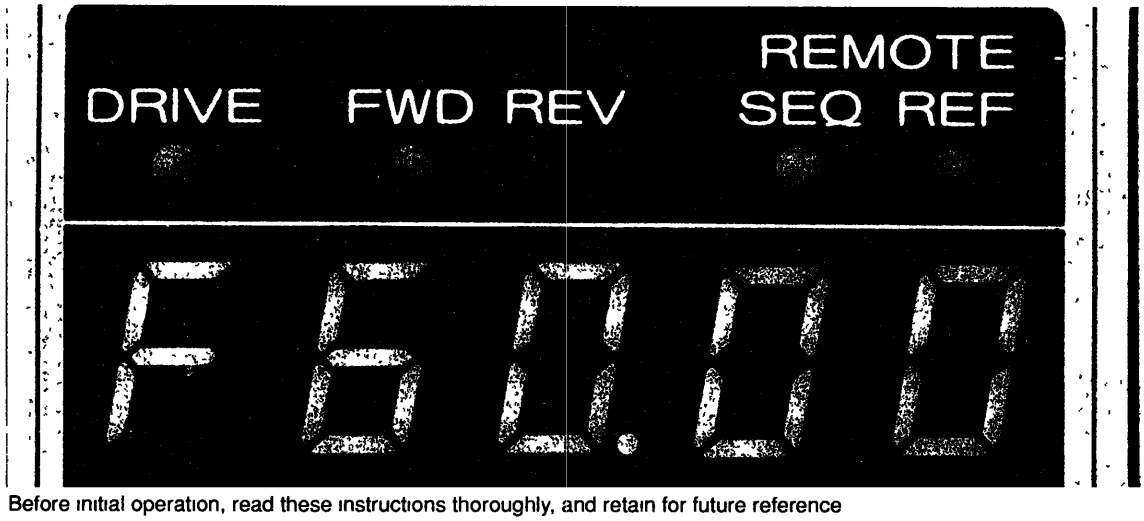
YASKAWA

Varispeed SERIES INVERTER VS-616G3 OPERATOR

DIGITAL OPERATOR INSTRUCTIONS

Model JVOP-100



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

YASKAWA

TOE-C736-60 1

Varispeed-616G3 (VS-616G3) is a high-performance/low noise general-purpose inverter, provided with multi-functions and is an improved version of VS-616GII. By employing a newly-designed digital operator better operation can be realized.

This manual describes the operation procedures of the digital operator provided with VS-616G3.

Before using VS-616G3, a thorough understanding of this manual and the VS-616G3 instruction manual and function description is recommended

This instruction manual will be of great help for daily maintenance, inspection and troubleshooting.

IMPORTANT INFORMATION

Parts with [ ] in this manual is effective for design revision order (E and beyond) in SPEC column on the inverter nameplate.

INVERTER NAMEPLATE

MODEL	CIMR-G3E2030 200V CLASS INVERTER
INPUT	AC 3PH 200~220V / 50Hz 200~230V / 60Hz 160A DC 270~330V 200A
OUTPUT	AC 3PH 0~230V 54kVA 146A
SPEC	20300E |
YASKAWA ELECTRIC CORPORATION	JAPAN

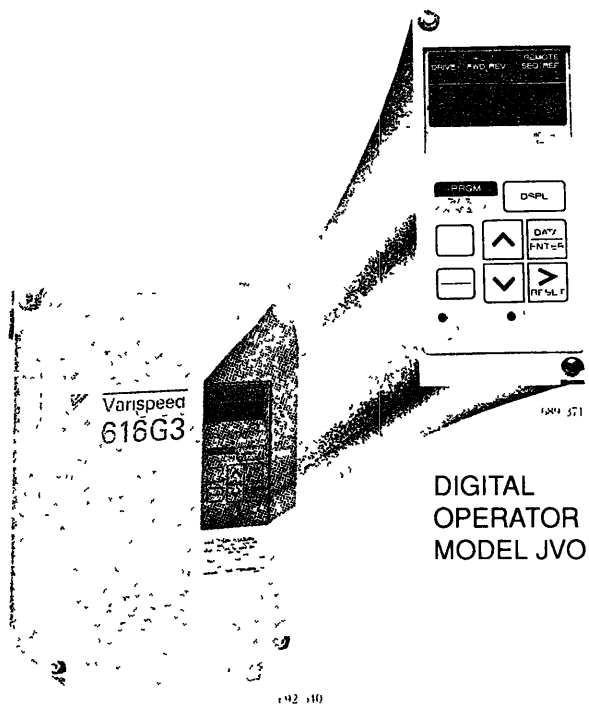
CONTENTS

Page

1. OUTLINE

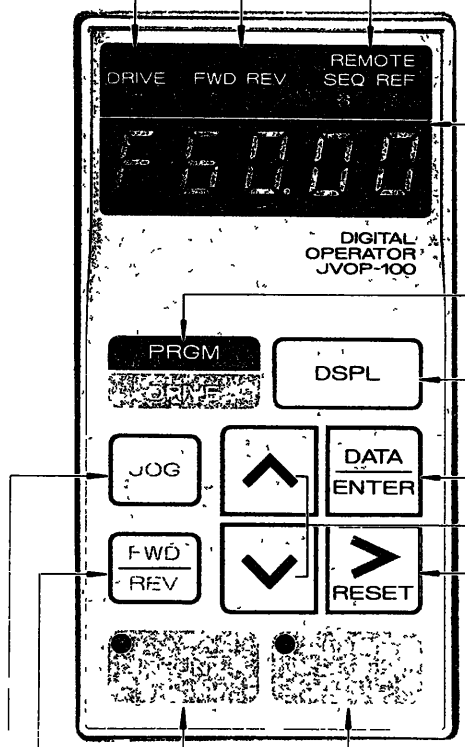
1.1 MAIN FUNCTIONS

Function	Description
Drive Mode	VS-616G3 can be operated easily with keys
Program Mode	Function selection and constant setting of VS-616G3 can be performed with dig tal operator
Monitor Function	Monitoring of output frequency, output current, output voltage or status of run / stop commands can be performed
Fault Contents Display	If a fault occurs, its contents order of occurrence are displayed When the power supply is turned on maintenance inspection or troubleshooting can be performed immediately since display of fault as a previous records is provided



DIGITAL
OPERATOR
MODEL JVOP-100

1.2 DIGITAL OPERATOR KEY



Mode Display LED

Drive Mode Display
Red lamp lights in DRIVE mode and goes out in PRGM mode

Rotation Direction Display
Red lamp lights in DRIVE mode and goes out in PRGM mode

REMOTE Mode
Red lamp lights when controlled by control terminal commands
SEQ When RUN/STOP signal is selected from terminals
REF When frequency ref is selected from terminals

Display

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

Mode Selection Key

Depressing this key changes mode (DRIVE or PRGM)

Display Selection Key

Depressing this key changes the display
See page 4 for explanation

Read/Write Key

Depressing this key changes the display
See next page for explanation

Numeral Change Key

Changes numeral such as set values and constant signals
∧ Increment key
∨ Decrement key

Digit Selection Key

Selects numerical digits Selected digit blinks
This key resets operation at faults

Run Command Key

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

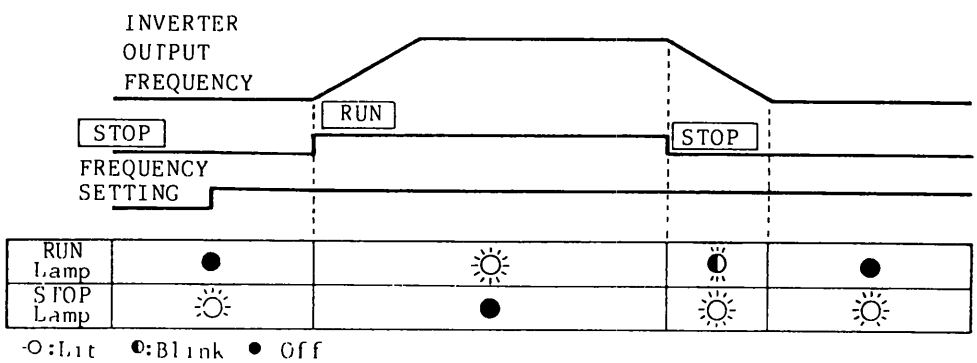
STOP command is input (Motor stops in either mode)*

Red lamp lights by depressing STOP *

Selects FWD or REV run
Effective only in DRIVE mode

While depressing this key, jog speed is selected
Effective only in DRIVE mode

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

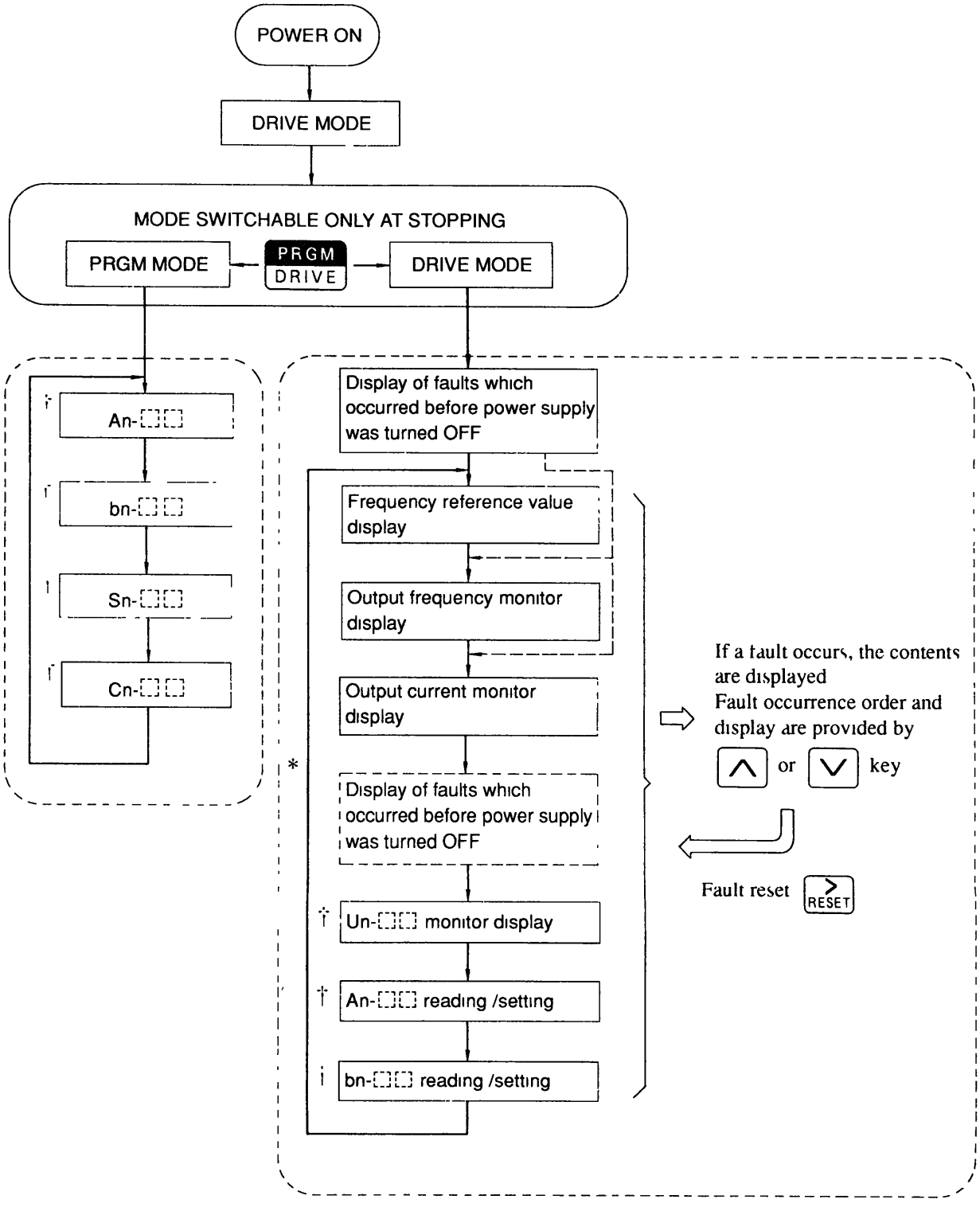


2. DRIVE MODE AND PRGM (PROGRAM) MODE

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

DRIVE mode functions	• Operation is enabled • An operation can be performed by RUN STOP JOG and FWD/REV keys • Frequency reference value or bn constants can be changed during running
PRGM mode functions	• Program (function selection, constant setting) can be changed Note Operation cannot be performed

2.1 DISPLAY CONTENTS



* The constant group to be displayed is changed each time display selection key DSPL is depressed

† For details of constants (An-□□, bn-□□, Cn-□□, Sn-□□, Un-□□), refer to Sect 7, "CONSTANT/ FUNCTION LIST "

2.2 CONSTANT GROUP

Constants of VS-616G3 are classified as follows:

Constant Group	Contents
An - □□	Frequency reference set ing
bn - □□	Constant group able to be changed during running
Cn - □□	Constant, among control constant groups, related to operation characteristics change
Sn - □□	Constant, among system constant groups, to be used for function selection

The ability to set or read the different groups of constants is determined by Sn-03 as shown below.

Sn-03	DRIVE Mode		PRGM Mode		Remarks
	Setting	Reading	Setting	Reading	
0000	An, bn	Sn, Cn	An, bn, Sn, Cn		Factory set
0101	An	bn, Sn, Cn	An	bn, Sn, Cn	

* It is recommended that Sn-03 be set to 0101 and reading mode entered after test run adjustment

Note To read the Sn or Cn while in the DRIVE mode depress the DSPL key with > RESET key depressed

3. CONSTANT SET AND CHANGE

3.1 STANDARD FACTORY SET

Contents	Set Value
Frequency Reference Input	Can be set by digital operator
Run Command Input	Can be set by digital operator [RUN / STOP / FWD / REV / JOG]
V / f Pattern	60Hz, constant torque characteristics (Standard motor)
Acceleration Time	10 seconds
Motor Protection	Electronic overload thermal protector (Standard motor)

Note For details, refer to Sect 7 "CONSTANT/FUNCTION LIST"

3.2 SET AND CHANGE OF FREQUENCY REFERENCE

(Example) Frequency reference value is set to 15 Hz.

Description	Key Operation	Digital Operator Display	Remarks
• Frequency reference value is displayed	DSPL	F 0 0.0 0 Blinking	
• Set or change reference value (Input "1")	∧ ∨	F 1 0.0 0	
• Select digit	RESET	F 1 0.0 0	
• Set or change reference value (Input "5")	∧ ∨	F 1 5.0 0	
• Write-in constant	DATA ENTER	F 1 5.0 0	Stops blinking for 2 seconds

3.3 CONSTANT CHANGE AND FUNCTION SELECTION

- All constants are changed or functions are selected in the same way.
- When changing Cn-□□ and Sn-□□ constants, program mode must be selected.

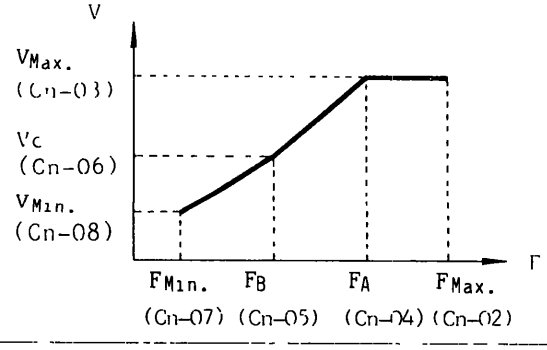
(Example) Jog frequency (An-09) set value is changed from 6 Hz to 10 Hz.

Description	Key Operation	Digital Operator Display	Remarks
• Constant group to be set or changed is displayed	DSPL	An-01	
• Select constant No to be set or changed	∧ ∨	An-09	
• Constant set value is displayed	DATA ENTER	06.00	
• Constant is set or changed	∧ ∨	10.00	
• Set value is written in	DATA ENTER	End	("End" is displayed for 0 5 second) Confirm "End" display for each constant

3.4 OPERATION ERRORS " oPE □□ "

The constant setting fault oPE is checked when power is applied or PRGM is changed to DRIVE mode. Digital operator displays faults if the oPE is detected. The fault contact output of the inverter is not executed. If the following "conditions" occur at power on or changing PRGM into DRIVE, it becomes oPE.

3

Display	Fault	Conditions	Example
oPE01	kVA Constant Setting Fault (Sn-01)	• When 400 V class constant is set for 200 V class inverter or 200 V class constant for 400 V	
oPE02	Constant Setting Range Fault	• When 'out of setting range' constant is set	
oPE03	Multi-function Input Setting Fault (Sn-15 to -18)	When multi function inputs Sn-15 to -18 are set as follows • Set values are not arranged in small nos order (including equal values) • Both search references 61 and 62 are set • UP command (set value = 10) and DOWN command (set value = 11) cannot be set simultaneously • UP command (set value = 10) DOWN command (set value = 11) and accel prohibit command (set value = 0A) are set together • More than two set values except FF are set	Sn-15=3 Sn-16=4 Sn-17=6 Sn-18=5
oPE10	V/f Data Set Fault (Cn-02 to -08)	When Cn-02 to 08 do not satisfy the following conditions • FMax ≧ FA > FB ≧ FMin (Cn-02) (Cn-04) (Cn-05) (Cn-07) 	Cn-02 50 Cn-04=60 Cn-05=3 Cn-07=1.5
oPE11	Constant Set Fault	When any following set fault • Carrier frequency upper limit (Cn-23) > 5 kHz and Carrier frequency lower limit (Cn-24) ≦ 5 kHz • Carrier frequency proportional gain (Cn-25) > 6 and (Cn-23) < (Cn-24)	Cn-23=6 kHz Cn-24=5 kHz
Err	Constant Write-in Fault	• The constant is not written in correctly to NV-RAM (Only at initialization)	

4. WIRING

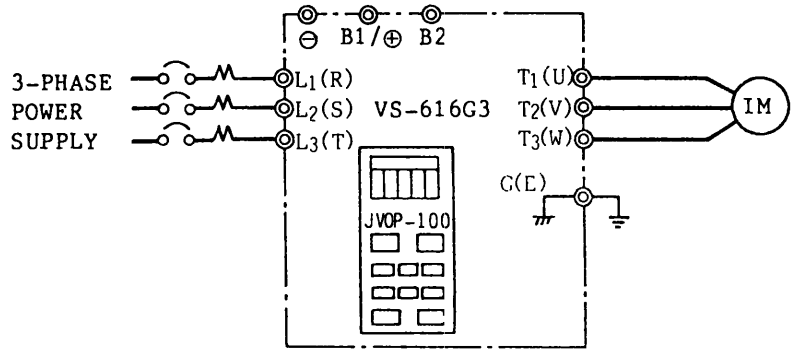
VS-616G3 has been programmed to operate from the digital operator when shipped from the factory. Therefore, just connecting the main circuit power enables drive operation.

When an operation is performed by combining external signals or external devices and digital operator, refer to Sect 7. "CONSTANT/FUNCTION LIST", in this manual.

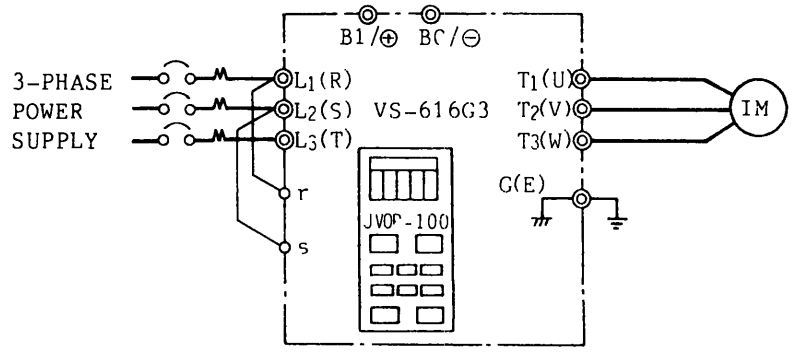
4.1 CONNECTION DIAGRAM

200 V Class

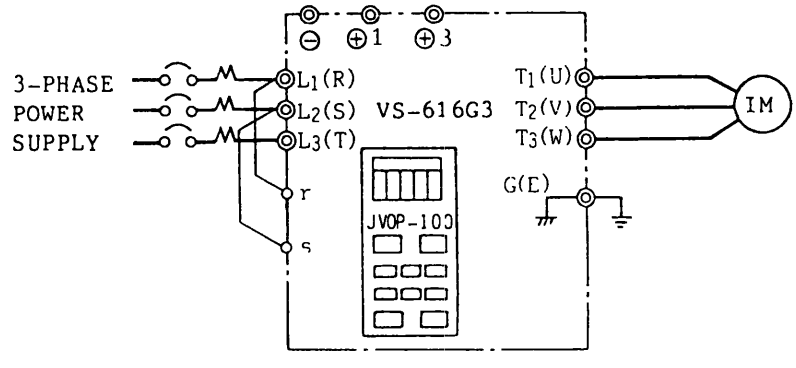
· 10 HP (7.5 kW, 13.7 kVA) or below



· 15 to 30 HP (11 to 22 kW, 20.6 to 41 kVA)

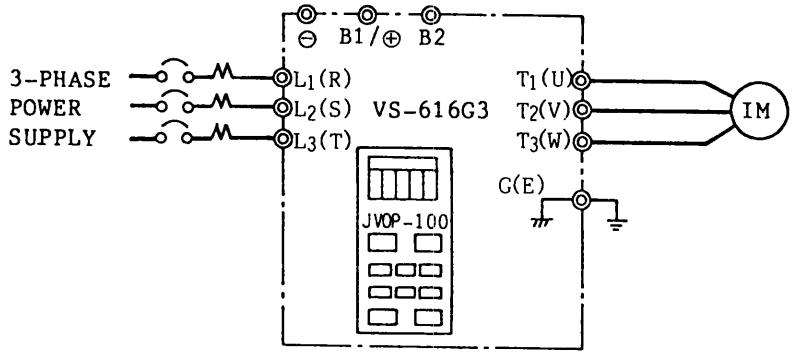


· 40 HP (30 kW, 54 kVA) or more

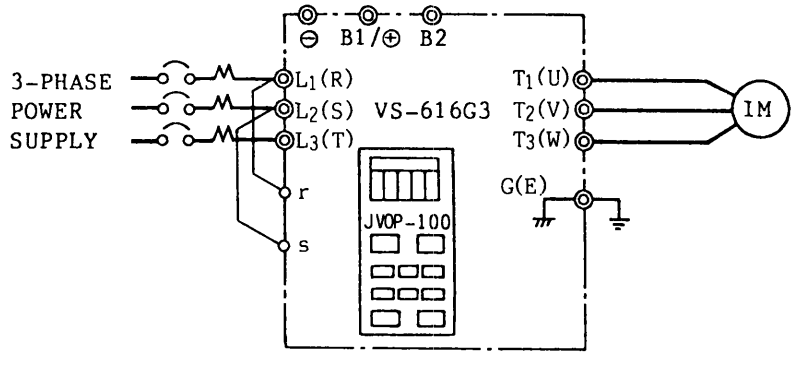


400 V Class

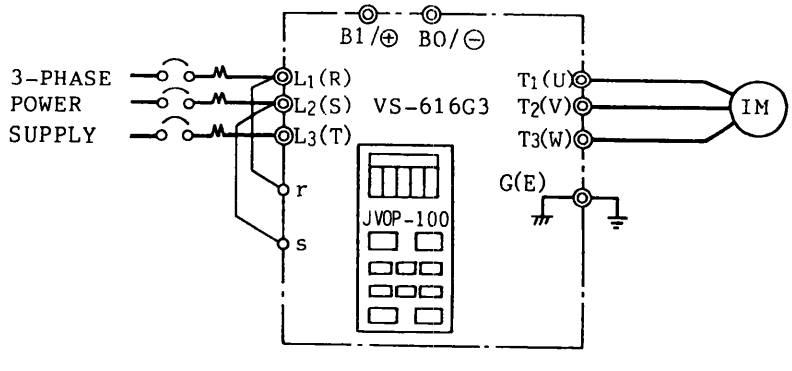
· 10 HP (7.5 kW, 13.7 kVA) or below



· 15/20 HP (11/15 kW, 20.6/27.4 kVA)

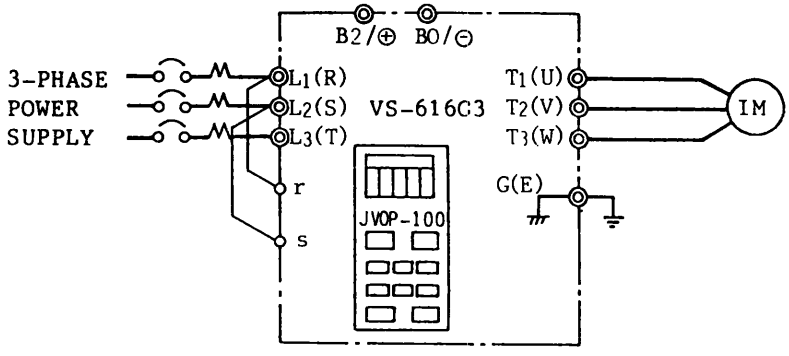


· 25/30 HP (18.5/22 kW, 34/41 kVA)

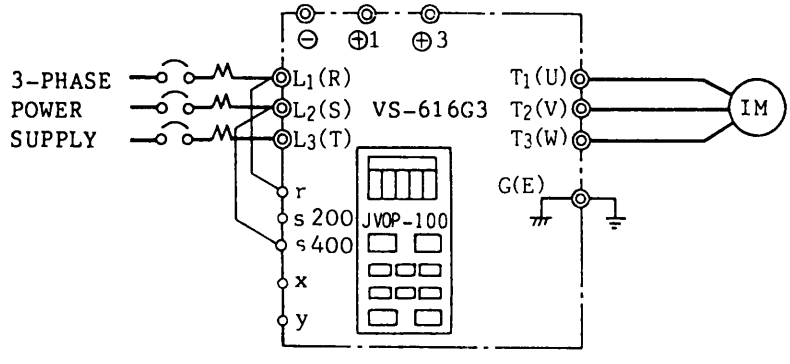


4.1 CONNECTION DIAGRAM (Cont'd)

· 40 to 60 HP (30 to 45 kW, 54 to 82 kVA)

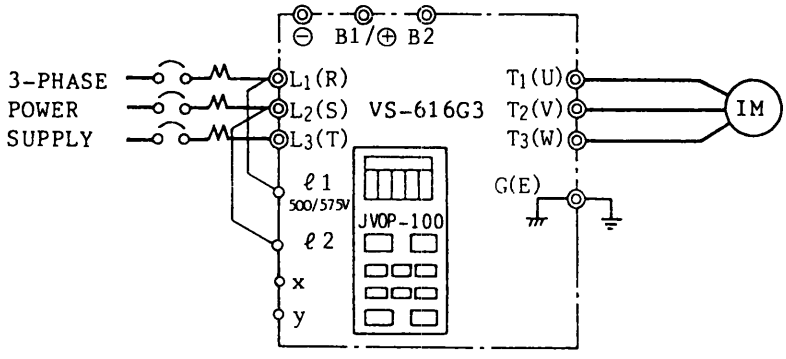


· 75 HP (55 kW, 110 kVA) or more

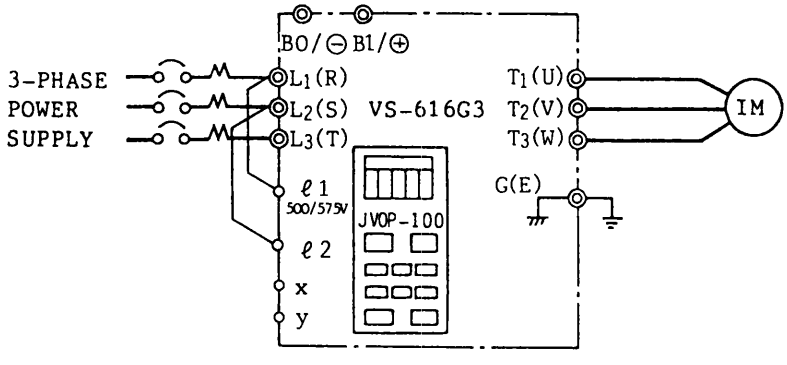


575 V Class

· 25 HP (18.5 kW, 25 kVA) or less



· 30 HP (22 kW, 30 kVA) or more



NOTE

The arrangement of control circuit terminals 1 to 27 is determined as shown below Refer to it for correct wiring

11	12	13	14	15	16	17	25	26	27
1	2	3	4	5	6	7	8	21	22

9	10	18	19	20

5. DIGITAL OPERATOR OPERATION

The following shows an example of digital operator operation.

PRECAUTION

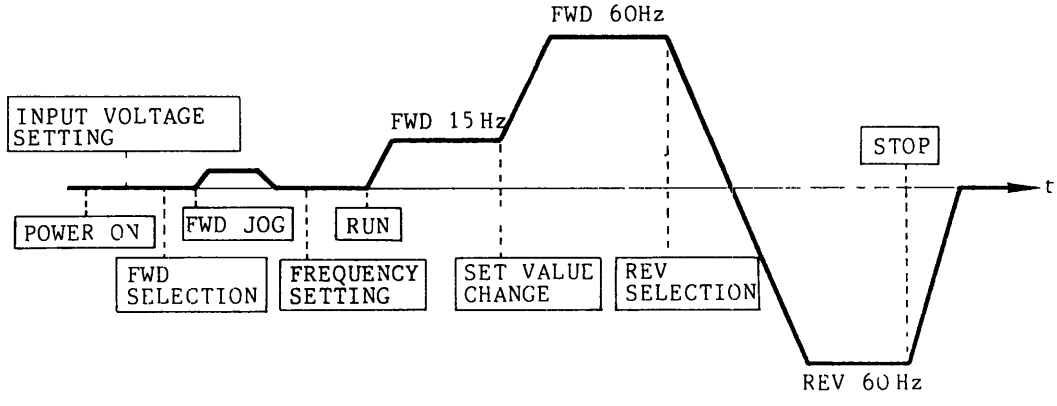
Before Power On

- For the inverter of 400 V class, 15 HP (11 kW, 20.6 kVA) or more, change the supply voltage selection tap of control transformer to the same tap as input voltage.

Before Operation

- Be sure to set input voltage in control constant Cn-01. The initial value is 200 for 200 V class, 400 for 400 V class.

■ Operation Pattern



■ Typical Operation

Description	Key Operation	Digital Operator Display	Remarks
① Turn on power supply — Frequency reference value is displayed		F 0.0 0	
Select PRGM mode	PRGM DRIVE	A n - 0 1	LED DRIVE OFF
② Set input voltage — Select control constant (Cn-□□)	DSPL — Depress three times	C n - 0 1	
(ex 220 V) Display Cn-01 data	DATA ENTER	2 0 0	
Set 220 V as input voltage	RESET, ∧, ∨	2 2 0	
	DATA ENTER	E n d	Displayed for 0.5 second. Confirm the display
Cont'd			

Description	Key Operation	Digital Operator Display	Remarks
Cont'd			
③ FWD JOG — Select DRIVE mode	PRGM/DRIVE	F 0.00	LED DRIVE lights
Select output frequency monitor display	DSPL	0.00	
Select rotating direction (FWD is default at power ON)			LED FWD lights
Jog operation	JOG	6.00	
④ Frequency setting — Frequency reference value display is selected	DSPL	Depress Six times F 0.00	
15 Hz — Change reference value	RESET, ∧, ∨	F 15.00	
Set value is written in	DATA/ENTER	F 15.00	Stops blinking for two seconds
Select output frequency monitor display	DSPL	0.00	
⑤ FWD run — Running operation	RUN	15.00	LED RUN lights
⑥ Change frequency reference value — Select frequency reference value display	DSPL	F 15.00	
60 Hz — Change reference value	RESET, ∧, ∨	F 60.00	
Set value is written in	DATA/ENTER	F 60.00	Stops blinking for two seconds
Select output frequency monitor value	DSPL	60.00	
⑦ REV run — Switch to reverse run	FWD/REV	-60.00	LED REV lights
⑧ Stop — Decelerate to a stop	STOP	0.00	LED STOP lights (RUN blinks while decelerating)

5

6. PROGRAM MODE SET AND CHANGE

The following shows an example of main functions and characteristics.

6.1 V/f PATTERN SET Sn-02

16 types of V/f patterns are available for operation to be performed according to motor type, load characteristics and using conditions.

PRECAUTION

- To select V/f pattern, set the inverter input voltage to Cn-01.
- For the details of the V/f patterns, refer to Par.7.3 SYSTEM CONSTANT "V/f PATTERN SELECTION" on page 67.

■ FIXED V/f PATTERN SELECTION

(Example) Change to variable torque characteristics (Set "7".)

Description	Key Operation	Digital Operator Display	Remarks
• Select PRGM mode	PRGM / DRIVE	An-01	LED DRIVE OFF
• Select Sn-02	DSPL (Depress twice) ∧ ∨	Sn-02	
• Constant display value is displayed	DATA / ENTER	01	
• Set or change constant	> / RESET ∧ ∨	07	
• Constant value is written in	DATA / ENTER	End	Displayed for 0.5 second. Confirm the display for each constant

■ INPUT VOLTAGE SET

(Example) Set input voltage to 220 V.

Description	Key Operation	Digital Operator Display	Remarks
• Select PRGM mode	PRGM / DRIVE	An-01	LED DRIVE OFF
• Select Cn-01	DSPL Depress three times; ∧ ∨	Cn-01	
• Constant set value is displayed	DATA / ENTER	200.0	
• Set or change constant	RESET ∧ ∨	220.0	
• Constant value is written in	DATA / ENTER	End	Displayed for 0 5 second Confirm the display for each constant

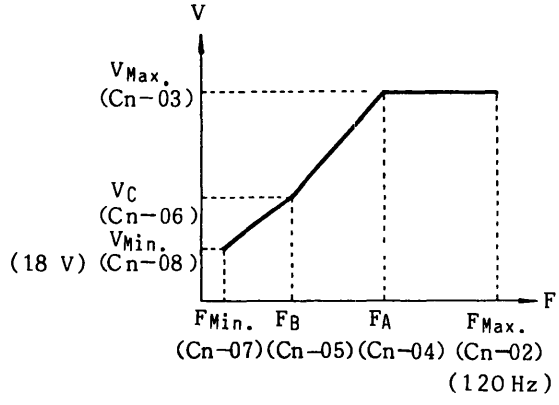
6

■ ARBITRARY V/f SET (Sn-02, Cn-02 to -08)

(Example) Change to "FMax = 120 Hz, VMin = 18 V"

Description	Key Operation	Digital Operator Display	Remarks
• Select PRGM mode	PRGM/DRIVE	Rn-01	LED DRIVE OFF
• Select Sn-02	DSPL (Depress twice), ∧, ∨	Sn-02	
• Constant set value is displayed	DATA/ENTER	01	
• Set or change constant Set to "F"	RESET, ∧, ∨	0F	
• Constant is written in	DATA/ENTER	End	
• Select Cn-02	DSPL, ∧, ∨	Cn-02	
• Constant set value is displayed	DATA/ENTER	060.0	
• Set or change constant	RESET, ∧, ∨	120.0	Refer to the next page
• Constant value is written in	DATA/ENTER	End	
• Select Cn-02	DSPL, ∧, ∨	Cn-03	
⋮	⋮	⋮	
• Select Cn-08	DSPL, ∧, ∨	Cn-08	
• Constant set value is displayed	DATA/ENTER	010.0	
• Set or change constant	RESET, ∧, ∨	018.0	Displayed for 0 5 second Confirm the display for each constant
• Constant value is written in	DATA/ENTER	End	

· Set Sn-02 to F.



· If $F_{Max.}$ (Cn-02) $\geqq F_A$ (Cn-04) $> F_B$ (Cn-05) $\geqq F_{Min.}$ (Cn-07) is not satisfied, a setting error occurs.

· When V/f pattern is selected to be linear, set the same value of Cn-07 as that of Cn-05. (Cn-06 setting is disregarded.)

6

6.2 ACCEL/DECEL TIME SET bn-01 to -04 (Sn-06, Sn-15 to -18)

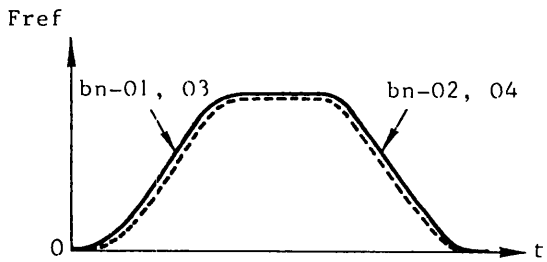
Accel/decel time can be changed in DRIVE mode during running.

- Acceleration and deceleration time each has two set values. When "accel/decel time change" is selected (7 is set in Sn-15, Sn-16, Sn-17 or Sn-18) as a multi-function terminal function, the values set in bn-03 and -04 become effective.
- S-curve characteristics of soft start can be selected in the 1- and 2-digits of Sn-06.

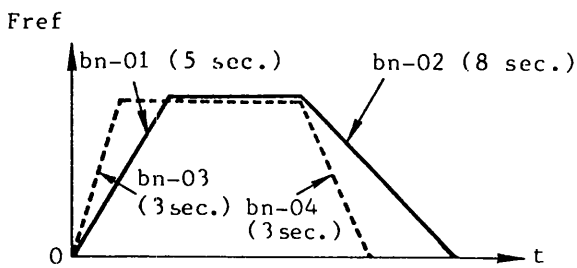
(Example) Select "accel/decel time changing function" to terminal 8 and set to "S-curve characteristics not provided" in the following table.

	bn-□□	Set Value
Accel Time 1	(bn-01)	5 sec
Decel Time 1	(bn-02)	8 sec
Accel Time 2	(bn-03)	3 sec
Decel Time 2	(bn-04)	3 sec

Factory set
(S-curve characteristics: provided)
bn-01 to 04: 10sec.



Setting change
(S-curve characteristics: not provided)



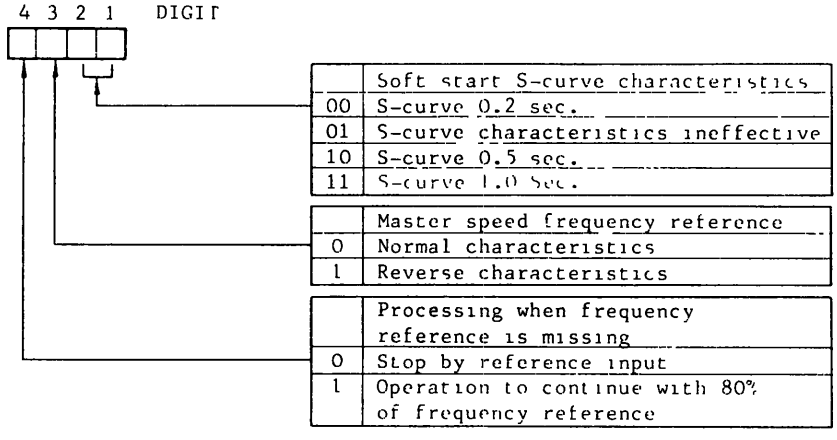
Description	Key Operation	Digital Operator Display	Remarks
• Select PRGM mode	PRGM DRIVE	An-01	LED DRIVE OFF
• Select bn-01	DSPL ∧ ∨	bn-01	
• Constant set value is displayed	DATA ENTER	0010.0	
• Set or change constant	RESET ∧ ∨	0005.0	
• Constant value is written in	DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
• Select bn-02	DSPL ∧ ∨	bn-02	
⋮	⋮	⋮	
• Select Sn-06	DSPL ∧ ∨	Sn-06	
• Constant set value is displayed	DATA ENTER	0000	Refer to the next page
• Set or change constant	RESET ∧ ∨	0001	
• Constant value is written in	DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
• Select Sn-18	DSPL ∧ ∨	Sn-18	
• Constant set value is displayed	DATA ENTER	08	
• Set or change constant	RESET ∨ ∧	07	
• Constant value is written in	DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant

6

6.2 ACCEL/DECEL TIME SET bn-01 to -04 (Sn-06, Sn-15 to -18) (Cont'd)

* Operation signal selection

Sn-06 Operation mode selection 3



	Soft start S-curve characteristics
00	S-curve 0.2 sec.
01	S-curve characteristics ineffective
10	S-curve 0.5 sec.
11	S-curve 1.0 sec.

	Master speed frequency reference
0	Normal characteristics
1	Reverse characteristics

	Processing when frequency reference is missing
0	Stop by reference input
1	Operation to continue with 80% of frequency reference

Application Example

Machine requires shockless operation at starting or end of acceleration.

6.3 OPERATION SIGNAL SELECTION Sn-04

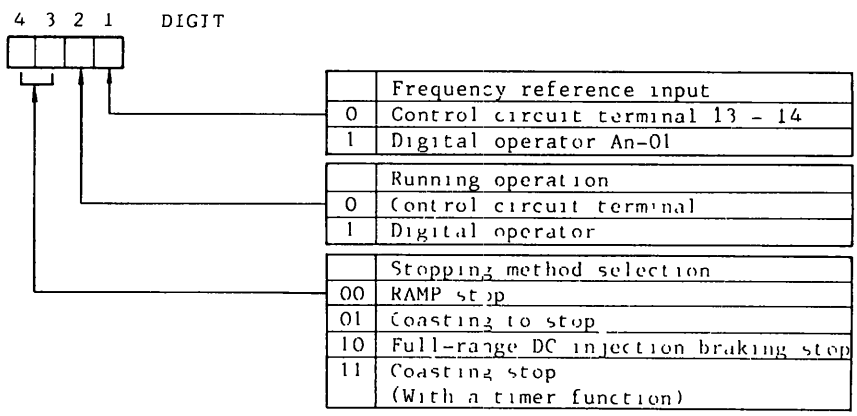
(Example) Change from operator control to terminal control of run/stop and frequency reference

Description	Key Operation	Digital Operator Display	Remarks
• Select PRGM mode	PRGM / DRIVE	An-01	LED DRIVE OFF
• Select Sn-04	DSPL, ∧, ∨	Sn-04	
• Constant set value is displayed	DATA / ENTER	0011	* Refer to the diagram shown below
• Set or change constant	>/RESET, ∨, ∧	0000	
• Constant value is written in	DATA / ENTER	End	Displayed for 0.5 second. Confirm the display for each constant

6

* Operation signal Sn-04

Sn-04 Operation mode selection



	Frequency reference input
0	Control circuit terminal 13 - 14
1	Digital operator An-01

	Running operation
0	Control circuit terminal
1	Digital operator

	Stopping method selection
00	RAMP stop
01	Coasting to stop
10	Full-range DC injection braking stop
11	Coasting stop (With a timer function)

6.4 PROTECTIVE CHARACTERISTICS SELECTION Sn-10 to -14

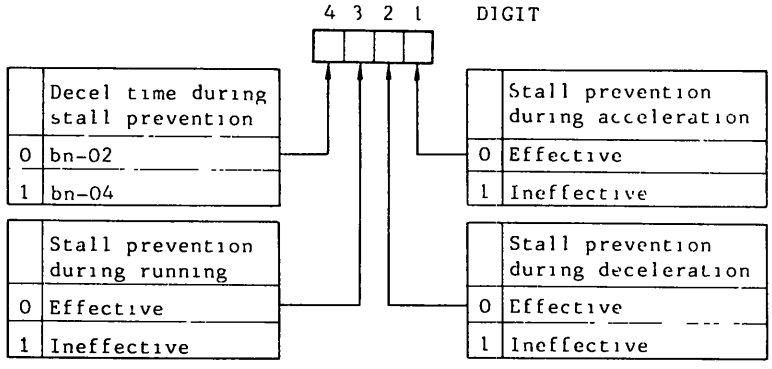
Protective characteristics can be selected by Sn-10, Sn-11, Sn-12 and Sn-14.

(Example) Operation is continued after recovery from momentary power loss and the electronic thermal protection is turned OFF.

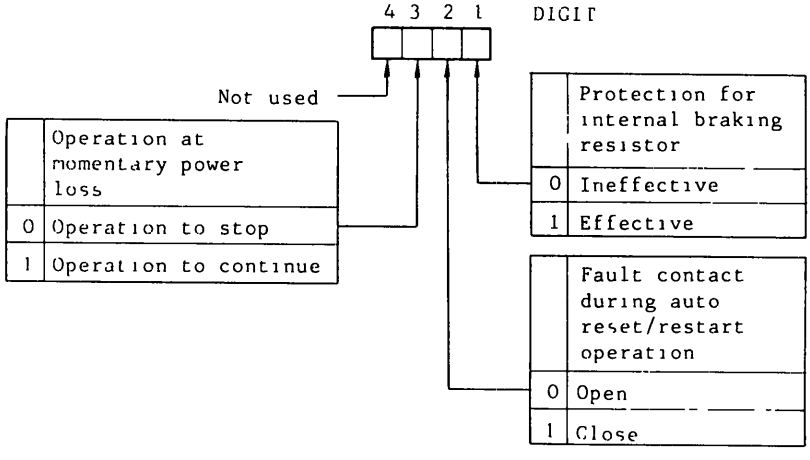
Description	Key Operation	Digital Operator Display	Remarks
• Select PRGM mode	PRGM/DRIVE	An-01	LED DRIVE OFF
• Select Sn-11	DSPL, ∧, ∨	Sn-11	
• Constant set value is displayed	DATA/ENTER	0000	* Refer to the pages 25 and 26
• Set or change constant	>/RESET, ∧, ∨	0100	
• Constant value is written in	DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
• Select Sn-14	DSPL, ∧, ∨	Sn-14	
• Constant set value is displayed	DATA/ENTER	0000	
• Set or change constant	>/RESET, ∧, ∨	0001	
• Constant value is written in	DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant

* Protective characteristics

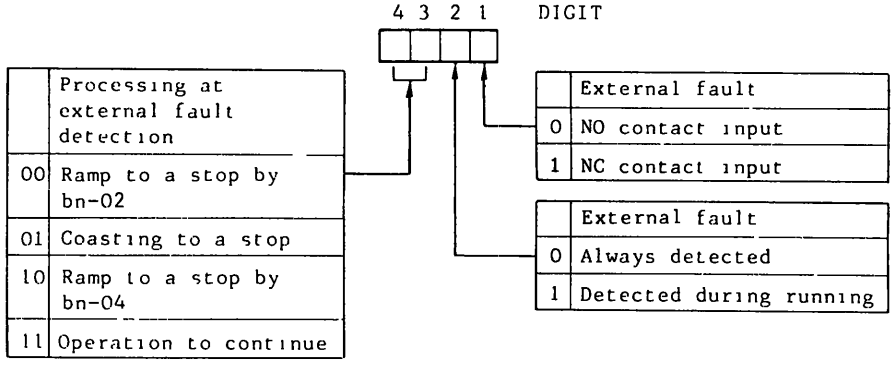
Sn-10 Protective characteristics 1 (stall prevention)



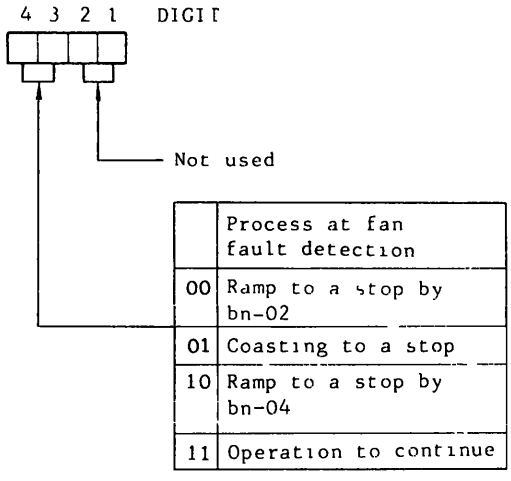
Sn-11 Protective characteristics 2 (Momentary power loss ride-thru)



Sn-12 Protective characteristics 3 (External fault terminal 3)

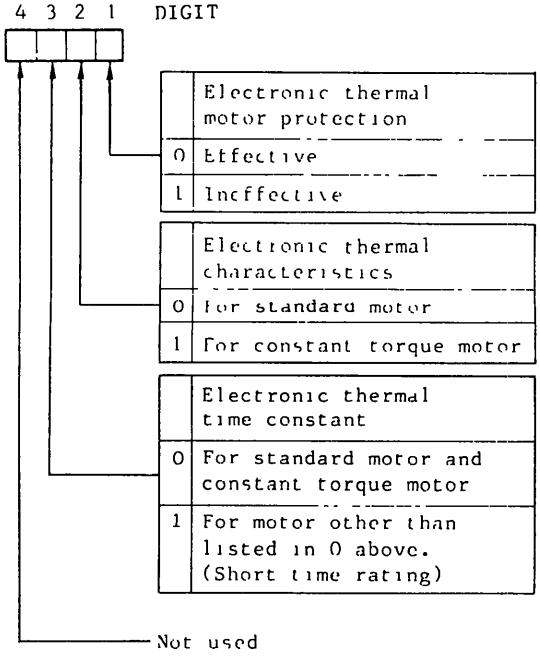


Sn-13 Protective characteristics 4 (Fan fault protection)



	Process at fan fault detection
00	Ramp to a stop by bn-02
01	Coasting to a stop
10	Ramp to a stop by bn-04
11	Operation to continue

Sn-14 Protective characteristics 5 (Motor protection)



	Electronic thermal motor protection
0	Effective
1	Ineffective

	Electronic thermal characteristics
0	For standard motor
1	For constant torque motor

	Electronic thermal time constant
0	For standard motor and constant torque motor
1	For motor other than listed in 0 above. (Short time rating)

6.5 MULTI-FUNCTION INPUT SELECTION Sn-04, Sn-15 to -19, bn-09

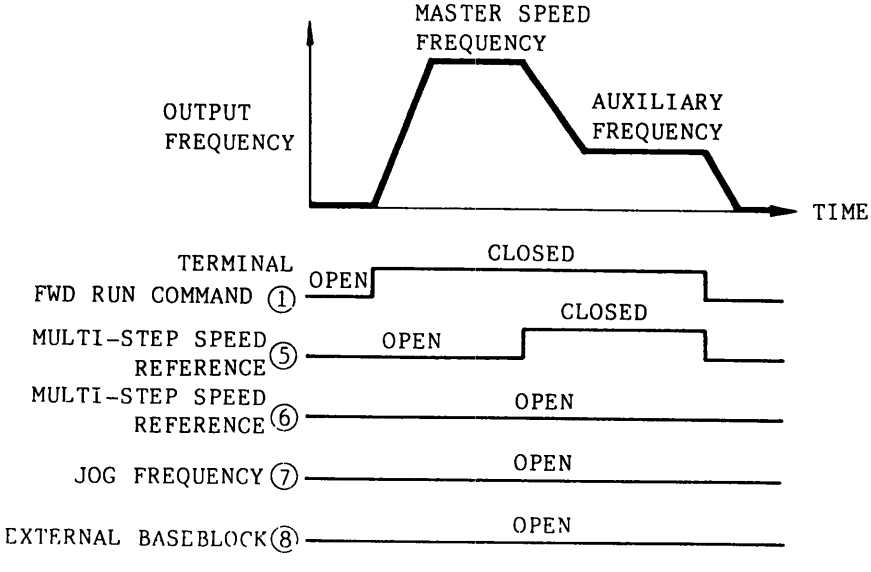
Response to constant input is selected by the setting of Sn-15 to -19.

(Example 1) 2-step speed operation by analog reference (Set Sn-04 to 0000)

Key Operation	Digital Operator Display
DSPL, ∧, ∨, DATA ENTER	Sn-04 / 0000

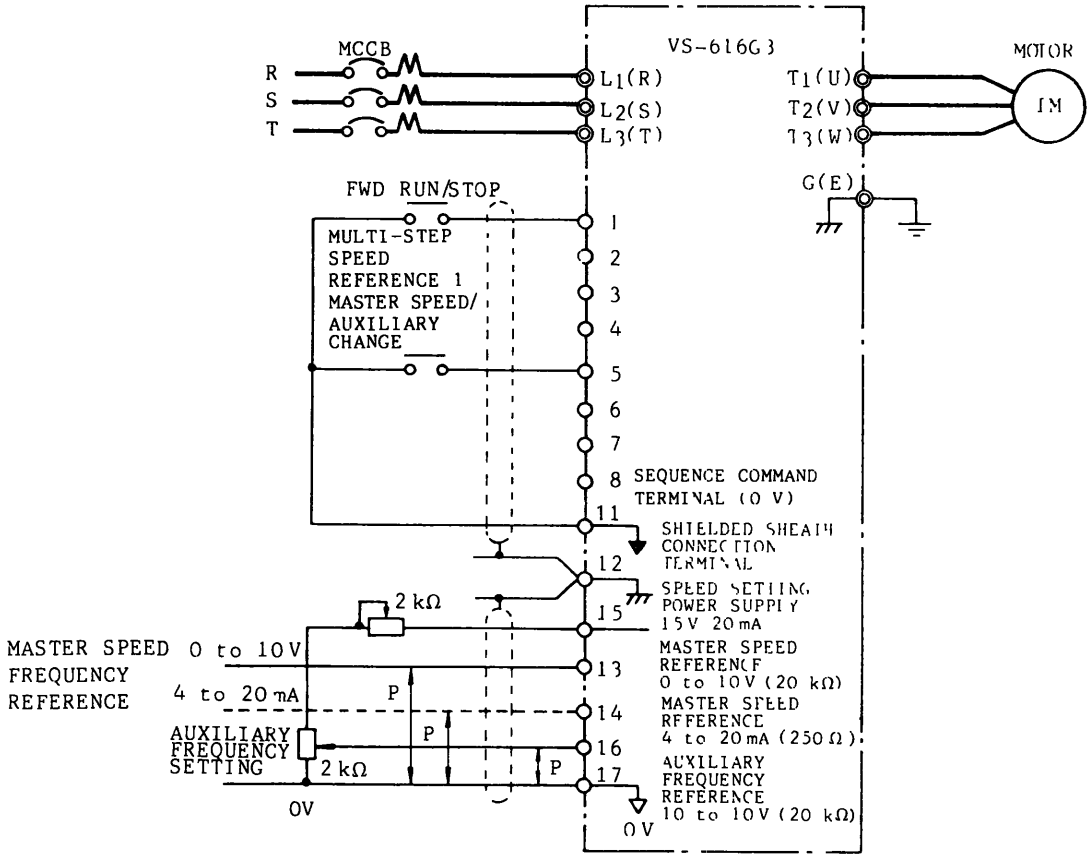
Constant Setting				
Terminal	Sn-	Set Value	Factory Setting	Name
5	15	3	3	Multi-step speed reference *
6	16	4	4	Multi-step speed reference 2
7	17	6	6	Jog frequency *
8	18	8	8	External baseblock command
16	19	0	0	Auxiliary frequency

* If jog frequency reference and multi-step speed reference (1, 2) are turned ON simultaneously, jog frequency reference has priority



6.5 MULTI-FUNCTION INPUT SELECTION

Sn-04, Sn-15 to -19, bn-09 (Cont'd)



(Example 2) 5-step speed operation + energy-saving operation (terminal 8).

Key Operation	Digital Operator Display	Remarks
DSPL ∧ ∨ DATA/ENTER RESET ∧ ∨ DATA/ENTER Only check set value: DSPL ∧ ∨ DATA/ENTER	5n-18 08 63 End bn-09 080	Displayed for 0.5 second. Confirm the display for each constant

The following shows a sequence to perform 5-step speed operation.

Constant Setting				
Terminal	Sn-	Set Value	Factory Setting	Name
5	15	3	3	Multi-step speed reference 1 *
6	16	4	4	Multi-step speed reference 2 †
7	17	6	6	Jog frequency ‡
8	18	63	8	Energy-saving operation

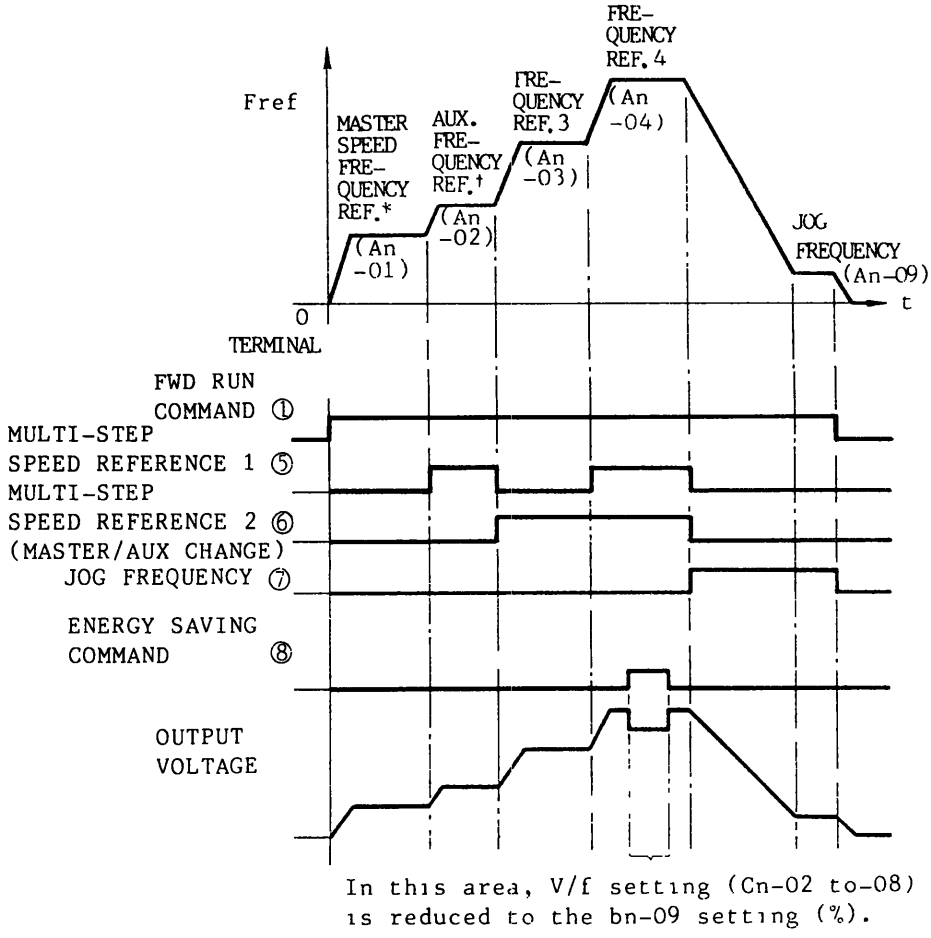
* For combination of multi-step operations, refer to pages 85 and 86

† For frequency reference, set in the form of An-□□

‡ Jog reference has priority over multi-step speed reference (1, 2) when they are turned ON simultaneously

6.5 MULTI-FUNCTION INPUT SELECTION

Sn-04, Sn-15 to -19, bn-09 (Cont'd)



* When Sn-04 is set to ××1, that value will be the internal set value (An-01)

†When Sn-19 is set with any value other than 00, An-02 will be effective When multi-function analog reference input is not used, set 0Γ as a set value

(Example 3) 9-step speed operation

Key Operation	Digital Operator Display	Remarks
DSPL ^ v	Sn-17	
DATA/ENTER	06	
>/RESET ^ v	05	Displayed for 0.5 second. Confirm the display for each constant
DATA/ENTER	End	
DSPL ^ v	Sn-18	
DATA/ENTER	08	
>/RESET ^ v	06	Displayed for 0.5 second. Confirm the display for each constant
DATA/ENTER	End	

Constant Setting				
Terminal	Sn-	Set Value	Factory Setting	Name
5	15	3	3	Multi-step speed reference 1 *
6	16	4	4	Multi-step speed reference 2‡
7	17	6	6	Multi-step speed reference 3
8	18	63	8	Jog frequency †

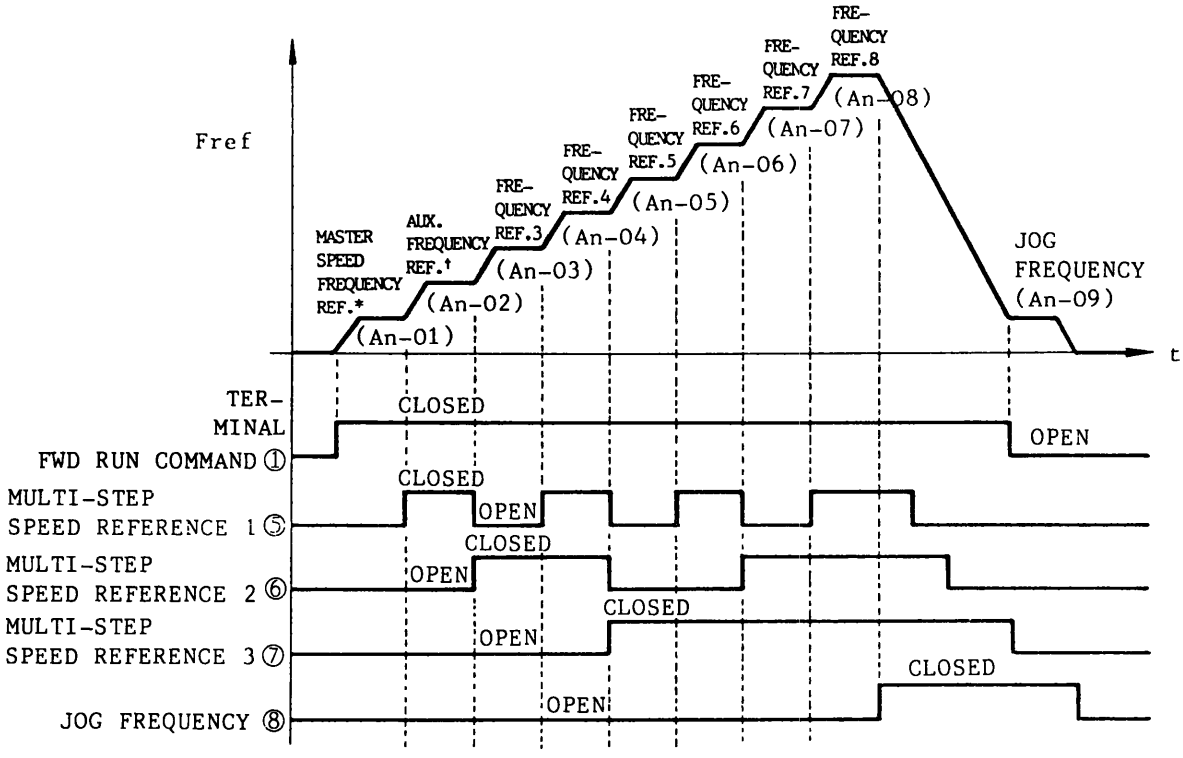
* For combination of multi-step operations, refer to pages 85 and 86

† For frequency reference, set in the form of An-□□□

‡ Jog reference has priority over multi-step speed reference (1 to 3) when they are turned ON simultaneously

6.5 MULTI-FUNCTION INPUT SELECTION

Sn-04, Sn-15 to -19, bn-09 (Cont'd)



* When Sn-04 is set to ×××1, that value will be internal set value (An-01)

† When Sn-19 is set with any value other than 00, An-02 will be effective When multi-function analog reference input is not used, set 0F as a set value

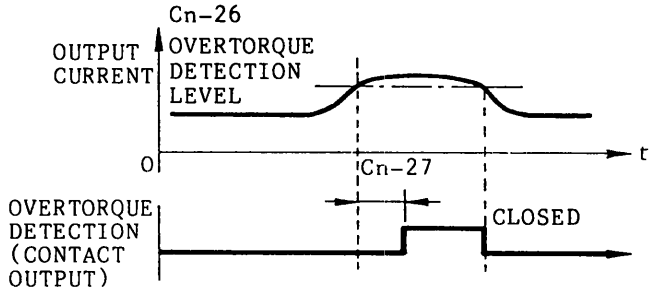
6.6 CONTACT OUTPUT SELECTION Sn-20

Contact output function can be selected by the setting of Sn-20.

(Example) Overtorque signal is read out from contact output.

- Applicable inverter: CIMR-G3A27P5 (rated current 32 A)
- Applicable motor : 10 HP (7.5 kW), 4 P (motor rated current 26.8 A)

Overtorque detection level is equivalent to motor rated torque. Set a mode in which overtorque signal is output only when overtorque is detected during constant speed running. Inverter rated current is regarded as 100% value.



6

6.6 CONTACT OUTPUT SELECTION Sn-20 (Cont'd)

Key Operation	Digital Operator Display	Remarks
DSPL ∧ ∨	Sn-07	
DATA ENTER	0000	
RESET ∧ ∨	0001	
DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
DSPL ∧ ∨	Sn-20	
DATA ENTER	00	
RESET ∧ ∨	06	
DATA ENTER	End	
DSPL ∧ ∨	Cn-26	
DATA ENTER	160	
RESET ∨ ∧	084	
DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
DSPL ∧ ∨	Cn-27	
DATA ENTER	00.1	

Application Example

As with an extruder, a cutter, or other machines, when a load is applied beyond a given set value, the machines (particularly cutting tools) should be protected.

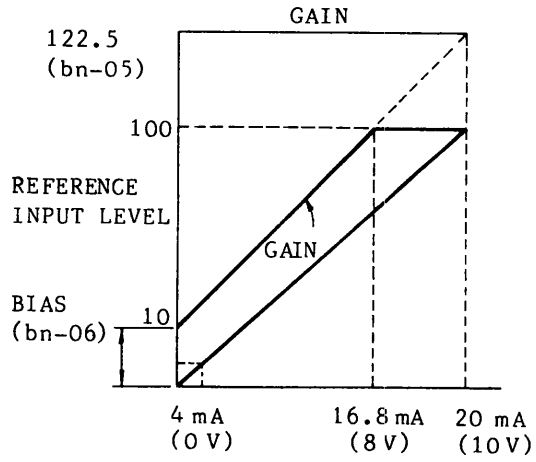
6.7 FREQUENCY REFERENCE CHANGE bn-05, -06

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

(Example)
Adjust so as to be 10% speed (6 Hz) at frequency reference input 4 mA and 100% speed at 16.8 mA (Set bn-05 = 0122.5 and bn-06 = +010.)

Key Operation	Digital Operator Display	Remarks
DSPL ^ v	bn-05	
DATA ENTER	0.100.0	
> RESET ^ v	0122.5 *1	
DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
DSPL ^ v	bn-06	
DATA ENTER	0.000 *2	
> RESET ^ v	001.0	Displayed for 0.5 second. Confirm the display for each constant
DATA ENTER	End	

6.7 FREQUENCY REFERENCE CHANGE bn-05, -06 (Cont'd)



FREQUENCY REFERENCE INPUT

Note Frequency reference gain (bn-05) and frequency reference bias (bn-06) can be changed while running in DRIVE mode

*1 How to calculate gain

$$\chi = \frac{100-b}{a} \cdots (1) \quad G = \chi + b \cdots (2)$$

χ is obtained from equation (1)

$$\chi = \frac{100-10}{0\,8} = 112\,5$$

G is obtained by substituting χ obtained in equation (1) to equation (2)

G = 112 5 + 10 = 122 5

a Reference input ratio at 100% frequency since it is 100% speed (60 Hz) at 16 8 mA in this example, the following equation is established

$$\frac{16\,8\ \text{mA}-4\ \text{mA}}{20\ \text{mA}-4\text{mA}} = 0\,8 \quad a = 0\,8$$

b Bias level (%)
Since it is 10% (6 Hz) at frequency reference input 4 mA in this example, the following equation is established

b = 10

G gain set value
122 5 in this example

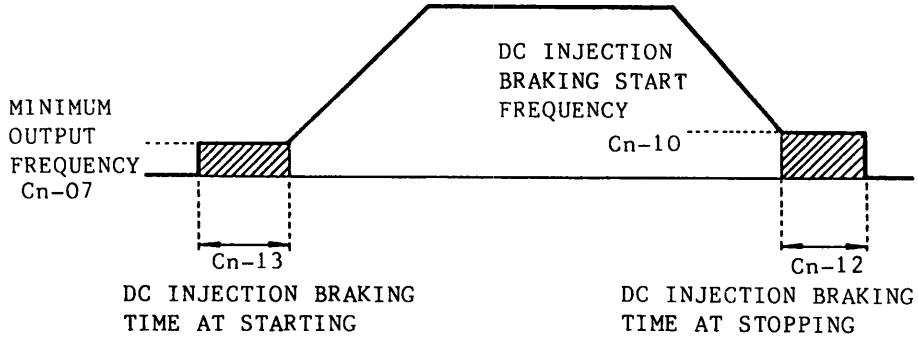
*2 0 in the uppermost digit indicates " + (plus) "
− is displayed when it is "− (minus) "

Application Example

For instrumentation input of 4 to 20 mA, the amount should be adjusted at startup. Maximum frequency should be adjusted.

6.8 DC INJECTION BRAKING (DB) Cn-10 to -13

DC injection braking at starting or stopping function is selected by the setting of Cn-10 to -13.



Time Chart of DC Injection Braking Time

(Example) Set 3 seconds to DC injection braking time at starting.

Key Operation	Digital Operator Display	Remarks
DSPL ∧ ∨	Cn-13	
DATA ENTER	0.0	
RESET ∧ ∨	3.0	
DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant.

6

Application Example

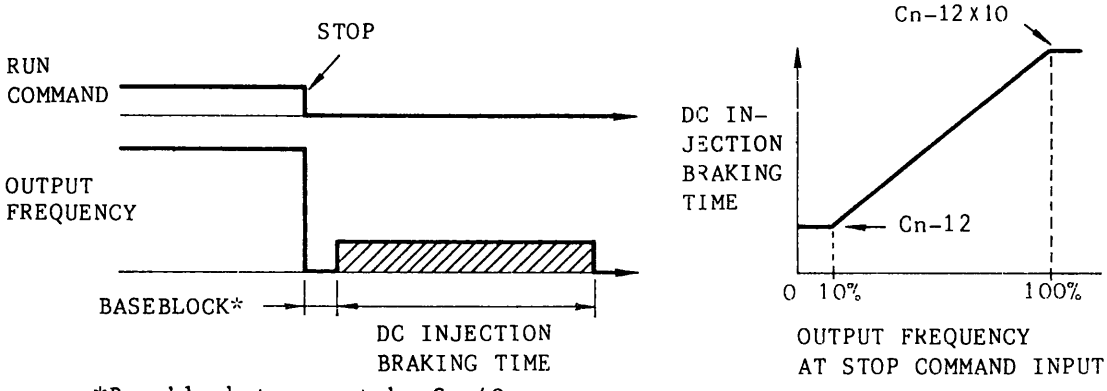
When an idle fan slips and the direction of rotation is indefinite, "OC" and "OV" trip should be avoided.

6.9 FULL-RANGE DC INJECTION BRAKING STOP (DB STOP)

Sn-04 = 10XX, Cn-12

When the full-range DC injection braking stop function is used, the inverter can be stopped without a braking resistor. When stop command is input, DC injection braking stop is executed. DC injection braking time while stopping is set by Cn-12 at 10% speed and varies according to output frequency at stop command input as shown below.

<Time Chart>



*Baseblock time set by Cn-40.

(Example)

Full-range DC injection braking stop is selected to set DC injection braking time to 1 second

Key Operation	Digital Operator Display	Remarks
DSPL, ∧, ∨	Sn-04	
DATA ENTER	0011	
∧, ∨	1011	Displayed for 0.5 second. Confirm the display for each constant
DATA ENTER	End	
DSPL, ∧, ∨	Cn-12	
DATA ENTER	00.5	
RESET, ∧, ∨	01.0	Displayed for 0.5 second. Confirm the display for each constant
DATA ENTER	End	

Application Example

Electric brake should be applied sparingly without a braking resistor. (duty is within 3 to 5%)

6.10 UPPER/LOWER LIMIT OF FREQUENCY REFERENCE

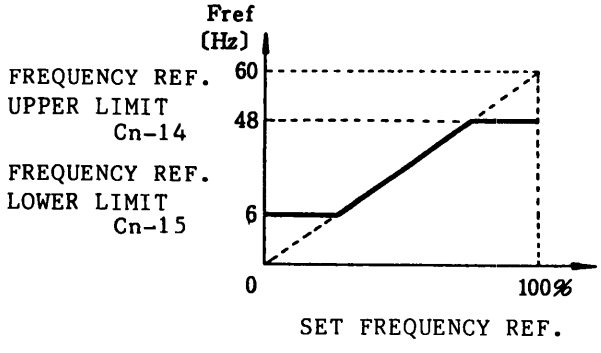
Cn-14, -15

Output frequency upper/lower limit value can be set.

When the lower limit value is less than minimum output frequency, rotation continues at the lower limit value until frequency reference reaches the value, by inputting the run command.

(Example)
Set upper, lower limit of frequency reference
Upper limit: 80%
Lower limit: 10%

Key Operation	Digital Operator Display	Remarks
DSPL ∧ ∨	Cn-14	
DATA/ENTER	100	
RESET ∨ ∧	080	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
DSPL ∧ ∨	Cn-15	
DATA/ENTER	000	
RESET ∧ ∨	010	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant



Note Setting Cn-14 to 109% enables frequency up to Cn-02 × 1.09 to be output.

Example: Assuming Cn-02 = 60 Hz, Cn-14 = 109 Hz, up to 65.4 Hz can be output. However, when 400 Hz is exceeded, the value is clamped to 400 Hz.

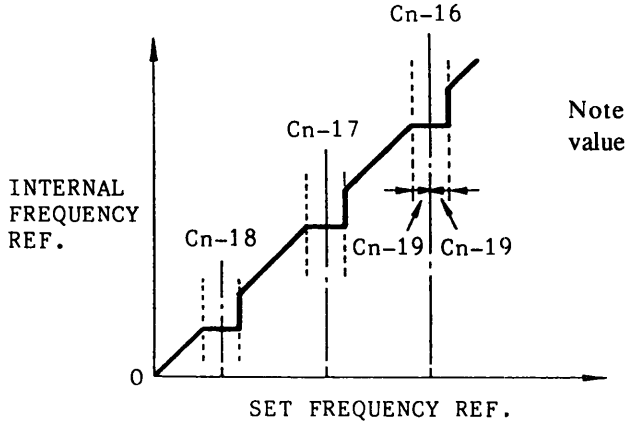
Application Example

- The maximum air quantity (upper limit) allowed and the minimum air quantity (lower limt) required should be maintained for a fan and a blower.
- For decelerator bearing lubrication, the lower limit of rotating speed is required.

6.11 PROHIBITED FREQUENCY Cn-16 to -19

When an operation is required to avoid mechanical resonance frequency, this setting prohibited frequency function is effective. Setting prohibited frequency is set to Cn-16 to -18 in the units of 0.1 Hz.

Setting prohibited frequency width is set to Cn-19 in the units of 0.1 Hz.



Note Ineffective when set value is 0.0 Hz

(Example) 30 Hz ± 0.5 Hz setting is prohibited.

Key Operation	Digital Operator Display	Remarks
DSPL ∧ ∨	Cn-16	
DATA/ENTER	0.0	
>/RESET ∧ ∨	30.0	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant.
DSPL ∧ ∨	Cn-19	
DATA/ENTER	1.0	Initial value 1.0 Hz
>/RESET ∧ ∨	0.5	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant.

Application Example

Operation avoiding mechanical resonance points is required.

6.12 DISPLAY MODE CHANGE Cn-20

(Example)
Frequency reference An-□□ is set or read in the units of 0.01%.

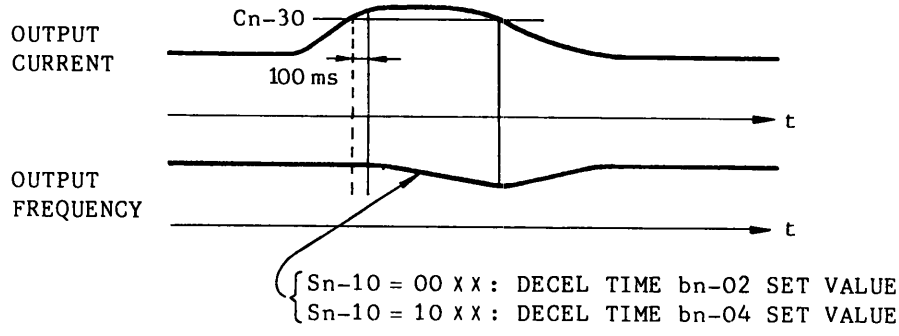
Key Operation	Digital Operator Display	Remarks
DSPL, ∧, ∨ DATA ENTER >RESET, ∨, ∧ DATA ENTER	Cn-20 0.0000 0000.1 End	Displayed for 0.5 second. Confirm the display for each constant.

Operator Display Mode

Cn-20	Unit of Setting / Reading
0	Units of 0.01 Hz
1	Units of 0.01%
2 to 39	Units of r/min (0 to 39999) r/min = 120 X frequency reference (Hz) / Cn-20 (Cn-20 is the number of motor poles)
40 to 39999	The position of decimal point is set by the value of the 5th digit of Cn-20 Value of 5th digit = 0 Displayed as XXXX Value of 5th digit = 1 Displayed as XXX.X Value of 5th digit = 2 Displayed as XX.XX Value of 5th digit = 3 Displayed as X.XXX A set value of 100% frequency is determined by the 1st digit to 4th digit of Cn-20 Example 1 When the set value of 100% speed is 200.0, Cn-20 = 12000 is set Example 2 When the set value of 100% speed is 65.00, Cn-20 = 26500 is set

6.13 STALL PREVENTION LEVEL DURING RUNNING Cn-30 (Sn-10)

If inverter output current exceeds Cn-30 (stall prevention level during running) set value and this status lasts more than 100 ms while running (agreed frequency), reduce output frequency to prevent motor stalling. If output current is lower than Cn-30 set value, increase output frequency again to continue operation. Inverter rated current is regarded as 100%.



(Example) Stall prevention level during running 120%
Decel time bn-04 set value

Key Operation	Digital Operator Display	Remarks
DSPL ∧ ∨	Cn-30	
DATA/ENTER	160	
>/RESET ∨ ∧	120	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
DSPL ∧ ∨	Sn-10	
DATA/ENTER	0000	
>/RESET ∧ ∨	1000	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant

Application Example

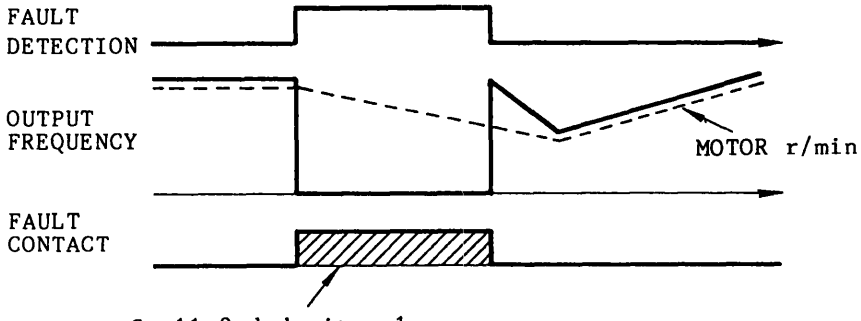
Rotation speed should be automatically reduced for rated operation regardless of possible overload, and on return to normal load, the previous rotation speed should be obtained for rerun.

6.14 AUTO RESET/RESTART OPERATION AT FAULT (FAULT RETRY) Cn-36

If a protective function (OC, OV, OL1, OL2, OL3, OH, UV1) (OC, GF, OV, rr, UV1) operates during running, auto reset/restart function can be selected.

Reset/restart operation can be performed up to 10 times. Setting 0, reset/restart operation at fault is not performed.

<Time Chart>



Key Operation	Digital Operator Display	Remarks
DSPL ^ v	Sn-11	
DATA/ENTER	0000	
>/RESET ^ v	0010	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
DSPL ^ v	Cn-36	
DATA/ENTER	00	
>/RESET ^ v	03	
DATA/ENTER	End	Displayed for 0.5 second. Confirm the display for each constant

Application Example

If the inverter protection function operates due to lightning surge, automatic reset should be made about four or five times to continue operation without stopping the motor.

6.15 INITIALIZING CONSTANTS Sn-03

(Example) Replacing control board.

Select inverter capacity and set V/f pattern and initialize constants. All constants except Sn-01 (inverter capacity) and Sn-02 (V/f pattern) are initialized to the data at the factory prior to shipment.

Description	Key Operation	Digital Operator Display	Remarks
Power ON • Frequency reference value is displayed		F 0.0.0 0	
Set inverter capacity • Select PRGM mode	PRGM DRIVE	R n - 0 1	LED DRIVE OFF
Select 200V 15kW • Select inverter capacity constant (Sn-01)	DSPL (Depress twice)	S n - 0 1	
• Sn-01 data is displayed	DATA ENTER	0 6	
• Change set value	RESET ∧ ∨	0 8	
• Set value is written in	DATA ENTER	E n d	Displayed for 0.5 second. Confirm the display for each constant
Set V / f pattern • Select V / f pattern constant (Sn-[illegible])	DSPL	S n - 0 1	
Select 60Hz standard pattern • Select Sn-02	∧ ∨	S n - 0 2	
• Sn-02 data is displayed	DATA ENTER	0 6	
• Change set value	RESET ∧ ∨	0 [illegible]	
• Set value is written in	DATA ENTER	E n d	Displayed for 0.5 second. Confirm the display for each constant
Cont'd			

Description	Key Operation	Digital Operator Display	Remarks
Cont'd			
Constant is initialized	• Select constant initialization constant	DSPL	Sn-02	
	• Select Sn-03	∧ ∨	Sn-03	
	• Data are displayed	DATA ENTER	0000	
	• Set to "1110"	RESET ∧ ∨	1110	
	• Set value is written in	DATA ENTER	End	Displayed for 0.5 second. Confirm the display for each constant
(When DATA ENTER key is depressed, all constants except Sn-01 and Sn-02 are changed to the values set prior to shipping)			
End	• Switch to DRIVE mode	PRGM DRIVE	F 00.00	LED DRIVE lights

7. CONSTANT/FUNCTION LIST

7.1 FREQUENCY REFERENCE An-□□

These references are used during multi-speed operation. Set values of An-□□ can be changed or read during running in DRIVE mode.

List of An-□□

An-□□	Data Name	Unit	Setting Range	Factory Set
01	Frequency reference 1	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
02 *	Frequency reference 2	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
03	Frequency reference 3	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
04	Frequency reference 4	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
05	Frequency reference 5	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
06	Frequency reference 6	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
07	Frequency reference 7	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
08	Frequency reference 8	0 01 Hz	0 00 Hz to 400 00 Hz	0 00 Hz
09	Jog frequency reference 9	0 01 Hz	0 00 Hz to 400 00 Hz	6 00 Hz

* Sn-19 must be set to 1

Note An-□□ setting/reading units differ according to operator display mode (Cn-20) set values The factory set is 0 01 Hz

7.2 CONSTANT CHANGE DURING RUNNING bn-□□

Set values of bn- □□ can be changed or read during running in DRIVE mode.

List of bn-□□

bn-□□	Data Name	Unit	Setting Range	Factory Set	
01	Acceleration time 1	0 1 s	0 0 to 6000 0 s	10 0 s	
02	Deceleration time 1	0 1 s	0 0 to 6000 0 s	10 0 s	
03	Acceleration time 2	0 1 s	0 0 to 6000 0 s	10 0 s	
04	Deceleration time 2	0 1 s	0 0 to 6000 0 s	10 0 s	
05	Frequency reference gain *	0 1%	0 to 1000 0%	100%	Sn-06 bit 3
06	Frequency reference bias *	1%	− 100 to 100%	0%	
07	Torque compensation gain	0 1	0 0 to 9 9	1 0	
08	Motor rated slip	0 1%	0 0 to 9 9%	0 0%	Cn-09, 34
09	Energy-saving level gain	1%	0 to 200%	80%	
10	Monitor No after turning ON power supply	−	1 to 3	1	
11	Analog monitor channel 1 gain ‡	0 01	0 01 to 2 55 ‡	1 00	
12	Analog monitor channel 2 gain ‡	0 01	0 01 to 2 55 ‡	0 5	

* Setting method is different from VS-616GII (LN)

† Cn-04 is regarded as 100% level

‡ When EPROM No is NSG 610010 − NSG 610012, the contents become as follows

11	Analog monitor channel 1 gain	1%	0 to 255%	100%
12	Analog monitor channel 2 gain	1%	0 to 255%	200%

7.2 CONSTANT CHANGE DURING RUNNING bn-□□ (Cont'd)

(1) Acceleration Time 1 (bn-01)

Acceleration time 1 is enabled when the accel/decel time change command of multi-function terminals is "open", or the accel/decel time change function is not provided for the multi-function terminals. The acceleration time in which frequency reference goes from 0% to 100% is set in the units of 0.1 second.

(2) Deceleration Time 1 (bn-02)

Deceleration time 1 is enabled when the accel/decel time change command of multi-function terminals is "open", or the accel/decel time change function is not provided for the multi-function terminals. The deceleration time in which frequency reference goes from 100% to 0% is set in the units of 0.1 second.

(3) Acceleration Time 2 (bn-03)

Acceleration time 2 is enabled when the accel/decel time change command of multi-function terminals is "closed". The acceleration time in which frequency reference goes from 0% to 100% is set in the units of 0.1 second.

(4) Deceleration Time 2 (bn-04)

Deceleration time 2 is enabled when the accel/decel time change command of multi-function terminals is "closed". The deceleration time in which frequency reference goes from 100% to 0% is set in the units of 0.1 second.

(5) Frequency Reference Gain (bn-05)

The input level when frequency reference voltage is 10 V is set in the units of 1%. Examples are shown in the below.

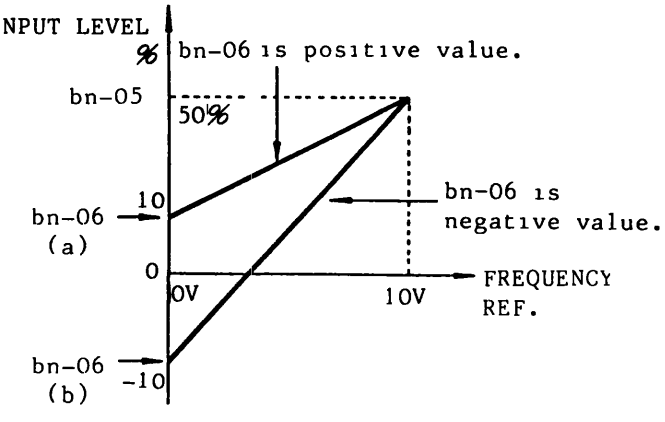
(6) Frequency Reference Bias (bn-06)

The input level when frequency reference voltage is 0 V is set in the units of 1%.

<Example>

① bn-05 = 50

② a: bn-06 = 10
b: bn-06 = -10

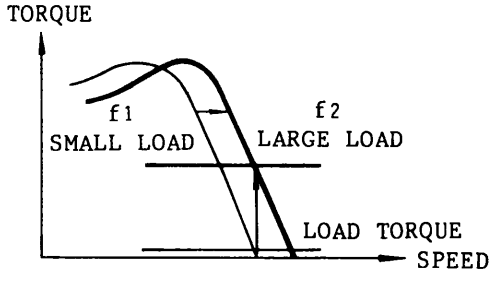


(7) Torque Compensation Gain (bn-07)

Torque compensation gain is set in the units of 0.1.

(8) Motor Rated Slip (bn-08)

Motor Rated slip is set in the units of 0.1%.



Simplified speed control is performed without encoder (PG or TG)
With frequency offset f1 to f2, speed fluctuation due to load is reduced

When the output current of the inverter is larger than motor no-load current (Cn-34), the output frequency of the inverter is compensated.

The amount of frequency compensation is determined by the formula below. The maximum voltage frequency (Cn-04) is 100% level :

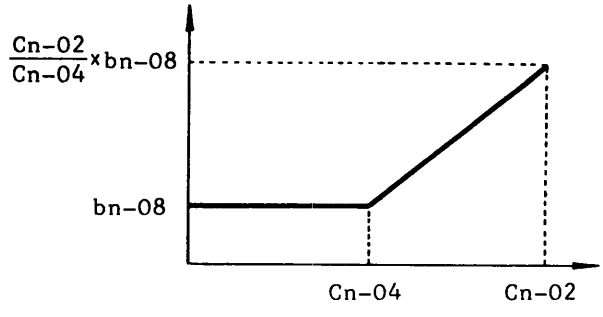
If the output current is equal to the motor rated current (Cn-09), the output frequency is compensated for by the motor rated slip (bn-08).

If frequency reference is equal to or smaller than minimum output frequency (Cn-07) or motor is in a regeneration mode, slip compensation is not performed.

The amount of output frequency compensation in a constant torque area and a constant output area is as shown in the figure below.

Amount of output frequency compensation =

$$\frac{\text{motor rated slip}}{\left(\begin{matrix}\text{motor rated}\\ \text{current}\end{matrix} - \begin{matrix}\text{motor no-load}\\ \text{current}\end{matrix}\right)} \times \left(\begin{matrix}\text{output}\\ \text{current}\end{matrix} - \begin{matrix}\text{motor no-load}\\ \text{current}\end{matrix}\right)$$



Motor rated current : Cn-09
Motor no-load current : Cn-34
Motor rated slip : bn-08

When 0.0 is set in bn-08, output frequency compensation is not performed.

7.2 CONSTANT CHANGE DURING RUNNING bn-□□ (Cont'd)

(9) Energy-saving Level Gain (bn-09)

Energy-saving level gain is set in the units of 1%.

(10) Monitor No. after Turning On Power Supply (bn-10)

Data to be monitored after turning ON power supply is selected with a constant No. in the form of Un-□□.

① Frequency reference
② Output frequency
③ Output current

(11) Multi-function Analog Output and Analog Monitor Card Channel 1 Gain (bn-11)*

The multi-function analog output and output voltage level of analog monitor card option (AO-8, AO-12) channel 1 are set in the form of 10 V × XX.

<Example> When 5 V is set as the 100% level,
specify bn-11 = 0.50.

(12) Analog Monitor Card Channel 2 Gain (bn-12)*

Output voltage level of analog monitor card option (AO-8, AO-12) channel 2 is set in the form of 10 V × XX.

<Example> When 3 V is set as the 100% level,
specify bn-12 = 0.30.

(13) Calibrating Meter

① Multi-function analog output
When bn-11 is displayed in PRG mode, a 100%-level voltage is output by the set value of bn-11.

② AO-8, AO-12
When bn-11 is displayed in PRG mode, channel 1 outputs a 100%-level voltage by the set value of bn-11. When bn-12 is displayed, channel 2 outputs a 100%-level voltage by the set value of bn-12.

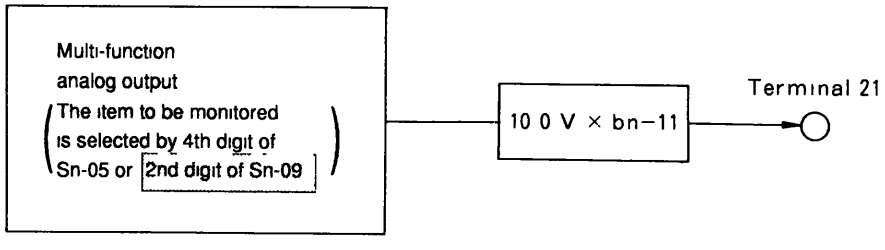


Diagram of Multi-function Analog Output

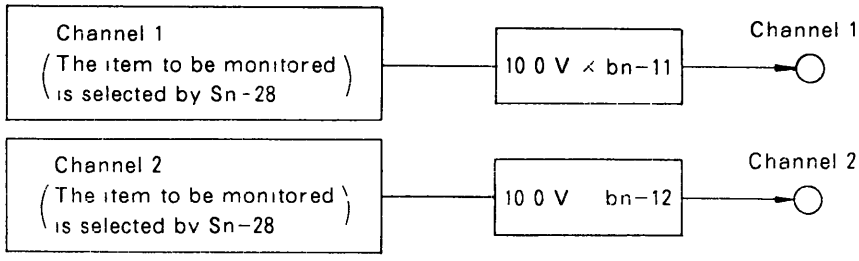


Diagram of AO-8, AO-12

— * When EPROM No. is NSG610010-NSG610012, the setting method is as follows:

(11) Multi-function Analog Output and Analog Monitor Card Channel 1 Gain (bn-11)

The multi-function analog output and the output voltage level of analog monitor card option (AO-8, AO-12) channel 1 are set in the form of 10 V/XX%.

<Example> When 5 V is set as the 100% level,
specify bn-11 = 200.

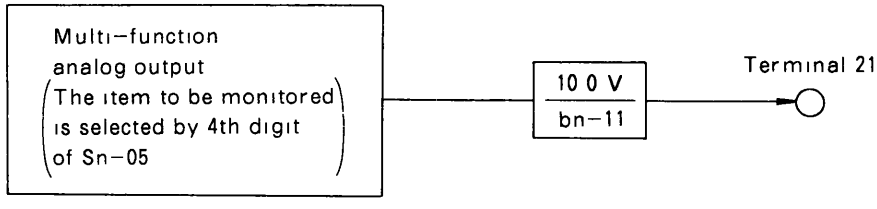


Diagram of Multi-function Analog Output

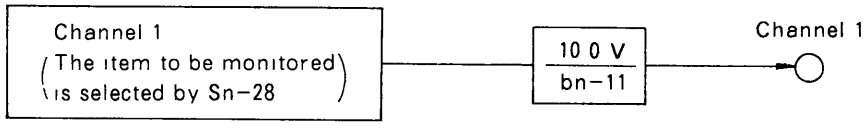


Diagram of AO-8, AO-12

(12) Analog Monitor Card Channel 2 Gain (bn-12)

Output voltage level of analog signal output option (AO-8, AO-12) channel 2 is set in the form of 10 V/XX%.

<Example> When 4 V is set as the 100% level,
specify bn-12 = 250

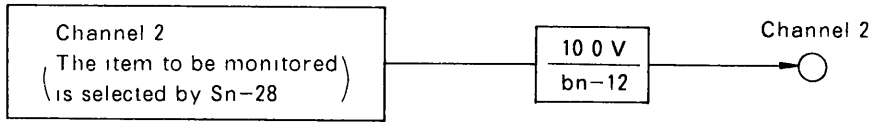


Diagram of AO-8, AO-12

7.3 SYSTEM CONSTANT Sn-□□

System Constant List (1/6)

Function	Sn-□□	Data Name	Description						Factory Set (4th Digit 3rd Digit 2nd Digit 1st Digit)
Basic Setting Constant	01	Inverter Capacity	Inverter capacity selected						—*1
	02	V / f	V / f pattern selected						0 1
Operator Status	03	Display of Operator	0 0 0 0	Setting and reading of An-□□, bn-□□, Sn-□□, Cn-□□ enabled					0 0 0 0
			0 1 0 1	Setting and reading of An-□□ reading of bn-□□, Sn-□□, Cn-□□ enabled					
		Constants Initialization	1 1 1 0	Constant initialization (Multi-function terminals are preset prior to shipping)*2					
			1 1 1 1	Constant initialization (For multi-function terminals, refer to Table of * 2)					
Operation Mode Selection 1	04				4th Digit	3rd Digit	2nd Digit	1st Digit	0 0 1 1
		Operation Method Select	Master frequency reference by analog input of control circuit terminals 13, 14		—	—	—	0	
			Master frequency reference from keypad		—	—	—	1	
			Control circuit terminal operation effective		—	—	0	—	
			Key operation reference effective		—	—	1	—	
		Stopping Method Select	RAMP stop		0	0	—	—	
			Coasting to stop		0	1	—	—	
			Full-range DC injection braking stop		1	0	—	—	
			Coasting stop (timer function provided)		1	1	—	—	
Operation Mode Selection 2	05	Priority of Stopping	STOP key effective during operation from control terminal		—	—	—	0	0 0 0 0
			STOP key not effective during operation from control terminal		—	—	—	1	
		Prohibition of REV run	REV run enabled		—	—	0	—	
			REV run disabled		—	—	1	—	
		Control Input Scan	Control inputs are scanned twice before being accepted by MPU		—	0	—	—	
			Control inputs are scanned once before being accepted by MPU		—	1	—	—	
		Analog Monitor Output	Selection of item to be analog output (terminals 21, 22) *3		0	—	—	—	
			Selection of item to be analog output (terminals 21, 22) *3		1	—	—	—	

System Constant List (2/6)

Function	Sn-□□	Data Name	Description	4th Digit	3rd Digit	2nd Digit	1st Digit	Factory Set (4th Digit 3rd Digit 2nd Digit 1st Digit)
Operation Mode Selection 3	06	S-curve at Accel / Decel Time	0 2 sec S-curve	—	—	0	0	0 0 0 0
			No S-curve	—	—	0	1	
			S-curve 0 5 sec	—	—	1	0	
			S-curve 1 0 sec	—	—	1	1	
		Input Reference	Response to master frequency reference 0 to 100% at 0 to 10V (4 to 20 mA)	—	0	—	—	
			Response to master frequency reference 0 to 100% at 10 to 0V (20 to 4 mA)	—	1	—	—	
		Processing When Frequency Reference is Missing	Stop by reference input	0	—	—	—	
			Operation to continue with 80% of frequency reference	1	—	—	—	
Operation Mode Selection 4 (Overtorque Detection)	07	Overtorque Detection	Overtorque detection not enabled	—	—	—	0	0 0 0 0
			Overtorque detection enabled	—	—	—	1	
			Enabled only if at agreed frequency	—	—	0	—	
			Enabled during operation (except during DC injection)	—	—	1	—	
			Operation continued after overtorque is detected	—	0	—	—	
			Coasts to stop if overtorque is detected	—	1	—	—	
			Not used	0	—	—	—	
Operation Mode Selection 5	08	Priority of Frequency Reference (When input option card is used)	Run by option card frequency reference input	—	—	—	0	0 0 0 0 0 1 0 0
			Run by inverter operator or control circuit terminal input run command input	—	—	—	1	
		Priority of Run Command (When input option card is used)	Run by option card run command input	—	—	0	—	
			Run by inverter operator or control circuit terminal input run command input	—	—	1	—	
		Stopping Method Selection at Communication Interface Card (SI-B) Communication Error	Ramp to a stop (decel time: bn-02)	0	0	—	—	
			Coasting to stop	0	1	—	—	
			Ramp to a stop (decel time. bn-04)	1	0	—	—	
			Operation to continue	1	1	—	—	

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

System Constant List (3/6)

Function	Sn-□□	Data Name	Description	4th Digit	3rd Digit	2nd Digit	1st Digit	Factory Set (4th Digit 3rd Digit 2nd Digit 1st Digit)
Operation Mode Selection 6	09	Analog Output Selection Method	Item to analog output (terminals 21-22) depends on Sn-05 4th digit and Sn-09 2nd digit	—	—	—	0	0 0 0 0
			Item to analog output (terminals 21-22) is set by communication interface card (SI-B).	—	—	—	1	
		Analog Monitor Selection	Selection of item to analog output (terminals 21-22) *3	—	—	0	—	
			Selection of item to analog output (terminals 21-22) *3	—	—	1	—	
		———	———	0	0	—	—	
Protective Characteristics Selection 1 (Stall Prevention)	10	Stall Prevention	Stall prevention during acceleration enabled	—	—	—	0	0 0 0 0
			Stall prevention during acceleration not enabled	—	—	—	1	
			Stall prevention during deceleration enabled	—	—	0	—	
			Stall prevention during deceleration not enabled	—	—	1	—	
			Stall prevention during running enabled	—	0	—	—	
			Stall prevention during running not enabled	—	1	—	—	
			Decel time during stall prevention "DECEL TIME 1" (bn-02 set value)	0	—	—	—	
			Decel time during stall prevention "DECEL TIME 2" (bn-04 set value)	1	—	—	—	
Protective Characteristics Selection 2	11	DB Resistor	No DB protection calculated or provided by inverter	—	—	—	0	0 0 0 0
			Protection provided for YASKAWA DB resistor only, if installed	—	—	—	1	
		Fault Contact during Auto Reset / Restart Operation	Fault contact is not energized during auto reset / restart operation	—	—	0	—	
			Fault contact is energized during auto reset / restart operation	—	—	1	—	
		Momentary Power Loss Protection	Operation stopped by momentary power loss detection	—	0	—	—	
			Operation continues after momentary power loss	—	1	—	—	
		——	Not used	0	—	—	—	

System Constant List (4/6)

Function	Sn-□□	Data Name	Description	4th Digit	3rd Digit	2nd Digit	1st Digit	Factory Set (4th Digit 3rd Digit 2nd Digit 1st Digit)
Protective Characteristics Selection 3	12	External Fault Signal Level	External fault input NO-contact input	—	—	—	0	0 1 0 0
			External fault input NC-contact input	—	—	—	1	
		Receiving External Fault Signal	External fault signal Always detected	—	—	0	—	
			External fault signal Detected during running only	—	—	1	—	
		Processing at External Fault Detection	Ramp stop (major fault)	0	0	—	—	
			Coasting to stop (major fault)	0	1	—	—	
			Ramp to a stop (major fault) ramp to a stop (bn-04 set value)	1	0	—	—	
			Operation to continue (minor fault)	1	1	—	—	
Protective Characteristics Selection 4	13	———	———	—	—	0	0	0 1 0 0
		Stopping Method at Fan Fault Detection *4	Deceleration to stop (decel time bn-02)	0	0	—	—	
			Coasting to stop	0	1	—	—	
			Deceleration to stop (decel time bn-04)	1	0	—	—	
			Operation to continue	1	1	—	—	
Protective Characteristics Selection 5	14	Motor Protection (Electronic Thermal)	Electronic thermal motor Protection effective	—	—	—	0	0 0 0 0
			Electronic thermal motor Protection ineffective	—	—	—	1	
			Electronic thermal characteristics are in accordance with standard motor	—	—	0	—	
			Electronic thermal characteristics are in accordance with constant torque motor	—	—	1	—	
			Electronic thermal time constants are standard	—	0	—	—	
			Electronic thermal time constants are short-time rating	—	1	—	—	
		Inverter Protection (Electronic Thermal) *4	Inverter Protection OL 103% continuous, 150% for one minute	0	—	—	—	
			Inverter Protection OL 113% continuous, 123% for one minute	1	—	—	—	

7

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

System Constant List (5/6)

Function		Sn-□□	Data Name	Description						Factory Set	
						4th Digit	3rd Digit	2nd Digit	1st Digit	4th Digit 3rd Digit 2nd Digit 1st Digit	
Multi-function Selection				Set Data							
	Contact Input Signal	15	Terminal 5 Function	00 - FF	Selects terminal 5 function (factory preset for multi-step speed reference 1)					0 3	
		16	Terminal 6 Function	00 - FF	Selects terminal 6 function (factory preset for multi-step speed reference 2)					0 4	
		17	Terminal 7 Function	00 - FF	Selects terminal 7 function (factory preset for jog frequency reference)					0 6	
		18	Terminal 8 Function	00 - FF	Selects terminal 8 function (factory preset for internal baseblock by NO contact input)					0 8	
	Analog Input	19	Multi-function Analog Input	00 - 0F	Selects multi-function analog input (terminal 16) function					0 0	
	Output Signal	20	Multi-function Output 1	00 - 0F	Selects multi-function contact output (terminals 9, 10) function (factory preset for during running)					0 0	
		21	Multi-function Output 2	00 - 0F	Selects multi-function open collector (terminal 25) function (factory preset for zero speed)					0 1	
		22	Multi-function Output 3	00 - 0F	Selects multi-function open collector (terminal 26) function (factory preset for agreed frequency)					0 2	
Option Card Function Selection		25	Analog Reference Card (AI-14B)	Positive / negative values of frequency reference determine FWD / REV operation		—	—	—	0	0 0 0 0	
				Positive frequency reference value determine forward operation negative = 0 output		—	—	—	1		
				Not used		0	0	0	—		
		26	Digital Reference Card (DI-08) (Frequency reference set mode)	BCD input 1% Resolution		0	0	0	0	0 0 0 0	
				BCD input 0 1% Resolution		0	0	0	1		
				BCD input 0 01% Resolution		0	0	1	0		
				BCD input 1 Hz Resolution		0	0	1	1		
				BCD input 0 1 Hz Resolution		0	1	0	0		
				BCD input 0 01 Hz Resolution		0	1	0	1		
				BINARY input 255 / 100%		0	1	1	1		
				BINARY input (input value displayed in decimal on operator)		1	0	0	0		

System Constant List (6/6)

Function	Sn-□□	Data Name	Description		4th Digit	3rd Digit	2nd Digit	1std Digit	Factory Set (4th Digit 3rd Digit 2nd Digit 1st Digit)
Option Card Function Selection	27	Digital Output Card DO-08	Item to be output from DO-08 *5		—	—	—	0	0 0 1 0
			Item to be output from DO-08 *5		—	—	—	1	
		Pulse Monitor Card PO-36F (Number of Output Pulses) F Inverter Output Frequency	X1 of inverter output frequency (1F)		0	0	0	—	
			X6 of inverter output frequency (6F)		0	0	1	—	
			X10 of inverter output frequency (10F)		0	1	0	—	
			X12 of inverter output frequency (12F)		0	1	1	—	
			X36 of inverter output frequency (36F)		1	0	0	—	
	28	Analog Monitor Card (AO-08, AO-12)	Channel 1 output	Output frequency (max frequency / 100%)	—	—	0	0	0 1 0 0
				Output current (rated current / 100%)	—	—	0	1	
				Output voltage ref (Cn-01 / 100%)	—	—	1	0	
				DC voltage (400V/100% for 200V class, 800V/100% for 400V class, 1000V/100% for 575V class)	—	—	1	1	
			Channel 2 output	Output frequency (max frequency / 100%)	0	0	—	—	
				Output current (rated current / 100%)	0	1	—	—	
				Output voltage ref (Cn-01 / 100%)	1	0	—	—	
				DC voltage (400V/100% for 200V class, 800V/100% for 400V class, 1000V/100% for 575V class)	1	1	—	—	

*1 Differs according to inverter capacity

*2 Initialization (Sn-03 = 1110, 1111)

After depressing the ENTER key, input the initial value of An-□□, bn-□□, Sn-□□,Cn-□□, (except Sn-01, Sn-02) into NV-RAM When the value is written in without an error, *End* is displayed When the value is written in with an error, *Err* is displayed The values of Sn-15 to -18 differ as follows between initializations with Sn-03 = 1110 and with Sn-03 = 1111

Multi-function Terminal	1110 (2 Wire Sequence)	1111 (3 Wire Sequence)
Terminal 5 (Sn-15)	3* (Multi-step speed command 1)	0 (FWD/REV run select)
Terminal 6 (Sn-16)	4* (Multi-step speed command 2)	3 (Multi-step speed reference 1)
Terminal 7 (Sn-17)	6* (Jog frequency reference)	4 (Multi-step speed reference 2)
Terminal 8 (Sn-18)	8* (External baseblock command)	6 (Jog frequency reference)

* Values have been factory-set

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

*3 Setting of Sn-05 4th digit and Sn-09 2nd digit.

Sn-05 4th Digit	Sn-09 2nd Digit	Description
0	0	Output analog signal proportional to inverter output frequency (Max frequency / 100%)
1	0	Output analog signal proportional to inverter output current (Rated current / 100%)
0	1	Output analog signal proportional to inverter output voltage reference (Cn-01 / 100%)
1	1	Output analog signal proportional to inverter output power. (Max. applicable motor capacity / 100%)

*4 Effective only for inverter models of capacity 200 V 40 HP (30 kW) or more, 400 V 75 HP (55 kW) or more, or 575 V 30HP (22 kW) or more

*5 Items output from DO-08 differ as shown below, according to Sn-27 1st digit setting

Terminal No	Sn-27 1st Digit				
	1st Digit = 0	1st Digit = 1			
	Output	Bits 0 to 3*	Code Output	Bits 0 to 3*	Code Output
TD5-TD11	Overcurrent (OC) (including grounding)	0000	No fault	1000	External fault (EFxx)
		0001	Overcurrent (including grounding) (OC)	1001	Inverter hardware fault (CPFxx)
TD6-TD11	Overvoltage (OV)	0010	Overvoltage (OV)	1010	Motor overload (OL1)
		0011	Inverter overload (OL2)	1011	Not used
TD7-TD11	Inverter overload (OL2)	0100	Inverter overheat (OH)	1100	Momentary power loss (UV)
		0101	Not used	1101	Not used
TD8-TD11	Fuse blown (FU)	0110	Fuse blown (FU)	1110	Not used
		0111	Not used	1111	Cooling fan fault (FAN)
TD9-TD11	Not used	Zero-speed detection			
TD10-TD11	Inverter overheat (OH)	Agreed frequency			
TD1-TD2	Zero-speed detection	Running			
TD3-TD4	Agreed Frequency	Minor fault			

* Bits 0 to 3 correspond to the following terminals.

Terminal No.	Bit
TD5 - TD11	0
TD6 - TD11	1
TD7 - TD11	2
TD8 - TD11	3

Note TD11 is common terminal

■ Inverter Capacity Selection Sn-01

Inverter capacity has been preset at the factory. However, if a spare board is used, reset the inverter capacity referring to the table below. Control constant Cn-□□ factory setting values (initial values) differ according to Sn-01 setting.

Inverter Capacity Selection

200 V Class

Name \ Data of Sn - 01			00	01	02	03	04	05	06	07
CIMR - G3□□□			20P4	20P7	21P5	22P2	23P7	25P5	27P5	2011
Inverter rated capacity		kVA	1 4	2 1	2 7	4 1	6 9	10 3	13 7	20 6
Max applicable motor capacity		HP (kW)	0 5 (0 4)	1 (0 75)	2 (1 5)	3 (2 2)	5 (3 7)	7 5 (5 5)	10 (7 5)	15 (11)
Inverter rated current		A	3 2	4 8	6 4	9 6	16	24	32	48
Factory Set	Cn - 09	Motor rated current A	1 9	3 3	6 2	8 5	14 1	19 6	26 6	39 7
	Cn - 23	Carrier frequency upper limit kHz	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0
	Cn - 24	Carrier frequency lower limit kHz	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0
	Cn - 25	Carrier frequency proportional gain	0	0	0	0	0	0	0	0
	Cn - 31	Motor phase-to-phase resistance Ω	6 950	5 604	2 190	1 478	0 837	0 434	0 241	0 250
	Cn - 32	Torque compensation iron loss W	14	26	53	77	112	172	262	245
	Cn - 33	Torque compensation limit V	50	50	50	50	50	50	50	50
	Cn - 37	Momentary power loss assurance time s	0 7	1 0	1 0	1 0	2 0	2 0	2 0	2 0
	Cn - 40	Minimum baseblock time s	0 5	0 5	0 5	0 5	0 5	0 7	0 7	0 7
	Cn - 41	V/f during speed search %	100	100	100	100	100	100	100	100

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

Inverter Capacity Selection

200 V Class

Name \ Data of Sn - 01			08	09	0A	0B	0C	0D	0E	0F
CIMR - G3 □□□□			2015	2018	2022	2L30* 2030	2L37* 2037	2L45* 2045	2L55* 2055	2L75* 2075
Inverter rated capacity kVA			27 4	34	41	54	68	78	95	130
Max applicable motor capacity HP (kW)			20 (15)	25 (18 5)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)
Inverter rated current A			64	80	96	130	160	183	224	300
Factory Set	Cn - 09	Motor rated current A	53 0	65 8	77 2	105	131	156	190	224
	Cn - 23	Carrier frequency upper limit kHz	15 0	15 0	15 0	10* 2 0	10* 2 0	10* 2 0	10* 2 0	10* 2 0
	Cn - 24	Carrier frequency lower limit kHz	15 0	15 0	15 0	10* 1 0	10* 1 0	10* 1 0	10* 1 0	10* 1 0
	Cn - 25	Carrier frequency proportional gain	0	0	0	0* 36	0* 36	0* 36	0* 36	0* 36
	Cn - 31	Motor phase-to-phase resistance Ω	0 149	0 110	0 086	0 067	0 045	0 035	0 028	0 019
	Cn - 32	Torque compensation iron loss W	272	505	538	699	823	852	960	1200
	Cn - 33	Torque compensation limit V	50	50	50	50	50	50	50	50
	Cn - 37	Momentary power loss assurance time s	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	Cn - 40	Minimum baseblock time s	0 7	1 0	1 0	1 0	1 0	1 0	1 0	1 0
	Cn - 41	V/f during speed search %	100	100	100	80	80	80	80	80

* Type numbers or data in the upper are for low noise type, and those in the lower are for general type

Inverter Capacity Selection

400 V Class

Name \ Data of Sn - 01			20	21	22	23	24	25	26	27	28	29	2A
CIMR - G3☐☐☐			40P4	40P7	41P5	42P2	43P7	45P5	47P5	4011	4015	4018	4022
Inverter rated capacity		kVA	1 4	2 1	3 4	4 1	6 9	10 3	13 7	20 6	27 4	34	41
Max applicable motor capacity		HP (kW)	0 5 (0 4)	1 (0 75)	2 (1 5)	3 (2 2)	5 (3 7)	7 5 (5 5)	10 (7 5)	15 (11)	20 (15)	25 (18 5)	30 (22)
Inverter rated current		A	1 6	2 6	4 0	4 8	8	12	16	24	32	40	48
Factory Set	Cn - 09	Motor rated current A	1 0	1 6	3 1	4 2	7 0	9 8	13 3	19 9	26 5	32 9	38 6
	Cn - 23	Carrier frequency upper limit kHz	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0
	Cn - 24	Carrier frequency lower limit kHz	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0	15 0
	Cn - 25	Carrier frequency proportional gain	0	0	0	0	0	0	0	0	0	0	0
	Cn - 31	Motor phase-to-phase resistance Ω	34 599	20 340	9 148	5 883	3.293	1 734	0 964	1 001	0 597	0 439	0 344
	Cn - 32	Torque compensation iron loss W	14	26	53	77	130	193	263	385	440	508	586
	Cn - 33	Torque compensation limit V	100	100	100	100	100	100	100	100	100	100	100
	Cn - 37	Momentary power loss assurance time s	1 0	1 0	1 0	1 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	Cn - 40	Minimum baseblock time s	0 5	0 5	0 5	0 5	0 5	0 7	0 7	0 7	0 7	1 0	1 0
	Cn - 41	V/f during speed search %	100	100	100	100	100	100	100	100	100	100	100

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

Inverter Capacity Selection

400 V Class

Name \ Data of Sn - 01			2B	2C	2D	3F	2E	2F	31	33	34	35	36
CIMR - G3□□□			4030	4037	4045	4L45	4L55* 4055	4L75* 4075	4LA1* 4110	4LA6* 4160	4185	4220	4300
Inverter rated capacity kVA			54	68	82	82	110	140	200	250	290	380	510
Max applicable motor capacity HP (kW)			40 (30)	50 (37)	60 (45)	60 (45)	75 (55)	100 (75)	145 (110)	210 (160)	245 (185)	290 (220)	390 (300)
Inverter rated current A			64	80	96	96	128	165	224	300	340	450	600
Factory Set	Cn - 09	Motor rated current A	52 3	65 6	79 7	79 7	98	120	175	245	306	368	490
	Cn - 23	Carrier frequency upper limit kHz	15 0	10 0	2 5	10 0	10* 2 0	10* 2 0	10* 2 0	10* 2 0	2 0	2 0	2 0
	Cn - 24	Carrier frequency lower limit kHz	15 0	10 0	2 5	10 0	10* 1 0	10* 1 0	10* 1 0	10* 1 0	1 0	1 0	1 0
	Cn - 25	Carrier frequency proportional gain	0	0	0	0	0* 36	0* 36	0* 36	0* 36	36	36	36
	Cn - 31	Motor phase-to-phase resistance Ω	0 292	0 178	0 140	0 140	0 100	0 066	0 040	0 025	0 020	0 016	0 011
	Cn - 32	Torque compensation iron loss W	750	925	1125	1125	1260	1600	2150	2850	3200	3700	4700
	Cn - 33	Torque compensation limit V	100	100	100	100	100	100	100	100	100	100	100
	Cn - 37	Momentary power loss assurance time s	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	Cn - 40	Minimum baseblock time s	1 0	1 0	1 0	1 0	1 0	1 0	2 0	2 0	2 0	2 0	2 0
	Cn - 41	V/f during speed search %	100	100	100	100	80	80	80	80	80	80	80

* Type numbers or data in the upper are for low noise type, and those in the lower are for general type

Inverter Capacity Selection

575 V Class

Name \ Data of Sn - 01			44	45	46	47	48	49	4A	4B
CIMR - G3A ☐☐			53P7	55P5	57P5	5011	5015	5018	5022	5030
Inverter rated capacity kVA			5	7 5	10	15	20	25	30	40
Max applicable motor capacity HP (kW)			5 (3 7)	7 5 (5 5)	10 (7 5)	15 (11)	20 (15)	25 (18 5)	30 (22)	40 (30)
Inverter rated current A			6 3	9 5	12 5	17	22	27	32	43
Factory Set	Cn - 09	Motor rated current A	6 1	9 0	11 0	17	22	27	32	41
	Cn - 23	Carrier frequency upper limit kHz	15 0	15 0	15 0	15 0	15 0	15 0	10 0	10 0
	Cn - 24	Carrier frequency lower limit kHz	15 0	15 0	15 0	15 0	15 0	15 0	10 0	10 0
	Cn - 25	Carrier frequency proportional gain	0	0	0	0	0	0	0	0
	Cn - 31	Motor phase-to-phase resistance Ω	0	0	0	0	0	0	0	0
	Cn - 32	Torque compensation iron loss W	0	0	0	0	0	0	0	0
	Cn - 33	Torque compensation limit V	143	143	143	143	143	143	143	143
	Cn - 37	Momentary power loss assurance time s	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	Cn - 40	Minimum baseblock time s	0 5	0 5	0 5	0 5	0 5	0 5	1 0	1 0
	Cn - 41	V/f during speed search %	100	100	100	100	100	100	80	80

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

Inverter Capacity Selection

575 V Class

Name \ Data of Sn - 01			4C	4D	4E	4F	50	51	52
CIMR - G3A□□			5037	5045	5055	5075	5090	5110	5160
Inverter rated capacity kVA			50	60	75	100	125	150	200
Max applicable motor capacity HP (kW)			50 (37)	60 (45)	75 (55)	100 (75)	120 (90)	145 (110)	210 (160)
Inverter rated current A			54	64	81	112	130	172	200
Factory Set	Cn - 09	Motor rated current A	52	62	77	99	125	144	192
	Cn - 23	Carrier frequency upper limit kHz	10 0	10 0	10 0	2 0	2 0	2 0	2 0
	Cn - 24	Carrier frequency lower limit kHz	10 0	10 0	10 0	1 0	1 0	1 0	1 0
	Cn - 25	Carrier frequency proportional gain	0	0	0	36	36	36	36
	Cn - 31	Motor phase-to-phase resistance Ω	0	0	0	0	0	0	0
	Cn - 32	Torque compensation iron loss W	0	0	0	0	0	0	0
	Cn - 33	Torque compensation limit V	143	143	143	143	143	143	143
	Cn - 37	Momentary power loss assurance time s	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	Cn - 40	Minimum baseblock time s	1 0	1 0	1 0	2 0	2 0	2 0	2 0
	Cn - 41	V/f during speed search %	80	80	80	80	80	80	80

■ V/f Pattern Selection Sn-02

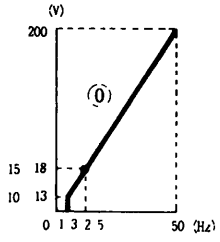
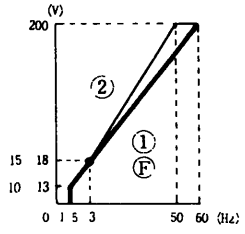
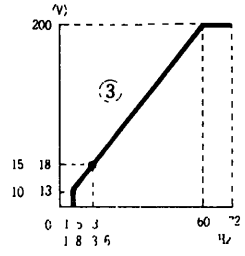
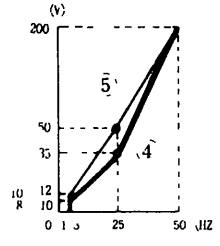
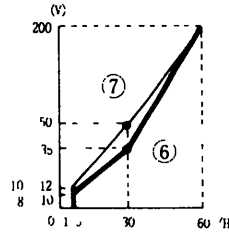
V/f pattern is selected by the setting of Sn-02. When V/f pattern is selected, never to fail to set input voltage of the inverter to Cn-01.

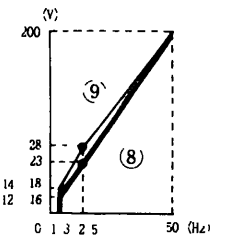
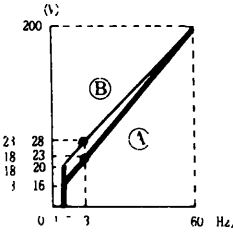
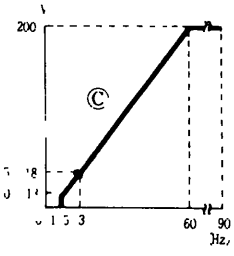
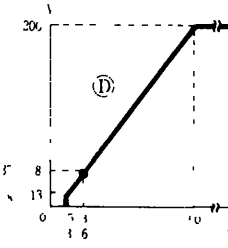
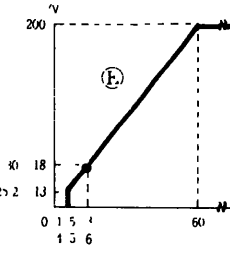
- Data ⓪-Ⓔ(of Sn-02) : change not enabled
- Data Ⓕ(of Sn-02) : change enabled
  (After initialization, V/f pattern becomes as shown below.)

7

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

V/f Pattern of 200 V Class* 0.5 to 2 HP (0.4 to 1.5 kW)

	Specifications		Sn-02	V/f Pattern †
General - purpose	50 Hz		0	
	60 Hz	60 Hz Saturation	1 F	
		50 Hz Saturation	2	
	72 Hz		3	
Variable Torque Characteristics	50 Hz	Variable torque 1	4	
		Variable torque 2	5	
	60 Hz	Variable torque 3	6	
		Variable torque 4	7	

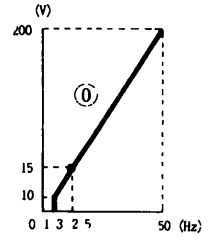
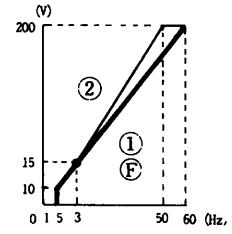
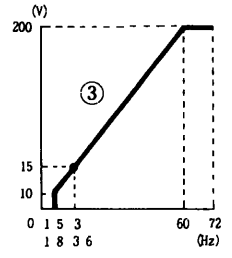
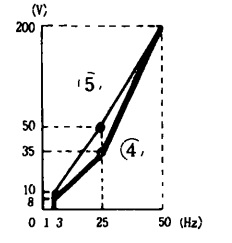
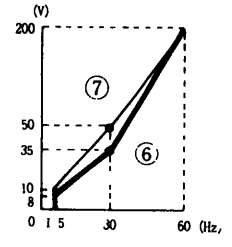
	Specifications		Sn-02	V/f Pattern †
High Starting Torque ‡	50 Hz	Low starting torque	8	
		High starting torque	9	
	60 Hz	Low starting torque	A	
		High starting torque	B	
Rated Output Operation (machine tool)	90 Hz		C	
	120Hz		D	
	180 Hz		E	

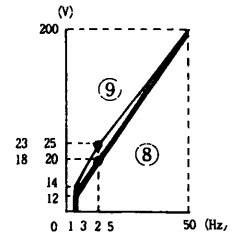
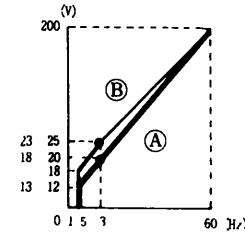
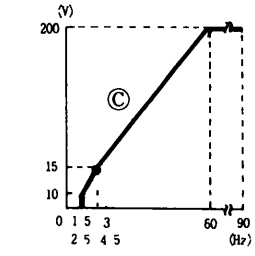
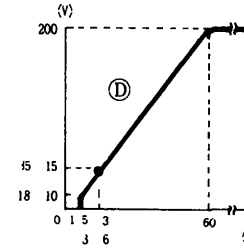
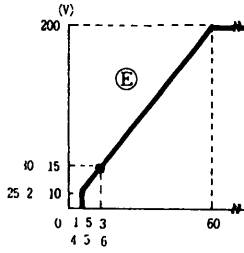
* For 400 V class, 2 times voltage value shown in table above
For 575 V class, $\frac{575}{200}$ times voltage value shown in table above

† Consider the following items as the conditions for selecting a V/f pattern
They must be suitable for
(1) The voltage and frequency characteristics of motor
(2) The maximum rotation speed of motor

‡ Select high starting torque only in the following conditions Normally, this selection is not required
(1) The wiring distance is long [492 ft (150 m) and above]
(2) Voltage drop at startup is large
(3) AC reactor is inserted in the input or output of the inverter
(4) A motor smaller than the maximum applicable inverter is used

V/f Pattern of 200 V Class* 3 to 60 HP (2.2 to 45 kW)

	Specifications		Sn-02	V/f Pattern †
General - purpose	50 Hz		0	
	60 Hz	60 Hz Saturation	1 F	
		50 Hz Saturation	2	
	72 Hz		3	
Variable Torque Characteristics	50 Hz	Variable torque 1	4	
		Variable torque 2	5	
	60 Hz	Variable torque 3	6	
		Variable torque 4	7	

	Specifications		Sn-02	V/f Pattern †
High Starting Torque 81 ‡‡	50 Hz	Low starting torque	8	
		High starting torque	9	
	60 Hz	Low starting torque	A	
		High starting torque	B	
Rated Output Operation (machine tool)	90 Hz		C	
	120Hz		D	
	180 Hz		E	

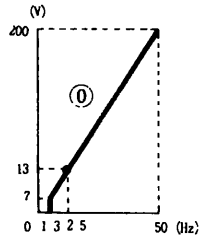
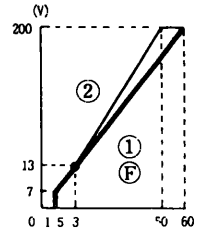
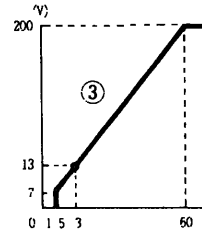
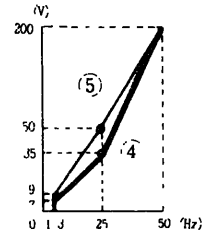
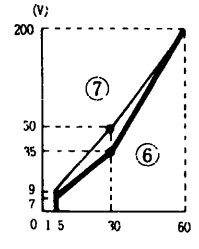
* For 400 V class, 2 times voltage value shown in table above
For 575 V class, $\frac{575}{200}$ times voltage value shown in table above

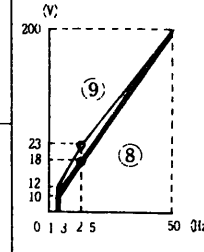
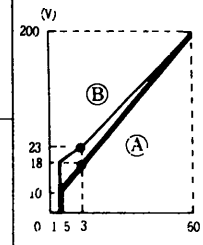
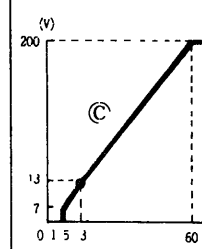
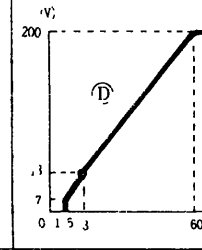
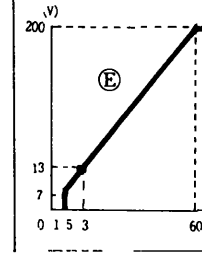
† Consider the following items as the conditions for selecting a V/f pattern
They must be suitable for
(1) The voltage and frequency characteristics of motor
(2) The maximum rotation speed of motor

‡ Select high starting torque only in the following conditions Normally, this selection is not required
(1) The wiring distance is long [492 ft (150 m) and above]
(2) Voltage drop at startup is large
(3) AC reactor is inserted in the input or output of the inverter
(4) A motor smaller than the maximum applicable inverter is used

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

V/f Pattern of 200 V Class* 75 to 400 HP# (55 to 300 kW)

	Specifications		Sn-02	V/f Pattern †
General - purpose	50 Hz		0	
	60 Hz	60 Hz Saturation	1 F	
		50 Hz Saturation	2	
	72 Hz		3	
Variable Torque Characteristics	50 Hz	Variable torque 1	4	
		Variable torque 2	5	
	60 Hz	Variable torque 3	6	
		Variable torque 4	7	

	Specifications		Sn-02	V/f Pattern †
High Starting Torque ‡	50 Hz	Low starting torque	8	
		High starting torque	9	
	60 Hz	Low starting torque	A	
		High starting torque	B	
Rated Output Operation (machine tool)	90 Hz		C	
	120Hz		D	
	180 Hz		E	

* For 400 V class, 2 times voltage value shown in table above
For 575 V class, $\frac{575}{200}$ times voltage value shown in table above

† Consider the following items as the conditions for selecting a V/f pattern
They must be suitable for
(1) The voltage and frequency characteristics of motor
(2) The maximum rotation speed of motor

‡ Select high starting torque only in the following conditions Normally, this selection is not required
(1) The wiring distance is long [492 ft (150 m) and above]
(2) Voltage drop at startup is large
(3) AC reactor is inserted in the input or output of the inverter
(4) A motor smaller than the maximum applicable inverter is used

Up to 100 HP (75 kW) for 200 V class

■ Operation Mode Select 1 Sn-04

(1) 1st digit (frequency reference select)

1st digit = 0 : Reference input from control circuit terminal 13 or 14 is the master speed frequency reference.

1st digit = 1 : Frequency reference 1 (An-01) is the master speed frequency reference.

Note : For combination of multi-step speed operation, refer to page 85 and 86.

(2) 2nd digit (run command select)

2nd digit = 0 : Run command from control circuit terminal is accepted.

2nd digit =1 : Run command from the digital operator is accepted.

Valid run command and frequency references differ as shown in the table below, depending on the combination of the 1st and 2nd digits.

CONSTANT / REF	SYSTEM CONSTANT 4	2nd digit	1st digit	2nd digit	1st digit	2nd digit	1st digit	2nd digit	1st digit
		0	0	0	1	1	0	1	1
Control Terminal	Master Speed Frequency Ref	Control circuit terminal 13, 14		An-01		Control circuit terminal 13, 14		An-01	
	FWD Run Command (Terminal 1)	○		○		×		×	
	REV Run Command (Terminal 2)	○		○		×		×	
	External Fault (Terminal 3)	○		○		○		○	
	Fault Reset (Terminal 4)	*		*		*		*	
	Comand of Terminal 5	○		○		†		†	
	Comand of Terminal 6	○		○		○		○	
	Comand of Terminal 7	○		○		○		○	
	Comand of Terminal 8	○		○		○		○	
	Aux Input	○		○		○		○	
	Fault Contact Output	○		○		○		○	
	Multi-function Contact Output	○		○		○		○	
	Multi-function PHC Output	○		○		○		○	
Operator	RUN Key	×		×		○		○	
	JOG Key	×		×		○		○	
	STOP Key	‡		‡		○		○	
	FWD / REV Key	×		×		○		○	
	> / RESET Key	*		*		*		*	
	DRIVE / PRG Key	Valid only when the inverter stop		Valid only when the inverter stop		Valid only when the inverter stop		Valid only when the inverter stop	
	LED of REF	Lit		OFF		Lit		OFF	
	LED of SEQ	Lit		Lit		OFF		OFF	
	Monitor display	○		○		○		○	

* Valid only when the inverter stops (FWD run command, REV run command, and DC injection braking command are "open")

† FWD/REV run command is not accepted

‡ When the STOP key is depressed, processing differs as follows, depending on the setting of the 1st digit of Sn-05

1st digit = 0 During running by signals from control circuit terminals, the STOP key from the operator is accepted If the STOP key is depressed, the inverter stops according to the setting of 3rd and 4th digits of Sn-04, while the STOP LED indicator blinks This stop command is held within the inverter until both the FWD run command and REV run command of control circuit terminals become "open", or another frequency reference is selected in the multi-step speed command or jog frequency reference section

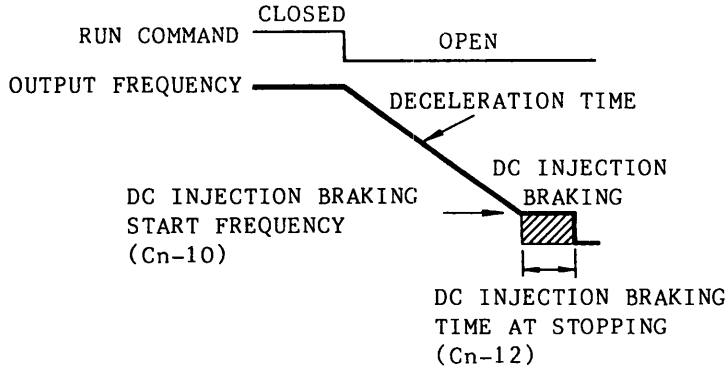
1st digit = 1 During running by signals from control circuit terminals, the STOP key from the operator is not accepted

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

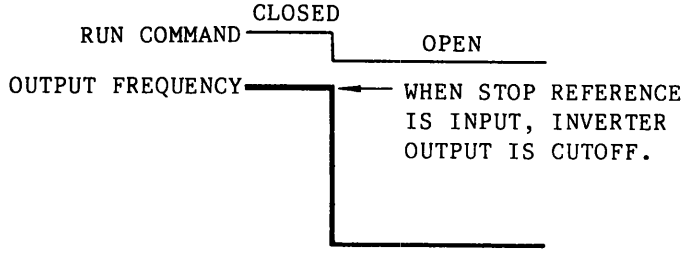
(3) 3rd digit, 4th digit (stop method select)

Stop method differs by the setting of 3rd and 4th digits as shown below.

① Sn-04 = 00 ×× RAMP stop

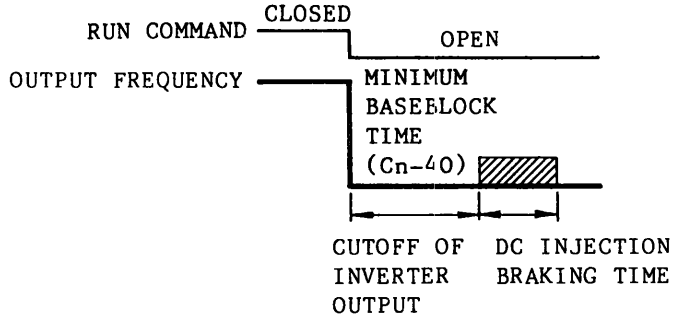


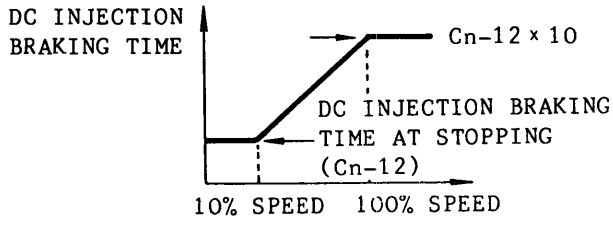
② Sn-04 = 01 ×× Coasting to a stop



③ Sn-04 = 10 ×× Full-range DC injection braking stop

DC injection braking time differs by the output frequency when stop command is input as shown below.

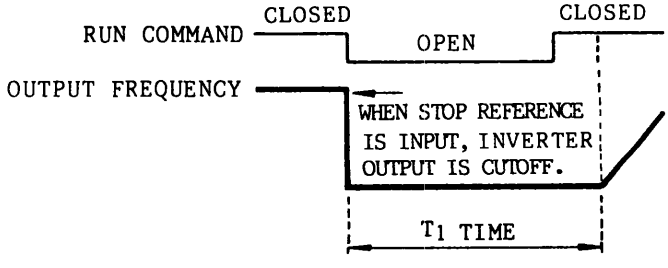


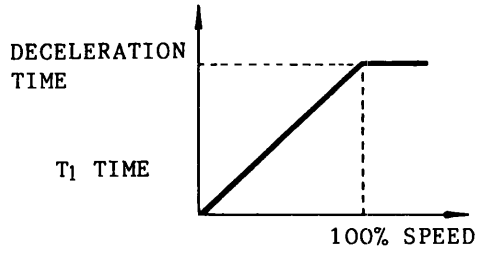


OUTPUT FREQUENCY WHEN STOP REFERENCE IS INPUT.

④ Sn-04 = 11 ×× Coasting to a Stop (timer function provided)

Once stop command is input, run command is disregarded during T_1 time.





OUTPUT FREQUENCY WHEN STOP REFERENCE IS INPUT.

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

■ Operation Mode Select 2 Sn-05

(1) 1st digit

Select processing to be performed when the STOP key of the digital operator is depressed during running by control circuit terminals.

1st digit = 0: During running by signals from control circuit terminals, the STOP key from the operator is accepted. If the STOP key is depressed, the inverter stops according to the setting of the 3rd and 4th digits of Sn-04 while the STOP LED indicator blinks. This stop command is held within the inverter until both the FWD run command and REV run command of control circuit terminals become "open", or other frequency reference is selected in the multi-step speed command or jog frequency reference section.

1st digit = 1: During running by signals from control circuit terminals, the STOP key from the operator is not accepted.

(2) 2nd digit (REV run prohibited)

2nd digit = 0 : REV run command from control circuit terminals or the digital operator is accepted.

2nd digit = 1: REV run command from control circuit terminals or the digital operator is not accepted

(3) 3rd digit (selection of double scanning of sequence command)

3rd digit = 0 : Sequence command (control circuit terminals 1 to 8) is scanned twice.

3rd digit = 1 : Sequence command (control circuit terminals 1 to 8) is scanned once.

(4) 4th digit (selection of the multi-function analog output)

Multi-function analog output (control circuit terminals 21, 22) output signal can be selected by Sn-05 4th digit and Sn-09 2nd digit.

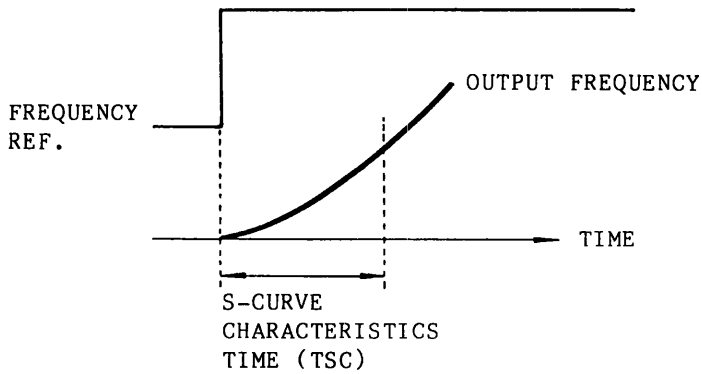
Sn-05 4th Digit	Sn-09 2nd Digit	Description
0	0	Outputs analog signal proportional to inverter output frequency (Max frequency / 100%)
1	0	Outputs analog signal proportional to inverter current (Rated current / 100%)
0	1	Outputs analog signal proportional to inverter output voltage reference (Cn-01 / 100%)
1	1	Outputs analog signal proportional to inverter output power (Max motor capacity / 100%)

■ Operation Mode Select 3 Sn-06

(1) 1st digit, 2nd digit (S-curve selection of soft starter)

The S-curve characteristics of the soft starter depend on the setting of the 1st and 2nd digits as follows:

2nd digit	1st digit	Contents
0	0	The S-curve characteristics is 0.2 second.
0	1	No S-curve characteristics
1	0	The S-curve characteristics is 0.5 second.
1	1	The S-curve characteristics is 1 second.

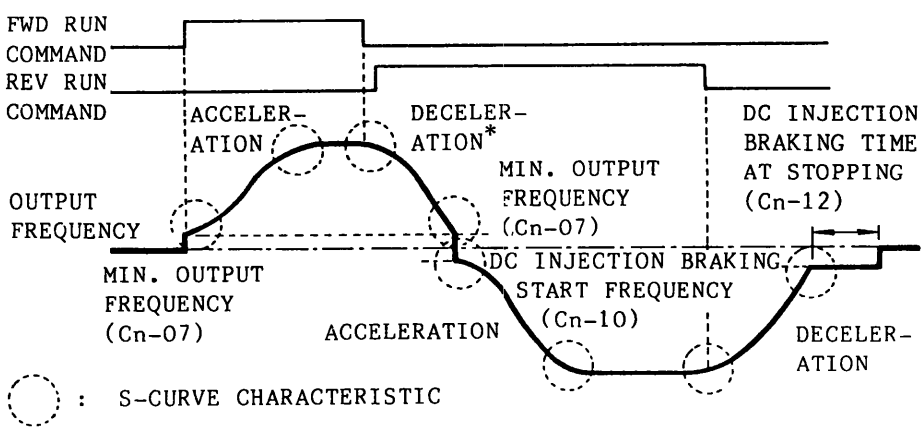


Note S-curve characteristics time refers to the time from acceleration rate 0 to the time when a normal acceleration rate determined by a specified acceleration time is obtained

7

(a) Time chart at FWD/REV run change with S-curve characteristics

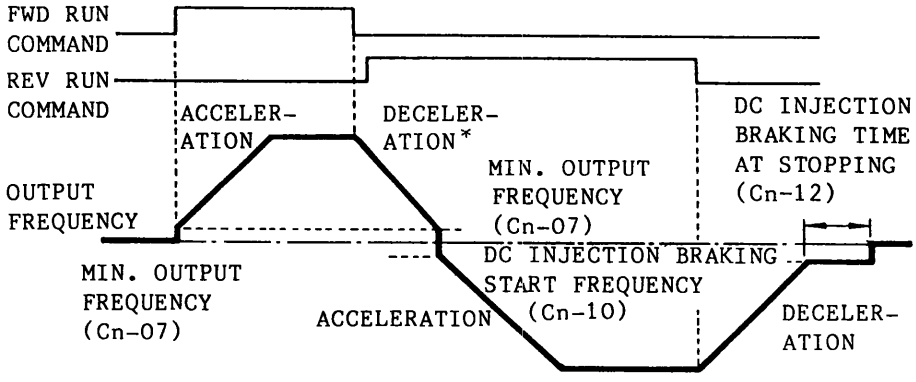
The figure below shows the time chart at FWD/REV run change during deceleration and stop.



* When 1st and 2nd digits are 00, no S-curve characteristics at completion of deceleration

(b) Time chart at FWD/REV run change without S-curve characteristics

The figure below shows the time chart at FWD/REV run change during deceleration and stop.

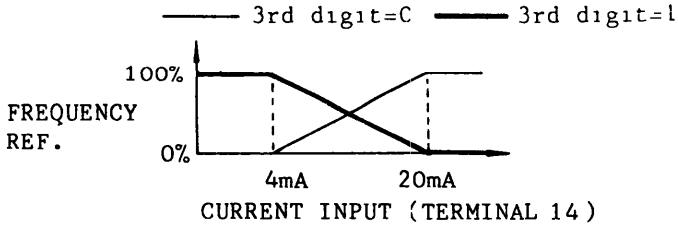


(2) 3rd digit (reverse characteristics select)

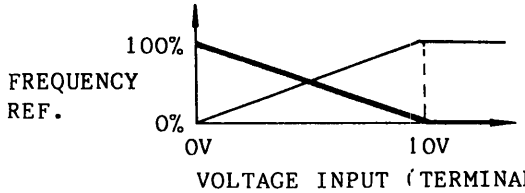
The input characteristics of the master speed frequency reference depend on the set value as follows. For the reverse characteristics, only + input is valid.

3rd digit = 0: Normal characteristics (0-10 V or 4-20 mA/0-100%)

3rd digit = 1: Reverse characteristics (10-0 V or 20-4 mA/0-100%)



CURRENT INPUT (TERMINAL 14)



VOLTAGE INPUT (TERMINAL 13)

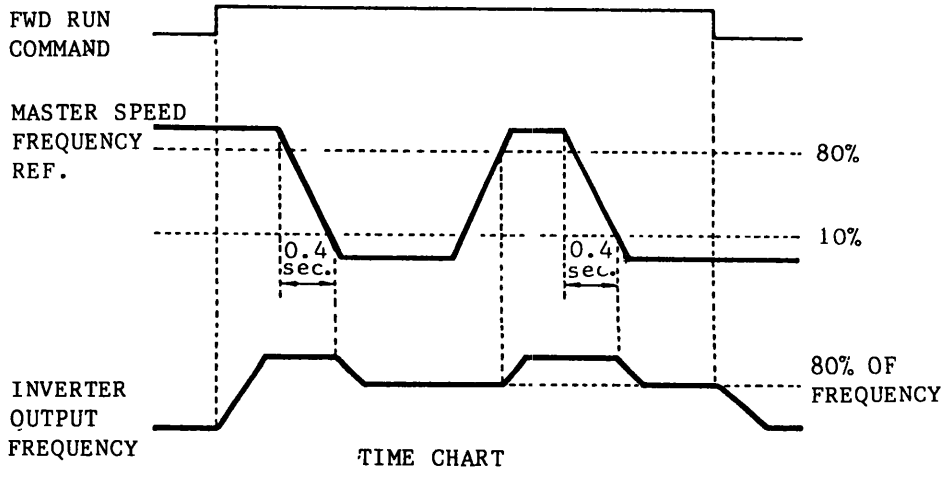
(3) 4th digit (operation select when frequency reference is missing)

4th digit = 0: Normal operation (varies with change of reference)
4th digit = 1: Operation continues with 80% frequency.

When 4th digit = 1 is set, the current master speed frequency reference is compared at all times with the one occurred 0.4 second before. When the current master speed frequency reference goes below 10% of the one that occurred 0.4 second before, operation continues with 80% (80% frequency) of the master speed frequency reference of the prior one. Consequently, the master speed frequency reference of the previous one (0.4 second before) is used as the current frequency reference.

In the following cases, this operation is released and the inverter returns to normal operation:

- Master speed frequency reference exceeding 80% frequency is input.
- Stop reference is input.
- Reference is missing during operation at less than 5% of frequency.



TIME CHART

■ Operation Mode Select 4 Sn-07

Define the operation at overtorque detection. Overtorque is detected by the following formula:
Inverter output current B overtorque detection level (Cn-26, Initial value: 160%)
(Detection time Cn-27, Initial value: 0.1 second, Hysteresis fixed at 10%)

(1) 1st digit

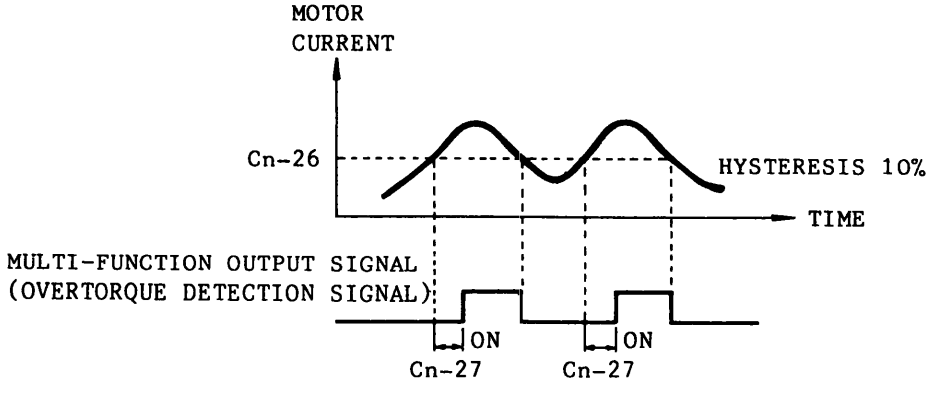
1st digit = 0: Overtorque is not detected.
1st digit = 1: Overtorque is detected.

(2) 2nd digit

2nd digit = 0: Overtorque is detected only during agreed frequency.
2nd digit = 1: Overtorque is detected during stop or during running except for DB.

(3) 3rd digit

3rd digit = 0: When overtorque is detected, oL3 blinks in the digital operator and the operation continues.
3rd digit = 1: When overtorque is detected, oL3 is displayed on the digital operator and the inverter output is shut OFF. Fault contact signal is output. (Treated as a fault)



Setting either Sn-20 to 22 to "0B" enables signal to be output at overtorque detection.

Operation Mode Select 5 Sn-08

(1) 1st digit (option/inverter change)

Specify whether option card or inverter frequency reference is used for operation.

1st digit = 0: Option card frequency reference is accepted.
1st digit = 1: Frequency reference from inverter control circuit terminals or the digital operator is accepted.

(2) 2nd digit (run command option/inverter change)

Select whether operation is performed by the option card or inverter run command.

2nd digit = 0: Run command from option card received.
2nd digit = 1: Run command from inverter control circuit terminalor digital operator received.

(3) 3rd digit, 4th digit (selection of stopping method at communication error detection)

Stopping method at communication error detection can be selected by communication interface card (SI-B).

4th digit	3rd digit	Contents
0	0	Ramp to a stop by bn-02 (major fault)
0	1	Coasting to a stop (major fault)
1	0	Ramp to a stop by bn-04 (major fault)
1	1	Operation to continue(minor fault)

■ Operation Mode Select 6 Sn-09

(1) 1st digit (selection of analog output)

Multi-function analog output signal contents can be set either by the inverter or option.

1st digit = 0: Output according to Sn-05 4th digit and Sn-09 2nd digit setting contents.

1st digit = 1: Output according to contents set by communication interface card (SI-B).

(2) 2nd digit (selection of multi-function analog output signal)

Multi-function analog output (control circuit terminals 21- 22) output signal can be selected according to Sn-05 4th digit and Sn-09 2nd digit set value. Output signal level is set by bn-11.

Sn-05 4th Digit	Sn-09 2nd Digit	Description
0	0	Outputs analog signal proportional to inverter output frequency (Max frequency / 100%)
1	0	Outputs analog signal proportional to inverter current (Rated current / 100%)
0	1	Outputs analog signal proportional to inverter output voltage reference (Cn-01 / 100%)
1	1	Outputs analog signal proportional to inverter output power (Max applicable motor capacity / 100%)

■ Protective Characteristics Select 1 Sn-10

(1) 1st digit (selection of stall prevention during acceleration)

1st digit = 0: Stall prevention during acceleration is enabled.
1st digit = 1: Stall prevention during acceleration is not enabled.

The function of stall prevention during acceleration automatically extends accelration according to load status (inverter output current), thus preventing the motor from stalling during acceleration. The stall prevention level during acceleration in a constant output area is reduced as follows:

$$\text{Acceleration stall prevention level of constant output field} = \frac{\text{acceleration stall prevention level (Cn-28)} \times \text{maximum voltage frequency (Cn-04)}}{\text{output frequency}}$$

When the 1st digit of Sn-10 is 1, the output frequency increases at the rate determined by acceleration time:

(2) 2nd digit (selection of stall prevention during deceleration)

2nd digit = 0: Stall prevention during deceleration is enabled.
2nd digit = 1: Stall prevention during deceleration is not enabled.

The function of stall prevention during deceleration automatically extends deceleration time according to the magnitude of the main circuit DC voltage, thus preventing overvoltage during deceleration.

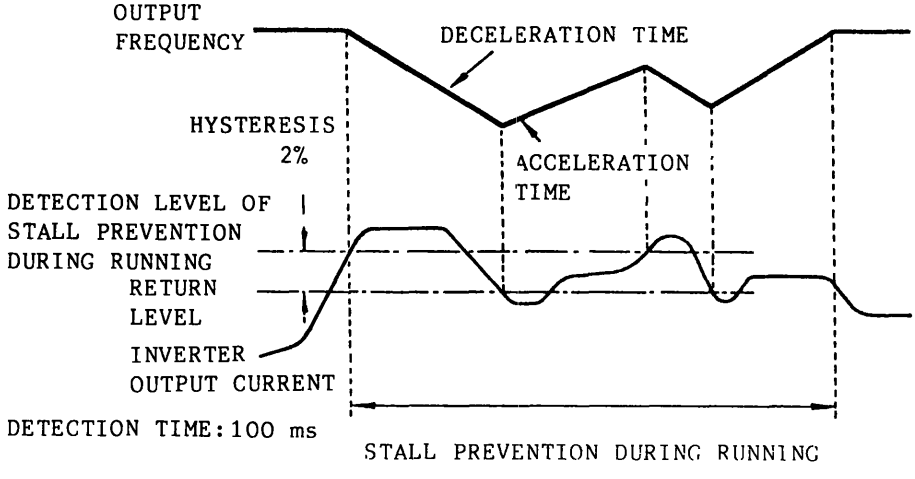
When the 2nd digit of Sn-10 is 1, the output frequency decreases at the rate determined by deceleration time. For positioning application, specify "stall prevention during deceleration not provided" (2nd digit = 1) in order to obtain stopping accuracy. With large load inertia, use a braking resistor to prevent overvoltage.

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

(3) 3rd digit (stall prevention during running)

3rd digit = 0: Stall prevention during running is enabled.
3rd digit = 1: Stall prevention during running is not enabled.

Stall prevention operation during running starts decelerating when the output current reaches 100 ms or greater than the set value of Cn-30 during frequency coincidence (operation level of stall prevention during running). The inverter decelerates as long as the output current exceeds the set value of Cn-30 (operation level of stall prevention during running). When the output current goes below the set value, the inverter reaccelerates. The deceleration time selected in the 4th digit of Sn-10 is taken. Even during stall prevention while running, stall prevention during deceleration and stall prevention during acceleration are enabled.



(4) 4th digit (selection of deceleration time during stall prevention while running)

4th digit = 0: The inverter decelerates for the deceleration time specified in bn-02.
4th digit = 1: The inverter decelerates for the deceleration time specified in bn-04.

■ Protective Characteristics Select 2 Sn-11

(1) 1st digit (existence of braking resistor)

1st digit = 0: Braking resistor protection not provided (braking resistor is not protected from overheating).

1st digit = 1: Braking resistor protection provided (braking resistor is protected from overheating).

On detecting overheating in the braking resistor, the inverter lights rH on the operator, shuts off inverter output, and outputs fault contacts. When braking contact failure (set value = D) is selected in the multi-function contact output, the pertinent multi-function contact output is output.

The following inverters can optionally accept braking resistors:

200 V class: 5 HP (3.7 kW) or less

400 V class: 3 HP (2.2 kW) or less

Notes:

1. Braking transistor operation level

   Braking transistor operation levels depend on input voltage as shown below shown.

   When the set value of Cn-01 is larger than the motor rated voltage, the following problems may occur. Set Cn-01 to match the motor rated voltage.

   (a) The motor is excited excessively during deceleration and heated.

   (b) The motor vibrates during deceleration.

   (c) The motor is saturated during deceleration and the main circuit devices are damaged.

Input Voltage(Cn - 01)		L V H Signal	0 V Level		B T R Level		U V Level	
Inverter	Set value		Detection	Return	Detection	Return	Detection	Return
200 V Class	255 or less	L	400	380	380	375	210	220
400 V Class	Set value ≧ 400	L	800	760	760	750	420	440
400 V Class	Set value < 400	H	700	660	660	650	420	440
575 V Class	Set value > 500	L	1000	950	950	938	525	550
575 V Class	Set value ≦ 500	H	875	825	825	812	525	550

2. Protection of braking transistor

   The models [200 V and 100 HP (7.5 kW) or less, 400 V and 20 HP (15 kW) or less, 575 V and 25 HP (18.5 kW) or less] incorporating braking transistors to protect them.

   On detecting a fault in the braking transistors, the inverter lights rr at the operator and shuts off the inverter output and braking transistor drive signal (BTA). It outputs fault contacts.

7.3 SYSTEM CONSTANT Sn-□□ (Cont'd)

(2) 2nd digit (fault contact signal during auto reset/restart operation)

2nd digit = 0: A fault contact signal is not output during autoreset/restart operation.

2nd digit = 1: A fault contact signal is output during auto reset/restart operation.

(3) 3rd digit (operation continued at momentary power loss)

3rd digit = 0: When momentary power loss is detected, undervoltage fault (Uv1) occurs and the inverter output is shut off.

3rd digit = 1: If momentary power loss time is within momentary power loss ride-thru time (Cn-37), the operation continues after the momentary power loss. If the momentary power loss ride-thru time is exceeded, undervoltage fault (Uv1) occurs and the inverter output is shut OFF.

Notes :

1. When the 3rd digit = 1, be sure not to shut OFF the external sequence signal (e.g. FWD, REV)
2. For lifters, do not use this function (the 3rd digit = 0)

■ Protective Characteristics Select 3 Sn-12

When an external fault signal of trminal 3 is input, EF3 is displayed and a fault contact signal is output immediately. The inverter stops according to the setting of the 3rd and 4th digits. The external fault signal is held within the inverter until a fault reset signal is input.

(1) 1st digit (level selection of external fault signal)

1st digit = 0: NO-contact input (when "closed", external fault operation is performed)

1st digit = 1: NC-contact input (when "open", external fault operation is performed)

(2) 2nd digit (acceptance of external fault signal)

2nd digit = 0: External fault signals are always accepted.

2nd digit = 1: External fault signals are accepted only duringrunning. (Not accepted during baseblock)

(3) 3rd digit, 4th digit (selection of processing at external fault detection)

4th digit	3rd digit	Contents
0	0	Ramp to a stop by bn-02 (major fault)
0	1	Coasting to a stop (major fault)
1	0	Ramp to a stop by bn-04 (major fault)
1	1	Operation to continue (minor fault)

■ Protective characteristics select 4 Sn-13

(1) 3rd digit, 4th digit (stopping method selection at fan fault)

Stopping method can be selected upon inverter cooling fan fault detection.

4th digit	3rd digit	Contents
0	0	Ramp to a stop by bn-02 (major fault)
0	1	Coasting to a stop (major fault)
1	0	Ramp to a stop by bn-04 (major fault)
1	1	Operation to continue (minor fault)

Note: This function is effective only for inverter models with capacity 40 HP (30 kW) or more (200 V class), 75 HP (55 kW) or more (400 V class), or 32 HP (22 kW) or more (575 V class).

■ Protective Characteristics Selection 5 Sn-14

(1) 1st digit (motor protection)

1st digit = 0: Electronic thermal motor protection is enabled.
1st digit = 1: Electronic thermal motor protection is not enabled.

(2) 2nd digit (selection of electronic thermal characteristics)

2nd digit = 0: Electronic thermal characteristics are in accordance with reduced torque motor (standard motor).
2nd digit = 1: Electronic thermal characteristics are in accordance with constant torque motor (special motor).

(3) 3rd digit (electronic thermal time constant)

3rd digit = 0: Used for standard motor and special motor (standard ratings)
3rd digit = 1: Used for motors other than the above (short-time ratings)

(4) 4th digit (selection of inverter protective characteristics)

4th digit = 0: When inverter output current exceeds 103% inverter protection electronic thermal characteristics start operating: Inverter protection (oL2) operates at 150% for one minute to shut OFF inverter output .
4th digit = 1: When inverter output current exceeds 113% inverter protection electronic thermal characteristics start operating: Inverter protection (oL2) operates at 123% for one minute to shut OFF inverter output

Note: This function is effective only for inverter models with capacity 40 HP (30 kW) or more (200 V class), 75 HP (55 kW) or more (400 V class), or 30 HP (22 kW) or more (575 V class).

7.4 MULTI-FUNCTION CONTACT INPUT SELECTION Sn-15 to -18

Select the set values shown below for Sn-15 to -18.

Terminal No	Sn -
Terminal 5	15
Terminal 6	16
Terminal 7	17
Terminal 8	18

Set Value	Function	Description
00	FWD / REV RUN select	Open: FWD run, Closed: REV run, (3 - wire sequence mode (00 set in Sn - 15) terminal 1 - run, 2 - stop, 5 FWD / REV selection)
01	Operation signal select Local / Remote	Open: Operated according to setting of Sn - 04 1st and 2nd digits Closed: Operated by frequency reference and run command from digital operator
02	Option / inverter reference select	Open: Operated by operation or frequency reference from option Closed: Operated by operation or frequency reference from inverter
03	Multi - step speed reference 1	Combination of multi - step speed references 1 to 3 correspond to speed reference (master speed An - 01) and speed references 2 to 8 (An - 02 to 08) Refer to "SYSTEM CONSTANT MULTI - STEP SPEED REFERENCE LIST"
04	Multi - step speed reference 2	
05	Multi - step speed reference 3	
06	Jog frequency reference select	Closed: Jog frequency reference is selected
07	Accel / decel time select	Open: Accelerates / decelerates with ACCEL time 1 and DECEL time 1 (bn - 01, bn - 02 set values) Closed: Accelerates / decelerates with ACCEL time 2 and DECEL time 2 (bn - 03, bn - 04 set values)
08	External baseblock (NO - contact input)	Closed: Inverter output is shut off (Frequency reference is held)
09	External baseblock (NC - contact input)	Open: Inverter output is shut off (Frequency reference is held)
0A	Accel / decel speed prohibit command* (HOLD command)	Frequency reference is held (SFS operation is stopped)
0B	Inverter overheat alarm	Closed: OH2 blinks on operator and operation continues (Minor fault)
0C	Multi - function analog input enabled / disabled	Closed: Multi - function analog input enabled (terminal 16) Open: Multi - function analog input disabled (terminal 16)
0D to 0F	Not used	—

* Contact your Yaskawa representative for availability in North American markets

Set Value	Function	Description
10	UP command	Closed Output frequency increment
11	DOWN command	Closed: Output frequency decrement
12	FJOG command	Closed: Forward jog run FWD LED lights. Display: 6Hz
13	RJOG command	Closed: Reverse jog run Digital operator REV LED does not light Display 6Hz
14 to 1F	Not used	—
20 to 2F	External fault 1	External fault signal input
30 to 3F	External fault 2	
40 to 4F	External fault 3	
50 to 5F	External fault 4	
60	DC injection braking command (JOG with priority)	Closed DC injection braking applied when the frequency output is less than the DC injection start frequency and the DC injection braking command is closed
61	Search 1	Closed Search from max frequency
62	Search 2	Closed Search from set frequency
63	Energy - saving operation	Closed Energy - saving
64	Search 3 (only when combined with VS-656D)	Closed Search from output frequency Open Baseblock
65 to FF	Not used	—

Setting error (OPE3) occurs by setting to Sn-15 to -18 in the following cases.

- When set values are not listed from the smaller to the larger.
- When more than two search references of set values 61, 62 and 64 are set simultaneously.

When the following combination is set at Sn-15 to -18, set value fault (OPE3) occurs.

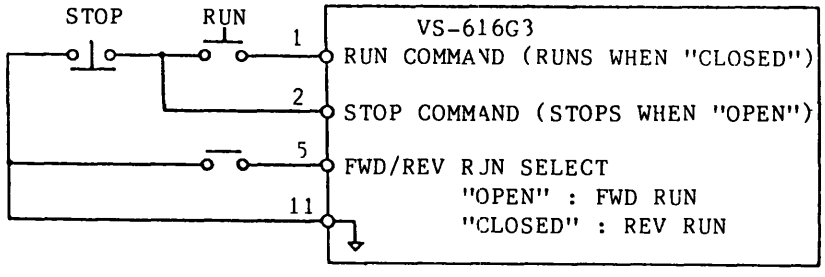
- Set values are not in a descending order.
- More than two search commands of set values 61 and 62 are set.
- UP/DOWN commands are not set simultaneously (only one command can be set.)
- UP/DOWN and accel/decel prohibit commands are set simultaneously.
- More than two set values except FF are set.

7.4 MULTI-FUNCTION CONTACT INPUT SELECTION

Sn-15 to -18 **(Cont'd)**

(1) FWD/REV run select (set value = 0)

When 0 is set in Sn-15, the mode becomes 3-wire sequence mode.



(2) Operation signal select (set value = 1)

Selection of operation signals is enabled only stopping.

Open: The inverter operates according to the setting of 1st, 2nd digits.

Closed: The inverter operates by frequency reference and run command from digital operator.

<Example> For local/remote mode select, set Sn-04 = ×× 00.

Open: Frequency reference and run command of control circuit terminals are accepted.

Closed: Frequency reference and run command of the digital operator are accepted.

(3) Option card/inverter reference select (set value = 2)

Specify which of the option or inverter references is used for operation. The option/inverter selection is effective only during stopping.

Open: Option card frequency reference and operation signals are accepted.

Closed: Frequency reference and operation signals from the inverter control circuit terminals or the digital operator are accepted.

(4) Selection of multi-step speed references 1 to 3 and jogging frequency select (set values = 3 to 6)

Up to nine step speeds can be selected by combinations of multi-step speed references and jog frequencies.

○ Closed × Open – No relation

Jog Frequency Reference Select	Multi - step Reference			Frequency Reference
	3	2	1	
×	×	×	×	Master speed frequency reference*
×	×	×	○	Auxiliary analog reference†
×	×	○	×	Frequency reference 3 (An - 03)
×	×	○	○	Frequency reference 4 (An - 04)
×	○	×	×	Frequency reference 5 (An - 05)
×	○	×	○	Frequency reference 6 (An - 06)
×	○	○	×	Frequency reference 7 (An - 07)
×	○	○	○	Frequency reference 8 (An - 08)
○	–	–	–	Jog frequency reference 3 (An - 09)

* In operator mode (1st digit of Sn - 04 is 1), frequency reference 1 (An - 01) is enabled

† When the multi - function analog input is selectec by functions other the frequency reference (Sn - 19 = 0), frequency reference 2 (An - 02) becomes effective When the multi - function analog input is not used, set F to the set value

· For multi-step speed operation with frequency reference by keypad, perform the following setting:

① Sn-04 = xxx1 -> An-01 becomes effective

② Sn-19 = OF -> An-02 becomes effective.

(5) Accel/decel time select (set value = 7)

Accel/decel time is switched when "closed". Switching is permitted even during acceleration or deceleration.

Open: The accel/decel time set by bn-01 and bn-02 is accepted.

Closed: The accel/decel time set by bn-03 and bn-04 is accepted.

(6) External baseblock (set value = 8)

Baseblock is performed when "closed". External baseblock differs as follows depending on the input status of run command:

· When an external baseblock signal is input during running, bb blinks at the digital operator and inverter output is shut OFF. When the external baseblock signal disappears, the inverter restarts with the frequency reference at that time. The voltage returns to the set value in the voltage recovery time.

· When a stop signal is input and an external baseblock signal is input while the inverter is decelerating, bb blinks at the digital operator, the inverter output is shut OFF, and the output frequency is set to 0 Hz.

7.4 MULTI-FUNCTION CONTACT INPUT SELECTION

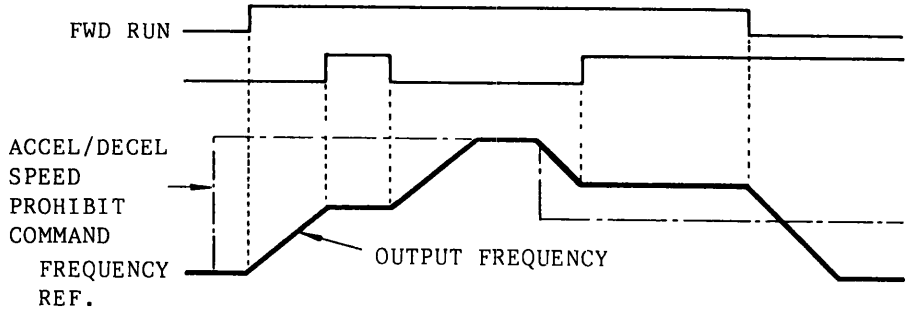
Sn-15 to -18 (Cont'd)

(7) External baseblock (set value = 9)

Baseblock is performed when "open". All other operations are the same as when a set value = 8.

(8) Accel/decel speed prohibit command* (set value = A)

As long as accel/decel speed prohibit command is input, accel/decel speed is prohibited and the output frequency at that time is held. When stop command is input, accel/decel speed prohibit state is freed and the system enters stop state. The figure below shows a time chart.



Note: If the run command is input again after the stop command is input while the accel/decel prohibit command is input, the holding output frequency is stored unless the accel/decel prohibit command is released. Therefore, operation is performed at the stored output frequency. Also when the power supply is turned OFF in the accel/decel prohibit command input status, the holding output frequency is still stored.

* Contact your Yaskawa representative for availability in North American markets

(9) Inverter overheat alarm (set value = B)

As long as an inverter overheat signal is input, OH2 blinks at the digital operator.

(10) Auxiliary analog reference input (set value = C)

When this function is selected by the multi-function terminal, the function set in the multi- function analog input is subject to the following restrictions.

Open: Multi-function analog input is not accepted.
(Same operation as when F is set in Sn-19)

Closed: Multi-function analog input is accepted.

(11) UP command/DOWN command (set value = 10, 11)

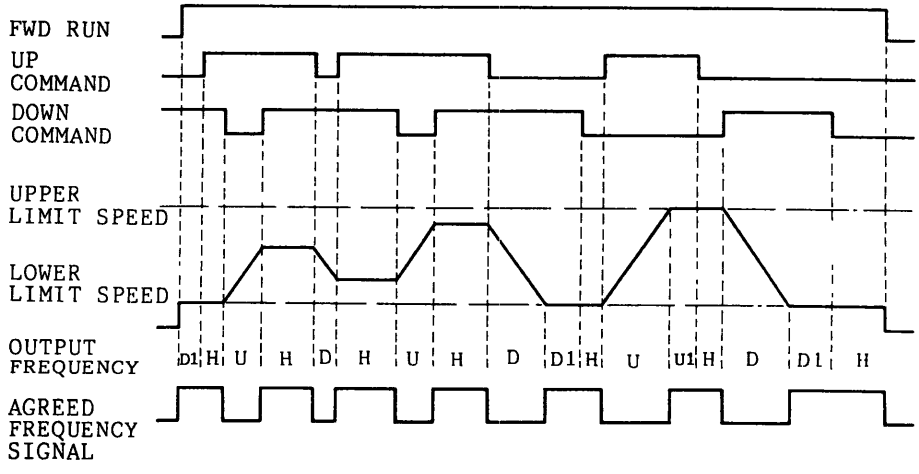
Acceleration/deceleration is performed by inputting the UP/DOWN commands without changing frequency reference in the forward (reverse) run command input status, and operation can be performed at a desired speed.

Set value = 10: UP command

Set value = 11: DOWN command

UP command	Closed	Open	Open	Closed
DOWN command	Open	Closed	Open	Closed
Status	Accel	Decel	Hold	Hold

The following shows the time chart when the UP/DOWN commands are used.



U = UP (accel) status
D = DOWN (decel) status
H = HOLD (constant speed) status
U1 = During clamp at upper limit speed even in UP status
D1 = During clamp at lower limit speed even in DOWN status

Notes·

1. When the UP/DOWN commands are used, set the Sn-04 1st digit (frequency reference selection) as shown below.
   Set 1st digit = 0 without fail.
   Setting 1st digit = 1 disables the UP/DOWN commands
2. When the UP/DOWN commands are selected, upper limit speed is set disregarding frequency reference.
   Upper limit speed = maximum output frequency (Cn-02) ×frequency reference lower limit (Cn-14)
3. The largest value among minimum output frequency (Cn-07), frequency reference lower limit (Cn-15) and main frequency reference input from control circuit terminal 13 or 14 is employed as lower limit speed.
4. By inputting the FWD/REV run commands, operation is started at the lower limit speed even if the UP/DOWN command are not input.
   When the power supply is turned OFF in the HOLD status, the held output frequency is stored. Therefore, by inputting the FWD/REV run commands in the HOLD status continuously after the power supply is tunned ON, operation is performed at the stored output frequency.
5. When the jog run command is input during running by UP/DOWN commands, the jog run command has priority.

(12) FJOG command, RJOG command (set value = 12, 13)

Forward and reverse jog frequency operation is enabled.

Set value = 12 FJOG command: Forward run by jog frequency reference (An-09) at closed.

Set value = 13 RJOG command: Reverse run by jog frequency reference (An-09) at colsed.

Notes:

1. When FJOG command or RJOG command is input during running, FJOG command or RJOG command has priority.
2. When both FJOG and RJOG commands are closed for 500 ms or more, the inverter stops according to the stopping method selection (Sn-04).
3. FJOG or RJOG command can be set individually.

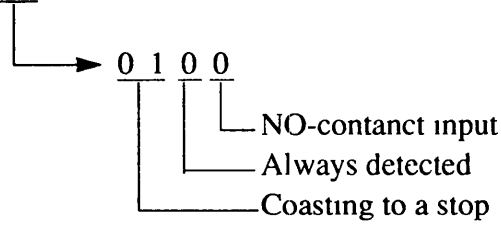
(13) External faults 1 to 4 (set values = 2X, 3X, 4X, 5X: X is O to F)

When external faults 1 to 4 are input, EF5 to EF8 is displayed at the digital operator, and the inverter operates according to combinations of four bits shown in the table below. The hexadecimal equivalent of combinations of four bits show below is set in the 1st digit of the setting value (2X, 3X, 4X, 5X) of external faults 1 to 4.

Bit No	0	1
0	External fault input NO - contact input	External fault input NC - contact input
1	External fault signal Always detected	External fault signal Detected during running only
3, 2	Selection of processing at external fault detection	00 Ramp to a stop (major fault) 01 Coasting to a stop (major fault) 10 Ramp to a stop by bn - 04 (major fault) 11 Operation to continue (minor fault)

<Example> External fault 1 is set to as follows.
: NO-contact input
: Signal is always detected
: Processing is coasting to a stop

Set value 24 H



The inverter operates differently as described below when experiencing major faults or minor faults. The digits in the error display EF5 to EF8 indicate the terminal numbers in which external faults 1 to 4 are set.

Major faults

If an external fault is input, the fault is displayed and the inverter stops according to process selection at external fault detection. Fault contact output relay is output immediately.

Minor faults

Fault display blinks only when external fault is input (the display is made for 0.5 second even when input is less than 0.5 second).

7.4 MULTI-FUNCTION CONTACT INPUT SELECTION

Sn-15 to -18 (Cont'd)

<Example> External faults 1 to 4 are set to multi-function terminals 1 to 4 (Nos. of terminal 5 to 8)

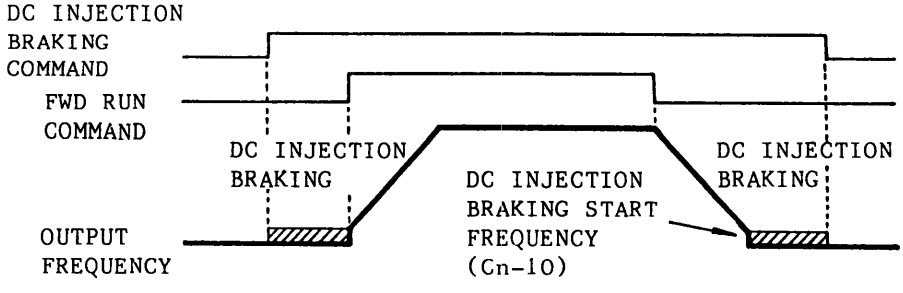
No of Fault	Multi - function Terminal	Display of Digital Operator	
		(Major Fault)	(Minor Fault)
External Fault 1	Terminal 5	EF5 lights (holding)	EF5 blinks
External Fault 2	Terminal 6	EF6 lights (holding)	EF6 blinks
External Fault 3	Terminal 7	EF7 lights (holding)	EF7 blinks
External Fault 4	Terminal 8	EF8 lights (holding)	EF8 blinks

Additional Notes of External Faults

1. External fault reset is enabled in baseblock status.
2. The following shows the priority order of process selection when more than one external fault is input.
   Coasting to a stop > ramp to a stop by bn-04 > ramp to a stop by bn-02
3. Fault retry is disabled when an external fault is input.

(14) DC injection braking command (set value = 60)

When DC braking command is input when the inverter stops, DC braking operation is performed. When operation signal or jog operation command is input, the DC braking operation is stopped and the operation is started. (Previleged operation)



(15) Search command (set value = 61, 62)

To start the motor during coasting when commercial power supply/inverter changing operation is performed, the motor can be operated without tripping by using the speed search function.

Set value = 61: Speed search starts with the maximum frequency.

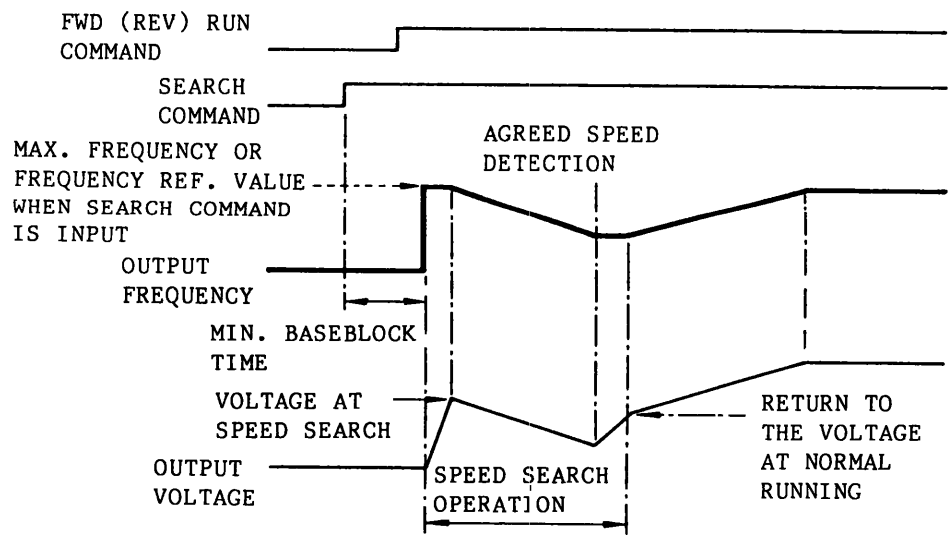
Set value = 62: Speed search starts with the frequency reference value when search command is input.

Search commands with set values of 61 and 62 cannot be set at the same time.

By inputting the run command with the search command "closed" during baseblock, speed search starts after shutting down the inverter output for the minimum baseblock time (Cn-40).

Speed search operation starts when inverter output current is larger than the set value of the speed search operation level (Cn-38). Frequency at which inverter output current is smaller than the speed search operation level (Cn-38) set value is determined as speed synchronous point: Re-acceleration/ deceleration is performed in the set accel/decel time up to the set frequency.

The following shows the timechart where the speed search command is input.

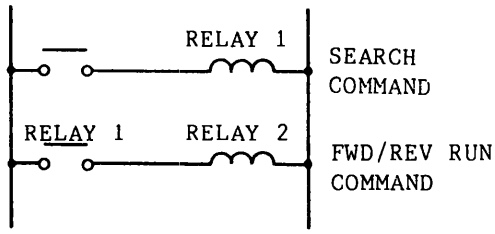


Notes

1 In momentary power loss operation continuation mode, speed search operation is performed beginning with current output frequency, regardless of the existence of search command After completion of speed search, the operation is performed according to the run command

2 Determine a sequence so that FWD/REV run command enters at the same time or later than search command

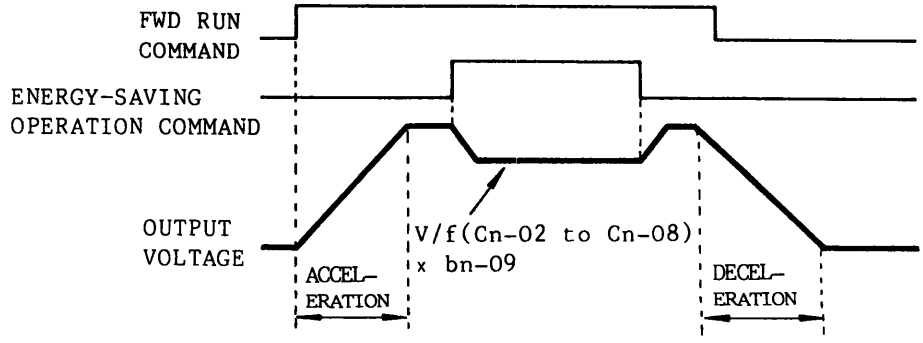
<Example of Sequence>



3 More than two search commands of set values 61 and 62 cannot be set

(16) Energy-saving operation command (set value = 63)

When energy-saving operation command is input, output voltage is reduced only during agreed frequency and energy-saving operation is performed. The output voltage during energy-saving operation command is the product of normal V/f (Cn-02 to Cn-08) and energy-saving gain (bn-09 initial value 80%). Output voltage attenuates and returns in voltage recovery time.



Time Chart of When Energy-saving Operation Command is Input

(17) Search 3 (set value = 64)

Used when PWM transistor converter (VS-656 DC3) and VS-616G3 are combined. MC operating signal from VS-656DC3 is taken in and the following operation is performed according to the signal status.

Closed (MC operation): Search starts from output frequency.

Open (non-MC operation): Baseblock status.

For the details, refer to the instruction manual for VS-656DC3.

7.5 MULTI-FUNCTION ANALOG INPUT SELECTION Sn-19

Select the set values shown below for Sn-19.

Set Value	Function	Remarks
00	AUX frequency reference *	Used for MASTER/AUX frequency reference selection
01	Frequency rference gain (F GAIN)	Total gain Internal gain (bn-05) × F GAIN
02	Frequency reference bias 1 (F BIAS 1)	Total bias Internal bias (bn-06) + F BIAS 1
03	Frequency reference bias 2 (F BIAS 2) (+ −)	Total bias Internal bias (bn-06) + F BIAS 2
04	Overtorque detection level	Internal over torque detection level (Cn-26) ineffective
05	V BIAS †	V BIAS addition after V/F conversion
06	Accel/decel time reduction coefficient	Accel/decel time varied by analog input
07	DC braking current	DC injection braking current varied by analog input (10 V/inverter rated current) Internal DC braking current setting (Cn-11) ineffective
08	Stall level during running	Stall level during running is set by analog input. Cn-30 becomes ineffective.
09	Frequency reference lower limit	Frequency reference lower limit value is set by analog input. Either Cn-15 set value or analog input whichever is larger becomes effective.
0A	Setting prohibit frequency 4	Setting prohibit frequency is set The fourth value in addition to frequency values set by Cn-16 to 18 can be set.
0B to 0F	Not used (no function provided)	

* Not to be used with An-02

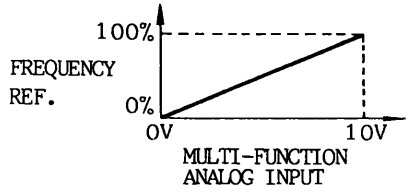
† 400 V class V BIAS value 0 to 200 V
575 V class V BIAS value 0 to 287 5 V

Note · For combinations of multi-step speed references at set value = 00, refer to pages 88 and 89

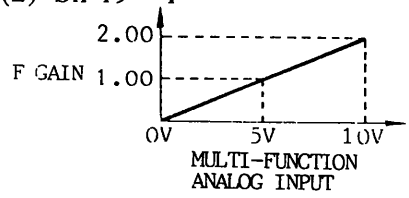
7.5 MULTI-FUNCTION ANALOG INPUT SELECTION Sn-19 (Cont'd)

Multi-function Analog Input Characteristics

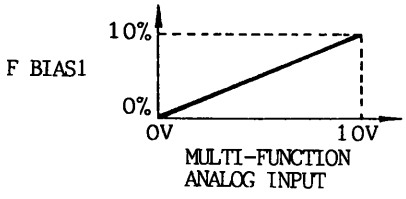
(1) Sn-19 = 0



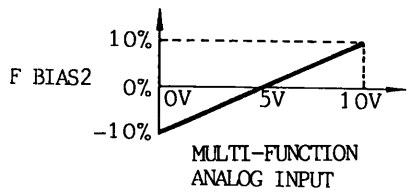
(2) Sn-19 = 1



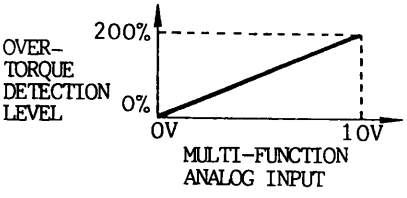
(3) Sn-19 = 2



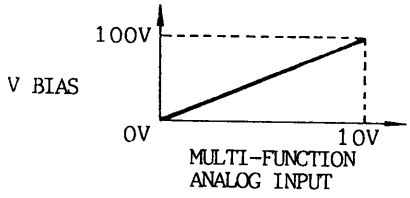
(4) Sn-19 = 3



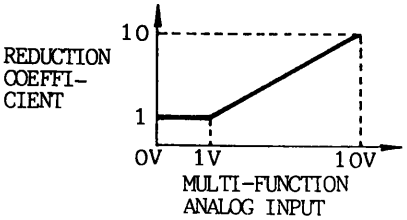
(5) Sn-19 = 4



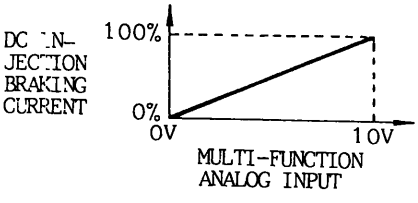
(6) Sn-19 = 5



(7) Sn-19 = 6

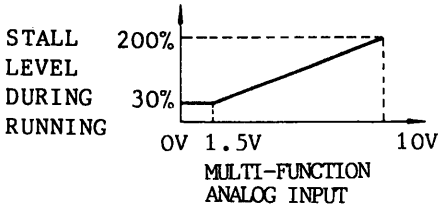


(8) Sn-19 = 7

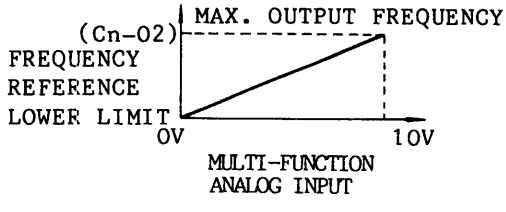


$$\text{Actual accel/decel time} = \frac{\text{Accel/decel time (bn-01 to -04)}}{\text{Reduction coefficient}}$$

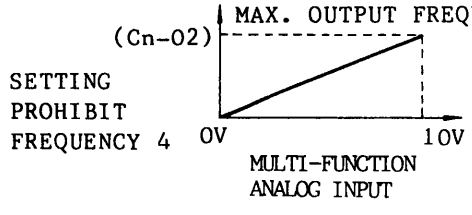
(9) Sn-19 = 08



(10) Sn-19 = 09



(11) Sn-19 = 0 A



7.6 MULTI-FUNCTION CONTACT OUTPUT SELECTION

Sn-20 to -22

Select the set values shown below for Sn-20 to -22.
Contact output for 0.1 sec. while detecting signal.

Terminal No	Sn-
Control circuit terminal 9, 10 (Contact output)	20
Control circuit terminal 25 27 (Open collector output)	21
Control circuit terminal 26 27 (Open collector output)	22

Set Value	Description	
	Name	Signal Level (Closed)
00	During running	Closed During running
01	Zero speed	Closed Zero speed
02	Agreed frequency	Closed $\left(\text{Frequency ref} - \text{Cn-22}\right) \leqq \text{Output frequency} \leqq \left(\text{Frequency ref} + \text{Cn-22}\right)$
03	Agreed frequency setting	Closed Set value 2 in agreed frequency status and (Cn-21 − Cn-22) ≦ Output frequency ≦ (Cn-21 Cn-22)
04	Frequency detection	Closed Output frequency ≦ Cn - 21
05	Frequency detection	Closed Output frequency ≧ Cn - 21
06	Inverter operation ready	Closed Inverter operation ready
07	During undervoltage detection	Closed During undervoltage detection
08	During baseblock	Closed During inverter output baseblock
09	Frequency reference mode	Open From control circuit terminal Closed From operator
0A	Control command	Open From control circuit terminal Closed From operator
0B	Overtorque detection	Closed During overtorque detection
0C	Frequency reference missing	Closed While frequency reference missing
0D	Braking resistor fault	Closed During braking resistor overheating or braking transistor fault
0E	Fault	Closed Fault (except CPF 00, CPF 01)
0F	Not used	—

7.6 MULTI-FUNCTION CONTACT OUTPUT SELECTION

Sn-20 to -22 **(Cont'd)**

(1) Operation (set value = 0)

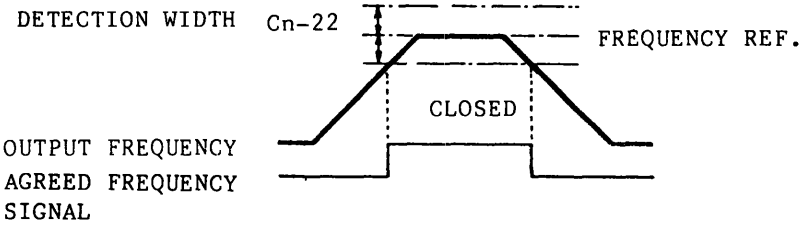
The operation contact is "closed" when FWD or REV run command is input, or the inverter outputs voltage.

(2) Zero-speed (set value = 1)

The zero-speed contact is "closed" when inverter output frequency is less than the minimum output frequency.

(3) Agreed frequency (set value = 2)

This is "closed" when output frequency is within the detection width shown in the figure below.

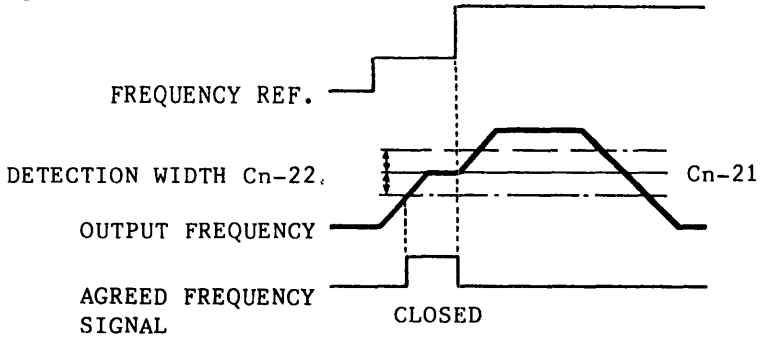


(Frequency ref. − Cn-22) ≦ Output frequency ≦ (Frequency ref. + Cn-22)

Cn-22: Agreed frequency detection width

(4) Agreed frequency (set value = 3)

This is "closed" when acceleration or deceleration is completed and output frequency is within the detection width shown in the figure below.



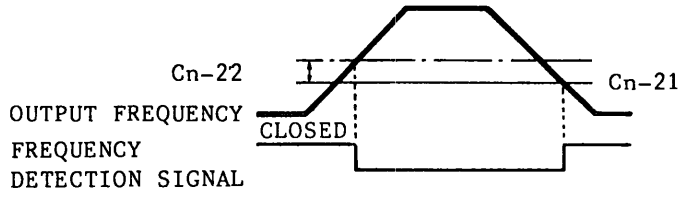
(Cn-21 − Cn-22) ≦ Output frequency ≦ (Cn-21 + Cn-22)

Cn-21: Agreed frequency point

Cn-22: Agreed frequency detection width

(5) Frequency detection (set value = 4)

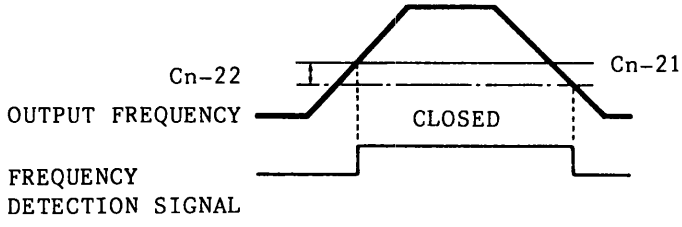
This contact is "closed" when output frequency is equal to or less than Cn-21, as shown in the figure below.



Output frequency ≦ Cn-21
Cn-21: Agreed frequency point
Cn-22: Agreed frequency detection width

(6) Frequency detection (set value = 5)

This contact is "closed" when output frequency is equal to or greater than Cn-21, as shown in the figure below.



Output frequency ≧ Cn-21
Cn-21: Agreed frequency point
Cn-22: Agreed frequency detection width

(7) Inverter operation ready (set value = 6)

This is "closed" when the inverter has become ready for operation.

(8) During undervoltage (UV) **detection** (set value = 7)

This contact remains "closed" as long as the inverter is detecting undervoltage.

(9) During baseblock (set value = 8)

This contact is always "closed" when inverter output is shut OFF.

(10) Frequency reference mode (set value = 9)

This contact is "closed" when the frequency reference mode from the operator is selected.

7.6 MULTI-FUNCTION CONTACT OUTPUT SELECTION

Sn-20 to -22 **(Cont'd)**

(11) Control command (set value = A)

This contact is "closed" when the control command from the keyboard is selected.

(12) Overtorque detection (set value = B)

This contact remains "closed" as long as the inverter is detecting overtorque. Set overtorque detection level in Cn-26 and set overtorque detection time in Cn-27.

(13) Frequency reference missing (set value = C)

This is "closed" when frequency reference missing is detected.

(14) Braking resistor fault (set value = D)

This is "closed" when the braking resistor is overheated or a fault is detected in the braking transistor.

(15) Fault (set value = E)

This contact is "closed" when the inverter detects a major fault. However, in the event of a fault in the watchdog (CPF00) or transmission between the mainframe and operator, the inverter is not operated.

(16) Not used (set value = F)

Set F in multi-function contact output not used.

7.7 CONTROL CONSTANT Cn-□□

Function	Cn-□□	Data Name	Set Unit	Set Range	Factory Set
V/f Pattern Setting	01	Input voltage	0 1 V	150 - 255 0 *1	200 0 *2 (230 0)
	02	Max output frequency	0 1 Hz	50 0 - 400 0	60 0
	03	Max voltage	0 1 V	0 1 - 255 0 *1	200 0 *2
	04	Max voltage frequency	0 1 Hz	0 1 - 400 0	60 0
	05	Mid output frequency	0 1 Hz	0 1 - 400 0	3 0
	06	Mid output frequency voltage	0 1 V	0 1 - 255 0 *1	15 0 *2
	07	Min output frequency	0 1 Hz	0 1 - 400 0	1 5
	08	Min output frequency voltage	0 1 V	0 1 - 255 0 *1	10 0 *2
Electronic Thermal Reference Current	09	Motor rated current	0 1 A	*3	1 9 *4
DC Injection Braking Function	10	DC braking start frequency	0 1 Hz	0 1 - 10 0	1 5
	11	DC braking current	1 %	0 - 100	50
	12	DC braking time at stopping	0 1 sec	0 0 - 25 5	0 5 (0 0)
	13	DC braking time at starting	0 1 sec	0 0 - 25 5	0 0
Frequency Limit Control	14	Frequency reference upper limit	1 %	0 - 109	100
	15	Frequency reference lower limit	1 %	0 - 109	0
Frequency Prohibited Control	16	Setting prohibit frequency 1	0 1 Hz	0 0 - 400 0	0 0
	17	Setting prohibit frequency 2	0 1 Hz	0 0 - 400 0	0 0
	18	Setting prohibit frequency 3	0 1 Hz	0 0 - 400 0	0 0
	19	Setting prohibit frequency range	0 1 Hz	0 0 - 25 5	1 0
Operator Display Change	20	Operator display mode	1	0 - 39999	0
Agreed Speed Detection	21	Agreed frequency	0 1 Hz	0 0 - 400 0	0 0
	22	Agreed frequency detection width	0 1 Hz	0 0 - 25 5	2 0

7.7 CONTROL CONSTANT Cn-□□ (Cont'd)

Function	Cn-□□	Data Name	Set Unit	Set Range	Factory Set
Carrier Frequency Adjustment	23	Carrier frequency upper limit	0 1 kHz	0 4 - 15 0 *6	15 0 *6
	24	Carrier frequency lower limit	0 1 kHz	0 4 - 15 0 *6	15 0 *6
	25	Carrier frequency proportion gain	1	0 - 99	0 *6
Overtorque Detection	26	Overtorque detection level	1 %	30 - 200	160
	27	Overtorque detection time	0 1 sec	0 0 - 25 5	0 1
Stall Prevention	28	Stall prevention level during acceleration	1 %	30 - 200	170
	29	Constant HP (kW) area stall prevention	1 %	30 - 200	50
	30	Stall prevention level during running	1 %	30 - 200	160
Torque Boost Control	31	Motor terminal resistance (Motor phase to phase resistance)	0 C01	0 000 - 65 535	6 950 *4
	32	Motor iron loss	1 W	0 - 65535	14 *4
	33	Torque compensation limitter	1 V	0 - 50 *1	50 *4
Simplified Speed Control	34	Motor no - load current	1 %	0 - 99 *5	30
	35	Slip compensation primary delay time	0 1 sec	0 0 - 25 5	2 0
Fault Retry	36	No of auto reset/restart operation	1	0 - 10	0
Corrective Action for Momentary Power Loss	37	Power loss ride-thru time	0 1 sec	0 0 - 2 0	0 7 *4
Speed Search Control	38	Speed search deactivation current level	1 %	0 - 200	150
	39	Speed search decel time	0 1 sec	0 1 - 25 5	2 0
	40	Min baseblock time	0 ' sec	0 5 - 5 0	0 5 *4
	41	V / f during speed search	1 %	10 - 100	100
	42	Voltage recovery time	0 I sec	0 1 - 5 0	0 3

*1 For 200V class ×2 for 400V class, ×575/200 for 575V class
*2 For 200V class ×2 for 400V class, ×575/200 for 575V class
*3 Setting range becomes 10 to 200% of inverter rated current
*4 Factory settings differ depending on inverter capacity (Sn-01 set value)
This example shows combination of CIMR-G3□20P4 (0 5 HP 0 4kW) and YASKAWA standard motor 200V 60Hz 0 5 HP 0 4kW (Refer to the table on pages 61 to 66)
At setting Sn-01, the set value changes to the factory setting For any application other than YASKAWA standard motors, set the value shown on the nameplate of the motor
*5 Motor rated current (Cn-09) becomes 100% level
*6 Factory setting and setting range differ depending on inverter capacity (Sn-01 set value)
Note Value in ( ) of column "Factory Set" is for Model CIMR-G3U□□□□

(1) Input voltage (Cn-01)

Set inverter input voltage, (in the unit of 0.1 V).

(2) V/f constant (Cn-02 to Cn-08)

Set inverter output frequency/voltage characteristics (V/f characteristics).

(a) Changing V/f characteristics

Sn-02 = 0 to E: V/f characteristics determined by set value. Settings of Cn-02 to Cn-08 cannot be changed. Refer to page 65.

Sn-02 = F: Any V/f characteristic can be obtained by the set values of constants Cn-02 to Cn-08.

(b) Voltage values (Cn-03, Cn-06, Cn-08) displayed in the operator depend on the set value of Sn-02 (V/f selection) as follows:

· Sn-02 = 0 to E: Proportional computation is performed with input voltage (Cn-01) as 100%.

<Example> When Cn-01 = 220 V and V/f pattern Sn-02 = 1, the following display is made in the operator:

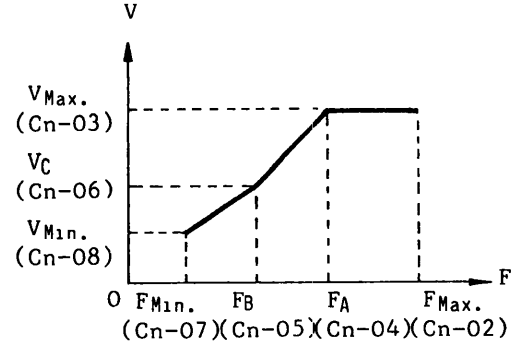
· Cn-03 = 220

· Cn-06 = 15 V $\times \frac{220}{200}$ = 16.5 V

· Cn-08 = 10 V $\times \frac{220}{200}$ = 11 V

· Sn-02 = F: The set value is displayed.

(c) When V/f characteristics are a straight line, the same value as Cn-07 is set in Cn-05. The set value of Cn-06 is disregarded.



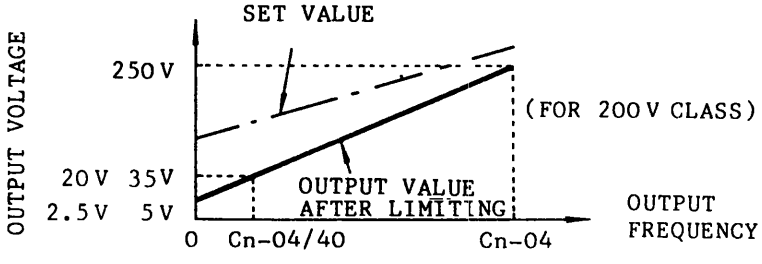
Notes

1 The maximum output voltage is limited by input voltage

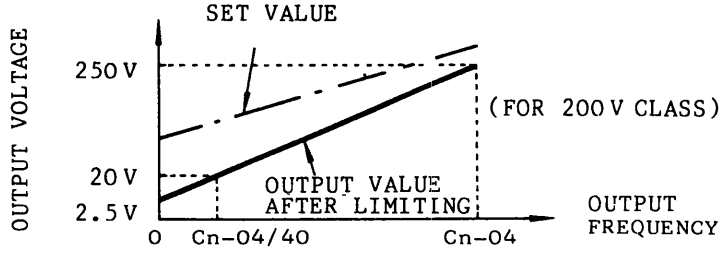
2 When the set values of Cn-02 to Cn-08 do not satisfy the following conditions, a setting error occurs and oPE 10 is displayed
The set value is checked at power ON and switching from PRG mode to DRIVE mode. $F_{Max} \geqq FA > FB \geqq F_{Min}$

3 Actual output voltage is limited to the following value even if an arbitrary V/f is set as Sn-02 =F.
For setting without limit, set Sn-02 = FF However, in this case, the inverter may malfunction unless V/f suitable for the motor characteristics is set
Output voltage limiting function is effective for EPROM No NSG610030 and after

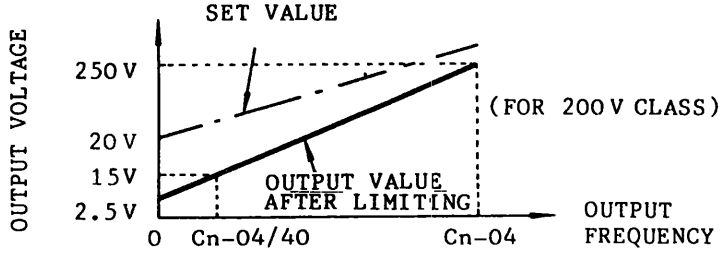
0.5 to 5 HP (0.4 to 3.7 kW)



7.5 to 60 HP (5.5 to 45 kW)



75 to 400 HP (55 to 300 kW)



(3) Motor rated current (Cn-09)

Set motor rated current by the electronic thermal function in units of 0.1 A for motor overload protection. The range of setting is 10% to 200% of inverter rated current. When the 1st digit of Sn-14 is 1, the electronic thermal function is disabled and the motor is not protected from overheating due to overload.

(4) DC braking start frequency (Cn-10)

Set a frequency for starting DC braking at deceleration stop in units of 0.1 Hz. When a set value is not greater than Cn-07 (minimum output frequency), DC braking is started with the minimum output frequency.

(5) DC braking current (Cn-11)

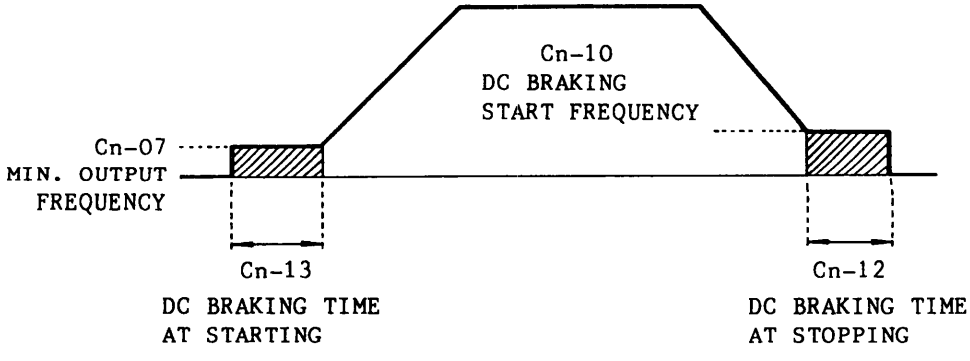
Set DC braking current in units of 1%. Inverter rated current is 100%.

(6) DC braking time at stopping (Cn-12)

Set the duration of DC braking at stop in units of 0.1 second. When a set value is 0, DC braking is not performed. and inverter output is shut off at the start of DC braking.

(7) DC braking time at starting (Cn-13)

Set the duration of DC braking at starting in units of 0.1 second. When a set value is 0, DC braking is not performed, and acceleration begins with the minimum output frequency.

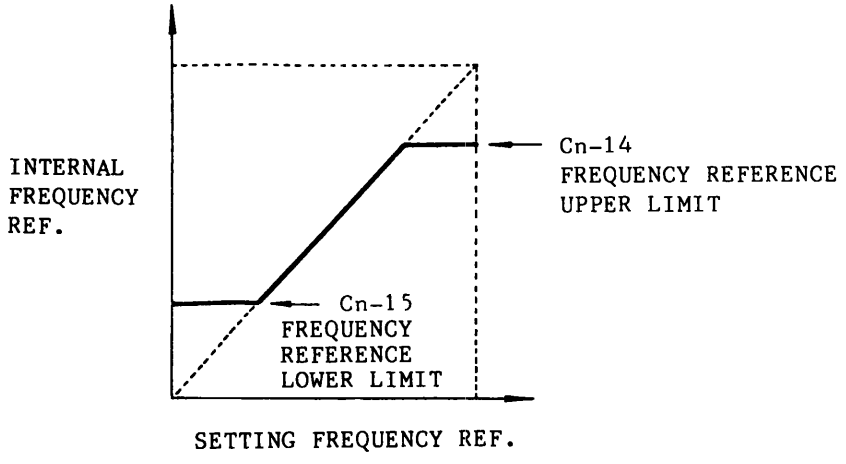


(8) Frequency reference upper limit (Cn-14)

Set the upper limit of frequency reference in units of 1%. Cn-02 (maximum frequency) is regarded as 100%.

(9) Frequency reference lower limit (Cn-15)

Set the lower limit of frequency reference in units of 1%. Cn-02 (maximum frequency) is regarded as 100%. When the run command is input with frequency reference of 0, acceleration continues from the minimum frequency to the lower frequency reference limit, and operation continues in the lower frequency reference limit.



(10) Setting prohibit frequencies 1 to 3 (Cn-16 to Cn-18)

Set a setting prohibit frequency in units of 0.1 Hz. A set value of 0.0 Hz disables this function.

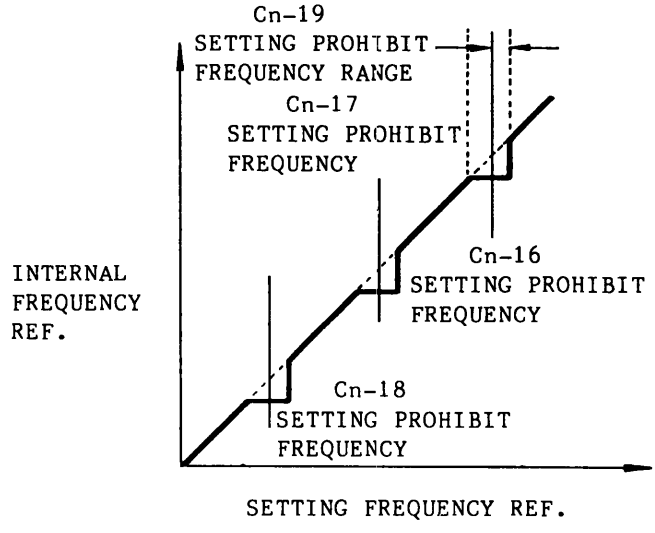
Note: If the setting prohibit frequency ranges overlap, set setting prohibit frequency 1 to 3 as shown below:

$$\underset{\left(\begin{smallmatrix}\text{setting prohibit}\\ \text{frequency 3}\end{smallmatrix}\right)}{\text{Cn-18}} \leqq \underset{\left(\begin{smallmatrix}\text{setting prohibit}\\ \text{frequency 2}\end{smallmatrix}\right)}{\text{Cn-17}} \leqq \underset{\left(\begin{smallmatrix}\text{setting prohibit}\\ \text{frequency 1}\end{smallmatrix}\right)}{\text{Cn-16}}$$

(11) Setting prohibit frequency range (Cn-19)

Set the range of setting prohibit frequency in units of 0.1 Hz. The range of the setting prohibit frequency is determined as follows, depending on combinations with Cn-16 to Cn-18.

Cn-16 to Cn-18 − Cn-19 ≦ the range of the setting prohibit frequency ≦ Cn-16 to Cn-18 + Cn-19



Note. Constant-speed operation is prohibited in the setting prohibit frequency range Output frequency does not jump during acceleration or deceleration, which is performed smoothly

(12) Operator display mode (Cn-20)

The setting unit of frequency references 1 to 8 and jog frequency reference depends on the set value of operator display mode (Cn-20) as follows:

Cn - 20	Setting / Reading Unit
0	Units of 0 01 Hz
1	Units of 0 01 %
2 to 39	Set in the units of r / min (0 to 39999) r / min = 120 X frequency reference (Hz) / Cn - 20 (Set the number of motor poles in Cn 20)
40 to 39999	The position of decimal point is set by the value of the 5th digit of Cn - 20 Value of 5th digit = 0 Displayed as XXXX Value of 5th digit = 1 Displayed as XXX X Value of 5th digit = 2 Displayed as XX XX Value of 5th digit = 3 Displayed as X XXX A set value of 100% frequency is determined by the 1st digit to 4th digit of Cn - 20 Example 1 When the set value of 100% speed is 200 0, Cn - 20 = 12000 is set 100% speed is displayed as 200 0 at Cn - 20 = 12000 60% speed is displayed as 120 0 Example 2 When the set value of 100% speed is 65 00, Cn - 20 = 26500 is set 60% speed is displayed as 39 00 at Cn - 20 = 26500

(13) Agreed frequency (Cn-21)

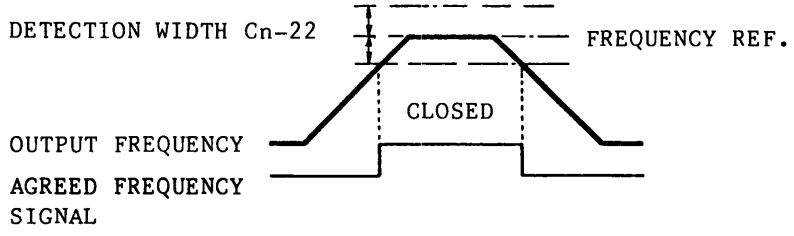
Set an agreed frequency point in units of 0.1 Hz.

(14) Agreed frequency detection width (Cn-22)

Set an agreed frequency detection width in units of 0.1 Hz. The relation with multi-function contact output are shown in the four figures below [(a) to (d)].

(a) Agreed frequency (set value of multi-function contact output = 2)

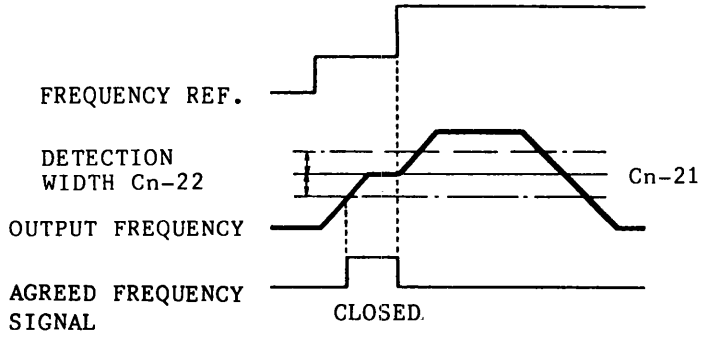
This is "closed" when output frequency is within the detection width shown in the following figure.



(Frequency ref. − Cn-22) ≦ Output frequency ≦ (Frequency ref + Cn-22)
Cn-21 Agreed frequency point
Cn-22 Agreed frequency detection width

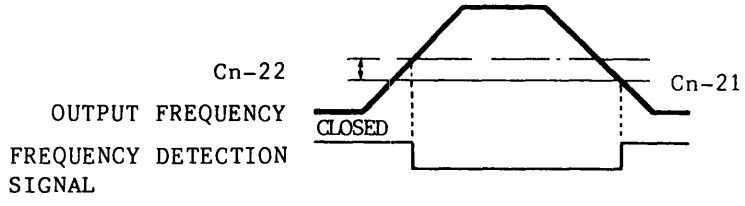
(b) Agreed frequency (set value of multi-function contact output = 3)

This is "closed" when acceleration or deceleration is completed and output frequency is within the detection width shown in the figure below.



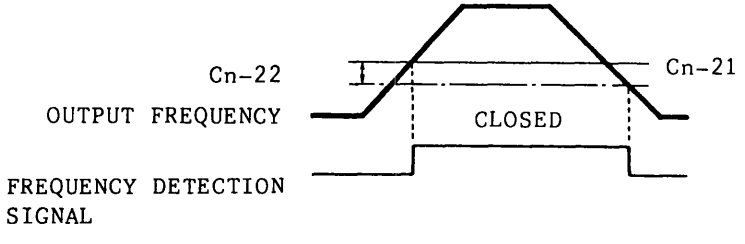
(Cn-21 − Cn-22) ≦ Output frequency ≦ (Cn-21 + Cn-22)
Cn-21. Agreed frequency point
Cn-22 Agreed frequency detection width

(c) Frequency detection contact (set value of multi-function contact output = 4)
This contact is "closed" when output frequency is equal to or less than Cn-21, as shown in the figure below.



Output frequency ≦ Cn-21
Cn-21 Agreed frequency point
Cn-22· Agreed frequency detection width

(d) Frequency detection contact (set value of multi-function contact output = 5)
This contact is "closed" when output frequency is equal to or more than Cn-21, as shown in the figure below.



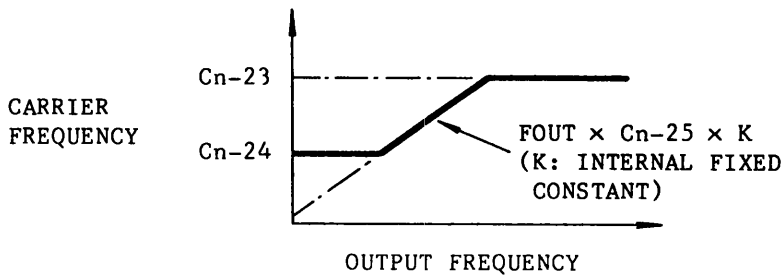
Output frequency ≧ Cn-21
Cn-21 Agreed frequency point
Cn-22 Agreed frequency detection width

(15) Carrier frequency upper/lower limit, proportion gain (Cn-23 to Cn-25)

The relationship between output frequency and carrier frequency is determined as follows from the set values of Cn-23 to Cn-25.

(a) For constant carrier frequency (set value of Cn-23):
Set 0 in Cn-25 and set the same value in Cn-23 and Cn-24.

(b) For carrier frequency: Carrier frequency changes according to Cn-23 to 25 set values and output frequency as shown below.



oPE 11 is displayed in the following cases:

① Cn-25 > 6 and Cn-24 > Cn-23
② Cn-23 > 5 kHz and Cn-24 ≦ 5 kHz

(16) Overtorque detection level (Cn-26)

Set overtorque detection level in units of 1%. Inverter rated current is regarded as 100%.

(17) Overtorque detection time (Cn-27)

Set overtorque detection time in units of 0.1 second.

(18) Stall prevention level during acceleration (Cn-28)

Set stall prevention level during acceleration in units of 1%. Inverter rated current is regarded as 100%.

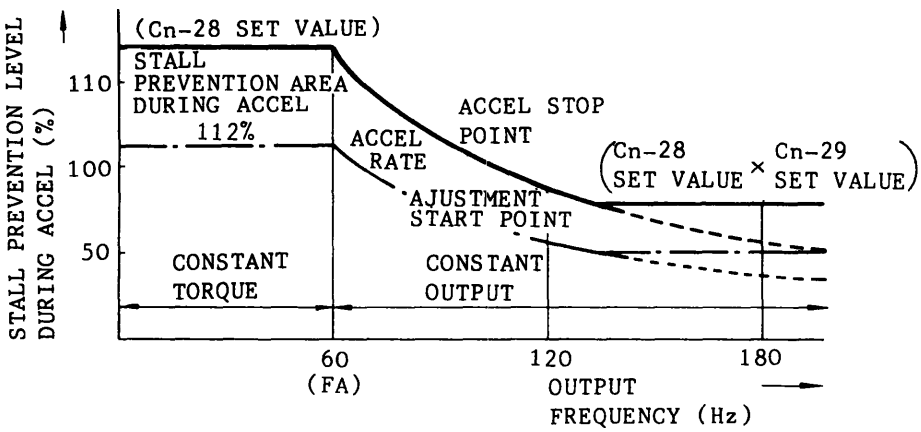
(19) Constant HP (kW) area stall prevention limitter (Cn-29)

Set constant HP (kW) area stall prevention level in units of 1%. Inverter rated current is regarded as 100%.

The function of stall prevention during acceleration automatically extends acceleration according to load status (inverter output current), thus preventing the motor from stalling during acceleration. The stall prevention level during acceleration in a constant output area is reduced as follows:

When the 1st digit of Sn-10 is 1, the output frequency increases at the rate determined by acceleration time:

$$\text{Acceleration stall prevention level of constant output area} = \frac{\text{Acceleration stall prevention level (Cn-28)} \times \text{Maximum voltage frequency (Cn-04)}}{\text{Output frequency}}$$

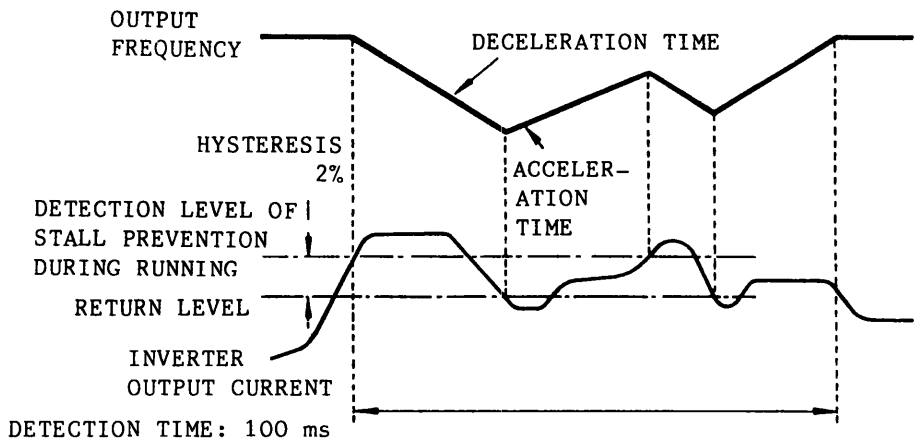


(20) Stall prevention level during running (Cn-30)

Set a proportion as a stall prevention level during running in units of 1%. Inverter rated current is regarded as 100%

Stall prevention during running starts deceleration when the output current reaches 100 ms greater than the setting value of Cn-30 (stall prevention level during running) during agreed frequency. The inverter decelerates as long as the output current exceeds the setting value of Cn-30 (stall prevention level during running). When the output current goes below the setting value, the inverter reaccelerates. The deceleration time selected in the 4th digit of Sn-10 is taken.

Even during stall prevention while running, stall prevention during deceleration and stall prevention during acceleration are enabled.



OPERATION OF STALL PREVENTION DURING RUNNING

(21) Motor no-load current (Cn-34)

Set motor no-load current in units of 1%. Motor rated current (Cn-09) is regarded as 100%.

When the output current of the inverter is larger than motor no-load current (Cn-34), the output frequency of the inverter is compensated.

The amount of frequency compensation is determined by the formula below. The maximum voltage frequency (Cn-04) is 100% level.

If the output current is equal to the motor rated current (Cn-09), the output frequency is compensated for by the motor rated slip (bn-08).

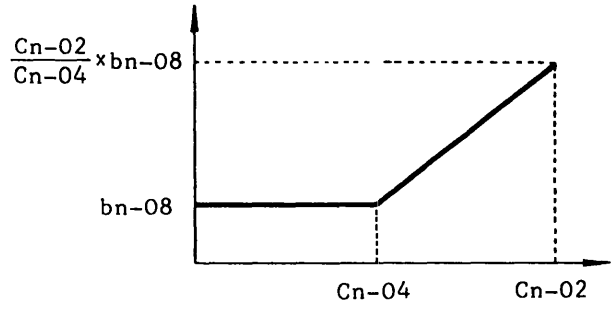
If frequency reference is equal to or smaller than minumum output frequency (Cn-07) or motor is in a regeneration mode, slip compensation is not performed.

Amount of output frequency compensation =

$$\frac{\text{Motor rated slip}}{\left(\begin{array}{c}\text{Motor rated}\\ \text{current}\end{array} - \begin{array}{c}\text{Motor no-load}\\ \text{current}\end{array}\right)} \times \left(\begin{array}{c}\text{Output}\\ \text{current}\end{array} - \begin{array}{c}\text{Motor no-load}\\ \text{current}\end{array}\right)$$

Motor rated current Cn-09
Motor no-load current Cn-34
Motor rated slip· bn-08

The amount of output frequency compensation in a constant torque area and a constant output area is as shown in the figure below.



(22) Slip compensation primary delay time (Cn-35)

Set slip compensation primary delay time in units of 0.1 second.

(23) No. of auto reset/restart operation (Cn-36)

Set the number of auto reset/restart operation. Setting of zero causes no auto reset/restart operation.

Each time one of OC, OV, OL1, OL2, OL3, OH, UV1 (OC, GF, OV, rr or UV1) fault occurs, one is added to the number of auto reset/ restart operation, and auto reset/restart operation is performed according to the following procedure. However, auto reset/restart operation is not performed in the following cases:

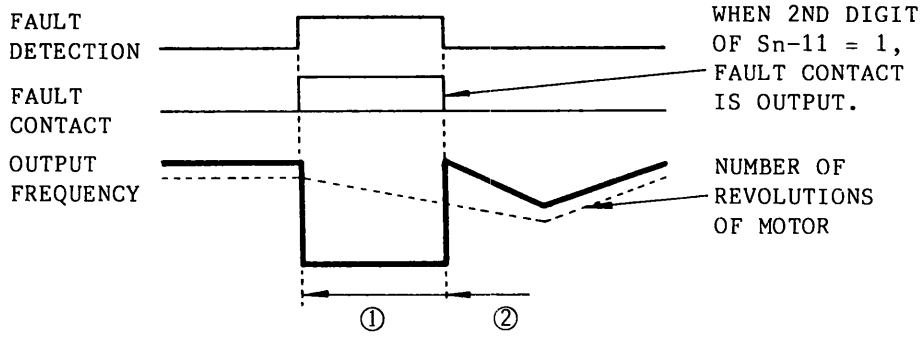
① When operation not continued at momentary power loss (3rd digit of Sn-11 = 0) is specified, UV1 fault is not automatically reset.
② When OC or OV fault occurs due to external fault during deceleration stop or DC injection braking stop, inverter output is shut off.

The number of auto reset/restart operation is cleared to zero when:

① No fault occurs for 10 minutes or more.
② A fault reset signal is input from control circuit terminals or digital operator.

Auto reset/restart operation

① When a fault is detected, inverter output is shut off for the minimum baseblock time (Cn-40). During shut off of inverter output, a fault occurring in the operator is displayed.
② When the minimum baseblock time (Cn-40) elapses, the fault is automatically reset, and speed search operation is performed with the output frequency at the time of the fault.
③ When the total number of fault exceeds the number of auto restart attempts (Cn-36), automatic reset is not performed and inverter output is shut off. At this time, fault contact output is output.



(24) Power loss ride-thru time (Cn-37)

Set in units of 0.1 second. The initial value depends on the inverter capacity.

7.7 CONTROL CONSTANT Cn-□□ (Cont'd)

(25) Speed search deactivation current level (Cn-38)

When inverter output current immediately after power recovery is larger than the set value of Cn-38, speed search operation is started. When inverter output current is smaller than the set value of Cn-38, the frequency is interpreted as a speed synchronization point and acceleration or deceleration is performed again up to a specified frequency.

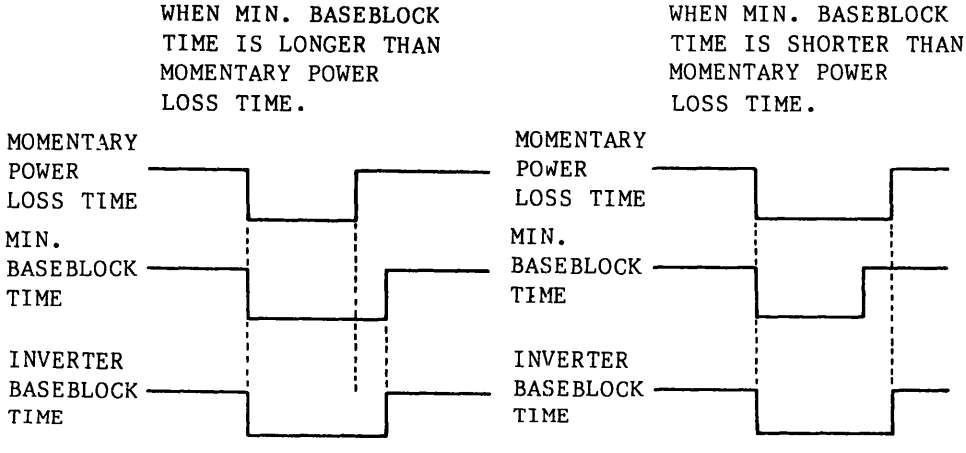
(26) Speed search decel time (Cn-39)

Set deceleration time during speed search in units of 0.1 second. Setting of 0.0 second causes no speed search.

(27) Minimum baseblock time (Cn-40)

On detecting momentary power loss, the inverter shuts off output and maintains the baseblock state for a given time. Set in Cn-40 the time when residual voltage is expected to be almost zero.

When momentary power loss time is longer than the minimum baseblock time, speed search operation is started immediately after power recovery.



(28) V/f during speed search (Cn-41)

To ensure that a fault such as OC does not occur during speed search operation, V/f must be reduced during speed search operation, as compared with that during normal operation. Set V/f during speed search as follows by the set value of Cn-41:

V/f during speed search = V/f at normal operation × Cn-41

(29) Voltage recovery time (Cn-42)

Set in Cn-42 the time between completion of speed search operation and return to V/f at normal operation. The set of voltage recovery time is set as follows:

200 V class: Time required to raise voltage from 0 to 200 V
400 V class: Time required to raise voltage from 0 to 400 V
575 V class: Time required to raise voltage from 0 to 575 V

7.8 MONITOR DISPLAY Un-□□

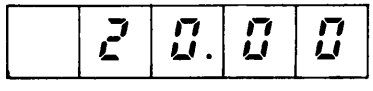
Items to be monitor displayed differ as follows, according to Un-xx.

Un - □□	Monitor Item	Display Example
01	Frequency reference	60 0*2
02	Output frequency	60 0
03	Output current	12 5 A
04	Output voltage	200 V
05	DC voltage	Pn 270
06	Output power(± display)*1	12 5*3
07	Input terminal status	*4
08	Output terminal status	*5
09	LED lamp check	88888
10	PROM No	*6

*1 + is not displayed

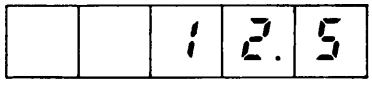
*2 Display of frequency reference (Un-01)
Frequency reference is displayed with five significant digits

<Example>



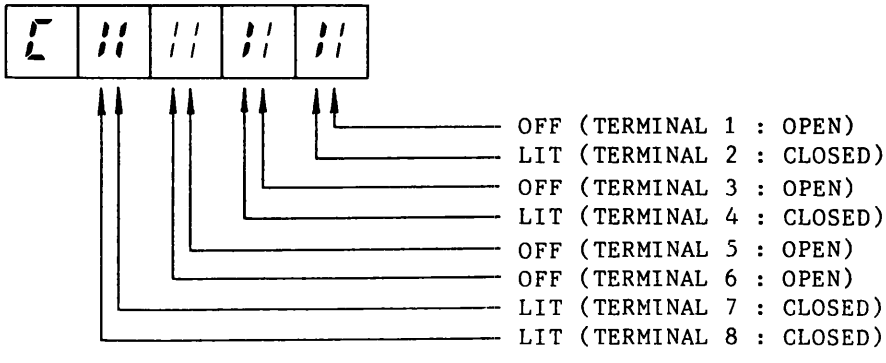
*3 Display of output power (Un-06)
Output power is displayed in units of 0 1 kW

<Example>



*4 Display of input terminal status (Un-07)
Input terminal status is displayed.

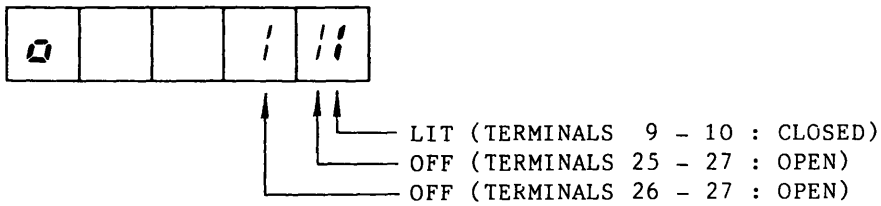
<Example> External terminals 1, 3, 5 and 6 open
External terminals 2, 4, 7 and 8 closed



7.8 MONITOR DISPLAY Un-□□ (Cont'd)

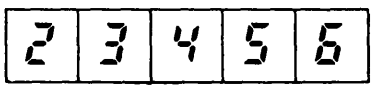
*5 Display of output terminal status (Un-08)
Output terminal status is displayed

<Example> Control circuit terminals 9 - 10 closed
Control circuit terminals 25 - 27, 26 - 27 open



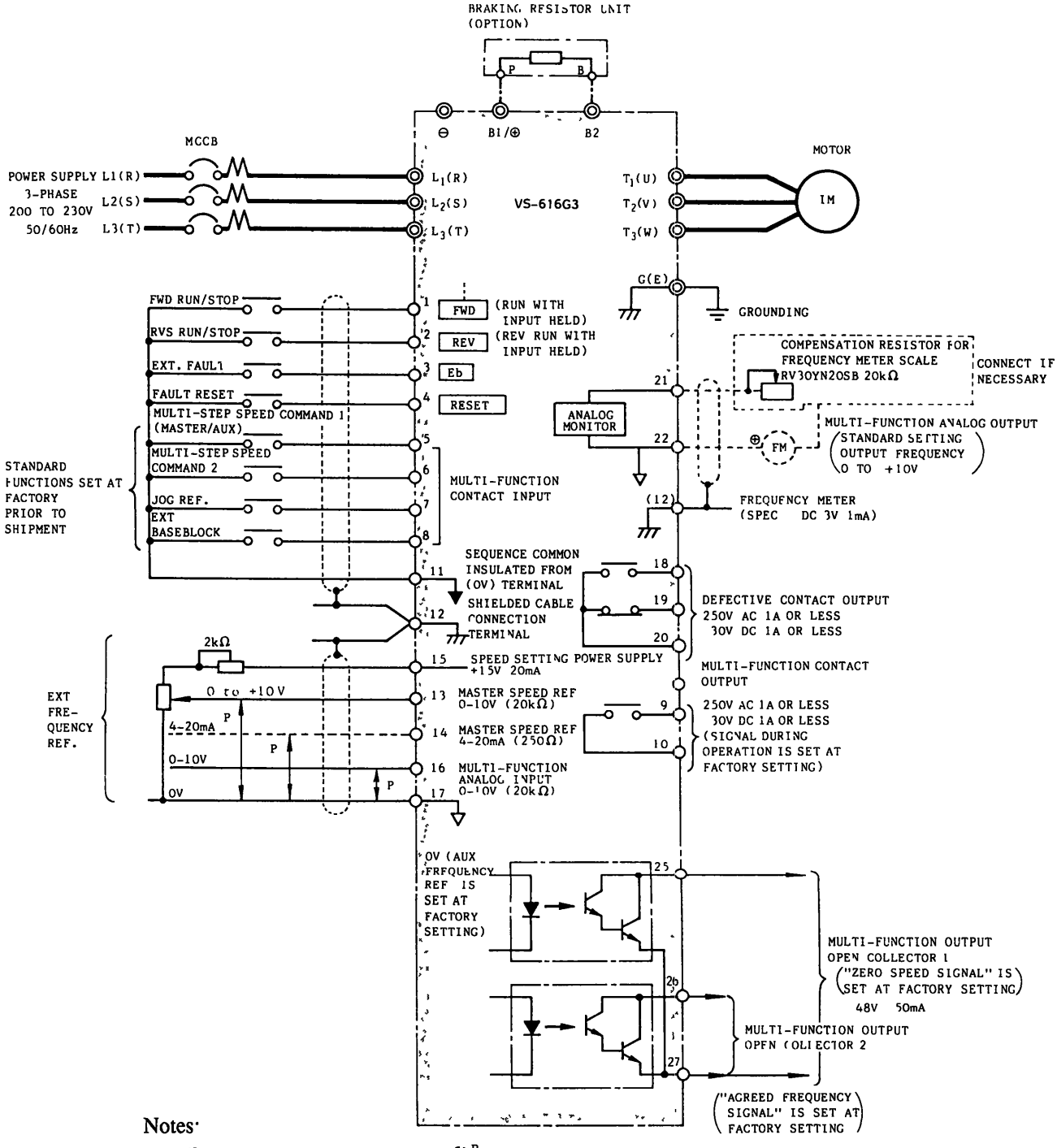
*6 Display of PROM No (Un-10)
PROM No is displayed

<Example> PROM No is NSG123456



8. VS-616 G3 TERMINAL FUNCTIONS

TYPICAL CONNECTION DIAGRAM [200 V Class, 10 HP (7 5 kW) or less]



Notes·

1. shows shielded wire and shows twisted pair shielded wire
2. Output current capacity of +15 voltage in external terminal 15 is max. 20 mA.
3. For master speed reference, use control circuit terminal 13 or 14.
4. ◎ shows main circuit and ○ shows control circuit.
5. Multi-function analog output is used for a indicator (e g frequency meter) It can not be used for control system such as feedback control For output for control system, use analog monitor card (AO-08 or AO-12) (option)

DIGITAL OPERATOR
INSTRUCTIONS

TOKYO OFFICE Ohtemachi Bldg 1-6-1 Ohtemachi Chiyoda-ku, Tokyo 100 Japan
Phone (03) 3284-9111 Telex YASKAWA J33530 Fax (03) 3284-9034
YASKAWA ELECTRIC AMERICA, INC
Chicago-Corporate Headquarters 2942 MacArthur Blvd Northbrook IL 600€2-2028 U S A
Phone (708) 291-2340 Fax (708) 498-2430
Chicago-Technical Center 3160 MacArthur Blvd Northbrook IL 60062-1917 U S A
Phone (708) 291-0411 Fax (708) 291-1018
MOTOMAN INC
805 Liberty Lane West Carrollton, OH 45449 U S A
Phone (513) 847-6200 Fax (513) 847-6277
YASKAWA ELÉTRICO DO BRASIL COMÉRCIO LTDA
Rua Conde Do Pinhal 8-5°, Andar Sala 51 CEP 01501-São Paulo-SP Brasil
Phone (011) 35-1911 Fax (011) 37-7375
YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone (49) 6196-569-300 Fax (49) 6196-888-301
Motoman Robotics AB
Box 130 S-38500 Torsås Sweden
Phone 0486-10575 Fax 0486-11410
Motoman Robotec GmbH
Kammerfeldstraße 1 85391 Allershausen Germany
Phone 08166-900 Fax 08166-9039
YASKAWA ELECTRIC UK LTD
3 Drum Mains Park Orchardton Woods Cumbernauld Scotland G68 9LD U K
Phone (236)735000 Fax (236)458182
YASKAWA ELECTRIC KOREA CORPORATION
8th Floor Seoul Center Bldg, 91-1 Sogong-Dong Chung-ku Seoul Korea 1C0-070
Phone (02)776-7844 Fax (02)753-2639
YASKAWA ELECTRIC (SINGAPORE) PTE LTD
Head Office CPF Bldg, 79 Robinson Road # 13-05, Singapore 0106 SINGAPORE
Phone 221-7530 Telex (87) 24890 YASKAWA RS Fax 224-5854
Service Center 221 Henderson Road, # 07-20 Henderson Building Singapore 0315 SINGAPORE
Phone 276-7407 Fax 276-7406
YATEC ENGINEERING CORPORATION
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road Taipei Taiwan
Phone (02) 563-0010 Fax (02) 567-4677
SHANGHAI OFFICE Room No 8B Wan Zhong Building 1303 Yan An Road (West) Shanghai 200050 CHINA
Phone (86) 212-1015 Fax (86) 212-1015
TAIPEI OFFICE Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road Taipei Taiwan
Phone (02) 563-0010 Fax (02) 567-4677

YASKAWA

YASKAWA ELECTRIC CORPORATION

© Printed in Japan June 1995 93-5 5TA ◇4
690 128