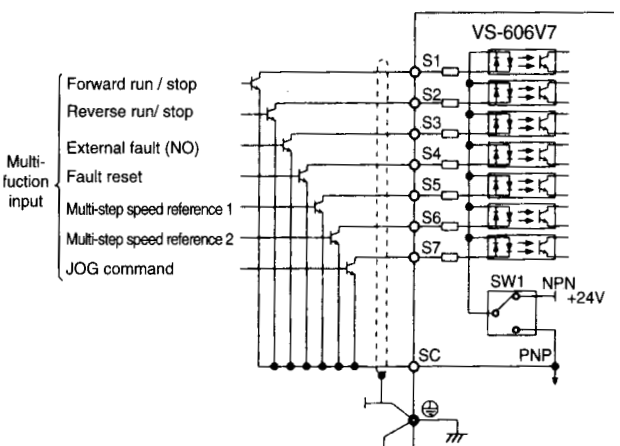
‡ Can be switched to pulse monitor output.

- **Sequence input connection with NPN/PNP transistor**

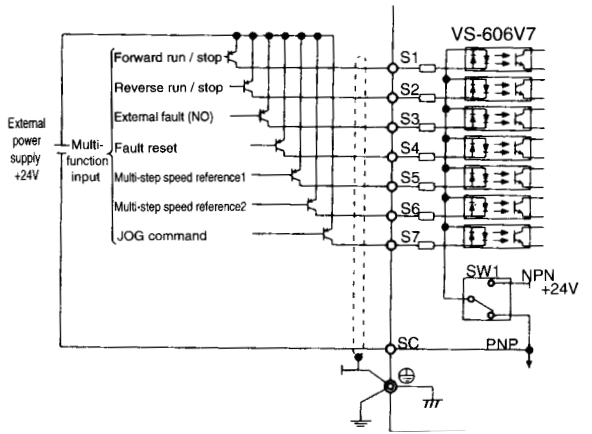


When connecting sequence inputs (S1 to S7) with transistor, turn the rotary switch SW1 depending on the polarity (0V common: NPN side, +24V common: PNP side).
Factory setting: NPN side

Sequence connection with NPN transistor (0V common)



Sequence connection with PNP transistor (+24V common)



- **Dimensions**

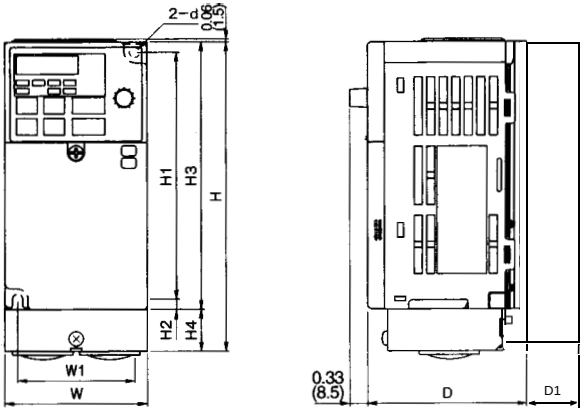


Fig. 1

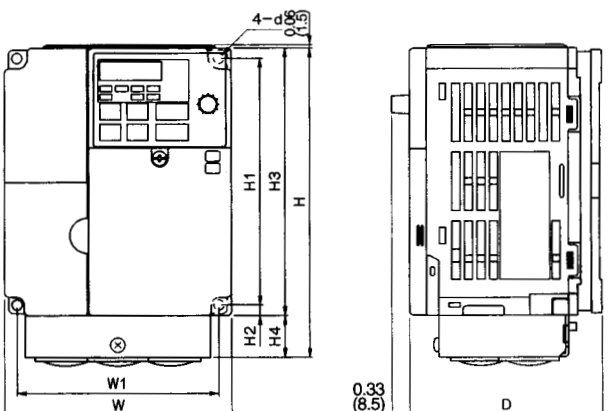


Fig. 2

Dimensions in inches (mm)/mass in lb (kg) /Heat Loss (W)

Voltage class	Capacity HP(kW)	W	H	D	W1	H1	H2	H3	H4	D1	d	Mass	Heat Loss (W)			Fig.
													Heat-sink	Unit	Total	
200V 3-phase	0.13 (0.1)	2.68 (68)	5.83 (148)	2.99 (76)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	1.55 (0.7)	3.7	9.3	13.0	1
	0.25 (0.2)	2.68 (68)	5.83 (148)	2.99 (76)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	1.55 (0.7)	7.7	10.3	18.0	1
	0.5 (0.4)	2.68 (68)	5.83 (148)	4.25 (108)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	2.20 (1.0)	15.8	12.3	28.1	1
	1 (0.75)	2.68 (68)	5.83 (148)	5.04 (128)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	2.65 (1.2)	28.4	16.7	45.1	1
	2 (1.5)	4.25 (108)	5.83 (148)	5.16 (131)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.53 (1.6)	53.7	19.1	72.8	2
	3 (2.2)	4.25 (108)	5.83 (148)	5.51 (140)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.75 (1.7)	60.4	34.4	94.8	2
	5 (3.7)	5.51 (140)	5.83 (148)	5.63 (143)	5.04 (128)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	5.30 (2.4)	96.7	52.4	149.1	2
	7.5 (5.5)	7.09 (180)	10.24 (260)	6.70 (170)	6.46 (164)	9.61 (244)	0.31 (8)			2.56 (65)	M5	10.14 (4.6)	168.8	87.7	256.5	2
	10 (7.5)	7.09 (180)	10.24 (260)	6.70 (170)	6.46 (164)	9.61 (244)	0.31 (8)			2.56 (65)	M5	10.58 (4.8)	209.6	99.3	308.9	2
200V single-phase	0.13 (0.1)	2.68 (68)	5.83 (148)	2.99 (76)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	1.55 (0.6)	3.7	10.4	14.1	1
	0.25 (0.2)	2.68 (68)	5.83 (148)	2.99 (76)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	1.77 (0.7)	7.7	12.3	20.0	1
	0.5 (0.4)	2.68 (68)	5.83 (148)	5.16 (131)	2.20 (56)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	2.43 (1.1)	15.8	16.1	31.9	1
	1 (0.75)	4.25 (108)	5.83 (148)	5.51 (140)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.75 (1.7)	28.4	23.0	51.4	2
	2 (1.5)	4.25 (108)	5.83 (148)	6.14 (156)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.75 (1.7)	53.7	29.1	82.8	2
	3 (2.2)	5.51 (140)	5.04 (128)	6.42 (163)	5.04 (128)	4.65 (118)	0.20 (5)			2.80 (71)	M4	4.85 (2.2)	64.5	49.1	113.6	2
	5 (3.7)	6.69 (170)	5.04 (128)	7.09 (180)	6.22 (158)	4.65 (118)	0.20 (5)			2.80 (71)	M4	6.39 (2.9)	98.2	78.2	176.4	2

Voltage class	Capacity HP(kW)	W	H	D	W1	H1	H2	H3	H4	D1	d	Mass	Heat Loss (W)			Fig.
													Heat-sink	Unit	Total	
400V 3-phase	0.5 (0.2)	4.25 (108)	5.83 (148)	3.62 (92)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	2.65 (1.2)	9.4	13.7	23.1	2
	0.75 (0.4)	4.25 (108)	5.83 (148)	4.43 (110)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	2.65 (1.2)	15.1	15.0	30.1	2
	2 (0.75)	4.25 (108)	5.83 (148)	5.51 (140)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.75 (1.7)	30.3	24.6	54.9	2
	3 (1.5)	4.25 (108)	5.83 (148)	6.14 (156)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.75 (1.7)	45.8	29.9	75.7	2
	3 (2.2)	4.25 (108)	5.83 (148)	6.14 (156)	3.78 (96)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	3.75 (1.7)	50.5	32.5	83.0	2
	3 (3.0)	5.51 (140)	5.83 (148)	5.63 (143)	5.04 (128)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	5.30 (2.4)	58.2	37.6	95.8	2
	5 (3.7)	5.51 (140)	5.83 (148)	5.63 (143)	5.04 (128)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	5.30 (2.4)	73.4	44.5	117.9	2
	5 (4.0)	5.51 (140)	5.83 (148)	5.63 (143)	5.04 (128)	4.65 (118)	0.20 (5)	5.04 (128)	0.79 (20)		M4	5.30 (2.4)	79.9	49.2	129.1	2
	7.5 (5.5)	7.09 (180)	10.24 (260)	6.70 (170)	6.46 (164)	9.61 (244)	0.31 (8)			2.56 (65)	M5	10.14 (4.6)	168.8	87.7	256.5	2
	10 (7.5)	7.09 (180)	10.24 (260)	6.70 (170)	6.46 (164)	9.61 (244)	0.31 (8)			2.56 (65)	M5	10.58 (4.8)	209.6	99.3	308.9	2

*200/400V class 7.5/10HP (5.5/7.5kW) inverters can be used as “IP00” if the top and bottom covers are removed.

• 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 and magnetic contactor, and fuse

- 200V 3-phase

VS-606V7 model	V7 ∗∗ 20P1	V7 ∗∗ 20P2	V7 ∗∗ 20P4	V7 ∗∗ 20P7	V7 ∗∗ 21P5	V7 ∗∗ 22P2	V7 ∗∗ 23P7	V7 ∗∗ 25P5	V7 ∗∗ 27P5
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7	9.5	13.0
Rated Output Current (A)	0.8	1.6	3	5	8	11	17.5	25.0	33.0
MCCB type NF30 (MITSUBISHI)	5A	5A	5A	10A	20A	20A	30A	50A	60A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-10-2E	HI-20E	HI-30E	HI-50E
Fuse (UL Class RK5)	5A	5A	5A	10A	20A	20A	30A	50A	60A

- 200V single-phase

VS-606V7 model	V7 ∗∗ B0P1	V7 ∗∗ B0P2	V7 ∗∗ B0P4	V7 ∗∗ B0P7	V7 ∗∗ B1P5	V7 ∗∗ B2P2	V7 ∗∗ B3P7
Capacity (kVA)	0.3	0.6	1.1	1.9	3.0	4.2	6.7
Rated Output Current (A)	0.8	1.6	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 (UL 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	V7 ∗∗ 45P5	V7 ∗∗ 47P5
Capacity (kVA)	0.9	1.4	2.6	3.7	4.2	5.5	7.0	11.0	14.0
Rated Output Current (A)	1.2	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18.0
MCCB type NF30, NF50 (MITSUBISHI)	5A	5A	5A	10A	10A	20A	20A	30A	30A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-10-2E	HI-10-2E	HI-10-2E	HI-10-2E	HI-20E	HI-20E
Fuse (UL Class RK5)	5A	5A	5A	10A	10A	20A	20A	30A	30A

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.

• Parameter List

- Addition of parameters accompanied by the upgraded software version

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

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

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

- Parameters that can be changed during operation

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

First Functions (Parameters n001 to n049)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
001	0101H	Parameter write-in prohibit / initialize	0 to 4, 6, 8, 9, 12, 13	1	1		39
002	0102	Control mode selection (Note 6)	0,1	1	0 (Note 1) (Note 6)		40
003	0103	Operation reference selection	0 to 3	1	0		47
004	0104	Frequency reference selection	0 to 9	1	1		48
005	0105	Stopping method selection	0, 1	1	0		71
006	0106	REV run prohibit	0, 1	1	0		50
007	0107	Operation stop enable/ disable selection	0, 1	1	0		70
008	0108	Frequency reference selection in local mode	0, 1	1	1 (Note 5)		48
009	0109	Setting method selection for frequency reference	0, 1	1	0		48
010	010A	Detecting selection of operator connecting fault	0, 1	1	0		47
011	010B	Maximum output frequency	50.0 to 400.0Hz	0.1Hz	50.0Hz		40
012	010C	Maximum voltage	0.1 to 255.0V (0.2 to 510.0)	0.1V	200.0V (Note 2)		40
013	010D	Maximum voltage output frequency	0.2 to 400.0Hz	0.1Hz	50.0Hz		40
014	010E	Mid. output frequency	0.1 to 399.9	0.1Hz	1.3Hz		40
015	010F	Mid. output frequency voltage	0.1 to 255.0V	0.1V	12.0V (Note 2)		40
016	0110	Minimum output frequency	0.1 to 10.0Hz	0.1Hz	1.3Hz		40
017	0111	Minimum output frequency voltage	0.1 to 50.0V	0.1V	12.0V (Note 2)		40
018	0112	Accel / decel time setting unit	0,1	1	0		55
019	0113	Acceleration time 1	0.00 to 6000s	Depend on n018 setting	10.0s		55
020	0114	Deceleration time 1	0.00 to 6000s	Depend on n018 setting	10.0s		55
021	0115	Acceleration time 2	0.00 to 6000s	Depend on n018 setting	10.0s		55
022	0116	Deceleration time 2	0.00 to 6000s	Depend on n018 setting	10.0s		55
023	0117	S-curve accel / decel selection	0 to 3	1	0		56

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		50
025	0119	Frequency reference 2	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
026	011A	Frequency reference 3	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
027	011B	Frequency reference 4	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
028	011C	Frequency reference 5	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
029	011D	Frequency reference 6	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
030	011E	Frequency reference 7	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
031	011F	Frequency reference 8	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		50
032	0120	Jog frequency reference	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	6.00Hz		51
033	0121	Frequency reference upper limit	0 to 110%	1%	100%		54
034	0122	Frequency reference lower limit	0 to 110%	1%	0%		54
035	0123	Unit Selection for frequency reference setting/display	0 to 3999	1	0		125
036	0124	Motor rated current	0 to 150% of inverter rated current	0.1A	(Note 3)		90
037	0125	Electronic thermal motor protection	0, 1, 2	1	0		90
038	0126	Parameter selection at electronic thermal motor protection	1 to 60 min	1 min	8 min		90
039	0127	Cooling fan operation selection	0, 1	1	0		92

Second Functions (Parameters 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	1 to 25,26 (Note 8)	1	1		74
051	0133	Multi-function input selection 2	1 to 25,26 (Note 8)	1	2		74
052	0134	Multi-function input selection 3	0 to 25,26 (Note 8)	1	3		74
053	0135	Multi-function input selection 4	1 to 25,26 (Note 8)	1	5		74
054	0136	Multi-function input selection 5	1 to 25,26 (Note 8)	1	6		74
055	0137	Multi-function input selection 6	1 to 25,26 (Note 8)	1	7		74
056	0138	Multi-function input selection 7	1 to 25, 26, 34, 35 (Note 8)	1	10		74
057	0139	Multi-function output selection 1	0 to 7, 10 to 19, 20, 21 (Note 8)	1	0		82
058	013A	Multi-function output selection 2	0 to 7, 10 to 19, 20, 21 (Note 8)	1	1		82
059	013B	Multi-function output selection 3	0 to 7, 10 to 19, 20, 21 (Note 8)	1	2		82
060	013C	Analog frequency reference gain (FR)	0 to 255%	1%	100%		52
061	013D	Analog frequency reference bias (FR)	-100 to 100%	1%	0%		52
062	013E	Analog frequency reference filter time parameter (FR)	0.00 to 2.00s	0.01s	0.10s		---
064	0140	Operation select for frequency reference loss (Note 9)	0,1	1	0		---
065	0141	Monitor output selection	0,1	1	0		66
066	0142	Monitor item selection	0 to 5	1	0		65
067	0143	Monitor gain	0.00 to 2.00	0.01	1.00		65
068	0144	Analog frequency reference gain (CN2 V_{IN})	-255 to 255%	1%	100%		79
069	0145	Analog frequency reference bias (CN2 V_{IN})	-100 to 100%	1%	0%		79

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
070	0146	Analog frequency reference filter time parameter (CN2 V_{in})	0.00 to 2.00s	0.01s	0.10s		79
071	0147	Analog frequency reference gain (CN2 I_{in})	-255 to 255%	1%	100%		79
072	0148	Analog frequency reference bias (CN2 I_{in})	-100 to 100%	1%	0%		79
073	0149	Analog frequency reference filter time parameter (CN2 I_{in})	0.00 to 2.00s	0.01s	0.01s		---
074	014A	Pulse train frequency reference gain (RP)	0 to 255%	1%	100%		79
075	014B	Pulse train frequency reference bias (RP)	-100 to 100%	1%	0%		79
076	014C	Pulse train frequency filter time parameter (RP)	0.00 to 2.00s	0.01s	0.10s		---
077 #2	014D	Multifunction analog input selection	0 to 4	1	0		78
078 #2	014E	Multifunction analog input signal selection	0,1	1	0		81
079 #2	014F	Frequency reference bias (FBIAS) value	0 to 50%	0.1%	10%		81

Third Functions (Parameters n080 to n119)

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
080	0150	Carrier frequency	1 to 4, 7 to 9	1	4 (Note 4)		68
081	0151	Operation selection after momentary power loss	0, 1, 2	1	0		55
082	0152	Fault restart	0 to 10 times	1	0		60
083	0153	Jump frequency 1	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		60

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
084	0154	Jump frequency 2	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		60
085	0155	Jump frequency 3	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		60
086	0156	Jump frequency width	0.00 to 25.50Hz	0.01Hz	0.00Hz		60
087	0157	Cumulative operation time selection (Note 9)	0.1	1	0		61
088	0158	Cumulative operation	0 to 6550	1=10H	0H		61
089	0159	DC injection braking current	0 to 100%	1%	50%		72
090	015A	DC injection braking time at stop	0.0 to 25.5%	0.1s	0.0s (Note 2)		72
091	015B	DC injection braking time at start	0.0 to 25.5%	0.1s	0.0s		---
092	015C	Stall prevention (current limit) during decel	0,1	1	0		88
093	015D	Stall prevention (current limit) during accel	30 to 200%	1%	170%		86
094	015E	Stall prevention (current limit) during running	30 to 200%	1%	160%		87
095	015F	Frequency detection level	0.00 to 400.0Hz	0.01Hz (less than 100Hz) / 0.1Hz (100Hz or more)	0.00Hz		59
096	0160	Overtorque detection 1	0 to 4	1	0		58
097	0161	Overtorque detection 2	0.1	1	0		58
098	0162	Overtorque detection level	30 to 200%	1%	160%		58
099	0163	Overtorque detection time	0.1 to 10.0s	0.1s	0.1s		58
100	0164	Memory selection of hold output frequency	0,1	1	0		77
101	0165	Speed search detection time (Note 9)	0.1 to 10.0s	0.1s	0.2s		---
102	0166	Speed search operation level (Note 9)	0 to 200%	1%	150%		---
103	0167	Torque compensation gain	0.0 to 2.5	0.1	1.0		42
104	0168	Time parameter at torque compensation	0.0 to 25.5s	0.1s	0.3s		42
105	0169	Torque compensation iron loss	0.0 to 6550	0.01W (less than 100W) / 1W (1000W or more)	(Note 3)		42
106	016A	Motor rated slip	0.0 to 20.0Hz	0.1Hz	(Note 3)		44

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
107	016B	Motor resistance for one-phase	0.000 to 65.50Ω	0.001Ω (less than 10Ω) / 0.01Ω (10Ω or more)	(Note 3)		44
108	016C	Motor leak inductance	0.00 to 655.0mH	0.01mH (less than 100mH) / 0.1mH (100mH or more)	(Note 3)		44

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
109	016D	Torque compensation voltage limiter	0 to 250%	1%	150%		–
110	016E	Motor no-load current	0 to 99%	1%	(Note 3)		44
111	016F	Slip compensation gain	0.0 to 2.5	0.1	0.0		89
112	0170	Slip compensation primary delay time	0.0 to 25.5s	0.1s	2.0s		89
113	0171	Slip compensation selection during regeneration	0,1	1	0		---
115 #2	0173	Stall prevention automatic decrease selection	0,1	1	0		87
116 #2	0174	Accel/decel time during stall prevention	0,1	1	0		88

Fourth Functions (Parameters 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

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
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		110
129	0181	PID feedback gain	0.00 to 10.00	0.01	1.00		113
130	0182	Proportional gain (P)	0.0 to 25.0	0.1	1.0		111
131	0183	Integral time (I)	0.0 to 360.0	0.1s	1.0		111
132	0184	Derivative time (D)	0.00 to 2.50	0.01s	0.00		111
133	0185	PID offset adjustment	-100 to 100%	1%	0%		112
134	0186	Integral (I) upper limit	-100 to 100%	1%	100%		112
135	0187	PID output primary delay parameter time	0.0 to 10.0	0.1s	0.0		112
136	0188	PID feedback loss detection selection	0,1,2	1	0		113
137	0189	PID feedback loss detection level	0 to 100%	1%	0%		113
138	018A	PID feedback loss detection time	0.0 to 25.5	0.1s	1.0		113
139	018B	Energy-saving control selection (V/f control mode)	0,1	1	0		105
140	018C	Energy-saving coefficient K2	0.0 to 6550	0.1	(Note 7)		105
141	018D	Energy-saving voltage lower limiter (at 60 Hz)	0 to 120%	1%	50%		106
142	018E	Energy-saving voltage lower limiter (at 6 Hz)	0 to 25%	1%	12%		106
143	018F	Power average time	1 to 200	1 = 24ms	1 (24ms)		107
144	0190	Search operation voltage limit	0 to 100%	1%	0%		107
145	0191	Search operation voltage step (at 100%)	0.1 to 100%	0.1%	0.5%		107
146	0192	Search operation voltage step (at 5%)	0.1 to 10.0%	0.1%	0.2%		107
149	0195	Pulse train input scaling	100 to 3300	1 (1 = 10Hz)	2500 (25kHz)		85
150	0196	Pulse monitor output frequency selection	0,1,6,12,24,36	---	0		66

No.	Register No. for Trans-mission	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
151	0197	Timeover detection selection	0 to 4	1	0		94
152	0198	Setting unit selection of communications frequency reference/ frequency monitor	0, 1, 2, 3	1	0		94
153	0199	Slave address	0 to 32	1	0		94
154	019A	Baud rate selection	0 to 3	1	2		94
155	019B	Parity selection	0, 1, 2	1	2		94
156	019C	Send waiting time	10 to 65ms	1ms	10ms		94
157	019D	RTS control	0, 1	1	0		94
158	019E	Motor code (energy-saving control)	0 to 70	1	(Note 7)		105
159	019F	Energy-saving voltage upper limit (at 60Hz)	0 to 120%	1%	120%		106
160	01A0	Energy-saving voltage upper limit (at 6Hz)	0 to 25%	1%	16%		106
161	01A1	Search operation power detection hold width	0 to 100%	1%	10%		108
162	01A2	Power detection filter time parameter	0 to 255	1 = 4 ms	5 (20ms)		108
163	01A3	PID output gain	0.0 to 25.0	0.1	1.0		113
164	01A4	PID feedback selection	0 to 5	1	0		110
165	01A5	Overheat protect select for installed braking resistor (Note 9)	0,1	1	0		61
166	01A6	Input open-phase detection level (Note 9)	0 to 100%	1%	0%		---
167	01A7	Input open-phase detection time (Note 9)	0 to 255,s	1,s	0,s		---
168	01A8	Output open-phase detection level (Note 9)	0 to 100%	1%	0%		---
169	01A9	Input open-phase detection time (Note 9)	0 to 2,0,s	0.1,s	0.0,s		---
175 #1 #2	01AF	Reducing carrier frequency selection at low speed	0,1	1	0 (Note 10)		70
176	01B0	Parameter copy selection	rdy,rEd,CPy vFy,vA,Sno	---	rdy		116
177	01B1	Prohibiting parameter read selection	0,1	1	0		117
178	01B2	Fault history	Stores, displays most recent 4 alarms	Setting disabled	–		36
179	01B3	Software No.	Displays lower-place 4 digits of software No.	Setting disabled	–		–

Notes:
1. Not initialized by parameter initalization.
2. Upper limit and initial setting of setting range are doubled at 400 class.
3. Changes depending on inverter capacity. Refer to the next page.
4. Changes depending on inverter capacity. Refer to page 64.
5. Initial setting of the model with operator JVOP-140 (with potentiometer) is 0. Setting can be set to 1 by parameter initialization.
6. When control mode selection (n002) is changed, initial setting correspondents to the control mode.
7. Changes depend on inverter capacity. Refer to page 101.
8. Setting value only applies to 200/400V class 7.5/10hp (5.5/7.5kW) inverters.
9. Parameter value only applies to 200/400V class 7.5/10hp (5.5/7.5kW) inverters
10. “1” for 200/400V class 7.5/10hp (5.5/7.5kW) inverters

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	Minimum output frequency	1.3Hz	1.0Hz
n017	Minimum output frequency voltage	12V*	4.3V*
n104	Torque compensation time parameter	0.3s	0.2s
n111	Slip compensation gain	0.0	1.0
n112	Slip compensation gain time parameter	2.0s	0.2s

* Values are double with 400V class.

Initial settings that change with inverter capacity

- 200V class 3-phase

No.	Name	Unit	Factory setting									
–	Inverter capacity	kW	0.1kW	0.25kW	0.55kW	1.1kW	1.5kW	2.2kW	–	3.7kW	5.5kW	7.5kW
n036	Motor rated current	A	0.6	1.1	1.9	3.3	6.2	8.5	–	14.1	19.6	26.6
n105	Torque compensation iron loss	W	1.7	3.4	4.2	6.5	11.1	11.8	–	19	28.8	43.9
n106	Motor rated slip	Hz	2.5	2.6	2.9	2.5	2.6	2.9	–	3.3	1.5	1.3
n107	Motor resistance for one phase*	Ω	17.99	10.28	4.573	2.575	1.233	0.8	–	0.385	0.199	0.111
n108	Motor leakage inductance	MH	110.4	56.08	42.21	19.07	13.4	9.81	–	6.34	4.22	2.65
n110	Motor no-load current	%	72	73	62	55	45	35	–	32	26	30

- 200V class single-phase

No.	Name	Unit	Factory setting									
–	Inverter capacity	kW	0.1kW	0.25kW	0.55kW	1.1kW	1.5kW	2.2kW	–	3.7kW	5.5kW	7.5kW
n036	Motor rated current	A	0.6	1.1	1.9	3.3	6.2	8.5	–	14.1	9.8	13.3
n105	Torque compensation iron loss	W	1.7	3.4	4.2	6.5	11.1	11.8	–	19	28.8	43.9
n106	Motor rated slip	Hz	2.5	2.6	2.9	2.5	2.6	2.9	–	3.3	1.5	1.3
n107	Motor resistance for one phase*	Ω	17.99	10.28	4.573	2.575	1.233	0.8	–	0.385	0.797	0.443
n108	Motor leak inductance	MH	110.4	56.08	42.21	19.07	13.4	9.81	–	6.34	16.87	10.59
n110	Motor no-load current	%	72	73	62	55	45	35	–	32	26	30

- 400V class 3-phase

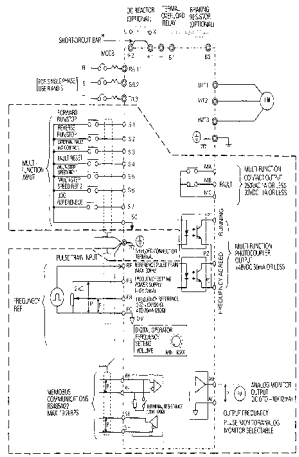
No.	Name	Unit	Factory setting									
–	Inverter capacity	kW	–	0.37kW	0.55kW	1.1kW	1.5kW	2.2kW	3.0kW	3.7kW	5.5kW	7.5kW
n036	Motor rated current	A	–	0.6	1.0	1.6	3.1	4.2	7.0	7.0	9.8	13.3
n105	Torque compensation iron loss	W	–	3.4	4.0	6.1	11.0	11.7	19.3	19.3	28.8	43.9
n106	Motor rated slip	Hz	–	2.5	2.7	2.6	2.5	3.0	3.2	3.2	1.5	1.3
n107	Motor resistance for one phase*	Ω	–	41.97	19.08	11.22	5.044	3.244	1.514	1.514	0.797	0.443
n108	Motor leak inductance	MH	–	224.3	168.8	80.76	53.25	40.03	24.84	24.84	16.87	10.59
n110	Motor no-load current	%	–	73	63	52	45	35	33	33	26	30

* Values of motor line-to-line resistance are set to half of the standard value.

= Values between V/f mode and Vector control mode.

Appendix - CE Conformance

CE Conformance-Low Voltage Directive (LVD) Compliance



① These circuits are hazardous and are separated from accessibility by protective separation.

② These circuits are not separated from hazardous circuits by protective separation, but only with basic insulation. These circuits cannot be accessed and must not be interconnected with any circuits which are accessible, unless they are isolated from accessible circuits by supplemental insulation. These circuits can be connected only to the following circuits:

30VDC or less (overvoltage category 2)

250 VAC or less (overvoltage category 2)

③ These circuits are not separated from hazardous circuits by protective separation, but only with basic insulation. These circuits cannot be accessed and must not be interconnected with any circuits which are accessible, unless they are isolated from accessible circuits by supplemental insulation.

CE Conformance - Electro-Magnetic Compatibility (EMC) Compliance

In order to conform to EMC standards, exclusive-use methods are required for line filter application, cable shielding and inverter installation. An outline of the methods follows.

The line filter and the inverter must be mounted on the same metal plate. The filter should be mounted as close to the inverter as practical. Keep cable as short as possible. The metal plate should be securely grounded. The ground of the line filter and inverter must be bonded to the metal plate with as much area as possible.

For line power input cable, screened cable is recommended at least within the panel. The screen of the cable should be connected to a solid ground. For the motor cable, screened cable (max. 20m) must be used and the screen of the motor cable is connected to ground at both ends by a short connection, using as large an area as practical.

For a more detailed explanation, please refer to Making YASKAWA Inverter Products Confirm with EMC Directive (G-TI#99012-V7).

The following table and figures show the line filter list for EMC standards and the installation/wiring of inverter and line filter.

Line Filter List for EMC Conformance

Recommended Line Filters for VS-606 made by Rasmi Electronics Ltd
(200V single phase)

VS-606V7	Model	Current (A)	Weight (kg)	Dimension W×D×H
CIMR-V7AUB0P1	RS 1010-V7	10	0.6	71 x 45 x 169
CIMR-V7AUB0P2				
CIMR-V7AUB0P4				
CIMR-V7AUB0P7	RS 1020-V7	20	1.0	111 x 50 x 169
CIMR-V7AUB1P5				
CIMR-V7AUB2P2	RS 1030-V7	30	1.1	144 x 50 x 174
CIMR-V7AUB3P7	RS 1040-V7	40	1.2	174 x 50 x 174

Rated Voltage: AC 250V single phase

Ambient Temperature: 40°C (max.)

Recommended Line Filters for VS-606V7 made by Rasmi Electronic Ltd
(200 V three phase)

VS-606V7	Model	Current (A)	Weight (kg)	Dimension W×D×H
CIMR-V7AU20P1	RS 2010-V7	10	0.8	82 x 50 x 194
CIMR-V7AU20P2				
CIMR-V7AU20P4				
CIMR-V7AU20P7				
CIMR-V7AU21P5	RS 2020-V7	16	1.0	111 x 50 x 169
CIMR-V7AU22P2				
CIMR-V7AU23P7	RS 2030-V7	26	1.1	144 x 50 x 174

Rated Voltage: AC 250V three phase

Ambient Temperature: 40×C (max.)

Recommended Line Filters for VS-606V7 made by Rasmi Electronic Ltd
(400 V three phase)

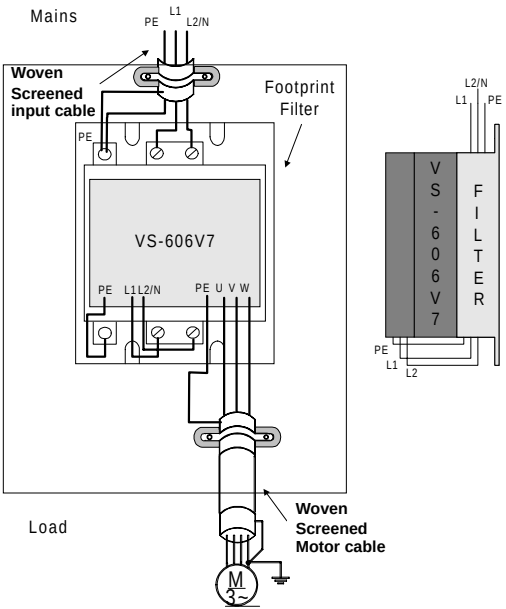
VS-606V7	Model	Current (A)	Weight (kg)	Dimension W×D×H
CIMR-V7AU40P2	RS 3005-V7	5	1.0	111 x 45 x 169
CIMR-V7AU40P4				
CIMR-V7AU40P7	RS 3010-V7	10	1.0	111 x 45 x 169
CIMR-V7AU41P5				
CIMR-V7AU42P2				
CIMR-V7AU43P7	RS 3020-V7	20	1.1	144 x 50 x 174

Rated Voltage: AC 480V three phase

Ambient Temperature: 40×C (max.)

Appendix 1.2

Installation of Line Filter and VS-606V7 (single phase)



Appendix 1.3

Installation of Line Filter and VS-606V7 (3 phase)

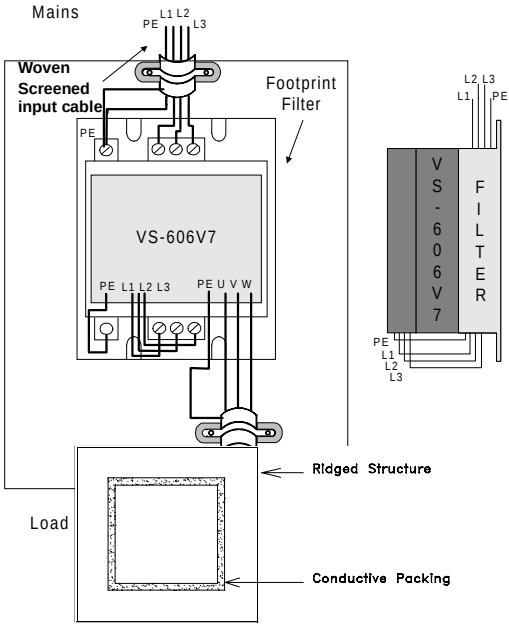


Figure 2 Door

Safety Warnings and Operating Information for Inverters

Introduction

Depending on their protection rating configuration, parts of inverters can have live, uninsulated and hot surfaces during operation. If housing components, the control unit or terminal covers are removed, incorrect installation and operation can lead to serious injuries and damage to other installations. It is thus absolutely essential to observe all the warnings and instructions in the operating manual. Installation, setup and maintenance should only be performed by properly qualified staff. IEC 364 / Cenelec HD 384 or DIN VDE 0100 and IEC 664 or DIN VDE. The applicable national safety and accident prevention regulations must also be observed.) For the purpose of observance of the safety requirement qualified staff are defined as individuals who are familiar with the installation, setup and operation of the converters and who have the proper qualifications for this work.

Proper use for intended purpose

Inverters are designed for installation in electrical systems or machines. A converter installed in a machine may only be activated if the machine conforms to the provisions of EU directive 89/392/EEC (machine directives). EN 60204 must also be observed. The converter may also only be operated if the requirements of the EMC directive (89/336/EEC) are also satisfied. This frequency converter conforms to the requirements of the low voltage directive, 73/23/EEC. The harmonized standards of the prEN 50178/DIN VDE 0160 series have been applied, in combination with EN 660439-1 / VDE 06600 Part 500 and EN 60146 / VDE 0558. The specifications on the ratings plate and the specifications and connection requirements described in the documentation must be observed at all times.

Transportation and storage

All instructions for transport, storage and proper handling must be observed. Climatic and environmental conditions must conform to the requirements of prEN 50178.

Installation

The converters must be installed and cooled in compliance with the regulations outlines and referred to in the documentation. The cooling air flow direction is an important requirement that must be observed. This means that the unit may only be installed and operated in the specified orientation (e.g. upright). All distances specified must also be observed. The converters must be protected against excessive stresses. No components may be bent and no distances required for proper insulation may be changed. To prevent the risk of static electricity damage never touch electronic components or contacts.

Electrical connections

All national safety regulations (e.g. VBG 4) must be observed when working on live equipment. The electrical installation of the units must conform to the applicable regulations. For further information please refer to the documentation. In particular, please take care to observe all installation instructions regarding proper EMC immunity, e.g. for shielding, earthing, location of filters and cable routing. This also applies for equipment with CE approvals. Compliance with the EMC legislation limits is the responsibility of the machine or system manufacturer.

RCCBs

For information on the use of RCCBs with inverters please contact your supplier or Yaskawa representative.

Operation

In some systems it may be necessary to install additional monitoring and protective facilities to comply with the applicable safety and accident prevention regulations. The only changes permitted are to the operator software of the inverters. Please note that the capacitors can remain charged for up to around 5 minutes after the frequency converter has been disconnected from the power supply. You should thus always wait for a short period before opening the unit and touching the electrical connections.

EU Manufacturer's Declaration

Products
Static inverter, series VS-606V7

Scope
YASKAWA inverters are components (BDM*, defined by IEC 22g/21CDV) designed exclusively for installation in machines or systems (end products) by qualified re-users (e.g. mechanical engineering manufacturers).

Responsibility
As a component manufacturer we are responsible for the provision of installation instructions. These can be found in the installation guidelines publication G-TI#99012-V7 (a Yaskawa publication free upon request).
Our products have been tested by authorized bodies pursuant to the requirements of the standard listed below. The products conform to these standards listed below. The products conform to these standards listed below. The products conform to these standards, subject to due and proper observation of the installation instructions provided in section 10 of this manual:

Immunity - EMC resistance pursuant to EN50082-2 (1995)

ENV50204 (1995)
EN61000-4-2 (1996)
EN61000-4-4 (1995)
EN61000-4-6 (1996)
EN61000-4-8 (1994)

Emission - EMC interference emissions pursuant to EN500081-2 (1993)

EN55011 (1991)	Class B Group 1 Up to 10m motor cable
	Class A Group 1 Up to 20m motor cable

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Germany

Always observe all the safety instructions provided in this product documentation!

***AdÜ:** Abkürzung bitte kontrollieren.

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