YASKAWA

Varispeed-606PC3

INSTRUCTION MANUAL

ULTRA-COMPACT ALL-DIGITAL LOW-NOISE INVERTER

MODEL: CIMR-PCU2 (230V 3-PHASE SERIES)
CIMR-PCUB (240V SINGLE-PHASE SERIES)
CIMR-PCU4 (460V 3-PHASE SERIES)

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

YASKAWA

MANUAL NO TOE-S606-3 1C

This instruction manual is composed of 2 sections : The first section describes handling, wiring, operation, maintenance/ inspections, troubleshooting and specifications of the Varispeed-606PC3 series (hereafter called VS-606PC3). The second section outlines the digital operator performance, constants, operation, etc.

Before using the VS-606PC3, a thorough understanding of this manual is recommended for daily maintenance, inspection and troubleshooting.

In this manual, "constant (No.□□)" indicates the item number of control constant set by digital operator.

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CONTENTS 1. (Cont'd)

CONTENTS 2.

CONTENTS 2. (Cont'd)

CONTENTS 2. (Cont'd)

WARNING

Twist wires together before inserting in grounding terminal.

CAUTION

Separate motor overcurrent, overload and overheating protection is required to be provided in accordance with CANADIAN ELECTRICAL CODE, PART I and NEC.
Use 75℃ copper wires only.
Low voltage terminals shall be wired with Class I Wiring.
When mounting units in an enclosure, remove the top, bottom and terminal covers.

AVERTISSEMENT

Enroulex les fils ensemble avant de les introduire dans la borne.
Des tensions subsistent aux bornes des condensateurs pendant cinq minutes aprés l' ouverture de circuit d' entrée.
Couper l' alimentation avant d' entreprendre le depannage du système électrique.

ATTENTION

Une protection distincte contre les surintensités, la surcharge et la surchaufee de moteur doit être fournie conformément AU CODE CANADIAN DE L' ÉLECTRICITE, PREMIER PARTIE et LE NATIONAL DE L' ÉLECTRICITE.

DANGER

Voltage are present on capacitors for five minutes after input circuit is open. Risk of electric shock and/or electrical energy-high current levels.

WARNING

Disconnect electrical supply before servicing the electrical system.

Do not change the wiring while power is applied to the circuit.

Do not check signals during operation.

WARNING

Refer to this manual for connection of circuits and the rating of auxiliary circuits.

Be sure to ground VS-606PC3 using the ground terminal G.

Connect the motor to output terminals T1, T2, T3. Connect an AC power supply to input terminals L1, L2, L3 (for 240 V single-phase series, connect only to L1 and L2).

CAUTION

Separate motor overcurrent, overload and overheating protection is required to be provided in accordance with CANADIAN ELECTRICAL CODE, PART I and NEC.

CAUTION

All the potentiometers of VS-606PC3 have been adjusted at the factory. Do not change their settings unnecessarily.

Do not make withstand voltage tests on any part of the VS-606PC3 unit. It is electronic equipment using semiconductors and vulnerable to high voltage.

Make sure to tighten screws on the main circuit and control circuit terminals. Refer to installation instructions for torque values. See Par. 1.5.3 "(5) Wire and terminal screw sizes."

Handle with care so as not to damage the inverter during transportation.

Do not pick-up by the front cover or the unit cover (plastic portion). Use the die-cast portion.

AVERTISSEMENT

Des tensions subsistent aux bornes des condensateurs pendant cinq minutes aprés 1' ouverture de circuit d' entrée.

Couper 1' alimentation avant d' entreprendre le depannage du système électrique.

ATTENTION

Une protection distincte contre les surintensités, la surcharge et la surchaufee de moteur doit être fournie conformément AU CODE CANADIAN DE L' ÉLECTRICITÉ, PREMIER PARTIE et LE NATIONAL DE L' ÉLECTRICITÉ.

1. VS-606PC3 INVERTER MAIN UNIT

The VS-606PC3 is an ultra-compact, all-digital inverter which provides low noise operation.

Two types are available : 1) with digital operator or 2) with drive status indicating plate (indicating cover), and each has two types of enclosures :

- Enclosed wall-mounted type (NEMA1)
- Water and dust tight type (NEMA4)

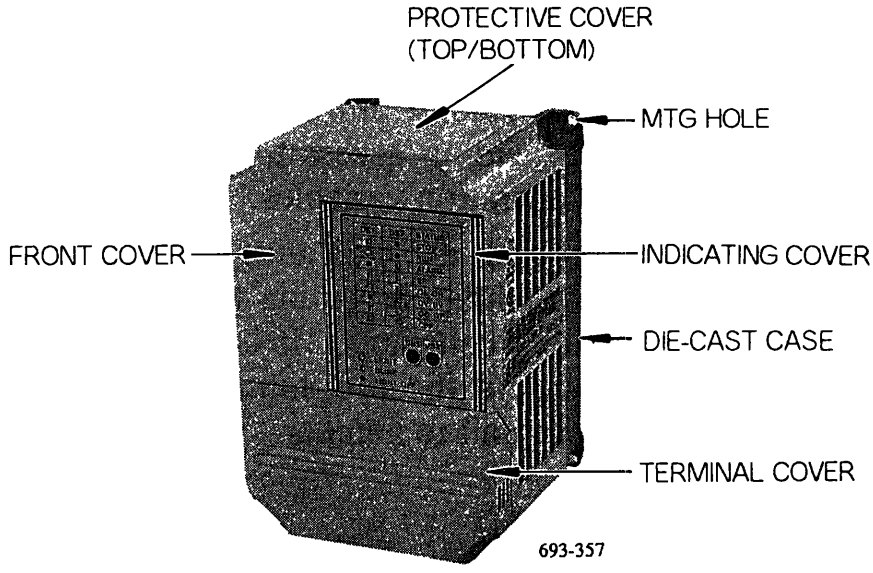
The digital operator allows maximum utilization of the drive by providing access to the inverter's program constants and operation variables.

The model with the indicating cover provides status and fault codes while preventing unauthorized access to the programming constants. It is also useful for those applications where the programming operator can be moved from one unit to another.

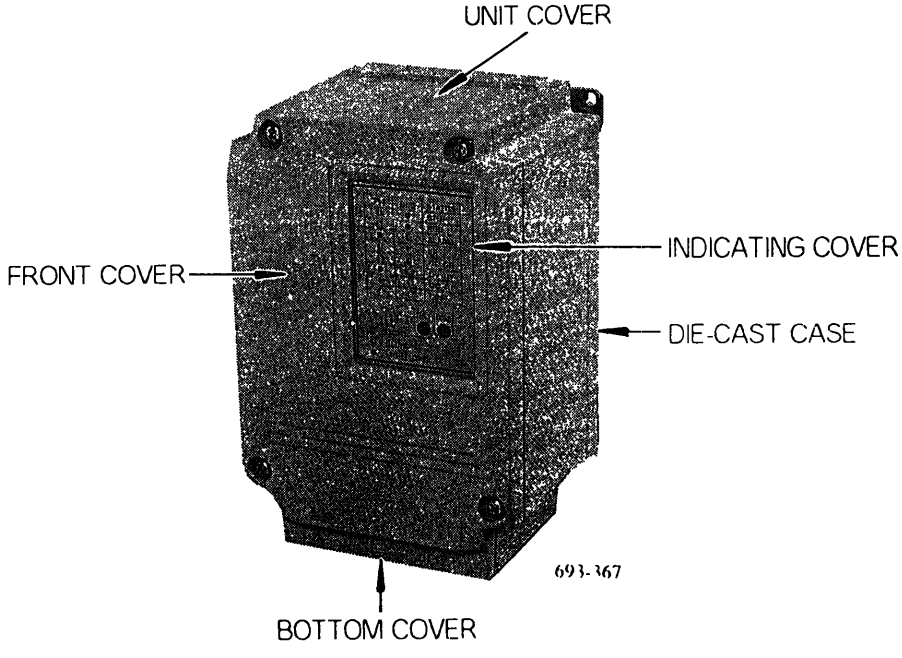
1.1 PARTS NAMES OF VS-606PC3

- With indicating cover

Enclosed wall-mounted type (NEMA1)

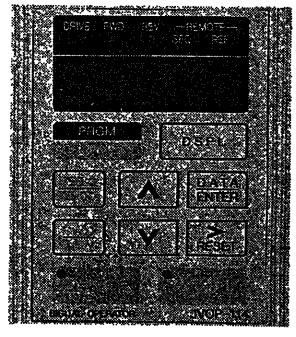


Water and dust tight type (NEMA4)



· With digital operator (option)

The digital operator shown to the right will be mounted in place of the indicating cover which is installed in the unit.



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DIGITAL OPERATOR
JVOP-114

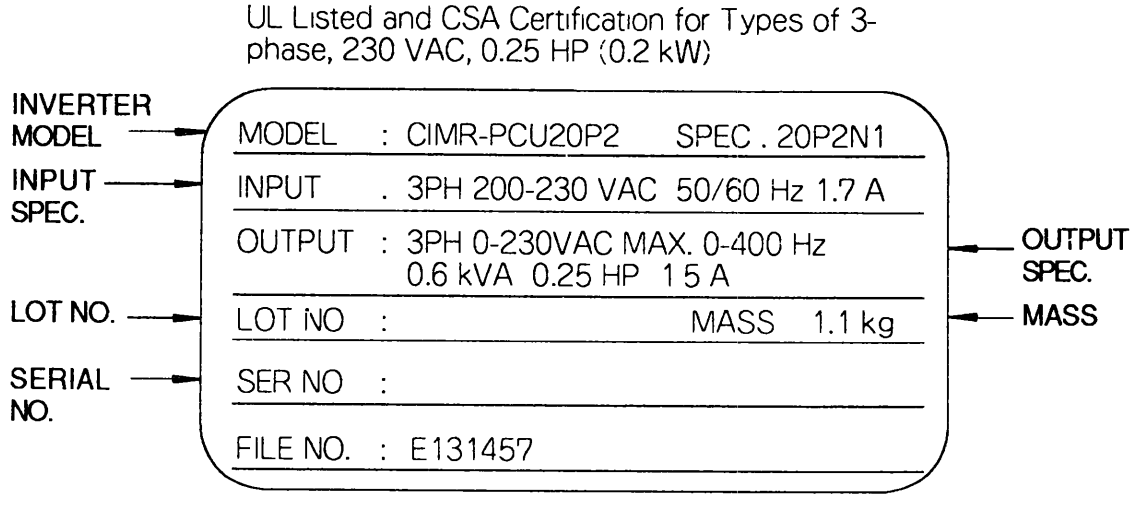
1.2 RECEIVING

This VS-606PC3 has been put through demanding tests at the factory prior to shipment. After unpacking, check the following.

- Verify the part numbers with the purchase order sheet and/or packing slip.
- Transit damage.

If any part of VS-606PC3 is damaged or missing, immediately notify the shipper.

1.2.1 Nameplate Data



1.2.2 Type Designation

CIMR-PC U 2 0P2

- Inverter
- VS-606PC3 Series
- Specifications
  U : UL Listed and CSA Certified Component
- Voltage class
  2 : Three-phase, 230 V
  4 : Three-phase, 460 V
  B : Single-phase, 240 V
- Applicable maximum motor output
  0P1 : 0.13 HP (0.1 kW)
  0P2 : 0.25 HP (0.2 kW)
  to
  3P7 : 5 HP (3.7 kW)
  "P" indicates a decimal point.

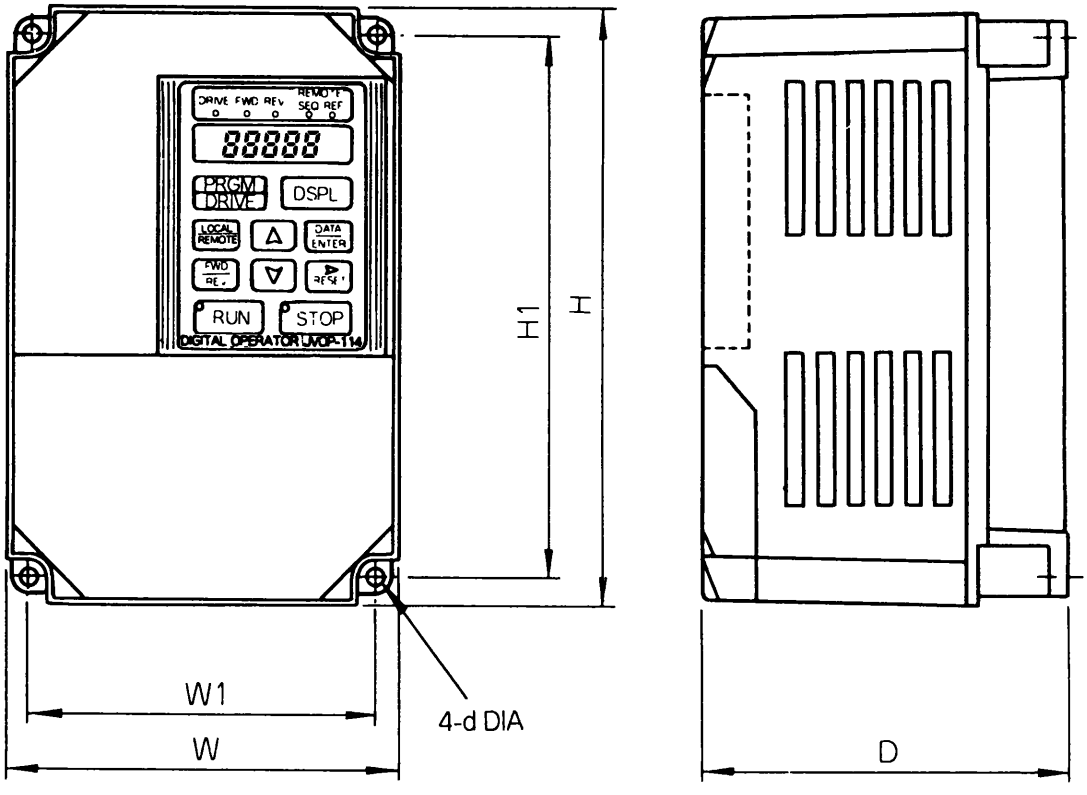
1.2.3 Spec Designation

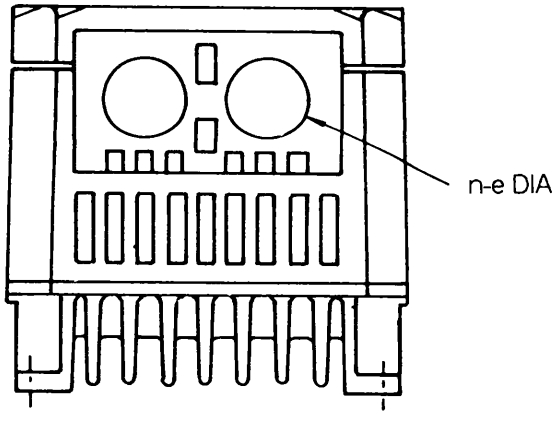
2 0P2 N 1 B

- Revision mark
- Enclosures
  1 : NEMA 1 (Enclosed wall-mounted type)
  8 : NEMA 4 (Water and dust tight type)
- Digital operator provided/not provided
  D : Digital operator provided
  N : Digital operator not provided (with indicating cover)
- Applicable maximum motor output
  0P1 : 0.13 HP (0.1 kW)
  0P2 : 0.25 HP (0.2 kW)
  to
  3P7 : 5 HP (3.7 kW)
  "P" indicates a decimal point.
- Voltage class
  2 : Three-phase, 230 V
  4 : Three-phase, 460 V
  B : Single-phase, 240 V

1.3 DIMENSIONS IN INCHES (mm)

Enclosed wall-mounted type (NEMA1)

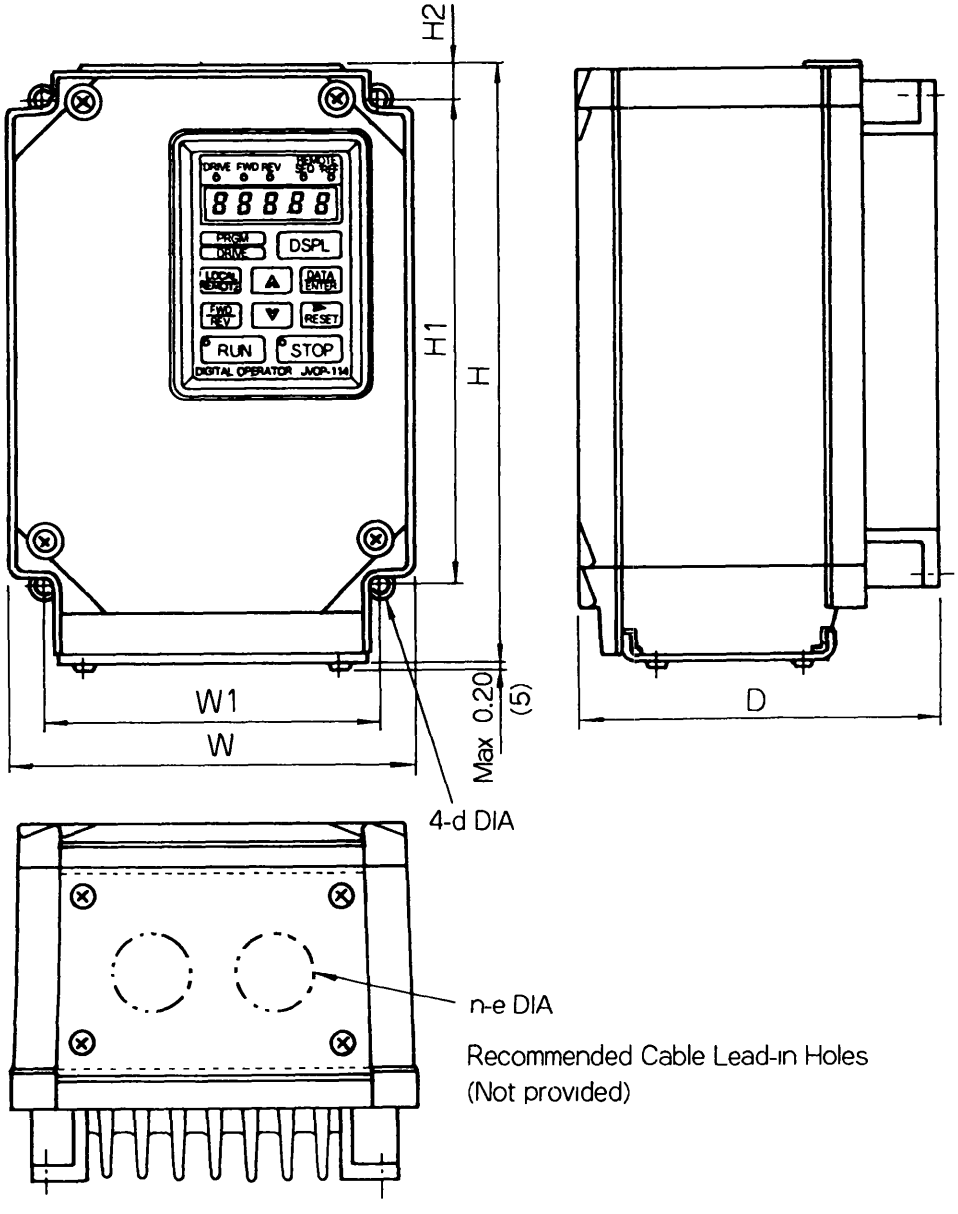




1. VS-606PC3 INVERTER MAIN UNIT (Cont'd)

VS-606PC3 Model CIMR-PCU ☐☐☐	W	W1	H	H1	D	d	n-e
20P1 20P2 20P4	4.13 (105)	3 66 (93)	5.91 (150)	5.43 (138)	3.94 (100)	0.20 (5)	2-0 87 (2-22)
20P7 21P5	5.51 (140)	5 04 (128)	5.91 (150)	5.43 (138)	5.45 (138.5)	0.20 (5)	3-0 87 (3-22)
22P0 22P2 23P7	5.51 (140)	4.96 (126)	7.87 (200)	7.32 (186)	6.69 (170)	0 22 (5 5)	1-0.87 2-1.10 (1-22 2-28)
B0P1 B0P2 B0P4	5.51 (140)	5.04 (128)	5.91 (150)	5.43 (138)	5.45 (138.5)	0.20 (5)	3-0 87 (3-22)
B0P7 B1P5	5.51 (140)	4.96 (126)	7.87 (200)	7.32 (186)	6.69 (170)	0.22 (5.5)	1-0.87 2-1.10 (1-22 2-28)
B2P2 B3P7	7.48 (190)	6.89 (175)	7.87 (200)	7.28 (185)	7.48 (190)	0.23 (5.8)	
40P2 40P4	5.51 (140)	4.96 (126)	7.87 (200)	7.32 (186)	4.72 (120)	0.22 (5.5)	1-0.87 2-1.10 (1-22 2-28)
40P7 41P5	5.51 (140)	4.96 (126)	7.87 (200)	7.32 (186)	6.69 (170)	0.22 (5.5)	
42P2 43P7	7.48 (190)	6.89 (175)	7.87 (200)	7.28 (185)	7.48 (190)	0.23 (5.8)	

Water and dust tight type (NEMA4)



VS-606PC3 Model CIMR-PCU □□□	W	W1	H	H1	H2	D	d	n-e
20P1 20P2	4.45 (113)	3.66 (93)	6.77 (172)	5.43 (138)	0.43 (11)	4.07 (103.5)	0.20 (5)	2-0.91 (2-23)
20P4 20P7	5.83 (148)	5.04 (128)	6.77 (172)	5.43 (138)	0.43 (11)	5.59 (142)	0.20 (5)	3-0.91 (3-23)
21P5 22P2	5.83 (148)	4.96 (126)	8.94 (227)	7.32 (186)	0.47 (12)	6.83 (173.5)	0.22 (5.5)	1-0.91 2-1.13 (1-23 2-28.6)
23P7	7.87 (200)	6.89 (175)	9.06 (230)	7.28 (185)	0.50 (12.8)	7.62 (193.5)	0.23 (5.8)	
B0P1 B0P2 B0P4	5.83 (148)	5.04 (128)	6.77 (172)	5.43 (138)	0.43 (11)	5.59 (142)	0.20 (5)	3-0.91 (3-23)
B0P7 B1P5	5.83 (148)	4.96 (126)	8.94 (227)	7.32 (186)	0.47 (12)	6.83 (173.5)	0.22 (5.5)	1-0.91 2-1.13 (1-23 2-28.6)
B2P2	7.87 (200)	6.89 (175)	9.06 (230)	7.28 (185)	0.50 (12.8)	7.62 (193.5)	0.23 (5.8)	
40P2 40P4	5.83 (148)	4.96 (126)	8.94 (227)	7.32 (186)	0.47 (12)	4.86 (123.5)	0.22 (5.5)	1-0.91 2-1.13 (1-23 2-28.6)
40P7 41P5	5.83 (148)	4.96 (126)	8.94 (227)	7.32 (186)	0.47 (12)	6.83 (173.5)	0.22 (5.5)	
42P2 43P7	7.87 (200)	6.89 (175)	9.06 (230)	7.28 (185)	0.50 (12.8)	7.62 (193.5)	0.23 (5.8)	

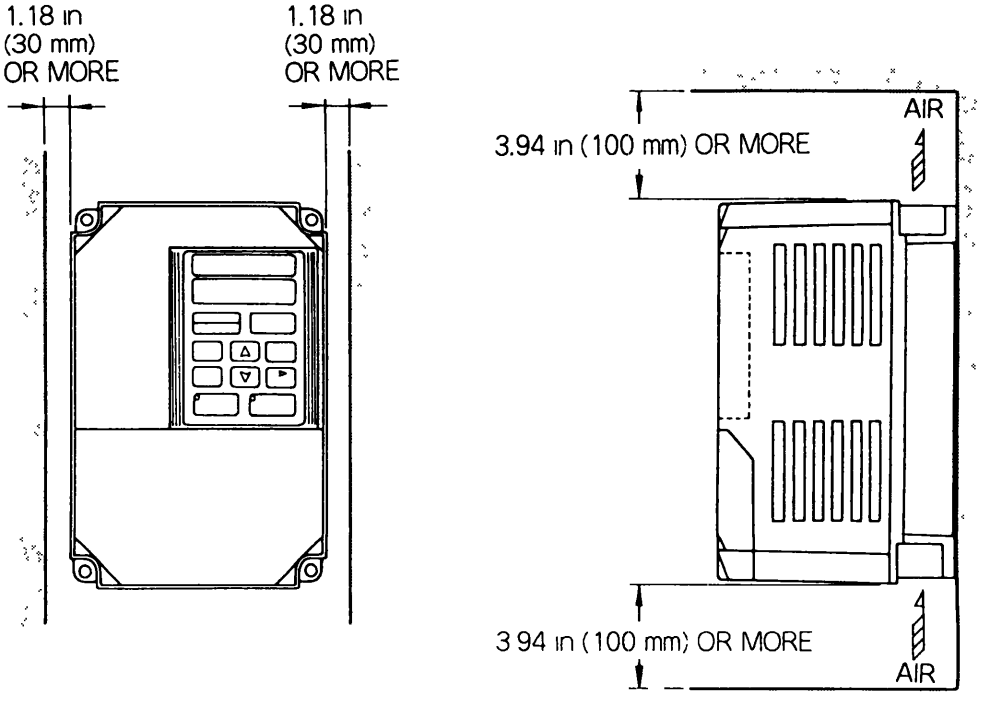
1.4 INSTALLATION

1.4.1 Transportation

- Handle with care so as not to damage the inverter during transportation.
- Do not pick-up by the front cover or the unit cover (plastic portion). Use the die-cast portion.
- Do not drop the inverter.

1.4.2 Mounting Space

Install the VS-606PC3 vertically and allow sufficient space for effective cooling as shown in Fig. 1.1.



(a) Front View (b) Side View

Notes :

1. The space required at top/bottom and both sides are common in enclosed wall-mounted type and water and dust tight type.
   The inverter shown above is enclosed wall-mounted type.
2. For external dimensions, refer to Par. 1.3 "Dimensions in inches (mm)" on page 6.

Fig. 1.1 Mounting Space

1.4.3 Location

Location of the equipment is important to achieve proper performance and normal operating life. The VS-606PC3 units should be installed in areas where the following conditions exist.

- Ambient temperature : +14 to 104°F, -10 to +40℃.
- Protected from rain or moisture. (For enclosed wall-mounted type)
- Protected from oil sprays, splashes.
- Protected from direct sunlight. (Avoid using outdoors.)
- Protected from corrosive gases or liquids.
- Free from airborne dust or metallic particles. (For enclosed wall-mounted type)
- Free from salt spray.
- Free from vibration.
- Free from magnetic noise. (Example : welding machines, power devices, etc.)
- Protected from high humidity.
- Free from combustibles.

CAUTION

Enclosed wall-mounted type (NEMA1)

When mounting units in an enclosure, remove the top, bottom and terminal covers, and install a cooling fan or some other means to cool the air entering into the inverter below 113°F (45 ℃).

Water and dust tight type (NEMA4)

- Never submerse this model in water.
- The models of a forced-air-cooled type are provided with a cooling fan in the die-cast case. Protect the cooling fan from moisture. Excessive water splash may reduce the inverter operating life.
- If water splashes on the cooling fan section, keep the cooling fan operating for approx. 30 minutes in order to dry it. (By conducting current to the inverter unit, the cooling fan rotates.)
- For the cable lead-in section (at the bottom cover), use a cable gland of a waterproof type. (Products described in pages 14 and 15 are available as options.)

  Cable lead-in holes are not provided in the bottom cover. According to your application, drill holes in the bottom cover. Refer to pages 8 and 9.
- After completion of wiring, mount the front cover and bottom cover with care. (Pay attention so as not to damage the gasket.) Since the inverter unit cover is sealed with the die-cast case, never remove it.
- The front cover mounting screws and bottom cover mounting screws are of stainless. Do not use any other screws than those attached. (In particular, screws of different length may cause damage.)
- When silicon rubber cement applied to the contacting section of the front cover and bottom cover for reinforcement of waterproof performance, use silicon rubber cement with less gas generated when hardening.

  (Recommended : KE-3494 made by SHIN-ETSU CHEMICAL CO., LTD.)

1.4.4 Cable Gland

When a cable gland is used for water and dust tight type (NEMA4) models, pay attention to the following items.

- Use multi-core cable for cable gland. (If more than two cables are inserted into one cable gland, a gap is created and may cause leakage.)
- Seal the cable gland with a gasket without fail. (A gasket is attached to the recommended cable gland.)

Cable Gland Mounting Hole (Not Drilled in Bottom Cover) Dimensions in inches (mm)	
VS-606PC3 Model CIMR-PCU[ ]	Qty-Dia
20P1 20P2	2-0.91 (2-23)
20P4 20P7	3-0.91 (3-23)
21P5 22P2 23P7	1-0.91 2-1 13 (1-23 2-28 6)
B0P1 B0P2 B0P4	3-0.91 (3-23)
B0P7 B1P5 B2P2	1-0 91 2-1 13 (1-23 2-28 6)
40P2 ⋮ 43P7	1-0 91 2-1 13 (1-23 2-28 6)

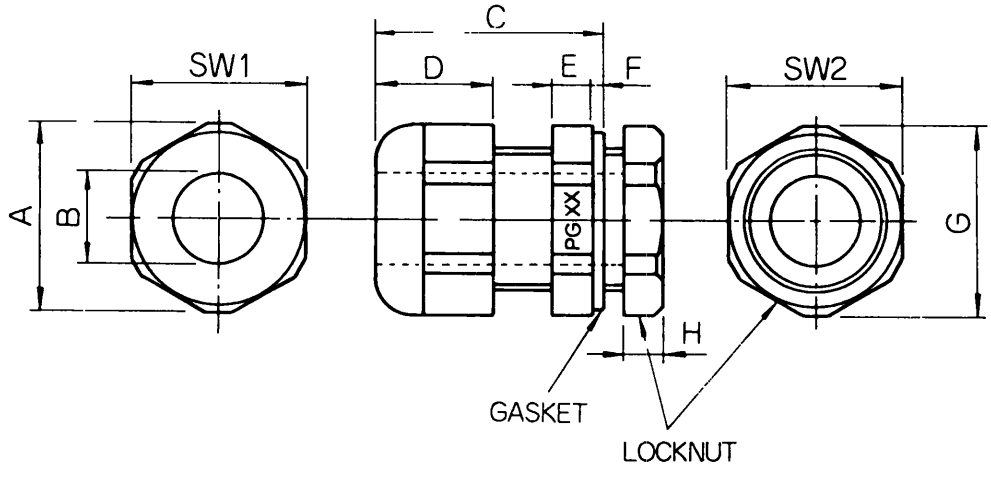
Recommended cable gland

For cable gland for water and dust tight type (NEMA4) models, refer to the following YASKAWA code No. and quantity when you place an order.

VS-606PC3 Model CIMR-PCU□□□□□□	Cable Gland	
	YASKAWA Code No.	Qty
20P1 20P2	WSZT31002-A	2
20P4 20P7	WSZT31002-A	3
21P5 22P2 23P7	WSZT31002-A WSZT31002-B	1 2
B0P1 B0P2 B0P4	WSZT31002-A	3
B0P7 B1P5 B2P2	WSZT31002-A WSZT31002-B	1 2
40P2 40P4 40P7 41P5 42P2 43P7	WSZT31002-A WSZT31002-B	1 2

Notes :
1. Lock nut, gasket and the like required for one-hole wiring with one cable gland are provided.
2. The quantity shown in the above table is the number of cable glands required for one inverter unit.

Dimensions in inches (mm)										
	A	B	SW1	Cmax	D	E	F	H	SW2	G
WSZT31002-A (Size PG 16)	1 16 (29.5)	0 57 (14.5)	1.06 (27)	1 42 (36)	0 73 (18 5)	0 24 (6)	0 08 (2)	0 26 (6.5)	1.18 (30)	1 30 (33)
WSZT31002-B (Size PG 21)	1 40 (35.5)	0 73 (18.5)	1 30 (33)	1 57 (40)	0 89 (22 5)	0 24 (6)	0 08 (2)	0.30 (7 5)	1 42 (36)	1 54 (39)



Specifications		
Cable Gland	Applicable cable size	Tightening torque
WSZT31002-A	0 39 DIA to 0 55 DIA (10 DIA to 14 DIA)	5 to 9 (N·m)
WSZT31002-B	0.51 DIA to 0 7 DIA (13 DIA to 18 DIA)	7.5 to 9 (N·m)

1.5 WIRING

Connect main circuit and control circuit wiring securely as described in the following.

CAUTION

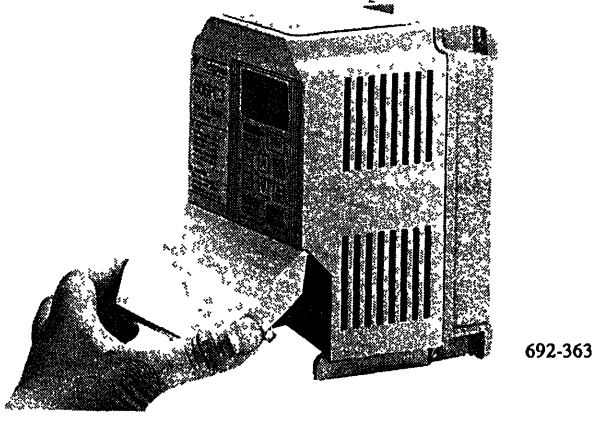
Use UL Listed and CSA Certified closed-loop (ring) connectors sized for the wire gauge involved. The connectors are to be installed using the correct crimp tool specified by the connector manufacturer.

1.5.1 Cover Mounting/Removing and Terminal Position

Enclosed wall-mounted type (NEMA1)

Terminal cover mounting/removing

For removing, press the cover in the direction of ① (on both sides) and, at the same time, lift in the direction of ②. For mounting, reverse the method.



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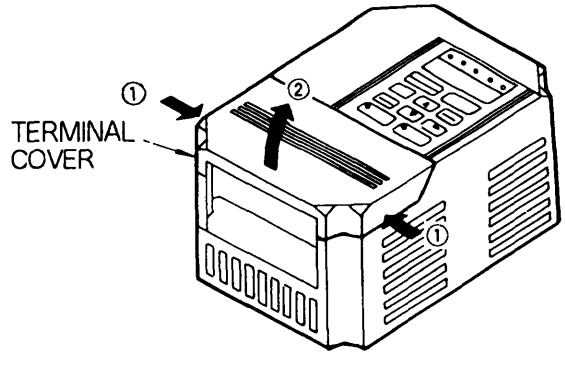
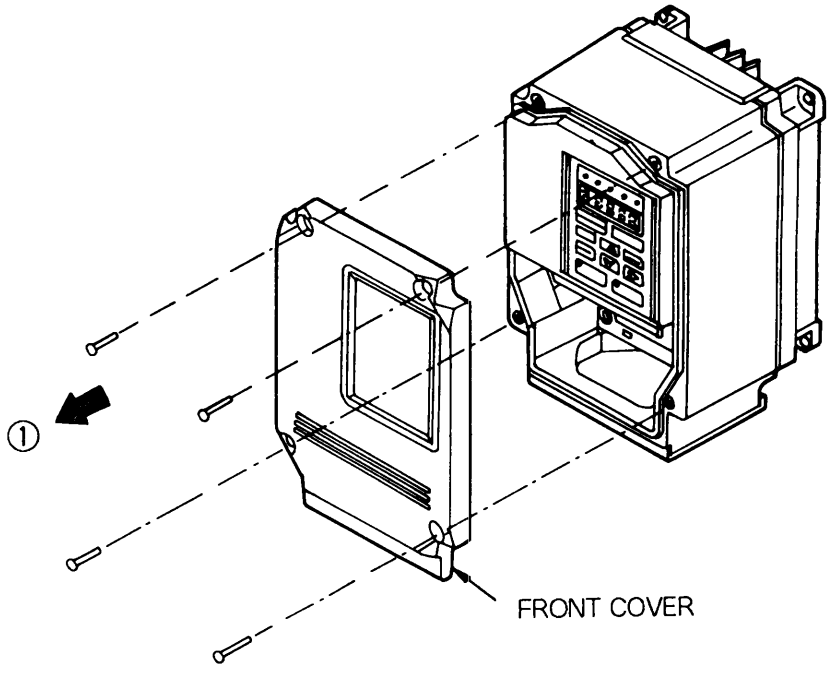


Water and dust tight type (NEMA4)

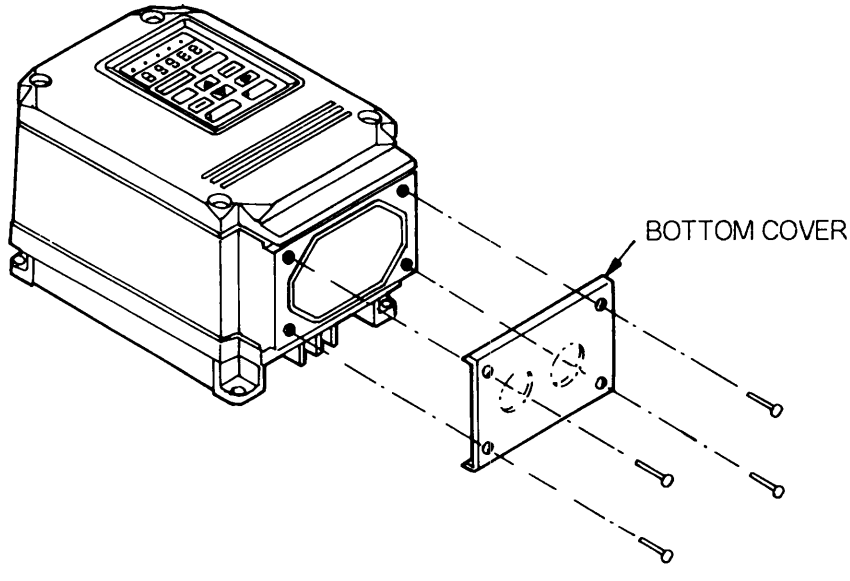
Front cover mounting/removing

Remove the four mounting bolts and take off the cover in the direction of ①. For mounting, reverse the method.



Bottom cover mounting/removing

Remove the four mounting bolts when installing cable glands, etc. Install wiring after inserting cables through the cable glands and securing them to the bottom cover.

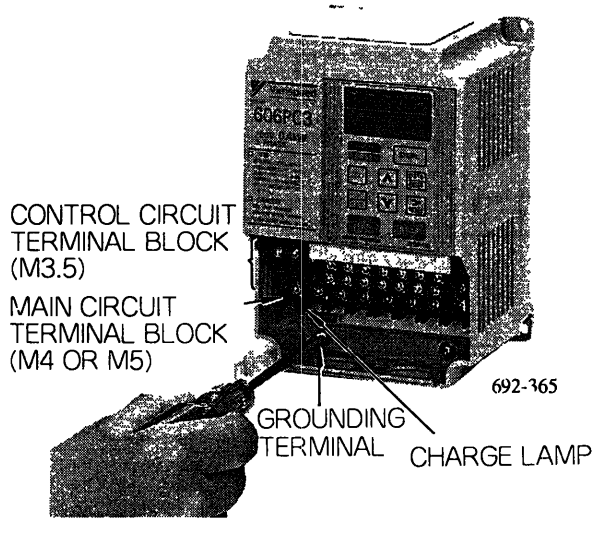


Terminal position

Main circuit and control circuit terminal blocks are shown below. Usually the terminal Nos. are shown on the terminal No. nameplate.

For some inverters, the terminal Nos. are printed on the printed board. The location of terminal blocks for both enclosed wall-mounted type (NEMA1) and water and dust tight type (NEMA4) is the same.

The photo shows the enclosed wall-mounted type (NEMA1).



1.5.2 Standard Wiring Diagram

Models with digital operator can be operated from the digital operator only by main circuit wiring. When these models are operated by control circuit terminals, control constant change is required. For details, refer to "OPERATION MODE SELECTION" on page 96. Models without digital operator (with indicating cover) are preset in operation mode from control circuit terminals at the factory prior to shipping.

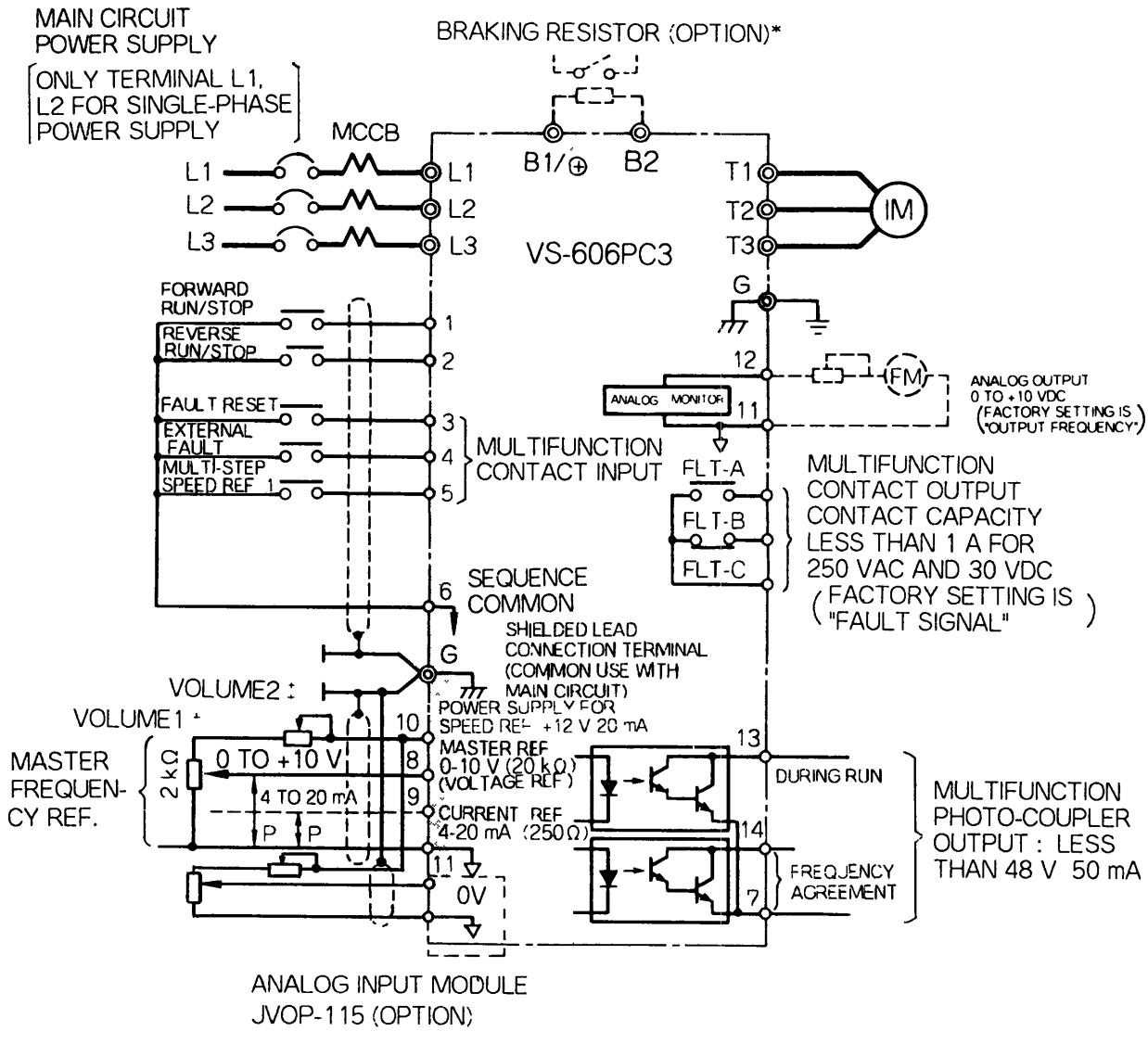


Fig. 1.2 Standard Wiring Diagram

Notes :

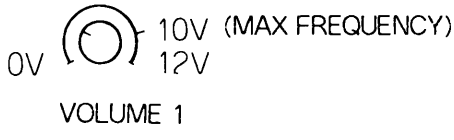
1.  indicates shielded leads and  twisted-pair shielded leads.
2. External terminal 10 of +12 V has maximum output current capacity of 20 mA.
3. Terminal symbols : ◎ shows main circuit ; ○ shows control circuit.
4. Terminal point 6 (sequence common) is isolated from terminal point 11 (0V).

* Set thermal overload relay between braking resistor and inverter when using braking resistor without thermal overload relay (ex. : type ERF-150WJ, option) to protect it from overheating. Use sequencer to break power supply side on thermal overload relay trip contact when using braking resistor. Also, when using braking resistor unit with thermal overload relay (type LKEB, option), use sequencer to break power supply side on thermal overload relay trip contact.

† Volume 1 : For frequency setting

‡ Volume 2 : Resistor to reduce the voltage from +12 V to +10 V. Considering the voltage drop by wiring impedance, power supply voltage is set to +12 V.

· When volume 2 is not provided :



Max frequency when turning volume 1 to 80%. Even if turning more, frequency remains at the maximum. Even if +12 V loads on terminal 8, it will not damage the inverter nor affect its operation.

1.5.3 Main Circuit

"Suitable for use on a circuit capable of delivering not more than 1000 rms symmetrical amperes, 240 V Max." Models with 20P1, 20P2, 20P4, B0P1, B0P2 and B0P4 suffix only.

"Suitable for use on a circuit capable of delivering not more than 1000 rms symmetrical amperes, 460 V Max." Models with 40P2 and 40P4 suffix only.

"Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 240 V Max." Models with 20P7, 21P5, 22P2, 23P7, B0P7, B1P5, B2P2 and B3P7 suffix only.

"Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 460 V Max." Models with 40P7, 41P5, 42P2 and 43P7 suffix only.

(1) Main circuit wiring

Connect wiring as shown in Fig. 1.3.

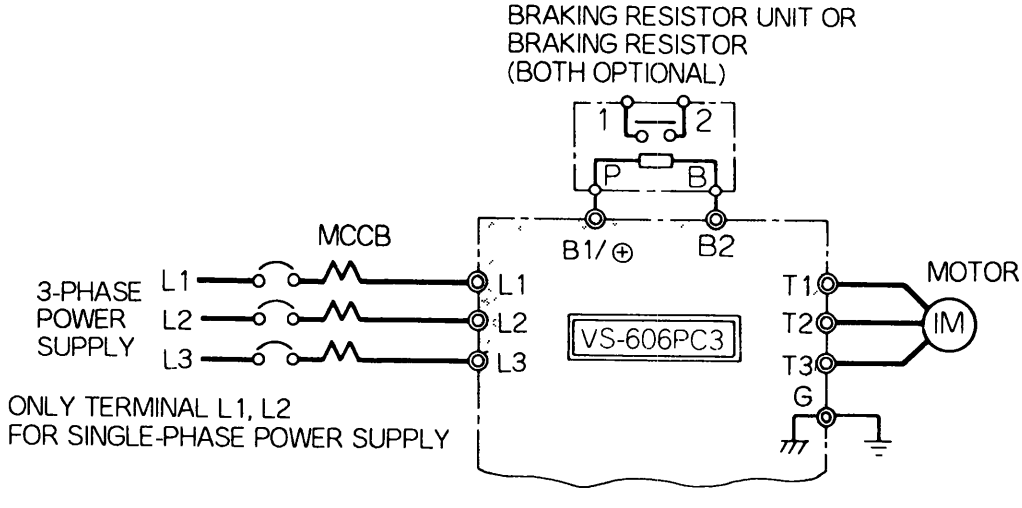


Fig. 1.3 Main Circuit Wiring

(2) Main circuit terminals

Table 1.1 VS-606PC3 Main Circuit Terminals

Terminal	Description
L1	Main circuit power input "L1", "L2" are used for single-phase input specifications.
L2	
L3	
T1	Inverter output
T2	
T3	
B1/⊕	Braking resistor or braking resistor unit connector (options)
B2	
G *	Grounding (ground resistance should be 100 ohms or less)

* Use screw for frame ground.

· Main circuit terminal arrangement

3-phase series (all models)

L1	L2	L3	B1/⊕	B2	T1	T2	T3

240 V single-phase series
NEMA1 0.13 to 1.5 HP (0.1 to 1.5 kW)
NEMA4 0.13 to 2 HP (0.1 to 1.5 kW)

L1	L2		B1/⊕	B2	T1	T2	T3

BLANK (Do not use)

240 V single-phase series
3 and 5 HP (2.2 and 3.7 kW)

L1	L2	B1/⊕	B2	T1	T2	T3

(3) Molded-case circuit breaker (MCCB) and Fuse for branch circuit protection

Be sure to connect MCCBs or Fuses between AC main circuit power supply and VS-606PC3 input terminals L1, L2, L3 to protect wiring. Recommended ratings of MCCB and Fuse are listed in Table 1.2. The fuses should be Listed Class RK5 fuses.

When a ground fault interrupter is used, select one not influenced by high frequency. Setting current should be 200 mA or more and operating time, 0.1 sec or more to prevent malfunctions.

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

Table 1.2 Branch Circuit Protection

● 230 V Class 3-phase Input Series

VS-606PC3 Model CIMR-		PCU20P1	PCU20P2	PCU20P4	PCU20P7	PCU21P5	PCU22P0	PCU22P2	PCU23P7
Inverter Capacity kVA	NEMA1	0.3	0 6	1.1	1.9	2.5	2.8	4.2	6 7
	NEMA4	0 3	0 6	1 1	1.9	2 8	-	4 2	6.7
Rated Output Current A	NEMA1	0 8	1 5	3	5	6.5	7.3	11	17 5
	NEMA4	0.8	1.5	3	5	7.3	—	11	17 5
MCCB or Fuse, Class RK5		3A	5A	5A	10A	20A	20A	20A	30A

● 240 V Class Single-phase Input Series

VS-606PC3 Model CIMR-		PCUB0P1	PCUB0P2	PCUB0P4	PCUB0P7	PCUB1P5	PCUB2P2	PCUB3P7
Inverter Capacity kVA	NEMA1	0.3	0 6	1 1	1.9	2.5	4.2	6.7
	NEMA4	0 3	0 6	1.1	1.9	2 8	4.2	-
Rated Output Current A	NEMA1	0.8	1.5	3.0	5 0	6.5	11.0	17.5
	NEMA4	0.8	1 5	3.0	5.0	7 3	11 0	-
MCCB or Fuse, Class RK5		3A	5A	10A	20A	20A	40A	50A

● 460 V Class 3-phase Input Series

VS-606PC3 Model CIMR-		PCU40P2	PCU40P4	PCU40P7	PCU41P5	PCU42P2	PCU43P7
Inverter Capacity	kVA	0 8	1 2	2	3	3 7	6 1
Rated Output Current	A	1	1 6	2 6	4	4 8	8
MCCB or Fuse, Class RK5		4A	5A	5A	10A	10A	20A

(4) Surge suppressor

The surge suppressors should be connected to the coils of control relays, magnetic contactors, magnetic valves, or magnetic brake used for the VS-606PC3 periphery. Otherwise, large surge voltage occurs at switching and may cause devices to be damaged or to malfunction. Select type from Table 1.3.

Table 1.3 Surge Suppressors

Coils of Magnetic Contactor and Control Relay		Surge Suppressor*		
		Model DCR2-	Specifications	Code No
200 V to 230 V	Large-size Magnetic Contactors	50A 22E	250 VAC 0.5μF 200Ω	C002417
	Control Relay MY-2, -3 (OMRON) HH-22, -23 (Fuji) MM-2, -4(OMRON)	10A 25C	250 VAC 0.1μF 100Ω	C002482
380 to 460 V Units		50D 100B	1000 VDC 0.5μF 220Ω	C002630

* Made by MARCON Electronics

(5) Wire and terminal screw sizes

- Use 600 V vinyl-sheathed lead or equivalent.
- Use 75℃ copper wires only.
- Low voltage terminals shall be wired with Class I Wiring.

Table 1.4 Torque Value and Wire Size for Field Wiring Terminals

● 230 V Class 3-phase Input Series

Circuit	VS-606 PC3 Model CIMR-	Terminal			Wire Size	
		Symbol	Screw	Torque	AWG	mm²
Main Circuit	PCU20P1	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU20P2	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU20P4	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU20P7	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU21P5	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	12-10	3.5 to 5.5
	PCU22P0*	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	12-10	3.5 to 5.5
	PCU22P2	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	12-10	3.5 to 5.5
		G		1.43	12-10	3.5 to 5.5
	PCU23P7	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	10	5.5
		G		1.43	10	5.5
Control Circuit	Common to All Models	1 to 14 FLT A, FLT B, FLT C	M3.5	0.95	22-14	0.3 to 2

* Water and dust tight type (NEMA4) not provided for this model

Table 1.4 Torque Value and Wire Size for Field Wiring Terminals (Cont'd)

● 240 V Class Single-phase Input Series

Circuit	VS-606 PC3 Model CIMR-	Terminal			Wire Size	
		Symbol	Screw	Torque	AWG	mm²
Main Circuit	PCUB0P1	L1, L2, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCUB0P2	L1, L2, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCUB0P4	L1, L2, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCUB0P7	L1, L2, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	12-10	3.5 to 5.5
	PCUB1P5	L1, L2, B1/⊕, B2, T1, T2, T3	M4	1.43	12-10	3.5 to 5.5
		G		1.43	12-10	3.5 to 5.5
	PCUB2P2	L1, L2, B1/⊕, B2, T1, T2, T3	M5	2.24	10-8	5.5 to 8
		G	M4	1.43	10-8	5.5 to 8
	PCUB3P7*	L1, L2, B1/⊕, B2, T1, T2, T3	M5	2.24	8	8
		G	M4	1.43	10-8	5.5 to 8
Control Circuit	Common to All Models	1 to 14 FLT-A, FLT-B, FLT-C	M3.5	0.95	22-14	0.3 to 2

* Water and dust tight type (NEMA4) not provided for this model

Table 1.4 Torque Value and Wire Size for Field Wiring Terminals (Cont'd)

● 460 V Class 3-phase Input Series

Circuit	VS-606 PC3 Mode CIMR-	Terminal			Wire Size	
		Symbol	Screw	Torque	AWG	mm²
Main Circuit	PCU40P2	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU40P4	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU40P7	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU41P5	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU42P2	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	14-10	2 to 5.5
	PCU43P7	L1, L2, L3, B1/⊕, B2, T1, T2, T3	M4	1.43	14-10	2 to 5.5
		G		1.43	12-10	3.5 to 5.5
Control Circuit	Common to All Models	1 to 14 FLT-A, FLT-B, FLT-C	M3.5	0.95	22-14	0.3 to 2

IMPORTANT

- Lead size should be determined considering voltage drop of leads. Voltage drop can be obtained by the following equation : select such lead size that voltage drop will be within 2% of normal rated voltage.

  phase-to-phase voltage drop (V)
  $=\sqrt{3} \times$ lead resistance (Ω/km) $\times$ wiring distance (m)
  $\times$ current (A) $\times 10^{-3}$

- Insertion of power supply coordination AC reactor
  When the power supply capacity exceeds 600 kVA, connect an AC reactor at the inverter input side for power supply coordination. This reactor is also effective for power factor improvement of the power supply.
  Refer to Par. 1.10 "OPTIONS AND PERIPHERAL UNITS" on page 60.

- Wiring length between inverter and motor
  If total wiring distance between inverter and motor is excessively long and inverter carrier frequency (main transistor switching frequency) is high, harmonic leakage current from the cable will increase to affect the inverter unit or peripheral devices. If the wiring distance between inverter and motor is long, reduce the inverter carrier frequency as shown below. Carrier frequency can be set by constant No. 43. For details, refer to "CARRIER FREQUENCY" on page 125. Carrier frequency is set to 10 kHz at the factory prior to shipping.

Wiring Distance between Inverter and Motor	Up to 30 m	Up to 50 m	Up to 100 m	100 m or more
Allowable Carrier Frequency (Constant No 43 set value)	15 kHz or less (6)	10 kHz or less (4)	5 kHz or less (2)	2.5 kHz or less (1)

(6) Wiring

(a) Main circuit input/output

(1) Phase rotation of input terminals L1, L2, L3 is available in either direction, clockwise or counterclockwise.

(2) When inverter output terminals T1, T2, and T3 are connected to motor terminals T1, T2, and T3, respectively, motor rotates counterclockwise, when viewed from opposite drive end, upon forward run command. To reverse the rotation, interchange any two of the motor leads.

(3) Never connect AC main circuit power supply to output terminals T1, T2, or T3. Inverter may be damaged.

(4) Care should be taken to prevent contact of wiring leads with the VS-606PC3 cabinet, for a ground fault or a short-circuit may result.

(5) Insert an L noise filter to the VS-606PC3 output, but never connect power factor correction capacitor, LC or RC to VS-606PC3 output.

(6) Be sure to tighten the main circuit terminal screws.

(7) Be sure to separate the main circuit wiring from inverter and peripheral device control lines. Otherwise, it may cause the devices to malfunction.

(b) Grounding

Ground the casing of the VS-606PC3 using ground terminal G.

(1) Ground resistance should be 100 Ω or less.

(2) Never ground VS-606PC3 in common with welding machines, motors, or other large-current electrical equipment, or a ground pole. Run the ground lead in a conduit separate from leads for large-current electrical equipment.

(3) Use the ground leads which comply with AWG standards and make the length as short as possible.

(4) Where several VS-606PC3 units are used side by side, all the units should be grounded as shown in (a) or (b) of Fig 1.4. Do not form a loop with the ground leads as shown in (c).

(a) GOOD (b) GOOD (c) POOR

Fig. 1.4 Grounding of Three VS-606PC3 Units

1.5.4 Control Circuit

> **CAUTION**
>
> Low voltage terminals shall be wired with Class I Wiring.

(1) Control circuit wiring

The control signals are connected by screws. Refer to Fig. 1.2 for I/O signals and screw terminal numbers. The terminal functions shown in the figure indicate standard setting prior to shipping. Since operation mode from the digital operator is set for the model with the digital operator, it is necessary to change the control constants when operation is performed from the control circuit terminals. For details, refer to "OPERATION MODE SELECTION" on page 96. For the model without digital operator (with indicating cover), operation mode from the control circuit terminals is the standard setting preset at the factory prior to shipping.

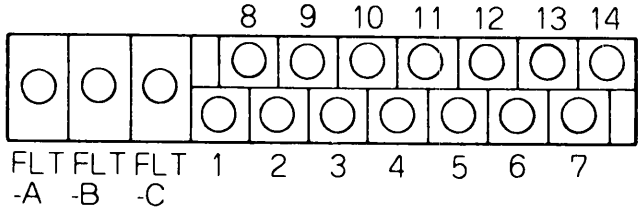
(2) Controrl circuit terminals (factory preset)

Table 1.5 Control Circuit Terminal Functions

Classification	Terminal	Signal Name	Function		Signal Level
Sequence Input Signal	1	Forward run /stop signal	Forward run at "closed", stop at "open"		Photo-coupler insulation input 24 VDC 8 mA
	2	Reverse run/stop signal	Reverse run at "closed", stop at "open"		
	3	Fault reset input	Reset at "closed"	Multifunction contact input 3 signals available to select*	
	4	External fault	Fault at "closed"		
	5	Multi-step speed ref.1	Effective at "closed"		
	6	Sequence control input common terminal	Common terminal for sequence input		
Analog Input Signal	10	Power supply terminal for frequency setting	Speed ref power supply		+12 V (Allowable current 20 mA max.)
	8	Frequency ref.	0 to +10V/Max. output frequency		0 to +10 V (20kΩ)
	9		4 to 20 mA/Max. output freqency		4 to 20 mA (250Ω)
	11	Common terminal for control circuit	0V		—
Sequence Output Signal	13	During running	"L" level at run	Multifunction photo-coupler output: two signals available to select †	Photo-coupler output +48 V 50 mA or less
	14	Frequency agreed signal	'L" level at set frequency=output frequency		
	7	Photo-coupler output common	Common terminal for sequence output		
	FLT-A	Fault signal contact output	Possible to select the function as multifunction output # "Closed" between A and C at fault "Open" between B and C at fault	Multi-function contact output	Contact capacity 250 VAC : 1A or less 30 VDC. 1A or less
	FLT-B				
	FLT-C	Fault signal contact output common			
Analog Output Signall	12	Frequency meter	0 to 10 V/max. output frequency Possible to select current meter output		0 to 11 V max. 2 mA or less
	11	Common			

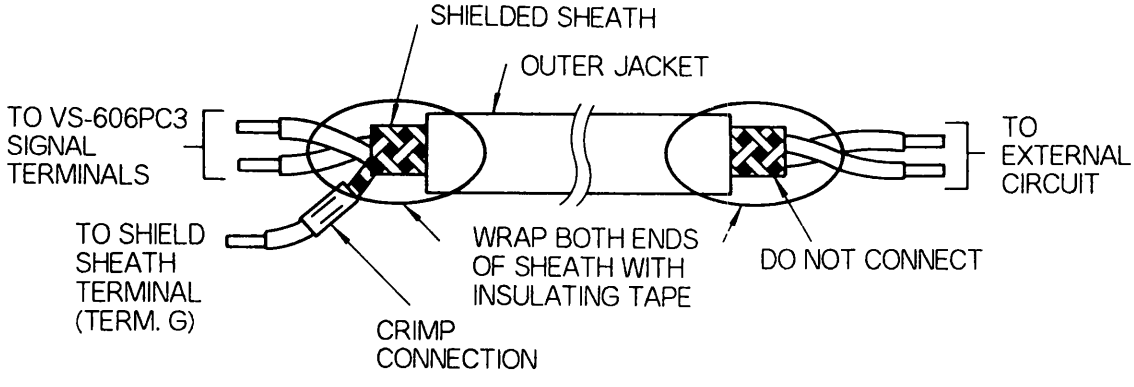
* For details, refer to "MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION" on page 115.
† For details, refer to "MULTIFUNCTION OUTPUT FUNCTION" on page 121.
‡ For details, refer to "MULTIFUNCTION ANALOG OUTPUT MONITOR SETTING" on page 110.
# For details, refer to "MULTIFUNCTION OUTPUT FUNCTION" on page 121.

· Control circuit terminal arrangement



(3) Precautions on control circuit wiring

- Separate the control signal line from power lines. Otherwise, it may cause a malfunction.
- For frequency setting signal (analog), use shielded lead and conduct termination sufficiently.



1.6 OPERATION

1.6.1 Pre-operation Check

Check the following items after completion of installation and wiring :

(1) Proper wiring.
Double check that the power supply is not connected to the output terminals T1, T2 and T3.

(2) No shortcircuit due to wiring contamination (dust, oil, etc.).

(3) Screws and terminals are tightened.

(4) For safe operation, the motor should be uncoupled from the load. Pay close attention to output current when the motor is operated with the load coupled.

(5) Wiring is not grounded.

(6) Run command is not input.
When the forward/reverse run command is input in the operation mode (factory setting for the model with indicating cover) from the control circuit terminal, the motor is activated automatically after the main circuit power supply is turned on. Turn on the inverter only after making sure that the run command is not input.

1.6.2 Pre-operation Setting

Since the standard inverter models are provided with the values indicated in Par.2.8 (see page 84 and beyond), the digital operator (JVOP-114) must be used in order to change the constants from the initial values to the values in accordance with the load specifications.

(1) Preset values prior to shipping
The following describes the functions and initial constant set values which are often used for operation.

(a) Output frequency and accel/decel time
The maximum output frequency is set to 60 Hz and accel/decel time to 10 seconds at the factory prior to shipping. To change the values, refer to "ACCEL/DECEL TIME SETTING" on page 105.

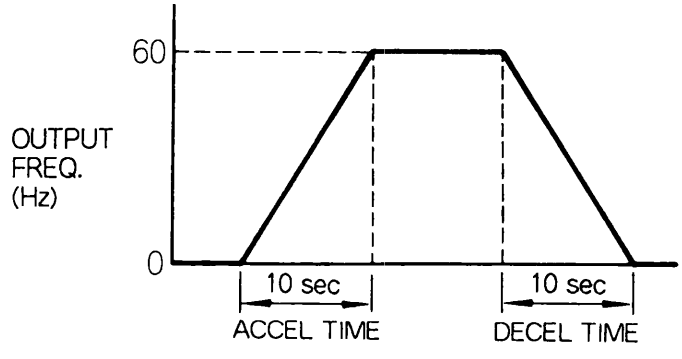


Fig. 1.6 Output Frequency and Accel/Decel Time

(b) Frequency setting signal and output frequency
Fig. 1.7 shows the inverter output frequency change as a result of changes of the input voltage signal at terminal ⑧ or current at terminal ⑨.

(c) V/f characteristics
Fig. 1.8 shows the output voltage for inverter output frequency. When its characteristic (max. voltage / frequency) differs from that of the optimum motor, refer to "V/f CHARACTERISTIC SETTING" on page 102.

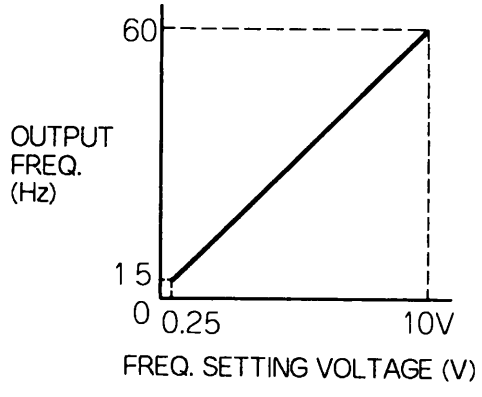
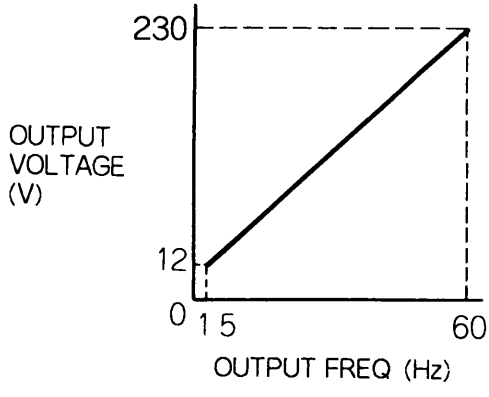


Fig. 1.7 Frequency Setting Signal and Output Frequency



Note : For 460 V class, the value is twice that of 230 V class.

Fig. 1.8 V/f Characteristics

(2) Motor rated current setting
Since the inverter is provided with an electronic thermal overload to protect the motor from overheating, the motor rated current should be programmed into constant (No.19). YASKAWA standard 4-pole motor current value is set as the initial value. For details, refer to "ELECTRONIC THERMAL OVERLOAD PROTECTION" on page 109.

Note : Provide a thermal overload relay or thermal protector when more than one motors are operated simultaneously.

1.6.3 Test Run Method

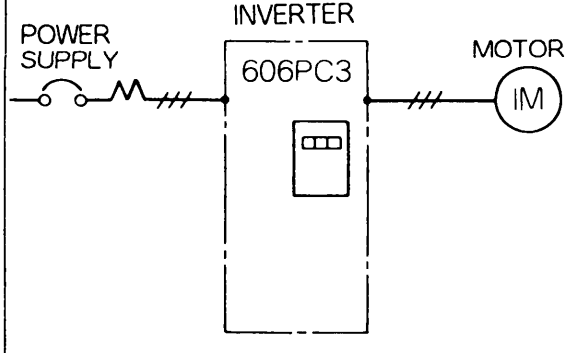
The inverter can be operated in the following two ways. The model with digital operator is set to "OPERATION MODE BY DIGITAL OPERATOR" and the model without digital operator (with indicating cover) is set to "OPERATION MODE FROM CONTROL CIRCUIT TERMINAL" prior to shipping.

Run by digital operator (Standard setting of model with digital operator)

This method is to operate the inverter by using the RUN (run command) key, etc. of the digital operator.

Since this operation mode is set at the factory prior to shipping, operation can be performed only by main circuit wiring.

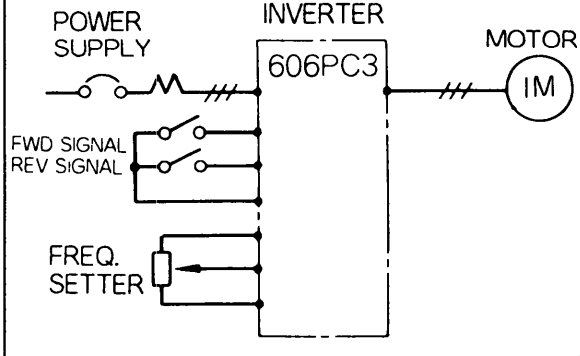
For details of the operation method, refer to Section 2 "DIGITAL OPERATOR" beginning on page 64.

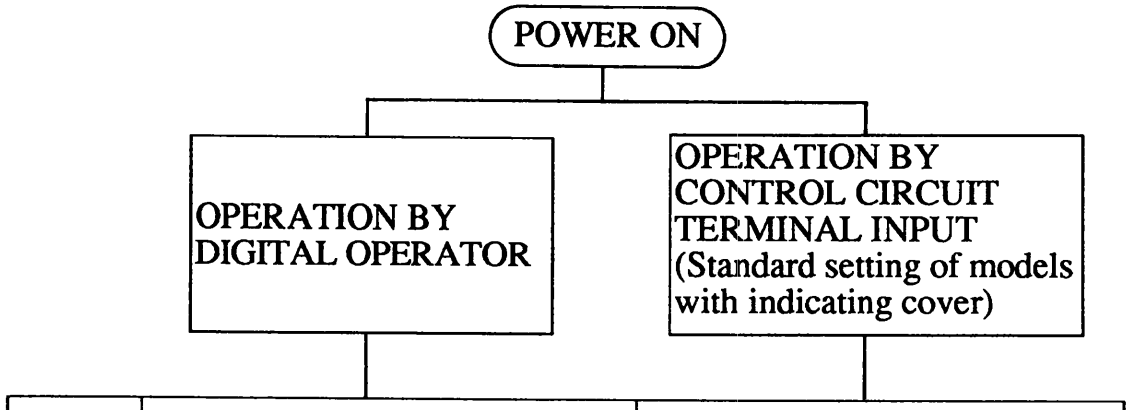


Run by control circuit terminal input (Standard setting of model with indicating cover)

This method is to operate the inverter by frequency setter or operation switch connected to the control circuit terminal.

To perform operation by control circuit terminal input of the model with digital operator, change the operation mode to "OPERATION FROM CONTROL CIRCUIT TERMINAL" (No. 01=0000).





Operation Method Selection	Need not to change the mode since operation mode by digital operator is set at the factory.	· Enter the program mode (depress PRGM/DRIVE key) and set No. 01 data to 0000 by using ∨, ∧ or >/RESET key. Then depress DATA/ENTER key. · Enter the drive mode (depress PRGM/DRIVE key). · After above operation, command from control circuit terminal can be received.*
Operation	· Select frequency reference value display F0000 by depressing DSPL key on digital operator. · Depress DATA/ENTER key after setting frequency value by using ∧, ∨ or >/RESET key. · Depress RUN key.	· Turn the frequency setter knob to the left to decrease value fully. (frequency reference=0) · Turn ON FWD or REV run signal. · Turn the frequency setter knob slowly to the right to increase value fully.
Stopping	· Depress STOP key.	· Turn the frequency setter knob slowly to the left to decrease value fully. · Turn OFF FWD or REV run signal.

*Models without digital operator (models with indicating cover) need not this operation.

Note : Refer to Par. 2.4 "DIGITAL OPERATOR OPERATION EXAMPLE" (page 74) for details of digital operator operation.

1.6.4 Inverter Status Display LEDs

With the model without digital operator, LEDs provided for the inverter are of help to know the inverter status. These LEDs can be seen through the indicating cover on the inverter front side. There are two LEDs : green (DS1) and red (DS2). Inverter status can be seen by these two LED lighting modes. Table 1.6 shows the LED lighting modes and the contents. Check that the inverter is in the normal status at power ON in the test run stage.

Table 1.6 LED Display and Contents

Inverter Status	LED Display DS1 (GR)	LED Display DS2 (RD)	Display Contents	Remarks
Normal	◐	●	Operation ready (during STOP)	———
	☼	●	During normal RUN	
Alarm	●	◐	Undervoltage (UV), external B.B, while stopped.	Automatic recovery by protective operation release
Protective operation	◐	◐	Inverter external fault (EF is input.)	Can be reset after removing the cause of fault.
	☼	◐	Overload protection such as inverter overload (OL), fin overheat, etc.	
	●	☼	Voltage protection such as overvoltage (OV), undervoltage (UV)	
	◐	☼	Overcurrent protection (OC) Ground fault (GF)	
Inverter fault	☼	☼	Digital hardware memory fault (CPF)	Cannot be reset.* (Replace the inverter.)
	●	●	Hardware fault such as control power supply fault, CPU runaway, etc.	Cannot be reset. (Replace the inverter.)

● : LED light off, ◐ : LED blink, ☼ : LED light.

* By initializing control constants using the digital operator, errors may be released. For details of constant initialization, refer to "PASSWORD SETTING" on page 95.

1.6.5 Digital Operator Display

When the inverter power supply is turned ON for the first time, the digital operator displays as shown below. If an alarm is displayed, refer to Par. 1.8 "FAULT DISPLAY AND TROUBLESHOOTING" on page 46 to remove the factor. For details of the digital operator display, refer to Par. 2.2 "DESCRIPTION OF DIGITAL OPERATOR DISPLAY AND OPERATING SECTIONS" on page 66. (In this paragraph, the status is where no command is input to the inverter).

① Drive mode display (DRIVE) : Lights.

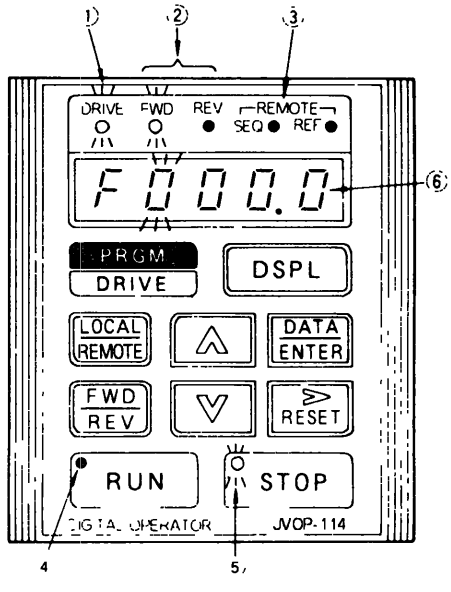
② Rotating direction display (FWD) : Lights.
(REV) : Extinguished.

③ REMOTE mode display (REMOTE SEQ, REF) : Extinguished.

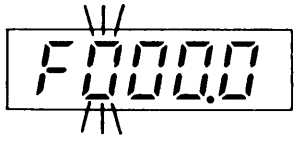
④ During RUN display (RUN) : Extinguished.

⑤ During STOP display (STOP) : Lights.

⑥ 7-segment LED display (5 digits) :
Output frequency reference set value



⇩



1.6.6 Check Points at Test Run

The following describes the check points at test run. If any fault occurs, recheck the wiring and load status. For details, refer to Par. 1.8.3 "Corrective Action for Motor Faults" on page 52.

- Motor rotates smoothly.
- Motor rotates in the proper direction.
- Motor does not have any abnormal vibration or beat.
- Acceleration or deceleration goes smoothly.
- Current suitable for load flows.
- Status display LEDs or digital operator display is proper.

PRECAUTIONS

(1) The motor does not start up if both FWD and REV run signals are turned ON simultaneously. If they are turned ON simultaneously during run, the motor stops according to the stopping method selection of constant (No.01) 3rd digit. (Deceleration to a stop is selected for factory setting.)

(2) If a fault occurs during acceleration or deceleration and the motor coasts to a stop, check the motor stop and then the following items. For details, refer to Par. 1.8 "FAULT DISPLAY AND TROUBLESHOOTING" on page 46.

- Load is not excessively large.
- Accel/decel time is long enough for load.

(3) Resetting must be performed by fault reset input signal (or [>RESET] key of the digital operator) or by turning OFF the power supply.

(4) If an input contactor is used to start and stop the inverter, the maximum number of starts/hour is 1.

1.7 MAINTENANCE

1.7.1 Periodical Inspection

VS-606PC3 requires very few routine checks. It will function longer if it is kept clean, cool and dry, while observing the precautions listed in "Location" (Par. 1.4.3). Check for tightness of electrical connections, discoloration or other signs of overheating. Use Table 1.7 as the inspection guide. Before servicing, turn OFF AC main circuit power and be sure that CHARGE lamp is OFF.

Table 1.7 Periodical Inspection

Component	Check	Corrective Action
External Terminals, Unit Mounting Bolts, Connectors, etc.	Loosened screws	Tighten
	Loosened connectors	Tighten
Cooling Fins	Build-up of dust or dirt	Blow with dry compressed air of 39.2×10^4 to 58.8×10^4Pa [57 to 85 psi (4 to 6 kg·cm^2)] pressure.
Printed Circuit Board	Accumulation of conductive dust or oil mist	Blow with dry compressed air of 39.2×10^4 to 58.8×10^4Pa [57 to 85 psi (4 to 6 kg·cm^2)] pressure. If dust and oil cannot be removed, replace the inverter unit.
Cooling Fan	Abnormal noise or vibration. Whether the cumulative operation time exceeds 20,000 hours or not.	Replace the inverter unit.
Power Elements, Smoothing Capacitor	Abnormal odor	Replace the inverter unit.

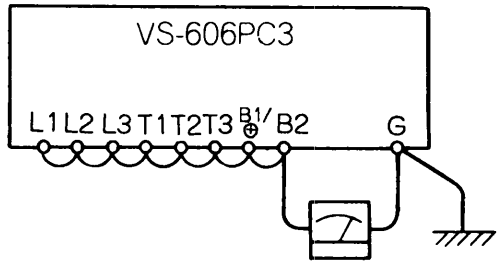
Note Do not remove the front cover of enclosed wall-mounted type (NEMA1) or the unit cover of water and dust tight type (NEMA4), or failure may occur

1.7.2 High Voltage Test

Use an insulation resistance tester (500 V) to conduct insulation resistance test (high voltage test) on the main control circuit as described below.

(1) Remove the inverter main circuit and control circuit terminal wiring and execute the test only between the main circuit terminals and ground (ground terminal G) as shown in Fig. 1.9.

(2) The equipment is normal with the insulation resistance tester indicating 1MΩ or more.



Note : Do not conduct high voltage test on the control circuit terminals.

Fig. 1.9 High Voltage Test

1.8 FAULT DISPLAY AND TROUBLESHOOTING

If a fault occurs and the inverter functions are lost, check for the causes and provide proper corrective actions, referring to the following checking method.

Contact your YASKAWA representative if any fault other than described below occurs, if the inverter itself malfunctions, if any parts are damaged, or if you have any other problems. A list of the YASKAWA representatives is available on the last page.

1.8.1 Checking of Causes

The inverter has protective functions to protect it from faults such as overcurrent or overvoltage. If a fault occurs, the protective functions operate to shut off the inverter output and the motor coasts to a stop. At the same time, the fault contact signal is output.

When the protective functions operate in models with indicating cover, the digital display unit displays a fault shown in Table 1.8. Also when the digital operator is used, the fault display is provided.

Operation can be restarted by turning ON the fault reset input signal (or [>/RESET] key of the digital operator) or turning OFF the power supply and ON again.

Table 1.8 Fault Display and Contents

Fault Display			Contents	Possible Cause/ Corrective Actions
Digital Operator	Inverter LED Display*			
	DS1 (GR)	DS2 (RD)		
OC (Over-current) oC	◐	☼	Inverter output current exceeds 200% of rated current. (Momentary action)	The following causes can be considered : inverter output side short-circuit, excessive load inertia (J), excessively short setting of accel/decel time, [constant (No. 09 to 12)] special motor use, motor start during coasting, start of motor with larger capacity than inverter, inverter output side magnetic contactor ON/OFF. Reset after finding the cause.
GF (Ground Fault) GF	◐	☼	Inverter output side is grounded.	Check that the motor or load side wiring is not grounded.
OV (Main Circuit Over-voltage) ou	●	☼	Main circuit DC voltage exceeds 410 V or more for 230 V class, 820 V or more for 460 V class because of excessive regenerative energy from motor (Exceeds overvoltage protection level.)	Decel time setting is not sufficient. [constant (No. 10, 12)] or minus load (cranes, etc.) is decreasing. Increase decel time or connect a braking resistor (option).
UV (Main Circuit Under-voltage) Uu 1	●	☼	Undervoltage occurred is entered. [Main circuit DC voltage becomes approx 210 V or less (230 V class 3-phase), 170 V or less (240 V class single-phase) or 420 V or less (460 V class 3-phase)].	Input power supply voltage is reduced, phases are opened or momentary power loss occurs, etc Check the power supply voltage, or check that main circuit power supply wiring is connected properly or terminal screws are tightened well.
OH (Cooling Fin Overheat) oH	☼	◐	Temperature rise caused by inverter overload operation, or intake air temperature rise. Cooling fan r/min is decreased	Load is too large, V/f characteristics are not proper, setting time is too short or intake air temperature exceeds 113°F(45°C), etc Correct load size, V/f set value [constant (No 02 to 08)] or intake air temperature Check the cooling fan

Table 1.8 Fault Display and Contents (Cont'd)

Fault Display			Contents	Possible Cause/ Corrective Actions
Digital Operator	Inverter LED Display*			
	DS1 (GR)	DS2 (RD)		
OL1 (Motor Overload) oL 1	☼	◐	Motor overload protection operates because of electronic thermal overload.	Correct load size, operation pattern or V/f set value [constant (No. 02 to 08)]. Set the rated current value described in the motor nameplate to constant (No. 19).
OL2 (Inverter Overload) oL2	☼	◐	Inverter overload protection operates because of electronic thermal overload.	Correct load size, operation pattern or V/f set value [constant (No. 02 to 08)]. Recheck the inverter capacity.
OL3 † (Overtorque Detection) oL3	☼	◐	Motor current exceeding set value is applied because of machine fault or overload.	Check the machine using status and remove the cause. Or increase the set value up to the machine allowable value [constant (No. 41)].
EF3, 4, 5 ‡ (External Fault) EF3, EF4, EF5	◐	◐	Inverter accepts external fault input from external circuit.	Check the external circuitry (sequence).
CPF# (Control Function Fault) CPF ...	☼	☼	Inveter control functions are broken down.	Turn OFF the power supply once and then turn it ON again. Or initialize the control constant by using the digital operator. If the fault still exists, replace the inverter.
	●	●		
Digital display is extinguished.	●	●	·Main circuit fuse is blown. (for 460 V class only) ·Control power supply fault ·Hardware fault	Replace the inverter

* LED display ☼: light ◐: blink ● light off

† For OL3 (overtorque detection), fault display or alarm display can be selected according to the constant (No.37) setting. For details, refer to "OVERTORQUE DETECTION FUNCTION" on page 124.

‡ EF3 shows external fault input from multifunction contanct input terminal ③, EF4 from terminal ④ and EF5 from terminal ⑤.

For details of CPF (control function faults), refer to Table 1 9, "Details of CPF Display".

Table 1.9 Details of CPF Display

Fault Display			Contents	Corrective Actions
Digital Operator	Inverter LED Display*			
	DS1 (GR)	DS2 (RD)		
CPF-00 CPF00	●	●	Initial memory fault is detected.	Turn OFF the power supply once and turn it ON again. If the fault still exists, replace the inverter.
CPF-01 CPF01	●	●	ROM fault is detected.	Turn OFF the power supply once and turn it ON again. If the fault still exists, replace the inverter.
CPF-04 CPF04	☼	☼	Constant fault is detected.	Record all data, and then make initialization. Turn OFF the power supply once and turn it ON again. If the fault still exists, replace the inverter. For initialization of constants, refer to Par. 2.5.1 "Constant Initialization" on page 76.
CPF-05 CPF05	☼	☼	AD converter fault is detected.	Turn OFF the power supply once and turn it ON again. If the fault still exists, replace the inverter.

* LED display ☼: light ●: light off

1.8.2 Alarm Display and Contents

Alarms, among inverter protective functions, do not operate fault contact output and returns to the former operation status automatically when the factor is removed.

The following shows the types and contents.

Table 1.10 Alarm Display and Contents

Alarm Display			Contents	Possible Cause/ Corrective Actions
Digital Operator	Inverter LED Display*			
	DS1 (GR)	DS2 (RD)		
EF (Simultaneous Input of FWD and REV commands) EF blinks.	●	◐	Both FWD and REV commands are "closed" for 500 ms or larger. Inverter stops according to constant No. 01.	Check the control interface circuit.
BB (External Baseblock) bb blinks.	●	◐	External baseblock is input. Inverter output shuts off. (Operation restarts when the external baseblock signal is removed. For the external baseblock signal, refer to "MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION" on page 115	Check the control interface circuit.

Alarm Display			Contents	Possible Cause/ Corrective Actions
Digital Operator	Inverter LED Display*			
	DS1(GR)	DS2 (RD)		
UV (Main Circuit Under-voltage) Uu blinks.	●	◐	Main circuit DC voltage is reduced less than detection level when inverter is not outputting.	Check the power supply voltage, main circuit power supply wiring connection or terminal screw tightening.
OL3 (Overtorque Detection) † oL3 blinks.	●	◐	Motor current exceeding the set value flows due to machine fault or overload. Inverter continues operation.	Check the machine using status and remove the cause of the fault. Or increase the set value [constant (No 41)] up to the machine allowable value
O V (Main Circuit Over-voltage) ou blinks.	●	◐	Main circuit DC voltage is more than over-voltage detection level when inverter is not outputting.	Check the power supply voltage.
O H (Cooling Fin Overheat) oH blinks.	●	◐	Intake air temperature rises when inverter is not outputting	Check the intake air temperature.

* LED display ◐ : blink ● light off

† For OL3 (overtorque detection), fault display or alarm display can be selected according to the constant (No 40) setting. For details, refer to "OVERTORQUE DETECTION FUNCTION" on page 124

1.8.3 Corrective Action for Motor Faults

Table 1.11 shows the check points and corrective actions of motor faults.

Table 1.11 Motor Faults and Corrective Actions

Fault	Check Point	Corrective Action
Motor does not rotate.	Power supply voltage is applied to power supply terminals L1, L2, L3 (Check that charge lamp is ON.)	Turn ON the power supply. Turn OFF the power supply and then ON again. · Check power supply voltage. · Check that terminal screws are tight.
	Voltage is output to output terminals T1, T2, T3 (Use rectifier type voltmeter.)	· Turn OFF the power supply and then ON again.
	Load is excessively large. (Motor is locked.)	Reduce the load. (Release the lock.)
	Fault is displayed.	Check according Par. 1.7 1
	FWD or REV run command is entered.	Correct the wiring.
	Frequency setting voltage is entered.	Correct the wiring. Check frequency setting voltage
	Operation (method selection) mode setting is proper	Check the operation method selection mode [constant (No. 01)] by using the digital operator
Motor rotating direction is reversed.	Wiring of output terminals T1, T2 and T3 is correct.	Match them to the phase order of motor T1, T2 and T3
	Wiring of FWD and REV run signals is correct.	Correct the wiring

Table 1.11 Motor Faults and Corrective Actions (Cont'd)

Fault	Check Point	Corrective Action
Motor rotates but variable speed is not available.	Wiring of frequency setting circuit is correct.	Correct the wiring.
	Operation (method selection) mode setting is correct.	Check operation method selection mode [constant (No. 01)] by digital operator.
	Load is not excessively large.	Reduce the load.
Motor r/min is too high (low).	Motor ratings (number of poles, voltage) are proper.	Check the specifications and nameplate.
	Maximum frequency set value is correct.	Check the maximum frequency set value [constant (No.02)]
	Voltage between motor terminals is not excessively reduced. (Use rectifier type voltage.)	Check V/f characteristic set value [constant (No 02 to 08)].
Motor r/min is not stable during operation*	Load is not excessively large	Reduce the load.
	Load variation is not excessively large.	Reduce the load variation Increase the inverter or motor capacity.
	3-phase power supply is used There is no open phase	Reconnect properly to prevent open phase.
	Single-phase power supply is used.	Connect an AC reactor to the power supply.

* Because of motor and load (geared machine) characteristics, motor r/min becomes unstable or motor current ripples. To correct these problems, changing the inverter control constants may be effective Refer to "CONSTANTS EFFECTIVE FOR REDUCTION OF MACHINE VIBRATION OR SHOCK" on page 129 for details of control constants to be changed.

1.9 SPECIFICATIONS

1.9.1 Specifications

Voltage Class			230 V 3-phase							
Inverter Model CIMR-PCU			20P1	20P2	20P4	20P7	21P5	22P0	22P2	23P7
Max Applicable Motor Output HP (kW)*		NEMA1	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	1.5 (1.5)	2.0 (2.0)	3 (2.2)	5 (3.7)
		NEMA4	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	2.0 (1.5)	—	3 (2.2)	5 (3.7)
Output Characteristics	Inverter Capacity kVA	NEMA1	0.3	0.6	1.1	1.9	2.5	2.8	4.2	6.7
		NEMA4	0.3	0.6	1.1	1.9	2.8	—	4.2	6.7
	Rated Output Current A	NEMA1	0.8	1.5	3	5	6.5	7.3	11	17.5
		NEMA4	0.8	1.5	3	5	7.3	—	11	17.5
	Max. Output Voltage V		3-phase, 200 to 230 V (proportional to input voltage)							
	Max. Output Frequency Hz		400 Hz (available with constant setting)							
Power Supply	Rated Input Voltage and Frequency		3-phase 200 to 230 V, 50/60 Hz							
	Allowable Voltage Fluctuation		±10%							
	Allowable Frequency Fluctuation		± 5%							
Control Characteristics	Control Method		Sine wave PWM							
	Frequency Control Range		0.1 to 400Hz							
	Frequency Accuracy (Temperature Change)		Digital command : 0.01% (+14 to 104°F, −10 to +40°C), Analog command : 0.1% (77±50°F, 25±10°C)							
	Frequency Setting Resolution		Digital operator reference . 0.1 Hz, Analog reference 0.06/60 Hz							
	Output Frequency Resolution		0.1Hz							
	Overload Capacity		150% rated output current for one minute							
	Frequency Setting Signal		0 to 10 VDC (20kΩ), 4 to 20mA (250Ω)							
	Accel/Decel Time		0.1 to 600 sec (accel/decel time set independently)							
	Approx Braking Torque †	NEMA1	150%		100%		50%	20%		
		NEMA4	150%		100%		20%	—	20%	
	V/f Characteristic		Possible to set any of V/f pattern							
	Stall Prevention Level		Possible to set operating current							
Protective Functions	Instantaneous Overcurrent		Motor coasts to a stop at approx. 200% of inverter rated current.							
	Overload		Motor coasts to a stop after 1 minute at approx. 150% of inverter rated output current							
	Ground Fault		Protected by electronic circuit							
	Motor Overload Protection		Electronic thermal overload relay							
	Overvoltage		Motor coasts to a stop if main circuit DC voltage exceeds 410 VDC							
	Undervoltage		Activated when DC voltage drops below 210 VDC							
	Momentary Power Loss		Stops if power loss is 15 ms or longer (preset prior to shipping) (operation can automatically restart after recovery from momentary power loss of up to approx. 2 seconds) ‡							
	Cooling Fin Overheat		Protected by thermoswitch (only for units with fan)							
	Power Charge Indication		Charge lamp stays ON until main circuit DC voltage drops below 50 V							

* Our standard 4-pole motor is used to determine max. applicable motor output

Voltage Class				230 V 3-phase							
Inverter Model CIMR-PCU				20P1	20P2	20P4	20P7	21P5	22P0	22P2	23P7
Operation Conditions	Input Signals	Operation Signal		Forward run/reverse run by separate commands							
		Fault Reset		Releases protection while the function is operating							
		Multifunction Input Selection		Multifunction contact input 3 of the following signals available to select. External fault, multispeed command, jog operation, accel/decel time select, 3-wire sequence, external baseblock, speed search command							
	Output Signals	Operation State	Photo-coupler Output	Multifunction contact output · two of the following signals available to select (48 VDC, 50 mA or less) (During running output, zero speed, frequency agreement, output frequency ≧ set value, during overtorque detection, etc)							
			Contact Output	Possible to select these functions as multifunction outputs · 1 NO/NC contact output (250 VAC 1 A, 30 VDC 1 A or less) (During running output, zero speed, frequency agreement, output frequency ≧ set value, during overtorque detection, etc)							
	Built-in Function			The following setting-up is available. frequency reference bias/gain, upper/lower frequency limit. DC injection braking current/time at starting/stopping, full-automatic torque boost, frequency meter calibrating gain, fault retry, prohibited frequency, S-curve accel/decel.							
	Monitor Display Function	LED Status Display		Displays contents at RUN/STOP and protective function operation.							
		Digital Operator		Displays set frequency, output frequency, output current, direction of rotation, and the fault status.							
		Analog Output Monitor		Analog output (0 to 10 VDC) Possible to select output frequency or output current							
Protective Configuration				Enclosed wall-mounted type (NEMA1), water and dust tight type (NEMA4)							
Cooling Method		NEMA1		Self-cooling					Forced-cooling		
		NEMA4		Self-cooling			Forced-cooling		—	Forced-cooling	
Mass lb (kg)		NEMA1		24 (11)			44 (2)		73 (33)		
		NEMA4		44 (2)		66 (3)		88 (4)	—	8.8 (4)	132 (6)
Environmental Conditions	Ambient Temperature			+14 to 104°F (−10 to +40°C) (not frozen)							
	Storage Temperature #			−4 to 140°F (−20 to +60°C)							
	Humidity			90% RH or less(non-condensing)							
	Vibration			Up to 9.8 m/s² (1G) at less than 20 Hz, Up to 2 m/s² (0.2 G) at 20 to 50 Hz							

† The values show a short-term average deceleration torque when the motor single-unit decelerates from 60 Hz at the shortest distance. It is not a continuous regenerative torque.
Average deceleration torque is changed by the motor loss. If the motor operates exceeding the base frequency, this value is reduced. When a large regenerative torque is needed, use an optional braking resistor.

‡ To select "automatic restart after momentary power loss," set the 1st digit of constant (No. 46) to "1." Automatic restart is available for up to 1 second for models CIMR-PCU20P7 or less or up to 2 seconds for models CIMR-PCU21P5 or greater.

Temperature during shipping (for short period)

Voltage Class			240 V Single-phase						
Inverter Model CIMR-PCU			B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7*
Max. Applicable Motor Output HP (kW)*		NEMA1	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	1.5 (1.5)	3 (2.2)	5 (3.7)
		NEMA4	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	—
Output Characteristics	Inverter Capacity kVA	NEMA1	0.3	0.6	1.1	1.9	2.5	4.2	6.7
		NEMA4	0.3	0.6	1.1	1.9	2.8	4.2	—
	Rated Output Current A	NEMA1	0.8	1.5	3.0	5.0	6.5	11.0	17.5
		NEMA4	0.8	1.5	3.0	5.0	7.3	11.0	—
	Max. Output Voltage V		3-phase, 200 to 240 V (proportional to input voltage)						
	Max. Output Frequency Hz		400 Hz (available with constant setting)						
Power Supply	Rated Input Voltage and Frequency		Single-phase 200 to 240 V, 50/60 Hz						
	Allowable Voltage Fluctuation		±10%						
	Allowable Frequency Fluctuation		± 5%						
Control Characteristics	Control Method		Sine wave PWM						
	Frequency Control Range		0.1 to 400Hz						
	Frequency Accuracy (Temperature Change)		Digital command : 0.01% (+14 to 104°F, −10 to +40°C), Analog command : 0.1% (77±50°F, 25±10°C)						
	Frequency Setting Resolution		Digital operator reference : 0.1 Hz, Analog reference : 0.06/60 Hz						
	Output Frequency Resolution		0.1Hz						
	Overload Capacity		150% rated output current for one minute						
	Frequency Setting Signal		0 to 10 VDC (20kΩ), 4 to 20mA (250Ω)						
	Accel/Decel Time		0.1 to 600 sec (accel/decel time set independently)						
	Approx Braking Torque †	NEMA1	150%		100%		50%	20%	
		NEMA4	150%		100%		20%	20%	—
	V/f Characteristic		Possible to set any of V/f pattern						
	Stall Prevention Level		Possible to set operating current						
Protective Functions	Instantaneous Overcurrent		Motor coasts to a stop at approx. 200% of inverter rated current.						
	Overload		Motor coasts to a stop after 1 minute at approx 150% of inverter rated output current						
	Ground Fault		Protected by electronic circuit						
	Motor Overload Protection		Electronic thermal overload relay						
	Overvoltage		Motor coasts to a stop if main circuit DC voltage exceeds 410 VDC						
	Undervoltage		Activated when DC voltage drops below 170 VDC						
	Momentary Power Loss		Stops if power loss is 15 ms or longer (preset prior to shipping) (operation can automatically restart after recovery from momentary power loss of up to approx 2 seconds)#						
	Cooling Fin Overheat		Protected by thermoswitch (only for units with fan)						
	Power Charge Indication		Charge lamp stays ON until main circuit DC voltage drops below 50 V						

* Water and dust tight type is not provided for model B3P7.

† Our standard 4-pole motor is used to determine max applicable motor output

Voltage Class				240 V Single-phase						
Inverter Model CIMR-PCU				B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7*
Operation Conditions	Input Signals	Operation Signal		Forward run/reverse run by separate commands						
		Fault Reset		Releases protection while the function is operating.						
		Multifunction Input Selection		Multifunction contact input . 3 of the following signals available to select External fault, multispeed command, jog operation, accel/decel time select, 3-wire sequence, external baseblock, speed search command						
	Output Signals	Operation State	Photo-coupler Output	Multifunction contact output two of the following signals available to select (48 VDC, 50 mA or less) (During running output, zero speed, frequency agreement, output frequency ≧ set value, during overtorque detection, etc)						
			Contact Output	Possible to select these functions as multifunction outputs 1 NO/NC contact output (250 VAC 1 A, 30 VDC 1 A or less) (During running output, zero speed, frequency agreement output frequency ≧ set value, during overtorque detection, etc)						
	Built-in Function			The following setting-up is available frequency reference bias/gain, upper/lower frequency limit. DC injection braking current/time at starting/stopping, full-automatic torque boost, frequency meter calibrating gain, fault retry, prohibited frequency, S-curve accel/decel.						
	Monitor Display Function	LED Status Display		Displays contents at RUN/STOP and protective function operation						
		Digital Operator		Displays set frequency, output frequency, output current, direction of rotation, and the fault status.						
		Analog Output Monitor		Analog output (0 to 10 VDC) Possible to select output frequency or output current						
Protective Configuration				Enclosed wall-mounted type (NEMA1), water and dust tight type (NEMA4)						
Cooling Method		NEMA1		Self-cooling					Forced-cooling	
		NEMA4		Self-cooling				Forced-cooling		—
Mass lb (kg)		NEMA1		4.9 (2.2)			6.6 (3)		10.6 (4.8)	11.0 (5)
		NEMA4		6.6 (3)			8.8 (4)		12.4 (5.6)	—
Environmental Conditions	Ambient Temperature			+14 to 104°F (−10 to +40°C) (not frozen)						
	Storage Temperature **			−4 to 140°F (−20 to +60°C)						
	Humidity			90% RH or less (non condensing)						
	Vibration			Up to 9.8 m/s² (1G) at less than 20 Hz, Up to 2 m/s² (0.2 G) at 20 to 50 Hz						

‡ The values show a short-term average deceleration torque when the motor single-unit decelerates from 60 Hz at the shortest distance It is not a continuous regenerative torque Average deceleration torque is changed by the motor loss If the motor operates exceeding the base frequency, this value is reduced When a large regenerative torque is needed, use an optional braking resistor

To select "automatic restart after momentary power loss," set the 1st digit of constant (No 46) to "1" Automatic restart is available for up to 1 second for models CIMR-PCUB0P7 or less or up to 2 seconds for models CIMR-PCUB1P5 or greater

** Temperature during shipping (for short period)

Voltage Class		460 V 3-phase					
Inverter Model CIMR-PCU		40P2	40P4	40P7	41P5	42P2	43P7
Max Applicable Motor Output HP (kW)*		0.5 (02)	0.75 (0.4)	1.5 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)
Output Characteristics	Inverter Capacity kVA	0.8	1.2	2	3	3.7	6.1
	Rated Output Current A	1	1.6	2.6	4	4.8	8
	Max Output Voltage V	3-phase, 380 to 460 V (proportional to input voltage)					
	Max Output Frequency Hz	400 Hz (available by programming)					
Power Supply	Rated Input Voltage and Frequency	3-phase 380 to 460 V, 50/60 Hz					
	Allowable Voltage Fluctuation	±10%					
	Allowable Frequency Fluctuation	± 5%					
Control Characteristics	Control Method	Sine wave PWM					
	Frequency Control Range	0.1 to 400 Hz					
	Frequency Accuracy (Temperature Change)	Digital command 0.01% (+14 to 104°F, −10 to +40°C), Analog command 0.1% (77±50°F, 25±10°C)					
	Frequency Setting Resolution	Digital operator reference . 0.1 Hz, Analog reference : 0.06/60 Hz					
	Output Frequency Resolution	0.1Hz					
	Overload Capacity	150% rated output current for one minute					
	Frequency Setting Signal	0 to 10 VDC (20kΩ), 4 to 20mA (250Ω)					
	Accel/Decel Time	0.1 to 600 sec (accel/decel time set independently)					
	Approx Braking Torque †	150%	100%		50%	20%	
	V/f Characteristic	Possible to set any of V/f pattern					
	Stall Prevention Level	Possible to set operating current					
Protective Functions	Instantaneous Overcurrent	Motor coasts to a stop at approx 200% of inverter rated current					
	Ground Fault	Protected by electronic circuit					
	Overload	Motor coasts to a stop after 1 minute at approx 150% of inverter rated output current					
	Motor Overload Protection	Electronic thermal overload relay					
	Overvoltage	Motor coasts to a stop if main circuit DC voltage exceeds 820 VDC					
	Undervoltage	Activated when DC voltage drops below 420 VDC					
	Momentary Power Loss	Stops if power loss is 15 ms or longer (setting prior to shipping) (operation can automatically restart after recovery from momentary power loss of up to approx 2 seconds) ‡					
	Cooling Fin Overheat	Protected by thermoswitch (only for fan cooled type)					
	Power Charge Indication	Charge lamp stays ON until main circuit DC voltage drops below 50 V					

* Our standard 4-pole motor is used to determine applicable motor output

† The values show a short-term average deceleration torque when the motor single-unit decelerates from 60 Hz at the shortest distance It is not a continuous regenerative torque
Average deceleration torque is changed by the motor loss. If the motor operates exceeding the base frequency, this value is reduced When a large regenerative torque is needed, use an optional braking resistor

Voltage Class				460 V 3-phase					
Inverter Model CIMR-PCU				40P2	40P4	40P7	41P5	42P2	43P7
Operation Conditions	Input Signals	Operation Signal		Forward operation/Reverse operation by separate commands					
		Fault Reset		Release protection while the function is operating					
		Multifunction Setting Input Selection		Multifunction contact input . 3 of the following signals available to select External fault, multispeed command, jog operation, accel/decel time select, 3-wire sequence, external baseblock, speed search command					
	Output Signals	Operation State	Photo-coupler Output	Multifunction contact output : two of the following signals available to select. (48 VDC, 50 mA or less) (During running output, zero speed, frequency agreement, output frequency ≧ set value, during overtorque detection, etc)					
			Contact Output	Possible to select these functions as multifunction outputs 1 NO/NC contact output (250 VAC 1 A, 30 VDC 1 A or less) (During running output, zero speed, frequency agreement, output frequency ≧ set value, during overtorque detection, etc)					
	Built-in Function			The following setting-up is available frequency reference bias/gain, upper/lower frequency limit, DC injection braking current/time at starting/stopping, full-automatic torque boost, frequency meter calibrating gain, fault retry, prohibited frequency, S-curve accel/decel					
	Monitor Display Function	LED Status Display		Displays contents at RUN/STOP and protective function operation.					
		Digital Operator (Option)		Displays set frequency, output frequency, output current, direction of rotation and the fault status.					
		Analog Output Monitor		Analog output (0 to 10 VDC). Possible to select output frequency or output current					
Protective Configuration				Enclosed wall-mounted type (NEMA1), water and dust tight type (NEMA4)					
Cooling Method		NEMA1		Self-cooling					Forced cooling
		NEMA4		Self-cooling			Forced cooling		
Mass lb (kg)		NEMA1		4 4 (2)		6 6 (3)		9 7 (4 4)	10 2 (4 6)
		NEMA4		5 7(2 6)		8 8 (4)		12 4 (5 6)	
Environmental Conditions	Ambient Temperature			+14 to 104°F (−10 to +40°C) (not frozen)					
	Storage Temperature #			−4 to 140°F (−20 to +60°C)					
	Humidity			90% RH or less (non-condensing)					
	Vibration			Up to 9 8 m/s^2 (1G) at less than 20 Hz, Up to 2 m/s^2 (0 2G) at 20 to 50 Hz					

† To select "automatic restart after momentary power loss," set the 1st digit of constant (No 46) to "1 "
Automatic restart is available for up to1 second for models CIMR-PCU40P7 or less or up to 2 seconds for models CIMR-PCU41P5 or greater

Temperature during shipping (for short period)

1.10 OPTIONS AND PERIPHERAL UNITS

1.10.1 Optional Units

Name	Model (Code No.)	Function	Installing Position
VS Operator * (Small Plastic Version)	JVOP-95-☐ † (73041-0905X-☐)	An exclusive control panel for remotely setting frequency and for turning the unit ON/OFF using analog commands (distance up to 50 m). Scale on the frequency meter : 60/120 Hz, 90/180 Hz	Separately installed
VS Operator * (Standard Version)	JVOP-96-☐ † (73041-0906X-☐)	An exclusive control panel for remotely setting frequency and for turning the unit ON/OFF using analog commands (distance up to 50 m). Scale on the frequency meter : 75 Hz, 150 Hz, 220 Hz	Separately installed
Braking Resistor Unit	LKEB-☐ (72600-K☐☐☐0)	Shortens the motor deceleration time by causing the regenerative energy to be consumed through the resistor. Available at 100% deceleration torque at 10% ED. Thermal overload relay to protect resistor overheating is built in.	Separately installed
Braking Resistor	ERF-150WJ☐☐	Shortens the motor deceleration time by causing the regenerative energy to be consumed through the resistor. Available at 100% deceleration torque at 3% ED for resistor unit only.	Separately installed

* When using VS operator connected with +12 V power supply for frequency setting (control circuit terminal 10), set constant no-22 to 1.25.
The frequency reference voltage becomes 100% of 8.0 V output frequency.

† The types of frequency indicators are to be shown in the box after the model name and the number.

Frequency Meter (max. scale)	Model (in☐)	Code No. (in☐)
60/120Hz, 75Hz	1	01
90/180Hz, 150Hz	2	02
220Hz	3	03

Name	Model (Code No.)	Function	Installing Position
Remote Interface for Digital Operator *	JVOP-112 (73606-V1120)	For remote operation of digital operator (type JVOP-116), used in combination with remote interface (RS-232C interface).	Inverter front cover.
Digital Operator	JVOP-114 (73606-V1140)	Performs operation sequence, all function selections and constant setting. Also displays frequency setting, output frequency, output current and fault. However, it cannot be used remote operation.	Inverter front cover.
Analog Input Module †	JVOP-115 (73606-V1150)	Performs multifunction analog input. ·Analog input level : 0-10 V (input impedance : approx. 20 kΩ) Analog signal function can be selected by setting constant No.35. [No.35 set value] 1 : Auxiliary frequency reference 2 : Frequency reference gain 3 : Frequency reference bias 4 : Output voltage bias	Inverter front cover.
Digital Operator *	JVOP-116 (73606-V1160)	Has the same functions as type JVOP-114 and used for remote operation in combination with remote interface.	Separately installed.

* Cannot be used for water and dust tight type (NEMA4).
† Refer to page 119.

1.10.2 Peripheral Units

Name	Model (Code No.)	Function
Frequency Meter	DCF-6A	Provided with VS operator as standard. Available as separate components for remote control from several locations.
Frequency Setter Frequency Meter Adjusting Potentiometer Frequency Setting Knob	—	
Potentiometer	—	Install at control circuit terminal for the calibration of frequency meter or ammeter and frequency reference.
AC Reactor	UZBA-□	Used for power supply coordination when power supply capacity exceeds 600 kVA, or for improvement of inverter input power factor.
Radio noise Protective Filter	LNFB□ (Single-phase) LNFD□ (Three-phase)	Use a radio noise filter to eliminate radio wave interference. It is provided at input terminals of the inverter main circuit.
VS System Module	JGSM-□	Enables optimum system configuration by combining required VS system modules according to automatic control system..
Molded-case Circuit Breaker (MCCB)	NF-□	Installation of MCCB at power supply will protect the inverter connection.
Magnetic Contactor (MC)	H1-□ E	MC is required on inverters using the dynamic braking function.
Surge Suppressor	DCR2-□	Absorbs surge currents by opening and closing of magnetic contactors and control relays. Must be installed on magnetic contactors or control relays near the inverter.
Output Voltmeter	SCF-12NH	Voltmeter for PWM inverter.
Isolator	DGP□	Isolates the inverter input and output signals to reduce induced noise.

Note : Contact your YASKAWA representative for further information.

MEMO

2. DIGITAL OPERATOR (JVOP-114)

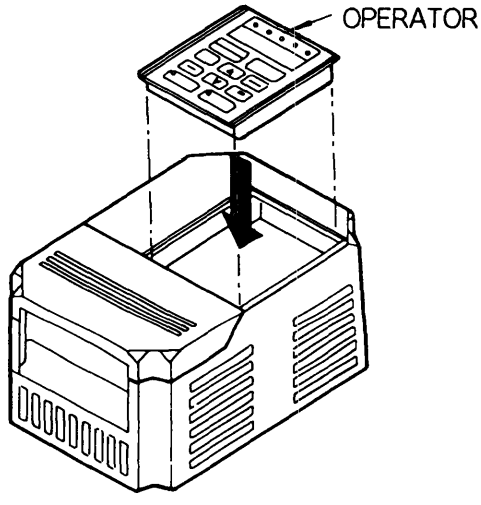
The digital operator (JVOP-114), mounted directly on the inverter, is a VS-606PC3 exclusive use operation panel which can perform operation, change the control constants and monitor operation status.

2.1 DIGITAL OPERATOR MOUNTING/REMOVING

The digital operator can be mounted and removed in the following procedures. It cannot be mounted or removed during current conduction. Be sure to turn off the inverter power supply and mount/remove it after the charge lamp is extinguished. Unless otherwise, it may cause malfunction.

How to mount operator

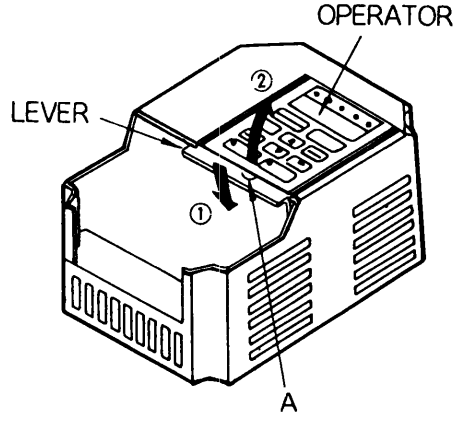
Insert the operator in the direction of the arrow mark until it goes to the end.



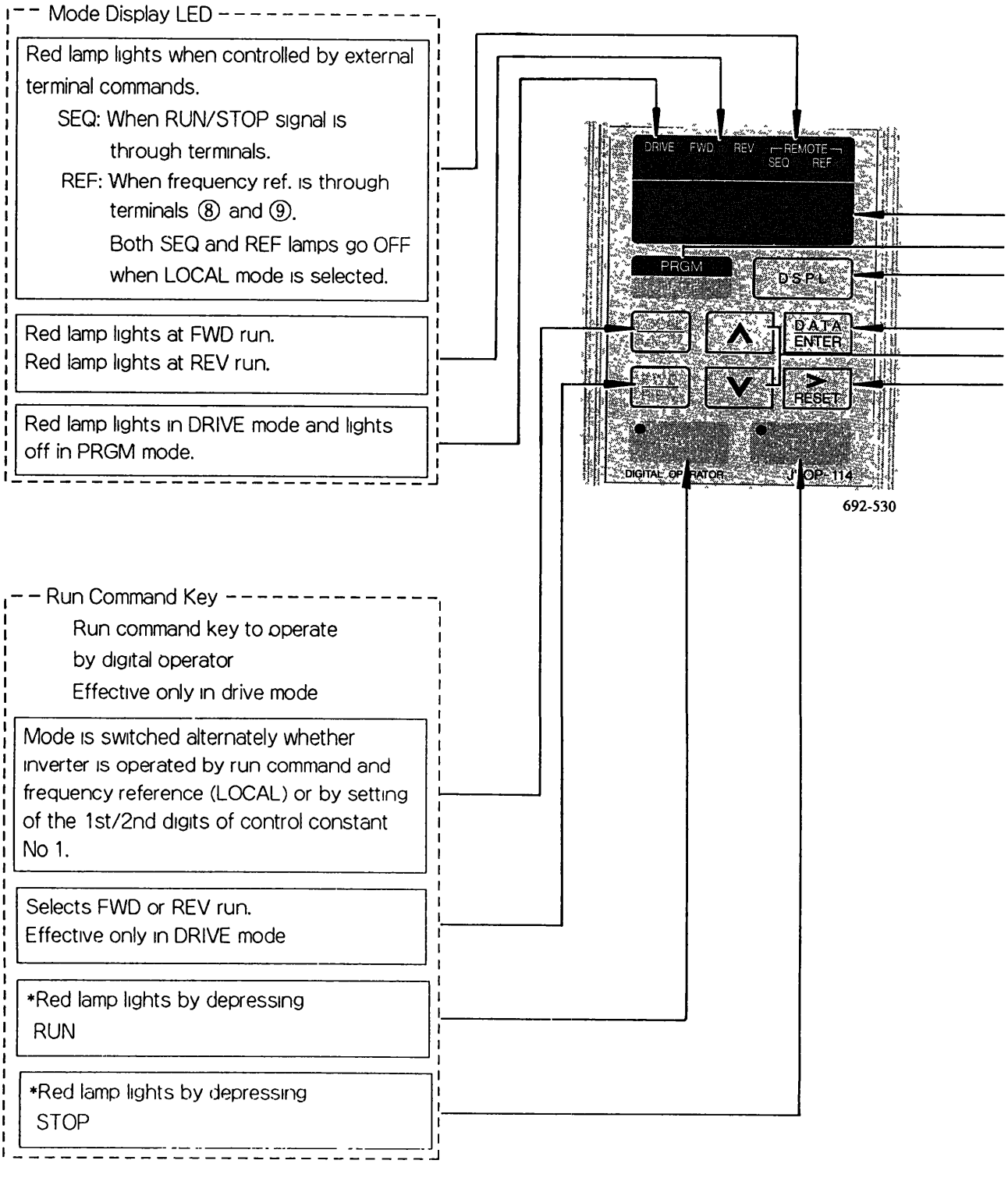
How to remove operator

(1) Remove the terminal cover (enclosed wall-mounted type) or the front cover (water and dust tight type). Refer to Par. 1.5.1.

(2) Lower the lever in the direction of ① and insert the minus driver in section A. (For water and dust tight type, it is not necessary to push down on the lever.) Then lift the operator in the direction of ② to remove it.



2.2 DESCRIPTION OF DIGITAL OPERATOR DISPLAY AND OPERATING SECTIONS



Display

Displays set value of each function or monitoring values such as frequency and output current. (5 digits)

Mode Selection Key

Depressing this key changes mode. (DRIVE or PRGM)

Display Selection Key

Depressing this key changes the display. See next page for explanation.

Read/Write Key

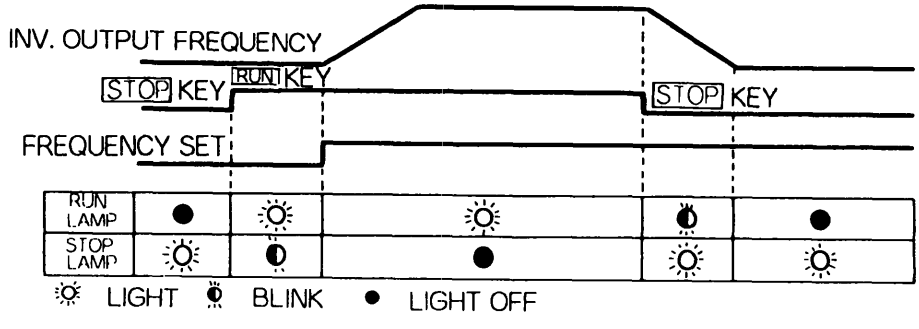
Depressing this key recalls and displays indicated data from memory. Depressing the second time enters displayed data into memory.

Numeral Change Key

Changes numeral such as set values and constant signals.
∧: Increase
∨: Decrease

Digit Selection Key

Selects numerical digits.
This key resets operation at faults



* RUN or STOP lamp charges in accordance with the operations.

2.3 FUNCTION/CONSTANT SETTING

2.3.1 DRIVE Mode and PRGM (Program) Mode

Selection of DRIVE mode or PRGM mode can be performed by using the PRGM/DRIVE key when the inverter is stopped. When function selection or a change of set value is required, switch to the PRGM mode.

- Operation is enabled.
- When stopped, LOCAL and REMOTE modes can be switched with each other by depressing LOCAL/REMOTE key.

DRIVE mode

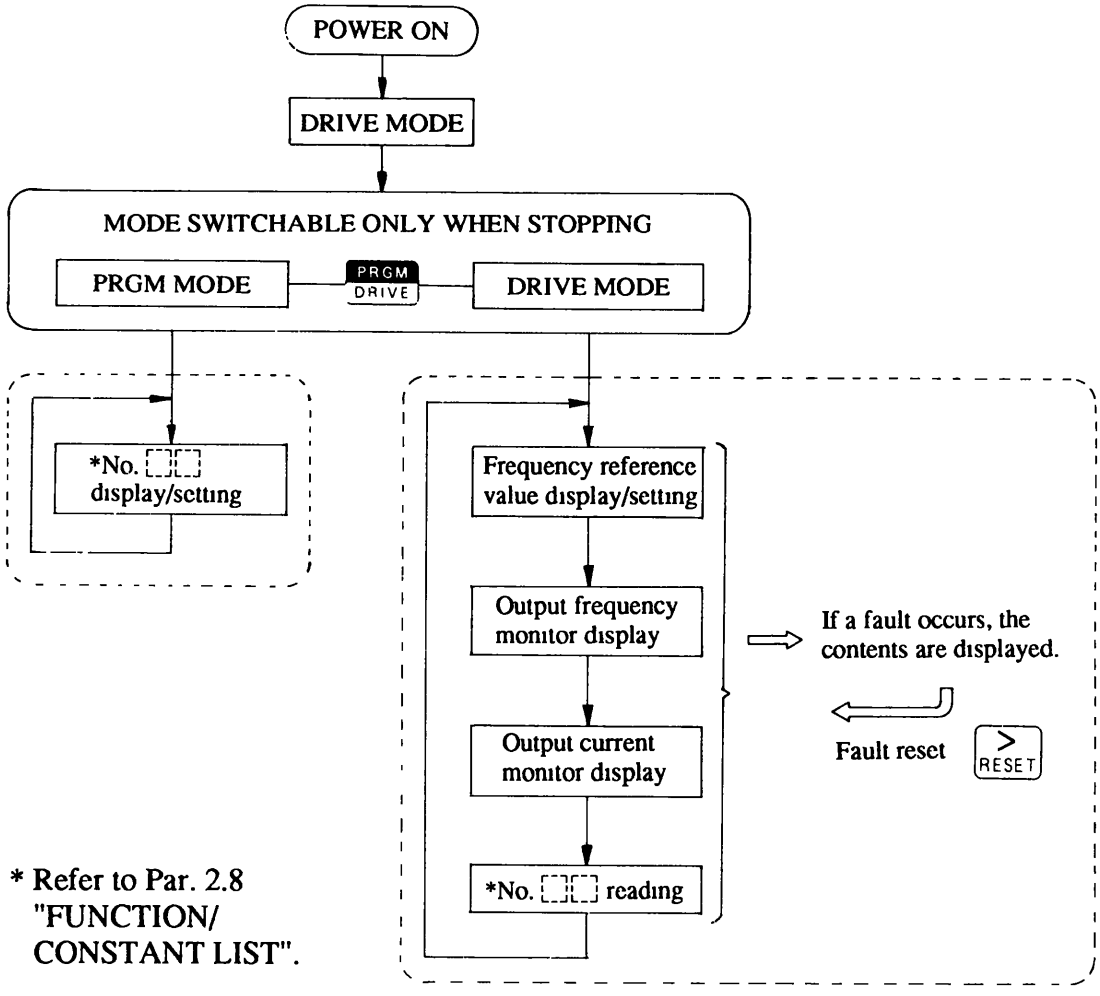
- An operation can be performed by RUN, STOP or FWD/REV keys.
- Frequency reference value can be changed during running.

PRGM mode

- Program (function selection, constant setting) can be changed. Operation is not enabled.

Display Contents of DRIVE Mode and PRGM Mode

- Display contents of the digital operator differ according to selected mode (PRGM/DRIVE).
- The constant group to be displayed is changed each time display selection key DSPL is depressed.
- If a fault occurs, the contents are displayed. Additionally, since the contents of the latest fault are stored, maintenance, inspection or troubleshooting can be performed quickly by checking the contents by the digital operator.



* Refer to Par. 2.8 "FUNCTION/ CONSTANT LIST".

2.3.2 Constant Reading and Setting

The VS-606PC3 has various functions for the optimum operation. The first functions are those basic to drive motors. The second are for basic applications. The third are more advanced application functions. Use it with the set values according to the load conditions or operation conditions of the matching machine. Control constans are read or set by the digital operator. Set constant (No.00) as follows :

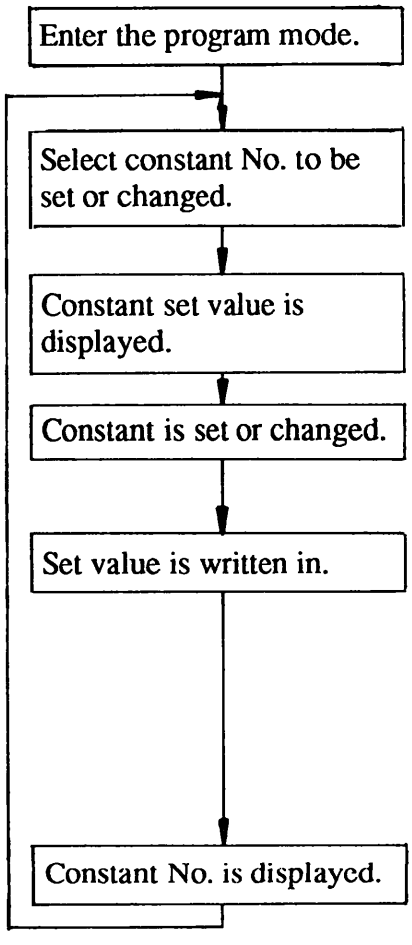
(1) 1st functions (constant Nos.00 to 19) can be set/read :
No.00 = 1 (Factory setting)

(2) 1st and 2nd functions (constant Nos.00 to 29) can be set/read :
No.00 = 2

(3) 1st, 2nd and 3rd functions (constant Nos.00 to 59) can be set/read :
No.00 = 3

<Typical setting>

- The following shows an example where acceleration time (No.09) is changed from 10 seconds to 5 seconds.
- Other constants can be changed in the same operation.



Depress PRGM/DRIVE key. — no-01

Change the value with ∧ or ∨ key. — no-09

Depress DATA/ENTER key. — 010.0

Change the value with RESET, ∧ or ∨ key. — 005.0

Depress DATA/ENTER key and check that End is displayed. (End is displayed for 1 second.) — End

The data are displayed again after End is displayed. — 005.0

Depress DSPL key to display constant No. — no-09

Note : Check that End is displayed for each constant setting. Constants cannot be changed simultaneously.

2.3.3 Precautions on Constant Setting

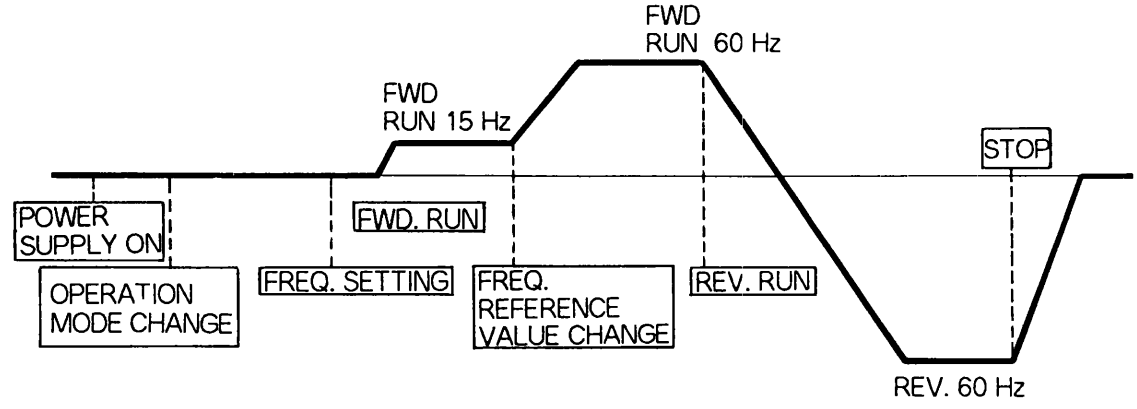
- Perform constant setting securely.
  Improper setting may cause functions not to operate or protective function to operate.
- Record the constants of which setting has been changed.
  Recording the final setting of constants is effective for maintenance or early troubleshooting. Refer to the Par. 2.8 "FUNCTION/CONSTANT LIST" which has a column for entering setting of constants on page 84.
- Change control constants little by little.
  Do not change the motor control constant setting such as V/f maximum output frequency, etc. rapidly. Change it little by little, checking the motor current or load machine status. Changing setting very rapidly may affect the inverter or machine.

- Setting Error
  In the following cases, the set value blinks for 3 seconds and the data before changing are returned.
  - When a value exceeding the setting range is set
  - If the following condition is not satisfied in the multifunction input selection constant setting :
    Multifunction input selection 1 (No. 32)=Multifunction input selection 2 (No. 33)
    Multifunction input selection 1 (No.32)=Multifunction input selection 3 (No.34)
    Multifunction input selection 2 (No.33)=Multifunction input selection 3 (No.34)
  - If the following conditions are not satisfied in the V/f constant setting :
    Max. output frequency (No. 02)≧Max. voltage output frequency (No. 04)＞Mid. output frequency (No.05)≧Min. voltage output frequency (No. 07)
    For the following setting, intermediate output frequency voltage (No. 06) is disregarded :
    Intermediate output frequency = Min. output frequency.
    For details, refer to "V/f CHARACTERISTIC SETTING" on page 102.
  - If the following condition is not satisfied in the frequency reference constant setting :
    Set frequency reference (Nos. 13 to 17)≦Max. output frequency (No. 02)×Output frequency upper limit value (No. 24)
    For details, refer to "V/f CHARACTERISTIC SETTING" on page 102 and "OUTPUT FREQUENCY LIMIT" on page 111.
  - If the following condition is not satisfied in the frequency reference upper / lower limit value setting :
    Frequency reference lower limit value (No. 25)
    ≦Frequency reference upper limit value (No. 24)

2.4 DIGITAL OPERATOR OPERATION EXAMPLE

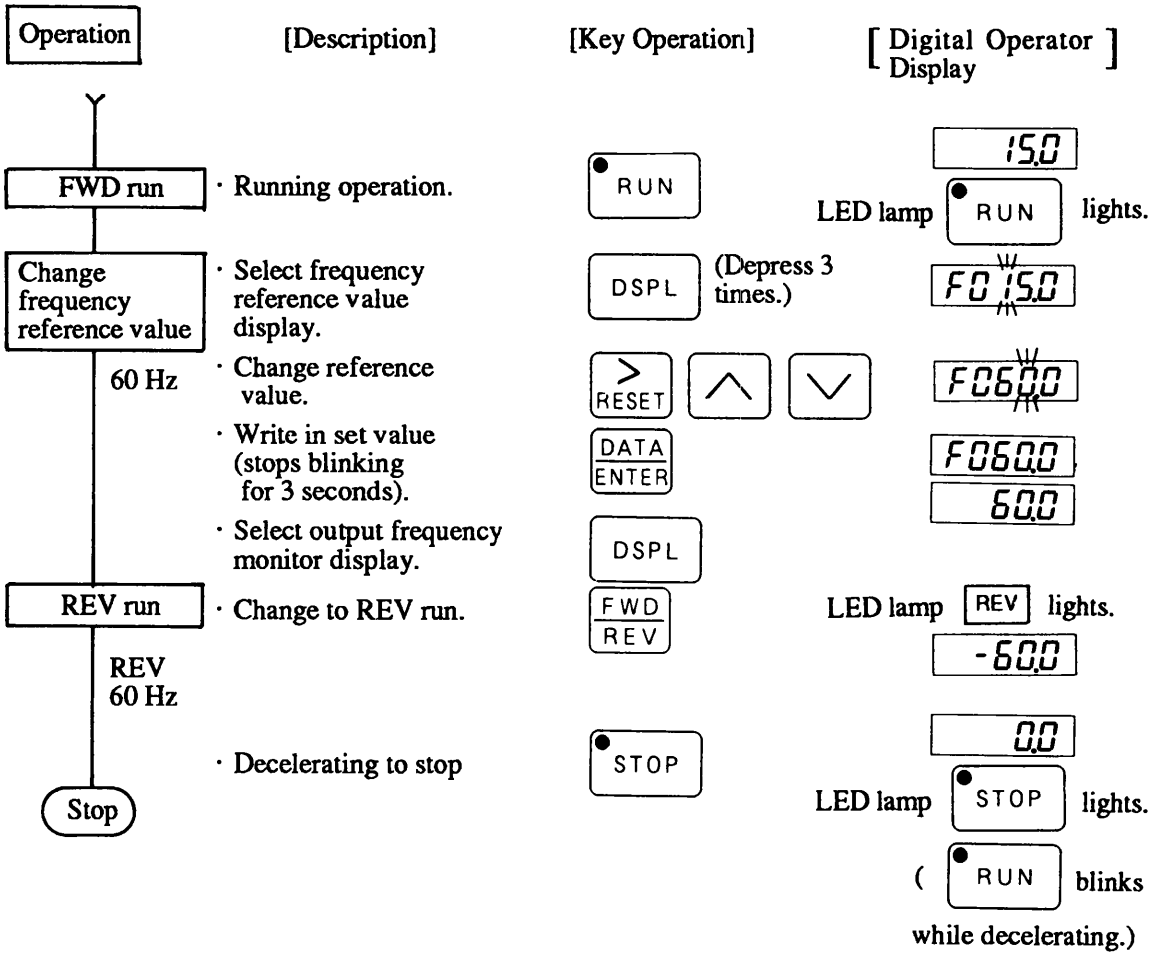
The following shows an example of digital operator operation.

Operation Pattern



Operation	[Description]	[Key Operation]	[Digital Operator Display]
Turn ON power supply	· Frequency reference value is displayed.		F000.0
	· Check rotating direction. (FWD is default on power ON.)		LED lamp [FWD] lights.
Note 1 Change operation mode.	· PRGM mode is selected.	PRGM/DRIVE	no-01
	· Constant (No.1) data is displayed.	DATA/ENTER	0000
	· Set value is changed.	>/RESET, ∧, ∨	0011
	· Set value is written in. (End is displayed for 1 second.) The data are displayed again after End is displayed.	DATA/ENTER	End 0011
Frequency Setting 15 Hz	· DRIVE mode is selected.	PRGM/DRIVE	F000.0
	· Change reference value.	>/RESET, ∧, ∨	F015.0
	· Set value is written in. (Stops blinking for 3 seconds).	DATA/ENTER	F015.0 (Stops blinking for 3 seconds.)
	· Select output frequency monitor display.	DSPL	0.0

(Cont'd)



Notes :

1. To change the operation mode to operation by digital operator, the method of selecting LOCAL mode by depressing LOCAL/REMOTE key is also available.
2. Operation mode change is not required in the inverter with digital operator. (Factory setting of models with digital operator : No. 01 = 0011)

2.5 CONSTANT INITIALIZATION AND WRITE-IN PROHIBIT

2.5.1 Constant Initialization (Operation to return to factory setting)

- Write in 8 to constant (No.00).

[Description]	[Key Operation]	[Digital Operator Display]
• Select PRGM mode.	PRGM DRIVE	no-01
• Select constant (No.00).	∨	no-00
• Constant (No.00) data is displayed.	DATA ENTER	01 *
• Change the set value.	RESET ∧ ∨	08
• Write in the set value. (End is displayed for 1 second.) The data are displayed again after End is displayed.	DATA ENTER	End 01 †

* Differs according to the setting data before changing.

† The display returns to 0 1 after write-in. This indicates that initialization is executed at writing in the data.

2.5.2 Constant Write-in Prohibit (Only constant reading possible)

· The following shows an example where 0 is written in to constant (No.00) [password (No.00) setting/reading and the first functions (constant Nos. 01 to 19) reading enabled].

[Description]	[Key Operation]	[Digital Operator Display]
· Select PRGM mode.	PRGM DRIVE	no-01
· Select constant (No.00).	∨	no-00
· Constant (No.00) data is displayed.	DATA ENTER	01 *
· Change the set value.	> RESET, ∧, ∨	00
· Write in the set value. (End is displayed for 1 second.) The data are displayed again after End is displayed.	DATA ENTER	End 00

* Differs according to the setting data before changing.
For details, refer to "PASSWORD SETTING" on page 95.

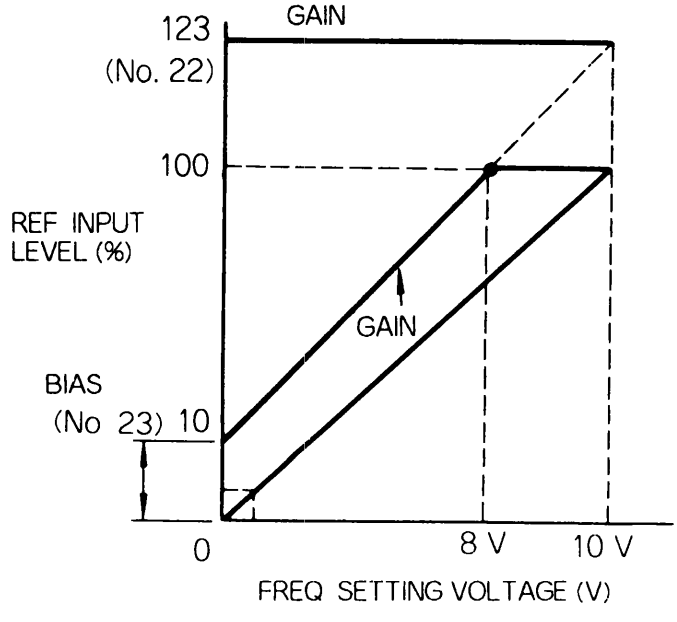
2.6 CORRECTIVE FUNCTION

2.6.1 Adjustment of Frequency Setting Value, Output Frequency Bias (No.23) and Gain (No.22)

Any desired value of output frequency for frequency set value (0 to 10V or 4 to 20mA) can be set.

<Example> Adjust so as to obtain 10% speed (6Hz) at frequency setting voltage 0V and 100% speed (60Hz) at 8V.
[Set constant (No.23)=0.10 and constant (No.22) =1.23.]

[Description]	[Key Operation]	[Digital Operator Display]
· Select PRGM mode.	PRGM/DRIVE	no.-01
<Bias> · Select constant (No.23).	∧	no-23
· Data (No.23) are displayed.	DATA/ENTER	0.00
· Change the set value.	>/RESET, ∨, ∧	0.10 (10%=0.1)
· Write in the set value. (End is displayed for 1 second.) The data are displayed again after End is displayed.	DATA/ENTER	End → 0.10



<Gain>

· Select constant (No.22).	DSPL, ∨	no-22
· Data (No.22) are displayed.	DATA ENTER	100
· Change the set value.	>RESET, ∧, ∨	123 *
· Write in the set value. (End is displayed for 1 second.) The data are displayed again after End is displayed.	DATA ENTER	End → 123

*How to calculate gain

$$x = \frac{100 - b}{a} \quad (1) \qquad G = \frac{10x + b}{100} \quad (2)$$

x can be obtained by equation (1).

$$x = \frac{100 - 10}{8} = 11.25$$

Then by substituting x obtained in equation (1) for equation (2) to obtain G :

$$G = \frac{10 \times 11.25 + 10}{100} = 1.225$$

$$= 1.23$$

a : Setting voltage at 100% frequency (V)
In this example, since 100% speed (60Hz) is obtained at 8V, a = 8.

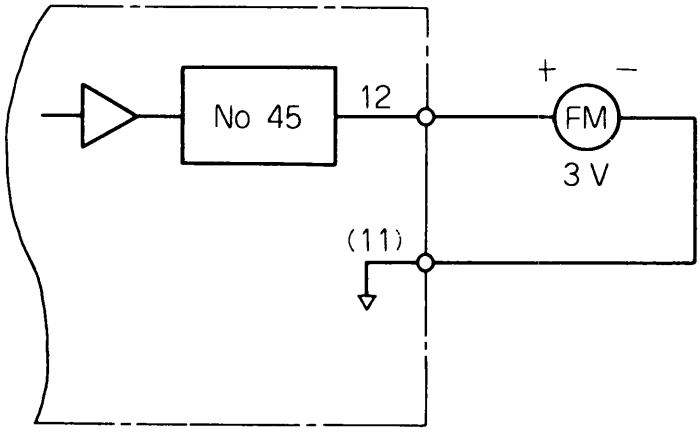
b : Bias level (%)
In this example, since 10% speed (6Hz) is obtained at frequency setting voltage 0V, b = 10.

G : Gain set value
In this example, it is 1.23.

2.6.2 Calibration of Frequency Meter/Ammeter

Calibration of frequency meter or ammeter* connected to the inverter can be performed even without providing a calibration resistor.

<Example> When the frequency meter specifications are 3V full-scale and 3V full-scale output is used at maximum output frequency [constant (No.02)] operation, set [constant (No.45)] to 0.30.



* Inverter output current can be monitored by setting constant No.21. For details, refer to "MULTIFUNCTION ANALOG OUTPUT MONITOR SETTING" on page 110.

Frequency Meter Calibration

[Description]	[Key Operation]	[Digital Operator Display]
· Select PRGM mode.	PRGM/DRIVE	no-01
· Select constant (No.45).	DSPL, ∧, ∨	no-45
· Data are displayed.	DATA/ENTER	1.00
· Change the set value.	>/RESET, ∨, ∧	0.30 10 V× 0.3 = 3.0 V*
· Write in the set value. (End is displayed for 1 second.)	DATA/ENTER	End
The data are displayed again after End is displayed.		0.30

* Since analog monitor gain is set to 1.00 prior shipping, 10V is output at maximum output frequency [constant (No.02)] operation.

Note : By data display of constant (No.45) in the program mode, voltage at 100% level according to the constant (No.45) set value is output by the meter calibrating function without any conditions.

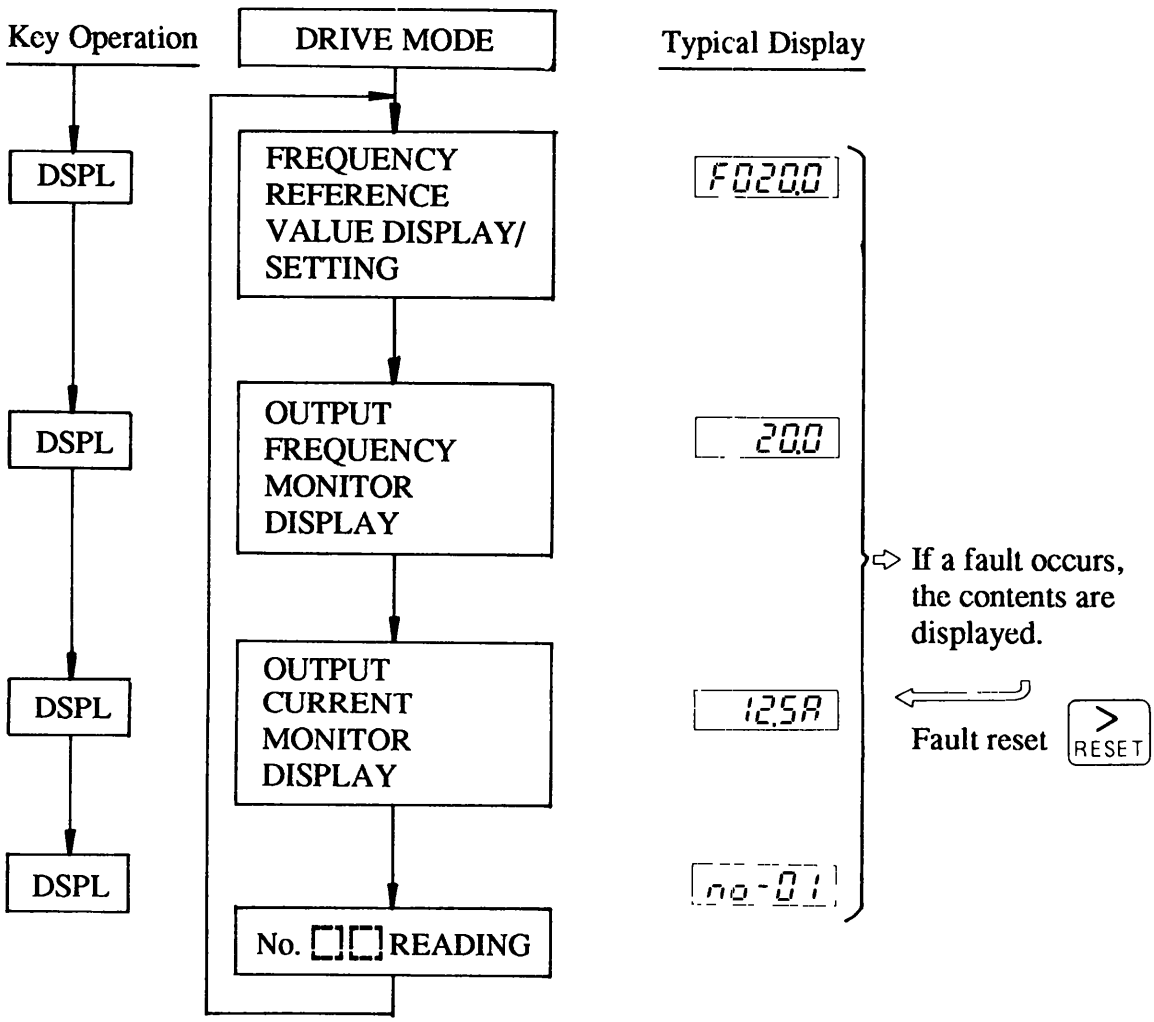
(Example) Assuming constant (No.45) = 0.30 : 10V × 0.30 = 3V is output without any conditions.

2.7 MONITOR

Frequency reference value, output frequency, output current and fault contents can be monitored.

2.7.1 Typical Monitor Contents and Display (DRIVE Mode)

The monitor item is changed every time the DSPL key is depressed.



2.7.2 Monitoring of Fault Contents

- If a fault occurs, the fault contents are displayed with priority over other display items.

  Depress the [>/RESET] key or turn on the fault reset input signal to reset the fault.
- Since the latest fault content data are stored in the inverter, even if the power supply is turned off, they can be monitored after the power supply is turned on again.

(1) Checking fault contents
The latest data are stored in the constant (No.48). (except UV)

(2) Clearing fault contents
The contents are cleared by setting "6" to the constant (No.00).
Or they are also cleared by constant initialization. [Set constant (No.00)=8 or 9.]
At this time, other constants are changed to the factory setting values. Therefore, record all of the constant data before initializing constant.

(3) Faults to be stored
OC (overcurrent), OV (overvoltage), OH (cooling fin overheat), OL1 (motor overload), OL2 (inverter overload), OL3 (overtorque detection), EF4, EF5 (external fault), CPF05 (AD converter fault).
For details, refer to Table 1.8 "Fault Display and Contents" on page 47.

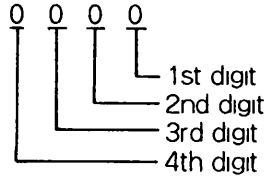
2.8 FUNCTION/CONSTANT LIST

2.8.1 First Functions (Constant Nos. 00 to 19)

Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
Constant Group Selection Fault Contents Clear Constant Initialization	00	Password	0 : Password (No. 00) setting/ reading and first function (constant Nos. 01 to 19) reading possible 1 : First function (constant Nos. 00 to 19) setting/ reading possible 2 : First and second functions (constant Nos. 00 to 29) setting/reading possible 3 : First, second and third functions (constant Nos. 00 to 59) setting/ reading possible 6 : Fault record clear 8 : Initialize (multifunction terminal : initial value setting) 9 : Initialize (3-wire sequence)	1		95
Operation Method Selection Stopping Method Selection	01*	Run Signal Selection 1	1st digit = 0 : Master frequency reference-Control circuit terminals 8 and 11, or 9 and 11 inputs = 1 : Master frequency reference-Operator FXXXX 2nd digit = 0 : Run by control circuit terminal run command = 1 : Run by operator run command 3rd digit = 0 : Deceleration to a stop = 1 : Coasting to a stop	0000 (0011)†		96
V/f Pattern Setting		Output Voltage Limiter Selection	4th digit = 0 : Free choice V/f with output voltage limiter = 1 : Free choice V/f without output voltage limiter			

* The first to fourth digits indicated in the description of constant (No 01) mean the following digits. This also applies to the other constants.

† The value in parentheses is factory set value of models with digital operator.



Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
V/f Pattern Setting	02	Maximum Output Frequency	Setting unit : 0.1 Hz, Setting range : 50.0 to 400.0 Hz	60.0 Hz		102
	03	Maximum Voltage	Setting unit : 0.1 V*, Setting range : 0.1 to 255.0 V*	230.0 V*		
	04	Maximum Voltage Output Frequency (Base Frequency)	Setting unit : 0.1 Hz, Setting range : 0.2 to 400.0 Hz	60.0 Hz		
	05	Mid. Voltage Output Frequency	Setting unit : 0.1 Hz, Setting range : 0.1 to 399.9 Hz	1.5 Hz		
	06	Mid. Output Frequency Voltage	Setting unit : 0.1 V*, Setting range : 0.1 to 255.0 V*	12.0 V*		
	07	Minimum Voltage Output Frequency	Setting unit : 0.1 Hz, Setting range : 0.1 to 10 Hz	1.5 Hz		
	08	Minimum Output Frequency Voltage	Setting unit : 0.1 V*, Setting range : 0.1 to 50 V*	12.0 V*		
First Accel/ Decel Time Setting	09	Acceler-ation Time 1	Setting unit : 0.1 s, Setting range : 0.0 to 600.0 s	10.0 s		105
	10	Deceler-ation Time 1	Setting unit . 0.1 s, Setting range . 0 0 to 600.0 s	10.0 s		
Second Accel/ Decel Time Setting	11	Acceler-ation Time 2	Setting unit . 0.1 s, Setting range : 0 0 to 600.0 s	10.0 s		
	12	Deceler-ation Time 2	Setting unit : 0.1 s, Setting range : 0.0 to 600.0 s	10.0 s		

* For 460 V class, the value is twice as that of 230 V class

Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
Frequency Reference *	13	Frequency Reference 1	Setting unit : 0 1 Hz, Setting range : 0.0 to 400.0 Hz	0.0 Hz		98
	14	Frequency Reference 2	Setting unit : 0.1 Hz, Setting range : 0.0 to 400.0 Hz	0.0 Hz		
	15	Frequency Reference 3	Setting unit : 0.1 Hz, Setting range . 0.0 to 400.0 Hz	0.0 Hz		
	16	Frequency Reference 4	Setting unit : 0.1 Hz, Setting range . 0.0 to 400.0 Hz	0.0 Hz		
	17	Jog Frequency Reference	Setting unit : 0.1 Hz, Setting range : 0.0 to 400 0 Hz	6.0 Hz		
Electronic Thermal Overload Motor Protection	18	Motor Protection Selection	1st digit = 0 · Electronic thermal overload motor protection provided = 1 : Electronic thermal overload motor protection not provided 2nd digit = 0 : Electronic thermal overload characteristics is for standard motor = 1 · Electronic thermal overload characteristics is for constant torque motor 3rd digit : Not used 4th digit : Not used	0000		109
Electronic Thermal Overload Reference Current	19	Motor Rated Current	Setting unit : 0.1 A, Setting range 10 to 120% of inverter rated current	1.9 A †		

* Can be changed even during run.
The maximum setting frequency to be set to frequency reference is the maximum frequency (No. 02).

† Initial setting differs according to the inverter capacity. The values in the above list are provided when model CIMR-PCU20P4T [0.75 HP (0 4 kW)] and YASKAWA standard motor 230 V 60 Hz 0.75 HP (0.4 kW) are combined.

The following shows the standard set value for each capacity. If the general-purpose motor rated current value is different from the standard value, change the setting.

● 230 V Class 3-phase Series

VS-606PC3 Model CIMR-PCU		20P1	20P2	20P4	20P7	21P5	22P0	22P2	23P7
Max. Applicable Motor Capacity HP (kW)	NEMA1	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	1.5 (1.5)	2.0 (2.0)	3 (2.2)	5 (3.7)
	NEMA4	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	2.0 (1.5)	—	3 (2.2)	5 (3.7)
Motor Current Value at Factory Setting A	NEMA1	0.6	1.1	1.9	3.3	6.2	6.2	8.5	14.1
	NEMA4	0.6	1.1	1.9	3.3	6.2	—	8.5	14.1

● 240 V Class Single-phase Series

VS-606PC3 Model CIMR-PCU		B0P1	B0P2	B0P4	B0P7	B1P5	B2P2	B3P7
Max. Applicable Motor Capacity HP (kW)	NEMA1	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	1.5 (1.5)	3 (2.2)	5 (3.7)
	NEMA4	0.13 (0.1)	0.25 (0.2)	0.75 (0.4)	1 (0.75)	2.0 (1.5)	3 (2.2)	—
Motor Current Value at Factory Setting A	NEMA1	0.6	1.1	1.9	3.3	6.2	8.5	14.1
	NEMA4	0.6	1.1	1.9	3.3	6.2	8.5	—

● 460 V Class 3-phase Series

VS-606PC3 Model CIMR-PCU		40P2	40P4	40P7	41P5	42P2	43P7
Max. Applicable Motor Capacity	HP (kW)	0.5 (0.2)	0.75 (0.4)	1.5 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)
Motor Current Value at Factory Setting	A	0.6	1.0	1.6	3.1	4.2	7.0

2.8.2 Second Functions (Constant Nos. 20 to 31)

Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
REV Run Prohibit	20	Run Signal Selection 2	1st digit = 0 : REV run enabled = 1 : REV run disabled	0000		96
Stall Prevention During Deceleration			4th digit = 0 : Stall prevention during deceleration provided = 1 : Stall prevention during deceleration not provided (when braking resistor connected)			113
	21	Output Monitor Selection	1st digit : Not used	0000		
Analog Monitor Selection			2nd digit = 0 : Analog monitor - output frequency = 1 : Analog monitor - output current (Analog monitor gain is set by constant No. 45.)			110
		S-curve Accel/decel Selection	3rd digit = 0 : S-curve accel/decel not provided = 1 : S-curve accel/decel provided (0.2 sec.) 4th digit : Not used			100
	22	Frequency Reference Gain	Setting unit : 0.01, Setting range : 0.01 to 2.00	1.00		107
	23	Frequency Reference Bias	Setting unit : 0.01, Setting range : -1.00 to 1.00	0.00		107

Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
Frequency Limit Control	24	Frequency Upper Limit	Setting unit : 1%, Setting range : 0 to 110%	100%		111
	25	Frequency Lower Limit	Setting unit : 1%, Setting range : 0 to 110%	0%		
DC Injection Braking	26	DC Injection Braking Current	Setting unit : 1%, Setting range : 0 to 100% of inverter rated current	50%		123
	27	DC Injection Braking Time at Stop	Setting unit : 0.1 s, Setting range : 0.0 to 5.0 s	0.0 s		
	28	DC Injection Braking Time at Start	Setting unit : 0.1 s, Setting range : 0.0 to 5.0 s	0.0 s		
Torque Compensation	29	Automatic Torque Boost Gain	Setting unit : 0.1, Setting range : 0.0 to 3.0	1.0		114
Stall Prevention	30	Stall Prevention Level while Acceleration	Setting unit : 1% Setting range : 30 to 200% of inverter rated current Note : Stall prevention during acceleration does not operate at 200%.	170%		112
	31	Stall Prevention Level during Running	Setting unit : 1% Setting range : 30 to 200% of inverter rated current Note : Stall prevention during run does not operate at 200%.	160%		

2.8.3 Third Functions (Constant Nos. 32 to 59)

Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
Multifunction Selection — Contact Input Signal	32	Multifunction Input Selection 1 (Terminal 3 Function Selection)	0 : FWD/REV run command (3-wire sequence selection) 1 : External fault (NO contact input) 2 : External fault (NC contact input) 3 : Multi-step speed reference 1 4 : Multi-step speed reference 2 5 : JOG command 6 : Accel/decel time select 7 : External baseblock (NO contact input) 8 : External baseblock (NC contact input) 9 : Search command from maximum frequency 10 : Search command from setting frequency 11 : Accel/decel hold 12 : LOCAL/REMOTE select 13 : Alarm reset	13		116
	33	Multifunction Input Selection 2 (Terminal 4 Function Selection)	1 : External fault (NO contact input) 2 : External fault (NC contact input) 3 : Multi-step speed reference 1 4 : Multi-step speed reference 2 5 : JOG command 6 : Accel/decel time select 7 : External baseblock (NO contact input) 8 : External baseblock (NC contact input) 9 : Search command from maximum frequency 10 : Search command from setting frequency 11 : Accel/decel hold 12 : LOCAL/REMOTE select 13 : Alarm reset	1		117

Function		No.	Name	Description	Initial Setting	User Set Values	Reference Page
Multifunction Selection	Contact Input Signal	34	Multifunction Input Selection 3 (Terminal 5 Function Selection)	1 . External fault (NO contact input) 2 : External fault (NC contact input) 3 : Multi-step speed reference 1 4 : Multi-step speed reference 2 5 : JOG command 6 : Accel/decel time select 7 : External baseblock (NO contact input) 8 : External baseblock (NC contact input) 9 : Search command from maximum frequency 10 : Search command from setting frequency 11 : Accel/decel hold 12 : LOCAL/REMOTE select 13 : Alarm reset	3		118
	Analog Input Signal	35	Multifunction Analog Input Selection	0 : Not used 1 : Auxiliary frequency reference 2 : Frequency reference gain 3 : Frequency reference bias 4 : Voltage bias	0		119
	Contact Output Signal	36	Multifunction Output Selection 1 (Terminals FLT-A, FLT-B, FLT-C Function Selection)	0 : Running 1 : Frequency agreement 2 : Zero speed 3 : Frequency detection (output frequency≧frequency detection level) 4 · Overtorque detection 5 : Fault 6 : Frequency detection (output frequency ≦frequency detection level) 7 . During BB 8 : During UV 9 : During speed search 10 : Operation mode (LOCAL/REMOTE)	5		121

Function		No.	Name	Description	Initial Setting	User Set Values	Reference Page
Multifunction Selection	Photo-Coupler Output Signall	37	Multifunction Output Selection 2 (Terminal 13 Function Selection)	0 : Running 1 : Frequency agreement 2 : Zero speed 3 : Frequency detection (output frequency≧frequency detection level) 4 : Overtorque detection 5 : Fault 6 : Frequency detection (output frequency≦frequency detection level) 7 : During BB 8 : During UV 9 : During speed search 10 : Operation mode (LOCAL/REMOTE)	0		121
		38	Multifunction Output Selection 3 (Terminal 14 Function Selection)	0 : Running 1 : Frequency agreement 2 : Zero speed 3 : Frequency detection (output frequency≧frequency detection level) 4 : Overtorque detection 5 : Fault 6 : Frequency detection (output frequency≦frequency detection level) 7 : During BB 8 : During UV 9 : During speed search 10 : Operation mode (LOCAL/REMOTE)	1		
Desired Speed Detection		39	Frequency Detection Level	Setting unit 0.1 Hz, Setting range 0.0 to 400.0 Hz	0.0 Hz		126

Function	No.	Name	Description	Initial Setting	User Set Value	Reference Page
Over-torque Detection	40	Overtorque Detection Function Selection	1st digit = 0 : Overtorque detection not provided = 1: Overtorque detection provided	0000		124
			2nd digit = 0 : Detected only during frequency agreement = 1: Detected during running			
			3rd digit = 0 : Operation continues after overtorque detection = 1: Output shut-off at overtorque detection			
			4th digit : Not used			
	41	Overtorque Detection Level	Setting unit : 1%, Setting range : 30 to 200% of inverter rated current	160%		
	42	Overtorque Detection Time	Setting unit : 0.1 s, Setting range : 0.1 to 10.0 s	0.1s		
Carrier Frequency Adjustment	43	Carrier Frequency	Setting unit : 1 (2.5 kHz) Setting range : 1 to 6 (2.5 to 15 kHz)	4 (10 kHz)		125
——	44	Not used	(Setting disabled.)	——		——

Function	No.	Name	Description	Initial Setting	User Set Values	Reference Page
Analog Monitor Scale Calibration	45	Analog Monitor Gain	Setting unit : 0.01, Setting range : 0.01 to 2.00	1.00		110
Momentary Power Loss Protection	46	Operation Selection after Momentary Power loss	1st digit= 0 : Continuous operation after momentary power loss not provided = 1 : Continuous operation after momentary power loss provided 2nd, 3rd, 4th digits : Not used.	0000		132
Fault Retry	47	Fault Retry Selection	Setting unit : 1 time, Setting range : 0 to 10 times Note : By setting 0 times, fault retry function becomes disabled.	0		135
Fault Trace	48	Fault Record	The latest fault is displayed (setting disabled.)	—	—	—
Software Version	49	PROM No.	PROM No. is displayed (setting disabled.)	—	—	—
Prohibited Frequency	50	Prohibited Frequency	Setting unit : 0.1 Hz, Setting range : 0.0 to 400.0 Hz	0.0 Hz		128
	51	Prohibited Width	Setting unit : 0.1 Hz, Setting range : 0.0 to 25 5 Hz	1.0 Hz		
—	52 to 59	Not Used	(Setting disabled.)	—		—

2.9 DESCRIPTION OF FUNCTIONS AND CONSTANTS

Constant Nos. are indicated as [N].

PASSWORD SETTING

Item Name	Constant to be Set	Factory Preset
Constant Group Selection	[0]	1

- [0]=0
  Password [0] setting/reading and the first function ([0] to [19]) reading are enabled.
  This setting prevents constant from being reset by improper operation after completion of constant setting.
  [0] can be written in.
- [0]=0 The first functions can be read.
- [0]=1 The first functions ([0] to [19]) can be set and read.
- [0]=2 The first and second functions ([0] to [29]) can be set and read.
- [0]=3 The first, second and third functions ([0] to [59]) can be set and read.
- [0]=6 Fault history is cleared.
- [0]=8 All control constants can be initialized. Terminal functions are returned to the factory setting.
- [0]=9 All control constants can be initialized. Terminal functions are of 3-wire sequence. Refer to "MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION" on page 115.

OPERATION MODE SELECTION

Item Name	Constant to be Set	Factory Preset
Start/Stop Procedure	1	0000 (0011)*
Reverse Rotation Prevention	20	0000

* The value in parentheses is factory setting of models with digital operator.

· Start procedure

Operation can be performed from the operator or control circuit terminal input.

1 = ××00 (× means 1 or 0.)

1st digit
- 0 : Frequency reference from control circuit terminal
- 1 : Frequency reference from the operator

2nd digit
- 0 : Start/stop control from control circuit terminal
- 1 : Start/stop control by the operator

· Stop procedure

Stopping mode can be selected according to the application.

1 = ×0××

3rd digit
- 0 : Deceleration to a stop
- 1 : Coasting to a stop

· Reverse rotation prevention

Prevents accidental selection of reverse rotation.
REV run command is disregarded if input.

20 = ×××1

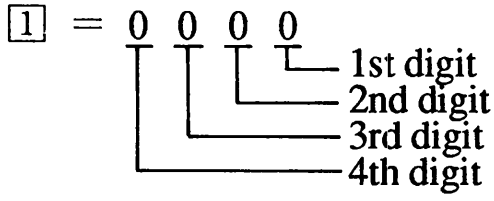
1st digit
- 0 : Reverse rotation is possible.
- 1 : Reverse rotation is impossible.

· Operation mode selection by LOCAL/REMOTE key on digital operator changes LOCAL/REMOTE mode alternately.

LOCAL mode : can be operated by run command and/or frequency reference by digital operator.

REMOTE mode : can be operated by the set value in the first/second digits of constant [1].

Note : The first to fourth digits indicated in the description of the constant mean the following digits.



ALARM RESET FUNCTION SELECTION

Item Name	Constant to be Set	Factory Preset
Alarm Reset	[32], [33], [34]	See page 90.

Alarm status of the inverter can be reset by presetting the multifunction input terminal. When an alarm occurs, reset it by connecting terminals ③ and ⑥ (when setting [32] = 13).

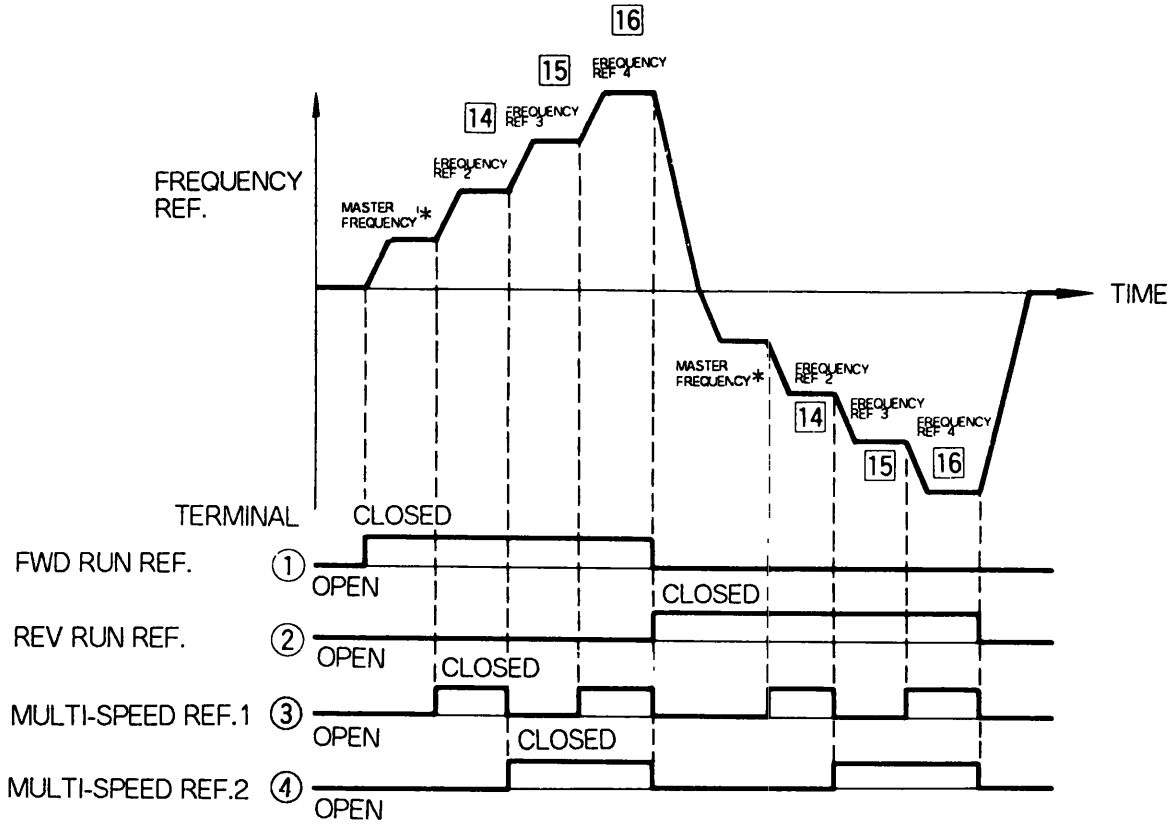
4-STEP SPEED CHANGE

Item Name	Constant to be Set	Factory Preset
Multi-speed Frequency Reference	13 to 16	See page 86.
Multi-speed Operation Function	32, 33, 34	See page 90.

Up to 4 steps of speed can be set by contact input by setting multi-speed references to multifunction contact input terminals.

This eliminates the need for an analog signal thereby enabling operation even at low speed without being affected by noise. See the following example. (When setting 32 = 3, 33 = 4)

- Set according to run specifications.



Note : For frequency reference change during running, only frequency reference selected by multi-speed reference during frequency reference value display can be changed. Additionally, when either multi-speed reference 1 or 2 is used, the other multi-speed reference that is not set is regarded to be always "open".

* 1st digit of [1]

0 : Frequency reference or auxiliary frequency reference from control circuit terminal

1 : Set value of [13]

DIGITAL OPERATOR

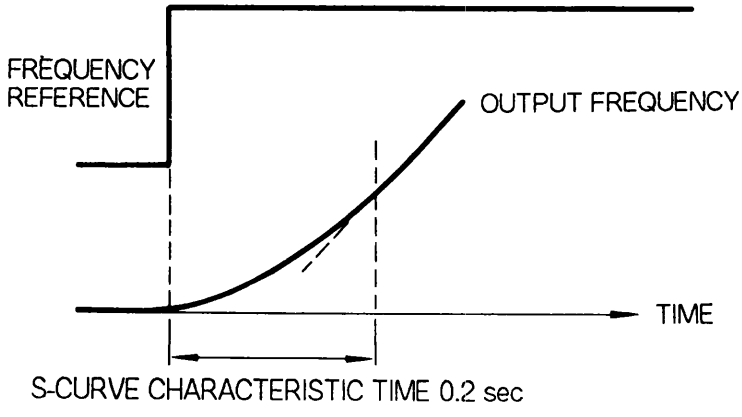
S-CURVE PATTERN SELECTION

Item Name	Constant to be Set	Factory Preset
S-curve Pattern Selection	21	0000

To prevent shock at machine starting/stopping, accel/decel in S-curve pattern is enabled by the setting of 21.

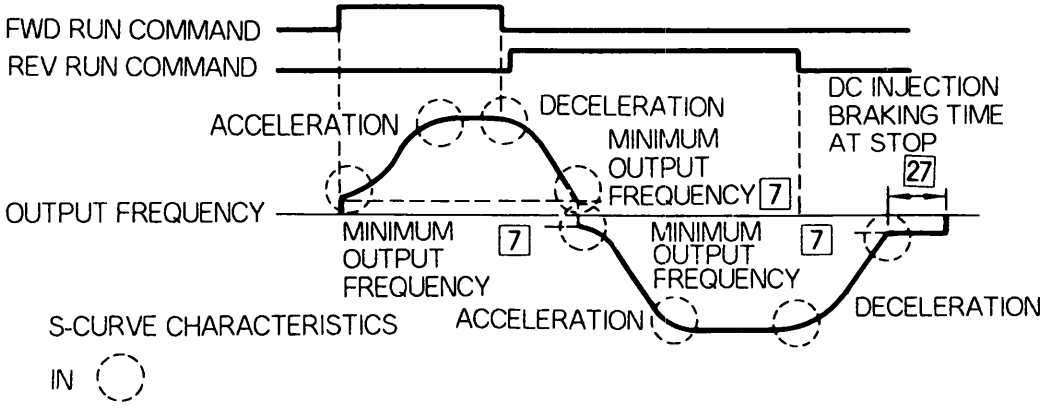
21 = ×0××

3rd digit
0 : S-curve section not provided (linear accel/decel)
1 : S-curve section provided (0.2 second)



Note : S-curve characteristic time refers to the time from the acceleration rate 0 to regular acceleration rate determined by the set acceleration time.

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

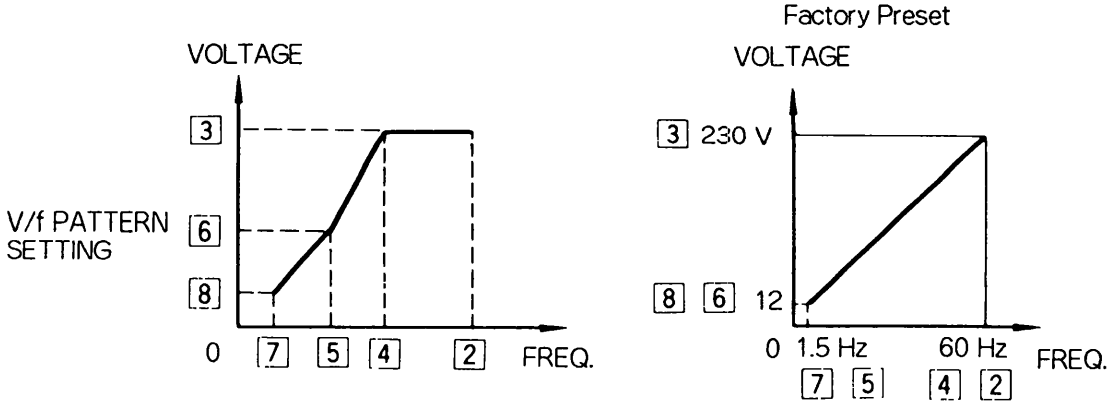


V/f CHARACTERISTIC SETTING

Item Name	Constant to be Set	Factory Preset
Max. Output Frequency	2	60.0 Hz
Max. Voltage	3	230.0 V
Max. Voltage Output Frequency	4	60.0 Hz
Mid. Output Frequency	5	1.5 Hz
Mid. Output Frequency Voltage	6	12.0 V
Min. Output Frequency	7	1.5 Hz
Min. Output Frequency Voltage	8	12.0 V
Output Voltage Limiter Selection	1	0000

- V/f pattern setting

  Any desired V/f pattern can be set for special specifications, too. Any V/f pattern can be set according to the load characteristics. The factory preset value is set to 60 Hz saturation type pattern.

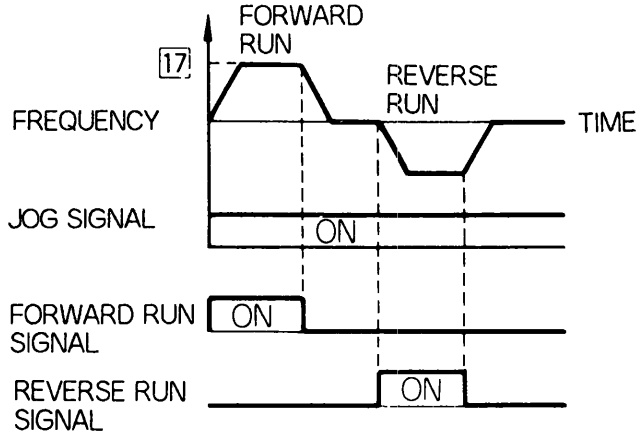


Note : If an excessively large value is set in low-speed area (3Hz or less), motor overheat or inverter malfunction may occur. Change the constant gradually monitoring load or motor current.

JOG OPERATION

Item Name	Constant to be Set	Factory Preset
Jog Frequency Reference Setting	17	6.0 Hz
Jog Reference Selection	32, 33, 34	See page 90.

To select the jog mode, close between terminals ③ - ⑥. Jog operation can then be performed by closing the FWD/REV run command (when setting 32 = 5).

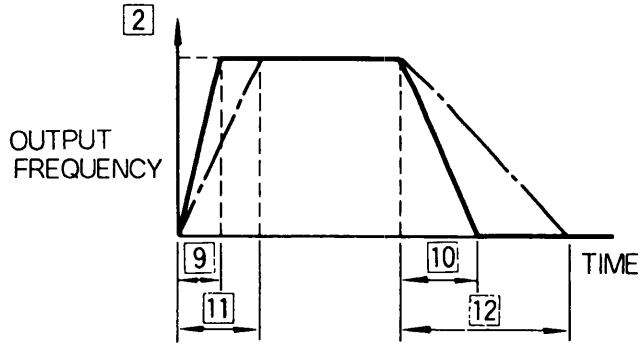


ACCEL/DECEL TIME SETTING

Item Name	Constant to be Set	Factory Preset
Acceleration Time 1	9	10.0 s
Deceleration Time 1	10	10.0 s
Acceleration Time 2	11	10.0 s
Deceleration Time 2	12	10.0 s
Accel/Decel Time Select	32, 33, 34	See page 90.

- Each item can be set from 0.0 sec to 600 sec.

The set time indicates the interval required before the maximum output frequency setting 2 is reached.
Accel/decel time can be set for two-step switching using multifunction contact input, even during running.
Between control circuit terminals ③ - ⑥
- Open : 9 and 10 are selected.
- Closed : 11 and 12 are selected.
(when setting 32 = 6)



Note : S-curve accel/decel reducing shock at motor starting is also enabled. When S-curve accel/decel is needed, refer to "S-CURVE PATTERN SELECTION" on page 100.

LOCAL/REMOTE MODE SELECTION

Item Name	Constant to be Set	Factory Preset
LOCAL/REMOTE Selection	32, 33, 34	See page 90.
Operation Mode Output	36, 37, 38	See page 91.

The following modes of operation can be selected by presetting the LOCAL/REMOTE switch command for the multifunction input terminal (when setting 32 =12).

When terminals ③ and ⑥ are disconnected :
LOCAL mode (operation mode output : no operation)
Operation is possible by using the digital operator operation commands or frequency references.

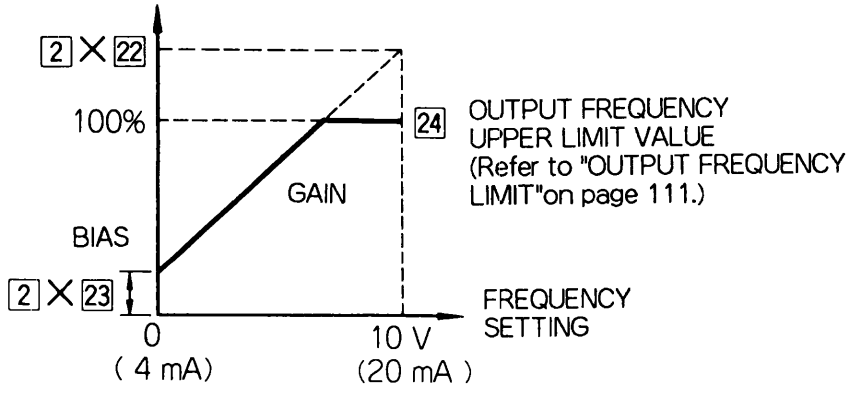
When terminals ③ and ⑥ are connected :
REMOTE mode (operation mode output : operation)
Operation is possible by using the operation commands or frequency references determined by the set values of the first and second digits in 1.

The same operation is available with the LOCAL/REMOTE key of the digital operator.

OUTPUT FREQUENCY CONTROL (GAIN/BIAS)

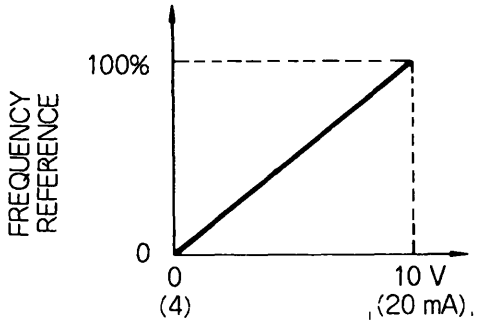
Item Name	Constant to be Set	Factory Preset
Frequency Reference Gain	22	1.00
Frequency Reference Bias	23	0.00

Output frequency (gain/bias) can be set freely according to frequency setting (0 to 10V or 4 to 20mA).



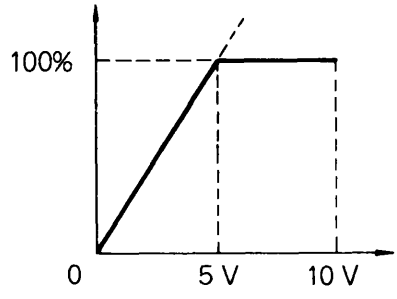
For the setting method, refer to Par. 2.6.1 "Adjustment of Frequency Setting Value, Output Frequency Bias (No.23) and Gain (No.22)" on page 78.

· Relation between analog input voltage/current and frequency



The figure shows the relation preset at the factory.
The relation between analog input and frequency can be changed by resetting of gain (no-22) and bias (no-23).

Example : 0 to 5 V analog input



SETTING :
GAIN (no-22) = 2.00%
BIAS (no-23) = 0.00%

ELECTRONIC THERMAL OVERLOAD PROTECTION

Item Name	Constant to be Set	Factory Preset
Motor Type	18	0000
Motor Rated Current	19	1.9 A *

* The example represents YASKAWA 0.5HP (0.4 kW), 230 V, 4-pole motor.
The YASKAWA standard motor current value is set at factory prior to shipping. See page 86.

Motor output current is detected by the inverter built-in electronic thermal overload function, and inverter exclusive-use motors or standard motors are prevented from overloading. (It is not necessary to mount the thermal overload relay externally. However, to connect several motors to one inverter, a thermal overload relay must be inserted for each motor. It is necessary to reduce carrier frequency according to the wiring distance between the inverter and motor when thermal overload relays are inserted. For details, refer to the precautions on wiring described on page 29.)

19 = Motor rated current value
Set the motor rated current value according to the value on the motor nameplate.

18 = ×× 0 ×
2nd digit
0 : Standard motor
1 : Exclusive-use motor

18 = ××× 1 can make electronic thermal overload function disabled.
1st digit
0 : Electronic thermal overload protection provided
1 : Electronic thermal overload protection not provided

MULTIFUNCTION ANALOG OUTPUT MONITOR SETTING

Item Name	Constant to be Set	Factory Preset
Output Monitor Select	21	0000
Analog Monitor Gain	45	1.00

Either output frequency or output current can be monitored by analog output between control circuit terminals ⑫ and ⑪. (0 to 10V output)

21 = ×× 0 ×

- × : Not used
- 0 : Output contents between control circuit terminals ⑫ - ⑪
- 2nd digit
  - 0 : Output frequency monitor
  - 1 : Output current monitor

Analog output monitor gain can be set by 45.
Additionally, analog output monitor voltage is output as shown below :
Output frequency monitor :
Output voltage (V)

$$= \text{Output frequency} \times \frac{10\ \text{V}}{\text{Max. output frequency } [2]} \times [45]$$

Output current monitor :
Output voltage (V)

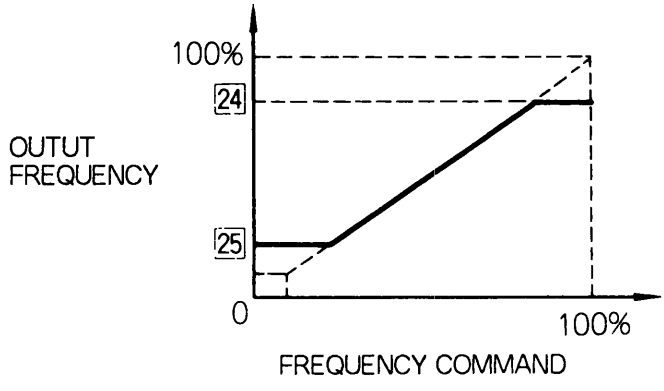
$$= \text{Output current} \times \frac{10\ \text{V}}{\text{Inverter rated current}} \times [45]$$

Note : Since output current becomes approx. 200% maximum of the inverter rated current, output voltage is clamped at approx. 11V when 45 is used at 1.00 and the inverter rated current is exceeded. To keep linearity, set 45 to approx. 0.5.

OUTPUT FREQUENCY LIMIT

Item Name	Constant to be Set	Factory Preset
Output Frequency (Speed) Upper Limit	24	100%
Output Frequency (Speed) Lower Limit	25	0

The upper and lower limits for the output frequency can be set. When the lower limit is not 0, acceleration to that lower limit setpoint begins until frequency reference reaches the lower limit value when the start command is input.



Note : By setting 24 to 110%, frequency up to 2 × 1.1 can be output.

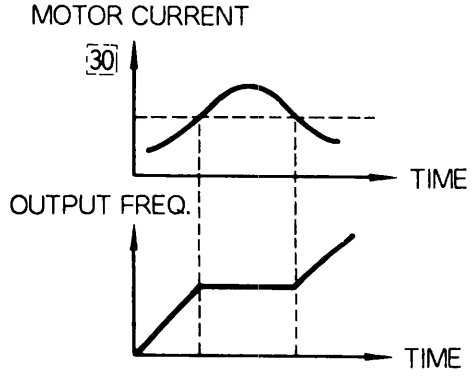
(Example) Assuming 2 = 60 Hz, 24 = 1.1, up to 66 Hz can be output. However, when the voltage exceeds 400 Hz, it is clamped at 400 Hz.

MOTOR STALL PREVENTION FUNCTION

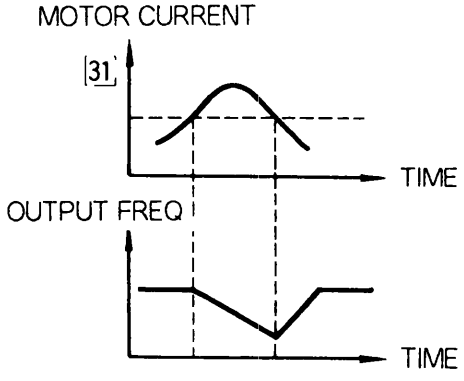
Item Name	Constant to be Set	Factory Preset
Operation Level for Stall Prevention during Acceleration	30	170%
Operation Level for Stall Prevention during Running	31	160%
Stall Prevention Function during Deceleration	20	0000

Automatically adjusts output frequency according to the load so as to continue operation of the machine without stalling the motor.

- Stall prevention during acceleration
  If the motor current exceeds the value set to 30 during acceleration, acceleration is stopped until the motor current is reduced to the 30 set value or less.



· Stall prevention during running
If the motor current exceeds the value set to [31] because of impact load during running, output frequency is automatically lowered. When the motor current is reduced to the [31] set value or less, the motor starts acceleration again and the operation is continued.



· Stall prevention during deceleration
Automatically adjusts deceleration rate with monitoring DC voltage to prevent overvoltage during deceleration. Set "1" for connecting braking resistor.

[20] = 0 × × ×

4th digit
0 : Stall prevention during deceleration enabled
1 : Stall prevention during deceleration disabled

· When the motor load is large or accel/decel time is short, the accel/decel time may be longer than the set value because of the stall preventive function.

FULL-RANGE AUTOMATIC TORQUE BOOST

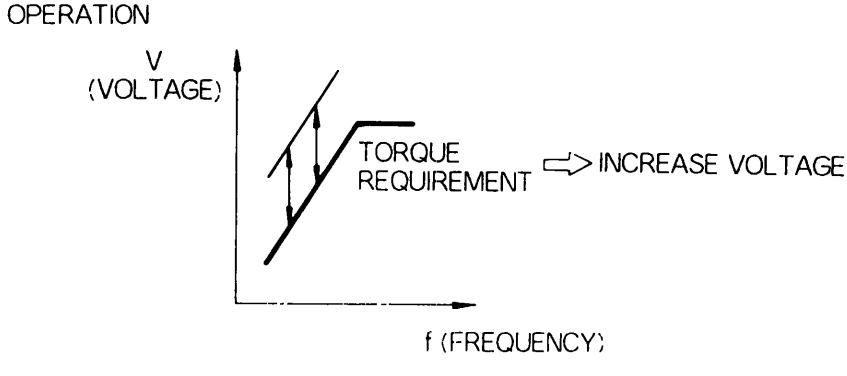
Item Name	Constant to be Set	Factory Preset
Torque Compensation Gain	29	1.0

Automatic control of V/f ratio according to the load torque ensures tripless operation and optimum output current. Therefore, tripless operation with excellent energy-saving effect is available. When the wiring distance between the inverter and motor is long (normally approx. 100 m) and when the motor torque is a little short, increase torque compensation gain gradually, checking the motor current. Normally, no adjustment is necessary.

- Full-range automatic torque boost

  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-606PC3 automatically adjusts the voltage not only during constant-speed operation but also during acceleration. Torque requirement is calculated by the inverter.

Output voltage ∝ Automatic torque boost gain (no-29) × Required torque



Although torque boost operates automatically, the factory preset value of automatic torque boost gain 29 does not need to be changed.

29 = 1.0 (factory preset value)

Change the value when the wiring distance between the inverter and motor is long or when the motor vibrates excessively.

MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION

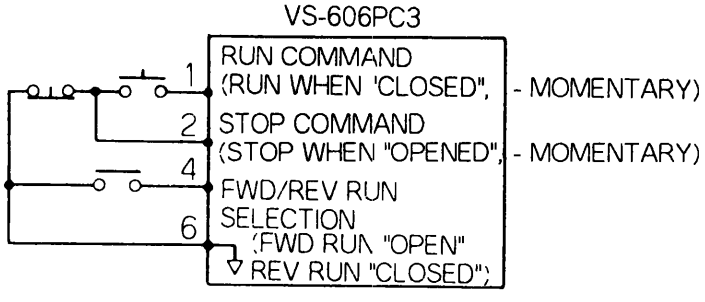
Item Name	Constant to be Set	Factory Preset
Multifunction Contact Input Function	32, 33, 34	Refer to page 90.

The function of control circuit terminals ③, ④ and ⑤ can be changed if necessary. Set 32, 33 and 34 in the descending order. The same value cannot be set simultaneously.
Terminal ③ function : Set to 32.
Terminal ④ function : Set to 33.
Terminal ⑤ function : Set to 34.

32 Set Value and its Functions

Set Value	Function	Page
0*	FWD/REV run command (3-wire sequence selection)	—
1	External fault (NO contact input)	140
2	External fault (NC contact input)	140
3	Multi-step speed reference 1	98
4	Multi-step speed reference 2	98
5	JOG command	104
6	Accel/decel time select	105
7	External baseblock (NO contact input)	144
8	External baseblock (NC contact input)	144
9	Search command from maximum frequency	130
10	Search command from setting frequency	130
11	Accel/decel hold command	137
12	LOCAL/REMOTE selection	97
13	Alarm reset	97

Terminal function at 3-wire sequence selection.



33 Set Value and its Functions

Set Value	Function	Page
1	External fault (NO contact input)	140
2	External fault (NC contact input)	140
3	Multi-step speed reference 1	98
4	Multi-step speed reference 2	98
5	JOG command	104
6	Accel/decel time select	105
7	External baseblock (NO contact input)	144
8	External baseblock (NC contact input)	144
9	Search command from maximum frequency	130
10	Search command from setting frequency	130
11	Accel/decel hold command	137
12	LOCAL/REMOTE selection	97
13	Alarm reset	97

34 Set Value and its Functions

Set Value	Function	Page
1	External fault (NO contact input)	140
2	External fault (NC contact input)	140
3	Multi-step speed reference 1	98
4	Multi-step speed reference 2	98
5	JOG command	104
6	Accel/decel time select	105
7	External baseblock (NO contact input)	144
8	External baseblock (NC contact input)	144
9	Search command from maximum frequency	130
10	Search command from setting frequency	130
11	Accel/decel hold command	137
12	LOCAL/REMOTE selection	97
13	Alarm reset	97

MULTIFUNCTION ANALOG INPUT FUNCTION SELECTION

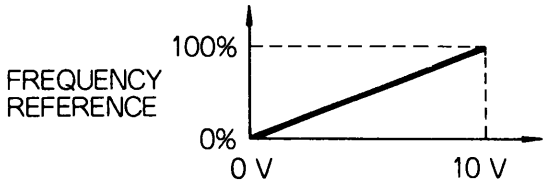
Item Name	Constant to be Set	Factory Preset
Multifunction Analog Input	35	See page 91.

Select a function for the analog signal to be input from the auxiliary input terminal (option).

Note : This function becomes effective when analog input module JVOP-115 (option) is mounted.

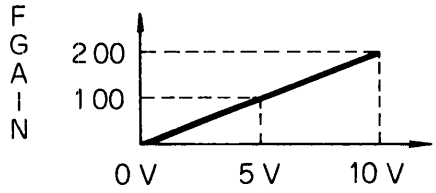
Set Value	Function	Remarks
0	Not used	———
1	Auxiliary frequency reference	When frequency reference 2 is selected by multi-speed reference, the analog signal input from auxiliary input terminal (option) becomes frequency reference. The set value of 14 is invalidated.
2	Frequency reference gain (FGAIN)	FGAIN is multiplied by frequency reference after calculation of internal gain 22 and bias 23 on analog signal input from control circuit terminal 8 or 9. (Refer to page 107.)
3	Frequency reference bias (FBIAS)	FBIAS is added to frequency reference after calculation of internal gain 22 and bias 23 on analog signal input from control circuit terminal 8 or 9. (Refer to page 107.)
4	Output voltage bias (VBIAS)	VBIAS is added to the voltage of V/f pattern. (Refer to page 102.)

(1) When 35 = 1



MULTIFUNCTION ANALOG INPUT

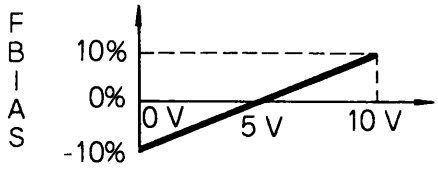
(2) When 35 = 2



MULTIFUNCTION ANALOG INPUT

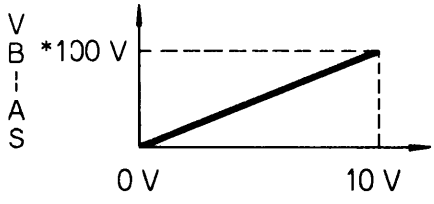
Set value of 2 = 100 %

(3) When 35 = 3



MULTIFUNCTION ANALOG INPUT

(4) When 35 = 4



MULTIFUNCTION ANALOG INPUT

Set value of 2 = 100 %

* VBIAS for 460 V class drives are 0 to 200 V.

MULTIFUNCTION OUTPUT FUNCTION

Item Name	Constant to be Set	Factory Preset
Multifunction Contact Output Function	36, 37, 38	See page 91.

Functions of control circuit terminals (FLT-A) - (FLT-C), (FLT-B) - (FLT-C), ⑬ - ⑦, and ⑭ - ⑦ can be switched.

Contact output function of terminals between (FLT-A) - (FLT-C) at : "closed" : Set into 36.

Contact output function of terminals between (FLT-B) - (FLT-C) at : "open" : Set into 36.

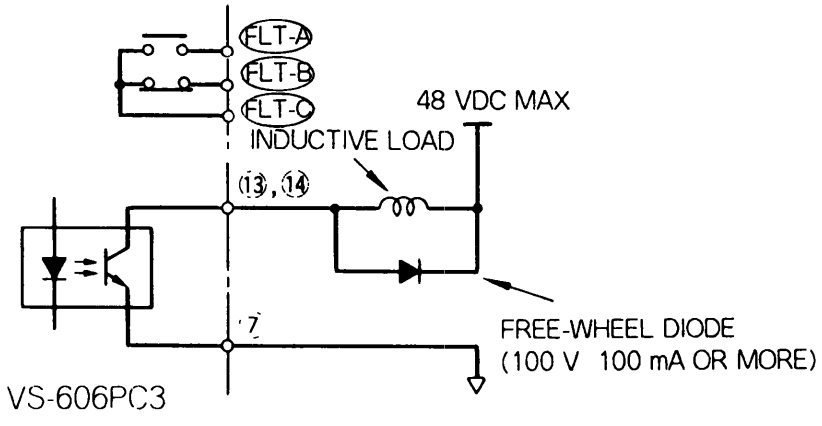
Photo-coupler output function of terminals between ⑬ - ⑦ at "L" : Set into 37.

Photo-coupler output function of terminals between ⑭ - ⑦ at "L" : Set into 38.

Set Value	Function
0*	In operation
1†	Frequency agreement
2	Zero speed
3	Frequency detection (output frequency≧frequency detection level)
4	Overtorque detected
5‡	Fault
6	Frequency detection (output frequency ≦ frequency detection level)
7	During BB
8	During UV
9	During speed search
10	Operation mode (LOCAL/REMOTE)

* Factory preset value of 37
† Factory preset value of 38
‡ Factory preset value of 36

- Maximum contact output capacity is 250 VAC 1A and 30 VDC 1A.
- Maximum photo-coupler output capacity is 48 VDC 50 mA.
- To drive an inductive load, be sure to insert a free-wheel diode to control surge voltage.

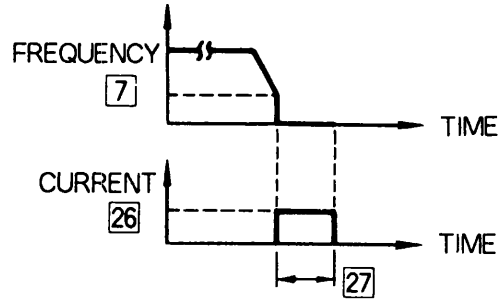


DC INJECTION BRAKING

Item Name	Constant to be Set	Factory Preset
DC Injection Braking at Stop	27	0.0 s
DC Injection Braking at Start	28	0.0 s
DC Injection Braking Current	26	50%

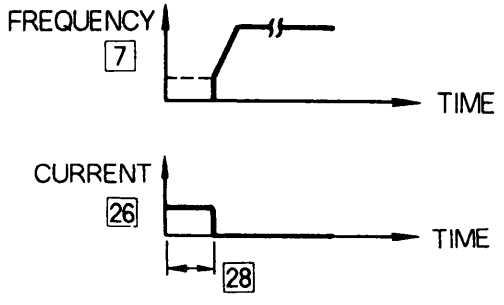
- DC injection braking at stop

  Prevents overrun at stop.
  If output frequency becomes minimum output frequency 7 or less, DC injection brake is applied for the time set by 27, and the motor is stopped. By setting 0.0s to 27, DC injection braking becomes disabled : the motor coasts to a stop when the output frequency is less than the minimum output frequency 7.



- DC injection braking at start

  Starts a coasting motor without tripping even when the direction of rotation is unknown.
  When the run command is input, DC injection brake is applied for the time set by 28, and the motor stops. Then the motor starts operation.



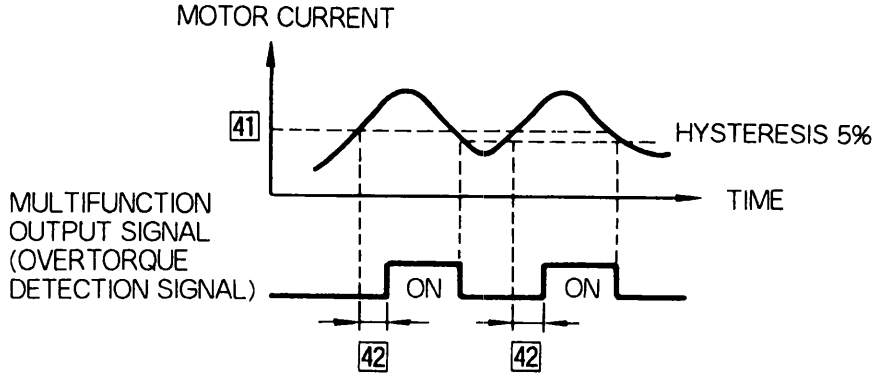
- DC braking current

  DC injection braking current 100% equals the inverter rated current.
  It is set to 50% at factory prior to shipping.

OVERTORQUE DETECTION FUNCTION

Item Name	Constant to be Set	Factory Preset
Overtorque Detection Level	41	160%
Overtorque Detection Time	42	0.1 s
Overtorque Detection Signal	36, 37, 38	See page 91.
Overtorque Detection Selection	40	0000

When excess load is placed on the machine, the increase in motor current is detected. If current exceeding the value set by 41 lasts for a time exceeding the value set by 42, the overtorque detection signal is output to contact output terminal (FLT-A), (FLT-B), (FLT-C) and to control circuit terminal ⑬ or ⑭ until the current is reduced to the 41 set value or less. To output the signal to contact output terminal (FLT-A), (FLT-B), (FLT-C), set 36 to 4. To output the signal to control circuit terminal ⑬, set 37 to 4, and to ⑭, 38 to 4.



The 40 setting can select overtorque detection only during agreed speed or during running. Additionally, it can select continuous operation or output shut-off at overtorque detection.

40 = ×000

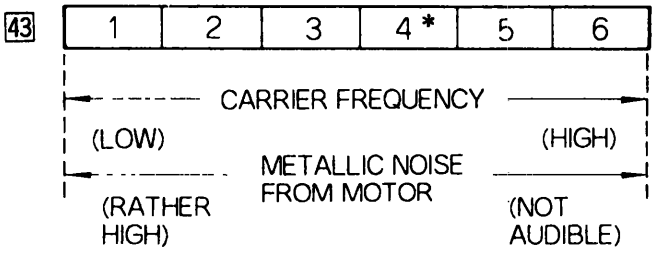
- 1st digit
  - 0 : Overtorque detection not provided
  - 1 : Overtorque detection provided
- 2nd digit
  - 0 : Detected only during agreed speed
  - 1 : Detected during running
- 3rd digit
  - 0 : Continuous operation after overtorque detection
  - 1 : Output shut off at overtorque detection
- Not used.

CARRIER FREQUENCY

Item Name	Constant to be Set	Factory Preset
Carrier Frequency	43	4

Changing the carrier frequency reduces RFI noise and leakage current without increasing motor noise.

Carrier frequency (kHz) = 2.5 kHz × 43 set value



Note : Reduce continuous output current for changing the frequency to 5 or 6.

Carrier Frequency Set Value	Maximum Continuous Output Current
1 to 4	Up to 100% of inverter output current
5	Up to 90% of inverter output current
6	Up to 80% of inverter output current

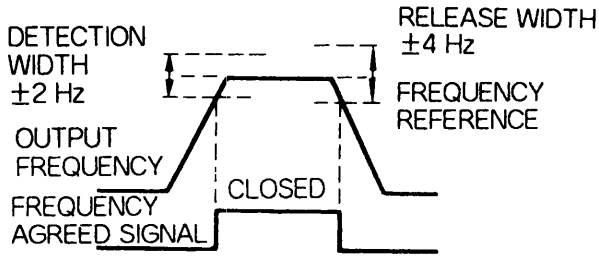
If wiring distance between inverter and motor is long, reduce the carrier frequency. For details, refer to wiring precautions on page 29.

ARBITRARY SPEED DETECTION LEVEL ADJUSTMENT AND SELECTION

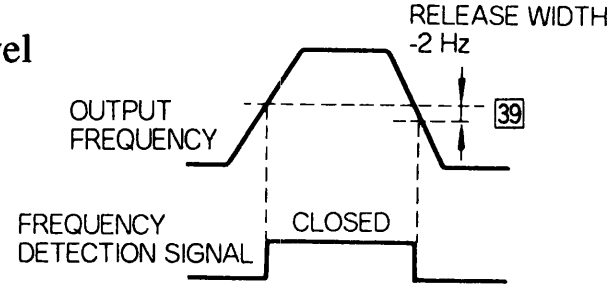
Item Name	Constant to be Set	Factory Preset
Frequency Detection Level	39	0.0 Hz
Multifunction Contact Output Function	36, 37, 38	See page 91.

This function is used when operation at an arbitrary speed must be indicated. By setting either set value to multifunction contact output function (36, 37, 38), the following signal output to contact output terminal (FLT-A), (FLT-B), (FLT-C) and to control circuit terminal ⑬ or ⑭ is enabled. Set 1, 3 or 6 to 36, 37 or 38 when the signal is to be output to contact output terminal (FLT-A), (FLT-B), (FLT-C) and control circuit terminals ⑬ and ⑭, respectively.

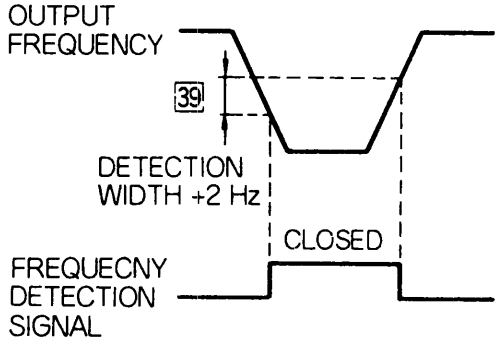
(1) Set value
= 1 : frequency agreed



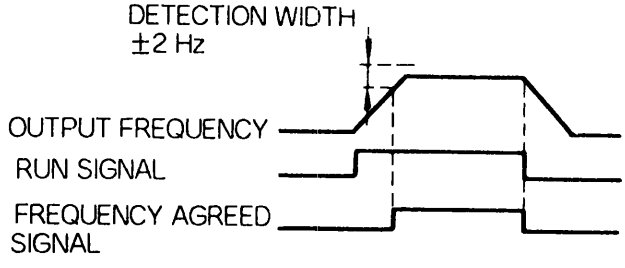
(2) Set value
= 3 : output frequency
≧ frequency detection level



(3) Set value
= 6 : output frequency
≦ frequency detection level



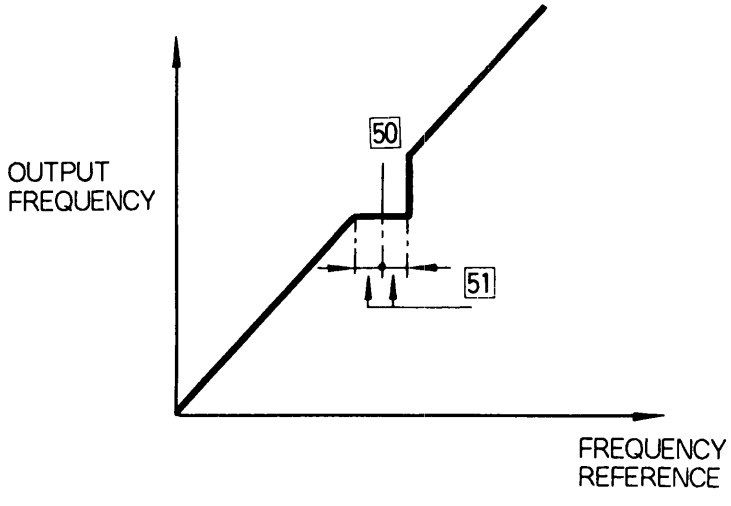
However, when "frequency agreed" is selected, the frequency agreed signal is turned OFF immediately at stop signal input.



PROHIBITED FREQUENCY SETTING

Item Name	Constant to be Set	Factory Preset
Prohibited Frequency	50	0.0 Hz
Prohibited Width	51	1.0 Hz

To operate the inverter without resonance caused by machine system characteristic frequency, resonance generating frequency can be prohibited. This function can be also for dead band control.



Continuous operation is prohibited within the prohibited range. However, output frequency is not prohibited during acceleration or deceleration for smooth acceleration or deceleration.

(1) Prohibited frequency (50)
By setting the value to 0.0Hz, this function becomes disabled.

(2) Prohibited width (51)
By setting the value to 0.0Hz, this function becomes disabled. The range to be prohibited is :
50 − 51 < prohibited range < 50 + 51
(Example) When prohibited frequency 1 50 is 45Hz and the prohibited width 51 is 2.0Hz :
Prohibited range= 43 to 47Hz.

CONSTANTS EFFECTIVE FOR REDUCTION OF MACHINE VIBRATION OR SHOCK

The following constants are effective for reduction of vibration or shock.

Effective Method	Constant to be Set	Factory Preset	Adjustment	Page
Shock				
· To decrease generating torque · To increase generating torque	2 to 8	See page 85.	Decrease or increase V/f.	85
	29	1.0	Decrease or increase torque boost.	114
To reduce shock at acceleration	21	0000	Set S-curve accel/decel.	100
	9, 11	10.0 s	Increase accel time.	105
	30	170%	Increase stall prevention level during accel.	112
To reduce shock at deceleration	1	0000	Set coasting to a stop.	96
	21	0000	Set S-curve accel/decel.	100
	10, 12	10.0 s	Increase decel time.	105
	7	1.5 Hz	Decrease or increase minimum output frequency.	102
	26	50%	Decrease DC injection braking current.	123
Vibration				
To decrease carrier frequency	43	4	——	125

SPEED SEARCH FUNCTION

Item Name	Constant to be Set	Factory Preset
Speed Search Function	32, 33, 34	See page 90.
Signal during Speed Search	36, 37, 38	See page 91.
Speed Search Operation Level	—	150% (fixed)
Minimum Baseblock Time	—	0.5 s (fixed)

When the motor during coasting is started during changing operation of commercial power supply and inverter, etc., the motor can be operated without tripping by using the speed search function.

The speed search command is input from multi-function contact input terminals ③, ④ and ⑤. For the functions of terminals ③, ④ and ⑤, "9" or "10" is set to 32 , 33 or 34.

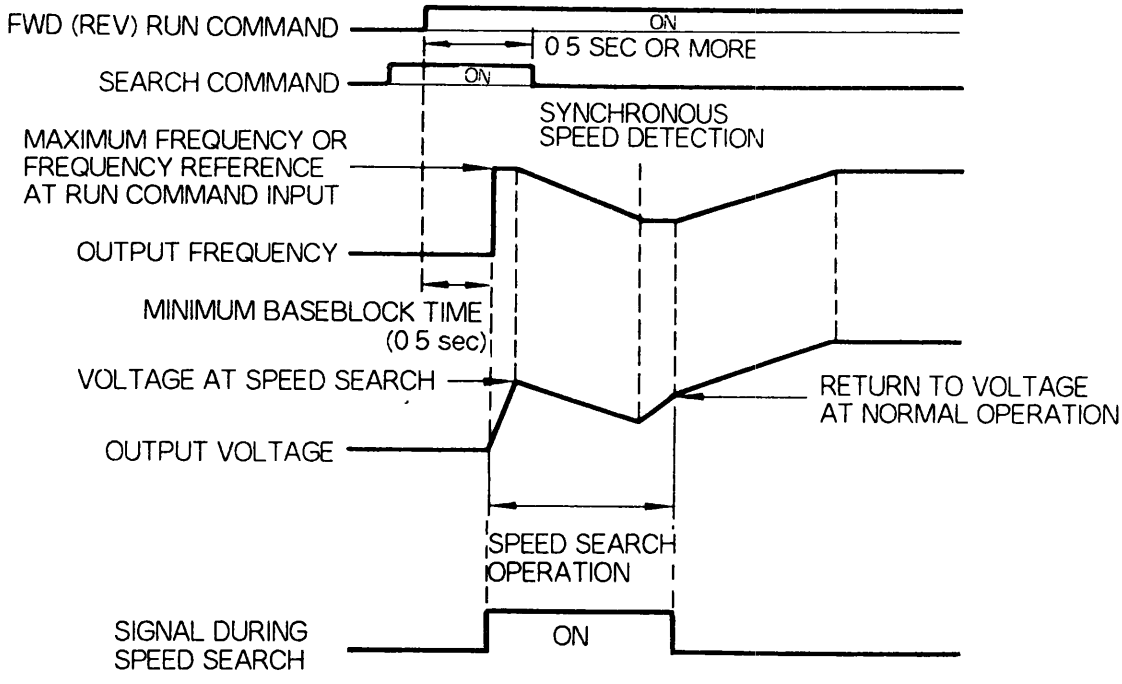
When setting to "9" : Search from maximum frequency

When setting to "10" : Search from setting frequency

By closing the search command during baseblock and inputting the run command, speed search is started after the inverter output is shut off for the minimum baseblock time 0.5 sec.

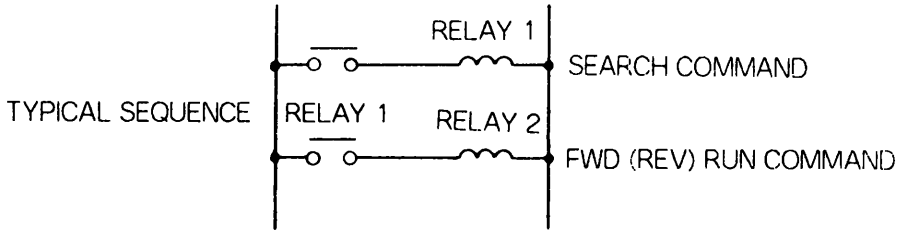
When the inverter output current is larger than the set value of the speed search operation level, the speed search operation starts. Frequency in which the inverter output current becomes smaller than the speed search operation level is judged to be the speed synchronized point, and the motor starts reacceleration/redeceleration up/down to the setting frequency in the set accel/decel time.

The following shows the time chart where the speed search command is input.



Notes :

1. When the search commands are input from maximum frequency and setting frequency simultaneously, the search command of lower terminal No. has the priority.
2. Make such sequence that FWD (REV) run command is to be input at the same time or after the search command. If run command is input before search command, search command becomes ineffective.



CONTINUOUS OPERATION AT MOMENTARY POWER LOSS

Item Name	Constant to be Set	Factory Preset
Operation Selection after Momentary Power Loss	46	0000
Speed Search Operation Level	—	150% (fixed)
Minimum Baseblock Time	—	0.5 s (fixed)

Even if a momentary power loss occurs, operation can be continued without any problem.

46 = × × × 0

1st digit
0 : Continuous operation after momentary power loss not provided
1 : Continuous operation after momentary power loss provided

Momentary power loss ride-thru time differs as shown below, according to the capacity of the models. (common to both 3-phase and single-phase series)

Models CIMR-PCU20P1 to PCU20P7 CIMR-PCUB0P1 to PCUB0P7 CIMR-PCU40P2 to PCU40P7	Approx. 1 sec.
Models CIMR-PCU21P5 to PCU23P7 CIMR-PCUB1P5 to PCUB3P7 CIMR-PCU41P5 to PCU43P7	Approx. 2 sec.

Note : If a power loss exceeds the momentary power loss ride-thru time, in the momentary power loss assurance time after the power loss, low voltage fault occurs, fault contact is output and the motor coasts to a stop.

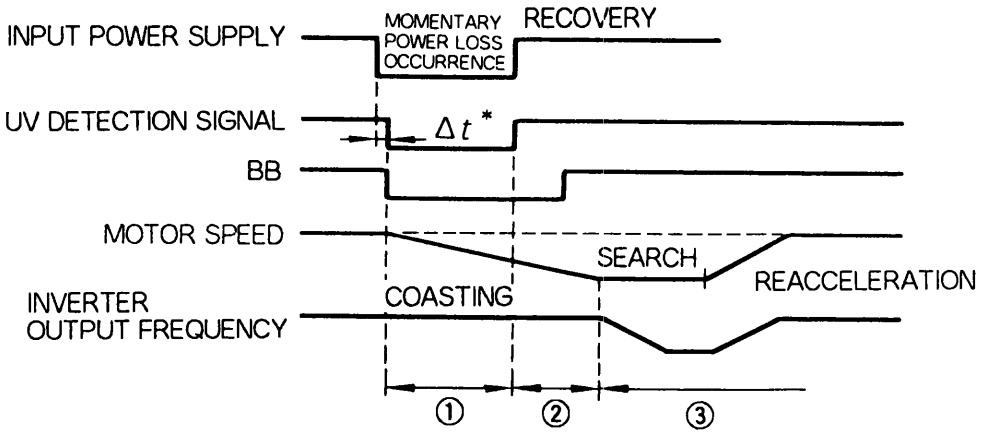
Operation when continuous operation after momentary power loss is provided is as described below :

① When undervoltage (UV) is detected, the inverter output is shut off and the frequency reference value and run command given before the momentary power loss are held.

Additionally, counting of the undervoltage time starts ; during counting, Uv is displayed, blinking on the digital display unit and digital operator. If undervoltage is detected, the inverter output is shut off for the minimum baseblock time 0.5 sec.

② After recovery from the momentary power loss, after checking that the inverter DC voltage has recovered sufficiently, speed search operation is performed.

③ Speed search operation starts when the inverter output current exceeds the speed search operation level. At this time, the new frequency reference value and run command are read in. The frequency in which the inverter output current is smaller than the speed search operation level is judged to be the speed synchronized point, and reacceleration/redeceleration is performed up/down to the set frequency in the set accel/decel time.



* $\triangle t$: Varies according to the inverter size. (Assured at 15 ms minimum.) Operation is automatically continued if recovery from momentary power loss in $\triangle t$ or less.

AUTOMATIC RESTART AFTER A FAULT

Item Name	Constant to be Set	Factory Preset
Fault Retry Selection	47	0
Speed Search Operation Level	—	150% (fixed)
Minimum Baseblock Time	—	0.5 s (fixed)
V/f during Speed Search	—	100% (fixed)

If an inverter fault occurs during running, the inverter performs self-diagnosis to restart automatically.

The number of the self-diagnosis and restarting times can be set up to 10 times to 47. By setting 0 times, the fault retry function becomes disabled.

The inverter restarts automatically in case of the following faults.

① Overcurrent protection (OC)
② Overvoltage protection (OV)
③ Cooling fin overheat (OH)

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

① No fault occurs for more than 10 minutes
② Fault reset input signal (or RESET key on the digital operator) is turned ON when the fault is checked.
③ The power supply is turned OFF.

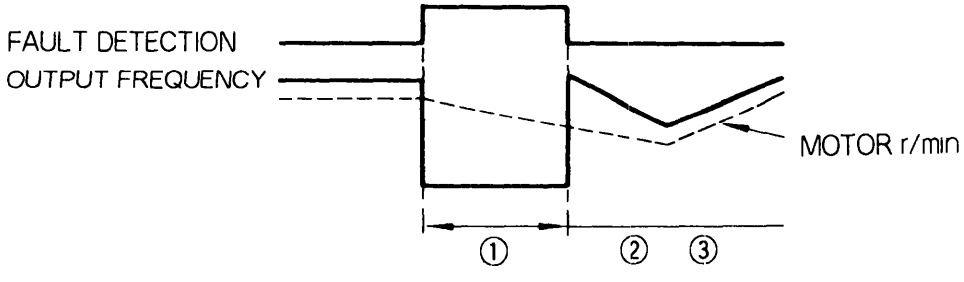
Fault retry operation is descdribed below :

① If a fault is detected, the inverter output is shut off for the minimum baseblock time 0.5 sec. While the inverter output is shut off, the fault is displayed on the digital display unit and the digital operator.

② After the minimum baseblock time 0.5 sec, the fault is automatically reset, and the speed search operation is performed from the output frequency at the fault occurrence.

③ If the inverter output current is larger than the speed search operation level, the speed search operation starts. The frequency in which the inverter output current is smaller than the speed search operation level is judged to be the speed synchronized point, and reacceleration/redeceleration is performed up/down to the set frequency in the set accel/decel time.

④ If the total number of faults exceeds the number of retry times [47], automatic reset is not performed and the inverter output is kept off. Then fault contact is output. (Fault contact is not output during fault retry.)



ACCEL/DECEL HOLD COMMAND

Item Name	Constant to be Set	Factory Preset
Accel/Decel Hold Function	32, 33, 34	See page 90.

When the accel/decel hold command is input during acceleration or deceleration, acceleration or deceleration is prohibited while the command is input, and the output frequency is held.

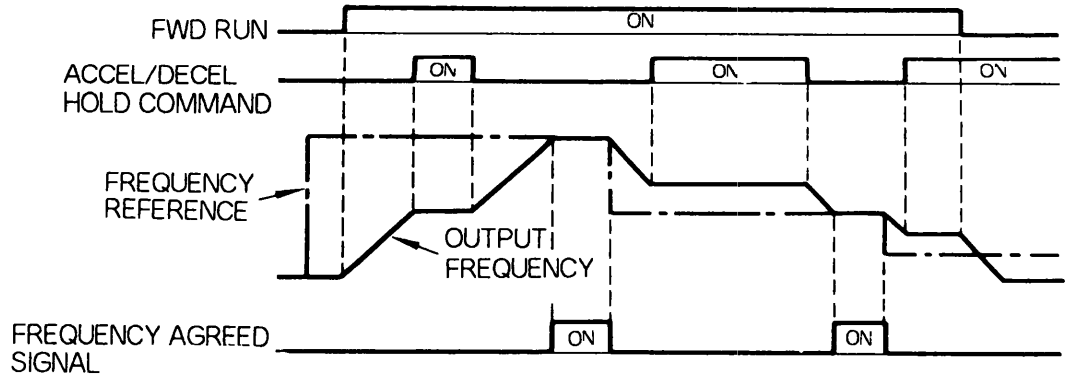
By inputting the stop command, the accel/decel command is released and the operation is in the stopped condition.

The accel/decel hold command is input from multifunction contact input terminal ③, ④ or ⑤.

For the function of terminal ③, ④ or ⑤, set "8" to 32, 33 or 34.

Terminal ③ function : Set to 32.
Terminal ④ function : Set to 33.
Terminal ⑤ function : Set to 34.

The following shows the time chart when the accel/decel hold command is input :



Note : When the FWD (REV) run command is input in the status where the accel/decel hold command is input, the baseblock status is continued and the motor does not operate.

However, when frequency reference lower limit 25 ≧ minimum output frequency 7 is set, the motor operates at the frequency reference lower time 25.

2.10 PROTECTIVE FUNCTIONS

Protective Function		Explanation	Monitor Display	Fault Output
Low Voltage Protection	Main Circuit Voltage Low	When the inverter power supply voltage drops, torque becomes insufficient and motor is overheated. Inverter output is stopped when the main circuit DC voltage becomes lower than the low voltage detection level. Detection level : Approx. 210 V or less (230 V, 3-phase), 170 V (240 V, single-phase), 420 V (460 V, 3-phase).	Uv 1 (UV1)	Operation
Overcurrent Protection		The inverter output is shut-off when the inverter output current becomes approx. 200% and above of inverter rated current.	oC (OC)	Operation
Ground-fault Protection		The inverter output is shut-off when a ground-fault occurs at the inverter output side.	GF (GF)	Operation
Overvoltage Protection		The inverter output is shut-off when the main circuit DC voltage becomes excessive because of regeneration energy caused by motor deceleration and negative load. Detection level : Approx. 410 V or more (230 V class 3-phase, 240 V class single-phase), 820 V or more (460 V class).	ov (OV)	Operation
Fuse Blown		The fuse clears to prevent wiring from being damaged by the short-circuit current when the main circuit transistor fails.	(Not displayed)	Non Operation
Cooling Fin Overheat (Only for Types of Forced Cooling)		The inverter output is shut-off when the cooling fin overheat is detected by thermistor. Check for a defective cooling fan or clogged filter	oH (OH)	Operation

Protective Function		Error Causes	Action to be Taken
Low Voltage Protection	Main Circuit Voltage Low	· Inverter capacity is too small. · Voltage drop due to wiring. · A motor of large capacity connected to the same power system has been started. · Rapid acceleration with generator power supply · Operation sequence when power is off · Defective electromagnetic contactor	· Check the power supply voltage. · Check the power capacity and power system.
Overcurrent Protection		· Extremely rapid accel/decel · Motor ON/OFF switching at the inverter output side · Short-circuit at the inverter output side · Motor of a capacity greater than the inverter rating has been started. · High-speed motor or pulse motor has been started.	Transistor error may occur Investigate the error cause, correct it, then restart.
Ground-fault Protection		Ground-fault at the inverter output side.	· Check that motor insulation is not deteriorated. · Check that wiring of load side are not damaged.
Overvoltage Protection		· Insufficient deceleration time · Negative load (Motor is turned by the load.) · High input voltage compared to motor rated voltage	· If braking torque is not proper, extend the decel time or connect a braking resister unit (option) · Check that the load is not minus. · Check the power supply voltage.
Fuse Blown		· Repeated overcurrent protection (OC) · Repeated overload protection (OL2) power reset · Rapid deceleration in excess excitation (improper V/f characteristic setting)	Turn OFF the power supply once and turn it ON again If the fault occurs again, replace the inverter · Do not replace the fuse.
Cooling Fin Overheat (Only for Types of Forced Cooling)		Defective cooling fan Intake air temperature rise Clogged filter	· Wash the filter Replace the inverter when the inverter cooling fin is defective. Intake air temperature 104° F (40℃) or less

Protective Function		Explanation	Monitor Display	Fault Output
Over-load Protec-tion	Motor	The inverter output is stopped when output current to the motor is detected by the electronic thermal in the inverter. Either a inverter duty constant-torque specialized motor or general-purpose motor can be selected. If more than two motors are driven, overload protection should be disabled. Use a thermal relay or thermal protector for each motor.	oL 1 (OL1)	Operation
	Inverter	The electronic thermal operates by the inverse time limit and the inverter output is shut-off when 105% or more of the inverter rated current occurs. Overload capacity · 150%, 1 min.	oL2 (OL2)	Operation
	Over-torque Detec-tion*	The motor operates according to operation selection [constant (No. 40)] when the inverter output current exceeds the overtorque detection level. This function is used to protect the machine or to monitor the output torque.	oL3 (OL3)	Operation
External Fault Signal Input		When an external fault signal is input, the inverter output is shuft-off.	EF3 (EF3) EF4 (EF4) EF5 (EF5)	Operation
Control Circuit Fault †		The inverter output is shut-off when a transmission error occurs in the control circuit or a component fails.	CPF00‡ to CPF05	Operation

* For overtorque detection (OL3), fault display or alarm display can be selected according to the constant (No. 40) setting. For details, refer to "OVERTORQUE DETECTION FUNCTION" on page 124

† For details of control circuit faults, refer to Table1 9 "Details of CPF Display" on page 49

‡ CPF00 to 05 indicate the contents of digital operator display

Protective Function		Error Causes	Action to be Taken
Over-load Protec-tion	Motor	· Overload, long operation at low speed, improper V/f characteristic setting. · Motor rated current [constant (No. 19)] setting is wrong.	· Investigate the cause of over-load and review the operation pattern, V/f characteristic, and motor/inverter capacities. (If inverter is repeatedly reset after an overload occurs, the inverter may fault. Investigate and correct the cause of overload before restart.). · Set the rated current of motor nameplate value to constant (No. 19). · If the above measures are not effective, lower the carrier frequency [constant (No 43)]
	Inverter		
	Over-torque Detec-tion*	Motor current exceeds the preset value because of machine error or overload.	Check the use of machine. Correct the overload cause or set a higher detection level [constant (No. 41)] which is within the allowable range.
External Fault Signal Input		External fault condition occurred.	Correct the cause of the fault input.
Control Circuit Fault †		· External noise · Excess vibration or shock	· Record all data of CPF04, then make initialization. · Turn OFF power, then turn ON again. If an error is persistent, replace the inverter.

* For overtorque detection (OL3), fault display or alarm display can be selected according to the constant (No. 40) setting. For details, refer to "OVERTORQUE DETECTION FUNCTION" on page 124.

† For details of control circuit faults, refer to Table1 9 "Details of CPF Display" on page 49.

‡ CPF00 to 05 indicate the contents of digital operator display

DIGITAL OPERATOR

2.11 PROTECTIVE FUNCTIONS (WARNINGS)

Protective Function	Explanation	Monitor Display	Fault Contact Output
Low-voltage Protection (Main Circuit Voltage Insufficient)	Monitor display appears when the main circuit DC voltage drops under the detection level while the inverter output is off. Detection level : Approx. 210 V or less (230 V 3-phase) Approx. 170 V or less (240 V single-phase) Approx. 420 V or less (460 V 3-phase)	(UV) Uu (Blink)	Non Operation
Overvoltage Protection	Monitor display appears when the main circuit DC voltage rises above the detection level while the inverter output is off. Detection level : Approx. 410 V or more (230 V class 3-phase, 240 V class single-phase) Approx. 820 V or more (460 V class)	(OV) ou (Blink)	Non Operation
Cooling Fin Overheat (Only for Types of Forced Cooling)	Monitor display appears when the cooling fin overheats : due to intake air temperature rise.	(OH) oH (Blink)	Non Operation
Overtorque Detection	This function is used to protect the machine and to monitor the inverter output torque. The motor operates according to selection of constant (No. 40) when the inverter output current exceeds the overtorque detection level. The monitor blinks when "operation continues" is preset.	(OL3) oL 3 (Blink)	Non Operation
Simultaneous Forward and Reverse Run Commands	When forward and reverse run commands are simultaneously closed for a period of time exceeding 500 ms, the inverter is stopped according to the preset stop method [constant (No. 01)]	(EF) EF (Blink)	Non Operation

Protective Function		Error Causes	Action to be Taken
Over-load Protec-tion	Motor	· Overload, long operation at low speed, improper V/f characteristic setting. · Motor rated current [constant (No. 19)] setting is wrong.	· Investigate the cause of over-load and review the operation pattern, V/f characteristic, and motor/inverter capacities. (If inverter is repeatedly reset after an overload occurs, the inverter may fault. Investigate and correct the cause of overload before restart.). · Set the rated current of motor nameplate value to constant (No. 19). · If the above measures are not effective, lower the carrier frequency [constant (No 43)] .
	Inverter		
	Over-torque Detec-tion*	Motor current exceeds the preset value because of machine error or overload.	Check the use of machine. Correct the overload cause or set a higher detection level [constant (No. 41)] which is within the allowable range.
External Fault Signal Input		External fault condition occurred.	Correct the cause of the fault input.
Control Circuit Fault †		· External noise · Excess vibration or shock	· Record all data of CPF04 , then make initialization. · Turn OFF power, then turn ON again. If an error is persistent, replace the inverter.

* For overtorque detection (OL3), fault display or alarm display can be selected according to the constant (No. 40) setting. For details, refer to "OVERTORQUE DETECTION FUNCTION" on page 124

† For details of control circuit faults, refer to Table1 9 "Details of CPF Display" on page 49.

‡ CPF00 to 05 indicate the contents of digital operator display.

DIGITAL OPERATOR

Protective Function	Error Causes	Action to be Taken
Low-voltage Protection (Main Circuit Voltage Insufficient)	Input voltage drop	· Check the main circuit DC voltage · Check the power supply capacity and power system.
Overvoltage Protection	Motor current exceeds the preset value because of machine error or overload	Check the use of machine. Correct the overload cause or set a higher detection level [constant (No. 41)] which is within the allowable range
Cooling Fin Overheat (Only for Types of Forced Cooling)	· Defective cooling fan · Intake air temperature rise · Clogged filter	Replace the cooling fan and clean the filter. Intake air temperature : 104° F(40°C) or less
Overtorque Detection	Motor current exceeded the set value because of machine fault or overload.	Check the driven machine and correct the cause of the fault or increase the set value [constant (No. 41)] up to the machine allowable value.
Simultaneous Forward and Reverse Run Commands	· Operation sequence error · 3-wire/2-wire selection error	· Recheck the control sequence. · Recheck constant settings (Nos. 32, 33 and 34).

Protective Function		Explanation	Monitor Display	Fault Contact Output
External Baseblock Signal Input (Main Circuit Transistor Instantaneous Shut-off)		When an external baseblock signal is input, the motor coasts to a stop. When the external baseblock signal is removed, the inverter output is immediately turned on at the previously set frequency	(BB) bb (Blink)	Non Operation
Stall Prevention Accel/Decel is Accomplished with Maximum Capacity of the Inverter without Tripping on Overcurrent or Overvoltage.	During Acceleration	Inverter acceleration is stopped when 170% or more of the inverter rated current is required by the load This prevents overload protection (OL1, OL2) or overcurrent (OC) from occuring. When current is reduced to less than 170%, acceleration is enabled	——	Non Operation
	During Normal Operation	Output frequency is decreased when 160% of the inverter rated current or greater is required by the load. This prevents motor and inverter overload (OL1, OL2). When current is reduced below 160%, inverter acceleration is enabled.		
	During Deceleration	Deceleration is stopped when the DC voltage is caused to rise by motor regenerative energy. This prevents overvoltage trips (OV). When DC voltage decreases, deceleration to the set value resumes.		

Protective Function		Error Causes	Action to be Taken
External Baseblock Signal Input (Main Circuit Transistor Instantaneous Shut-off)		———	———
Stall Prevention Accel/Decel is Accomplished with Maximum Capacity of the Inverter without Tripping on Overcurrent or Overvoltage.	During Acceleration	· Insufficient power for accel/decel · Overload · Phase loss	· Set proper accel/decel time [constant (Nos. 09 to 12)] for smooth operation. · For stall prevention during normal operation, lighten the load or increase inverter capacity.
	During Normal Operation		
	During Deceleration		

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