Varispeed-616G3
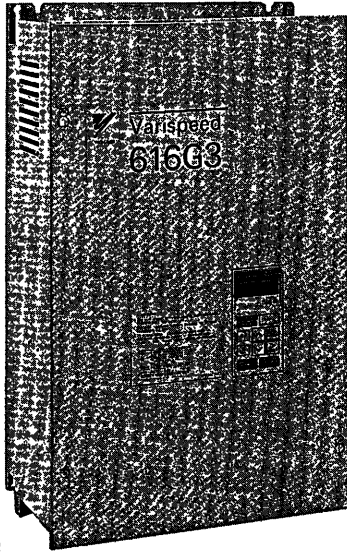
GENERAL-PURPOSE INVERTER

200 TO 230V, 40 TO 100HP (30 TO 75kW) 54 TO 130kVA
380 TO 460V, 75 TO 400HP (55 TO 300kW) 110 TO 510kVA

YASKAWA

692-532

An inverter is a device to convert three-phase AC commercial power supply to DC with an inverter section to produce AC variable frequency voltage from this converted DC.

This AC variable frequency voltage can then be used for speed control of three-phase squirrel-cage induction motors.

WARNING

1) After turning OFF the main circuit power supply, do not touch circuit components until "CHARGE" lamp is extinguished. The capacitors are still charged and can be quite dangerous.

2) Do not connect or disconnect wires and connectors while power is applied to the circuit.

3) Do not check signals during operation.

4) Be sure to ground VS-616G3 using the ground terminal G (E).

5) Never connect main circuit output terminals T1 (U), T2 (V), T3 (W) to AC main circuit power supply.

CAUTION

1) All the potentiometers of VS-616G3 have been adjusted at the factory. Do not change their settings unnecessarily.

2) Do not perform any dielectric test on any part of the VS-616G3 unit. It is electronic equipment using semi-conductors and vulnerable to damage from high voltage.

3) Control PC board employs CMOS ICs which are easily damaged by static electricity. Do not touch the CMOS elements.

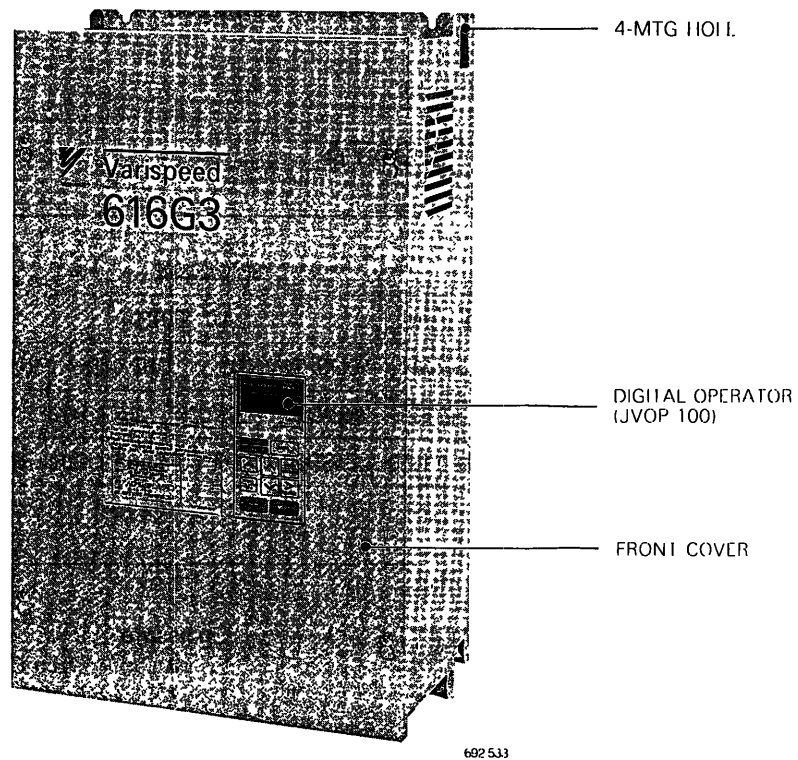4) Make sure to tighten screws on the main circuit and control circuit terminals.

CONTENTS

CONTENTS (APPENDIX)

VS-616G3 CONFIGURATION

4-MTG HOLE

DIGITAL OPERATOR
(JVOP 100)

FRONT COVER

692 533

VS-616G3

RECEIVING

Now, lets check the followings.

This VS-616G3 has been put through demanding tests at the factory before shipment. After unpacking, check the followings.

• Verify the received product with the purchase order sheet (invoice) and/or packing slip.

• Transit damage.

    If any part of VS-616G3 is damaged or lost, immediately notify the shipper.

■ NAMEPLATE DATA

MODEL: CIMR-G3U2030	SPEC: 20300E	
A.C. INPUT	**A.C. OUTPUT**	
VOLTS: 200-220 HZ: 50	VOLTS: 0-230 MAX.	HZ: 0-400 PHASE: 3
VOLTS: 200-230 HZ: 60	VARIABLE TORQUE CONT. AMPS: 146.0 HP: 50	
PHASE: 3 AMPS: 160.0	CONSTANT TORQUE CONT. AMPS: 130.0 HP: 40	
FILE NO. : E131457		

Enclosure
0 : Open Chassis Type
1 : NEMA1 (Enclosed wall-mounted Type)

■ MODEL DESIGNATION

CIMR - G3 U 2 030

Inverter

G3 Series

Specifications
U: UL Listed and CSA Certified Component
   (U.S.A use)
V: UL Listed and CSA Certified Component
   (JAPAN use)
A: Non UL Listed Component (JAPAN use)
E: Non UL Listed Component (Europe use)

Voltage   2: 200 to 230V
          4: 380 to 460V

Applicable maximum motor output
030: 40HP (30kW)
 to   to
300: 400HP (300kW)
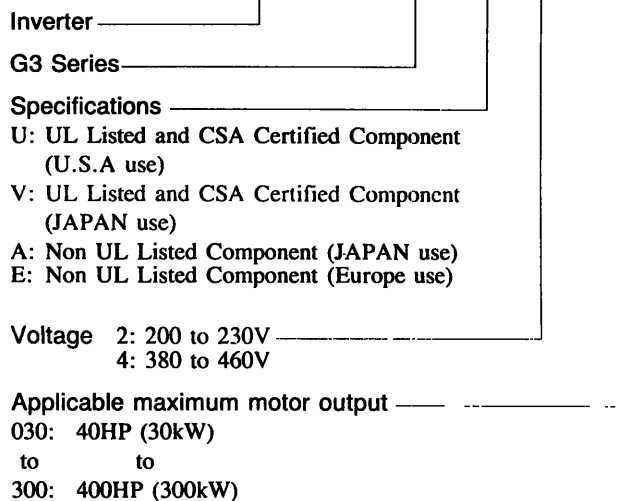
INSTALLATION

```
┌─────────────────────── CAUTION ───────────────────────┐
│                                                        │
│  • Never move, lift or handle the VS-616G3 cabinet by the front cover. │
│  • Lift the cabinet from the bottom.                   │
│  • Do not drop the inverter.                           │
│                                                        │
└────────────────────────────────────────────────────────┘
```

MOUNTING SPACE

Keep enough space.

Install VS-616G3 vertically and allow sufficient space for effective cooling as shown in Fig. 1.

1 18in(30mm) OR MORE   1 18in(30mm) OR MORE

5 9in(150mm) OR MORE   AIR

ALLOWABLE TEMPERATURE OF CONTROL PART 131°F(55°C)

FRONT COVER

OPEN CHASSIS TYPE 113°F(45°)
ENCLOSED WALL-MOUNTED TYPE 104°F(40°C)

* Allowable temperature up to 122°F(50°C) when front cover is removed

5 9in(150mm) OR MORE   AIR
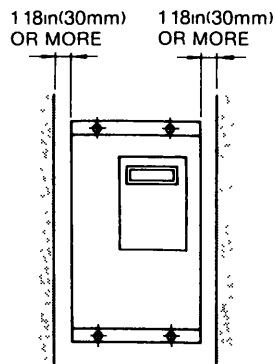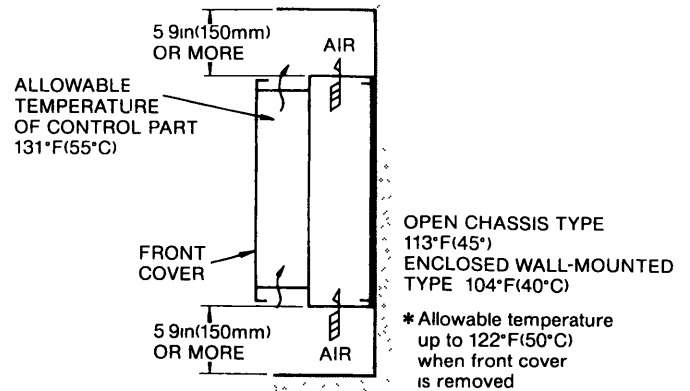
(a) Front View   (b) Side View

Note: For product external dimensions and mounting dimensions, refer to APPENDIX B "DIMENSIONS" on page 33.

Fig. 1 Mounting Spaces

LOCATION

Location of the equipment is important to achieve proper performance and normal operating life. The VS-616G3 units should be installed in areas where the following conditions exist.

- Protected from rain or moisture.

- Protected from direct sunlight.

- Protected from corrosive gases or liquids.

- Free from airborne dust or metallic particles.

- Free from vibration.

- Free from magnetic noise (e.g. welding machines, power units)

- Ambient temperature:
  +14 to 104°F, −10 to +40°C (For enclosed type),
  +14 to 113°F, −10 to +45°C (For open chassis type)

- Free from combustible materials, gases, etc.

CAUTION

When mounting units in a common enclosure, install a cooling fan or some other means to cool the air entering the inverter below 113°F (45°C).


WIRING

CONNECTION DIAGRAM

---IMPORTANT---

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

The following shows an interconnection diagram of the main circuit and control circuit. With digital operator, the motor can be operated by wiring the main circuit only. (Terminal ⊚ shows main circuit and ○ control circuit)
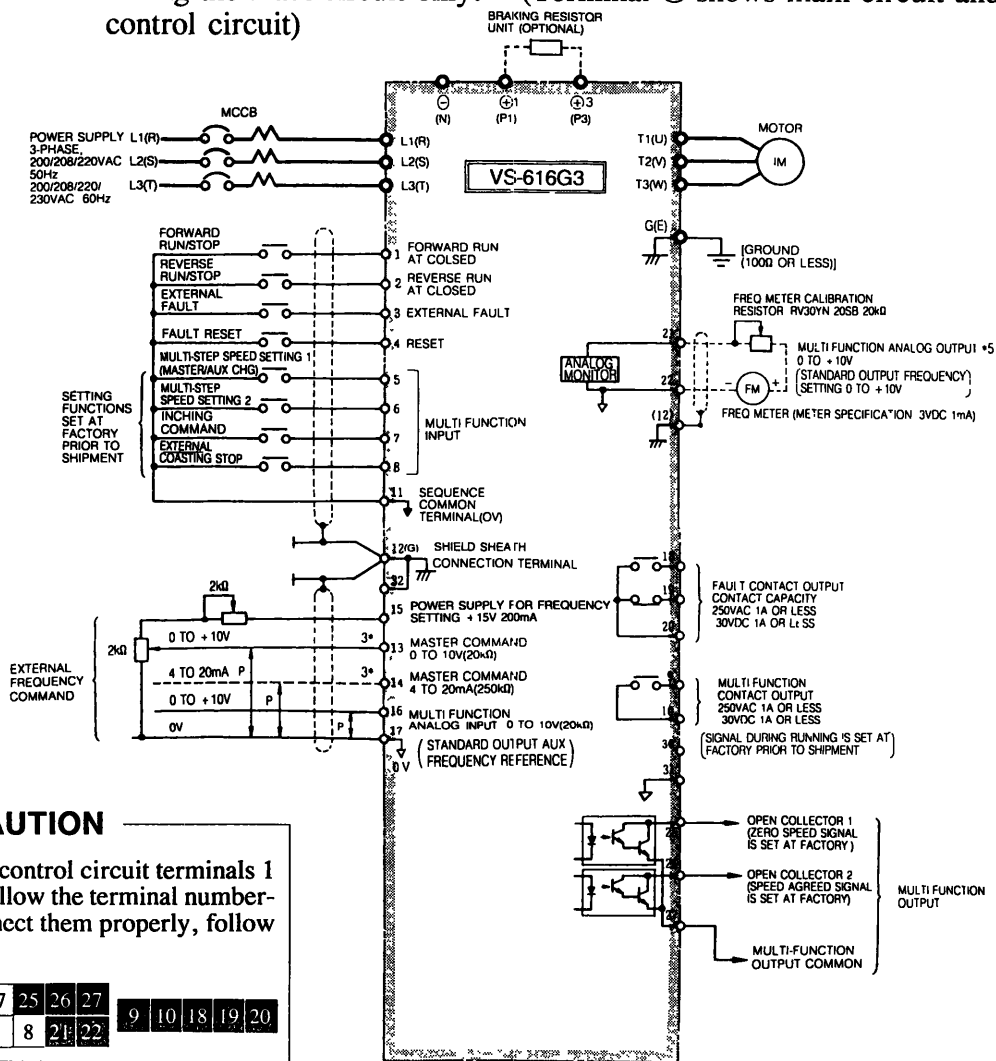
---CAUTION---

The connections of control circuit terminals 1 through 27 do not follow the terminal numbering order. To connect them properly, follow the figure below.

11	12(G)	13	14	15	16	17	25	26	27	9	10	18	19	20
1	2	3	4	5	6	7	8	21	22					

Notes: 1. ⊤⊤ indicates shielded leads and ⊤⊤ twisted-pair shielded leads.

2. Control circuit terminal 15 of +15V has maximum output current capacity of 20mA.

3. Either external terminal 13 or 14 can be used.
(For Simultaneous input, two signals are internally added in the unit.)

4. Multi-function analog output is an exclusive meter output such as frequency meter etc and not available for the feed back control system. Use analog monitor cards (Model AO-08 or AO-12) for the control system.

5. Control circuit terminal 12 (G) is frame ground of the unit.

6. Switching between master frequency command at external terminal 13 or 14 and aux frequency command at 16 corresponds to the master/aux. selection contact input.

Fig. 2 Connection Diagram

MAIN CIRCUIT

MAIN CIRCUIT TERMINALS

Model CIMR-G3[ ] Max Applicable Motor Output Terminals	2030 to 2075 230V Class 40 to 100HP (30 to 75kW)	4055 to 4300 460V Class 75 to 400HP (55 to 300kW)
L1 (R)		
L2 (S)	Main circuit input power supply	
L3 (T)		
T1 (U)		
T2 (V)	Inverter output	
T3 (W)		
$\ominus$ (N)		
$\oplus$ 3 (P3)	• Braking resistor unit ($\oplus$1 - $\ominus$)	
$\oplus$ 1 (P1)	• Main circuit capacitor ($\oplus$3 - $\ominus$)	
ℓ_1 (r)	• Cooling fan power supply (control power supply)	
ℓ_2 ($\triangle$)	ℓ_1-ℓ_2 200 to 230VAC input	• Cooling fan power supply (control power supply)
ℓ_2 200 ($\triangle$ 200)		ℓ_1-ℓ_2 200 200 to 230VAC input
ℓ_2 400 ($\triangle$ 400)		ℓ_1-ℓ_2 400 380 to 460VAC input
x	• External power supply	
y	(220VAC, 10VA)	
G (E)	Ground terminal	

■ Model CIMR-G3[ ]2030 to 2075
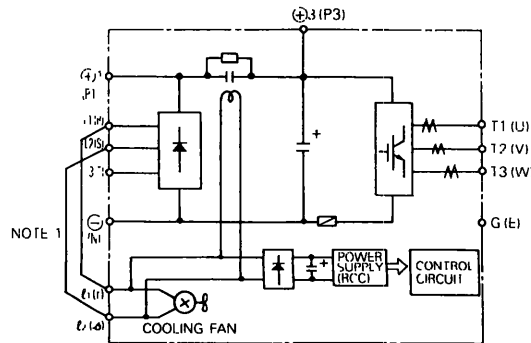
■ Model CIMR-G3[ ]4055 to 4300
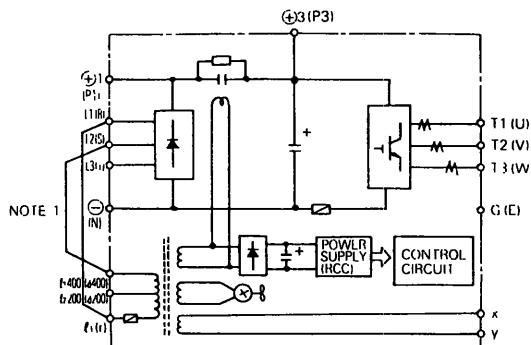
Notes: 1. When main circuit power supply and control circuit power supply is separately, provid-ed, remove the wiring to control circuit. If not provided separately, never remove the wiring to control circuit.

2. RCC power supply is provided from control power supply side.

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-616G3 input terminals L1 (R), L2 (S), L3 (T) to protect wiring. Recommended ratings of MCCB and Fuse are listed in Table 1. The fuses should be listed class RK5 fuses.

When a ground fault interrupter is used, select the one with no influence for high frequency, and setting current should be 200mA or over and operating time, 0.1 sec or over to prevent malfunction.

(Example) • Mitsubishi Electric NV series (manufactured in 1988 and after)
• Fuji Electric EGSG series (manufactured in1984 and after)

Table 1 Branch Circuit Protection

230V Class

VS-616G3	Model CIMR-		200 to 230V				
			G3 2030	G3 2037	G3 2045	G3 2055	G3 2075
	Capacity	kVA	54	68	78	95	130
	Rated Output Current	A	130	160	183	224	300
MCCB or Fuse, Class RK5	Rated Current		225A	225A	300A	400A	600A

460V Class

VS-616G3	Model CIMR-		380 to 460V						
			G3 4055	G3 4075	G3 4110	G3 4160	G3 4185	G3 4220	G3 4300
	Capacity	kVA	110	140	200	250	290	380	510
	Rated Output Current	A	128	165	224	300	340	450	600
MCCB or Fuse, Class RK5	Rated Current		225A	300A	400A	600A	600A	800A	1000A

SURGE SUPPRESSOR

For the surge suppressors should be connected to the coils of relays, magnetic contactors, magnetic valves, or magnetic relays. Select type from Table 2.

Table 2 Surge Suppressors

Coils of Magnetic Contactor and Control Relay		Surge Suppressor*		
		Model	Specifications	Yaskawa Code No.
200 to 230V	Large-size Magnetic Contactors	DCR2-50A22E	250 VAC 0.5μF + 200Ω	C002417
	Control Relay MY-2, -3(OMRON) HH-22, -23(Fuji) MM-2, -4(OMRON)	DCR2-10A25C	250 VAC 0.1μF + 100Ω	C002482
380 to 460V Units		DCR2-50D100B	1000 VDC 0.5μF + 220Ω	C002630

*Made by MARCON Electronics.

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WIRE AND TERMINAL SCREW SIZES

The wire sizes and types are shown in Tables 3 and 4.

Table 3   230V Class Wire Size

Circuit	VS-616G3 Model CIMR-	Inverter Capacity kVA	Terminal			75°C Wire Range		Wire Type
			Symbol	Screw	Torque N·m	AWG	mm²	
Main Circuit	G3□□2030 †	54	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 10	20.4	3 / 0	86	Power cable 600V vinyl sheathed wire or equivalent
			G (E)	*	23.0	4 -2	22 - 34	
			ℓ1 (r), ℓ2 (△)	M 4	1.43	14 - 10	2 - 5.5	
	G3□□2037 †	68	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 10	20.4	1/0 × 2P	54 × 2P	
			G (E)	*	23.0	4 - 2	22 - 34	
			ℓ1 (r), ℓ2 (△)	M 4	1.43	14 - 10	2 - 5.5	
	G3□□2045 †	78	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3) T1 (U), T2 (V), T3 (W)	M 10	20 4	2/0 × 2P	68 × 2P	
			G (E)	*	23.0	4 - 2	22 - 34	
			ℓ1 (r), ℓ2 (△)	M 4	1.43	14 - 10	2 - 5.5	
	G3□□2055 †	95	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 10	20.4	4/0 × 2P	108 × 2P	
			G (E)	*	23.0	3 - 2	27 - 38	
			ℓ1 (r), ℓ2 (△)	M 4	1.43	14 - 10	2 - 5.5	
	G3□□2075 †	130	l1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 12	36.7	300MCM×2P	152 × 2P	
			G (E)	*	23.0	1 - 2/0	43 - 68	
			ℓ1 (r), ℓ2 (△)	M 4	1.43	14 - 10	2 - 5.5	
Control Circuit	Common to All Models	—	1 - 27	M 3.5	0 95	18 - 14	0.75 - 2	Twisted shielded wire with class 1 wiring or equivalent

* Indicates the use of Pressure Lug Terminals
† Where □ is "U" or "V".

IMPORTANT

- Use 75°C copper wires only.
- Low voltage terminals shall be wired with Class I Wiring.

Table 4   460V Class Wire Size

Circuit	VS-616G3 Model CIMR-	Inverter Capacity kVA	Terminal			75°C Wire Range		Wire Type
			Symbol	Screw	Torque N·m	AWG	mm²	
Main Circuit	G3□4055 †	110	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 10	20.4	3/10	86	Power cable· 600V vinyl sheathed wire or equivalent
			G (E)	*	23 0	4 - 2	22 - 34	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1.43	14 - 10	2 - 5.5	
	G3□4075 †	140	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 10	20.4	1/0 × 2P	54 × 2P	
			G (E)	*	23.0	4 - 2	22 - 34	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1.43	14 - 10	2 - 5.5	
	G3□4110 †	200	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 10	20.4	4/0 × 2P	108 × 2P	
			G (E)	*	23.0	3 - 2	27 - 34	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1.43	14 - 10	2 - 5 5	
	G3□4160 †	250	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 12	36.7	250MCM × 2P	127 × 2P	
			G (E)	*	23.0	1 - 2/0	43 - 68	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1.43	14 - 10	2 - 5.5	
	G3□4185 †	290	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 16	91.8	350MCM × 2P	177 × 2P	
			G (E)	*	23.0	1 - 2/0	43 - 68	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1 43	14 - 10	2 - 5.5	
	G3□4220 †	380	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 16	91.8	500MCM × 2P	253 × 2P	
			G (E)	*	23.0	1/0 - 2/0	54 - 68	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1.43	14 - 10	2 - 5 5	
	G3□4300 †	510	L1 (R), L2 (S), L3 (T), ⊖ (N), ⊕1 (P1), ⊕3 (P3), T1 (U), T2 (V), T3 (W)	M 16	91.8	900MCM × 2P	456 × 2P	
			G (E)	*	23.0	2/0	68	
			ℓ1 (r), ℓ2 200 (ℓ200), ℓ2 400 (ℓ400), x, y	M 4	1.43	14 - 10	2 - 5.5	
Control Circuit	Common to All Models	—	1 - 27	M 3.5	0 95	18 - 14	0.75 - 2	Twisted shielded wire with class 1 wiring or equivalent.

* Indicates the use of Pressure Lug Terminals.
† Where □ is "U" or "V".

IMPORTANT

Wire size should be determined considering voltage drop. Voltage drop is obtained by the following equation: select the size so that voltage drop will be less than 2% the normal rated voltage.

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

CAUTION

The external interconnection wiring must be performed with following procedures.

After completing VS-616G3 interconnections, be sure to check that connections are correct. Never use control circuit buzzer check.

MAIN CIRCUIT INPUT/OUTPUT

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

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

(3) Never connect AC main circuit power supply to output terminals T1 (U), T2 (V), and T3 (W). Otherwise the inverter may be damaged.

(4) Care should be taken to prevent contact of wiring leads with VS-616G3 cabinet, for short-circuit may result.

(5) Never connect power factor correction capacitor or noise filter to VS-616G3 output.

(6) Never open or close contactors in the output circuit unless inverter is properly sized.

GROUNDING

Ground the casing of the VS-616G3 using ground terminal G (E).

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

(2) Never ground VS-616G3 in common with welding machines, motors, and other large-current electrical equipment, or ground pole. Run the ground lead in a separate conduit 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-616G3 units are used side by side, all the units should preferably be grounded directly to the ground poles. However, connecting all the ground terminals of VS-616G3 in parallel, and ground only one of VS-616G3 to the ground pole is also permissible (Fig. 3). However, do not form a loop with the ground leads.
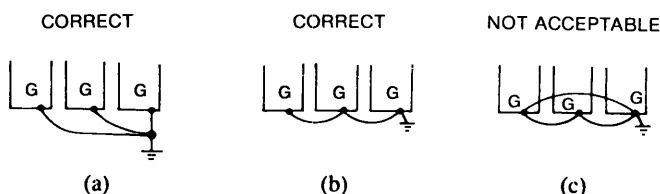

CORRECT	CORRECT	NOT ACCEPTABLE
(a)	(b)	(c)

Fig. 3 Grounding of Three VS-616G3 Units

CONTROL CIRCUIT

Low voltage terminals shall be wired with Class I Wiring.

CONTROL CIRCUIT TERMINALS

Classifi-cation	Terminal	Signal Function	Description		Signal Level
Sequence Input Signal	1	Forward operation-stop signal	Forward run at closed, stop at open		Photo-coupler insulation Input +24VDC 8mA
	2	Reverse operation-stop signal	Reverse run at closed, stop at open		
	3	External fault input	Fault at closed, normal state at open		
	4	Fault reset input	Reset at closed		
	5	Master/Aux. change (Multi-step speed ref.1)	Aux. freq. ref. at "closed"	Multi-function contact input: the following signals available to select. Forward/reverse, run mode, multi-speed, jog frequency, accel/decel time, external fault, external base block stop, hold command, inverter overheat prediction, DB command, aux. input effective, speed search, energy-saving operation	
	6	Multi-step speed ref.2	Effective at "closed"		
	7	Jog command	Jog run at "closed"		
	8	External coasting stop	Inv. output stop at "closed"		
	11	Sequence control input common terminal	—		
Analog Input Signal	15	Power supply terminal for speed ref.	Speed ref. power supply		+15V (Allowable current 20mA max)
	13	Master speed frequency ref.	0 to −10V/100% freq.		0 to +10V (20kΩ)
	14		4 to 20mA/100% freq.		4 to 20mA (250Ω)
	16	Aux. frequency ref.	10V/100%	Multi-function contact input. one of the following signals available to select, speed command, speed gain, speed bias, overtorque, overvoltage bias, rate of accel / decel DB current	0 to +10V (10kΩ)
	17	Common terminal for control circuit	0V		—
	12	Connection to shield sheath of signal lead	—		—
Sequence Output Signal	9	During running (NO)	Run at "closed"	Multi-function contact output: one of the following signals available to output. Output during running, zero speed, agreed speed, arbitrary agreed speed, frequency detection, overtorque, undervoltage, run mode, coasting stop, braking resistor overheat	Dry contact Contact capacity: 250VAC 1A or less 30VDC 1A or less
	10				
	25	Zero speed detection	Makes at min, freq. (Cn-07) or less		Open collector output +48V 50mA or less
	26	Speed agreed detection	Makes when the freq. reaches to ±1% of set freq.		
	27	Open collector output common			—
	18	Fault contact output (NO, NC)	Fault at closed between terminals 18 and 20		Dry contact Contact capacity: 250VAC 1A or less 30VDC 1A or less
	19		Fault at open between terminals 19 and 20		
	20				
Analog Output Signal	21	Frequency meter output	0 to 10V/100% freq.	Ammeter output selection available	0 to 11V max. 2mA or less
	22	Common			

■ TYPICAL CONTROL CIRCUIT TERMINAL ARRANGEMENT

11	12 (G)	13	14	15	16	17	25	26	27		9	10	18	19	20
1	2	3	4	5	6	7	8	21	22						

─────────── CAUTION ───────────

The external interconnection wiring must be performed with following procedures.

After completing VS-616G3 interconnections, be sure to check that connections are correct. Never use control circuit buzzer check.

(1) Separation of control circuit leads and main circuit leads

Signal leads 1 through 32 must be separated from main circuit leads L1 (R), L2 (S), L3 (T), $\oplus$ 1 (P1), $\oplus$ 3 (P3), T1 (U), T2 (V), T3 (W), $\ominus$ (N) and other power cables to prevent erroneous operation caused by noise interference.

(2) Control circuit leads 9, 10, 18, 19, 20 (contact output) must be separated from leads 1 to 8, 11 to 17, 21, 22 and 25 to 27.

(3) Use the twisted shielded or twisted-pair shielded wire for the control circuit line and connect the shield sheath to the inverter terminal 12 to prevent malfunction caused by nosie. See Fig. 4. A wiring distance should be less than 164 ft (50 m).
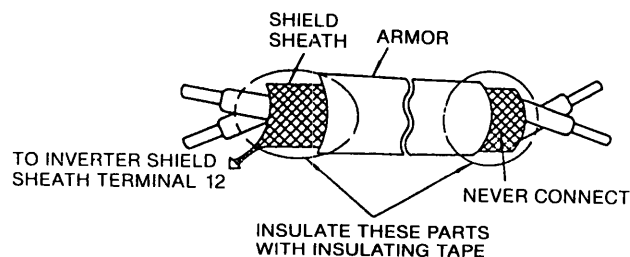
SHIELD
SHEATH ARMOR

TO INVERTER SHIELD
SHEATH TERMINAL 12

NEVER CONNECT

INSULATE THESE PARTS
WITH INSULATING TAPE

Fig. 4 Shielded Wrie Termination

TEST OPERATION

To assure safety, prior to test operation disconnect the coupling or belt which connects the motor with the machine so that motor operation is isolated. If an operation must be performed while the motor is directly connected to the machine, use great care to avoid any possible hazardous condition.

CHECK BEFORE TEST OPERATION
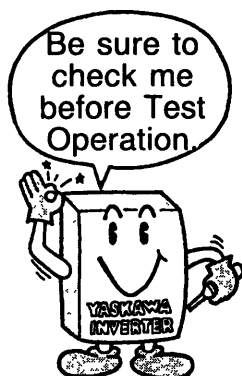
After completion of installation and wiring, check for
(1) proper wiring
(2) short circuit due to wire clippings
(3) loose screw-type terminals
(4) proper load

Be sure to check me before Test Operation.

SETTING THE LINE VOLTAGE SELECTING CONNECTOR FOR 460V CLASS 75HP (55kW) AND ABOVE

The line voltage selecting connector shown in Fig. 5 must be set according to the type of main circuit power supply. Insert the connector at the position showing the appropriate line voltage.
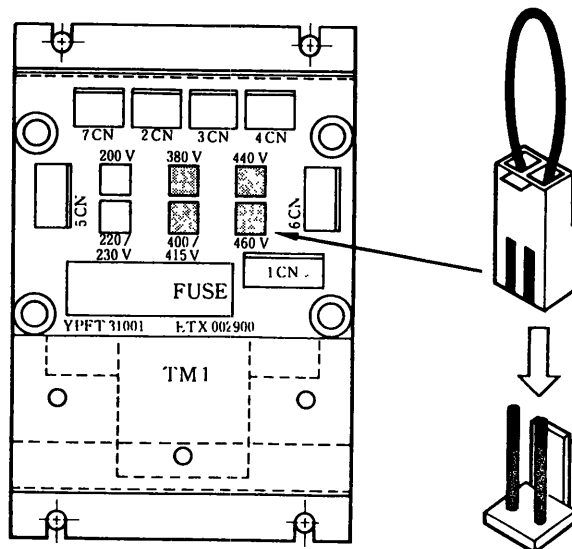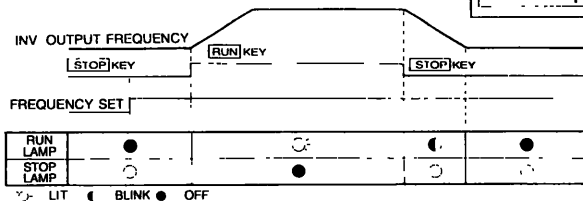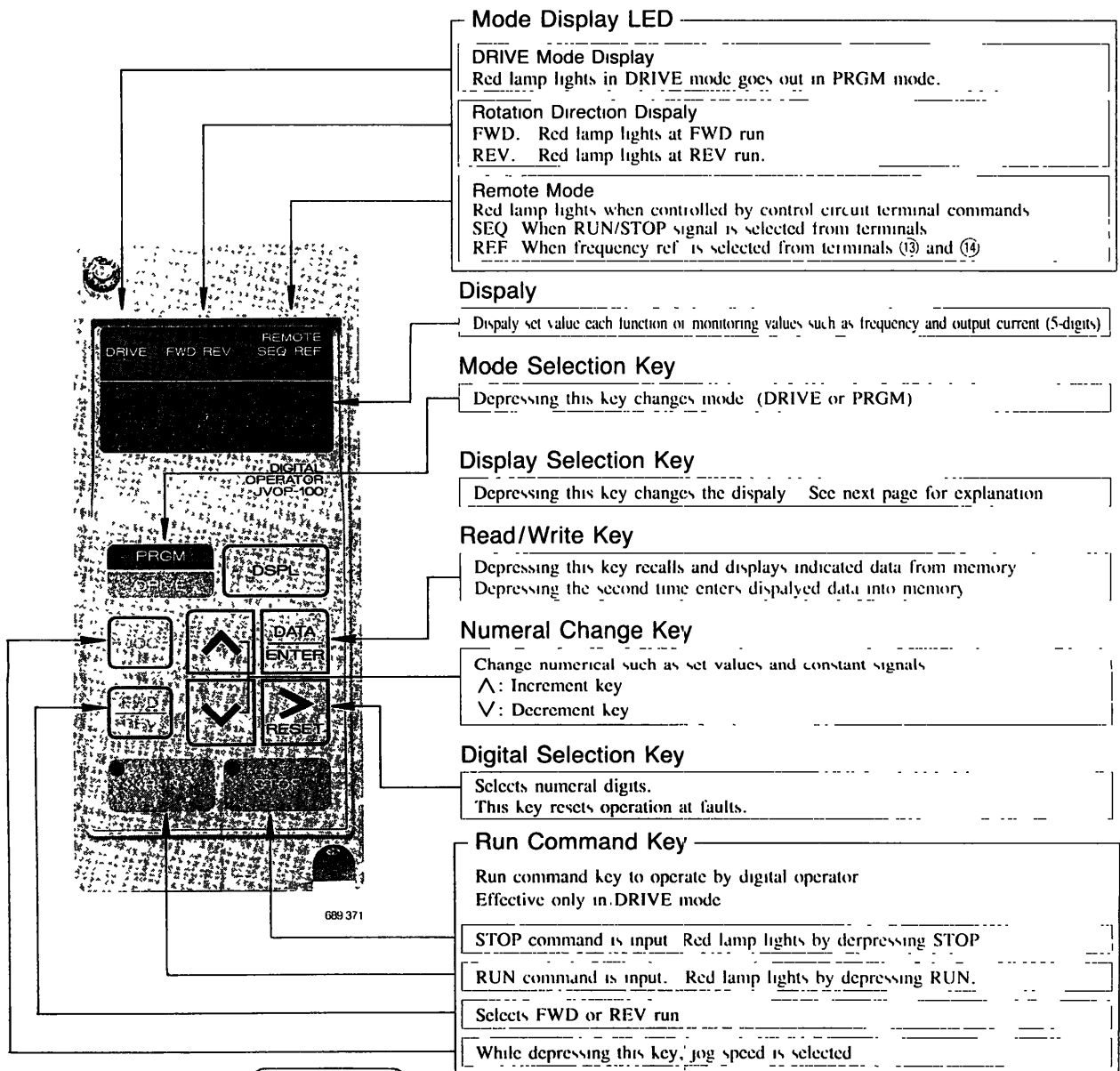The unit is preset at the factory for 460 line voltage.
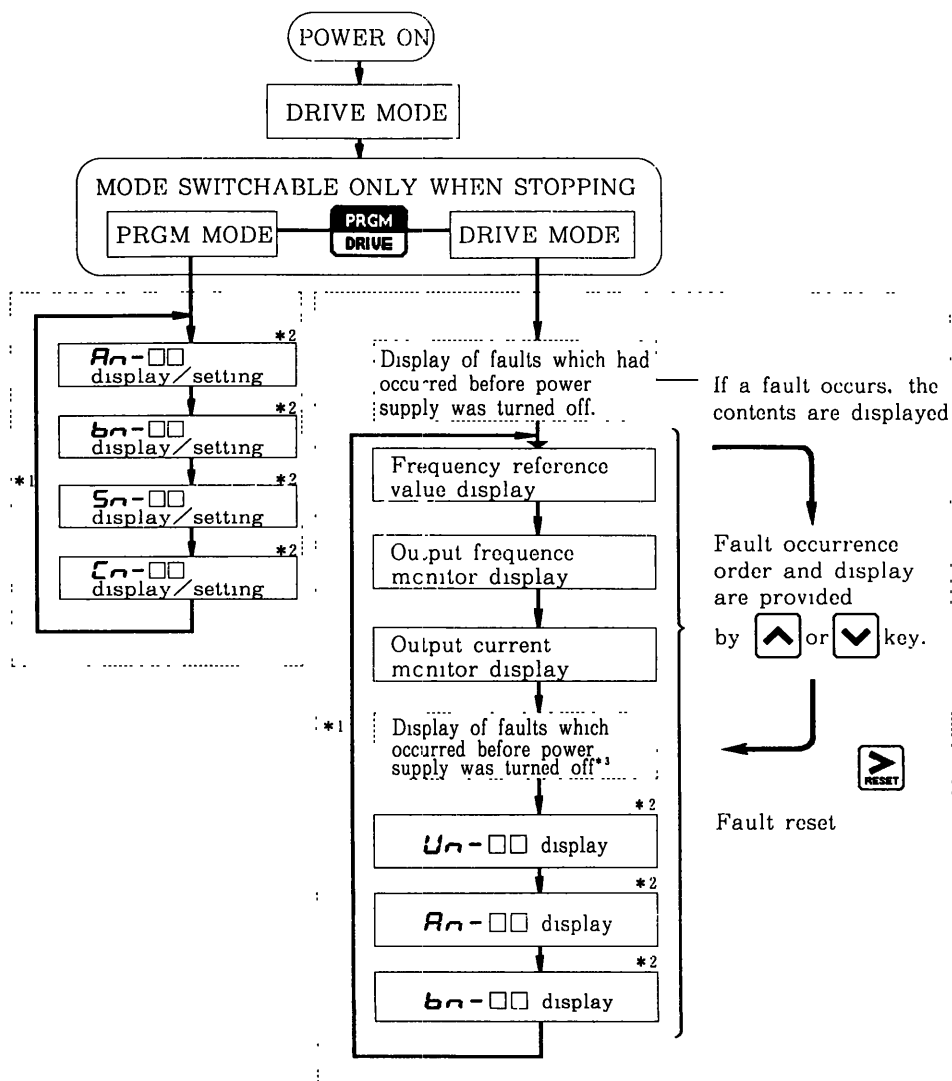
Fig. 5 Selection of Line Voltage

OPEATION

DIGITAL OPERATOR

Digital operator has DRIVE mode and PRGM mode. Selecting DRIVE mode enables the inverter to operate. PRGM mode enables the programs to be written-in. DRIVE and PRGM modes can be switched by [PRGM/DRIVE] key only when stopped.

Mode Display LED

DRIVE Mode Display
Red lamp lights in DRIVE mode goes out in PRGM mode.

Rotation Direction Dispaly
FWD. Red lamp lights at FWD run
REV. Red lamp lights at REV run.

Remote Mode
Red lamp lights when controlled by control circuit terminal commands
SEQ When RUN/STOP signal is selected from terminals
REF When frequency ref is selected from terminals ⑬ and ⑭

Dispaly

Dispaly set value 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 dispaly See next page for explanation

Read/Write Key

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

Numeral Change Key

Change numerical such as set values and constant signals
∧: Increment key
∨: Decrement key

Digital Selection Key

Selects numeral digits.
This key resets operation at faults.

Run Command Key

Run command key to operate by digital operator
Effective only in DRIVE mode

STOP command is input Red lamp lights by derpressing STOP

RUN command is input. Red lamp lights by depressing RUN.

Selects FWD or REV run

While depressing this key, jog speed is selected

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INV OUTPUT FREQUENCY
[STOP]KEY   [RUN]KEY   [STOP]KEY

FREQUENCY SET

RUN or STOP lamp changes in accordance with the following operations.

RUN LAMP	●	○	(	●
STOP LAMP	○	●	○	

◌ LIT (BLINK ● OFF

DRIVE MODE AND PRGM MODE

(POWER ON)

DRIVE MODE

MODE SWITCHABLE ONLY WHEN STOPPING

PRGM MODE — **PRGM / DRIVE** — DRIVE MODE

*2
Rn - □□
display/setting

*2
bn - □□
display/setting

*1

*2
Sn - □□
display/setting

*2
Cn - □□
display/setting

·Display of faults which had occured before power supply was turned off. —— If a fault occurs, the contents are displayed

Frequency reference value display

Ou.put frequence mcnitor display

Output current mcnitor display

*1 Display of faults which occurred before power supply was turned off*3

*2
Un - □□ display

*2
Rn - □□ display

*2
bn - □□ display

Fault occurrence order and display are provided

by [∧] or [∨] key.

[>/RESET]

Fault reset

*1: The constant group to be displayed is changed each time display selection key [DSPL] . is depressed.

*2: For details of constants (An-□□, bn-□□, Cn-□□, Sn-□□, Un-□□), refer to "BASIC CONSTANTS" on page 22.

*3: Faults that occurred in the previous operation are displayed. Even if the power supply is turned OFF at fault occurrence, the constants are stored so that they are displayed after the power supply is turned ON again. (When no fault occurred, fault display of the previous operation is skipped.)

■ DRIVE MODE

Monitor item is changed each time display selection key [DSPL] is depressed. At fault occurrence, the digital operator displays the fault. Depressing [> RESET] key changes to the previous display.

Description	Key Operation	Digital Operator Display	Remarks
Drive mode selected	[PRGM] [DRIVE]	LED [DRIVE] Lights	No display when no fault occurred before power supply was turned OFF.
Display of faults which occurred before power supply was turned OFF.			
Frequency reference value display/setting		$F\underline{00}.\,00$	
	DSPL		
Output frequency monitor display		$0.\,00$	
	DSPL		
Output current monitor display		$0.\,0A$	
	DSPL		
Display of faults which occurred before power supply was turned OFF.		$U\,IUU\,I$	Example Main circuit undervoltage trip
	DSPL		
$Un-$ *		$Un-0\,I$	
	DSPL		
$An-$ *		$An-0\,I$	Monitor value is displayed by [DATA ENTER] Key.
	DSPL		
$bn-$ *		$bn-0\,I$	
	DSPL		

*: Check the display data referring to "BASIC CONSTANTS" on page 22.

■ PRGM MODE

Monitor item is changed each time [DSPL] key is depressed.

Description	Key Operation	Digital Operator Display	Remarks
PRGM mode selected	[PRGM / DRIVE]	$An-0\ 1$	LED [DRIVE] OFF
$An-$ *		$An-0\ 1$	
	[DSPL]		
$bn-$ *		$bn-0\ 1$	Date are displayed by [DATA ENTER]
	[DSPL]		
$Sn-$ *		$Sn-0\ 1$	
	[DSPL]		
$Cn-$ *		$Cn-0\ 1$	
	[DSPL]		

*: Check the display data referring to "BASIC CONSTANTS" on page 22.

[Typical Accel Time Setting]

Accel time can be set either in the DRIVE or PRGM mode.

Accel Time Setting	Key Operation	Digital Operator Display	Remarks
· Accel time constant selected	[DSPL]	$bn-0\ 1$	
· Accel time data display	[DATA ENTER]	$10.\ 0$	10 sec preset at factory
· Set 12.5 seconds to accel time.	[>RESET] [∧] [∨]	$12.\ 5$	
· Write-in data.	[DATA ENTER]	End	

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BASIC CONSTANTS

The constants described here are those required for basic operation.

■ *Un -*　　(Monitor Type)

No.	Item	Display	Unit
Un-01	Frequency reference	*120 00*	Hz
Un-02	Output frequency	*120 00*	Hz
Un-03	Output current	*4 8A*	A
Un-04	Voltage reference	*200U*	V
Un-05	DC voltage (V.P-N)	*Pn270*	V
Un-06	Output power/("-" displayed at regeneration)	*0. 75*	kW

■ *An -*　(Frequency Reference)

No.	Item	Display	Unit
An-01	Master frequency	*120 00*	Hz
An-09	Inching frequency	*6 00*	Hz

■ *bn -*　(Constant to be Changed during Operation)

No.	Item	Display	Unit
bn-01	Acceleration time	*10. 0*	sec
bn-02	Deceleration time	*10. 0*	sec
bn-11	Frequency meter output gain	*1. 000*	—

■ *Sn -*　(System Constant to be Changed at Stopping)

No.	Operation Conditions		Data (digits) 1	2	3	4	Setting prior to Shipment
Sn-04	RUN MODE	Master frequency reference: Control terminal 13 or 14 input	—	—	—	0	0011
		Master frequency reference: Digital operator *An-01*	—	—	—	1	
		Operated by control terminal run command.	—	—	0	—	
		Operated by run command from the digital operator.	—	—	1	—	
	STOP MODE	Frequency deceleration to stop	0	0	—	—	
		Coasting to stop	0	1	—	—	
		Full range DC injection braking to stop	1	0	—	—	
		Coasting to stop (restart possible after the time set *bn-02*)	1	1	—	—	

■ *Cn -*　(Control Constnat to be Changed at Stopping)

No.	Item	Display	Unit
Cn-09	Motor rated current (to agree with motor NP)	*3. 3*	A
Cn-11	DC injection braking current	*50*	%
Cn-12	DC injection braking time at stop	*0. 5*	sec
Cn-14	Frequency reference (upper limit)	*100*	%
Cn-15	Frequency reference (lower limit)	*12*	%
Cn-36	No. of retry operations at fault	*5*	times

INPUT VOLTAGE SET

Set the power supply voltage to be used, by using the digital operator.
The factory set for 230V class is 200V, and for the 460V class is 400V.

Use "Cn-01." for changing input voltage.
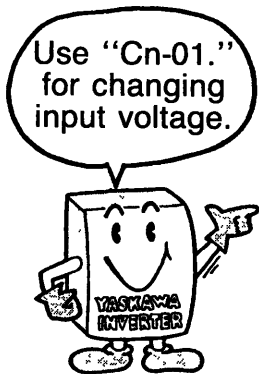
Input Voltage Setting Method	Key Operation	Digital Operator Display	Remarks
POWER ON			
Frequency reference value displayed		*F00. 00*	
Change mode to PRGM	PRGM DRIVE	*An-01*	LED DRIVE OFF.
Select *Cn-01*	DSPL Depress three times.	*Cn-01*	
Data displayed.	DATA ENTER	*200. 0*	
Change set value — Set to 220V.	> RESET ∧ ∨	*220. 0*	
Write-in new set value.	DATA ENTER	*End*	Displayed for 0 5 second
Switch to DRIVE mode.	PRGM DRIVE	*F00. 00*	LED DRIVE lights.

DIGITAL OPERATOR OPERATION

The following diagram describes typical digital operator operation in the pattern shown below.

■ OPERATION PATTERN
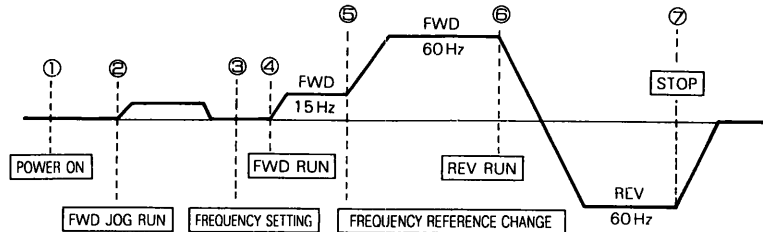
■ TYPICAL OPEATION

Description	Key operation	Digital Operator Display	Remarks
① POWER ON · Frequency reference value is displayed		$FOO.\ OO$	
· Select output frequency monitor display · Check rotation direction (FWD at power ON.)	DSPL	$O.\ OO$	LED [FWD] lights.
② FWD JOG RUN · Jog run operation (Moving while key depressed.) 6 Hz	JOG	$6.\ OO$	
Cont'd			

Description	Key Operation	Digital Operator Display	Remarks
Cont'd			
③ Frequency setting 15 Hz · Select frequency reference value display.	**DSPL** Depress three times.	*F00. 00*	
· Change reference setting.	**≥** **∧** **∨**	*F 15. 00*	
· Write-in set value. Stop blinking for 2 seconds.	**DATA ENTER**	*F 15. 00*	Stop blinking for 2 second
· Select output frequency monitor display.	**DSPL**	*0 00*	
④ FWD run 15 Hz · FWD run operation	**RUN**	*15 00*	LED **RUN** lights
⑤ Frequency set value change 60 Hz · Select frequency reference	**DSPL** Depress six times.	*F 15 00*	
· Change set value.	**≥** **∧** **∨**	*F60. 00*	FWD run (60Hz)
· Write-in set value Stop blinking for 2 seconds.	**DATA ENTER**	*F60 00*	Stop blinking for 2 second
· Select output frequency monitor display.	**DSPL**	*60 00*	
⑥ REV run 60 Hz · Switch to REV run	**FWD REV**	*-60. 00*	REV run (60Hz) LED REV lights
⑦ Stop · Deceleration to a stop.	**STOP**	*0. 00*	LED **STOP** lights ⌈LED **RUN** blinks during deceleration⌋

CONTROL TERMINAL SIGNAL OPERATION

Let's operate your machine using Control Terminal signal.

Description		Key Operation	Digital Operator Display	Remarks
POWER ON	· Frequency reference value displayed · Select PRGM mode	[PRGM/DRIVE]	$FOO\ OO$ $An-O1$	LED [DRIVE] OFF
OPERATION CONDITIONS SET	· $Sn-O1$ displayed	[DSPL] Depress twice.	$Sn-O1$	
	· Set $Sn-O4$.	[≥/RESET][∧][∨]	$On-O4$	
	· Data displayd.	[DATA/ENTER]	$OO11$	
	· Set data to 0000	[≥/RESET][∧][∨]	$OOOO$	
SET VALUE WRITE-IN	· Check for "End" display (Operation by control terminal signal enables.)	[DATA/ENTER]	End	Displayed for 0.5 second
DRIVE MODE SELECTION	· Change to DRIVE mode	[PRGM/DRIVE]	$FOO.\ OO$	LED [DRIVE] lights.
FREQUENCY SET	· Input and check for frequency value of control terminal 13 or 14.		$F6O.\ OO$	
OUTPUT FREQUENCY DISPLAY	· Change to output frequency display.	[DSPL]	$O.\ OO$	
OPERATION CHECK	· Closed/open among terminals 1 to 11 with terminals 7 to 11 closed to perform jog operation		$6.\ OO$	LED [RUN] lights.
RUN	· After checking for normal operation, close among control terminals 1 and 11 to perform FWD run.		$6O.\ OO$	Increased to 60 Hz. LED [RUN] lights.
STOP	· Open among control terminals 1 to 11 to stop		$O.\ OO$	Decreased to 0 Hz LED [STOP] lights. (LED [RUN] blinks during deceleration)

MAINTENANCE

PERIODIC INSPECTION

Be sure to inspect me periodically.

VS-616G3 requires very few routine checks. It will function longer if it is kept clean, cool and dry, while observing the precautions listed in "Location". Check for tightness of electrical connections, discoloration or other signs of overheating. Use Table 5 as your inspection guide. Before servicing, turn off AC main circuit power and be sure that CHARGE lamp is OFF.

Table 5   Periodical Inspection

Component	Check	Corrective Action
External terminals, unit mounting bolts, connectors, etc.	Loose screws	Tighten
	Loose connectors	Tighten
Cooling fins	Build-up of dust and dirt	Blow with dry compressed air of 39.2 × 10⁴ to 58.8 × 10⁴ Pa (57 to 85 psi.) pressure.
Printed circuit board	Accumulation of conductive dust or oil.	Blow with dry compressed air of 39.2 × 10⁴ to 58.8 × 10⁴ Pa (57 to 85 psi) pressure. If dust and oil cannot be removed, replace the board.
Cooling fan	For abnormal noise and vibration. Whether the cummulative operation time exceeds 20,000 hours or not.	Replace the cooling fan.
Power elements	Accumulation of dust and dirt	Blow with dry compressed air of 39.2 × 10⁴ to 58.8 × 10⁴ Pa (57 to 85 psi) pressure.
Smoothing capacitor	Discoloration or odor	Replace the capacitor or inverter unit.

Note: Operating conditions as follows:

  • Ambient temperature : 30°C (86°F)/yearly average

  • Load factor : 80% or below

  • Operation rate : 12 hours or below / day

MAINTENANCE

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Table 5   Periodical Inspection

Component	Check	Corrective Action
External terminals, unit mounting bolts, connectors, etc.	Loose screws	Tighten
	Loose connectors	Tighten
Cooling fins	Build-up of dust and dirt	Blow with dry compressed air of 39.2×10^4 to 58.8×10^4 Pa (57 to 85 psi.) pressure.
Printed circuit board	Accumulation of conductive dust or oil.	Blow with dry compressed air of 39.2×10^4 to 58.8×10^4 Pa (57 to 85 psi) pressure. If dust and oil cannot be removed, replace the board.
Cooling fan	For abnormal noise and vibration. Whether the cummulative operation time exceeds 20,000 hours or not.	Replace the cooling fan.
Power elements	Accumulation of dust and dirt	Blow with dry compressed air of 39.2×10^4 to 58.8×10^4 Pa (57 to 85 psi) pressure.
Smoothing capacitor	Discoloration or odor	Replace the capacitor or inverter unit.

Note: Operating conditions as follows:

  • Ambient temperature : 30°C (86°F)/yearly average

  • Load factor : 80% or below

  • Operation rate : 12 hours or below / day

SPARE PARTS

As insurance against costly downtime, it is strongly recommended that renewal parts to be kept on hand in accordance with the table below. When ordering renewal parts, please specify to your Yaskawa representative: Parts Name, Parts Code No. and Quantity.

Table 6-1 Common Spare Parts

Specifications \ Parts Name	Control PC Board	Digital Operator
Model	—	JVOP-100
Code	ETC61320[ ]-S[ ][ ][ ][ ]	CDR000070
Q'ty	1	1

Table 6-2 Spare Parts for 230V Class

VS-616G3 Model \ Parts Name Specifications		Gate Driver	Gate Driver Sub Board	Main Circuit Transistor	Main Circuit Diode	Fuse	Cooling Fan
CIMR-G3[ ]2030	Model	—		CM300HA-12E	160L2G43	A50P200	THA1V-U7556MX
	Code	ETC67046[ ]	—	STR000478	SID000447	FU000810	FAN000191
	Q'ty	1		6	3	1	2
CIMR-G3[ ]2037	Model	—		CM400HA-12E	160L2G43	A50P275	THA1V-U7556MX
	Code	ETC67043[ ]	—	STR000479	SID000447	FU000811	FAN000191
	Q'ty	1		6	6	1	2
CIMR-G3[ ]2045 CIMR-G3[ ]2055	Model	—	—	CM300HA-12E (2P)	160L2G43	A50P400	THA1V-U7556MX
	Code	ETC67016[ ]	ETC67044[ ]	STR000456	SID000447	FU000938	FAN000191
	Q'ty	1	1	12	6	1	2
CIMR-G3[ ]2075	Model	—	—	CM400HA-12E (2P)	160L2G43	A50P600	THA1V-U7556MX
	Code	ETC67017[ ]	ETC67045[ ]	STR000457	SID000447	FU000926	FAN000191
	Q'ty	1	1	12	9	1	2

Table 6-3 Spare Parts for 460V Class

VS-616G3 Model \ Specifications \ Parts Name		Gate Driver	Gate Driver Sub Board	Main Circuit Transistor	Main Circuit Diode	Fuse	Cooling Fan
CIMR-G3□4055	Model	—		CM400HA-24	160Q2G43	CR6L-200/UL	THA1V-U7556MX
	Code	ETC67030□□	—	STR000385	SID000410	FU000929	FAN000191
	Q'ty	1		6	6	1	2
CIMR-G3□4075	Model	—		CM400HA-24	160Q2G43	CR6L-300/UL	THA1V-U7556MX
	Code	ETC67031□□	—	STR000385	SID000410	FU000930	FAN000191
	Q'ty	1		6	6	1	2
CIMR-G3□4110	Model	—	—	CM300HA-24E (2P)	160Q2G43	A70P350	THA1V-U7556MX
	Code	ETC67035□□	ETC67036□□	STR000468	SID000410	FU000803	FAN000191
	Q'ty	1	1	12	9	1	2
CIMR-G3□4160	Model	—	—	CM400HA-24E (2P)	RM250DZ-24	A70P600	THA1V-U7556MX
	Code	ETC67039□□	ETC67040□□	STR000469	SID000411	FU000924	FAN000191
	Q'ty	1	1	12	6	1	2

VS-616G3 Model \ Specifications \ Parts Name		Gate Driver	Gate Driver Sub Board	Drive Unit	Main Circuit Diode	Cooling Fan Unit
CIMR-G3□4185	Model	—	—	—	RM250DZ-24	—
	Code	ETC67047□□	ETC67048□□	ETJ00276□□	SID000411	EUX00350□□
	Q'ty	1	1	3	6	3
CIMR-G3□4220	Model	—	—	—	RM250DZ-24	—
	Code	ETC67037□□	ETC67038□□	ETJ00273□□	SID000411	EUX00350□□
	Q'ty	1	1	3	6	3
CIMR-G3□4300	Model	—	—	—	RM250DZ-24	—
	Code	ETC67041□□	ETC67042□□	ETJ00274□□	SID000411	EUX00350□□
	Q'ty	1	1	3	9	3

FAULT DISPLAY

If there's a fault, use Table 7 for corrective action.
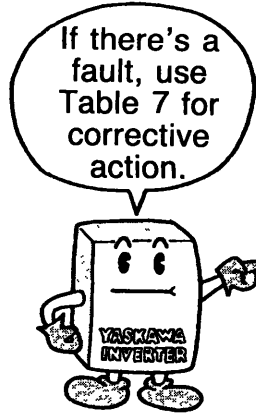
As Table 7 shows, the faults that the VS-616G3 detects are classified into troubles and alarms. If a problem occurs, the fault contact is output and the motor coasts to a stop. When an alarm is issued, the digital operator indicates the alarm for warning.

Table 7 Fault Display and Details

Indication	Fault Display	Description	Corrective Action
$Uu1$	Undervolatge (PUV)	Two seconds are counted after detection of low voltage.	• Check wiring of line units. (at power supply side) • Correct power supply voltage.
$Uu2$	Undervoltage (CUV)	Control circuit becomes low voltage during operation.	
$Uu3$	Undervoltage (MC-ANS fault)	Main circuit magnetic contactor does not operate correctly.	
GF	Grounding	Grounding current > approx. 50% of inverter rated current	• Check that motor insulation not deteriorated. • Check that there is no damage to wiring at load side.
oC	Overcurrent	Inv. output current > 200% of Inv. rated current	• Check the motor winding resistance and ground. • Increase accel time.
ou	Overvoltage	Detection level: Approx. 400V for 200V class Approx. 800V for 400V class [(Cn-01) ≥ 400V] Approx. 700V for 400V class [(Cn-01) < 400V)	Increase decel time and/or add braking resistor.
FU	Fuse blown	—	Check short-circuit at load, ground fault etc.
oH	Radiation fin overheated	Fin temperature 90°C (194°F)	Check fan or ambient temperature (less than 45°C, 113°F).
$oL1$	Overload	Protect the motor.	Measure motor temperature-rise and reduce load, then reset V/f.
$oL2$	Overload	Protect the inverter.	Reduce load, and increase accel time, then reset V/f.
$oL3$	Overtorque	When selecting inv. output OFF at "inv. output current > overtorque detection level" and overtorque detection.	—
rr	Regenerative transistor fault	—	Replace transistor.
rH	Braking resistor overheated	Protect braking resistor incorporated in inverter unit.	Reduce regenerative load, or use other resistor unit separately installed.
FAn	Coolig fan fault	Cooling fan stops during operation	Replace cooling fan.
$EF3$	Control circuit terminal ③ fault	Stop mode selection possible	Check state of input terminal with data Un-07 $Un-07$ (Replace inverter if " 1 " is indicated as the state of open terminal.
$EF5$	Control circuit terminal ⑤ fault		
$EF6$	Control circuit terminal ⑥ fault		
$EF7$	Control circuit terminal ⑦ fault		
$EF8$	Control circuit terminal ⑧ fault		

Table 7 Fault Display and Details (Cont'd)

Indication	Fault Dispaly	Description	Corrective Action
bUS	Communication inverter card (option) communication error	Stop mode selection possible	Check communication cable between communication interface card (SI-B) and master controller.
CPF00	Operator communication error	Communication between G3 and operator is not established 5 seconds after the power supply is turned ON.	• Insert operator connector again. • Replace control board.
CPF01	Operator commuincation error	Communication error occurs for 2 seconds after commuincation between G3 and operator is once established after the power supply is turned ON.	• Insert operator connector again. • Replace control board.
CPF02	Control circuit fault	Inverter fault	• Replace control PC board.
CPF03	NV-RAM (S-RAM) fault		
CPF04	NV-RAM (BCC, Access Code) fault		
CPF05	A/D converter fault in CPU		
CPF06	Optional connection fault	—	• Check and secure the option card connector.
CPF20	Fault of A/D converter built in analog speed reference card (option)	Option card fault	Replace option card.
CPF21	Self-analysis fault of CP-213 commuincation interface card (option)		
CPF22	Model code fault of CP-213 commuincation interface card (option)		
CPF23	Mutual analysis fault of CP-213 communication interface card (option)		

CAUTION

Do not replace the DC bus fuse without first checking the output transistors.

APPENDIX A

SPECIFICATIONS

Inverter Model CIMR-G3		200 to 230V					380 to 460V						
		2030	2037	2045	2055	2075	4055	4075	4110	4160	4185	4220	4300
Max. Applicable Motor Output HP (kW)*1	Constant Torque Ratings	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	75 (55)	100 (75)	150 (110)	200 (160)	250 (185)	300 (220)	400 (300)
	Variable Torque Ratings	50 (37)	60 (45)	75 (55)	100 (75)	125 (90)	100 (75)	150 (110)	200 (160)	250 (185)	300 (220)	400 (300)	500 (355)
Output Characteristics	Inverter Capacity kVA	54	68	78	95	130	110	140	200	250	290	380	510
	Constant Torque Rating Current A	130	160	183	224	300	128	165	224	300	340	450	600
	Variable Torque Rating Current*2 A	146	180	205	252	337	144	180	252	337	380	506	675
	Max. Output Voltage	3-Phase, 200/208/220/230V (Proportional to input voltage)					3-Phase, 380/400/415/440/460V (Proportional to input voltage by programming)						
	Rated Output Frequency	50, 60, 72, 90, 120, 180 Hz (up to 400 Hz available)											
Power Supply	Rated Input Voltage and Frequency	3-Phase 200/208/220V, 50 Hz 200/208/220/230V, 60 Hz					3-Phase 380/400/415/440/460V, 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	Digital command: 0.01% +14 to 104°F −10 to 40°C Analog command: 0.1% 77 ±18°F 25 ±10°C											
	Frequency Resolution	Digital operator reference: 0.1 Hz. Analog reference: 0.06 Hz/60 Hz											
	Output Frequency Resolution	0.01 Hz (1/30000)											
	Overload Capacity	150% constant torque rating current for 1 minute / 110% variable torque rating current for 1 minute											
	Frequency Setting Signal	0 to 10 VDC (20 kΩ), 4-20 mA (250 Ω) 0-±10V (OPTIONAL)											
	Accel/Decel Time	0.1 to 6000 sec (Accel/Decel time setting independently)											
	Braking Torque	Approx. 20%											
	No. of V-f Patterns	15 types of V/f pattern selection and arbitrary program V/f pattern setting enabled					4: For general purpose / 4: For high starting torque / 4: For fans and pumps / 3: For machine tools.						
	Motor Overload Protection	Electric thermal overload relay											
Protective Functions	Instantaneous Overcurrent	Motor coasts to a stop at approx. 200% of inverter rated current.											
	Blown Fuse Protection	Motor coasts to a stop by blown-fuse.											
	Overload	Motor coasts to a stop after 1 minute at 150% constant torque rating current. / Motor coasts to a stop after 1 minute at 110% variable torque rating current.											
	Overvoltage	Motor coasts to a stop if converter output voltage exceeds 400V.					Motor coasts to a stop if converter output voltage exceeds 800V. (approx 700V).*3						
	Undervoltage	Motor coasts to a stop if converter output voltage drops to 210V or below.					Motor coasts to a stop if converter output voltage drops to 420V or below.						
	Momentary Power Loss	Immediately stop by 15 ms and above momentary power loss. (Continuous system operation during power loss less than 2 sec is equipped as standard.) Setting made before shipment.											
	Fin Overheat	Thermostat											
	Stall Prevention	Stall prevention at accel/decel and constant speed operation											
	Ground Fault	Provided by electronic circuit											
	Power Charge Indication	Charge lamp stays ON until bus voltage drops below 50V.											
Environmental Conditions	Location	Indoor (protected from corrosive gases and dust)											
	Ambient Temperature	+14 to +104°F(−10 to +40°C) (Enclosed type, totally-enclosed type) +14 to +122°F (−10 to +50°C)*4 (Open chassis type) (not frozen)											
	Storage Temperature*5	−4 to 140°F (−20 to +60°C)											
	Humidity	90% RH (non - condensing)											
	Vibration	9.81m/s² (1G) less than 20Hz, up to 1.96m/s² (0.2G) at 20 to 50Hz											

*1 YASKAWA standard 4-pole motor is used to determine max applicable motor output.
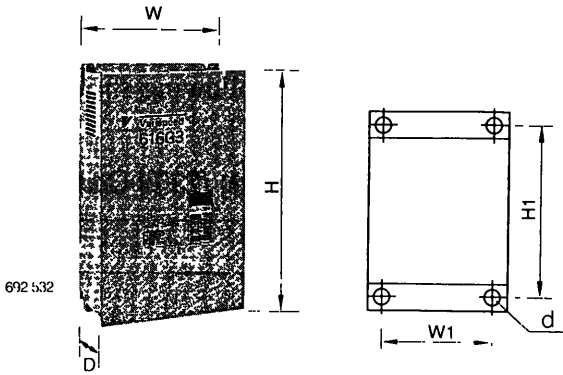*2 Application of variable torque rating requires adjustment of 4th digit of Sn-14: from 0 to 1 (0××× to 1×××).
*3: Approx. 700V when input voltage set value (Cn-01) is less than 400.0V Approx 800v when it exceeds 400 0V
*4. Up to 122°F (50°C) allowed when front cover is removed (open chassis type)
*5: Temperature during shipping (for short period)

APPENDIX B

DIMENSIONS in inch (mm)

692 532

Voltage V	Motor Capacity HP (kW)	VS-616G3 Enclosed Type						Mass lb (kg)
		W	H	D	W1	H1	Mtg Hole d	
200 to 230	40 (30)	16.73 (425)	26.57 (675)	11.02 (280)	12 4 (315)	25.78 (655)	M8	112 (51)
	50 (37)	18.7 (475)	31.5 (800)	11.02 (280)	14.76 (375)	30 7 (780)	M10	130 (59)
	60 (45)							143 (65)
	75 (55)							143 (65)
	100 (75)	23.62 (600)	50.39 (1280)	17.83 (453)	21 65 (550)	49.0 (1245)	M12	337 (153)
380 to 460	75 (55)	22 63 (575)	36.41 (925)	11.02 (280)	18.70 (475)	35 43 (900)	M10	194 (88)
	100 (75)							203 (92)
	150 (110)	22.63 (575)	36.41 (925)	12.99 (330)	18 70 (475)	35 43 (900)	M10	229 (104)
	200 (160)	23.62 (600)	53.54 (1360)	17.83 (453)	21.65 (550)	52.16 (1325)	M12	374 (170)
	250 (185)	37.40 (950)	57.08 (1450)	17.12 (435)	Note 3	55 11 (1400)	M12	793 (360)
	300 (220)							
	400 (300)	37 79 (960)	62.99 (1600)	17.91 (455)	Note 3	61 02 (1550)	M12	925 (420)

Notes 1. For detailed dimensions, contact your YASKAWA Representative.
2 NEMA1 (Enclosed type) will be designed and manufactured on your order.
3 The following shows the external diagram of 460V class open chassis type 250HP (185kW), 300HP (220kW) and 400HP (300kW).
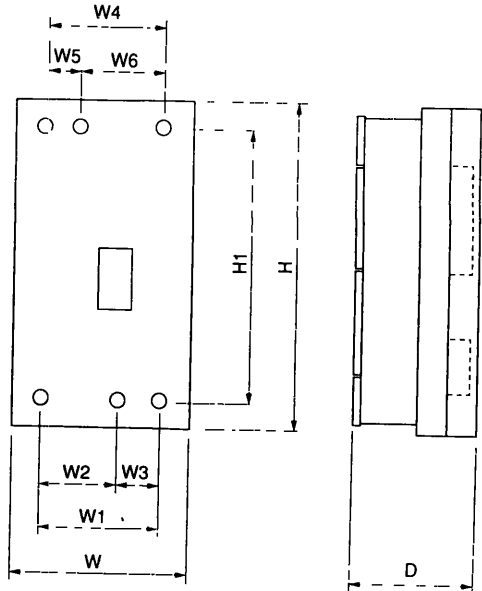
Voltage V	Enclosure	Model CIMR-	W1	W2	W3	W4	W5	W6
380 to 460	Open Chassis	G3 4185 / G3 4220	29 52 (750)	17 32 (440)	12.20 (310)	33.46 (850)	11.22 (285)	22 24 (565)
		G3 4300	29 52 (750)	17.32 (440)	12.20 (310)	34.37 (873)	11 73 (298)	22.63 (575)

APPENDIX C

V/f PATTERN (Sn-02)

The following V/f patterns can be selected by Sn-02. Set inverter input voltage to Cn-01 before V/f pattern selection.
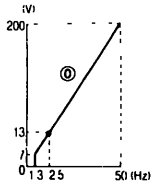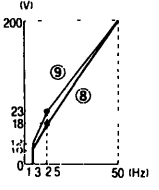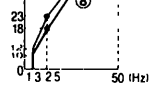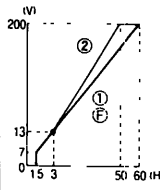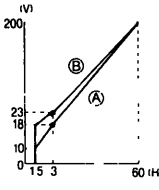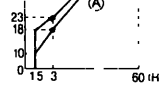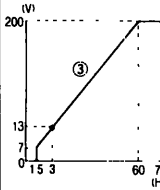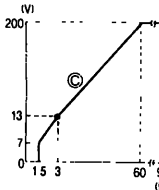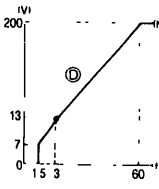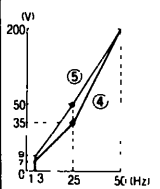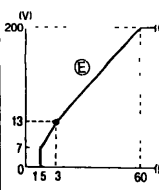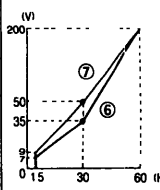
- Sn-02 data ⓪ to Ⓔ : Impossible to change
- Sn-02 data Ⓕ : Possible to set freely (The following shows the data after initialization.)

■ 40HP (30kW) to 60HP (45kW) V/f PATTERN SELECTION (230V Class)

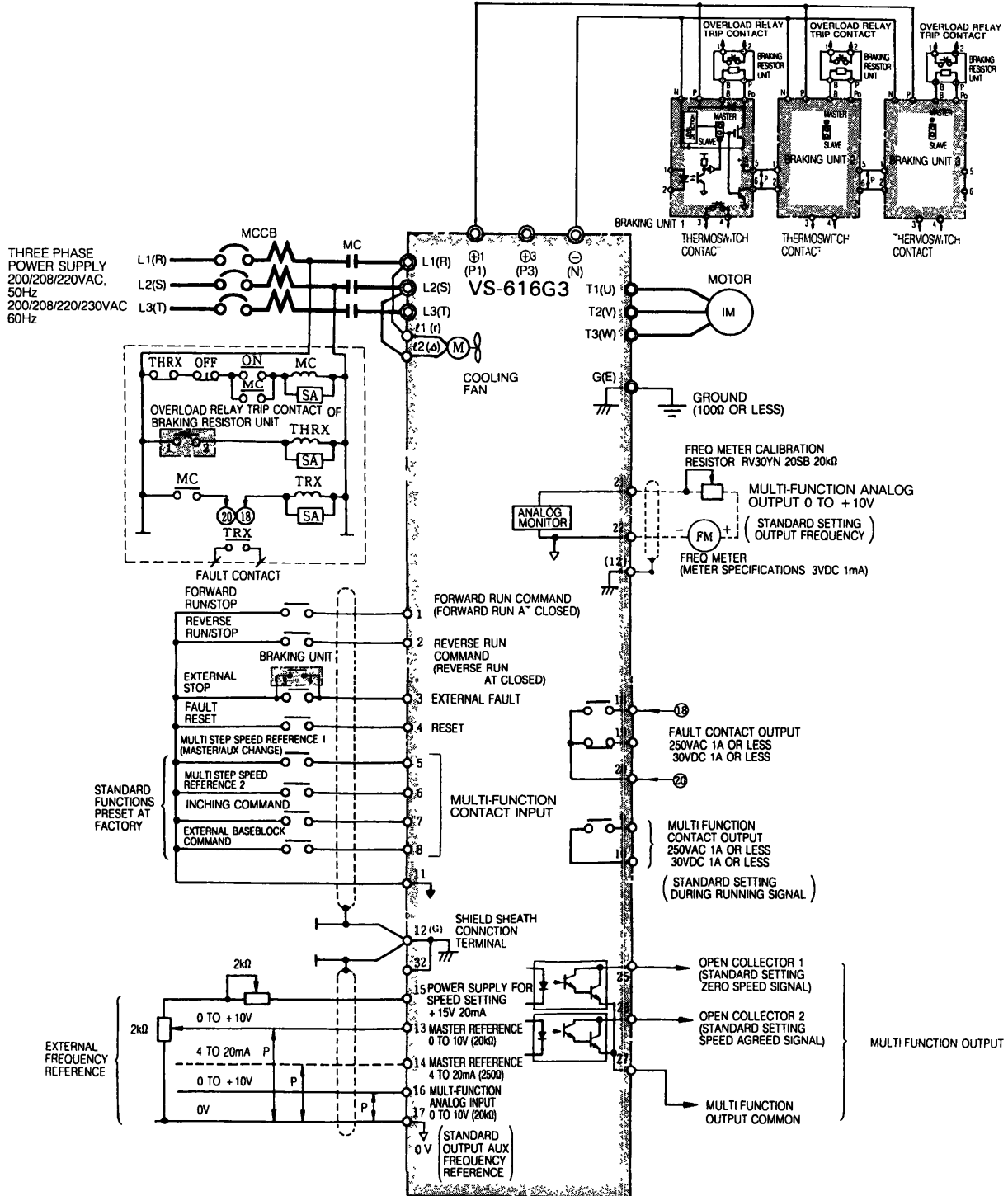| Appli-cation	Specification		Sn-02	V/f Pattern	Appli-cation	Specification		Sn-02	V/f Pattern
General Purpose	50Hz		⓪		High Starting Torque	50Hz	Low Starting Torque	⑧	
							High Starting Torque	⑨	
	60Hz	60Hz Saturation	① Ⓕ			60Hz	Low Starting Torque	Ⓐ	
		50Hz Saturation	②				High Starting Torque	Ⓑ	
	72Hz		③		Constant HP Operation (Machine Tools)	90Hz		Ⓒ	
Variable Torque Operation (Fans and Pumps)	50Hz	Variable Torque 1	④			120Hz		Ⓓ	
		Variable Torque 2	⑤						
	60Hz	Variable Torque 1	⑥			180Hz		Ⓔ	
		Variable Torque 2	⑦						

Notes: 1. Consider the following points as V/f pattern selecting conditions
   (1) Select a pattern in accordance with the motor voltage-frequency characteristics
   (2) Select a pattern in accordance with the motor maximum r/min
  2. High starting torque must be selected only in the following cases
   (1) Wiring distance is long (approx 150m or more)
   (2) Voltage drop at starting is large
   (3) AC reactor is inserted in inverter input or output
   (4) Motor smaller than the maximum applicable motor is operated

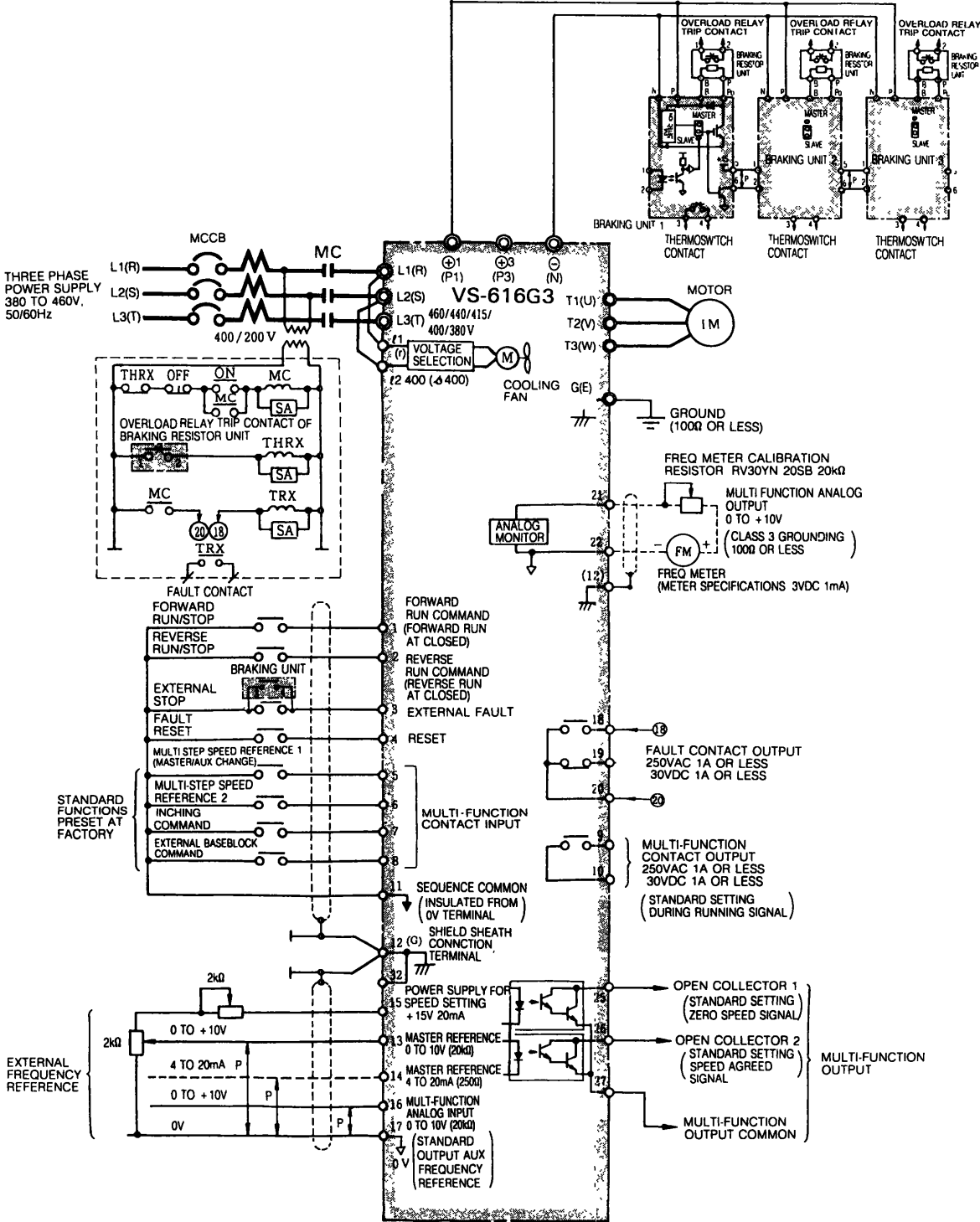## ■ 75HP (55kW) to 400HP (300kW) V/f PATTERN SELECTION (230V Class*)

Appli-cation	Specification		Sn-02	V/f Pattern	Appli-cation	Specification		Sn-02	V/f Pattern
General Purpose	50Hz		⓪	(V) 200 ⓪ 13 / 0 1 3 25 50 (Hz)	High Starting Torque (Note 2)	50Hz	Low Starting Torque	⑧	(V) 200 ⑨ ⑧ 23 18 14 10 0 1 3 25 50 (Hz)
							High Starting Torque	⑨	
	60Hz	60Hz Saturation	① Ⓕ	(V) 200 ② ① Ⓕ 13 7 0 1 5 3 50 60 (Hz)		60Hz	Low Starting Torque	Ⓐ	(V) 200 Ⓑ Ⓐ 23 18 10 0 1 5 3 60 (Hz)
		50Hz Saturation	②				High Starting Torque	Ⓑ	
	72Hz		③	(V) 200 ③ 13 7 0 1 5 3 60 72 (Hz)	Constant HP Operation (Machine Tools)	90Hz		Ⓒ	(V) 200 Ⓒ 13 7 0 1 5 3 60 90 (Hz)
Variable Torque Operation (Fans and Pumps)	50Hz	Variable Torque 1	④	(V) 200 ⑤ ④ 50 35 9 7 0 1 3 25 50 (Hz)		120Hz		Ⓓ	(V) 200 Ⓓ 13 7 0 1 5 3 60 120 (Hz)
		Variable Torque 2	⑤						
	60Hz	Variable Torque 1	⑥	(V) 200 ⑦ 50 35 9 7 0 1 5 30 60 (Hz)		180Hz		Ⓔ	(V) 200 Ⓔ 13 7 0 1 5 3 60 180 (Hz)
		Variable Torque 2	⑦						

* Voltage values arc doubled for 460V class.
  150 to 400HP (110 to 300kW) for only 460V class.

Notes: 1. Consider the following points as V/f pattern selecting conditions.
  (1) Select a pattern in accordance with the motor voltage-frequency characteristics.
  (2) Select a pattern in accordance with the motor maximum r/min.
2. High starting torque must be selected only in the following cases
  (1) Wiring distance is long (approx. 492ft 150m or more).
  (2) Voltage drop at starting is large.
  (3) AC reactor is inserted in inverter input or output.
  (4) Motor smaller than the maximum applicable motor is operated.

APPENDIX D

TYPICAL CONNECTION DIAGRAM

(1) Braking Unit (3 in parallel)
For Models CIMR-G3□2030 to -G3□2075
(230V Class, 40 to 100HP, 30 to 75kW)

For Models CIMR-G3□4055 to -G3□4160
(460V Class, 75 to 200HP, 55 to 160kW)

(2) Run/Stop by Main Circuit Magnetic Contactor
For Models CIMR-G3⬜2030 (230V Class, 40HP, 30kW)

Turn on the power supply after checking that the motor has stopped. This circuit cannot be used for an application with frequent run-stop (repeating frequency: within 1 hour).

System Constant Setting

System Constant No.	Data			
	4th digit	3rd digit	2nd digit	1st digit
Sn-04	—	1	0	1 *
Sn-11	—	1	—	—

*Frequency reference setting
0: Set by frequency setting resistor
1: Digital operator set value (An-01)
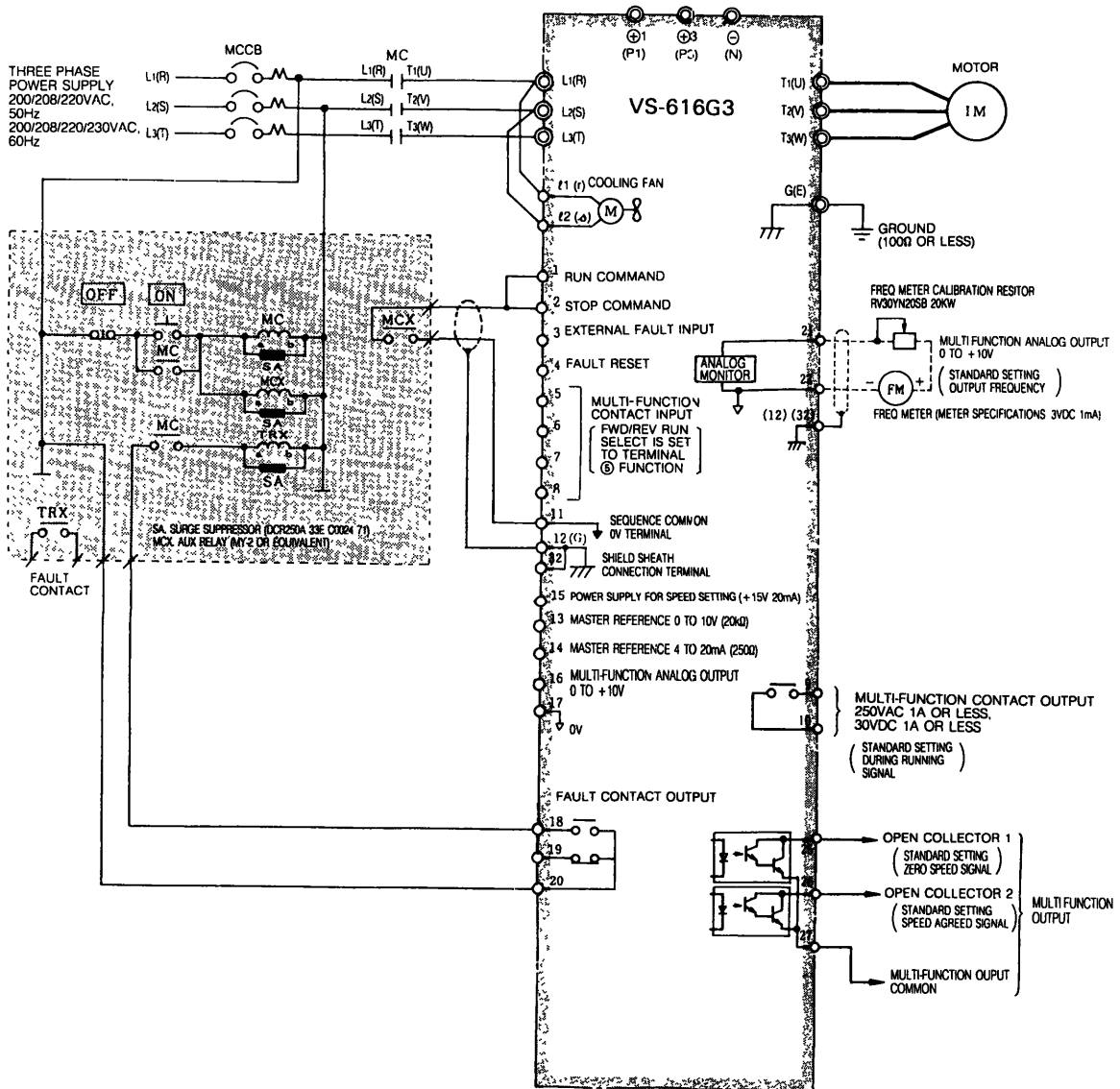
Notes: 1. Braking is not activated at deceleration stop. It coasts to a stop.
2. Use MC or MCX of delay release type for restart operation after momentary power loss.
3. Frequency setting resistor is not required for the use of digital operator's set value as frequency reference.

(3) With VS Operator Models JVOP - 95 · ▢

System Constant Setting

System Constant No.	Data			
	4th digit	3rd digit	2nd digit	1st digit
Sn-04	—	—	0	0
Sn-05	0.	—	0	—
Sn-15	—	—	0	3
Sn-19	—	—	0	0*
Sn-20	—	—	0	0

* Connect to control circuit terminal 13 or 16 according to the application. For terminal 16, set Sn-19 = x x 0 0.

(4) With VS Operator Models JVOP - 96 • ▢

System Constant Setting

System Constant No.	Data			
	4th digit	3rd digit	2nd digit	1st digit
Sn-04	—	—	0	0
Sn-05	0	—	0	—
Sn-15	—	—	0	3
Sn-19	—	—	0	0*
Sn-20	—	—	0	0

* Connect to control circuit terminal 13 or 16 according to the application. For terminal 16, set Sn-19 = × ×0 0.

(5) With Transistor Open Collector for Operation Signal

System Constant Setting

System Constant No.	Data			
	4th digit	3rd digit	2nd digit	1st digit
Sn-04	—	—	0	0

(6) With Contact Output, Photo-coupler Output
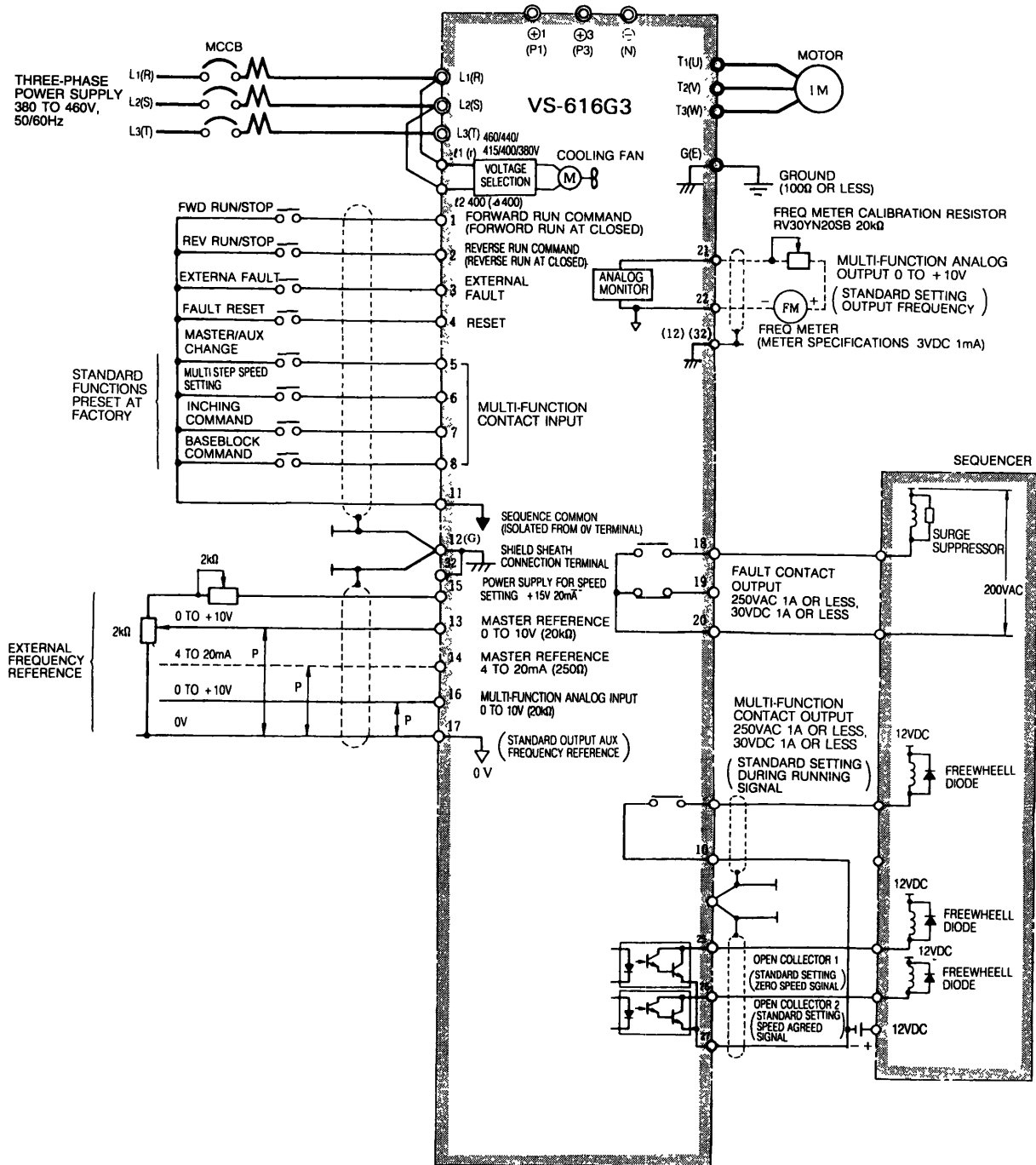
APPENDIX E

OPTION

(1) OPTION CARDS

(Except digital output card DO-08, there terminals are to be connected only class 2 circuits.)

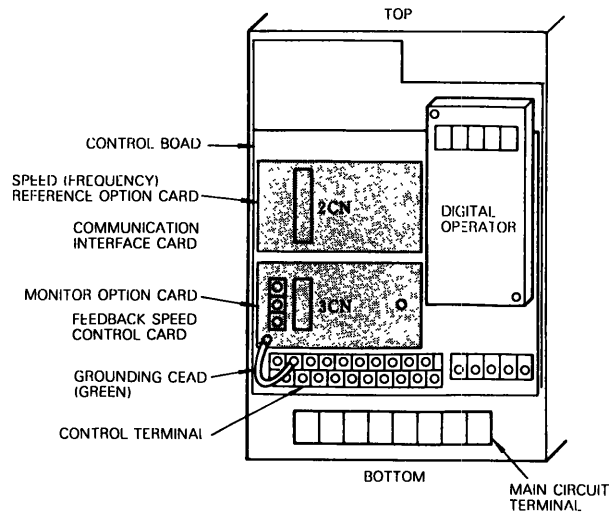| Name		Code No.	Function	Installing Position	Document No.
Speed Reference	Analog Speed Reference Card AI-14U	73600-C001X	Permits setting a high-accuracy, high-resolution analog speed reference • Input signal level: 0 to +10VDC (20kΩ) 1 channel 4 to 20mA DC (250Ω) 1 channel • Input signal level: 14 bits (1/16384)	Attach the card at 2CN on the control circuit board. (See Note 1)	TOE-C736-30.13
	Analog Speed Reference Card AI-14B	73600-C002X	Permits setting a high-accuracy, high-resolution analog speed reference • Input signal level: 0 to ±10VDC (20kΩ), 4 to 20mA DC (250Ω) 3 channels • Input resolution: 13 bits + sign (1/8192)	Attach the card at 2CN on the control circuit board. (See Note 1)	TOE-C736-30.14
	Digital Speed Reference Card DI-08	73600-C003X	Permits setting an 8-bit digital speed reference • Input signal: Binary 16 bits/BCD 2 digits + Sign • Input voltage: +24V (isolated) • Input current: 8mA	Attach the card at 2CN on the control circuit board. (See Note 1)	TOE-C736-30.15
	Digital Speed Reference Card DI-16G	73600-C011X	Permits setting 16-bit digital speed reference. • Input signal: Binary 16 bits/BCD 4 digits + sign • Input voltage: +24V (isolated) } Supplied by external device. • Input current: 8mA/point	Attach the card at 2CN on the control circuit board. (See Note 1)	—
Communication Interface Card SI-B		73600-C006X	Permits operation or constant setting by command from master controller. • Communication method: Synchronous • Communication speed: 19.2kBPS (up to 136.5kBPS possible) • Interface: RS-232, RS-422, RS-485	Attach the card at 2CN on the control circuit board. (See Note 1)	—
Monitor	Analog Monitor Card AO-08	73600-D001X	Provides an analog signal for monitoring the output state (output frequency, output current, etc.) of the inverter. • Output resolution: 8 bits (1/256) • Output voltage: 0 to +10V (not isolated) • Output channel: 2 channels	Attach the card at 3CN on the control circuit board. (See Note 2)	TOE-C736-30.21
	Analog Monitor Card AO-12	73600-D002X	Provides an analog signal for monitoring the output state (output frequency, output current, etc.) of the inverter. • Output resolution: 11 bits (1/2048) • Output voltage: 0 to +10V (not isolated) • Outut channel: 2 channels	Attach the card at 3CN on the control circuit board. (See Note 2)	TOE-C736-30.22
	Pulse Monitor Card PO-36F	73600-D003X	Provides a pulse string signal corresponding to the output frequency of the inverter. • Output pulse: 1F, 6F, 10F, 12F, 36F (F: Output frequency) • Output voltage: +12V ±10% (isolated) • Output current: 20mA max.	Attach the card at 3CN on the control circuit board. (See Note 2)	TOE-C736-30.23
	Digital Output Card DO-08	73600-D004X	Extends multifunction output signal output status. Output method : Open collector output × 6 points (48 VDC 50mA or less) : Relay contact (1a) 250VAC 1A or less output × 2 points 30VDC 1A or less	Attach the card at 3CN on the control circuit board. (See Note 2)	TOE-C736-30.24

Notes: 1. Only one of the speed (frequency) reference option cards or communication interface cards can be attached at 2CN.
2. Only one of the monitor option cards or feedback speed control cards can be attached at 3CN.
3. When a communication interface card is attached at 2CN, no option card can be attached at 3CN.

(1) OPTION CARDS (Cont'd)

⌈Except digital output card DO-08, there treminals are⌉
⌊to be connected only class 2 circuits.   ⌋

Name		Code No.	Function	Installing Position	Document No.
Feedback Speed Control Card	PG Speed Control Card PG-C	73600-D005X	Permits compensation of speed variation caused by slip, by speed feed-back using a pulse generator (PG) provided to the motor. • Phase A (single pulse) input • PG frequency range: 50 to 32767 Hz • Pulse monitor output: +12V, 20mA • Input voltage: +12V ⎫ • Input current: 300mA ⎭ Supplied by external source.	Attach the card at 3CN on the control circuit board. (See Note 2)	—

Notes: 1. Only one of the speed (frequency) reference option cards or communication interface cards can be attached at 2CN.
2. Only one of the monitor option cards or feedback speed control cards can be attached at 3CN.
3. When a communication interface card is attached at 2CN, no option card can be attached at 3CN.

Option Card Installing Position

(2) OPTIONAL UNIT

Name	Model (Code No.)	Function	Installing Position	Document No.
Digital Monitor	JVOP - 101 (73041 - 0911X)	Permits display of frequency and current by digital monitor and indication of a problem. Not equipped with key pads for RUN/STOP operation and setting a constant so that it can be safely used at the site.	*1 On the inverter front cover	TOE-C730-50.4
Remote Operator	JVOP - 102 (73041 - 0912X)	Digital operator (JVOP-100) and digital monitor (JVOP-101) are built-in. Can perform operation or monitoring by serial communication at a distance of 328ft (100m) maximum from the inverter. 200mA current 100P	Separately-mounted For open chassis or enclosed type	—
Remote Monitor	JVOP -103 (73041 - 0913X)	Power supply: 85 to 264VAC, 50 to 60Hz (D-SUB connector, cover, power supply connector provided)		
Remote Interface	JVOP - 104 (73041 - 0914X)	Mounted on the inverter at remote operation or monitoring [up to 328ft (100m)] by remote operator (JVOP-102) or remote monitor (JVOP-103). 20mA current 100P/RS-232C (D-SUB connector, cover provided)	On inverter	—
Operator/Monitor Adapter	JVOP - 109 (73041 - 0919X)	This removable adapter panel can be used on the inverter cover with an extension cable when the digital operator or digital monitor needs to be removed from the inverter cover.	*1 On the inverter front cover	TOE-C736-50.11
Adapter Panel Exclusive Use Extension Cable	3.3ft (1m) cable (72616-W3001-01) 9.9ft (3m) cable (72616-W3003-01)	Used for remote operation of digital operator/monitor using adapter panel (JVOP-109)	—	
VS Operator (Small Plastic Version)	JVOP - 95●¦ ¦ *2 (73041 - 0905X - ¦ ¦)	An exclusive control panel for remotely setting frequency and for starting and stopping a inverter using analog commands [distance up to 164ft (50m)]. Scale on the frequency indicator: 60/120Hz, 90/180Hz	Separately installed	—
VS Operator (Standard Version)	JVOP - 96●¦ ¦ *2 (73041 - 0906X●¦¦)	An exclusive control panel for remotely setting frequency and for starting and stopping a inverter using analog commands [distance up to 164ft (50m)]. Scale on the frequency indicator, 75Hz, 150Hz, 220Hz	Separately installed	—
Exclusive Extension *1 Cable for Digital Operator or Monitor	3.3ft (1m) cable (72616 - W3001) 9.9ft (3m) cable (72616 - W3003)	This extension cable is used when the digital operator or digital monitor is used after removing from the inverter front cover. The cable is available in 3.3ft (1m) and 9.9ft (3m) lengths. The package of the extension cable includes a simple indicating cover. Depending on the application, the use of the operator/monitor adapter JVOP-109 is recommended.	*1 On the inverter front cover (indicating cover)	TOE-C730-50.10

(2) OPTIONAL UNIT (Cont'd)

Name	Model (Code No.)	Function	Installing Position	Document No.
Braking Unit	CDBR - . (72600 - R .... 0)	Used in combination with the braking resistor unit to reduce motor deceleration time.	Separately installed	TOE-C736-50.5
Braking Resistor Unit	LKEB -. (72600 - K . 0)	Shortens the motor deceleration time by causing the regenerative energy to be consumed through the resistor.	Separately installed	TOE-C736-50.5
Back up Capacitor Unit for Momentary Power Loss	P00.:0 (73600 - P00 '0)	Designed for momentary power loss of control power. (Backup time: 2sec.)	Separately installed	TOE-C736-50.6
Control Power Unit for DI-16G	AVR387 (72600-AVR387)	Used to supply power to digital reference card (DI-16G). • Input: 200 to 240VAC ±10% 50/60Hz • Output: +24VDC 0.2A	Separately installed	—
	AVR388 (72600-AVR388)	Use AVR388 for momentary power loss. (Backup time: 2sec.)		
Control Power Unit for PG-C	AVR385 (72600-AVR385)	Used to supply power to PG speed control card (PG-C). • Input: 200 to 240VAC ±10% 50/60Hz • Output: +12VDC 0.3A	Separately installed	—
	AVR386 (72600-AVR386)	Use AVR386 for momentary power loss. (Backup time: 2sec.)		

∗1 Only one of the options, JVOP-101 and -109, used on the front cover of the inverter can be installed at a time.
When attaching such an option on the front cover, the digital operator (JVOP-100, provided as a standard feature) must be removed.

∗2 The type of frequency indicator is to be shown in the box after the model name and the code number.

In Case of VS Operator

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

∗3 Exclusive extension cables with blind cover can not be removed on the inverter front cover.
When digital operator/monitor is operated remotely (3.3ft 1m, 9.9ft 3m), use exclusive use extension cable (with indicating cover) or adapter panel and adapter panel exclusive use extension cable.

Varispeed-616G3

GENERAL-PURPOSE INVERTER

200 TO 230V, 40 TO 100HP (30 TO 75kW) 54 TO 130kVA
380 TO 460V, 75 TO 400HP (55 TO 300kW) 110 TO 510kVA

YASKAWA ELECTRIC CORPORATION

YASKAWA

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