ACP & D LIMITED

SPEECON 7200M3

Manual

27/03/03

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1 7200M3 INVERTER MAIN UNIT

The 7200M3 is an all-digital inverter of compact size and low noise. Two types of models are available: with digital operator (JNEP--13) and with analog operator (JNEP--14). Using the digital operator achieves optimum drive and monitoring by changing the control constant setting. The model provided with the analog operator is used for simple applications where no complicated constant setting are necessary. Free kit operator (JNEP--15) is also available for sample applications.

1.1 PARTS NAMES OF 7200M3

• With Digital operator

PROTECTIVE COVER
TERMINAL COVER
DIGITAL OPERATOR (JNEP--13
DIE-CAST CASE

• With analog operator

External dimensions and mounting Method of analog operator is the same as for digital operator.

ANALOG OPERATOR (JNEP--14)

• Free Kit operator

Dimensions are the same as As for digital operator.

1.2 RECEIVING

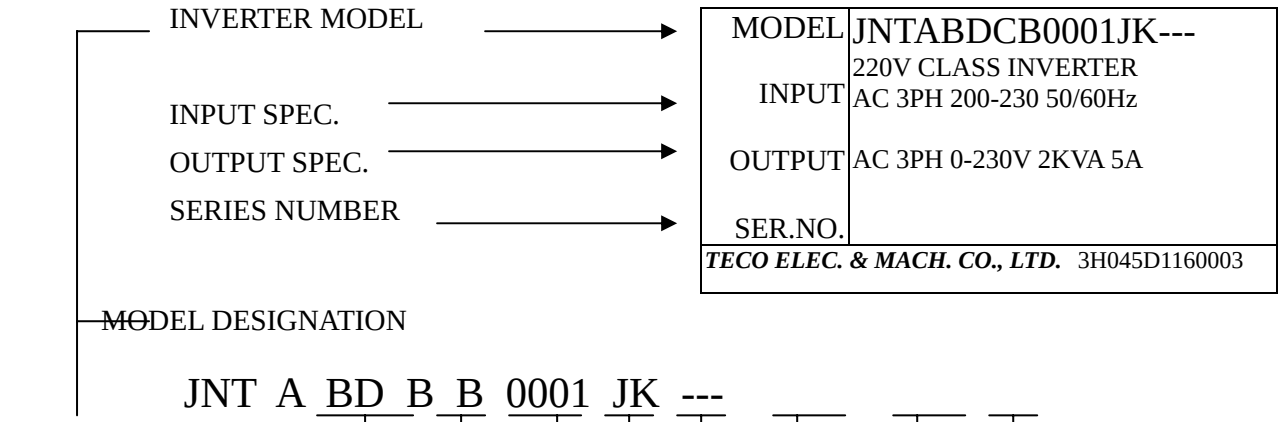
This 7200M3 has been put thorough demanding tests at the factory before shipment.
After unpacking, check for the following.

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

- Transit damage

  If any part of 7200M3 is damaged or missing, immediately notify the shipper.

NAMEPLATE DATA



MODEL DESIGNATION

JNT A BD B B 0001 JK ---

7200M3 SERIES

Reserved

Voltage

Input Voltage
A:Three-phase
B:Single-phase

JK:200 to 230V
AZ:400 to 460V

Specifications
BD:Domestic standards
BE:UL listed component
(planning)

Applicable max. motor Output
R500:0.5HP
0010:10HP

Operator type
B:Digital Operator (JNEP--13)
C:Analog Operator (JNEP--14)
D:Free Kit (JNEP--15)

Enclosures and mountings
A:Open chassis type (IEC IP00)
B:Enclosed ,Wall-mounted type
(NEMA-1)

1.3 INSTALLATION

CAUTION:

• Handle with care so as not to damage the inverter during transportation
• Do not hold only the faceplate (plastic section) but the die-cast section.

LOCATION

Location of the equipment is important to achieve proper performance and normal operating life. The 7200M3 units should be installed in areas where the following conditions exist.

•Ambient temperature:
-10 to +40°C ,+14 to 104°F (For enclosed type) ,
-10 to +45ºC ,+14 to 113ºF (For open chassis type)
•Protected from rain or moisture.
•Protected from direct sunlight.
•Protected from corrosive gases or liquids.
•Free form airborne dust or metallic particles.
•Free form vibration.
•Free form magnetic noise.

MOUNTING SPACE

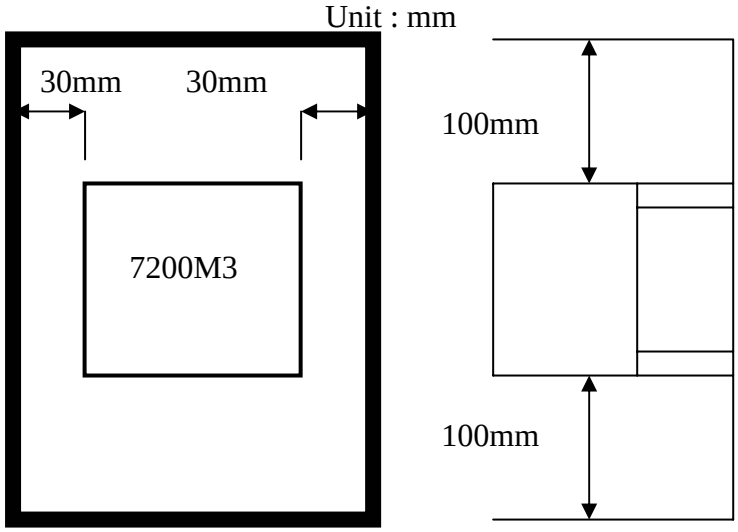


Fig 1.1 Mounting Space

1.4 WIRING

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

1.4.1 Terminal Cover Mounting/Removing

Please see the 7200M3 manual page 4.

For removing terminal cover, first remove the operator, then press the cover in direction of 1 (on both sides) and, at the same time, lift in direction of 2 . For mounting, reverse the procedure. The figure below shows how to unlock (in direction of 1) and lock (in direction of 2) the ribbon cable between the digital operator and the inverter.

Please see the 7200M3 manual page 4.

1.4.2 Standard Wiring Diagram

Models with digital operator can be operated from the digital operator (JNEP--13) only by main circuit wiring. When these models are operated by control circuit terminals, control constant change is required. For details, refer to RUN STOP PROCEDURE SELECTION" on page 68. Models with analog operator (JNEP--14) re preset in operation mode from control circuit terminals at the factory prior to shipping.

(1) Run by digital operator

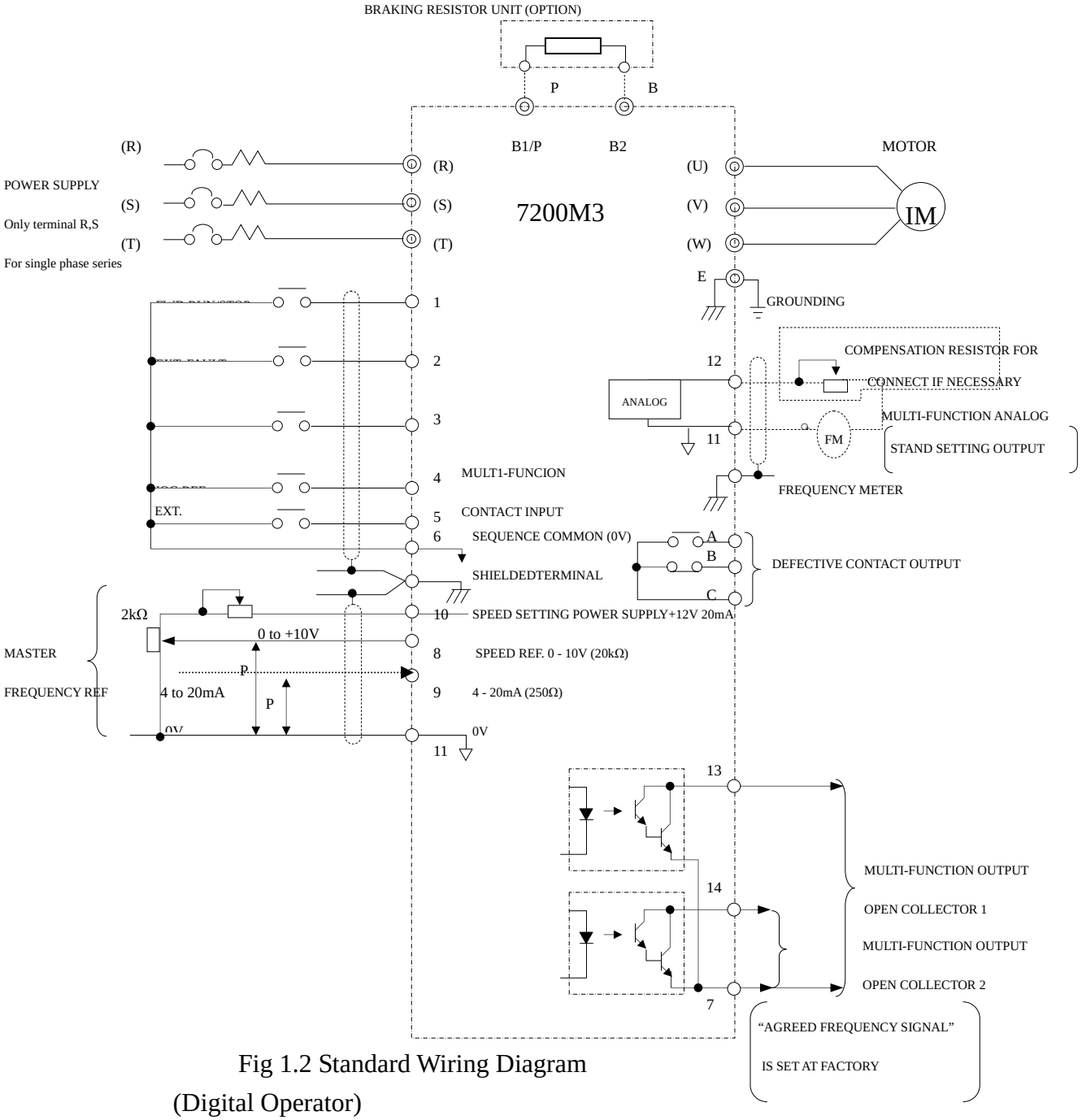


Fig 1.2 Standard Wiring Diagram (Digital Operator)

(2) Run by analog operator

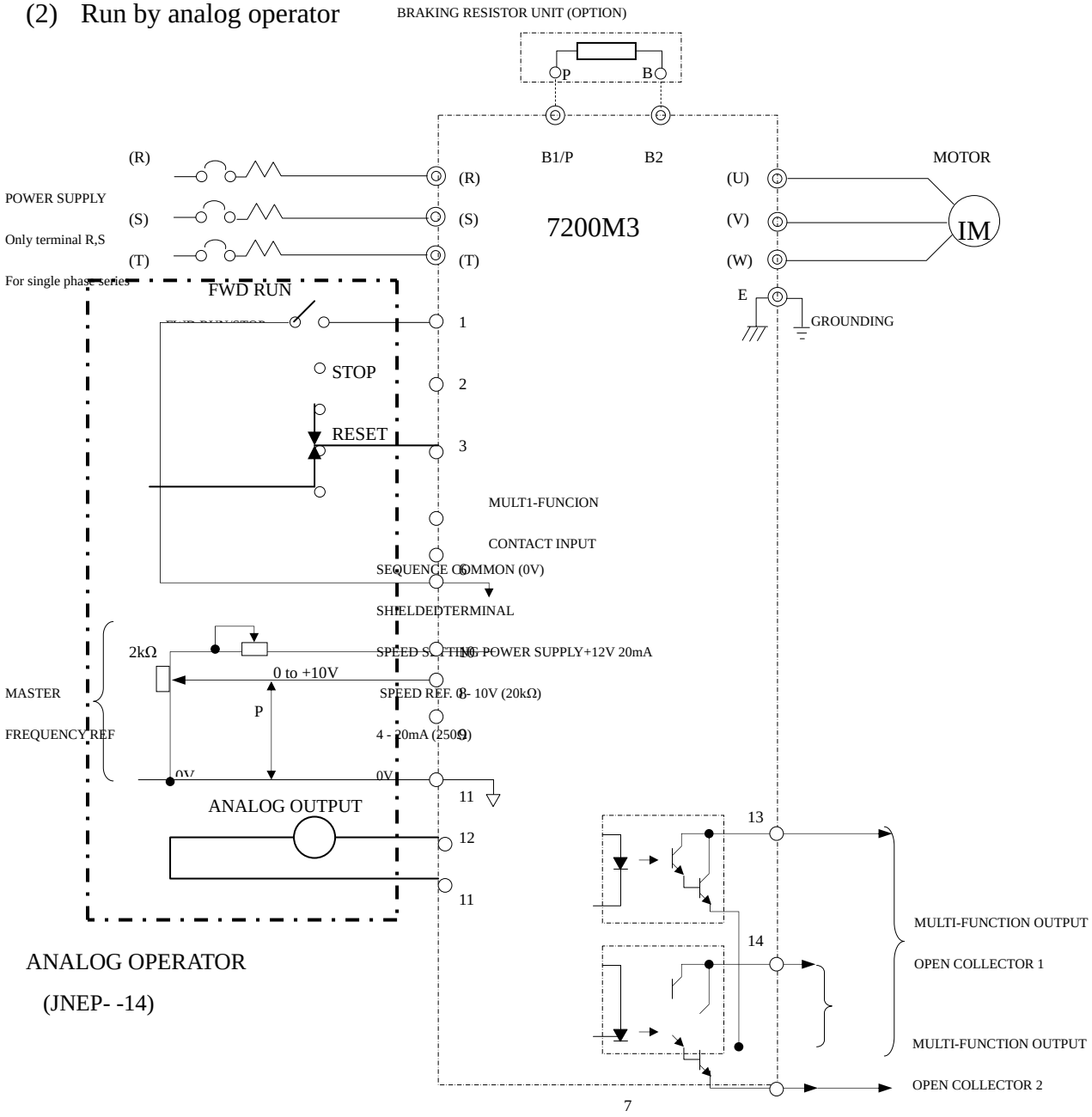


Fig 1.3 Standard Wiring Diagram (Analog Operator)

Notes:

1. Indicates shielded leads and p twisted-pair shielded leads.

2.External terminal (10) of +12V has maximum output current capacity of 20 mA.

3.Terminal Symbols: ◎ shows main circuit; ○ shows control circuit.

*Set thermal overload relay between braking resistor and inverter when using braking resistor (type ERF-150WJ) to protect braking resistor from overheating.

Also, use sequencer to break power supply side on thermal overload relay trip contact when using braking resistor.

1.4.3 Main Circuit

(1) Main circuit wiring

Connect wiring as shown in Fig.1.4

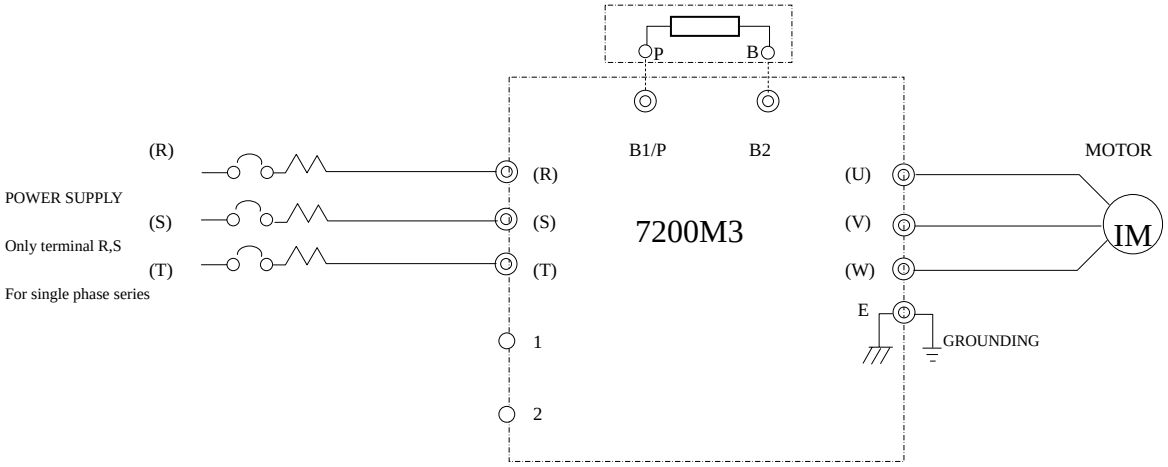


Fig.1.4 Main Circuit Wiring

(2) Main circuit terminals

Table 1.1 7200M3 Main Circuit Terminals

Terminal	Description
R	Main circuit power input R , S are used for single-phase input specifications.
S	
T	
U	Inverter output
V	
W	
B1/P	Braking resistor (options)
B2	
E*	Grounding (ground resistance should be 100 ohms or less)

* Use screw for frame ground.

• Main circuit terminal arrangement

3-Phase series (all models)

R	S	T	B1/P	B2	U	V	W

220V single-phase series

R	S		B1/P	B2	U	V	W

BLANK

(3) Molded-case circuit breaker (MCCB) and power supply magnetic contactor. (MC)

Be sure to connect MCCBs between AC main circuit power supply and 7200M3, input terminals R , S , T, to protect wiring. Recommended MCCBs are listed in Table1.2.

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

Table 1.2 Molded-case Circuit Breakers and Magnetic Contactors

•220V Class (3-Phase & Single-Phase Input Series)

Voltage Class	220V 3-phase					220V Single-phase					
Inverter model	JNTABDCB JK---					JNTBBDCB JK---					
R500	0001	0002	0003	0005	7R50	0010	R500	0001	0002	0003	0005
Capacity KVA 1.4	2.1	2.7	4.1	6.9	10.3	13.7	1.4	2.1	2.7	4.1	6.9
Rated Output Current A 3.2	4.8	6.5	9.6	16	24	32	3.2	4.8	6.5	9.6	16
MCCB 5A	10A	20A	20A	30A	50A	60A	10A	20A	20A	40A	50A
TAIAN CN-11 Magnetic Contactors Model	CN-11	CN-11	CN-11	CN-16	CN-18	CN-25	CN-11	CN-11	CN-16	CN-18	CN-25

•440V Class (3-Phase Input Series)

Voltage Class	440V 3-phase						
Inverter model	JNTABI AZ---						
	R500	0001	0002	0003	0005	7R50	0010
Capacity KVA	1.4	2.2	3.4	4.1	6.9	10.3	13.7
Rated Output Current A	1.6	2.6	4	4.8	8	12	16
MCCB	5A	10A	10A	10A	20A	20A	30A
TAIAN Magnetic Contactors Model	CN-11	CN-11	CN-11	CN-11	CN-18	CN-18	CN-25

(4) Surge absorber

The surge absorbers should be connected to the coils of control relays , magnetic contactors ,magnetic valves ,or magnetic brake used for the 7200M3 periphery. Otherwise ,large surge voltage occurs at

switching and may cause devices to be damaged or to malfunction. Select type from Table 1.3.

Table 1.3 Surge Absorbers

Coils of Magnetic Contactor and Control Relay		Surge Absorber*	
		Model DCR2-	Specifications
200V to 230V	Large-size Magnetic Contactors	50A 22E	220 VAC 0.5uF 200 ohm
	Control Relay MY-2,-3(OMRON) HH-2, -23(FUJI) MM-2,-4(OMRON)	10A 25C	250 VAC 0.1uF 100
380 to 460 V Units		50D 100B	1000 VDC 0.5uF 220 ohm

*Made by MARCON Electronics.

(5)Wire and terminal screw sizes

Table 1.4 shows wire sizes and types.

Table 1.4 Wire Size

· 220V Class 3-phase Input Series

Circuit	Model JNTAABD-CB	Inverter Capacity (KVA)	Terminal Symbol	Terminal Screw	Wire Size	Wire Type	
					AWG	mm²	
Main Circuit	R500JK---	1.4	R, S, T, B1/P, B2, U, V, W	M4	14 –10 14 -10	2 to 5.5 2 to 5.5	Power cable: 600V vinylsheathed lead or equivalent
	0001JK---	2.1	R, S, T, B1/P, B2, U, V, W	M4	14 –10 14 -10	2 to 5.5 2 to 5.5	
	0002JK---	2.7	R, S, T, B1/P, B2, U, V, W	M4	12 -10 14 -10	3.5 to 5.5 2 to 5.5	
	0003JK---	4.1	R, S, T, B1/P, B2, U, V, W	M4	12 -10 14 -10	3.5 to 5.5 2 to 5.5	
	0005JK---	6.9	R, S, T, B1/P, B2, U, V, W	M4	12 -10 14 -10	3.5 to 5.5 2 to 5.5	
	7R50JK---	10.3	R, S, T, B1/P, B2, U, V, W	M5	10 -8 14 -10	5.5 to 8 2 to 5.5	
	0010JK---	13.7	R, S, T, B1/P, B2, U, V, W	M5	10 -8 14 -10	5.5 to 8 2 to 5.5	
Control Circuit	Common to All Models		1 ~ 14 , A , B , C	M3.5	20 -14	0.5 to 2	Shielded lead or equivalent

Table 1.4 Wire Size (Cont'd)

220 V Class Single-phase Input Series

Circuit	Model JNTBB DCB	Inverter Capactiy(KVA)	Terminal Symbol	Terminal Screw	Wire Size AWG	Wire Size mm²	Wire Type
Main Circuit	R500JK---	1.4	R, S, T, B1/P B2, U, V, W E	M4	14 –10 14 –10	2 to 5.5 2 to 5.5	Power cable: 600V vinylsheathed lead or equivalent
	0001JK---	2.1	R, S, T, B1/P B2, U, V, W E	M4	14 –10 14 –10	2 to 5.5 2 to 5.5	
	0002JK---	2.7	R, S, T, B1/P B2, U, V, W E	M4	14 –10 14 –10	2 to 5.5 2 to 5.5	
	0003JK---	4.1	R, S, T, B1/P B2, U, V, W E	M4	12 -8 14 –8	3.5 to 8 2 to 8	
	0005JK---	6.9	R, S, T, B1/P B2, U, V, W E	M4	10 -8 14 –8	5.5 to 8 2 to 8	
Control Circuit	Common to All Models		1˜ 14, A, B, C	M 3.5	20 -14	0.5 to 2	Shielded lead orequivalent

· 440V Class 3-phase Input Series

Circuit	Model JNTAB DCB	Inverter Capactiy (KVA)	Terminal Symbol	TerminalScrew	Wire Size AWG	Wire Size mm²	Wire Type
Main Circuit	R500AZ---	1.4	R, S, T, B1/P B2, U, V, W E	M4	14 -10 14 -10	2 to 5.5 2 to 5.5	Power cable:600Vvinyls heathed lead or equivalent
	0001AZ---	2.2	R, S, T, B1/P B2, U, V, W E	M4	14 -10 14 -10	2 to 5.5 2 to 5.5	
	0002AZ---	3.4	R, S, T, B1/P B2, U, V, W E	M4	14 -10 14 -10	2 to 5.5 2 to 5.5	
	0003AZ---	4.1	R, S, T, B1/P B2, U, V, W E	M4	14 -10 14 -10	2 to 5.5 2 to 5.5	
	0005AZ---	6.9	R, S, T, B1/P B2, U, V, W E	M4	14 -10 14 -10	2 to 5.5 2 to 5.5	
	7R50AZ---	10.3	R, S, T, B1/P B2, U, V, W E	M5	12 -10 14 -10	3.5 to 5.5 2 to 5.5	
	0010AZ---	13.7	R, S, T, B1/P B2, U, V, W E	M5	12 -10 14 -10	3.5 to 5.5 2 to 5.5	
Control Circuit	Common to All Models		1˜ 14, A, B, C	M3.5	20 -14	0 .5 to 2	Shielded lead or equivalent

NOTE

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

Phase-to-phase voltage drop(V)= √ 3× lead resistance(ohm/km)×wiring distance(m) ×current(A) ÷ 10^{3}

- Insertion of power supply coordination AC reactor

  When the power supply capacity exceeds 600 KVA, connect an AC reactor at the inverter input side for power supply coordination. This reactor is also effective for power factor improvement of the power supply.

- Wiring length between inverter and motor

  If total wiring distance between inverter and motor is excessively long and inverter carrier frequency (main transistor switching frequency) is high, harmonic leakage current from the cable willincrease to affect the inverter unit or peripheral devices. If the wiring distance between inverter and motor is long, reduce the in verter carrier frequency as shown below. Carrier frequency can be set by constant Pn-40. For details, refer to “CARRIER FREQUENCY SETTING” on page 89. Carrier frequency is set to 10 KHz at the factory prior to shipping.

Wiring Distance between Inverter and motor	Up to30 m	Up to50 m	Up to 100 m	100 m or more
Allowable Carrier Frequency (Constant Pn40 Set Value)	15KHz or less(6)	10KHz or less(4)	5KHz or less(2)	2.5KHz or less(1)

(6) Wiring

(a)Main circuit input/output

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

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

(3)Never connect AC main circuit power supply to output terminals U, V, W. Inverter may be damaged.

(4)Insert an L noise filter to the 7200M3 output, but never connect power factor correction capacitor, LC or RC to 7200M3 output.

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

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

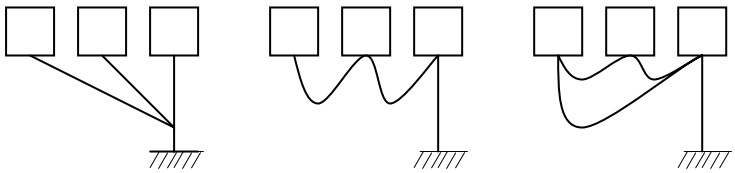
(b)Grounding

(1)Ground the casing of the 7200M3 using ground terminal E. Ground resistance should be 100ohm or less.

(2)Never ground 7200M3 in common with welding machines, motors, or other large-current electrical equipment,or a ground pole. Run the ground lead in a conduit separate from leads for large-current electrical equipment.

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

(4)Where several 7200M3 units are used side by side, all the units should be grounded as shown in (a) or (b) of Fig 1.5. Do not from a loop with the groundleads as shown in (c).



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

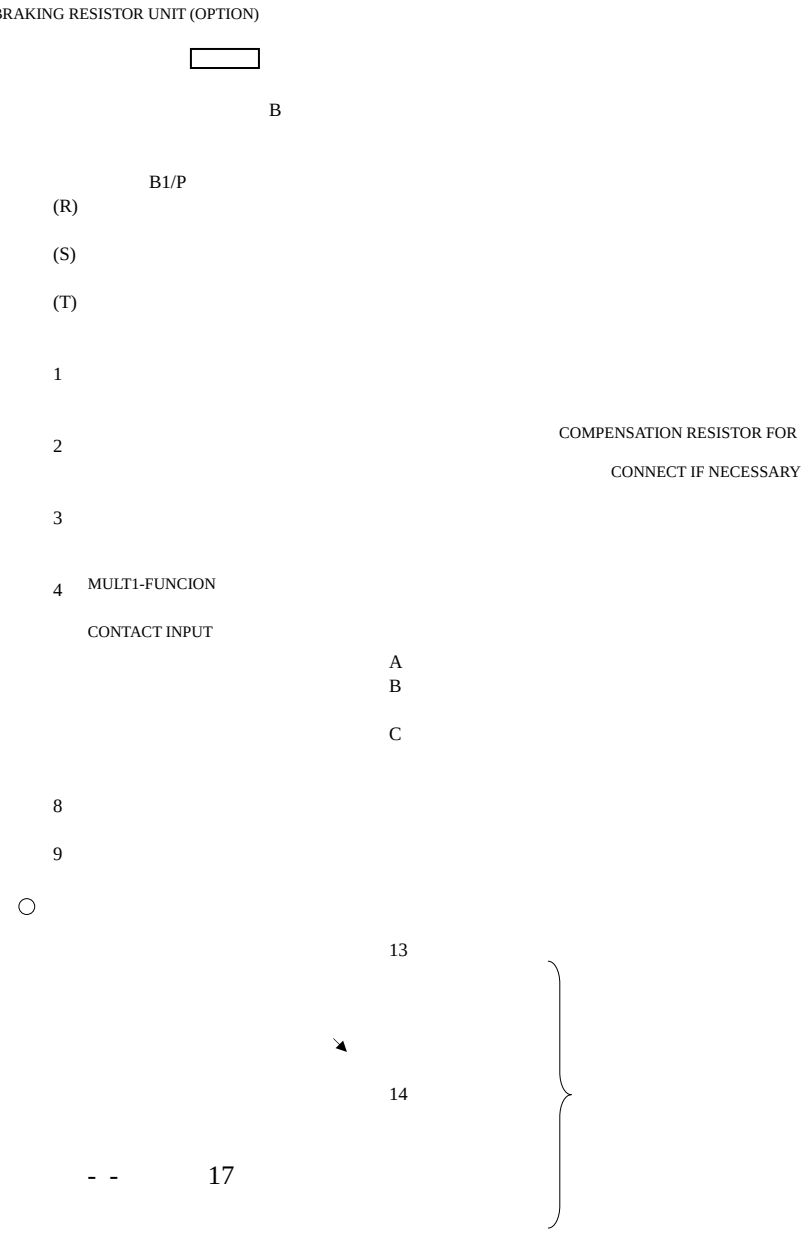
Fig.1.5 Grounding of Three 7200M3 Unit

1.4.4 Control Circuit

(1)Control circuit wiring

Fig.1.6 shows the relation between the I/O signals (factory pre-set values) and screw terminal numbers. The control signals are connected by screws. The terminal functions shown in the figure indicate standard setting prior to shipping. Since operation mode from the digital operator is set for the model with the digital operator, it is necessary to change the control constants when operation is performed from the control circuit terminals.

For the model with analog operator (JNEP--14) operation mode from the control circuit terminals is the standard setting preset at the factory prior to shipping.



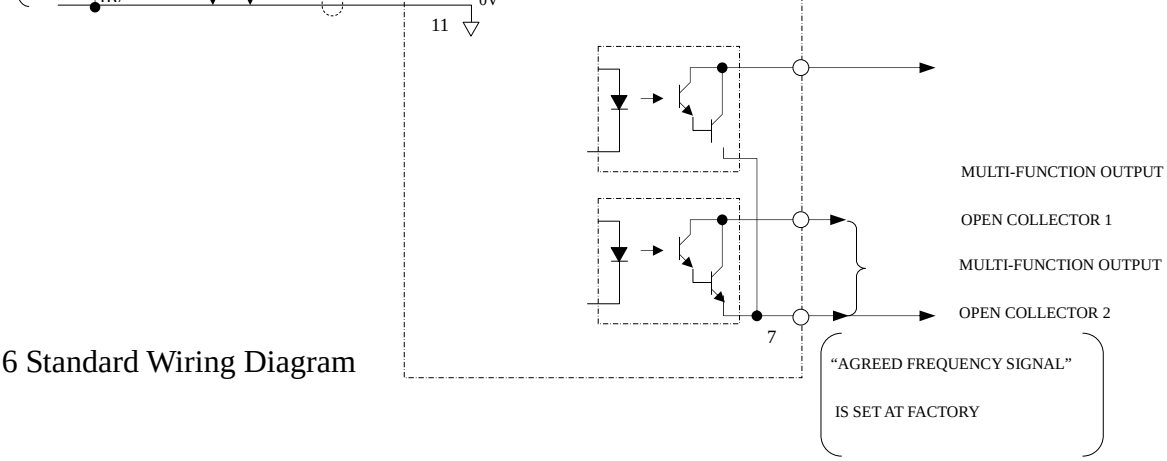


Fig 1.6 Standard Wiring Diagram

(2) Control circuit terminals (factory preset)

■ CONTROL CIRCUIT

Classi-fication	Terminal	Signal Name	Function		Signal level
Sequence Input Signal	1	Forward operation-stop signal	Forward run at closed, stop at open		Photo-coupler insulation input +24V DC 8mA
	2	Reverse operation-stop signal	Reverse run at closed, stop at open		
	3	Fault reset input	Reset at closed		
	4	External fault input	Fault at closed	Multifunction contact input: Two signals available to select. (Note 1)	
	5	Multi-step speed ref. 1	Effective at "closed"		
	6	Sequence control input common terminal	----------		
Analog Input Signal	10	Power supply terminal for speed ref.	Speed ref. power supply		+12V (Allowable current 20mA max.)
	8	Speed frequency ref.	0 to +10V/ Max. Output freq.		0 to +10V (20kΩ)
	9		4 to 20Ma/ Max. Output freq..		4 to 20Ma (250Ω)
	11	Common terminal for control circuit	0 v		----------
Sequence Output Signal	13	During running (NO)	"L" level at Run	Multifunction contact input: Two signals available to select. (Note 2)	Open collector output +48V 50Ma or less
	14	Speed agreed detection	"L" level at set. Frequency = output freq.		Open collector output +48V 50Ma or less
	7	Open collector output common			---------
	A	Fault contact output common (NO, NC)	Fault at closed between terminals A and C Fault at open between terminals B and C		Dry contact Contact capacity: 250VAC 1A or less 30VDC 1A or less
	B				
	C				
Analog Output signal	21	Frequency meter output	0 to 10V/ Max. output frequency. Possible to select current meter output. (Note 3)		0 t0 11 V max. 2 mA or less
	22	Common			

NOTE: 1. For details, refer to "MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION'' on page84.

2. For details, refer to "MULTIFUNCTION PHOTO-COUPLER OUTPUT FUNCTION SELECTION" on page 86.

3. For details, refer to "MULTIFUNCTION ANALOG MONITOR SETTING on page 76.

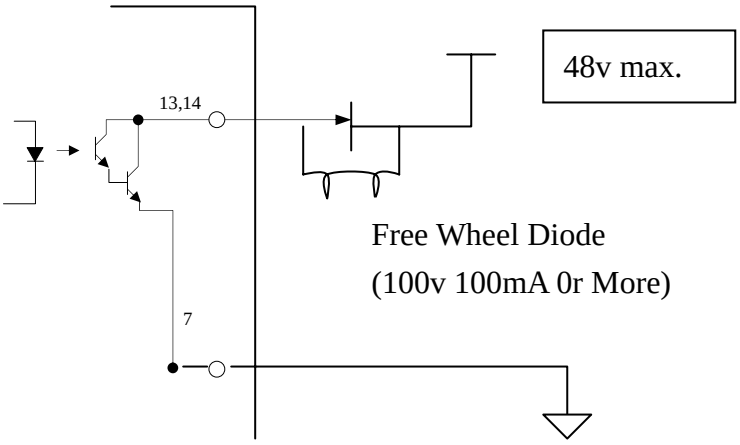
· Control circuit terminal arrangement

A	B	1	2	3	4	5	6	7	8	9	10	11	12	13	14

(3) Precautions on control circuit wiring

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

- Wiring length of the control signal line must be 50 m or less.
- To drive the contact input signal by transistor, use one having ratings of 50V 50m A or more. Circuit leakage current at signal OFF must be 100 A or less.
- To drive an inductive load (relay coil, etc.) by multifunction photo coupler output, be sure to insert a free wheel diode.



7200M3

1.5 OPERATION

1.5.1 Pre-operation Check

Check the following items after completion of installation and wiring:

(1) No fault in wiring.

Never connect AC main circuit power supply to output terminal (U, V, W)

(2) No short circuit because of wiring contamination (dust, oil, etc.)

(3) Screws and terminals are tightened. Wiring is proper.

Load status is good.

(4) For safe operation, the motor must be able to operate alone by separating it from the coupling of belt, which connects the motor and the machine. Pay close attention when the motor is operated with the machine directly connected.

(5) Wiring is not grounded.

(6) Run command is not input.

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

1.5.2 Pre-operation Setting

Since the standard inverter models are provided with the values indicated in Par. 2.8 (see page 58 and beyond), the digital operator (JNEP--13) must be used in order to change the constants from the initial values to the values in accordance with the load specifications.

The following describes the functions and initial constant set values which ere often used for operation.

Output frequency and accel / decel time	Frequency setting signal and output frequency
The maximum output frequency is set to 60 Hz and accel/decel time to 10 seconds at the factory prior to shipping .To change the values, refer to “ACCEL/DECEL TIME SETTING” on page 71.	Fig 1.8 shows the inverter output frequency for control circuit terminal master frequency reference voltage. To change the value, refer to “FREQUENCY COMMAND GAIN/BIAS” on page 78.

OUTPUT FREQ.

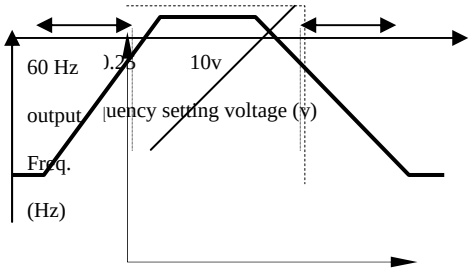
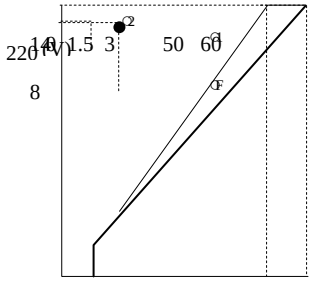


Fig. 1.7 Output Frequency and Accel/Decel Time

Fig. 1.8 Frequency Setting Signal and Output Frequency

V / F characteristics

Fig. 1.9 shows the output voltage for inverter output frequency. When its characteristic (max.voltage/frequency) differs from that of the optimum motor, refer to “V/f CHARACTERISTIC SETTING” on page 69.



*For 440 V class, the value is twice that of 220 V class.

Fig. 1.9 V/f Characteristics

Motor rated current setting

Since the inverter is provided with an electronic thermal overload protective function in order to protect the motor from overheating, set the rated current value described on the motor nameplate to constant (Pn-19). TECO standard 4-pole motor current value is set as the initial value .For details, refer to “ELECTRONIG THERMAL OVERLOAD FUNCTION” on page 74.

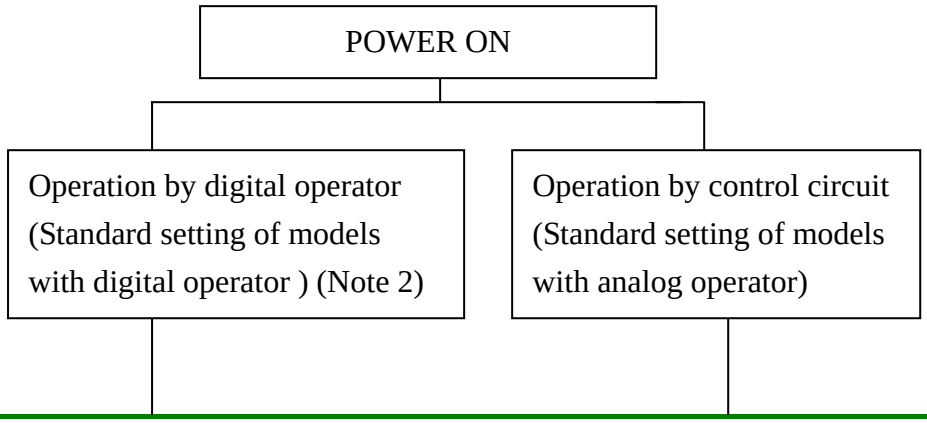
Note:

Provide a thermal overload relay or thermal protector for each motor when more than two motors are operated simultaneously.

1.5.3 Test Run M

The inverter can be operated in the following two ways .The model with digital operator is set to "OPERATION MODE BY DIGITAL OPERATOR" and the model with analog operator (JNEP--14) is set to "OPERATION MODE FROM CONTROL CIRCUIT TERMINAL" prior to shipping.

Run by digital operator (Standard setting of model with digital operator)	Run by control circuit terminal input (Standard Setting of model with analog operator)
This method is to operate the inverter by using the RUN (run command) key, etc. of the digital operator. Since this operation mode is set at the factory prior to shipping, operation can be performed only by main circuit wiring. For details of the operation method, refer to Section 2 beginning on page 43.	This method is to operate the inverter by frequency setter or operation switch connected to the control circuit terminal. To perform operation by control circuit terminal input of the model with digital operator, change the operation mode to " OPERATION FROM CONTROL CIRCUIT TERMINAL" (Pn-01=0000).



Operation Method Selection	Need not to change the mode since operation mode by digital operator is set at the factory.	· Enter the program mode (depress PRG/DRV key) and set Pn-01 data 0000 by using UP, DOWN Or SHIFT key. Then depress DATA key. • Enter the drive mode. (depress PRG/DRV key). • After above operation, command from control circuit terminal can be received. (Note)
Operation	△ ▽ · Select frequency reference value display F000.0 by depressing DSPL key on digital operator. • Depress DATA key after setting frequency value by using , or SHIFT key. • Depress RUN key.	· Turn the frequency setter knob to the left to decrease value fully. (Frequency reference=0) • Turn on FWD or REV run signal. • Turn the frequency setter knob slowly to the right to increase value fully.

Stopping	· Depress RUN key.	· Turn the frequency setter knob slowly to the left to decrease value fully. • Turn off FWD or REV run signal.

Note: 1. Models with analog operator (the standard setting preset at the factory prior to shipping) need not this operation.

2.Refer. to Par.2.2 “DIGITAL OPERATOR OPERATION EXAMPLE” (Page 49) for details of digital operator operation.

1.5.4 Inverter Status Display LED

With the model with analog operator or free kit operator, LED provided for the inverter is of help to know the inverter status. This LED can be seen by removing the terminal cover or from the right side without removing the cover. Inverter status can be seen by the LED lighting modes. Table 1.6 shows the LED lighting modes and the contents. Check that the inverter is in the normal status at power ON in the test run stage. Free kit operator (JNEP--15) has are LED on the operator cover also, it display the same inverter status as showing in table 1.6.

Table 1.6 LED Display and Contents

Inverter Status	LED Display DSI (RED.)	Display Contents	Remarks
Normal	☀	Operation ready (during STOP)	
		During normal RUN	
Alarm	☼	Power supply voltage reduction, external BB inputting. Etc. in STOP status	Automatic recovery by protective operation release
Protective operation	☼	Inverter external fault (EF is input).	Can be reset by removing the factor. (Hardware fault if not recovered)
		Overload protection such as inverter overload (OL.), fin overheat, etc.	
		Voltage protection such as over voltage (OV) under voltage (UV)	
		Over current protection (OC)	
Inverter fault		Digital hardware memory fault (CPF)	Cannot be reset (replace the inverter) (Note 1)
	•	Hardware fault such as control power supply fault, CPU runaway, etc.	Cannot be reset. (Replace the inverter).

• : LED light off, ☀ : LED blink, ☼ :LED light

Note 1. By initializing control constants using the digital operator, errors may be released. For details of constant initialization, refer to “DISPLAY OF OPERATOR” on page 67.

1.5.5 Digital Operator Display

When the inverter power supply is turned ON for the first time, the digital operator displays as shown below. If an alarm is displayed, refer to Par 1.7 “FAULT DISPLAY AND TROUBLESHOOTING” on page 26 to remove the factor.

1. 2. 3.

1. Drive mode display (DRV): Lights.
2. Rotating direction display (FWD): Lights
   (REV): Extinguished
3. EXT mode display (EXT RUN, CMD):
   Extinguished.
4 .During RUN display (RUN):
5. During STOP display (STOP): Lights.
6. 7-segment LED display (5digits):
   Output frequency reference set value

1.5.6 Check Points at Test Run

The following describes the checkpoints at test run. If any fault occurs, recheck the wiring and load status. For details, refer to Par. 1.7.3 “Corrective Action for Motor Faults” onpage31.

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

CAUTIONS

(1) The motor does not start up if both FWD and REV run signals are turned ON simultaneously. If they are turned ON simultaneously during run, the motor stops according to the stopping method selection of constant (Pn-01) 3 rd digit. (Deceleration to a stop is selected for factory setting.)

(2) When output frequency is reduced to 1.5 Hz (preset value prior to shipping) at deceleration, the DC injection braking operates for 0.5 second (preset value prior to shipping) and metallic noise is generated by the motor. However, this noise is normal. To eliminate this noise, refer to “DC INJECTION BRAKING” on page 80.

(3) If a fault occurs during acceleration or deceleration and the motor coasts to a stop, check the motor stop and then the following items. For details, refer to Par. 1.7 “FAULT DISPLAY AND TROUBLESHOOTING” on page 26.

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

(4) Resetting must be performed by fault reset input signal (or SHIFT key of the digital operator) or by turning OFF the power supply.

(5) In a sequence where run/stop is performed by the magnetic contactor for main circuit power supply, the repeating time (power ON interval to the inverter) must be one hour or more.

1.6 MAINTENANCE

1.6.1 Periodical Inspection

7200M3 requires very few routine checks .It will function longer if it is kept clean cool and dry, while observing the precautions listed in “Location” (Par.1.3). Check for tightness of electrical connections, discoloration or other signs of overheating. Use Table 1.7 as the inspection guide. Before servicing, turn OFF AC main circuit power and be sure that CHARGE lamp is OFF.

Table 1.7 Periodical Inspections

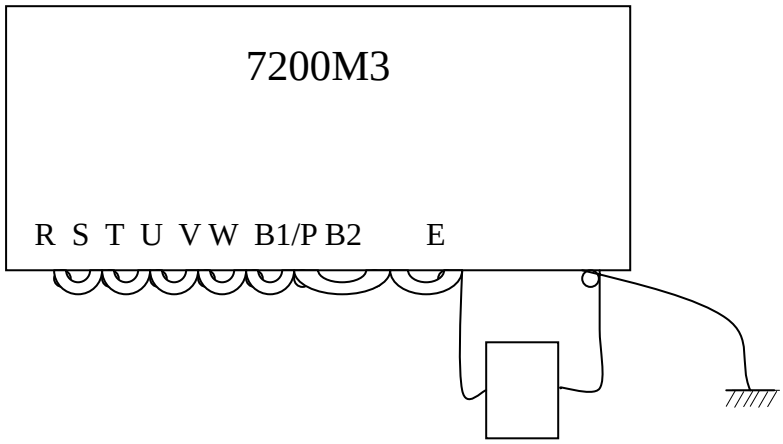
Component	Check	Corrective Action
External Terminals, Unit Mounting Bolts, Connectors, etc.	Loosened screws	Tighten
	Loosened connectors	Tighten
Cooling Fins	Build-up of dust or dirt	Blow with dry compressed air of 392 ×10³ to 588×10³ Pa[57 to 85 1bs.. in² (4 to 6 kg. cm²)]pressure..
Printed Circuit Board	Accumulation of conductive dust or oil mist	Clean the board. If dust and oil cannot be removed, replace the inverter unit
Cooling Fan	Abnormal noise or vibration. Whether the cumulative operation time exceeds 20,000 hours or not	Replace the inverter unit.
Power Elements	Accumulation of dust or dirt	
Smoothing Capacitor	Discoloration or odour	Replace the inverter unit.

1.6.2 High Voltage Test

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

(1) Remove the inverter main circuit and control circuit terminal wiring and execute the test only between the main circuit terminals and ground [ground terminal E] as shown in Fig.1.10.

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



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

Fig.1.10 High Voltage Test

1.7 FAULT DISPLAY AND TROUBLESHOOTING

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

Contact your TECO representative if any fault other than described below occurs, if the inverter itself malfunctions, if any parts are damaged, or if you have any other problems.

1.7.1 Checking of Causes

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

When the protective functions operate in models with analog operator, LED displays a fault show in table 1.6. Also when the digital operator is used, the fault display is provided as shown in table 1.8.

The operation can be restarted by turning ON the fault reset input signal (or RESET key of the digital operator) or turning OFF the power supply and ON again.

Table 1.8 Fault Display and Contents

Digital Operator fault display	Contents	Possible Cause/ Corrective Actions
OC (Over-current)	Inverter output current exceeds 200% of rated current. (Momentary action)	The following cause can be considered: inverter output side short-circuits. Excessive short setting of accel/decel time, [constant Pn-09~12] special motor use, motor start during coasting, start of motor with larger capacity than inverter, inverter output side magnetic contactor ON/OFF. Reset after finding the cause.
OV (Over-voltage)	Main circuit DC voltage exceeds 410 V or more for 2220 V class. 820 V or more for 440 V class because of excessive regenerative energy from motor. (Exceeds over voltage protection level.)	Decel. time setting is not sufficient. [Constant Pn-10, 12] or minus load (cranes, etc.) is decreasing. Increase decel. time or connect a braking resistor (option).
UV (Under-voltage)	Under voltage status is entered. [Main control DC voltage becomes approx. 210 V or less (220 V class 3-phase).170 V or less (220 V class single-phase) or 420 V or less (440 V class 3-phase)].	Input power supply voltage is reduced, phases are opened or momentary power loss occurs, etc. Check the power supply voltage, or check that main circuit power supply wiring is connected properly or terminal screws are tightened well.
OH (Cooling Fin Overheat)	Temperature rise caused by inverter overload operation, or intake air temperature rise. Cooling fan r/min is decreased	Load is too large, V/f characteristic are not proper, setting time is too short or intake air temperature exceeds 113°F (45°C), etc. Correct load size, V/f set value [constant Pn-02~Pn-08] or intake air temperature. Check the cooling fan.

Table 1.8 Fault Display and Contents (Cont'd)

Digital Operator fault display	Contents	Possible Cause/ Corrective Actions
OL1 (Motor Overload)	Motor overload protection operates because of electronic thermal overload.	Correct load size, operation pattern or V/f set value [constant Pn-02~08]. Set the rated current value described in the motor nameplate to constant Pn-19.
OL2 (Inverter Overload)	Inverter overload protection operates because of electronic thermal overload.	Correct load size, operation pattern or V/f set value [constant Pn-02~08]. Recheck the inverter capacity.
OL3 (Overtorque Detection)	Motor current exceeding set value is applied because of machine fault or overload.	Check the machine using status and remove the cause. Or increase the set value up to the machine allowable value [constant Pn-38].
EF4.5 (Note 2) (External Fault)	Inverter accepts external fault input from external circuit.	Check the external circuitry (sequence).
CPF (Note 3) (Control Function Fault)	Inverter control functions are broken down	Turn OFF the power supply once and then turns it ON again. Or initialize the control constant by using the digital operator. If the fault still exists, replace the inverter.
Digital display is extinguished.	· Main circuit fuse is blown. (For 440V class only) • Control power supply fault • Hardware fault	Replace the inverter.

Note: 1. For OL3 (overtorque detection) fault display or alarm display can be selected according to the constant (Pn-37) setting. For details, refer to "OVERTORQUE DETECTION FUNCTION" on page 99.

2. EF4 shows external fault input from multifunction contact input terminal 4,and EF5 from terminal 5.

3. For details of CPF (control function faults) refer to Table 1.9. "Details of CPF Display.

Table 1.9 Details of CPF Display

Digital Operator fault display	Contents	Possible Cause/ Corrective Actions
CPF-00	Digital Operator Communication error 1	Turn OFF the power supply once and turn it ON again. If the fault still exists, replace the inverter.
CPF-01	Digital Operator Communication error 2	
CPF-04	E²PROM fault	Record all data, and then make initialization. Turn OFF the power supply once and turn it ON again. If the fault still exists, replace the inverter. For initialization of constants, refer to Par. 2.5.1 “Constant Initialization” on page51.
CPF-05	AD converter fault in CPU	

1.7.2 Alarm Display and Contents

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

The following shows the types and contents.

Table 1.10 Alarm Display and Contents

Digital Operator fault display	Contents	Possible Cause/ Corrective Actions
EF (Simultaneous Input of FWD and REV commands) *EF* blinks.	Both FWD and REV commands are "closed" for 500 ms or larger. Inverter stops according to constants Pn-01.	Check the sequence circuit.
BB xternal Baseblock) *bb* blinks.	External baseblock signal is accepted. Inverter stops output. (Operation restarts by releasing the external baseblock signal.) For the external baseblock signal, refer to "MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION" on page 84.	Check the sequence circuit
UV (Main Circuit Under-voltage) *Uv* blinks.	Main circuit DC voltage is reduced less than detection level when inverter is not outputting.	Check the power supply voltage, main circuit power supply wiring connection or terminal screw tightening.
OL3 (Overtorque Detection) (Note 1) *oL3* blinks	Motor current exceeding the set value flows due to machine fault or overload. Inverter continues operation.	Check the machine using status and remove the cause of the fault. Or increase the set value [constant Pn-38] up to the machine allowable value.
OV (Over Voltage) *ov* blinks	Main circuit DC voltage is more than overvoltage detection level. When inverter is not outputting.	Check the power supply voltage
OH (Cooling fin Over Heat) *oH* blinks	Intake air temperature rises when inverter is not outputting.	Check the intake air temperature.

Note: 1. For OL3 (overtorque detection) fault display or alarm display can be selected according to the constant (Pn-37) setting .For details, refer "OVERTORQUE DETECTION FUNCTION" on page 88.

1.7.3 Corrective Action for Motor Faults

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

Table 1.11 Motor Faults and Corrective Actions

Fault	Check point	Corrective Action
Motor does not rotate.	Power supply voltage is applied to power supply terminals R, S, T. (Check that charge lamp is ON.)	• Turn ON the power supply. • Turn OFF the power supply and then ON again. • Check power supply voltage. • Check that terminal screws are tight.
	Voltage is output to output terminals U, V, W (Use rectifier type voltmeter.)	• Turn OFF the power supply and then ON again.
	Load is excessively large. (Motor is locked.)	Reduce the load. (Release the lock.)
	Fault is displayed.	Check according to Par. 1.7.1.
	FWD or REV run command is entered.	Correct the wiring.
	Frequency setting voltage is entered.	· Correct the wiring. · Check frequency setting Voltage.
	Operation (method selection) mode setting is proper.	Check the operation method Selection mode [constant Pn-01] by using the digital operator.
Motor rotating direction is reversed.	Wiring of output terminals U, V, W is correct.	Match them to the phase order of motor U, V, W.
	Wiring of FWD and REV run signals is correct.	Correct the wiring.

Fault	Check Point	Corrective Action
Motor rotates but variable speed is not available.	.Wiring of frequency setting circuit is correct	Correct the wiring.
	Operation (method selection) mode setting is correct.	Check operation method selection mode [constant Pn-01] by digital operator.
	Load is not excessively large.	Reduce the load.
Motor r/min is too high (low).	Motor ratings (number of poles, voltage) are proper.	Check the specifications and nameplate.
	Accel/decel ratio by speed changer (gears, etc.) is correct.	Check speed changer (gears etc.)
	Maximum frequency set value is correct.	Check the max. Frequency set value [constant Pn-02]
	Voltage between motor terminals is not excessively reduced. (Use rectifier type Volt-meter)	Check V/f characteristic set value [Constant Pn-02~08]
Motor r/min is not stable during operation (Note)	Load is not excessively large.	Reduce the load.
	Load variation is not excessively large.	· Reduce the load variation. · Increase the inverter or motor capacity.
	3-phase or single-phase power supply is used.	Connect an Ac reactor to the power supply if single-phase power supply is used.

Note: Because of motor and load (geared machine) characteristics, motor r/min becomes unstable or motor current ripples. To correct these problems, changing the inverter control constants may be effective. Refer to “FUNCTIONS FOR REDUCTION OF MACHING VIBRATION OR SHOCK” on page 99 for details of control constants to be changed.

1.8 SPECIFICATIONS

1.8.1 Specifications

Voltage Class		220 3-phase						
Inverter Model		□ JNTABDCB JK---						
		R500	0001	0002	0003	0005	7R50	0010
Max. Applicable Motor Output HP (KW) *1		0.5(0.4)	1(0.75)	2(1.5)	3(2.2)	5(3.7)	7.5(5.5)	10(7.5)
Output characteristics	Inverter Capacity KVA	1.4	2.1	2.7	4.1	6.9	10.3	13.7
	Rated Output current A	3.2	4.8	6.5	9.6	16	24	32
	Max. Output Voltage V	3-phase 200 to 230V , 50/60 Hz (proportional to input voltage)						
	Max. Output Frequency	400 Hz (available with constant setting)						
Power Supply	Rated Input Voltage and Freq.	3-phase 200 to 230V , 50/60 Hz						
	Allowable Volt. Fluctuation	± 10 %						
	Allowable Freq. Fluctuation	± 5 %						
Control Characteristics	Control Method	Sine wave PWM						
	Freq. Control Range	0.1 to 400 Hz						
	Frequency Accuracy	Digital command: 0.01%, Analog command : 0.1%						
	Freq. Setting Resolution	Digital : 0.1 Hz , Analog : 0.06/60Hz						
	Output freq. Resolution	0.1 Hz						
	Overload Capacity	150% rated output current for one minute						
	Freq. Setting Signal	0 to 10v (20kΩ), 4 to 20 mA (250Ω)						
	Accel/Decel. Time	0.1 to 600 sec (accel/decel time setting independently)						
	Braking Torque	Approx. 20%(up to 150% possible with optional braking resistor)						
	V/F Characteristic	Possible to set any program of v/f pattern						
	Stall prevention level	Possible to set operating current						
Protection Function	Instantaneous OC	Motor coasts to stop at approx. 200% rated current						
	Overload	Motor coasts to stop for 1 minute at approx. 150% rated output current						
	Motor overload	Electronic thermal overload relay						
	Overvoltage	Motor coasts to stop if main circuit voltage exceeds 410v						
	Undervoltage	Stop when main circuit DC voltage is approx. 210v or less						
	Momentary Power loss	15ms or longer *2						
	Cooling Fin Overheat	Protected by thermoswitch (only for forced cooling method)						
	Power Charge Indication	Charge lamp stays on until main circuit DC voltage drops below 50v						

*1. TECO standard 4-pole motor is used for max. applicable motor output

*2. To select “automatic restart after momentary power loss “ set the 1st digit of constant (Pn-46) to “1”

Automatic restart is available within approx. 1 second for models of 1HP or less or within approx. 2 seconds for models of 2 HP or more.

1.8.1 Specifications (continue)

Voltage Class		220 Single-phase				
Inverter Model		JNTBBDCB JK---				
		R500	0001	0002	0003	0005
Max. Applicable Motor Output HP (KW) *1		0.5(0.4)	1(0.75)	2(1.5)	3(2.2)	5(3.7)
Output characteristics	Inverter Capacity KVA	1.4	2.1	2.7	4.1	6.9
	Rated Output current A	3.2	4.8	6.5	9.6	16
	Max. Output Voltage V	3-phase 200 to 240V , 50/60 Hz (proportional to input voltage)				
	Max. Output Frequency	400 Hz (available with constant setting)				
Power Supply	Rated Input Voltage and Freq.	Single-phase 200 to 240V , 50/60 Hz				
	Allowable Volt. Fluctuation	± 10 %				
	Allowable Freq. Fluctuation	± 5 %				
Control Characteristics	Control Method	Sine wave PWM				
	Freq. Control Range	0.1 to 400 Hz				
	Frequency Accuracy	Digital command: 0.01% , Analog command : 0.1%				
	Freq. Setting Resolution	Digital : 0.1 Hz , Analog : 0.06/60Hz				
	Output freq. Resolution	0.1 Hz				
	Overload Capacity	150% rated output current for one minute				
	Freq. Setting Signal	0 to 10v (20kΩ), 4 to 20 mA (250Ω)				
	Accel/Decel. Time	0.1 to 600 sec (accel/decel time setting independently)				
	Braking Torque	Approx. 20%(up to 150% possible with optional braking resistor)				
	V/F Characteristic	Possible to set any program of v/f pattern				
	Stall prevention level	Possible to set operating current				
Protection Function	Instantaneous OC	Motor coasts to stop at approx. 200% rated current				
	Overload	Motor coasts to stop for 1 minute at approx. 150% rated output current				
	Motor overload	Electronic thermal overload relay				
	Overvoltage	Motor coasts to stop if main circuit voltage exceeds 410v				
	Undervoltage	Stop when main circuit DC voltage is approx. 210v or less				
	Momentary Power loss	15ms or longer *2				
	Cooling Fin Overheat	Protected by thermoswitch (only for forced cooling method)				
	Power Charge Indication	Charge lamp stays on until main circuit DC voltage drops below 50v				

1.8.1 Specifications (continue)

Voltage Class		220 3-phase						
Inverter Model		JNTABDCB JK---						
		R500	0001	0002	0003	0005	7R50	0010
Max. Applicable Motor Output HP (KW) *1		0.5(0.4)	1(0.75)	2(1.5)	3(2.2)	5(3.7)	7.5(5.5)	10(7.5)
Environmental characteristics	Mass (Kg)	----	2.5	2.5	5.0	5.0	9.5	9.5
	Cooling Method	Self-cooling			Forced cooling			
	Protective Configuration	NEMA 1 (open chassis type also available)						
	Location	Indoor (protected from corrosive gases and dust)						

1.8.1 Specifications (continue)

Voltage Class		220 Single-phase				
Inverter Model		JNTBBDCB JK---				
		R500	0001	0002	0003	0005
Max. Applicable Motor Output HP (KW) *1		0.5(0.4)	1(0.75)	2(1.5)	3(2.2)	5(3.7)
Output characteristics	Inverter Capacity KVA	1.4	2.1	2.7	4.1	6.9
	Rated Output current A	3.2	4.8	6.5	9.6	16
	Max. Output Voltage V	3-phase 200 to 240V , 50/60 Hz (proportional to input voltage)				
	Max. Output Frequency	400 Hz (available with constant setting)				
Mass (Kg)		-----	4.6	4.6	6.7	7.4
Cooling Method		Self-cooling		Self-cooling	Forced cooling	
Protective Configuration		NEMA 1 (open chassis type also available)				
Location		Indoor(protected from corrosive gases and dust)				

1.8.1 Specifications (continue)

Voltage Class		440 3-phase						
Inverter Model		JNTABDCB AZ---						
		R500	0001	0002	0003	0005	7R50	0010
Max. Applicable Motor Output HP (KW) *1		0.5(0.4)	1(0.75)	2(1.5)	3(2.2)	5(3.7)	7.5(5.5)	10(7.5)
Output characteristics	Inverter Capacity KVA	1.4	2.1	2.7	4.1	6.9	10.3	13.7
	Rated Output current A	1.6	2.6	4	4.8	8	12	16
	Max. Output Voltage V	3-phase 380 to 460V , 50/60 Hz (proportional to input voltage)						
	Max. Output Frequency	400 Hz (available with constant setting)						
Power Supply	Rated Input Voltage and Freq.	3-phase 380 to 460V , 50/60 Hz						
	Allowable Volt. Fluctuation	± 10 %						
	Allowable Freq. Fluctuation	± 5 %						
Control Characteristics	Control Method	Sine wave PWM						
	Freq. Control Range	0.1 to 400 Hz						
	Frequency Accuracy	Digital command: 0.01% , Analog command : 0.1%						
	Freq. Setting Resolution	Digital : 0.1 Hz , Analog : 0.06/60Hz						
	Output freq. Resolution	0.1 Hz						
	Overload Capacity	150% rated output current for one minute						
	Freq. Setting Signal	0 to 10v (20kΩ), 4 to 20 mA (250Ω)						
	Accel/Decel. Time	0.1 to 600 sec (accel/decel time setting independently)						
	Braking Torque	Approx. 20%(up to 150% possible with optional braking resistor)						
	V/F Characteristic	Possible to set any program of v/f pattern						
	Stall prevention level	Possible to set operating current						
Protection Function	Instantaneous OC	Motor coasts to stop at approx. 200% rated current						
	Overload	Motor coasts to stop for 1 minute at approx. 150% rated output current						
	Motor overload	Electronic thermal overload relay						
	Overvoltage	Motor coasts to stop if main circuit voltage exceeds 820v						
	Undervoltage	Stop when main circuit DC voltage is approx. 420v or less						
	Momentary Power loss	15ms or longer *2						
	Cooling Fin Overheat	Protected by thermoswitch (only for forced cooling method)						
	Power Charge Indication	Charge lamp stays on until main circuit DC voltage drops below 50v						

*1. TECO standard 4-pole motor is used for max. applicable motor output

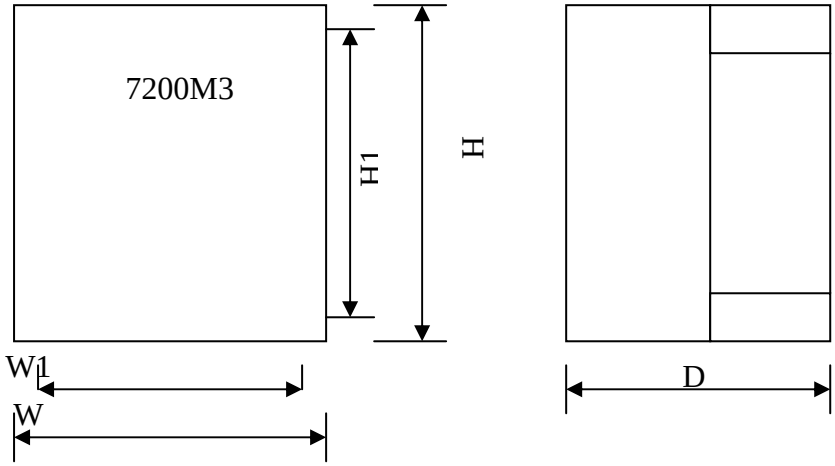
*2. To select “automatic restart after momentary power loss “ set the 1st digit of constant (Pn-46) to “1” Automatic restart is available within approx. 1 second for models of 1HP or less or within approx. 2 seconds for models of 2 HP or more.

1.8.1 Specifications (continue)

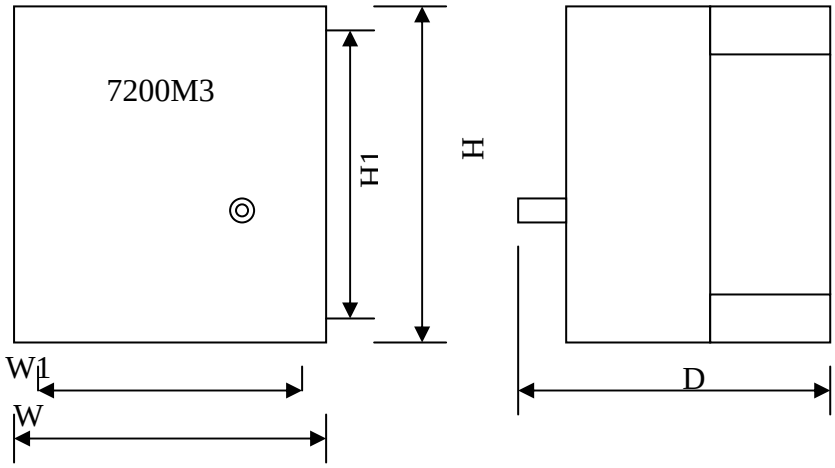
Voltage Class		440v 3-phase						
Inverter Model		□ JNTABDCB AZ---						
		R500	0001	0002	0003	0005	7R50	0010
Max. Applicable Motor Output HP (KW) *1		0.5(0.4)	1(0.75)	2(1.5)	3(2.2)	5(3.7)	7.5(5.5)	10(7.5)
Environmental characteristics	Mass (Kg)	----	4.5	4.6	6.4	6.7	9.5	9.5
	Cooling Method	Self-cooling			Forced cooling			
	Protective Configuration	NEMA 1 (open chassis type also available)						
	Location	Indoor (protected from corrosive gases and dust)						

1.8.2 Dimensions

(A) Digital Operator Type



(B) Analog Operator Type



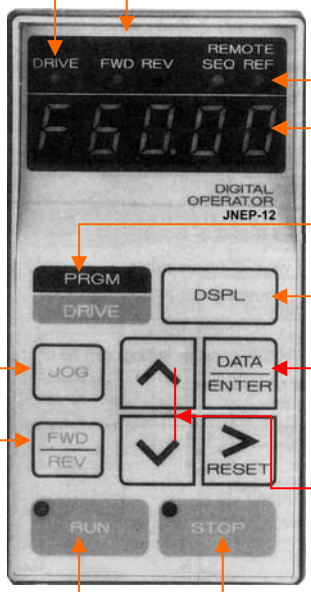
Unit : mm

Operator	Contents	Dimension (mm)					
		W	H	D	W1	H1	d
Digital	220V 3Ø 0.5~2 HP	140	150	150	130	140	M4
	220V 1Ø 0.5~2 HP 3Ø 3~5 HP 440V 3Ø 0.5~2 HP	140	250	171	130	240	M4
	220V 1Ø 3~5 HP 440V 3Ø 3~5 HP	205	305	165	180	285	M6
	220V 3Ø 7.5~10 HP 440V 3Ø 7.5~10 HP	205	354	200	180	335	M6
Analog	220V 3Ø 0.5~2 HP	140	150	170	130	140	M4
	220V 1Ø 0.5~2 HP 3Ø 3~5 HP 440V 3Ø 0.5~2 HP	140	250	191	130	240	M4
	220V 1Ø 3~5 HP 440V 3Ø 3~5 HP	205	305	185	180	285	M6
	220V 3Ø 7.5~10 HP 440V 3Ø 7.5~10 HP	205	354	220	180	335	M6

1.9 OPTIONS AND PERIPHERAL UNITS

Name	Model (Code No.)	Function	Installing position	Ref. No (3H358)
Extension Cable for Digital Operator	1m 3H300C0820006 3m 3H300C0800005	This extension cable is used when the digital operator is used after removing from the inverter front cover. The cable is available in 1-m and 3-m lengths.	On the front cover	D0180005
Frequency Meter	3M901D3760000	60Hz/120Hz.	Separately installed	—
R .P. M. Meter	3M901D4250005	0~1800RPM	Separately installed	—
Digital Operator	JNEP--13	The 7200M3 operator has two types of models: with digital operator and with analog operators. Models with digital operators can be operated from the digital operator only by main circuit wiring.	On the inverter front cover	—
Free kit Operator	JNEP--15	Models with free kit operator are operated by control circuit terminals. There is only a LED on the operator, can display the inverter status	On the inverter front cover	—
Analog Operator Unit	JNEP--16	An exclusive control panel for remotely setting frequency and for turning the unit ON/OFF using analog commands (distance up too50m).	Separately installed	—
Braking Resistor	ERF-150W (3H333C-001)	Shortens the motor deceleration time by causing the regenerative energy to be consumed through the resistor. Available at 100% deceleration torque at 3% ED for resistor unit only.	Separately installed	—
Frequency Setting potentiometer	3H300D1260002	Including 2kΩ potentiometer, knob and scale plate.	On the inverter front cover	—

2. DESCRIPTION OF DIGITAL OPERATING SECTIONS



Mode Display

Drive Mode Display

Rotation Direction Display

REMOTE Mode

Red lamp lights when controlled by control terminal commands.

Display

Display set, value of each function or monitoring values such as

Mode Selection

Depressing this key changes mode. (DRIVE or PRGM)

Display Selection

Depressing this key changes the Display.

Read/Write

Depressing this key changes the Display.

Numeral Change

Changes numeral such as set values and constant signals.

: Increment key

: Decrement key

Digit Selection

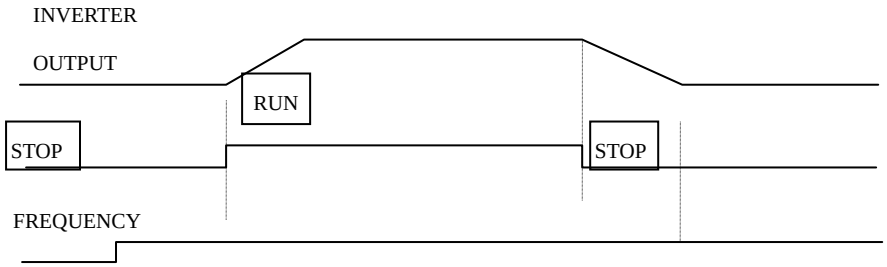
Selects numerical digits. Selected digit blinks.

Run Command Key

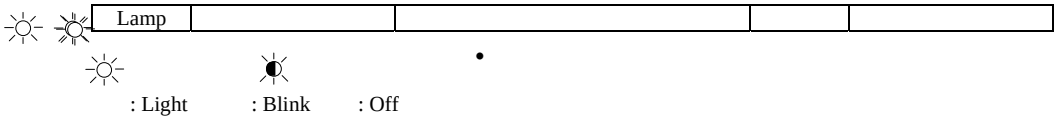
Run Command Key to operate by digital operator.

STOP command is input. (Motor stops in either mode.)*
Red lamp lights by depressing STOP. *
Selects FWD or REV rum.
While depressing this key, jog speed is selected.

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



RUN Lamp	•			•
STOP		•		



2.1 FUNCTION/CONSTANT SETTING

2.1.1 DRV (Drive) Mode and PRG (Program) Mode

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

DRV mode: • Operation is enabled.

• An operation can be performed by , , or keys.

• Frequency reference value can be changed during running.

PRG mode: • Program (function selection, constant setting) can be changed.

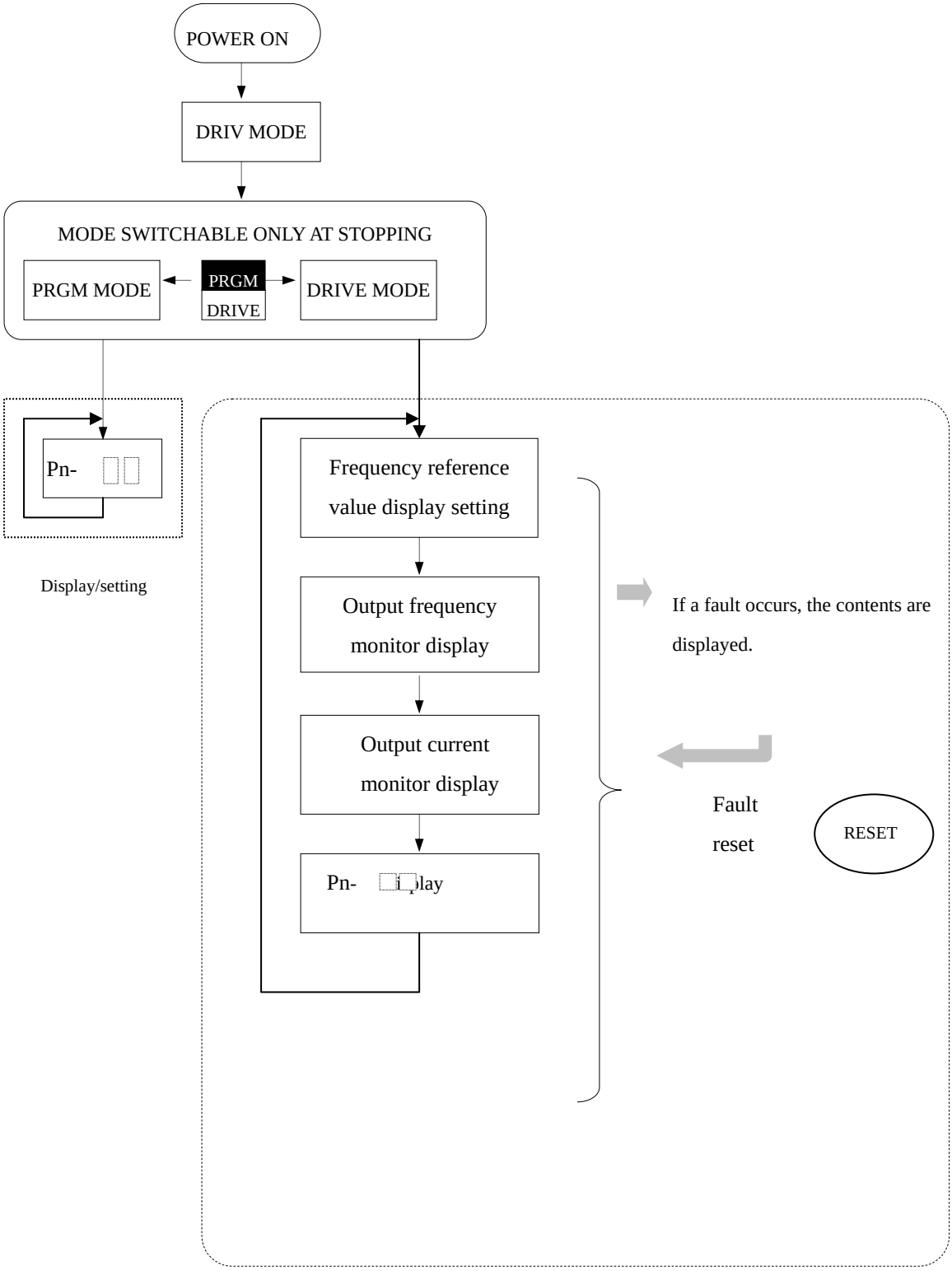
• Operation is not enabled.

Display Contents of DRV Mode and PRG Mode

(1) Display contents of the digital operator differ according to selected mode (PRG/DRV).

(2) The constant group to be displayed is changed each time display selection key DSPL is depressed.

(3) If a fault occurs, the contents are displayed. Additionally, since the contents of the latest fault are stored, maintenance, inspection or troubleshooting can be performed quickly by checking the contents by digital operator.



* Refer to Par. 2.6 ”FUNCTION / CONSTANT LIST “.

2.1.2 Constant Reading and Setting

The 7200M3 has various functions for the optimum operation. The A group functions are those basic to drive motors. The B group are for basic applications. The C group are more advanced application functions. Use it with the set values according to the load conditions or operation conditions of the matching machine. Control constants are read or set by the digital operator. Set constant (Pn-00) as follows:

Setting Value		Description	Note
Pn-00=	0	A group function (Pn-01~19) can not be set	Lock mode
	1	A group function (Pn-00~19) can be set/read	Factory Setting
	2	A, B group function (Pn-00~29) can be set/read	—
	3	A, B, C group function (Pn-00~59) can be set/read	—

(Typical setting)

*The following shows an example where acceleration time (Pn-09) is changed from 10 seconds to 5 seconds.

*Other constant can be changed in the same operation.

Depress Key.

Change the value with

Or Key.

Depress Key.

Change the value with

, Or Key.

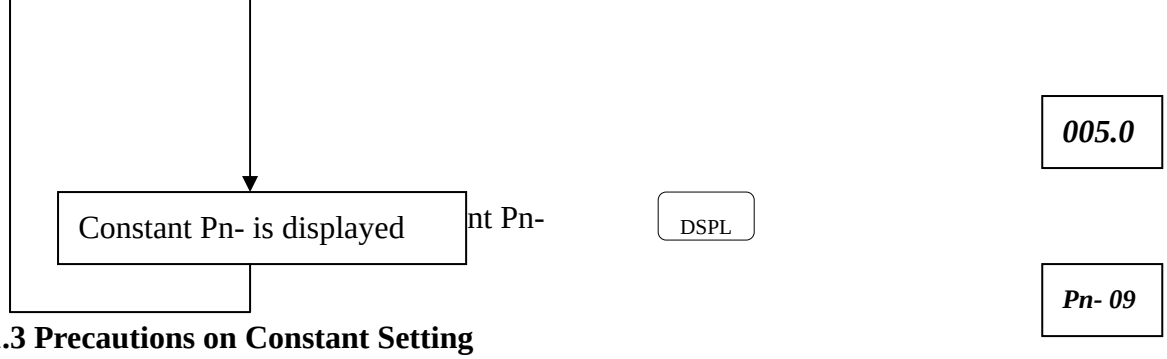
Depress Key and

Check that “End ” is displayed.

(“End” is displayed for 1 second.)

The data are displayed again .

Depress Key.



2.1.3 Precautions on Constant Setting

(1) Perform constant setting securely.

Improper setting may cause functions not to operate or protective function to operate.

(2) Record the constants of which setting has been changed.

Recording the final setting of constants is effective for maintenance or early troubleshooting. Refer to the Par. 2.6 “FUNCTION/ CONSTANT LIST” which has a column for entering setting of constants on page 58.

(3) Change control constants in increments

Do not change the motor control constant setting such as V/f maximum output frequency, etc. rapidly. Change it in increments , checking the motor current or load machine status. Changing setting very rapidly may affect the inverter or machine.

(4) In the following cases are setting error, the set value blinks for 3 seconds and the data before changing are returned.

(a) When a value exceeding the setting range is set.

(b) If the following condition is not satisfied in the multifunction input selection constant setting:

Multifunction input selection 1 (Pn-32)<Multifunction input selection 2(Pn-33).

(c) If the following conditions are not satisfied in the V/f constant setting:

Pn-02>=Pn-04>=Pn-05>=Pn-07

For details, refer to “V/f CHARACTERISTIC SETTING ”on page 69.

(d) If the following condition is not satisfied in the frequency reference constant setting:

Pn-13~17<=Pn-02×Pn-24

For details, refer to “V/f CHARACTERISTIC SETTING” on page 69 and “OUTPUT FREQUENCY LIMIT” on page 79.

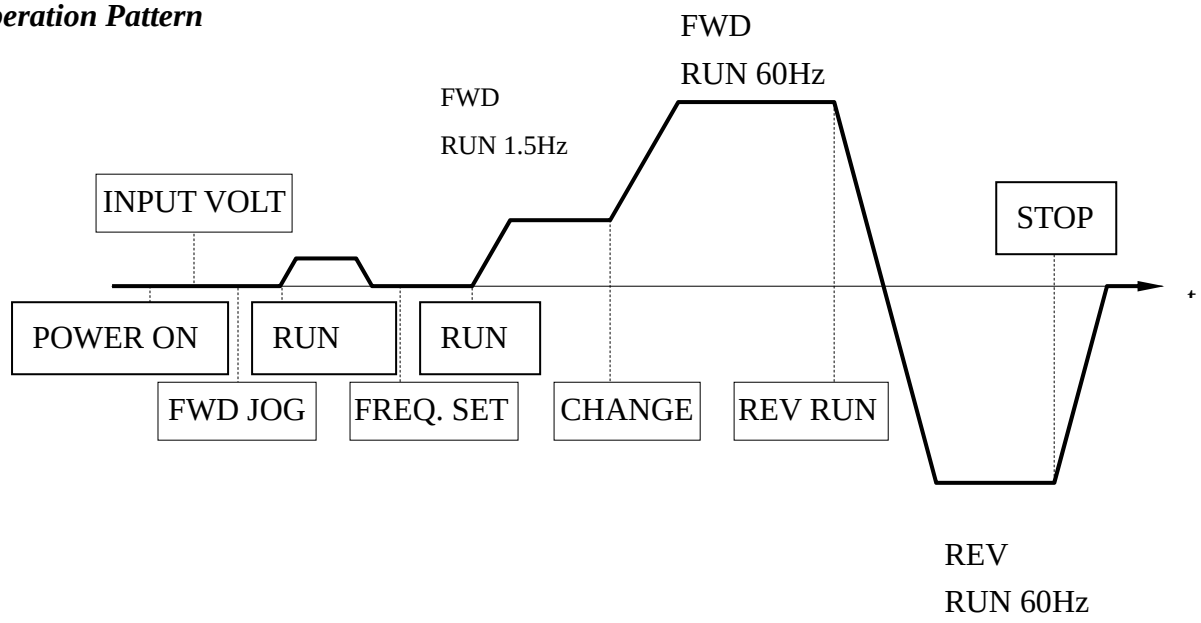
(e) If the following condition is not satisfied in the frequency reference upper/lower limit value setting:

Pn-25<=Pn-24

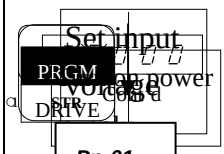
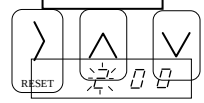
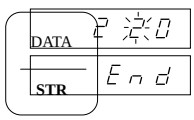
2.2 DIGITAL OPERATOR OPERATION EXAMPLE

The following shows an example of digital operator operation.

Operation Pattern



■ Typical Operation

Description	Key Operation	Digital Operator Display	Remarks
 ● Frequency reference value is displayed. (ex: 220V)			LED DRIVE OFF
 ● Select PRGM mode. ● Select control constant (Pn-)	Depress three times.		
 ● Display Pn-03 data.			Displayed for 0.5 second.
● Set 220V as input voltage.			Confirm the display.

Description	Key Operation	Digital Operator Display	Remarks
Frequency Stop REV run	RUN	RUN	
● Select DRIVE mode.	Change 60Hz Frequency Reference value	Blinks while decelerating	LED DRIVE lights.
● Select output Frequency monitor display.			LED FWD lights.
● Select rotating direction. (FWD is default at power ON.)			
● Jog operation.			
● Frequency reference value display is selected.	Depress Six times.		Stops blinking for two seconds.
● Change reference value.			
● Set value is written in.			LED lights.
● Select output frequency monitor display.			
● Running operation.			
● Select frequency reference value display.			Stops blinking for two seconds.
			LED REV lights.
● Change reference value.			
● Set value is written in.			LED lights.
● Select output frequency monitor value.			
● Switch to reverse run.			

● Decelerate to a stop.			

2.3 CONSTANT INITIALIZATION AND LOCK PROTECTION

2.3.1 Constant Initialization(Operation to return to factory setting)

● Write in 8 to constant (Pn-00)

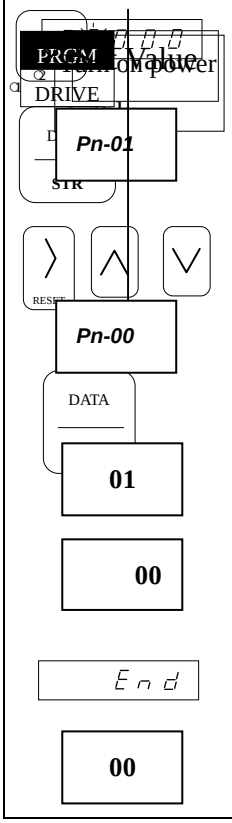
Description	Key Operation	Digital Operator Display	Remarks
● Turn on the power supply. Frequency reference value is displayed.			
● Select PRGM mode.			LED DRIVE OFF
● Select constant (Pn-00)			
● Display Pn-00 data.			
● Change the set value.			
● Write in the set value.			(Note 1)
(“End is displayed)			Displayed for 0.5 second.
The data are displayed			Confirm the display.
			(Note 2)

Note : 1. Differs according to the setting data before changing

2.The display returns to 01 after write-in. This indicateds that initialization is executed at writing in the data.

2.3.2 Constant lock Protection (Only constant reading possible)

· The following shows an example where 0 is written in to constant (Pn-00)[password(Pn-00) setting/reading and the first functions (constant Pn-01 to 19) reading enabled].

Description	Key Operation	Digital Operator Display	Remarks
 ● Frequency reference value is displayed. ● Select PRGM mode. ● Select constant (Pn-00) ● Display Pn-00 data. ● Change the set value. ● Write in the set value. (“End is displayed) The data are displayed			LED DRIVE OFF (Note) Displayed for 0.5 second. Confirm the display.

Note: Differs according to the setting data before changing.

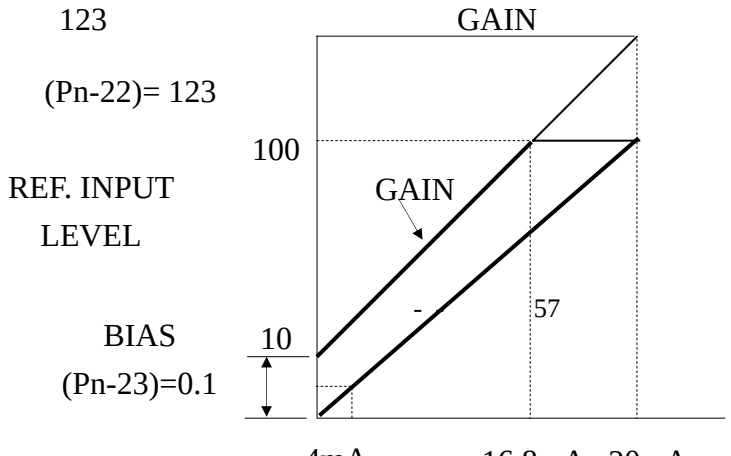
For details , refer to “DISPLAY OF OPERATOR” on page 67.

2.4 CORRECTIVE FUNCTION

2.4.1 Output Frequency Bias (Pn-23) and Gain (Pn-22)

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

Description	Key Operation	Digital Operator Display	Remarks
● Frequency reference value is displayed.			
● DR… mode.			LED DRIVE OFF
● …nt (Pn-23) (**Bias)**			
● …3 data.			
● DSPL …t value			(10%=0.1)
● Write in the set value. (“End is displayed)			Displayed for 0.5 second.
The data are displayed			Confirm the display.
● …nt (Pn-23) (**Bias)**			
● Display Pn-23 data.			
● Change the set value			
● …et value. (“End is displayed)			
The data are displayed			



FREQUENCY REFERENCE INPUT

Note: Frequency reference gain (Pn-22) and frequency reference bias (Pn-23) can be changed while running in DRIVE mode.

Note: How to calculate gain

$X = \frac{100 - b}{a}$ … (1)

$G = 10X + b$ … (2)

X is obtained from equation (1)

$X = \frac{100 - 10}{0.8} = 112.5$

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

$G = 112.5 + 10 = 122.5 = 123$

a: Reference input ratio at 100% frequency since it is 100% speed (60 Hz) at 16.8mA in this example, the following equation is established.

$\frac{16.8mA - 4mA}{20mA - 4mA} = 0.8a = 0.8$

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

G: gain set value
123 in this example

Application Example

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

2.4.2 Calibration of Frequency Meter

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

<Example>When the frequency meter specifications are 3V

(1mA) full-scale, 3V full-scale output is used at maximum output frequency [constant (Pn-02)] operation.Set constant (Pn-45)=0.30.

Description	Key Operation	Digital Operator Display	Remarks
● Frequency reference value is displayed. DSPL PRGM DRIVE RESET ● Pn-01 mode. Pn-45 ● nt (Pn-45) DA ● 5 data. 1.00 ● Change the set value **0.30** ● Write in the set value. (“End is displayed) End The data are displayed **0.30**			LED DRIVE OFF (Note) Displayed for 0.5 second. Confirm the display.

Note:

1. Since analog monitor gain is set to 1.00 prior shipping, 10V is output at maximum output frequency [constant (Pn-02)] operation.
2. By data display of constant (Pn-45) in the program mode, voltage at 100% level according to the constant (Pn-45) set value is output by the meter calibrating function without any conditions.

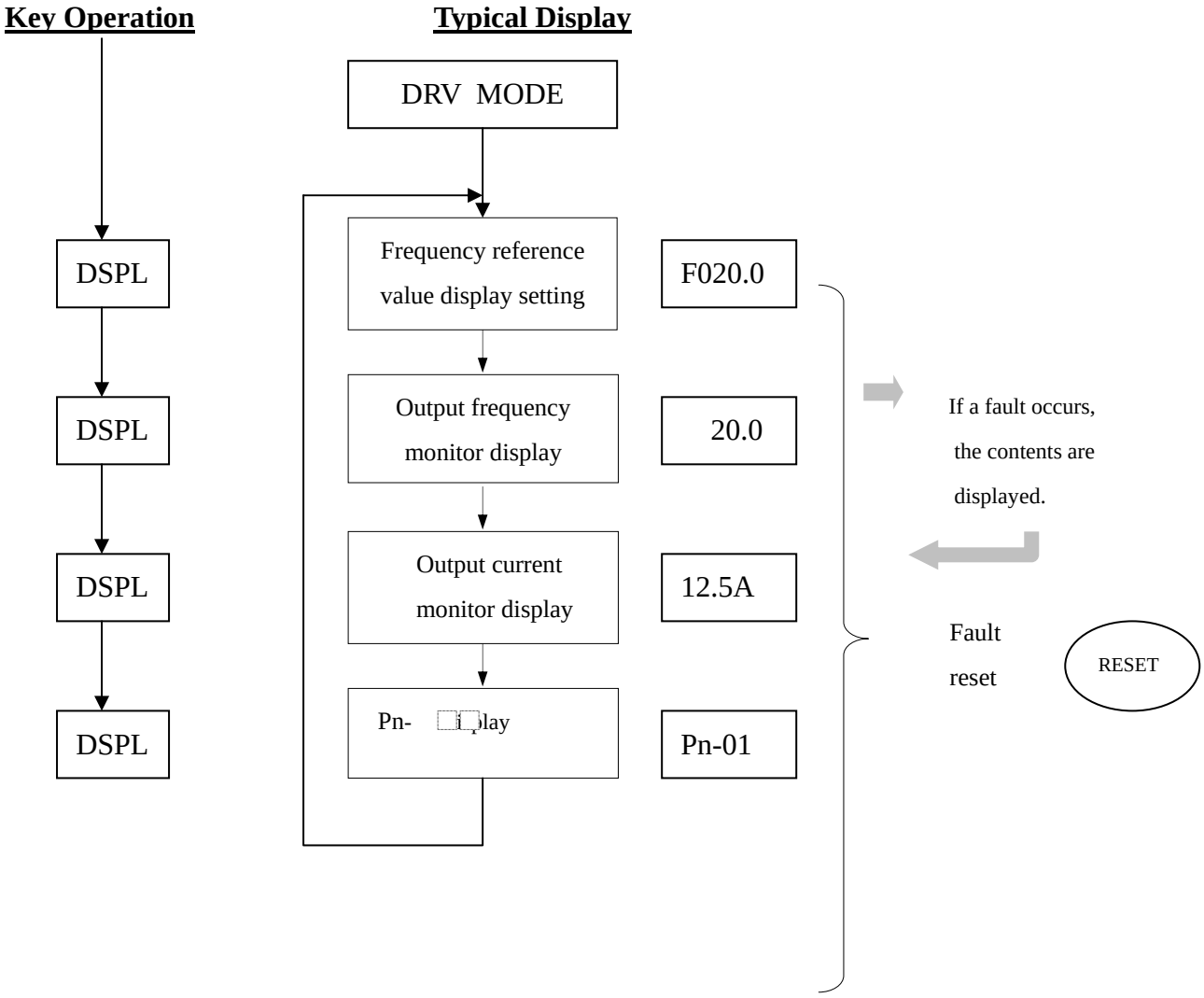
(Example) Assuming constant(Pn-45)=0.30 : 10V×0.30=3V is output without any conditions.

2.5MONITOR FUNCTION

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

(1) Typical Monitor Contents and Display (DRV Mode)

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



(2) Monitoring of Fault Contents

a) If a fault occurs, the fault conents are displayed with priority over other display items. Depress the RESET key or turn on the fault reset input signal (terminal 3), to reset the fault.

b) Since the latest fault content data are stored in the inverter, even if the power supply is turned off, they can be monitored after the power supply is turned on again

(1) Checking fault contents
The latest data are stored in the constant (Pn-48). (except UV)

(2) Clearing fault contents
The contents are cleared by setting “6” to the constant (Pn-00). Or they are also cleared by constant initialization.
[Set constant (Pn-00)=8 or9.]
At this time, other constants are changed to the factory setting values. Therefore, record all of the constant data before initializing constant.

(3) Faults to be stored
OC(overcurrent), OV(overvoltage), OH(cooling fin overheat), OL1(motor overload), OL2(inverter overload), OL3(overtorque detection), EF4, EF5(external fault), CPF05(AD converter fault).
For details, refer to Table 1.8 “Fault Display and Contents” on page 27.

2.6FUNCTION/CONSTANT LIST

2.6.1 A Group Functions(Constant Pn-00 to 19)

Function	Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par.
Display of Operator	00	Constant Group Selection	0:A group function constant(Pn-01~19) are locked(can be read only). Pn-00 can be set/read. 1:A group function constant(Pn-00~19)can be set/read 2.A,B group function constant(Pn-00~29)can be set/read. 3.A,B,C group function constant(Pn-00~59) can be set/read.	1		2.7.1
		Fault Contents Clear	6:Fault record clear			
		Constant Initialization	8:Inittalize(multifunction terminal:initial value setting) 9:Initalize (3-wire sequence)			
Run Stop Signal Selection 1	01 (Note 1)	Operation Method Selection	4 3 2 1: Master frequency Reference-Control circuit terminals 8 and 11, or 9 and 11 inputs	0011 (0000) (Note2)		2.7.2
			- - - 0: Master frequency reference-Operator FXXXX			
			- - - 1: Run by control circuit terminal run command			
			- - 0 - : Run by operator run command			
			- - 1 - : Deceleration to stop			
		Stopping Method Selection	- 0 - - : Coasting to stop			
			- 1 - -			
Output Voltage Limiter Selection		V/f Pattern Setting	0 - - - : Free choice V/f with output voltage limiter			
			1 - - - : Free choice V/f without output voltage limiter			

Note:

1.The first four digits indicated in the description of constant (Pn-01) mean the following digits. This also applies to the other constants.

0 0 0 0

1st digit

2nd digit

3rd digit

4th digit

2.The value is factory set value of models with analog operator.

Function	Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par
V/f Pattern Setting	02	Maximum Output Frequency	Setting unit:0.1 Hz Setting range:50.0 to 400.0Hz	60.0Hz		**2.7.3**
	03	Maximum Voltage	Setting unit:0.1Hz Setting range:0.1 to 255.0V	220V (Note 1)		
	04	Maximum Voltage Output Frequency (Base Frequency	Setting unit:0.1Hz Setting range:0.2 to 400.0Hz	60.0Hz		
	05	Intermediate Output Frequency	Setting unit:0.1Hz Setting range:0.1 to 399.9 Hz	1.5Hz		
	06	Intermediate Output Frequency Voltage	Setting unit:0.1 V Setting range:0.1 to 255.0V	13.2V (Note 1)		
	07	Minimum Output Frequency	Setting unit:0.1Hz Setting range:0.1 to 10Hz	1.5Hz		
	08	Minimum Output Frequency Voltage	Setting unit:0.1 V, Setting range:0.1 to 50V	13.2V (Note 1)		
First Accel/Decel Time Setting	09	Acceleration Time 1	Setting unit:0.1s, Setting range:0.0 to 600.0s	10.0s		2.7.4
	10	Deceleration Time 1	Setting unit:0.1s, Setting range:0.0 to 600.0s	10.0s		
Second Accel/Decel Time Setting	11	Acceleration Time 2	Setting unit:0.1s, Setting range:0.0 to 600.0s	10.0s		
	12	Deceleration Time 2	Setting unit:0.1s, Setting range:0.0 to 600.0s	10.0s		

Note:1. For 440 V class, the value is twice as that of 220 V class.

Function	Pn-	Name	Description					Initial Setting	User Set Values	Ref. Par.
Frequency Reference (Note 1)	13	Frequency Reference 1	Setting unit:0.1 Hz, Setting range:0.0 to 400.0 Hz					0.0Hz		2.7.5
	14	Frequency Reference 2	Setting unit:0.1 Hz, Setting range:0.0 to 400.0 Hz					0.0Hz		
	15	Frequency Reference 3	Setting unit:0.1 Hz, Setting range:0.0 to 400.0 Hz					0.0Hz		
	16	Frequency Reference 4	Setting unit:0.1 Hz, Setting range:0.0 to 400.0 Hz					0.0Hz		
	17	Jog Frequency Reference	Setting unit:0.1 Hz, Setting range:0.0 to 400.0 Hz					6.0Hz		2.7.6
Electronic Thermal Overload Motor Protection	18	Motor Protection Selection	4	3	2	1	Electronic thermal overload motor protection provided	0000		2.7.7
			-	-	-	0				
			-	-	-	1	Electronic thermal overload motor protection not provided			
			-	-	0	-	Electronic thermal overload characteristics is for standard motor			
			-	-	1	-	Electronic thermal overload characteristics is for constant torque motor			
			-	0	-	-	Electronic thermal overload time constant is of standard rating			
			-	1	-	-	Electronic thermal overload time constant is of short-term rating			
			0	-	-	-	Not used			
			1	-	-	-				
Electronic Thermal Overload Reference Current	19	Motor Rated Current	Setting unit :0.1A, Setting range: 10 to 120% of inverter rated current					3.3A (Note 2)		2.7.7

Note:1 Can be changed even during run.

The maximum setting frequency to be set to frequency reference is the maximum frequency(Pn-02).

2. Initial setting differs according to the inverter capacity. The values in the above list are provided when model JNTABDCB0001 JK--- and TECO standard motor 220V 60Hz 4 poles 1HP(0.75kw) are combined.

2.6.2 B Group Functions(Constant Pn-20 to 29)

Function	Pn-	Name	Description					Initial Setting	User Set Values	Ref. Par.
Run Signal Selection 2	20	REV Run Prohibit	4	3	2	1		0000		
			-	-	-	0	REV run enabled			2.7.2
			-	-	-	1	REV run disabled			
		Operator Stop Key Precedence	-	-	0	-	STOP key effective from control circuit terminals during run			-
			-	-	1	-	STOP key ineffective from control circuit terminals during run			
		Output Frequency UP/DOWN operation	-	0	-	-	Change the frequency reference by Increament or Decreament key,after depress the STR key, the output frequency starting to up or down			2.7.25
			-	1	-	-	The output frequency can be up or down by Increament or Decerament key, directly.			
		Stall Prevention During Deceleration	0	-	-	-	Stall prevention during deceleration provided			2.7.14
			1	-	-	-	Stall prevention during deceleration not provided(when braking resistor connected)			
Analog Monitor Selection	21		-	-	-	0	Not used	0000		2.7.8
			-	-	-	1				
		Output Monitor Selection (Note 1)	-	-	0	-	Analog monitor output frequency			
			-	-	1	-	Analog monitor output current			
		S-curve Accel/decel Selection	0	0	-	-	Not provided			2.7.9
			0	1	-	-	0.2 Sec			
			1	0	-	-	0.5 Sec			
			1	1	-	-	1.0 Sec			

Note:1. Analog monitor gain is set by constant Pn-45.

Function	Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par.
	22	Frequency Reference Gain	Setting unit: 0.01, Setting range: 0.01 to 2.00	1.00		2.7.10
	23	Frequency Reference Bias	Setting unit: 0.01, Setting range:-1.00 to 1.00	0.00		
Frequency Limit Control	24	Frequency Upper Limit	Setting unit: 1%, Setting range: 0 to 110%	100%		2.7.11
	25	Frequency Lower Limit	Setting unit: 1%, Setting range: 0 to 110%	0%		
DC Injection Braking	26	DC Injection Braking Current	Setting unit: 1%, Setting range:0 to 100% of inverter rated current	50%		2.7.12
	27	DC Injection Braking Time at Stop	Setting unit:0.1s, Setting range:0.0 to 5.0s	0.5s		
	28	DC Injection Braking Time at Start	Setting unit:0.1s, Setting range:0 to 5.0s	0.0s		
Torque Compen-sation	29	Automatic Torque Boost Gain	Setting unit:0.1, Setting range:0.0 to 3.0	1.0		2.7.13

2.6.3 C Group Functions (Constant Pn-30 to 59)

Function		Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par.
Stall Prevention		30	Level of Stall Preventive Operation during Acceleration	Setting unit:1%, Setting range:30 to 200%of inverter rated current	170% (Note 1)		2.7.14
		31	Level of Stall Preventive Operation during run	Setting unit:0% Setting range:30 to 200%of inverter rated current	160% (Note 2)		
Multifunction Selection	Contact Input Signal	32	Multifunction Input Selection 1 (Terminal 4 Function Selection	0:FWD/REV run command(3-wire sequence selection) 1:External fault(No contact input) 2: External fault(NC contact input) 3:Multi-step speed reference 1 4:Multi-step speed reference 2 5:JOG command 6:Accel/decel time select 7:External baseblock(No contact input) 8: External baseblock(NC contact input) 9:Search command from maximum frequency 10: Search command from setting frequency 11:Accel/decel prohibit	1		2.7.15 2.7.25
		33	Multifunction Input Selection 2 (Terminal 5 Function Selection)	1:External fault(No contact input) 2: External fault(NC contact input) 3:Multi-step speed reference 1 4:Multi-step speed reference 2 5:JOG command 6:Accel/decel time select 7:External baseblock(No contact input) 8: External baseblock(NC contact input) 9:Search command from maximum frequency 10: Search command from setting frequency 11:Accel/decel prohibit	3		

Note:1. Stall prevention during acceleation does not operate at 200%.

2. Stall prevention during run does not operate at 200%.

Function	Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par.
Photo Coupler Output Signal	34	Multifunction Output Selection 1 (Terminal 13 Function Selection)	0:Running 1:Frequency agreement 2:Zero speed 3:Frequency detection (output frequency≧ frequency detection level) 4:Overtorque detection	0		2.7.16 2.7.17
	35	Multifunction Output Selection 2 (Terminal 14 Function Selection)	0:Running 1:Frequency agreement 2:Zero speed 3:Frequency detection (output frequency≧ frequency detection level) 4:Overtorque detection	1		
Desired Speed Detection	36	Frequency Detection Level	Setting unit:0.1 Hz, Setting range:0.0 to 400.0Hz	0.0Hz		2.7.17
Over-torque Detection	37	Overtorque Detection Function Selection	4 3 2 1 Overtorque detection - - - 0 not provided - - - 1 Overtorque detection provided - - 0 - Detected only frequency agreement - - 1 - Detected during running - 0 - - Operation continues after overtorque - 1 - - detection output shut-off at overtorque detection 0 - - - Not used 1 - - -	0000		2.7.18
	38	Overtorque Detection Level	Setting unit:1%, Setting range: 30 to 200% of inverter rated current	160%		
	39	Overtorque Detection time	Setting unit:0.1s, Setting range:0.1 to 10.0s	0.1s		

Function	Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par.
Carrier Frequency Adjustment	40	Carrier Frequency	Setting unit: 1(2.5kHz) Setting range:1 to 6(2.5 to 15kHz)	4 (10kHz)		2.7.19
-	41 to 44	Not used	(Setting disabled)	-		
Analog Monitor Scale Calibration	45	Analog Monitor Gain	Setting unit:0.01, Setting range:0.01 to 2.00	1.00		2.7.20
Momentary Power Loss Protection	46	Operation Selection after Momentary Power Loss	4 3 2 1 - - - 0 Continuous operation after momentary power loss not provided	0000		2.7.21
			- - - 1 Continuous operation after momentary power loss provided			
			0 0 0 - Not used			
Fault Retry	47	Fault Retry Selection	Setting unit:1 time Setting range:0 to 10 times Note: By setting 0 times, fault retry function becomes disabled.	0		2.7.22
Fault Trace	48	Fault Record	The latest fault is displayed(setting disabled).	-	-	-
Software Version	49	PROM No.	PROM No. is displayed (setting disabled).	-	-	-
Frequency Jump Control	50	Jump Frequency 1	Setting unit:0.1Hz, Setting range:0.0 to 400.0Hz	0.0Hz		2.7.23
	51	Jump Frequency 2	Setting unit:0.1Hz, Setting range:0.0 to 400.0Hz	0.0Hz		
	52	Jump Frequency 3	Setting unit:0.1Hz, Setting range:0.0 to 400.0Hz	0.0Hz		
	53	Jump Frequency Width	Setting unit:0.1Hz, Setting range:0.0 to 25.5Hz	1.0Hz		

Function	Pn-	Name	Description	Initial Setting	User Set Values	Ref. Par
Speed Search Control	54	Speed Search Operation Level	Setting unit:1%, Setting range: 0 to 200% of inverter rated current	150%		2.7.21 2.7.22 2.7.24
	55	Minimum Baseblock Time	Setting unit:0.1s, Setting range:0.5 to 5.0s	0.5s		
	56	V/f during Speed Search	Setting unit:1%, Setting range: 0 to 100%	100%		
-	57 to 59	Not Uesd	(Setting disabled.)	-		-

2.7 DESCRIPTION OF FUNCTIONS AND CONSTANTS

The following describes the functions and constants set by digital operator, Constant Pn-□ □ are indicated as

2.7.1 DISPLAY OF OPERATOR

Item Name	Constant to be set	Factory Preset
Consta□ Group Selection		1

□
. =0 The A group functions:

0 can be set and read.
0 - 19 can be read only, This setting prevents constant from being reset by improper operation after completion of constant setting.

□
. =1 The A group functions (0 to 19) can be set and read.

□
. =2 The A and B group functions (0 to 29)can be set and read

□
. =3 The A,B and C group functions (0 to 59) can be set and read.

□
. =6 Fault history is cleared.

□
. =8 All control constants can be initialized. Terminal functions are retuned to the factory setting.

□
. =9 All control constants can be initialiaed. Therminal functions are of 3-wire sequence. Refer to

“MULTIFUNCTION CONTACT INPUT FUNCTION SELECTION” onpage 84

2.7.2 RUN˙ STOP PROCEDURE SELECTION

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

*The value in parentheses is factory setting of models with analog operator (JNEP- -14)

- Start procedure

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

  1 **= *X X 0 0*** **(X** means 1 or 0)

  1st digit

  0: Frequency reference from control circuit terminal

  1: Frequency reference from the operator.

  2nd digit

  0: Start/stop control from control circuit terminal

  1: Start/stop control from the operator.

- Stop procedure

  Stopping mode can be selected according to the application.

  1 **= *X 0* X X**

  3rd digit

  0:Deceleration to stop

  1:Coasting to stop.

- Reverse rotation

Prevents accidental selection of reverse rotation.

Reverse run command is disregarded if input

20 = X X X 1

1st digit

0: Reverse rotation is possible

1: Reverse rotation is impossible.

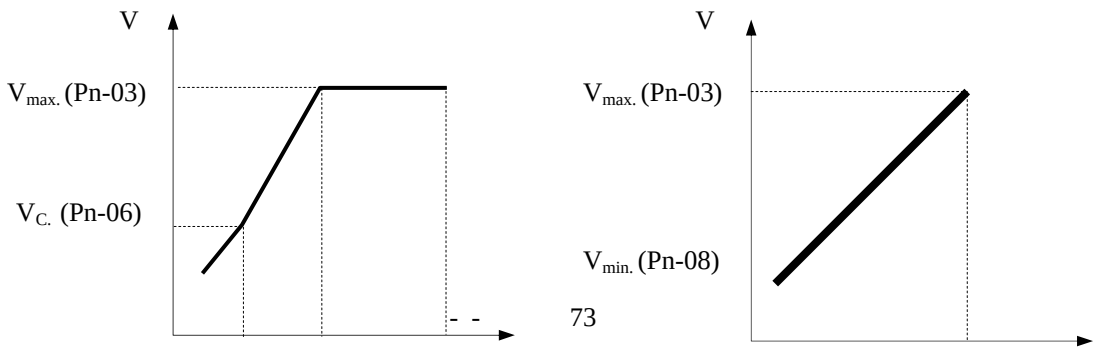
2.7.3 V/f CHARACTERISTIC SETTING

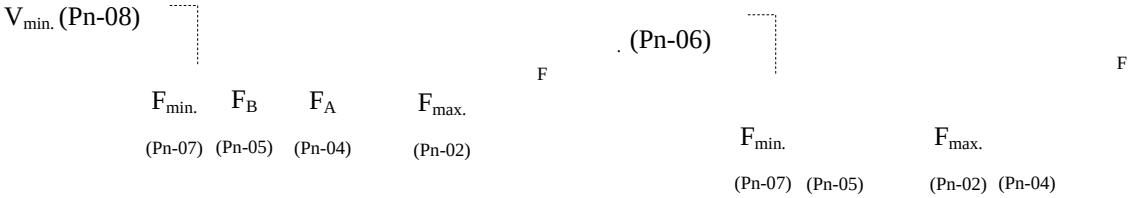
Item Name	Constant to be set	Factory Preset
Max. Output Frequency	***2***	60.0Hz
Max. Voltage	***3***	220.0V
Max. Voltage Output Frequency	***4***	60.0Hz
Intermediate Output Frequency	***5***	1.5Hz
Intermediate Output Frequency Voltage	***6***	13.2V
Min. Output Frequency	***7***	1.5Hz
Min. Output Frequency Voltage	***8***	13.2V
Output Voltage Limiter Selection	***1***	0000

- V/F pattern setting

  Any desired v/f pattern can be set for special specifications, too. Any v/f pattern can be set according to the load characterics. The factory preset value is set to

  60 Hz saturation type pattern.





Note: 1.If an excessively large value is set in low-speed area (3 Hz or less), motor overheat or inverter malfunction may occur. Change the constant gradually monitoring load or motor current.

2.The v/f constants setting have to be satisfied as following conditions:

Max. output frequency (Pn-02)≧ Max. voltage frequency (Pn-04) > Intermediate output frequency (Pn-05)≧ Min. output frequency (Pn-07)

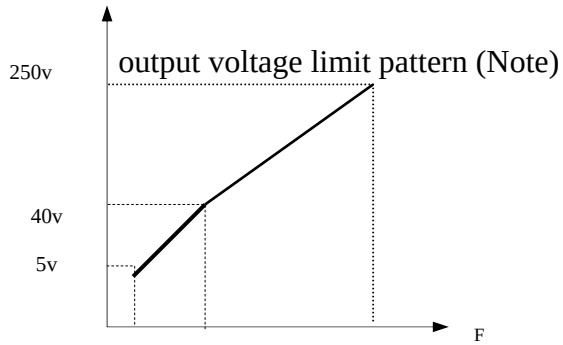
3.For the following setting, intemediate output frequency voltage (Pn-06) is disregarded:
Intermediate output frequency (Pn-05) = Min. output frequency (Pn-07)

· Output limiter selection

When v/f is set to excessively large value, an inverter fault may occur. Therefore, in order to prevent the malfunction, the upper limit is provided for the output voltage. However, the setting is not necessary under normal operation.

1 = 0 X X X

4^{th} digit
0: Desired v/f with output voltage limiter
1: Desired v/f without output voltage limiter



Note: For 440 v class, the value is twice that of 220 v class.
If “1” is set, v/f matching the motor characteristics must be selected.

2.7.4 ACCEL / DECEL TIME SETTING

Item Name	Constant to be set	Factory Preset
Acceleration Time 1	***9***	10.0s
Deceleration Time 1	***10***	10.0s
Acceleration Time 2	***11***	10.0s
Deceleration Time 2	***12***	10.0s
Accel/Decel Time Select	***32 , 33***	See page 63.

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

The set time indicates the interval required before the maximum output freqnency setting Pn-02 is reached.

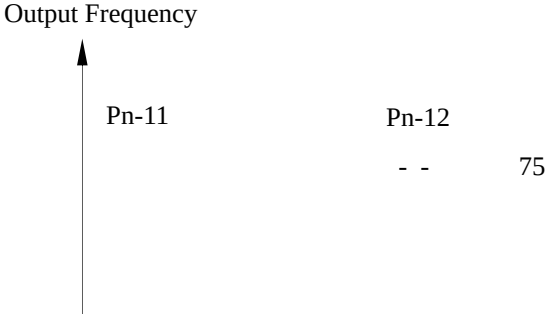
Accel/decel time can be set for two-step switching using multifunction contact input (control circuit terminals 4 or 5), even during running.

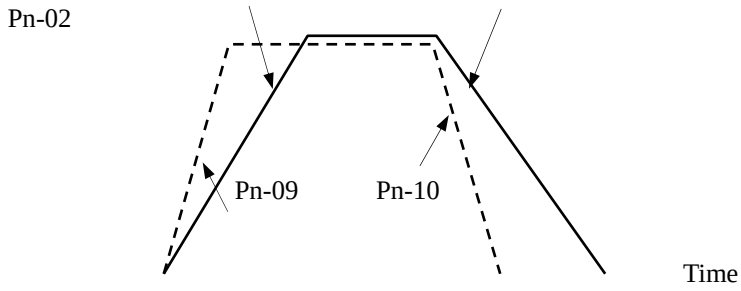
Between control circuit terminals 4 or 5.

· open : Pn-09 and Pn-10 are selected.

· closed : Pn-11 and Pn-12 are selected

(When setting = 6)





Note: S-curve accel/decel reducing shock at motor starting is also enabled. When S-curve accel/decel is needed, refer to “S-CURVE PATTERN SELECTION” on page 77.

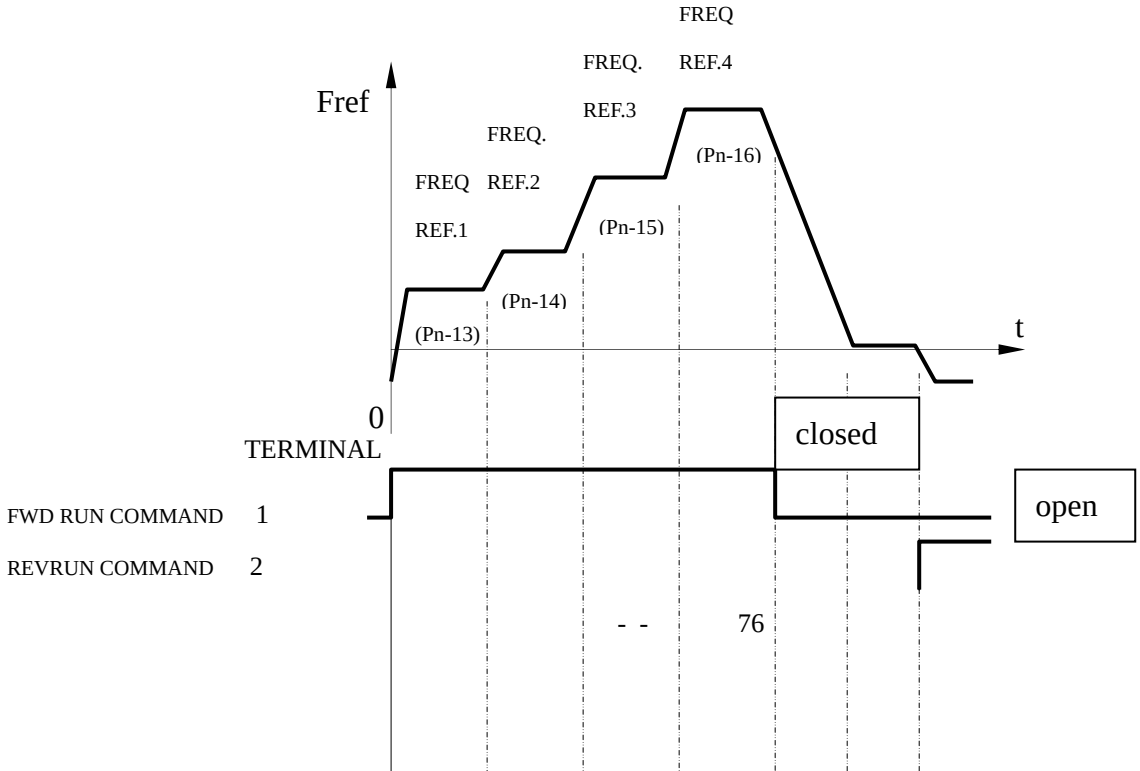
2.7.5 4-STEP SPEED CHANGE

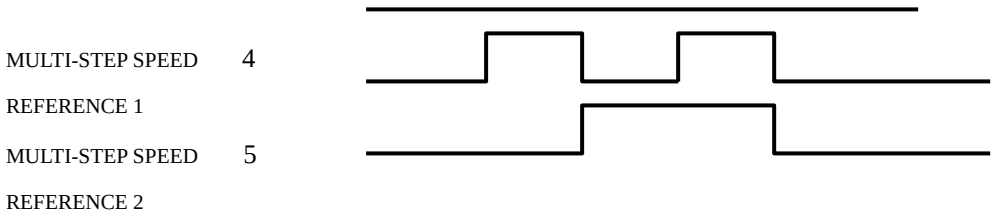
Item Name	Constant to be set	Factory Preset
Multi-speed Frequency Reference	***13 to 16***	See page 60.
Multi-speed Operation Function	***32 , 33***	See page 63.

Up to 4 steps of speed can be set by contact input by setting 4 and 5 multi-speed references To multi-function contact input terminals.

This eliminates the need for an analog signal thereby enabling operation even at low speed without being affected by noise. See the following example.

· Set according to run specifications.





Note: 1. Frequency reference can be changed only if it is selected by multi-speed reference.

2.The following condition must be satisfied :

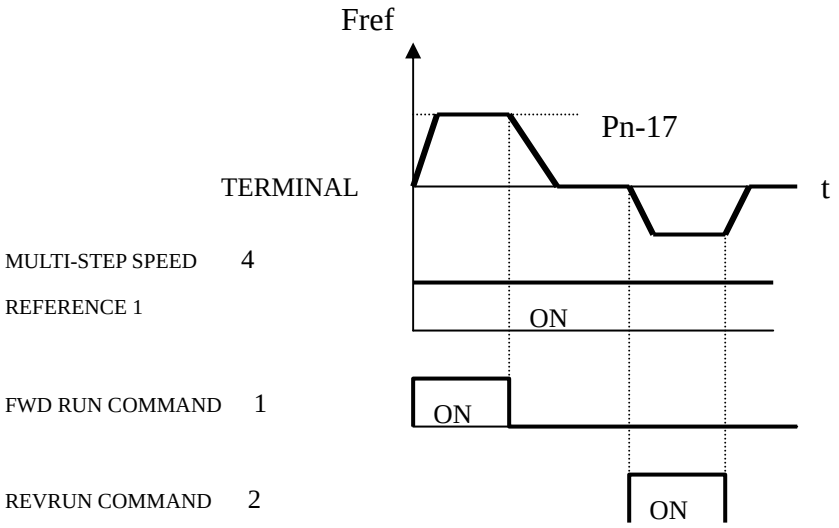
Set frequency reference(Pn-13 to 16) ≦ Max. output frequency (Pn-02) × output frequency upper limit value (Pn-24)

2.7.6 JOG OPERATION

Item Name	Constant to be set	Factory Preset
Jog Frequency Reference Setting	***17***	6.0Hz
Jog Reference Selection	***32*** , ***33***	See page 63.

Select the JOG mode (closed between terminals 4 to 6) and JOG operation can be performed by FWD/REV run command (when setting Pn-32 = 5)

Depressing the JOG key on the digital operator performs the same operation.



Note: The following condition must be satistied in the jog frequency reference setting.

JOG frequency reference (Pn-17) ≦ Max. output frequency (Pn-02) ×

output frequency upper limit value (Pn-24)

2.7.7 ELECTRONIC THERMAL OVERLOAD FUNCTION

Item Name	Constant to be set	Factory Preset
Motor Type	***18***	0000
Motor Rated Current	***19***	3.3 A (Note)

Motor output current is detected by the inverter built-in electrical thermal overload function, and inverter exclusive use motor or standard motors are prevented from overloading. (It is not necessary to mount the thermal relay externally. However, to connect several motors to one inverter, a thermal overload relay must be inserted for each motor. It is necessary to reduce carrier frequency according to the wiring distance between the inverter and motor when thermal overload relays are inserted. For details, refer to the precautions on wiring described on page 12)

Pn-19 = Motor rated current value

Set the motor rated current value according to the value on the motor nameplate.

Pn-18 = X 0 0 0

	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)

· The electronic thermal overload function is depended on the motor overload protection start current (ie. Motor rated current). The setting range is 10~120% of inverter rated current. The standard set value for each capacity has already set at factory as following. If the general-purpose motor rated current value is different from the standard value, change the setting.

· 220V Class Common in 3-phase and Single-phase Series

Model	3-ph JNTABDCB JK--- Sin-phase JNTBBDCB JK---	R500	0001	0002	0003	0005	7R50	0010
Max. Applicable HP Motor Capacity (KW)		0.5 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)
Motor Current Value at Factory Setting (A)		2.1	3.3	6.4	8.6	13.5	20.1	25.1

· 440V Class 3-phase Series

Mod JNTABDCB AZ----	R500	0001	0002	0003	0005	7R50	0010

Max. Applicable HP Motor Capacity (KW)	0.5 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)
MotorCurrent Value at Factory Setting (A)	1.0	1.7	2.9	4.1	6.8	10.1	12.6

Note: The motor current value at factory setting is according to TECO standard 4-pole motor.

2.7.8 MULTIFUNCTION ANALOG OUTPUT MONITOR SETTING

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

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

Pn-21 = X X 0 X

Not used

Output contents between control circuit terminals 12 to 11

2nd digital

0: Output ~~fre~~quency monitor

1: Output ~~cur~~rent monitor

Analog output monitor gain can be set by Pn-45.

Additionally, analog output monitor voltage is output as show below :

Output frequency monitor:

Output voltage (v)

= output frequency × 10 ÷ Max. output frequency (Pn-02) × (Pn-45)

Output current monitor:

Output voltage (v)

= output current × 10 ÷ Inverter rated current × (Pn-45)

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

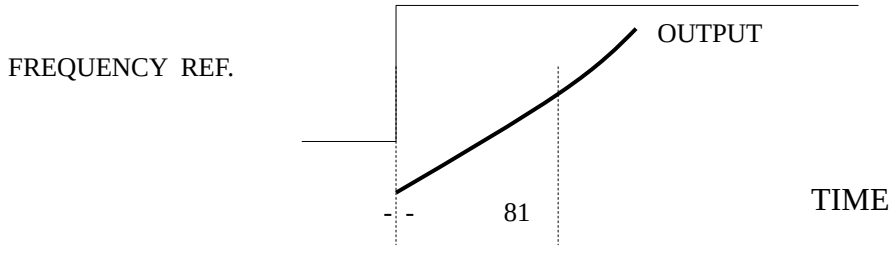
2.7.9 S-CURVE PATTERN SELECTION

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

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

Pn-21 = 0 0 X X

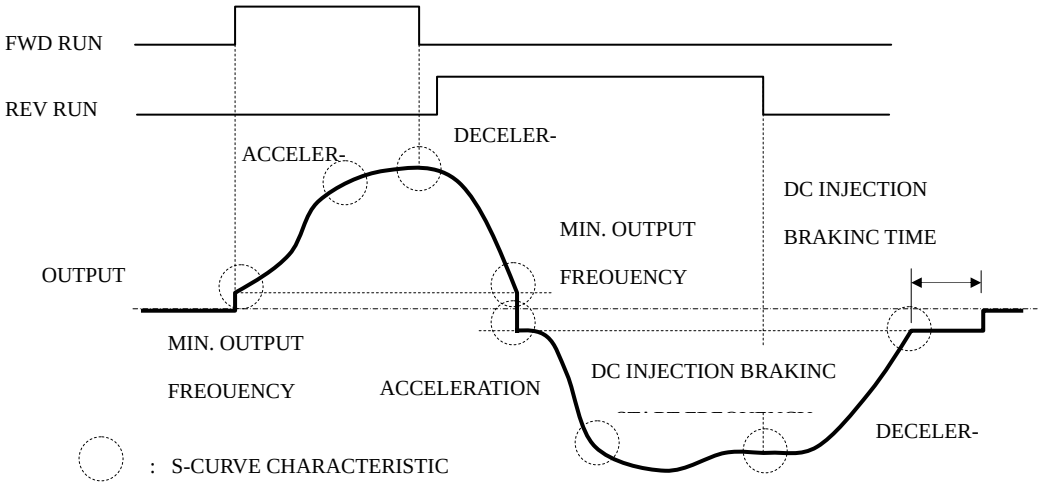
4th digit	3rd digit	Contents
0	0	No S-curve characteristics.
0	1	The S-curve characteristics is 0.2 second.
1	0	The S-curve characteristics is 0.5 second.
1	1	The S-curve characteristics are 1 second.



S-CURVE CHARACTERISTICS TIME (TSC)

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.

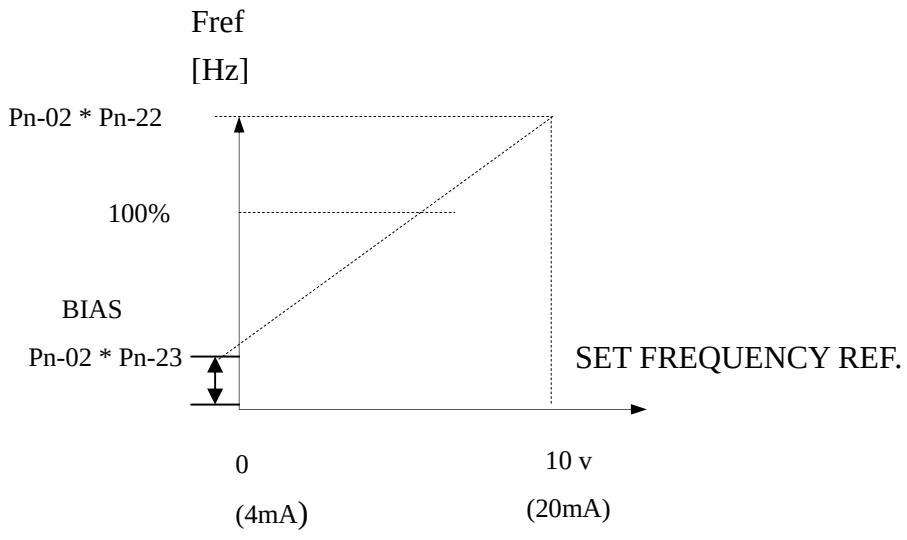
The figure below shows the time chart at FWD/REV run change during deceleration and stop.



2.7.10 FREQUENCY COMMAND GAIN/BIAS

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

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

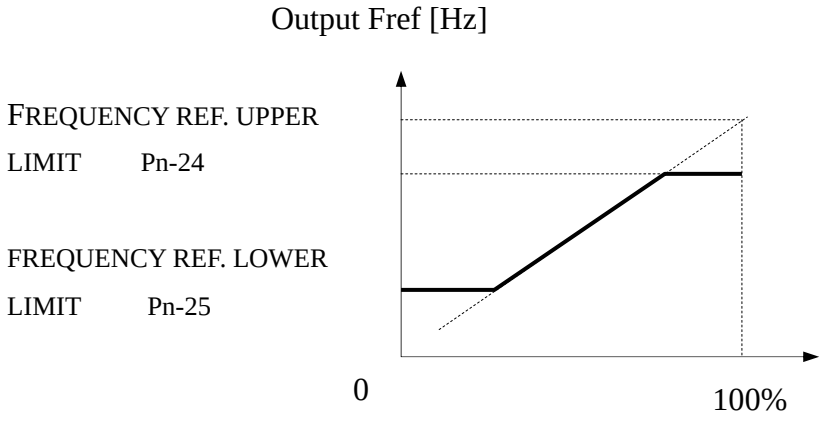


For the setting method, refer to Par.2.4.1 " Output Frequency Bias (Pn-23) and Gain (Pn-22)" On page 53.

2.7.11 OUTPUT FREQUENCY LIMIT

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

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



Note: By setting Pn-24 to 110%, frequency up to Pn-02 x 1.1 can be output.

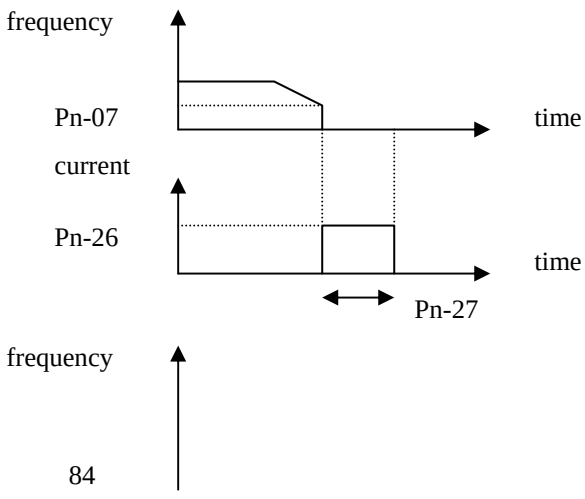
(Example) Assuming Pn-02 = 60.0Hz, Pn-24 = 1.1, up to 66Hz can be output. However, when the frequency exceeds 400Hz, it is clamped at 400Hz.

2.7.12 DC INJECTION BRAKING

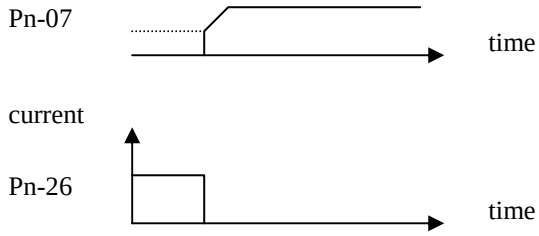
Item Name	Constant to be set	Factory Preset
DC Injection Braking during Stop	***27***	0.5s
DC Injection Braking at Start	***28***	0.0s
DC Injection Braking Current	***26***	50%

· DC injection braking at stop

Prevents overrun at stop.
If output frequency becomes Minimum output frequency Pn-07 or less, DC injection brake is applied for the time set by Pn-27, and the motor is stopped. By setting 0. 0s to Pn-27, DC injection braking becomes disable: the motor coast to stop when the output frequency is



less than the minmum output frequency Pn-07.



· DC injection braking at start

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

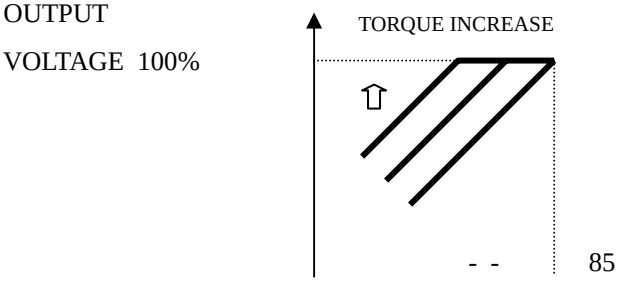
· DC braking current

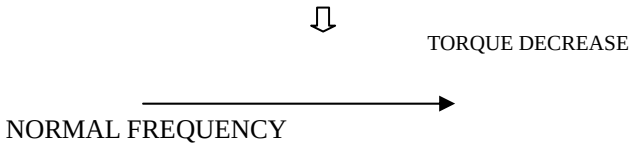
DC injection braking current 100% equals the inverter rated current. It is set to 50% at factory prior to shipping.

2.7.13 FULL-RANGE AUTOMATIC TORQUE BOOST

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

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





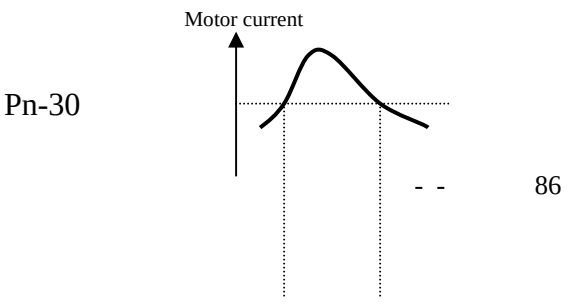
2.7.14 MOTOR STALL PREVENTION FUNCTION

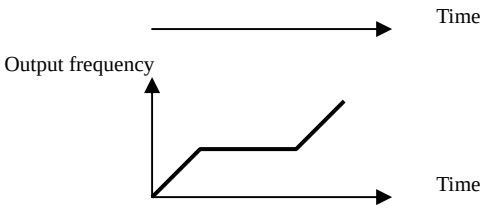
Item Name	Constant to be set	Factory Preset
Operation Level for Stall Prevention during Acceleration	***30***	170%
Operation Level for Stall Prevention during Running	***31***	160%
Stall Prevention Function during Deceleration	***20***	0000

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

- Stall prevention during acceleration.

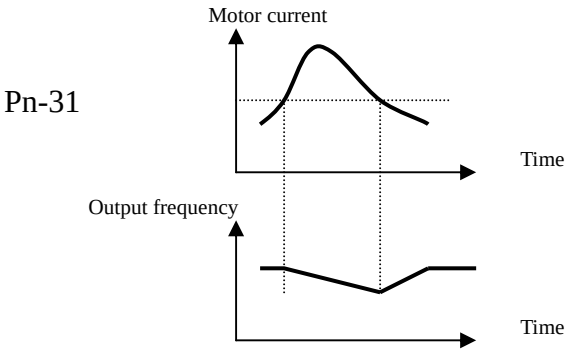
If the motor current exceeds the value set to Pn-30 during acceleration, accleration is stopped until the motor current is reduced to the Pn-30 set value or less.





- Stall prevention during running

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



- Stall prevention during deceleration

Automatically adjusts deceleration rate with monitoring DC voltage to prevent overvoltage during deceleration. Set “1” for connecting braking resistor.

Pn-20 = 0 X X X

4^{th} digit

0: Stall prevention during deceleration enabled.

1: Stall prevention during deceleration disabled.

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

2.7.15 ULTIFUNCTION CONTACT INPUT FUNCTION SELECTION

Item Name	Constant to be set	Factory PRESET
Multifunction Contact Input Function	***32*** **,** ***33***	Refer to page 63

The function of control circuit terminals 4 and 5 can be changed if necessary.
Set Pn-32 and Pn-33 in the descending order.

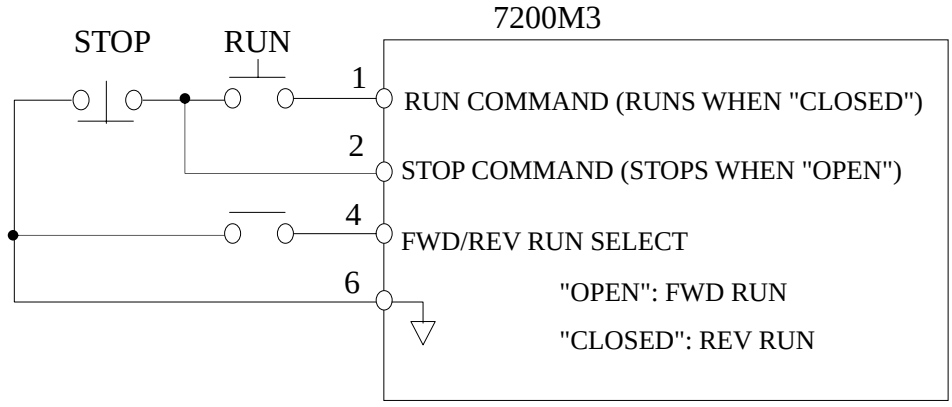
Pn-32 set value **<** Pn-33 set value

Terminal 4 function: Set to Pn-32

Set Value	Function	Page
0(Note)	FWD/REV run command (3-wire sequence selection)	-
1	External fault (NO contact input	101
2	External fault (NC contact input)	101

3	Multi-step speed reference 1	72
4	Multi-step speed reference 2	72
5	JOG command	73
6	Accel/decel time select	71
7	External baseblock (NO contact input)	107
8	External baseblock (NC contact input)	107
9	Search command from maximum frequency	96
10	Search command from setting frequency	96
11	Accel/decel prohibit command	98

Note: Terminal function at 3-wire sequence selection.



Terminal 5 function: Set to Pn-33

Set Value	Function	Page
1	External fault (NO contact input)	101
2	External fault (NC contact input)	101
3	Multi-step speed reference 1	72
4	Multi-step speed reference 2	72
5	JOG command	73
6	Accel/decel time select	71
7	External baseblock (NO contact input)	107
8	External baseblock (NC contact input)	107
9	Search command from maximum frequency	96
10	Search command from settingfrequency	96
11	Accel/decel prohibit command	98

- Contact input capacity is 24 Vdc 8mA or less.

- Circuit leakage current at signal OFF must be 100μA or less.

Wiring example (Open-collector input)

Note: When the multifuntion contact input is selected as JOG command, the Jog frequency.

2.7.16 MULTIFUNCTION PHOTO- COUPLER OUTPUT FUNCTION SELECTION

Item Name	Constant to be set	Factory Preset
Multifunction Contact Output Fubction	***34*** **,** ***35***	See page 64

Functions of control circuit terminals 13 - 7 , and 14 - 7 , can be switched.
Function of terminal between 13 - 7 at “L” :Set into Pn-34 .
Function of terminal between 14 - 7 at “L” :Set into Pn-35 .

Set Value	Function
0(Note 1)	Running
1(Note 2)	Frequency agreed
2	Zero speed
3	Frequency detection (output frequency ≧ frequency detection level)
4	Overtorque detected

Note: 1. Factory preset value of .
2. Factory preset value of .

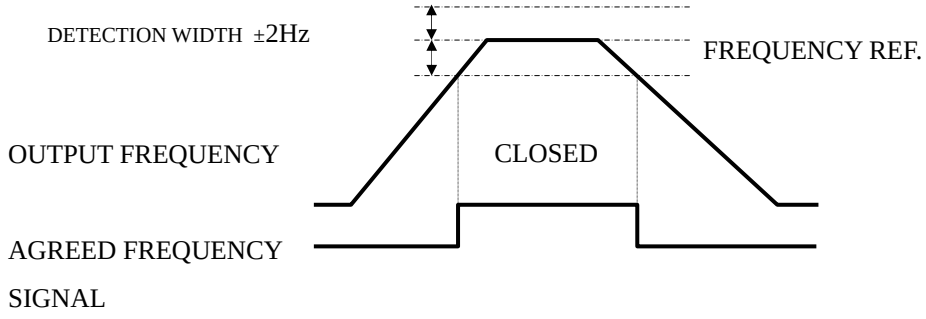
- Maximum output capacity is 48 VDC 50mA.
- To drive an inductive load, be sure to insert a free-wheel diode to control surge voltage.

2.7.17 SPEED AGREED SIGNAL OUTPUT

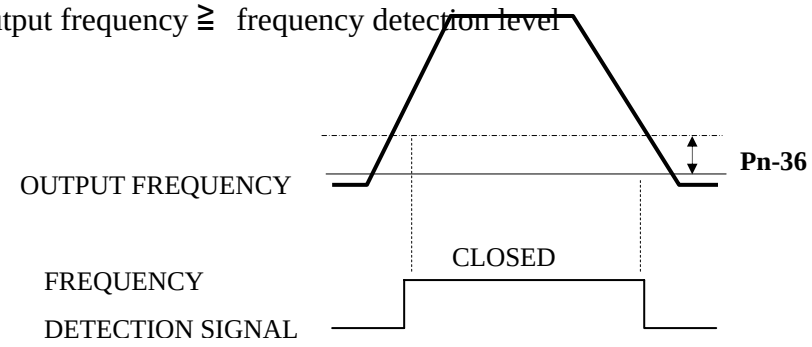
Item Name	Constant to be set	Factory Preset
Frequency Detection Level	***36***	0.0 Hz
Multifunction Contact Output Function	***34*** , ***35***	See page 64

This function is used when operation at an arbitrary speed must be indicated. By setting either set value to multifunction contact output function (Pn-34 , Pn-35) the following signal output to control circuit terminal 13 or 14 is enabled. Set 1 or 3 to Pn-34 or Pn-35 when the signal is to be output to control circuit terminals 13 and 14 , respectively.

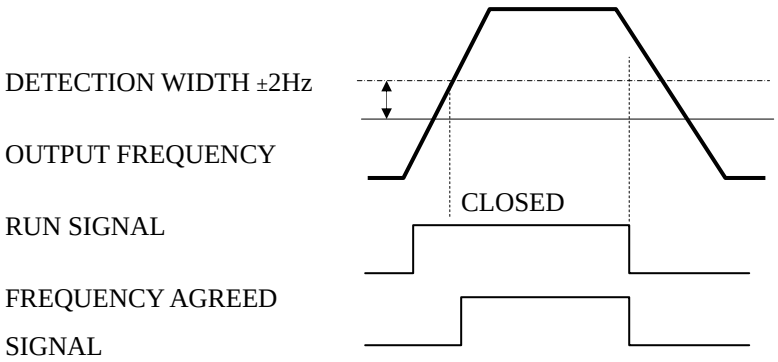
(1) Set value = 1 : frequency agreed



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



However, When “frequency agreed” is selected, the frequency agreed signal is turned OFF immediately at stop signal input.

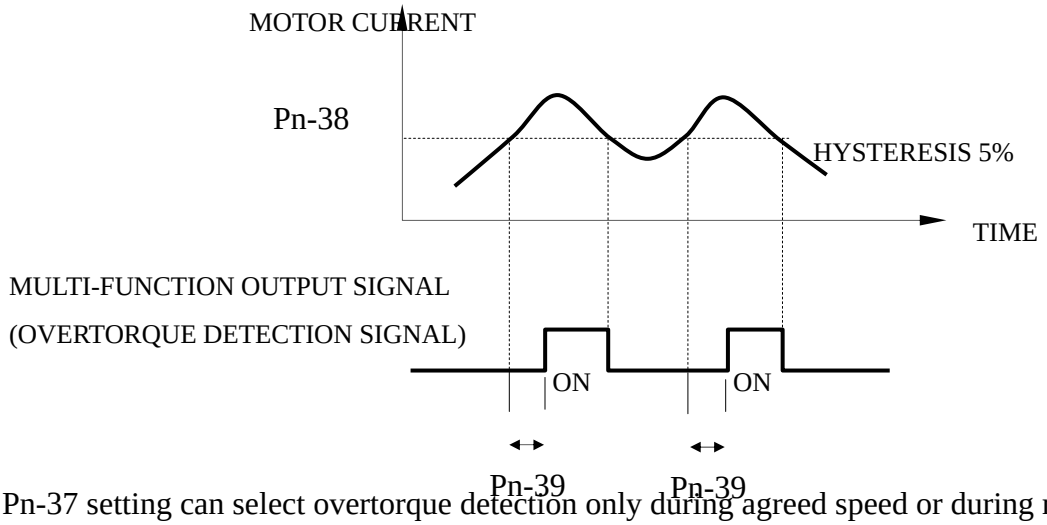


2.7.18 OVERTORQUE DETECTION FUNCTION

Item Name	Constant to be set	Factory Preset
Overtorque Detection Level	***38***	160%

Overtorque Detection Time	***39***	0.1s
Overtorque Detection Signal	***34 , 35***	See page 64
Overtorque Detection Selection	***37***	0000

When excess load is placed on machine, the increase in motor current is detected. If current exceeding the value set by Pn-38 lasts for a time exceeding the value set by Pn-39, the overtorque detected signal is output to control circuit terminal 13 or 14 until the current reduced to the Pn-38 set value or less. To output the signal to control circuit terminal 13 , set Pn-34 to 4, and to 14, Pn-35 to 4.



The Pn-37 setting can select overtorque detection only during agreed speed or during running Additionally, it can select continuous operation or output shut-off at overtorque detection.

Pn-37 = X 0 0 X

2nd digit

0:Overtorque is detected only during agreed frequency.

1:Overtorque is detected during running except for DB.

3rd digit

0: When overtorque is detected, the operation continues.

1: When overtorque is detected, the inverter output is shut OFF.

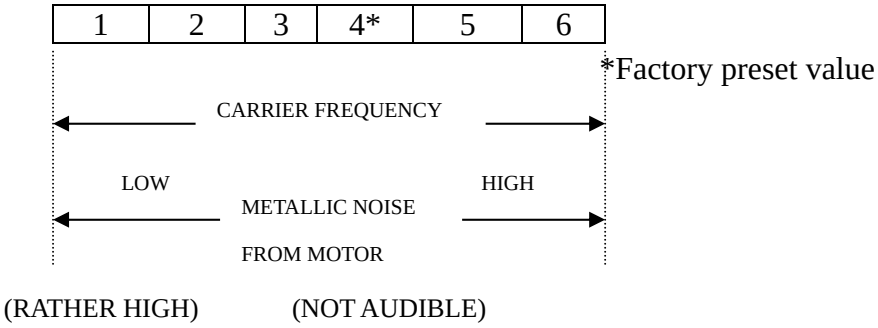
Fault contact signal is output. (Treated as a fault)

2.7.19 CARRIER FREQUENCY SETTING

Item Name	Constant to be set	Factory Preset
Carrier Frequency	***40***	4

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

Carrier frequency (kHz)=2.5kHz ×Pn-40 set value



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

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

If wiring distance between inverter and motor is long, reduce the carrier frequency. For details, refer to wiring precautions on page 12.

2.7.20 FREQUENCY/CURRENT METER CALIBRATION

Item Name	Constant to be set	Factory Preset
Analog Monitor Gain	***45***	1.00
Output Monitor Selection	***21***	0000

Frequency/ current meter connected to the inverter can be calibrated by without using a resistor for calibration. For the setting method, refer to Par. 2.4.2 “Calibration of Frequency Meter” on page 55 and “MULTIFUNCTION ANALOG OUTPUT MONITOR SETTING” on page 76.
Selection of output between control circuit terminals 12 -- 11

21 **= X X 0 X**

2nd digit

0: Output frequency

1: Output current

2.7.21 OPERATION AT MOMENTARY POWER LOSS

Item Name	Constant to be set	Factory Preset
Operation Selection after Momentary Power Loss	***46***	0000
Speed Search Operation Level	***54***	150%
Minimum Baseblock Time	***55***	0.5s

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

46 = X X X 0

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

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

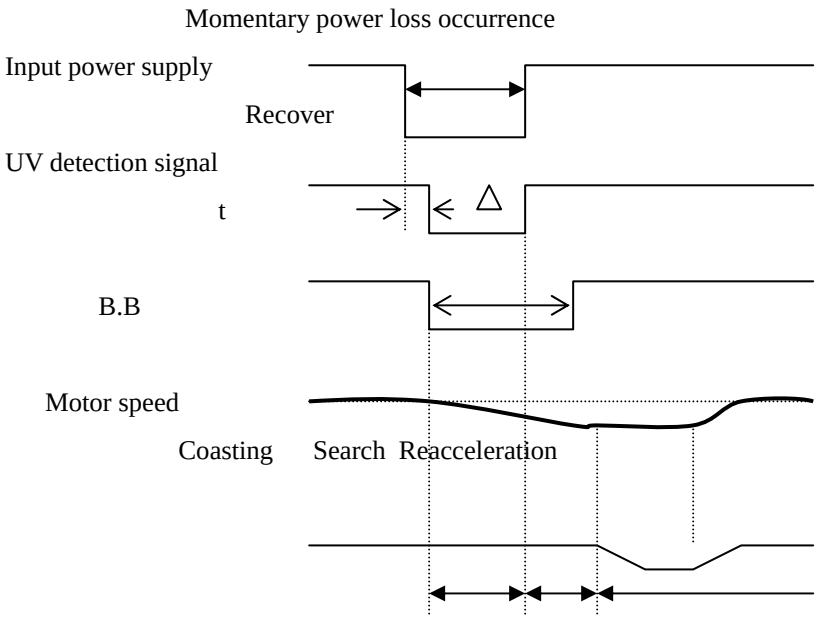
- 0.5 to 1HP (0.4 to 0.75Kw): Approx. 1 second

- 2 to 10HP(1.5 to 7.5Kw): Approx. 2 seconds

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

Operation when continuous operation after momentary power loss is provided , which is describing as below :

1. When undervoltage(UV) is detected, the inverter output is shut off and the frequency reference value and run command given before the momentary power loss are held. Additionally, counting of the undervoltage time starts; during counting, UV is displayed, blinking on the digital display unit and digital operator. If undervoltage is detected, the inverter output is ahut off for the minimum baseblock time Pn-55.
2. After recovery from the momentary power loss, after checking that the inverter DC voltage has recovered sufficiently, speed search operation is performed.
3. Speed search operation starts when the inverter output current exceeds the speed search operation level Pn-54 set value. At this time, the new frequency reference value and run command are read in. The frequency in which the inverter output current is smaller than the speed search operation level Pn-54 set value is judged to be the speed synchronised point, and reacceleration/ redeceleration is performed up/down to the set frequency in the set accel/decel time.



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

Do not provide an excessively small value for the minimum baseblock time setting. Otherwise, the inverter protective function may operate at search operation start.(Refer to page 96.)

2.7.22 AUTOMATIC RESET AND RESTART FUNCTION

Item Name	Constant to be set	Factory Preset
Fault Retry Selection	***47***	0
Speed Search Operation Level	***54***	150%
Minimum Baseblock Time	***55***	0.5s
V/f during Speed Search	***56***	100%

If an inverter fault occurs during running, the inverter performs selfdiagnosis to restart automatically.

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

The inverter restarts automatically in case of the following faults.

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

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

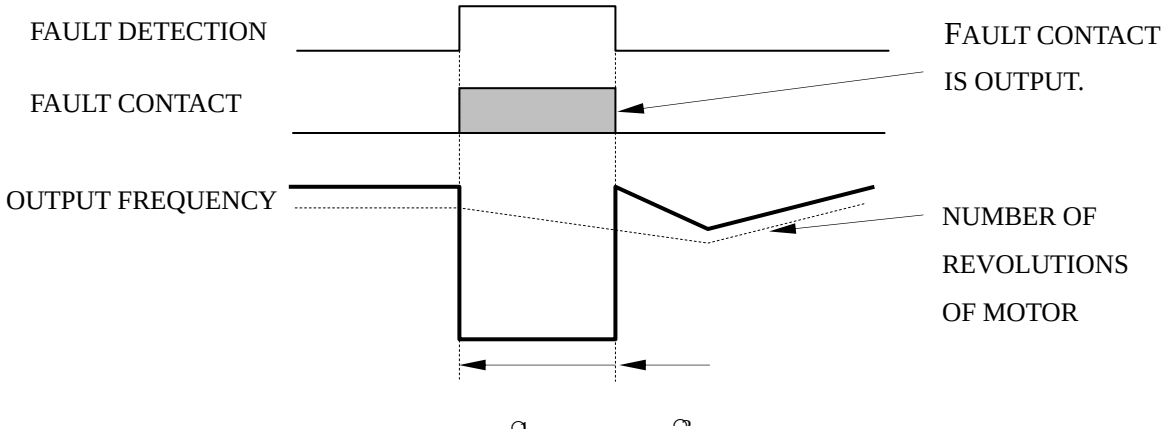
1.No fault occurs for more than 10 minutes.

2.Fault reset input signal (or reset key on the digital operator) is turned ON when the fault is checked.

3.The power supply is turned off.

Fault retry operation is described below:

3. If a fault is detected, the inverter output is shut off for the minimum baseblock time Pn-55. While the inverter output is shut off, the fault is displayed on the digital display unit and the digital operator.
4. After the minimum baseblock time Pn-55, the fault is automatically reset, and the speed search operation is performed from the output frequency at the fault occurrence.
5. If the inverter output current is larger than the speed search operation level Pn-54 set value, the speed search operation starts. The frequency in which the inverter output current is smaller than the speed search operation level Pn-54 set value is judged to be the speed synchronized point, and reacceleration/ redeceleration is performed up/down to the set frequency in the set accel/decel time.
6. If the total number of faults exceeds the number of retry times Pn-47, automatic reset is not performed and the inverter output is kept off. Then fault contact is output. (Fault contact is not output during fault retry.)



Note:

1.**v/f during speed search**

The v/f during speed search can be set as shown below by the Pn-56 set value so that a protective function as OC will not occur during speed search. However, this setting is not needed under normal operation.

V/f during speed search=V/f at normal operation × Pn-56

2. **Minimum baseblock time**

Do not provide excessively small value for the minimum baseblock time setting.

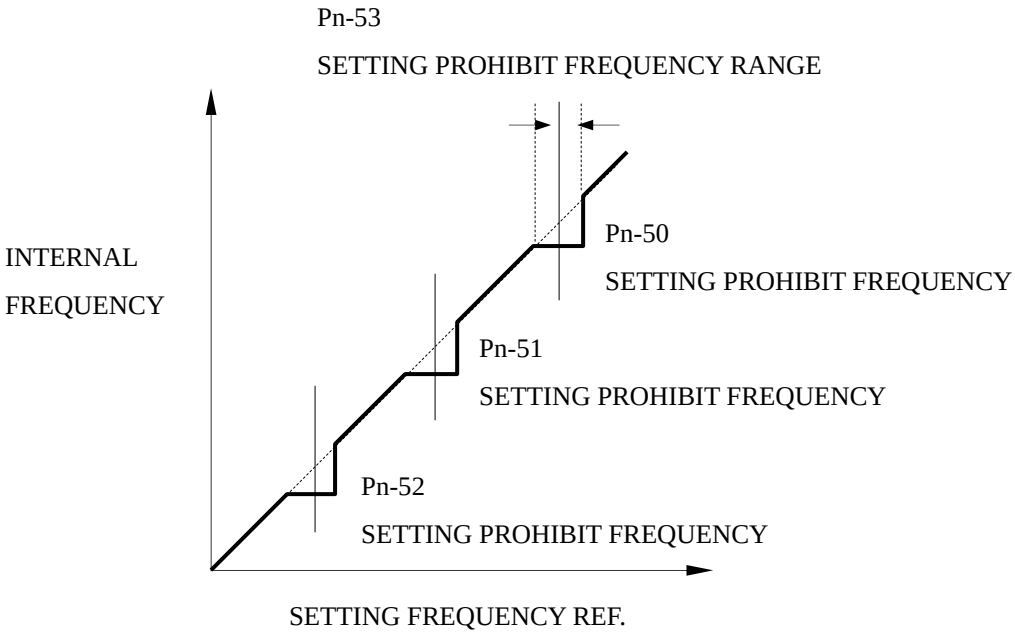
Otherwise, the inverter protective function may operate at speed search operation start.

(Refer to page 96.)

2.7.23 FREQUENCY JUMP CONTROL

Item Name	Constant to be set	Factory Preset
Jump Frequency 1	***50***	0.0Hz
Jump Frequency 2	***51***	0.0Hz
Jump Frequency 3	***52***	0.0Hz
Jump Width	***53***	1.0Hz

To operate the inverter without oscillation caused by machine system characteristic frequency, oscillation generating frequency can be allowed to jump. This function can be also for dead band control.



Constant—speed operation is prohibited within the jump width. However, output frequency does not jump during acceleration or deceleration for smooth acceleration or deceleration.

(1) Jump frequency 1 to 3 (***50*** to ***52***)

By setting the value to 0.0Hz, this function becomes disabled. Set jump frequency 1 to 3 as described below :

Jump frequency 3 (***52***) ≦ Jump frequency 2 (***51***) ≦ Jump frequency 1 (***50***)

(2) Jump width (***53***)

By setting the value to 0.0Hz, this function becomes disabled. The range to jump is : ***50*** to ***52*** - ***50*** to ***53*** <jumping range< ***50*** to ***52*** + ***50*** to ***53*** .

(Example) When jump frequency 1 (***50)*** is 45Hz and the jump width (***53***) is 2.0Hz: Jumping range = 43 to 47Hz.

2.7.24 SPEED SEARCH FUNCTION

Item Name	Constant to be set	Factory Preset
Speed Search Function	***32 , 33***	See page
Speed Search Operation Level	***54***	150%
Minimum Basseblock Time	***55***	0.5s
V/f during Speed Search	***56***	100%

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

The speed search command is input from multifunction contact input terminals 4 and 5 .For the functions of terminals 4 and 5 , “9”or “10” is set to ***32*** or ***33*** .

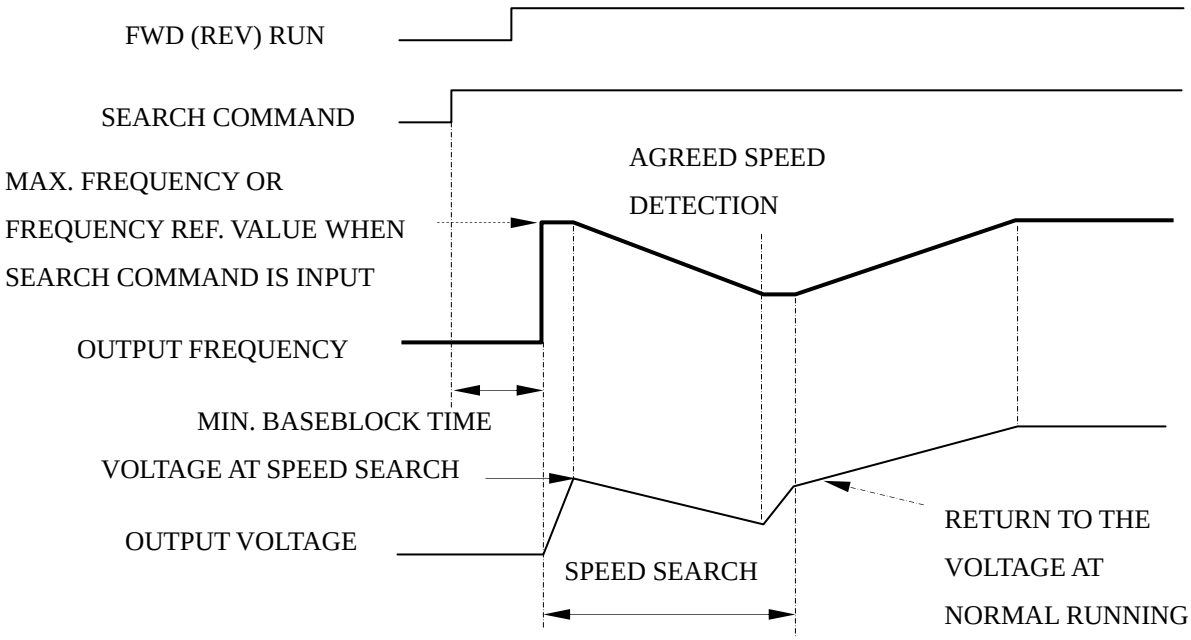
When setting to “9”: Search from maximum frequency

When setting to “10”: Search from setting frequency

By closing the search command during baseblock and inputting the run command, speed search is started after the inverter output is shut off for the minmim baseblock time ***55*** .

When the inverter output current is larger than the set value of the speed search operation level ***54*** , the speed search operation starts. Frequency in which the inverter output current becomes smaller than the speed search operation level ***54*** set value is judged to be speed synchronized point, and the motor starts reacceleration/redeceleration up/down to the setting frequency in the set accel/decel time.

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

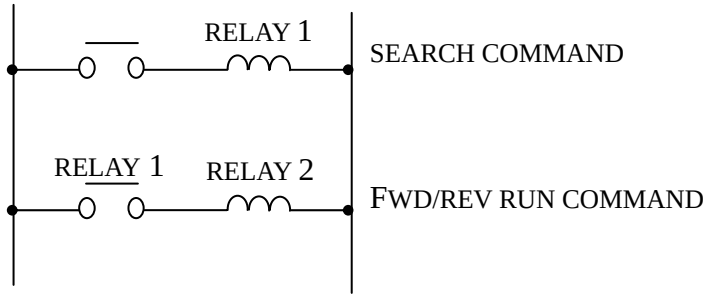


Notes:

7. Search commands with ser values of 9 and 10 (e.g. Pn-32 = 9, Pn-33 = 10)

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

<Example of Sequence>



3. The minimum baseblock time is a time when the inverter output is shut off during the motor remaining voltage occurrence. Setting this time shorter can reduce the time until speed search start, but an inverter protective function such as overcurrent (OC) may operate because of the motor remaining voltage and the like. Therefore, do not reduce the time unnecessarily.

2.7.25 FREQUENCY UP/ DOWN FUNCTION

Item Name	Constant to be set	Factory Preset
Accel/Decel Prohibit Function	***32*** **,** ***33***	See page 63
Output Frequency UP/DOWN operation	***20***	0000

A) Output frequency UP/DOWN operation by control circuit terminals

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

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

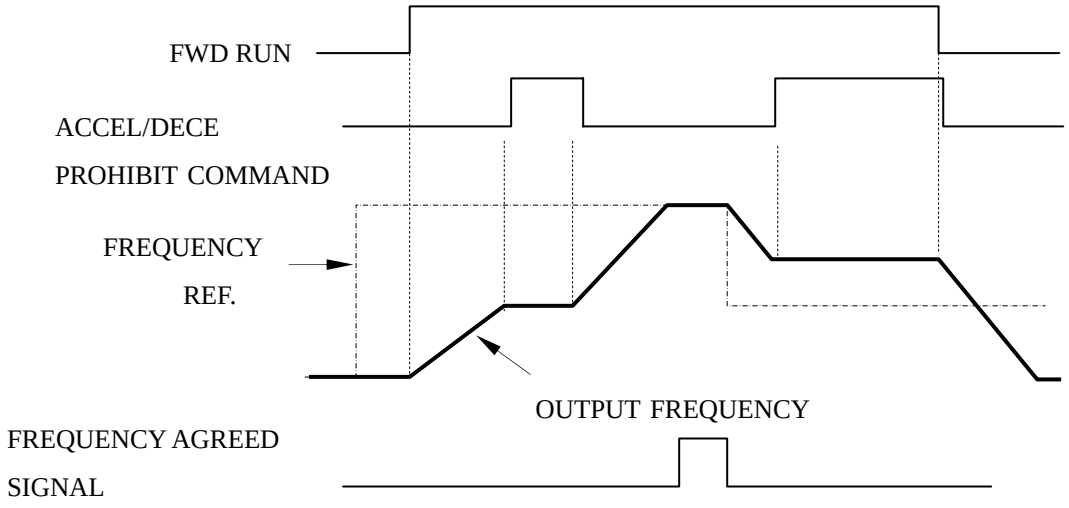
The accel/decel prohibit command is input from multifunction contact input terminal 4 or 5 .

For the function of terminal 4 or 5 , set all to ***32*** or ***33***

Terminal 4 function: Set to ***32*** .

Terminal 5 function: Set to ***33*** .

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



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

However, when frequency reference lower limit Pn-25 ≧ minimum output frequency Pn_07 is set, the motor operates at the frequency reference lower limit Pn-25.

B) Output frequency UP/DOWN operation by digital operator key.

20 = X 0 X X

0: Changes the frequency reference by Increments or < (up or down) key, after dpress the STR (store) key, then the output frequency start to UP or DOWN.

1: The output frequency can UP or DOWN by Increment or Decrement (up or down)key directly, without depress STR(store) key. If depress the STR key, then the frequency reference set by Increment/Decrement key will be stored.

2.7.26 FUNCTIONS FOR REDUCTION OF MACHINE VIBRATION OR SHOCK

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

Effective Method	Constant to be Set	Factory Preset	Adjustment	Page
· Shock				
· To decrease generating torque · To increease generating torque	***2*** to ***8***	See page 59	Decrease or increase V/f.	59
	29	1.0	Decrease or increase torque boost	81
To reduce shock at acceleration	***21***	0000	Set S-curve accel/decel.	77
	9 , ***11***	10.0s	Increase accel time	71
	30	170%	Increase stall prevention level during accel.	82
To reduce shock at deceleration	***1***	0000	Set coasting to a stop	68
	21	0000	Set S-curve accel/decel.	77
	10 , ***12***	10.0s	Increase decel time	71
	7	1.5Hz	Decrease or increase minmim output frequency	69
	26	50%	Decrease DC injection braking current.	80
· Vibration				
To decrease carrier frequency	***40***	4	Decrease PWM carrier frequency	89

2.8 PROTECTION FUNCTION AND TROUBLESHOOTING

Protection function		Explanation	Monitor display	Fault contact output
Low voltage protection	Main circuit low voltage Momentary power loss protection	When the inverter power voltage drops, torque becomes insufficient and motor is overheated. Inverter output is stopped when the main circuit DC voltage becomes lower than the low voltage detection level. Detection level: Approximately 210 Vdc or less for 220V class 3-Phase 170 Vdc or less for 220V class single-Phase and 420 Vdc or less for 440V class 3-phase	(UV1)	Operation
Overcurrent protection		The inverter output is shut-off when the inverter output current becomes approx. 200% and above of inverter rated current.	(OC)	Operation
Ground - fault protection (Optional function)		The inverter out is shut-off when a ground-fault occurs at the inverter output side and the ground-fault current exceeds approximately 50% of the inverter rated current.		Operation
Overvoltage protection		The inverter output is shut-off when the main circuit DC voltage becomes excessive because of regeneration energy caused by motor deceleration and negative load. Detection: Approx. 820 Vdc or more for input voltage 440V class 410 Vdc or more for input voltage 220V class	(OV)	Operation
Fuse blown		The inverter output is shut-off when the main circuit transistor fails. The fuse clears to prevent wiring from being by the short-circuit current.	Not display	No Operation
Cooling fin overheat (Only for forced cooling type)		The inverter output is shut-off when the ambient temperature rises and the heat sink fin reaches 90 ℃. Please check for a defective cooling fan or clogged filter.	(OH)	Operation
Overload protection	Motor	Inverter output is stopped when motor overload is detected by the electronic thermal overload in the inverter. Either a inverter duty constant-torque specialized motor or general-purpose motor can be selected. If more than one motor is driven, overload protection should be disabled. Use a thermal relay or thermal protector for each motor.	(OL1)	Operation
	Inverter	The inverter output is shut-off when the electronic thermal overload reaches or exceeds the inverse time limit of 112% of the inverter's rated current occurs. Maximum rated overload: 150%, 1 min.	(OL2)	Operation
	Over torque detection *1	The motor operates according to a preset mode when the inverter output current exceeds the overtorque detection level. This function is used to protect the machine or to monitor the output torque.	(OL3)	Operation
External fault signal input		When an external alarm signal is input, the inverter operates according to a preset stop method (coasting to a stop, continuous operation, or ramp to stop)	EF4 to EF5	Operation
Control circuit fault, option fault *2		The inverter output is shut-off when a transmission error occurs in the control circuit or a component fails. The inverter output is also shut-off when a specialized option such as the digital operator is not properly connected.	To	Operation

*1. For overtorque detection (OL3), fault display or alarm display can be selected according to the constant (Pn-37) setting. For details refer to “Overtorque Detection Function” on page 88.

*2. For details of control circuit faults, refer to Table 1.9 “Details of CPF Display” on page 29 indicate the contents of digital operator display.

	Error causes	Action to be taken
Uv1	● Inverter capacity is too small. ● Voltage drop due to wiring. ● Inverter power voltage selection is wrong. ● A motor of large capacity (11 kW or greater) connected to the same power system has been started. ● Rapid acceleration with generator power supply ● Operation sequence when power is off ● Defective electromagnetic contactor	● Check the power capacity and power system. ● UV display appears when the inverter power is turned off while operation signal is input. Remove the power after stopping the inverter. (Set the third and fourth bits of Sn-04 to 01.)
OC	● Extremely rapid accel/decel ● Motor on/off switching at the inverter output side ● Short-circuit or ground-fault at the inverter output side ● Motor of a capacity greater than the inverter rating has been started ● High-speed motor or pulse motor has been started.	Transistor error may occur. Investigate the error cause, correct it, then restart.
GF	● Motor dielectric strength is insufficient. ● Load wiring is not proper.	Check for ground-fault in motor or load wiring.
OV	● Over voltage ● Insufficient deceleration time ● Regenerative load (Motor is turned by the load.) ● High input voltage compared to motor rated voltage	If braking torque is not proper, extend the decel time or use a braking resistor. (If braking resistor is already installed, verify that Sn-10, 2nd digit to 1.)
FU	● Repeated overcurrent protection (OC) ● Repeated overload protection (OL2) power reset ● Rapid deceleration in excess excitation (improper V/f characteristic setting) ● External noise	Correct the cause, check the main circuit transistor, replace the fuse, then restart.
OH	● Defective cooling fan ● Ambient temperature rise ● Clogged filter	Replace the cooling fan and clean the filter. Ambient temperature: 104 ℉ (40 ℃) or less for enclosed type 122 ℉ (50 ℃) or less for open chassis
OL1 OL2	Overload, low speed operation or extended acceleration time, improper V/f characteristic setting. Motor rated current (Pn-19) setting is wrong.	Investigate the cause of overload and review the operation pattern, V/f characteristic, and motor/inverter capacities. (If inverter is repeatedly reset after an overload occurs, the inverter may fault. Investigate and correct the cause of overload.)
OL3	Motor Current exceeds the preset value because of machine error or overload.	Check the use of the machine. Correct the overload cause or set a higher detection level which is within the allowable range.
EF4 EF5	External fault condition occurred.	Correct the cause of the fault input.
	● External noise ● Excess vibration or shock ● CPF 02: Control circuit fault ● CPF 03: NVRAM (SRAM) fault ● CPF 04: NVRAM BCC Code error ● CPF 05: AD converter fault in CPU	● Check data in parameter setting. Record all data, then set Pn-00 = 08 for initializing. ● Turn off power, then turn on again. If error is persistent, contact your TECO representative.

2.9 Warning and Self-Diagnosis Functions

Protection function		Explanation	Monitor display	Fault contact output	
Low-voltage protection main circuit voltage insufficient		Monitor display appears if low voltage protection conditions such as a drop in main circuit voltage or momentary power loss occur while the inverter output is off.	(UV) (Blink)	Non operation	
Over voltage protection		Monitor display appears when the main circuit DC voltage rises above the detection level while the inverter output is off.	(OV) (Blink)	Non operation	
Cooling fin overheat warning		Monitor display appears when a separate thermal protector contact is input to the external terminal.	(OH) (Blink)	Non operation	
Overtorque detection		This function is used to protect the machine and to monitor the inverter output torque. The inverter output reacts in a preset manner when the inverter output current exceeds the over torque detection level. The monitor display blinks when "operation continue" is preset.	(OL3) (Blink)	Non operation	
Stall prevention Accel/decel is accomplished with maximum capacity of the inverter without trip- ping on over- current or overvoltage a	During acceleration	Inverter acceleration is stopped when 170% of or more of the inverter rated current is required by the load. This prevents overload protection (OL2) or overcurrent (OC) from occurring. When current is reduced to less than 170%, acceleration is enabled.	-	Non operation	
	During normal operation	Output frequency is decreased when 160% of the inverter rated current or greater is required by the load. This prevents motor and inverter overload (OL1, OL2). When current is reduced below 160%, inverter acceleration is than enabled.			
	During deceleration	Deceleration is stopped when the DC voltage is caused to rise by motor regenerative energy. This prevents overvoltage trips (OV). When DC voltage decreases, deceleration to the set value then resumes.			
Simultaneous normal and reverse rotation commands		When forward and reverse rotation commands are simultaneously detected for a period of time exceeding 500ms, the inverter is stopped according to the preset stop method.	(EF) (Blink)	Non operation	
External baseblock signal input (Minor failure) main circuit transistor instantaneous shut-off		When an external base block signal is input, the motor coasts to a stop. When the external base block signal is removed, the inverter output is immediately turned on at the previously set frequency.	(BB) (Blink)	Non operation	
Digital operator communication error		Digital operator communication error 1		Non operation	
		Digital operator communication error 2			

	Error causes	Action to be taken
UV	● Input voltage drop	Check the main circuit DC voltage in Un-xx. If the voltage is low, adjust the input voltage.
OV	● Input voltage rise	Check the main circuit DC voltage in Un-xx. If the voltage is high, adjust the input voltage.
OH	● Overload ● Cooling fan fault ● Ambient temperature rise ● Clogged filter	Replace the cooling fan and clean the filter. Ambient temperature: 104 ℉ (40 ℃) or less for enclosed type 122℉ (50℃) or less for open chassis
OL3	● Motor current exceeded the set value because of machine fault or overload.	Check the driven machine and correct the cause of the fault or set to a higher value.
STALL	● Insufficient power for accel/decel ● Overload ● Phase loss	● Set proper accel/decel time for smooth operation. ● For stall prevention during normal operation lighten the load or increase inverter capacity.
EF	● Operation sequence error ● 3-wire/2-wire selection error	● Recheck the control sequence. ● Recheck system constant (Pn-32 to Pn -33).
bb	● External fault conditions set-up	Take appropriate measurement for the cause of external fault input.
CPF00 CPF02	● External noise ● Excess Vibration or shock ● Digital operator fault ● Control board fault	● Check the digital operator connection ● Turn off the power supply once and turn it on again. If the fault still exists, replace the digital operator or control board.

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