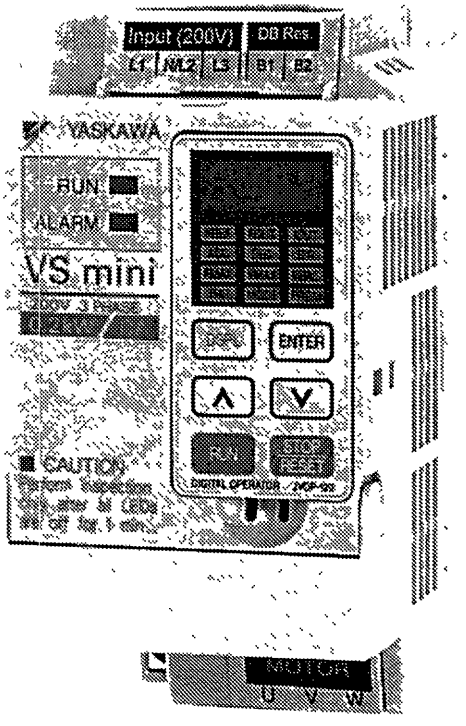
VS mini C Series

INSTRUCTION MANUAL

ULTRA-COMPACT ALL DIGITAL INVERTER

STANDARD FUNCTION TYPE

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Before initial operation, read these instructions thoroughly, and retain for future reference.

YASKAWA

TOE-S606-10 10

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WARNINGS

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

(2) The VS mini internal capacitor is still charged even after the power supply is turned OFF. To prevent electrical shock, disconnect all power before servicing inverter. Then wait at least one minute after the power supply is disconnected and all LED's are extinguished.

(3) Do not perform withstand voltage test on any part of the VS mini. This electronic equipment uses semiconductors and is vulnerable to high voltage.

(4) Do not remove the digital operator unless the power supply is turned OFF. Never touch the printed control board (PCB) while the power supply is turned ON.

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1. RECEIVING

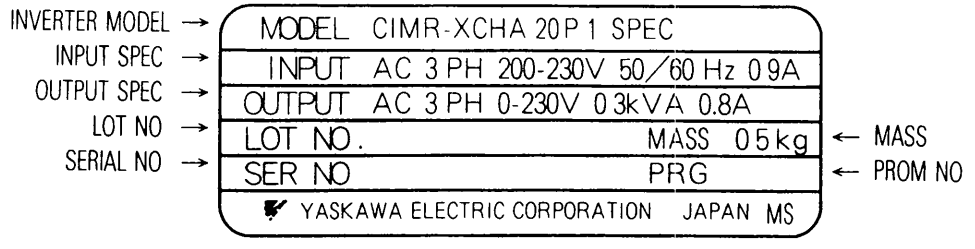
After unpacking the VS mini, check the following :

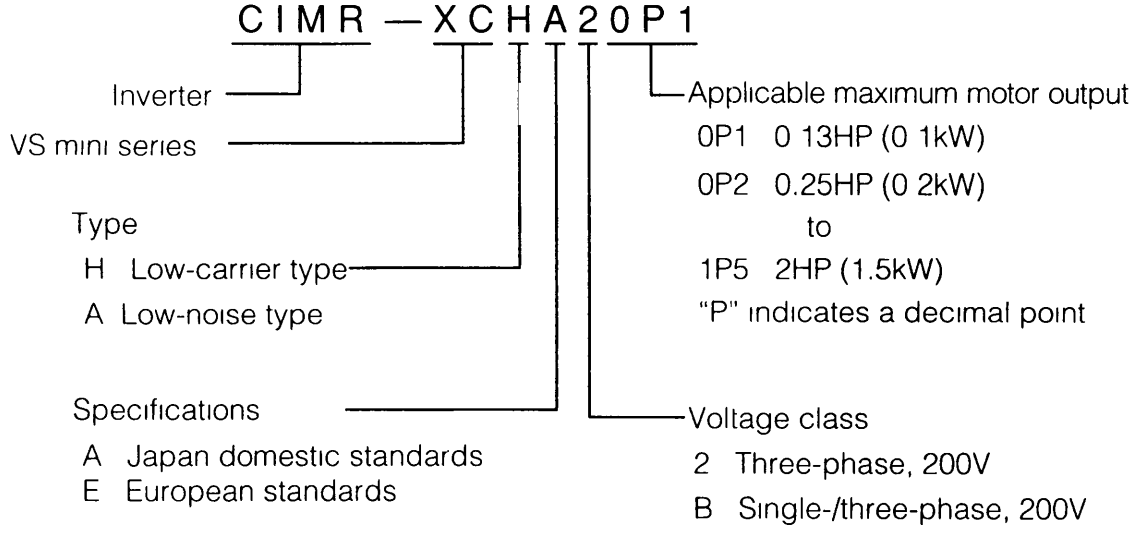
□ Verify that the part numbers match your purchase order or packing slip.
□ Check the unit for physical damage that may have occurred during shipping.

If any part of VS mini is missing or damaged, call for service immediately.

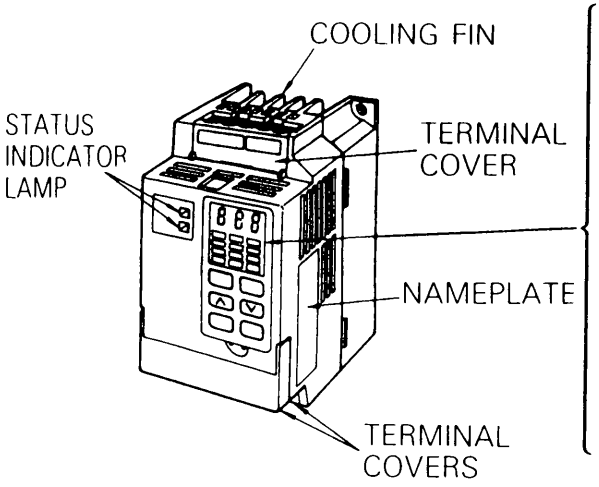
■ Checking the Name Plate

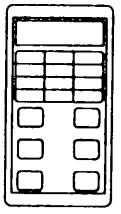
Japan Domestic Standards for Types of 3-phase, 200VAC, 0.13HP (0.1kW)





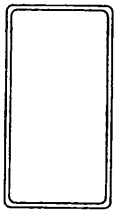
2. IDENTIFYING THE PARTS





Digital operator JVOP-120

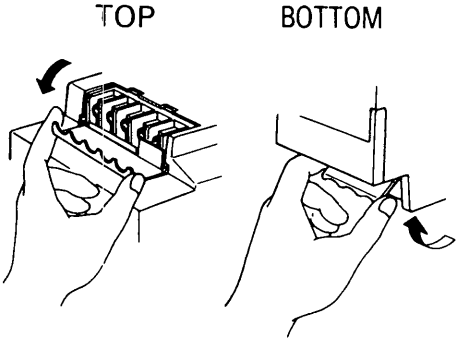
Used for setting or changing constants.

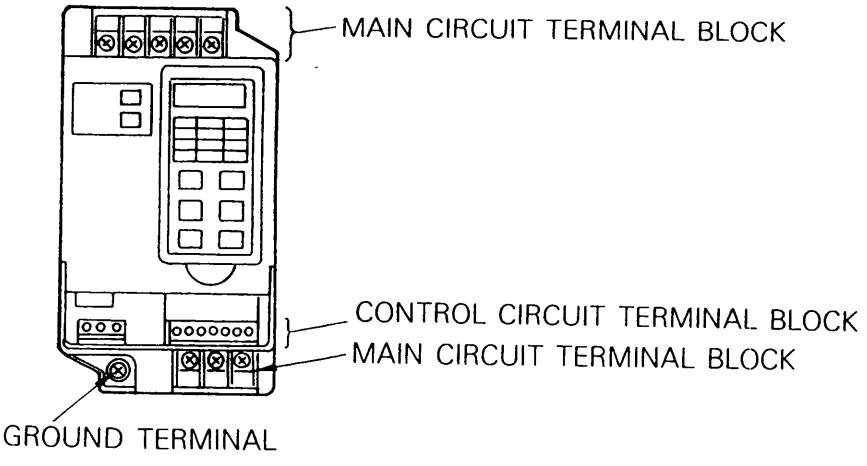


Blank cover (optional)

In models with blank cover, the blank cover is mounted in place of the digital operator

⇩ Opening the terminal covers





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3. MOUNTING

■ Mounting Precautions

(1) To mount the VS mini, hold it by the cooling fin section.

(2) The VS mini generates heat. For effective cooling, mount it vertically. Refer to the figure in "Mounting Dimensions" on the following page.

■ Choosing a Location to Mount the Inverter

Be sure the inverter is protected from the following conditions :

□ Extreme cold and heat. Use only within the ambient temperature range : 14 to 122℉ (-10 to +50℃)

□ Rain, moisture.

□ Oil sprays, splashes

□ Salt spray

□ Direct sunlight. (Avoid using outdoors)

□ Corrosive gases (e.g. sulfurized gas) or liquids

□ Dust or metallic particles in the air.

□ Physical shock, vibration.

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

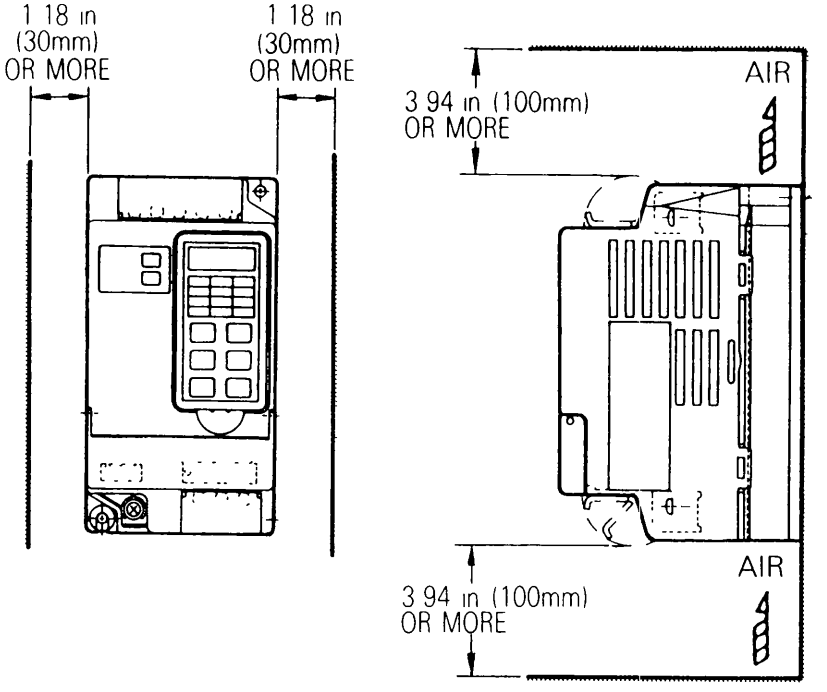
□ High humidity.

□ Radioactive substances.

□ Combustibles : thinner, solvents, etc.

■ Mounting Dimensions

To mount the VS mini, dimensions as shown below are required.



Caution :

When mounting units in an enclosure, install a fan or other cooling devices to keep the temperature of the air entering the inverter below 122°F (50 °C).

4. WIRING

■ Wiring Instructions

(1) Connect the power supply wiring to terminals L1(R), N/L2(S) and L3(T) on the main circuit input side (top of the inverter).

Inverter Power Supply Specifications

3-phase Input Power Supply Specification Product CIMR-XC 2	Single-/3-phase Input Power Supply Specification Product CIMR-XC□□B□□□	
Connect to L1(R), N/L2(S), L3(T)	3-phase input	Connect to L1(R), N/L2(S), L3(T)
	Single-phase input	Connect to L1(R), N/L2(S)

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

(3) Separate the inverter wiring from the motor wiring –328ft (100m) max.

(4) Control wiring must be less than 164ft (50m) in length and separate from the power wiring.

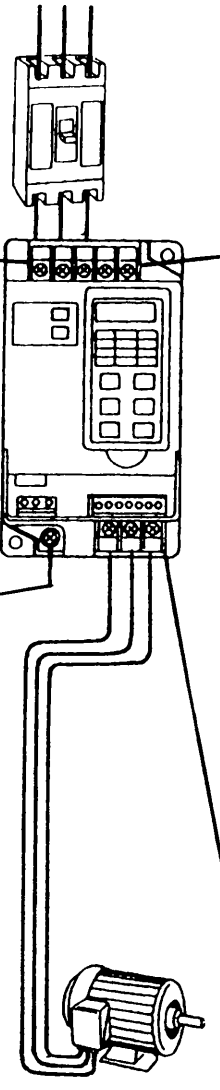
(5) Tighten the screws on the main circuit and control circuit.

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

■ Wire and Terminal Screw Sizes

Circuit	Model	Terminal Symbol	Screw	Wire Size mm²	Wire Size AWG	Type
Main Circuit	CIMR-XC A - - - (Japan use)	R, S, T, B1, B2, U, V, W, ⏚	M3 5	0 75 to 2	18 to 14	600V vinyl-sheathed wire or equivalent
	CIMR-XC E - - - (Europe use)	L1, N/L2, L3, B1, B2, U, V, W, ⏚				
Control Circuit	Common to all models	SF, SR, S1, SC, FS, FR, FC	—	Twisted 0 5 to 0 75 Single 0 5 to 1 25	Twisted 20 to 18 Single 20 to 16	Shielded wire or equivalent
		MA, MB, MC		Twisted 0 5 to 1 25 Single 0 5 to 1 25	Twisted 20 to 16 Single 20 to 16	

■ Wiring the Main Circuit



• Main circuit input power supply

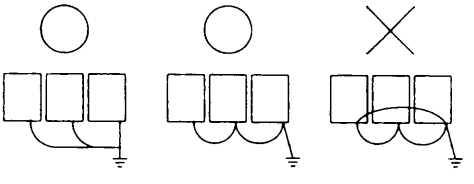
Connect the power supply wiring to input terminals L1(R), N/L2(S) and L3(T) [L1(R), N/L2(S) for single-/3-phase specifications] Never connect them to U, V, W, B1 or B2. Otherwise the inverter may be damaged

• Grounding (Use ground terminal ⏚.)

Ground resistance should be 100Ω or less.

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

When several VS mini units are used side by side, ground each unit as shown in examples (a) or (b) below Do not loop the ground wires as shown in example (c).



(a) (b) (c)

• Braking resistor connection (optional)

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

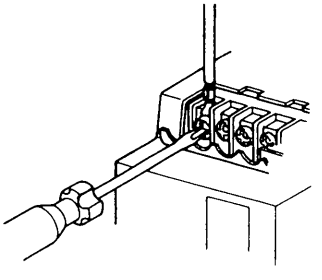
To protect the braking resistor from overheating, install a thermal overload relay between the braking resistor and the inverter. This provides a sequence which shuts off the power supply, by a thermal relay trip contact.

Use this same procedure when connecting a braking resistor unit.

• Inverter output

Connect the motor terminals to U, V, W.

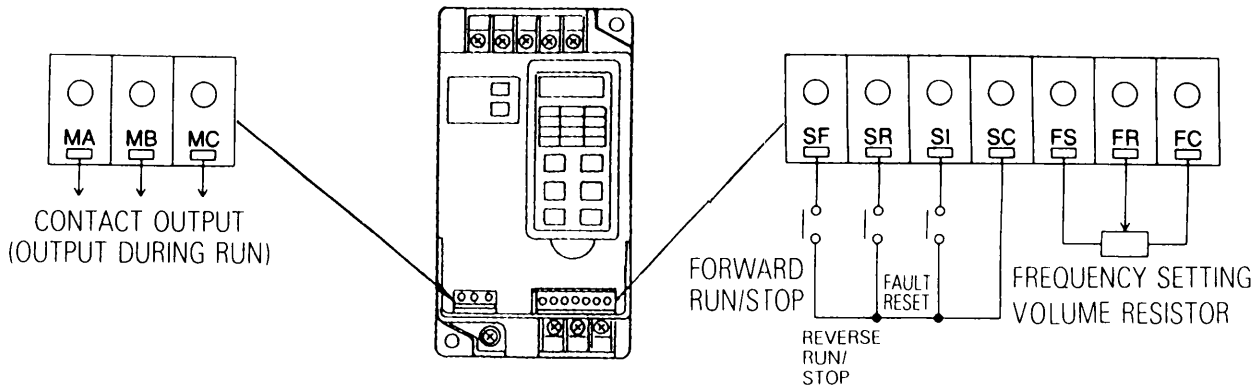
Wiring the main circuit terminals



Connect with a Phillips (plus) screwdriver.

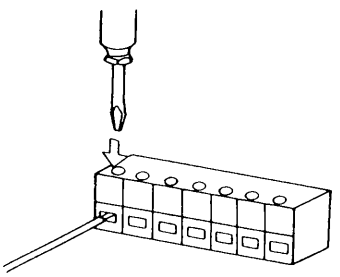
■ Wiring the Control Circuit

Terminal functions described below are based on factory settings.

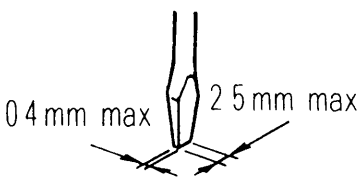


For details, refer to "Standard Wiring" on page 40.

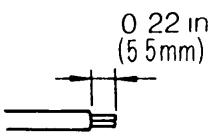
Wiring the control circuit terminals



Screwdriver blade width

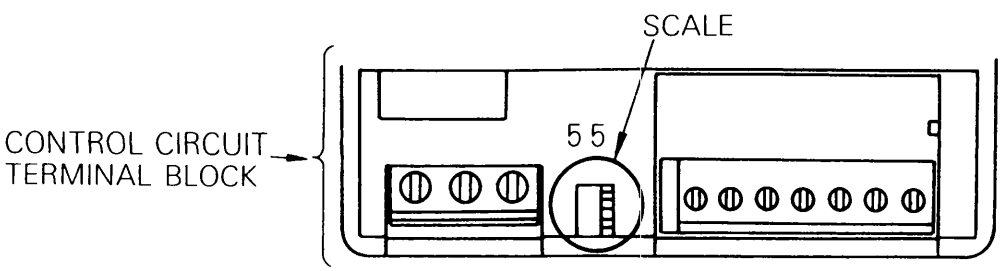


Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver.



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

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



■ Wiring Inspection

After completing wiring, check the following :

□ Wiring is proper.

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

□ Screws are securely tightened.

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

Caution :

If the FWD (REV) run command is given during the operation mode (MODE = 1, 3 or 5) from the control circuit terminal, the motor will start automatically after the main circuit input power supply is turned ON.

5. OPERATING THE INVERTER

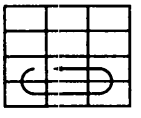
■ Test Run

The inverter operates by setting the frequency (speed).
There are two types of operation modes for the VS mini :

① Run command from the digital operator.

② Run command from the control circuit terminal.

Prior to shipping, the drive is set up to receive run command and frequency reference from the operator. Below are instructions for running the VS mini using the digital operator. For instructions on using the control circuit terminals, refer to MODE description on page 19.

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
(1) Turn ON the power supply Frequency reference (6.0Hz) is displayed	6.0	FREF lights	RUN ☼ ALARM ● (Operation ready)
(2) Press RUN. Inverter runs at 6.0Hz The motor rotates in a counterclockwise direction (FWD run), when viewed from opposite drive end		 LED's rotate in direction of motor	RUN ☼ ALARM ● (Normal operation)
(3) Press STOP RESET to stop motor rotation	6.0		

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

Operation Check Points

□ Motor rotates smoothly.

□ Motor rotates in the correct direction.

□ Motor does not have abnormal vibration or noise.

□ Acceleration or deceleration is smooth.

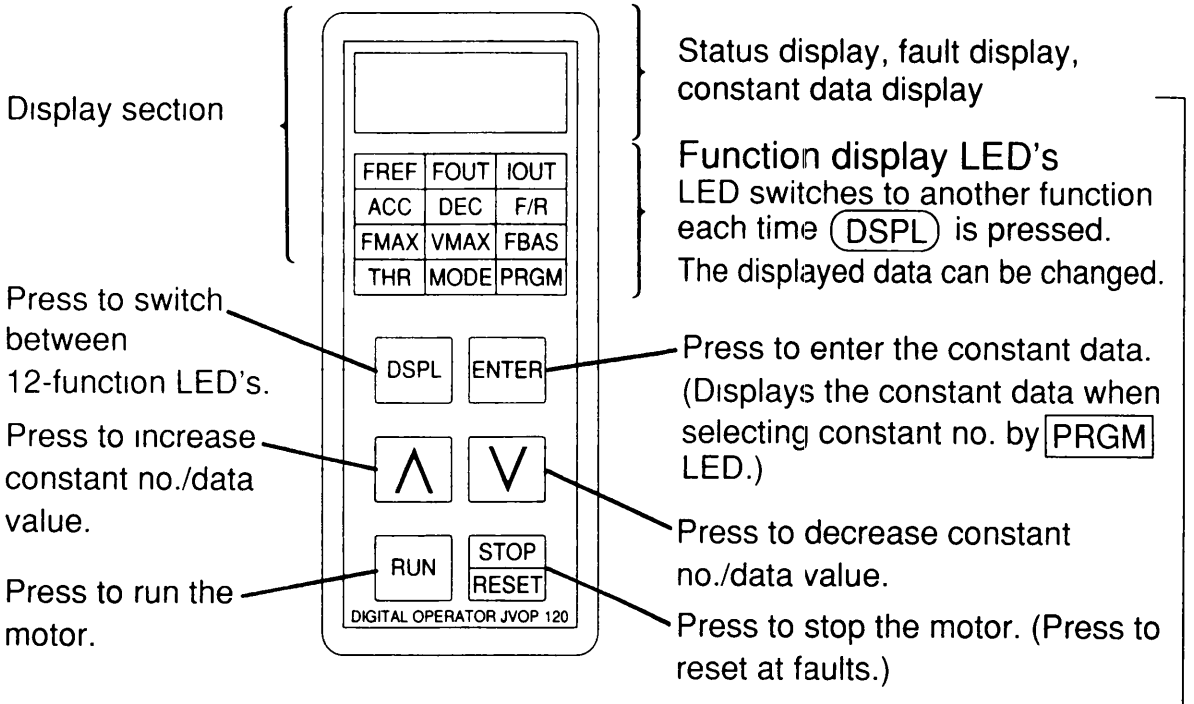
□ Current matching the load flows.

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

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■ Operating the Digital Operator

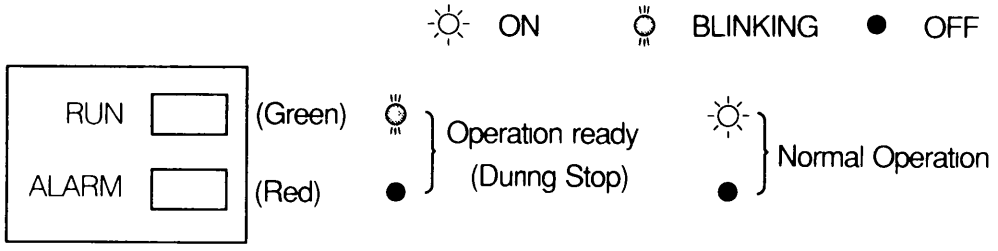
All functions of the VS mini are set by the digital operator. Below are descriptions of the display and keypad sections.



Green	FREF Frequency reference setting/monitoring	FOUT Output frequency monitor	IOUT Output current monitor
	ACC Accel time	DEC Decel time	F/R Operator RUN command FWD/REV selection
Red	FMAX Max frequency	VMAX Max voltage	FBAS Max voltage output frequency (base frequency)
	THR Electronic thermal reference current (Motor rated current)	MODE Operation mode selection	PRGM Constant no /data

Description of Status Indicator LED's

There are two LED's on the upper left section of the face of the VS mini. The inverter status is indicated by various combinations of ON, BLINKING and OFF LED's.

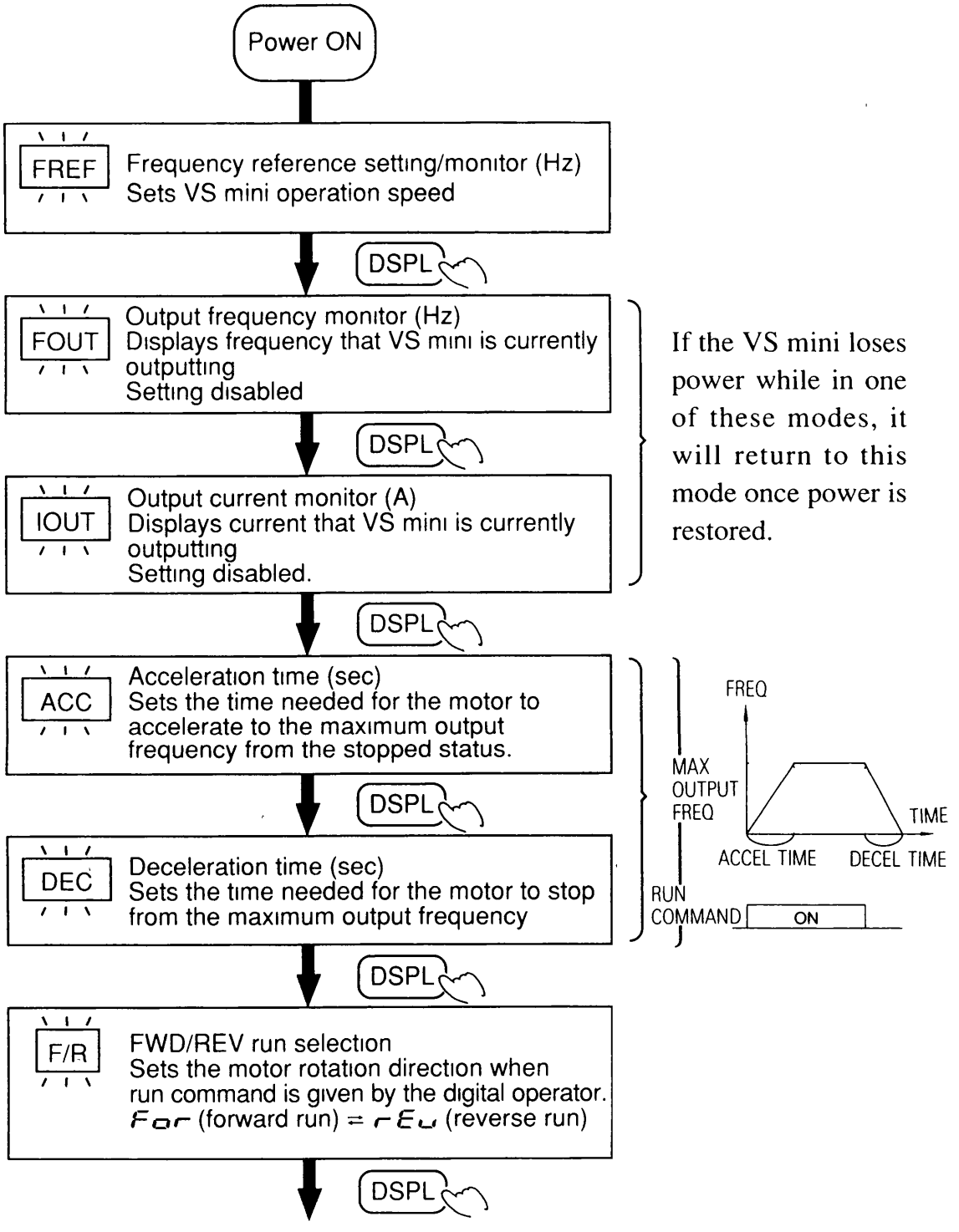


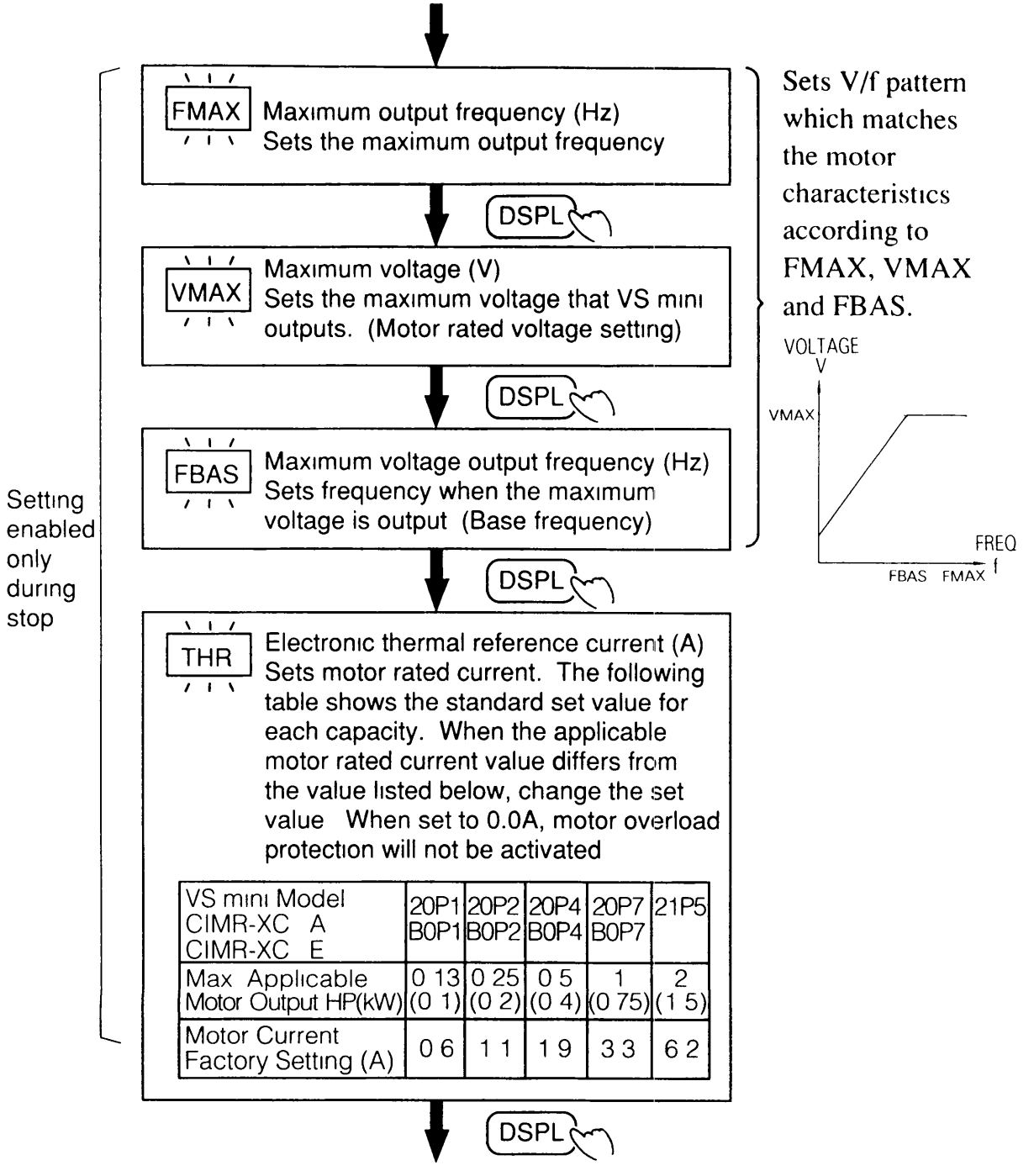
For the details on how the status indicator LED's function at inverter faults, refer to Section 8 "FAULT DIAGNOSIS AND CORRECTIVE ACTIONS" on page 33. If a fault occurs, the ALARM LED lights.

■ LED Description

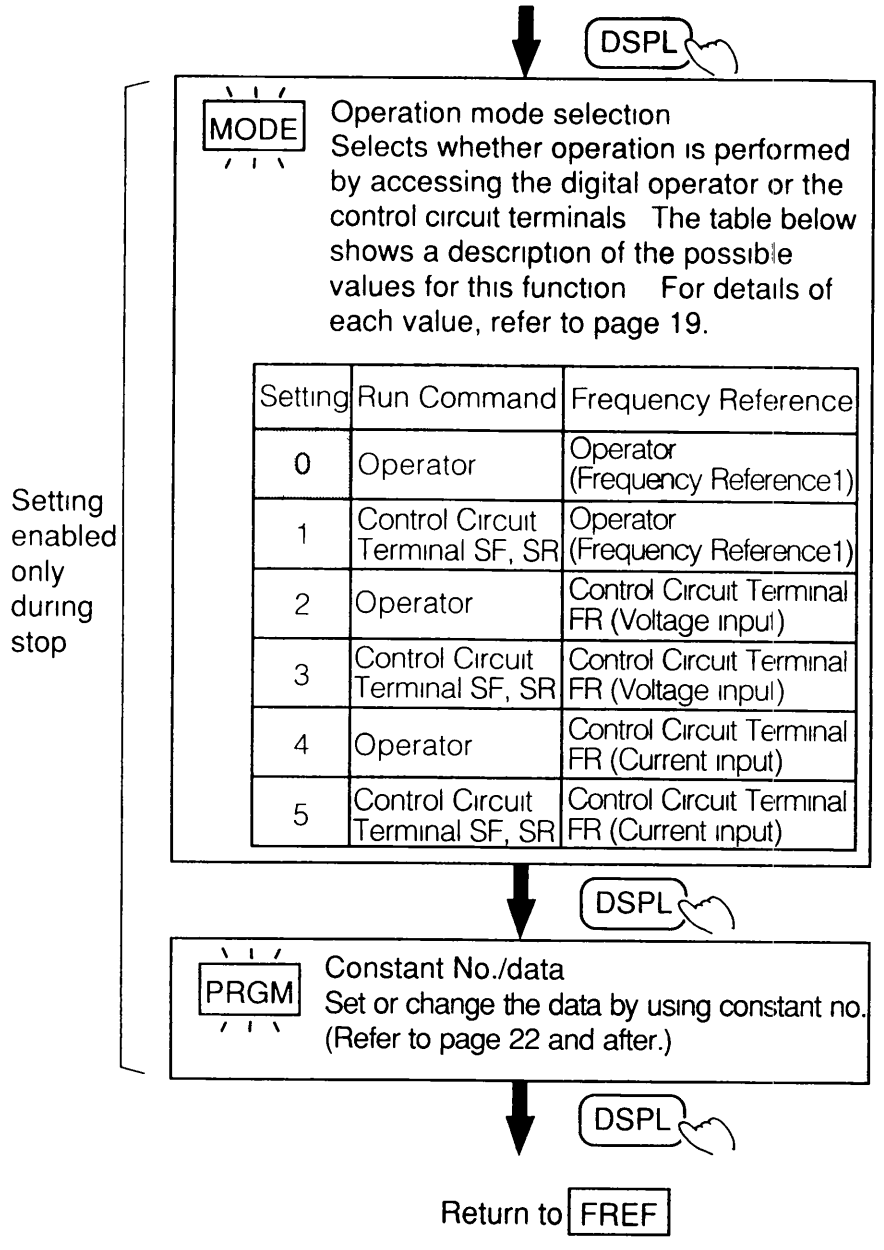
By pressing (DSPL) on the digital operator, each of the function LED's can be selected.

The following flowchart describes each function LED.





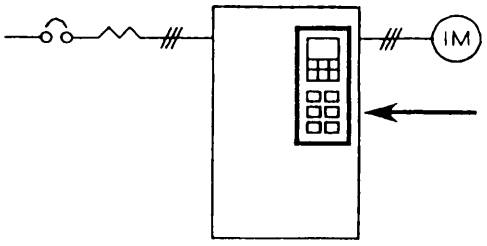
VS mini Model CIMR-XC A CIMR-XC E	20P1 B0P1	20P2 B0P2	20P4 B0P4	20P7 B0P7	21P5
Max Applicable Motor Output HP(kW)	0 13 (0 1)	0 25 (0 2)	0 5 (0 4)	1 (0 75)	2 (1 5)
Motor Current Factory Setting (A)	0 6	1 1	1 9	3 3	6 2



Setting	Run Command	Frequency Reference
0	Operator	Operator (Frequency Reference1)
1	Control Circuit Terminal SF, SR	Operator (Frequency Reference1)
2	Operator	Control Circuit Terminal FR (Voltage input)
3	Control Circuit Terminal SF, SR	Control Circuit Terminal FR (Voltage input)
4	Operator	Control Circuit Terminal FR (Current input)
5	Control Circuit Terminal SF, SR	Control Circuit Terminal FR (Current input)

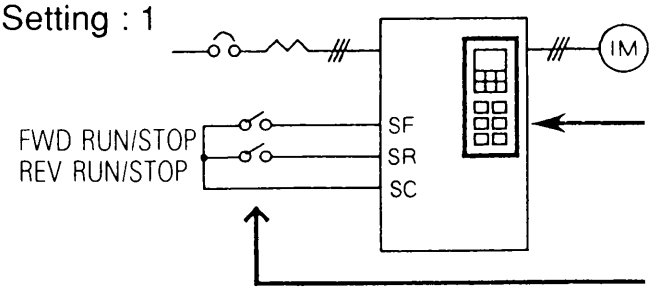
Detailed Description of [MODE] (Operation Mode Selection)

Setting : 0



Give RUN/STOP command and set frequency by operating the digital operator.
Use [F/R] to alternate between FWD/REV run.

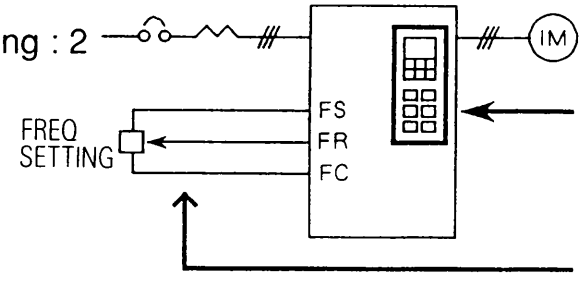
Setting : 1



Use the digital operator keys to set the frequency

Use the switch connected to the control circuit terminal to alternate between RUN/STOP and FWD/REV run

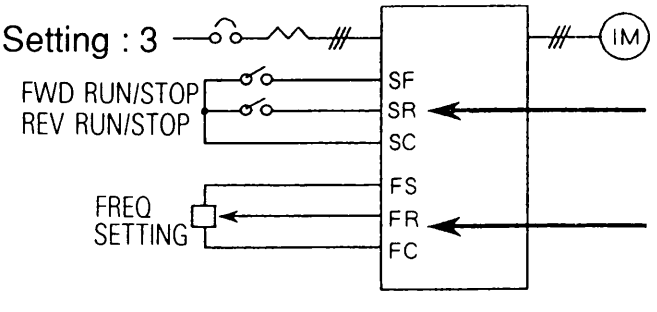
Setting : 2



Give RUN/STOP command by operating the digital operator
Use [F/R] to alternate between FWD/REV run

Set frequency by analog voltage signal [0-100% (max frequency)/ 0-10V] from the control circuit terminal

Setting : 3



Use the switch connected to the control circuit terminal to alternate between RUN/STOP and FWD/REV run

Set frequency by analog voltage signal [0-100% (max. frequency)/ 0-10V] from the control circuit terminal

Note To set frequency reference with a volume resistor, it will be 100% at rotation ratio of 80% To set frequency reference to 100% at rotation ratio of 100%, set constant n39 (frequency reference gain) to approx. 1.2

Setting : 4 or 5

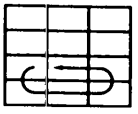
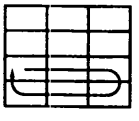
For details, refer to "Setting Frequency by Current Reference Input" on page 28.

■ Simple Data Setting

By using the function LED's on the digital operator, simple accel/decel operation of the VS mini is possible.

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

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
1 Turn ON the power supply	6 0	FREF	RUN ○ ALARM ●
2 Set frequency Press [DSPL] to move to [FREF].	6 0	FREF	
3. Press [∧] to display 60 0	60 0 (Blinking)		
4. Press [ENTER]	60.0		
5 Set the acceleration time. Press [DSPL] to move to [ACC]	10.0	ACC	
6 Press [∧] to display 15 0.	15.0 (Blinking)		
7 Press [ENTER]	15.0		
8. Set the deceleration time. Press [DSPL] to move [DEC].	10.0	DEC	
9 Press [∨] to display 5.0.	5.0 (Blinking)		
10. Press [ENTER]	5.0		
11. Monitor output frequency. Press [DSPL] to move to [FOUT]	0 0	FOUT	

Operation Steps	Operator Display	12-LED Display	Status Indicator LED
12 Press [RUN] The motor accelerates to 60Hz in 15 seconds	60.0		RUN ☼ ALARM ●
13. Press [STOP/RESET] to stop the motor. The motor decelerates to stop in 5 seconds	0.0		RUN ◎ ALARM ●
14 Rotate the motor in reverse direction. Caution : Never rotate the motor in reverse in applications where reverse run is not allowed. Press [DSPL] to move to [F/R].	For		
15. Press [∧] or [∨] to display rEv	rEv (Blinking)		
16. Press [ENTER].	rEv		
17. Press [RUN] Reverse run starts			RUN ☼ ALARM ●
18 Press [STOP/RESET] to stop the motor			RUN ◎ ALARM ●

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6. PROGRAMMING FEATURES

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

■ Constant Set-up and Initialization

Constant selection/initialization (n01)

The following table describes the data which can be set or read when n01 is set.

Setting	Constant that can be set	Constant that can be referred
0 (Constant write disable)	n01	n01 to n68
1	n01 to n40	n01 to n68
2 to 7	Not used (disabled)	
8 9 (Constant Initialization)	Initialize Initialize (3-wire sequence)*	

* Refer to page 26.

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

(1) If Max. output frequency (n24) ≧ Max. voltage output frequency (n26)
For details, refer to V/f pattern setting on page 17.

(2) If Electronic thermal reference current (n31) ≦ 120% of inverter rated current

■ Setting Operation Conditions

Multi-step speed selection

By combining frequency reference and input terminal function selection, two steps of speed can be set.

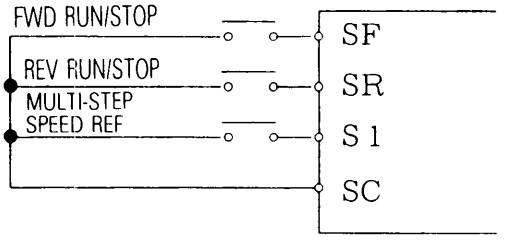
2-step speed change

n02=1 (operation mode selection)

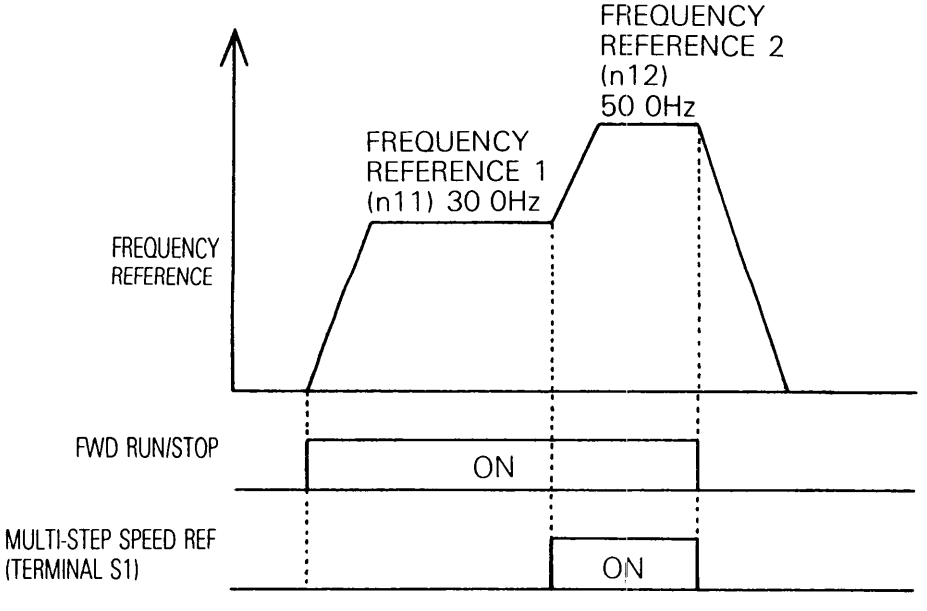
n11=30.0Hz

n12=50.0Hz

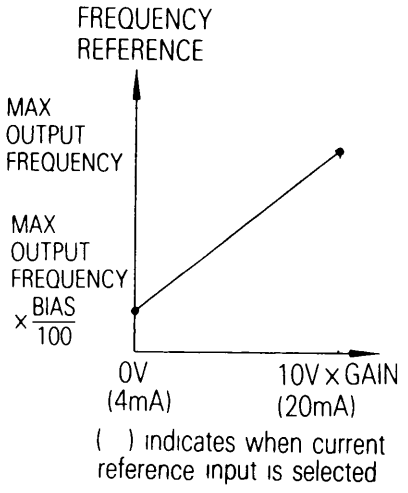
n06=4 (Multi-function contact input terminal)



Note When n02 is set at 2, 3, 4 or 5, frequency reference 1 (n11) becomes disabled and frequency reference from control circuit terminal FR becomes enabled.



Adjusting frequency setting signal



( ) indicates when current reference input is selected

When the frequency reference is output by analog input of control circuit terminals FR and FC, the relation between analog voltage and frequency reference can be set.

• Frequency reference gain (n39)

The analog input voltage value for the maximum output frequency (n24) can be set in units of 0.01 times.
Factory setting : 1.00

• Frequency reference bias (n40)

The frequency reference provided when analog input is 0V (4mA) can be set in units of 1%.
(n24: Maximum output frequency = 100%)
Factory setting: 0%

Gain : Outputs 100% (max. output frequency : FMAX, n24) at A V.

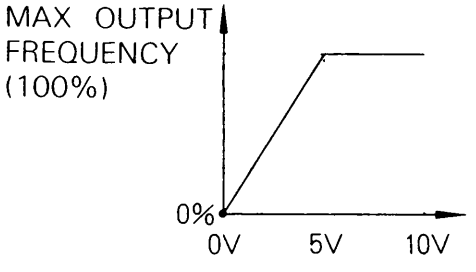
$$\Rightarrow n39 = \frac{A\,V}{10V}$$

Bias : Outputs B % (ratio to max. output frequency) at 0V.

$$\Rightarrow n40 = B\,\%$$

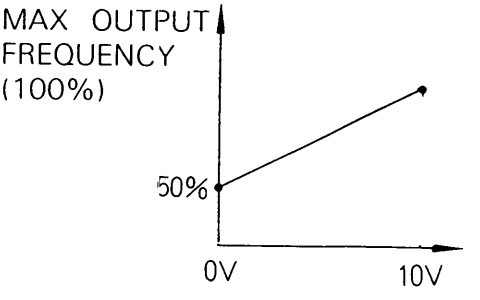
Typical Setting

① At 0 to 5V input



Gain Constant n39=0.50
Bias Constant n40=0

② To operate the inverter with frequency reference of 50% to 100% at 0 to 10V input



Gain Constant n39=1.00
Bias Constant n40=50

Automatic restart after momentary power loss (n36)

When momentary power loss occurs, operation restarts automatically.

Setting	Description
0	Continuous operation after momentary power loss not provided.
1*	Continuous operation after power recovery within 0 5 second
2*†	Continuous operation after power recovery (Fault output not provided)

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

† When 2 is selected, operation restarts if power supply voltage reaches its normal level
No fault signal is output

Reducing motor noise or leakage current (n37)

Sets inverter output transistor switching frequency (carrier frequency).

Setting	Carrier frequency (kHz)	Metallic noise from motor	Noise and current leakage
1	2 5	Higher ↑ ↓ Not audible	Smaller ↑ ↓ Larger
2	5 0		
3	7 5		
4	10 0		

Note : n37 setting

Low-carrier type : 1 (fixed)

Low-noise type . setting range: 1 to 4, factory setting: 4

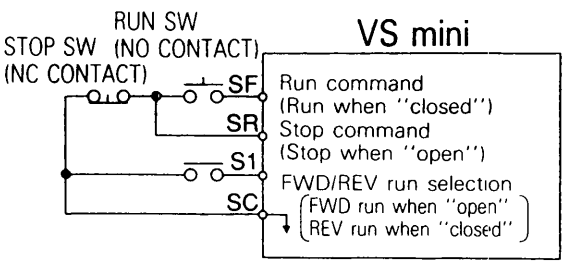
■ Building Interface Circuits with External Devices

Using input signals (n06)

Multi-function input terminal S1 function can be changed when necessary by setting constants n06.

Setting	Name	Description	Ref.
0	FWD/REV run command (3-wire sequence selection)	Setting enabled only for n06	26
1	Fault reset	—	—
2	External fault (NO contact input)	Inverter stops by external fault signal input. Digital operator display is "EF 1"	—
3	External fault (NC contact input)		
4	Multi-step speed reference 1	—	23

Terminal function at 3-wire sequence selection

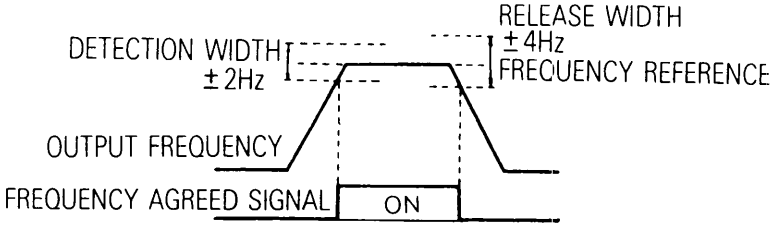


Using output signals (n09)

Multi-function output terminal MA and MB functions can be changed when necessary by setting constant n09.

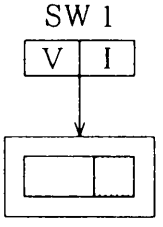
Setting	Name	Description	Ref.
0	Fault	"Closed" when inverter fault occurs.	—
1	In operation	"Closed" when FWD or REV run command is input, or when the inverter outputs voltage	—
2	Agreed frequency	—	27

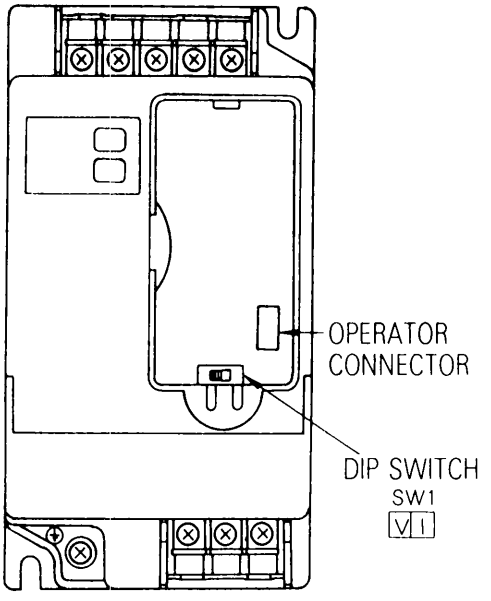
• Setting example of "Frequency agreed signal" (Setting = 2)



■ Setting Frequency by Current Reference Input

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



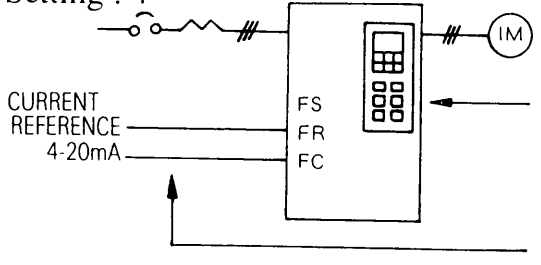


CAUTION

Do not remove the digital operator and change the dip switch unless the power supply is turned OFF.

After switching SW1, set MODE LED item to 4 or 5.

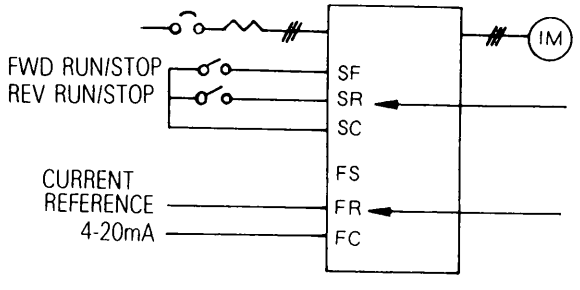
• Setting : 4



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

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

• Setting : 5



Switch run/stop and FWD/REV run with switching device connected to the control circuit terminal.

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

Frequency reference gain (n39)/bias (n40) can be set even when current reference input is selected. For details, refer to "Adjusting frequency setting signal" on page 24.

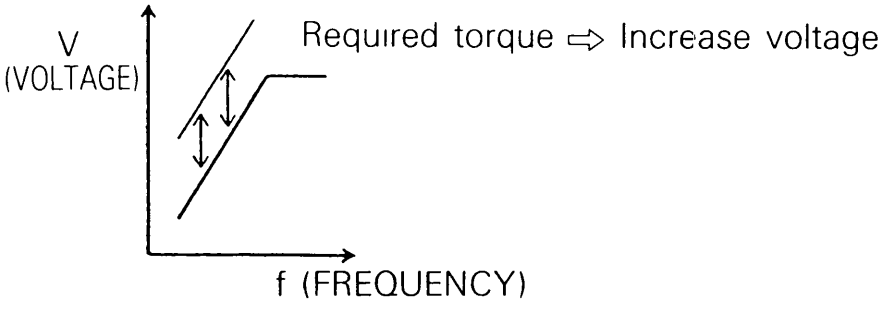
■ Adjusting Motor Torque

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 mini automatically adjusts the voltage during constant-speed operation as well as during acceleration.
The required torque is calculated by the inverter.
This ensures tripless operation and energy-saving effects.

Output voltage $\propto$ Required torque

• Operation

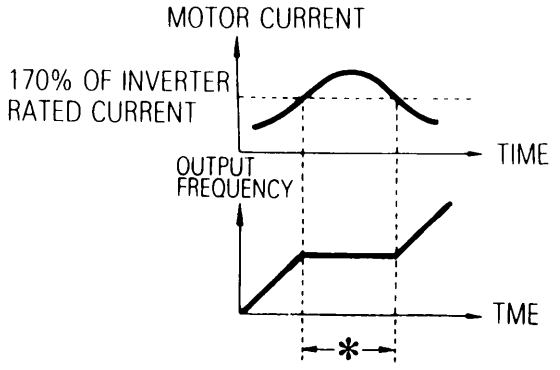


Preventing motor from stalling (Current limit)

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

• Stall prevention (current limit) during acceleration

During acceleration, if the output current exceeds 170% of the inverter rated current, acceleration, stops and frequency is maintained. When the output current goes down below 170%, acceleration starts.



* Controls the acceleration rate to prevent the motor from stalling.

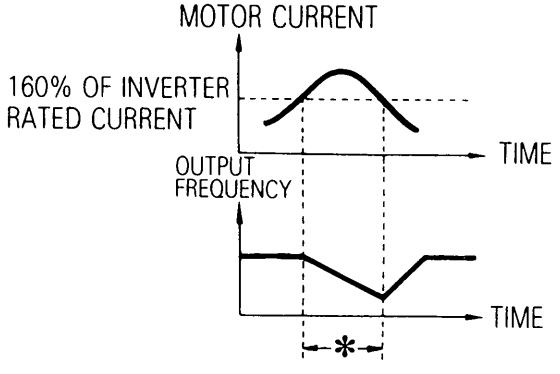
In the constant output area [output frequency ≧ max. voltage output frequency (n26)], the stall prevention (current limit) level during acceleration is changed by the following equation.

$$\boxed{\text{Stall prevention (current limit) level during accel in constant output area}} = \boxed{170\%} \times \frac{\boxed{\text{Max. voltage output frequency (n26)}}}{\boxed{\text{Output frequency}}}$$

• Stall prevention (current limit) during running

During agreed speed if the output current exceeds 160% of the inverter rated current, deceleration starts.

When the output current exceeds 160%, deceleration continues. When the output current goes down below 160%, acceleration starts, up to the set frequency.

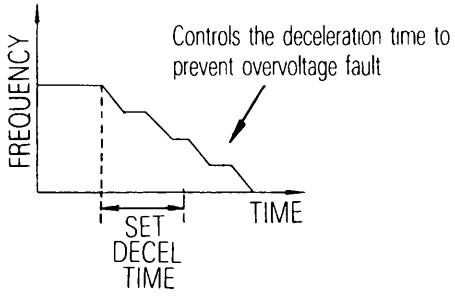


* Decreases frequency to prevent the motor from stalling.

• Stall prevention (current limit) during deceleration (n33)

To prevent overvoltage during deceleration, the inverter automatically extends the deceleration time according to the value of main circuit DC voltage. When using an optional braking resistor, set n33 to 1.

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



7. MAINTENANCE AND INSPECTION

Periodically inspect the inverter as described in the following table to prevent accidents and to ensure high performance with high-reliability.

DANGER :

To prevent electrical shock, disconnect all power before servicing inverter. Then wait at least one minute after power supply is disconnected and all LED's are extinguished.

Location to Check	Check For	Solution
Terminals, unit mounting bolts, etc.	Connection hardware is properly seated and securely tightened	Properly seat and tighten hardware
Cooling fins	Built up dust, dirt, and debris	Blow with dry compressed air . 39 2 × 10^4 to 58 8 × 10^4 Pa, 57 to 85 psi (4 to 6kg / cm^2) pressure
Printed circuit board	Accumulation of conductive material or oil mist	Blow with dry compressed air : 39.2 × 10^4 to 58 8 × 10^4Pa, 57 to 85 psi (4 to 6kg / cm^2) pressure If dust or oil cannot be removed, replace the inverter unit
Power elements and smoothing capacitor	Abnormal odor or discoloration	Replace the inverter unit.

8. FAULT DIAGNOSIS AND CORRECTIVE ACTIONS

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

<Corrective actions for models with blank cover (no operator)>

1. Input fault reset or cycle the power supply OFF and ON.
2. When a fault cannot be corrected:
   (1) Turn the power supply OFF and check the wiring and control logic.
   (2) Turn the power supply OFF and replace the blank cover with the digital operator to display faults.

<Corrective Actions of Models with Digital Operator>

☼ ON ☼ BLINKING ● : OFF

Warning Display and Contents

Warning Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
EF Blinking	☼ ☼ or ☼ ☼	Warning Fault contacts do not change state	EF (Simultaneous FWD/REV run commands) When FWD and REV run commands are simultaneously input for over 500ms, the inverter decelerates to a stop	Check SF and SR input terminals
SrP Blinking			STP (Operator function stop) STOP RESET is pressed during running by the control circuit terminals SF and SR The inverter decelerates to a stop	
Uv Blinking	☼ ☼		UV (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the inverter output is OFF	Check the following · • Power supply voltage • Main circuit power supply wiring is connected • Terminal screws are securely tightened
ou Blinking			OV (Main circuit overvoltage) Main circuit DC voltage exceeds the overvoltage detection level while the inverter output is OFF	Check the power supply voltage
oH Blinking			OH (Cooling fin overheat) Intake air temperature rises while the inverter output is OFF	Check the intake air temperature

Fault Display and Contents

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oC	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop	OC (Overcurrent) Inverter output current momentarily exceeds approx 250% of rated current	• Short circuit or grounding at inverter output side • Excessive load GD^2 • Extremely rapid accel/decel time (constants n20 and n21) • Special motor used • Starting motor during coasting • Motor of a capacity greater than the inverter rating has been started • Magnetic contactor open/closed at the inverter output side
ou			OV (Main circuit over-voltage) Main circuit DC voltage exceeds the overvoltage detection level because of excessive regenerative energy from the motor	• Insufficient decel time (constants n21) • Lowering of minus load (elevator, etc) ⇩ • Increase decel time. • Connect optional braking resistor
Uu1			UV1 (Main circuit low voltage) Main circuit DC voltage drops below the low-voltage detection level while the inverter output is ON	• Reduction of input power supply voltage • Open phase of input supply • Occurrence of momentary power loss ⇩ Check the following . • Power supply voltage • Main circuit power supply wiring is connected • Terminal screws are secure
Uu2			UV2 (Control power supply fault) Voltage fault of control power supply is detected	Cycle power If the fault remains, replace the inverter

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
oH	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop.	OH (Cooling fin overheat) Temperature rise because of inverter overload operation or intake air temperature rise	• Excessive load • Improper V/f pattern setting • Insufficient accel time if the fault occurs during acceleration • Intake air temperature exceeding 122°F (50°C) ⇩ Check the following • Load size • V/f pattern setting (constants n24 to n26) • Intake air temperature
oL 1			OL1 (Motor overload) Motor overload protection operates by built-in electronic thermal overload relay	• Check the load size or V/f pattern setting (constants n24 to n26) • Set the motor rated current shown on the nameplate by constant n31
oL2			OL2 (Inverter overload) Inverter overload protection operates by built-in electronic thermal overload relay	• Check the load size or V/f pattern setting (constants n24 to n26) • Check the inverter capacity
EF 1			EF1, (External fault) Inverter receives an external fault input from controll circuit terminal	Check the multi-function input terminal S1

Fault Display		Inverter Status	Explanation	Causes and Corrective Actions
Digital Operator	RUN (Green) ALARM (Red)			
F00	● ☼	Protective Operation Output is shut OFF and motor coasts to a stop	CPF-00 Initial memory fault is detected	Cycle power. If the fault remains, replace the inverter
F01			CPF-01 ROM fault is detected.	
F04			CPF-04 Constant fault is detected.	• Record all constant data and initialize the constants (Refer to page 22 for constant initialization) • Cycle power If the fault remains, replace the inverter
F05			CPF-05 AD converter fault is detected	Cycle power If the fault remains, replace the inverter
F06			CPF-06 Option connecting fault	Remove power to the inverter. Check the connection of the option.
— (OFF)	● ●		• Insufficient power supply voltage • Control power supply fault • Hardware fault	Check the following . • Power supply voltage • Main circuit power supply wiring is connected • Terminal screws are securely tightened. • Control sequence. • Replace the inverter.

9. SPECIFICATIONS

■ Standard Specifications

Model CIMR-XC	200V 3-phase	Low-carrier type	H 20P1	H 20P2	H 20P4	H 20P7	H 21P5
		Low-noise type	A 20P1	A 20P2	A 20P4	A 20P7	A 21P5
	200V single-/ 3-phase	Low-carrier type	H B0P1	H B0P2	H B0P4	H B0P7	—
		Low-noise type	A B0P1	A B0P2	A B0P4	A B0P7	—
Max Applicable Motor Output HP (kW)*			0 13 (0 1)	0 25 (0 2)	0 5 (0 4)	1 (0 75)	2 (1 5)
Output characteristics	Inverter capacity (kVA)		0 3	0 6	1 1	1 9	2 6
	Rated output current (A)		0.8	1 5	3 0	5.0	7 0
	Max output voltage(V)	200V 3-phase	3-phase, 200 to 230V (proportional to input voltage)				
		200V single-/ 3-phase	3-phase, 200 to 240V (proportional to input voltage)				
	Max output frequency (Hz)		400Hz (Programmable)				
Power supply	Rated input voltage and frequency	200V 3-phase	3-phase, 200 to 230V, 50/60Hz				
		200V single-/ 3-phase	Single-phase 200 to 240V, 50/60Hz 3-phase, 200 to 230V, 50/60Hz				
	Allowable voltage fluctuation		-15% to +10%				
	Allowable frequency fluctuation		±5%				
Control characteristics	Control method		Sine wave PWM (High-carrier frequency PWM for low-noise)				
	Frequency control range		0 5 to 400Hz				
	Frequency accuracy (temperature change)		Digital command ±0 01% (14 to 122°F, -10 to +50°C)				
			Analog commands ±1% (77 ±18°F, 25 ±10°C)				
	Frequency setting resolution		Digital operator reference 0 1Hz (less than 100Hz) 1Hz (100Hz or more)				
			Analog reference . 0 06Hz/60Hz (1/1000)				
	Output frequency resolution		0 1Hz				
	Overload capacity		150% rated output current for one minute				
	Frequency reference signal		0 to +10VDC (20kΩ), 4 to 20mA (250Ω) (Selectable)				
	Accel/decel time		0 1 to 999 sec (accel/decel time are independently programmed)				
	Braking torque‡		Short-term average deceleration torque† 0 13HP, 0 25HP (0 1kW, 0 2kW) 150% 0 5HP, 1HP (0 4kW, 0 75kW) 100% 2HP (1 5kW) 50% or more Continuous regenerative torque Approx 20% (150% with optional braking resistor, braking transistor built-in)				
	V/f characteristic		Possible to program any V/f pattern				
Protective functions	Motor overload protection		Electronic thermal overload relay				
	Instantaneous overcurrent		Motor coasts to a stop at approx 250% of inverter rated current				
	Overload		Motor coasts to a stop after 1 minute at 150% of inverter rated output current				
	Overvoltage		Motor coasts to a stop if DC bus voltage exceeds 410V				
	Undervoltage		Stops when DC bus voltage is approx 200V or less (approx 160V or less for single-/3-phase series)				
	Momentary power loss		One of the following operations are selectable Not provided (Stops if power loss is 15ms or longer)/Automatically restarts at recovery from momentary power loss of approx 0 5 sec /Automatically restarts				
	Cooling fin overheat		Protected by electronic circuit				
	Stall prevention level		Provided during acceleration and constant-speed run (fixed level) Provided/not provided available during deceleration				
	Ground fault		Protected by electronic circuit (Overcurrent level)				
	Power charge indication		Run lamp stays ON or digital operator LED stays ON				

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

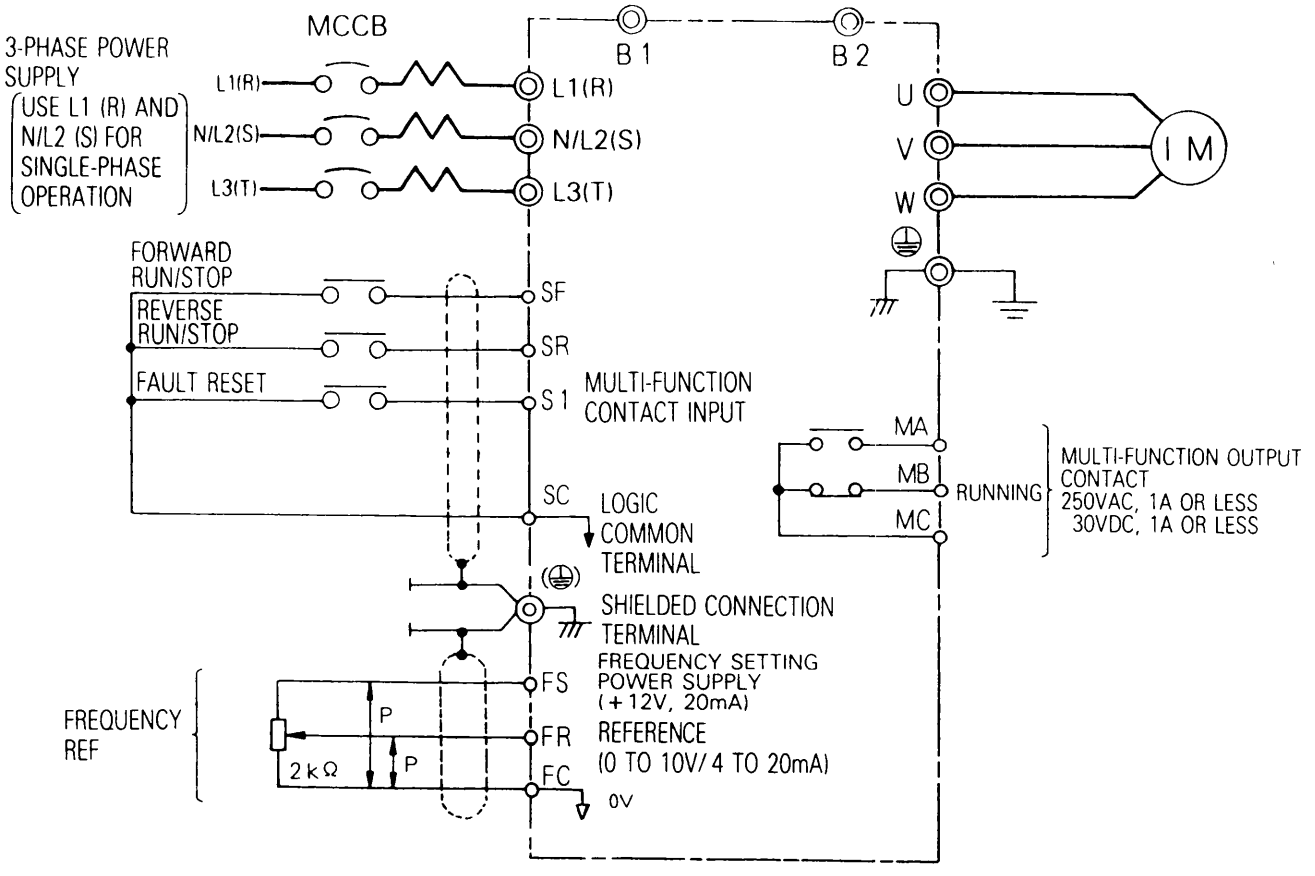
† Shows deceleration torque for an uncoupled motor decelerating from 60Hz with the shortest possible deceleration time

Model CIMR-XC	200V 3-phase	Low-carrier type	H 20P1	H 20P2	H 20P4	H 20P7	H 21P5
		Low-noise type	A 20P1	A 20P2	A 20P4	A 20P7	A 21P5
	200V single-/ 3-phase	Low-carrier type	H B0P1	H B0P2	H B0P4	H B0P7	—
		Low-noise type	A B0P1	A B0P2	A B0P4	A B0P7	—

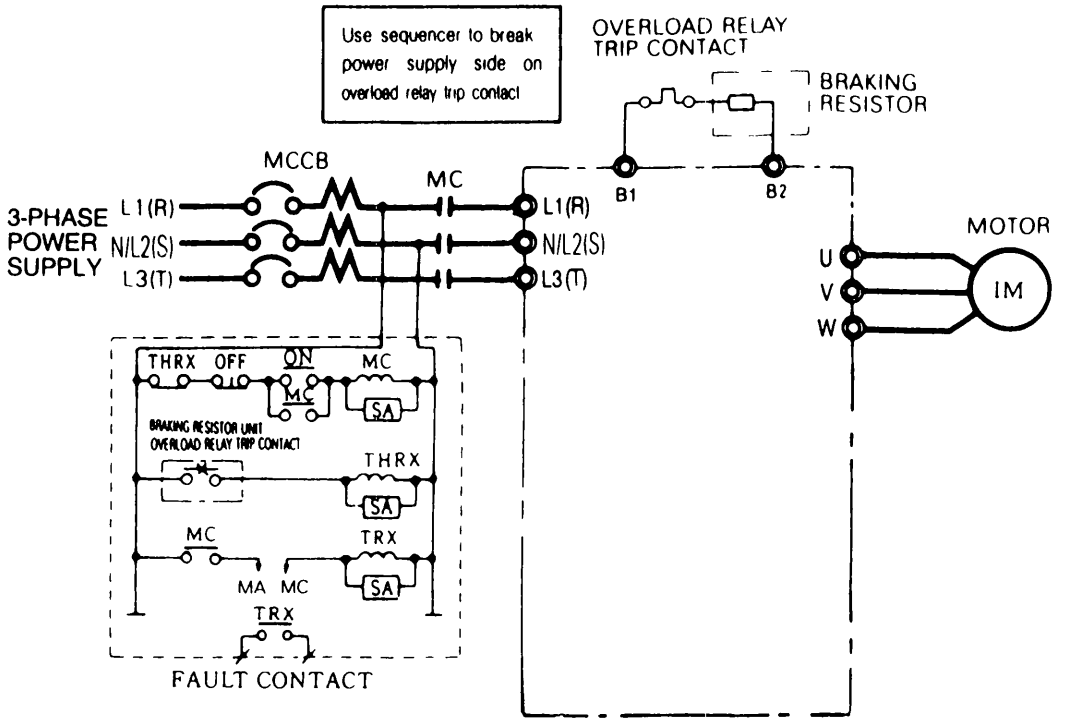
Other functions	Input signals	Run/Stop input	Two signals (Forward run/stop, reverse run/stop)
		Multi-function input	One of the following input signals are selectable . Forward-reverse run (3-wire sequence), fault reset, external fault (NO/NC contact input), multi-step speed operation
	Output signals	Multi-function output	Two of the following output signals are selectable (1 NONC contact output) Fault, running, at frequency
		Standard function	Full-range automatic torque boost, DC injection braking at stop {Current 50% of inverter rated current Time 0 5s (fixed)}, frequency reference bias/gain
	Display	Status indicator LED	Run and ALARM provided as standard LED'S
		Digital operator (JVOP-120)	Available to monitor frequency reference, output frequency, output current, FWD/REV selection
		Terminals	Main circuit screw terminals Control circuit plug-in screw terminal
		Wiring distance between inverter and motor	328ft (100m) or less
Enclosure			Open chassis
Cooling method			Self-cooling
Environmental conditions		Ambient temperature	14 to 122°F (-10 to 50°C) (not frozen)
		Humidity	90% RH or less (non-condensing)
		Storage temperature*	-4 to 140°F (-20 to 60°C)
		Location	Indoor (free from corrosive gases or dust)
		Elevation	3280ft (1000m) or less
		Vibration	Up to 9 8m/s² (1G) at less than 20Hz, up to 2m/s² (0 2G) at 20 to 50Hz

* Temperature during shipping (for short periods)

■ Standard Wiring



Connection Example of Braking Resistor



Terminal Description

Type			Terminal	Name	Function (Signal Level)	
Main Circuit			L1 (R) N/L2 (S), L3 (T)	AC power supply input	L1 (R) and N/L2 (S) for single-phase power supply	
			U, V, W	Inverter output	For inverter output	
			B1, B2	Braking resistor connection	For braking resistor connection	
			⏚	Grounding	For grounding (grounding resistance should be 100Ω or less)	
Control Circuit	Input	Sequence	SF	Forward run/stop	Runs when CLOSED, stops when OPEN	24VDC 8mA, Photocoupler insulation
			SR	Reverse run/stop	Runs when CLOSED, stops when OPEN	
			S1	Multi-function contact input 1	Factory preset is "Fault reset"	
			SC	Sequence common	Common terminal for sequence input	
		Frequency Reference	FS	Power supply terminal for frequency setting	+12V (allowable current max 20mA)	
			FR	Frequency reference input	0 to 10VDC (20kΩ) or 4 to 20mA (250Ω)	
			FC	Frequency reference input common	0V	
	Output	Multi-function Output	MA	NO contact output	Factory preset is "During running"	Contact capacity : 250VAC, 1A or less
			MB	NC contact output		
			MC	Contact output common		

■ Dimensions

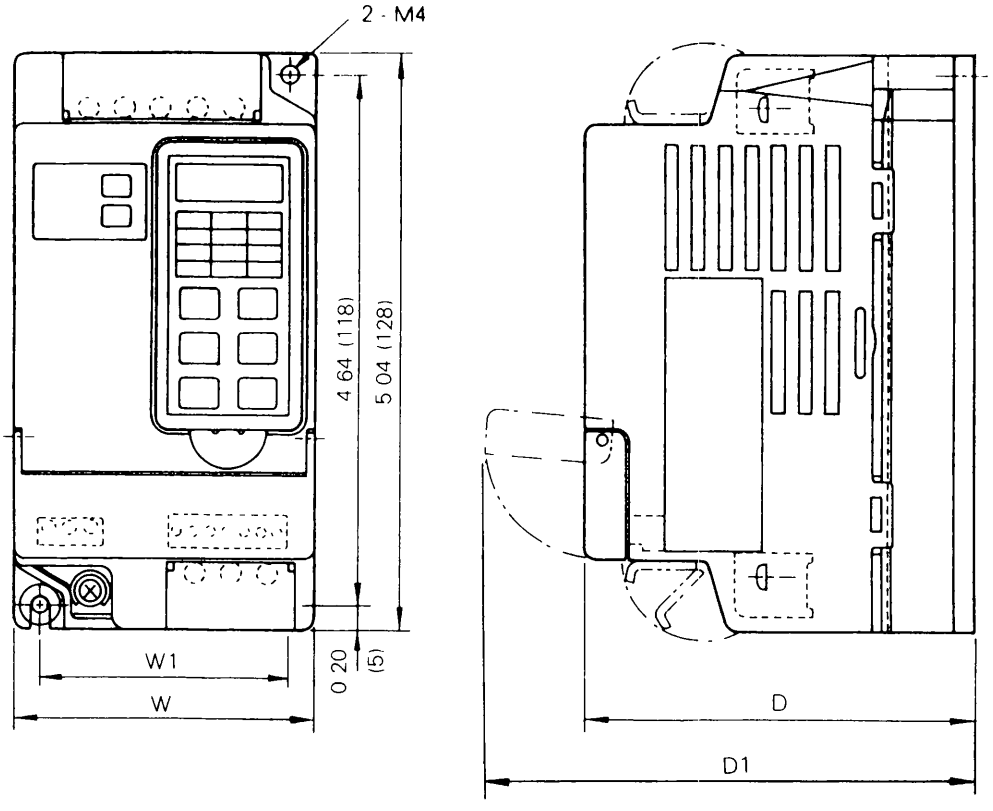


Fig. 1

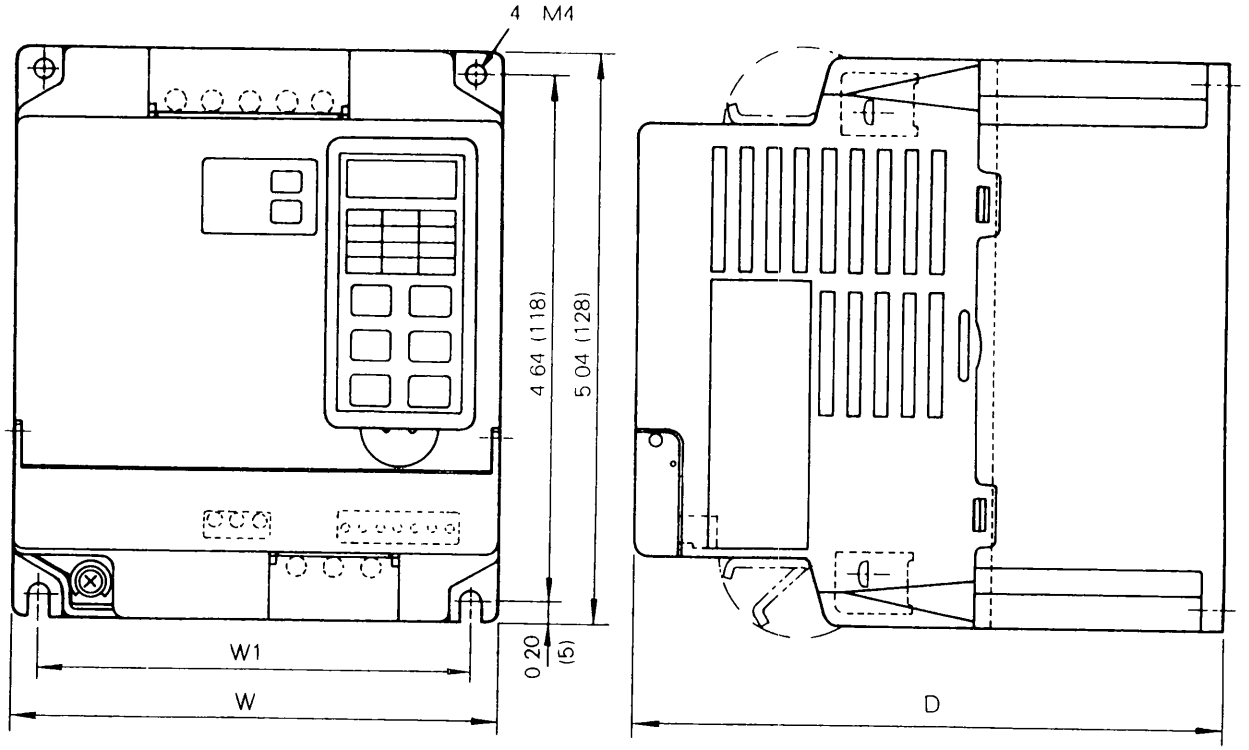


Fig. 2

Dimensions in inches (mm)/ mass in lb (kg)

Model		Low-carrier type						Low-noise type					
Capacity HP(kW)		W	D	W1	D1	Mass	Fig	W	D	W1	D1	Mass	Fig.
3-phase 200V	0 13 (0 1)	2 68 (68)	2 76 (70)	2 20 (56)	3 58 (91)	1 1 (0 5)	1	2 68 (68)	2 95 (75)	2.20 (56)	3.78 (96)	1.1 (0 5)	1
	0 25 (0 2)	2 68 (68)	2 95 (75)	2 20 (56)	3 78 (96)			2 68 (68)	3.46 (88)	2.20 (56)	4 29 (109)	1.3 (0.6)	
	0 5 (0 4)	2 68 (68)	3 46 (88)	2 20 (56)	4 29 (109)	1 3 (0 6)		2.68 (68)	4 33 (110)	2 20 (56)	5 16 (131)	2.0 (0 9)	
	1 (0 75)	2 68 (68)	5 12 (130)	2 20 (56)	5 94 (151)	2 0 (0 9)		4.25 (108)	5 12 (130)	3 78 (96)	5.94 (151)	2 9 (1 3)	2
	2 (1 5)	4 25 (108)	6 10 (155)	3 78 (96)	6 93 (176)	3 3 (1 5)	2	4 25 (108)	6 10 (155)	3 78 (96)	6 93 (176)		
Single-/3-phase 200V	0 13 (0 1)	2 68 (68)	2 95 (75)	2 20 (56)	3 78 (96)	1 1 (0 5)	1	2 68 (68)	2 95 (75)	2 20 (56)	3 78 (96)	1 1 (0 5)	1
	0 25 (0 2)	2 68 (68)	3.74 (95)	2 20 (56)	4 57 (116)	1 3 (0 6)		2 68 (68)	4 25 (108)	2.20 (56)	5.09 (129)	1 3 (0 6)	
	0 5 (0 4)	4.25 (108)	5 12 (130)	3 78 (96)	5 94 (151)	2 9 (1.3)	2	4 25 (108)	5 12 (130)	3 78 (96)	5.94 (151)	2 9 (1 3)	2
	1 (0 75)	4 25 (108)	5 12 (130)	3 78 (96)	5 94 (151)			4 25 (108)	5 12 (130)	3 78 (96)	5 94 (151)		

■ Recommended Peripheral Devices

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

- MCCB (Molded-case circuit breaker) :
  Be sure to connect it for wiring protection.
- Magnetic contactor:
  Mount a surge suppressor on the coil (refer to the table shown below.)
  When using a magnetic contactor to start and stop the inverter, do not exceed one start per hour.

Recommended MCCB and magnetic contactor

- 200V 3-phase

VS mini model CIMR-XC A CIMR-XC E	20P1	20P2	20P4	20P7	21P5
Capacity (kVA)	0.3	0.6	1.1	1.9	2.6
Rated Output Current (A)	0.8	1.5	3	5	7
MCCB type NF30 (MITSUBISHI)	5A	5A	5A	10A	20A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-7E	HI-10-2E

- 200V single-/3-phase

VS mini model CIMR-XC A CIMR-XC E	B0P1	B0P2	B0P4	B0P7
Capacity (kVA)	0.3	0.6	1.1	1.9
Rated Output Current (A)	0.8	1.5	3	5
MCCB type NF30, NF50 (MITSUBISHI)	5A	5A	10A	20A
Magnetic contactor type HI (YASKAWA CONTROL)	HI-7E	HI-7E	HI-7E	HI-10-2E

Surge suppressors

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

- Ground fault interrupter:
  Select a ground fault interrupter not affected by high frequencies. To prevent malfunctions, the current should be 200mA or more and the operating time 0.1 sec. or more.
  Example : • NV series by Mitsubishi Electric Co., Ltd. (manufactured in 1988 and after)
  • EGSG series by Fuji Electric Co., Ltd. (manufactured in 1984 and after)
- AC reactor :
  Install an AC reactor to connect to a power supply transformer of large capacity (600kVA or more) or to improve power factor on the power supply side.
- Noise filter:
  Use a noise filter exclusively for inverter if radio noise generated from the inverter causes other control devices to malfunction.

CAUTION :

1. Never connect a general LC/RC noise filter to the inverter output circuit.
2. Do not connect a phase advancing capacitor to the I/O sides and/or a surge suppressor to the output side.
3. When a magnetic contactor is installed between the inverter and the motor, do not turn it ON/OFF during operation.

For the details of the peripheral devices, refer to the catalog.

■ Constants List

No	Name	Setting Range	Setting Unit	Initial Setting	User Setting	Ref. Page
1	Constant write-in prohibit/initialize	0, 1, 8, 9	1	1		22
2	Operation mode selection	0 to 5	1	0		19
4	FWD/REV run selection	For FWD rEv REV Note This set value becomes effective when the run command is set to "operator" at operation mode selection (n02)		For		16
6	Multi-function input select 1 (terminal S1)	0 to 4	1	1		26
9	Multi-function output select 1 (terminal MA/MB)	0 to 2	1	1		27
11	Frequency reference 1	0 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	6 0Hz		23
12	Frequency reference 2			0 0Hz		
20	Acceleration time	0 0 to 999s	0 1s (less than 100Hz)/ 1s (100Hz or more)	10 0s		16
21	Deceleration time			10 0s		
24	Maximum output frequency	50 0 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	60 0Hz		17
25	Maximum voltage	1 to 255V	1V	200V		
26	Maximum voltage output frequency	1 6 to 400Hz	0 1Hz (less than 100Hz)/ 1Hz (100Hz or more)	60 0Hz		
31	Electronic thermal reference current	0 to 120% of inverter rated current	0 1A	*		17
33	Stall prevention (current limit) during deceleration	0, 1	1	0		31
36	Operation after momentary power loss	0 to 2	1	0		25
37	Carrier frequency — Low-carrier type	1 (2 5kHz)	1 = 2 5kHz (Carrier frequency = set value x 2 5kHz)	1(2 5kHz)		25
	Carrier frequency — Low-noise type	1 to 4 (2 5 to 10kHz)		4 (10kHz)		
39	Frequency reference gain	0 10 to 2 00	0 01	1 00		24
40	Frequency reference bias	−99 to 99%	1%	0%		
68	Fault record	Stores, displays most reccent alarm (setting disabled)		—	—	—

*Differs depending on the inverter capacity.

VS mini C Series
INSTRUCTION MANUAL

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