

Panasonic

INVERTER DV-505E SERIES

For speed control of three-phase induction motor

OPERATION MANUAL

To avoid improper handling or misapplications of this product which may damage or shorten it's service life, read this instruction manual carefully.

Please keep this manual for future reference.

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1. THE FIRST STEP

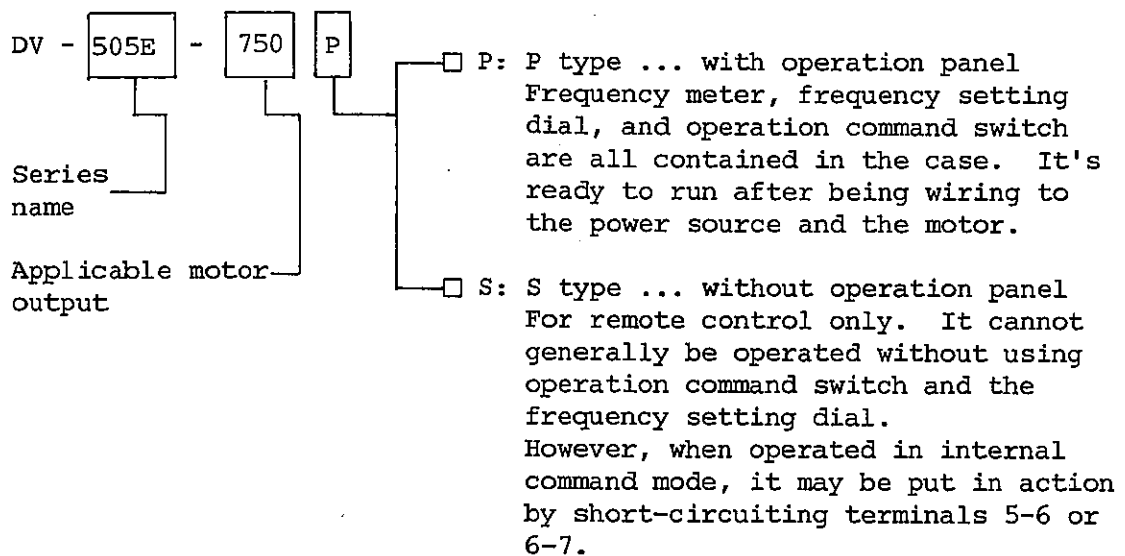
1.1 After unpacking

- Check the following points.

- (1) Make sure the delivered unit is exactly the one you've ordered. What's the model? How about the output?
- (2) Check if any part has been damaged during transportation.

* If you find any defect, please contact your dealer immediately.

- Coding of model



1.2 Cautions for safety

- (1) Do not connect power source to the output terminals for motor (U, V, W or T1, T2, T3).
- (2) After turning off the power source, a certain waiting time is necessary only to allow the capacitor to discharge. Commence servicing/checking after the CHARGE lamp (LED1, red) located the terminal V (T2) of PCB has gone out.
- (3) Note that the power source is not disconnected if the operation command switch is set to stop position.
- (4) If the inverter will not be used for an extended period turn off the power source.
- (5) When operating the inverter, use the no-fuse breaker (NFB) and thermal relay (TH-Ry) according to the wiring diagram. Select the thermal relay according to the motor rating.
- (6) Since the inverter DV-505E series is for wall-mount use, always mount it in vertical position. Do not install it horizontally.
- (7) Make sure of the ground connection. The ground terminal (E) should be connected to the earth ground.
- (8) When using at frequencies higher than 60 Hz, check the allowable maximum speed of your machine including the motor itself.
- (9) Always replace the furnished terminal cover on the terminal in order to prevent electric shock. This terminal cover can be easily removed or replaced by the hook provided.

2. INSTALLATION OF INVERTER

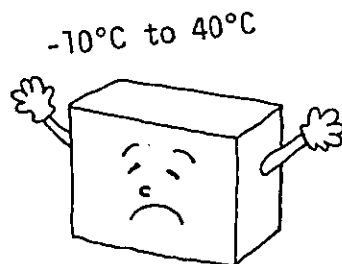
2.1 Place of installation

- (1) The DV-505E series inverter is of wall-mount type. Install vertically, and keep a sufficient free space for ventilation.

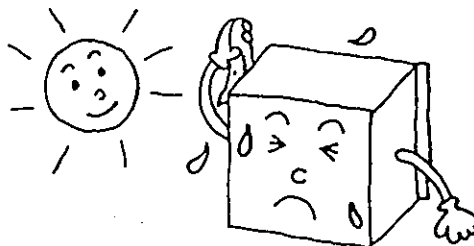
NOTES) • Mount securely with screws or bolts by making use of the base mounting plate so that stress as such as bending twisting may not be applied to the inverter's main body.

- Use M6 screws and bolts. As for the mounting pitch, see the external dimensions.

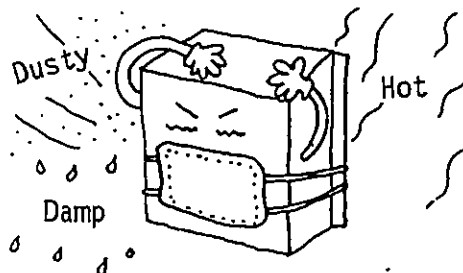
- (2) Install at ambient temperature of -10°C to $+40^{\circ}\text{C}$. When installed out of this range, erroneous operation or trouble may occur.



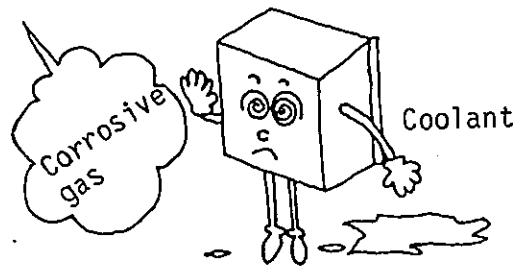
- (3) Do not install in location exposed to direct sunlight.



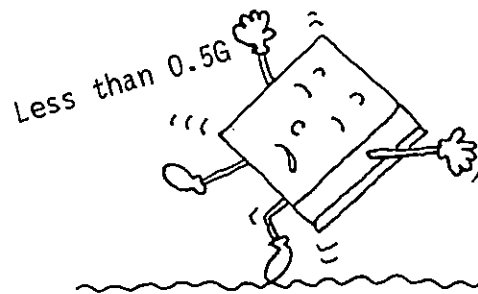
- (4) Avoid hot, damp, dusty or atmospheres filled with iron dust.



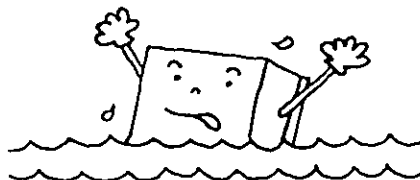
- (5) Avoid corrosive gas atmosphere, and keep off splashes of coolant.



- (6) Do not install in an area subject to vibration.



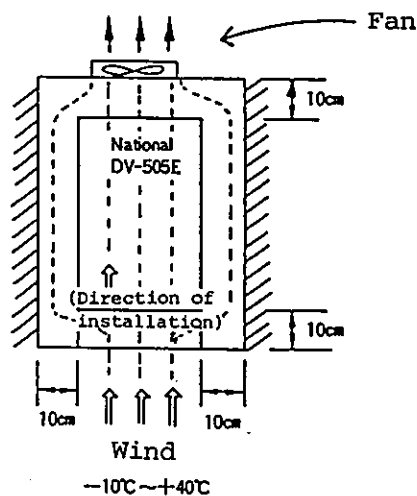
- (7) The control box is not of waterproof structure. Do not use outdoors.



2.2 Assembling into control panel

Setting into open control panel

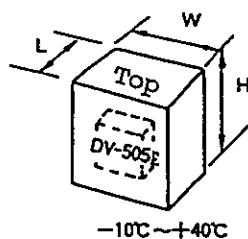
Put into a well ventilated box. Always keep a free area of more than 10 cm around the inverter to allow ventilation.



Setting into enclosed control panel

Inverter capacity	Enclosed, dust-proof type		
	Loss (at rating)	Req'd cooling area (ref.)	Box size (ref.)
DV-505E-400 ^S _P	60 W	1.12 m ²	400W × 300L × 600H
DV-505E-750 ^S _P	90 W	1.80 m ²	400W × 300L × 1100H

- The box size is given in the unit of mm.
- The box size is for reference because the actual size varies significantly depending on the ambient temperature and other conditions.
- Other heat generation than that from inverter is not taken into consideration in the given box size.



3. STANDARD SPECIFICATION

3.1 Specification table

DV-505E SERIES

Model		DV-505E-400 ^S _P	DV-505E-750 ^S _P
Output rating	Applicable motor output (kW) *1	0.4	0.75
	Output capacity (kVA)	1.0	1.7
	Rated output current (A)	3	5
	Max. output voltage *2	3-phase AC 230 V	
Weight (kg)		2.3	2.5
Protective structure		Open type	
Power source	Voltage, frequency	3-phase AC 230 V, 50/60 Hz	
	Allowable voltage regulation	180~242 V	
	Allowable frequency variation	±5%	
Control specification	Control method	Carrier frequency constant sine wave PWM control	
	Frequency range	1.5 to 60 Hz, 3 to 120 Hz (start/stop from 1 Hz)	
	Frequency resolution	0.24 Hz (at~60 Hz), 0.48 Hz (at~120 Hz)	
	Frequency precision	±0.5% (25°C±10°C)	
	Voltage/frequency ratio	V/F ratio constant up to 60 Hz; V constant after 60 Hz torque boost (voltage UP at low frequency)	
	Frequency setting signal	DC 0~+5 V	
	Overcurrent capacity	150%, 2 minutes	
	Regenerative brake torque	20% (short-time)	
	Maximum brake torque	DC dynamic brake (0 to 100%: 3 Hz or less; 0 to 60%: all range)	
	Acceleration/deceleration time *3	0-1.4 sec (0.2 sec step), 0-70 sec (10 sec step) 0-3.5 sec (0.5 sec step), 0-140 sec (20 sec step) 0-7 sec (1 sec step), 0-700 sec (100 sec step) 0-14 sec (2 sec step), 0-1400 sec (200 sec step) [60 Hz reference time] Setting possible separately for acceleration/deceleration	

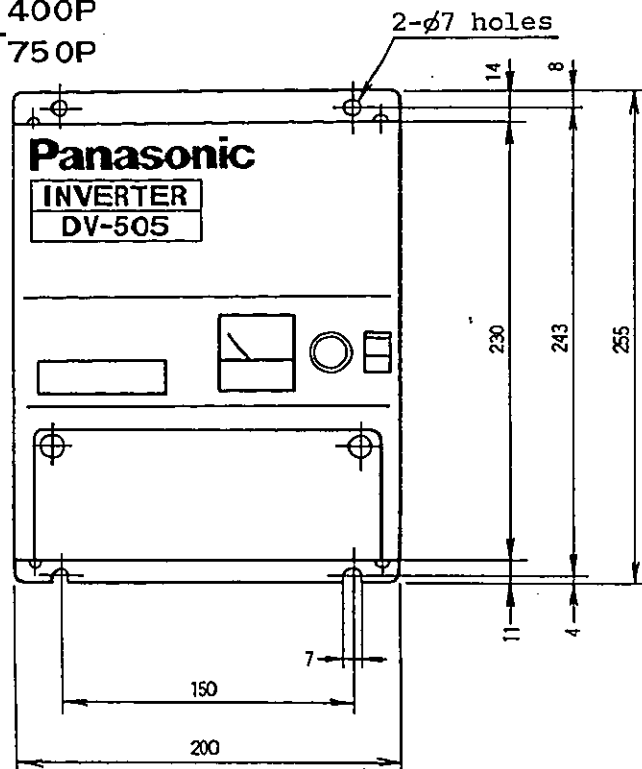
Model		DV-505E-400 ^S _P	DV-505E-750 ^S _P
Jogging frequency range		0~25 Hz	
Operation mode	External command mode	Frequency setting by external VR	One mode is selected by internal switch.
	Internal command mode	Frequency setting by internal VR	
	4-speed operation mode	Frequency setting of external VR (1st speed), parameters (2nd to 4th speeds). (However, jogging function and free-run function are not effective.)	
Protective function		Overcurrent shut-off, regenerative overvoltage shut-off, instantaneous power failure protection, undervoltage protection	
Display		Trip, charge (power source), parameter display, undervoltage warning	
Ambient conditions	Ambient temperature	-10°C to 40°C (not to be frozen). *Without main body case, -10 to 50°C	
	Ambient humidity	90% RH or less (not to condense dew)	
	Atmosphere	Free from corrosive gas	
	Altitude	1,000 m or less	
	Vibration	0.5G or less	
Others		Reset or free-run stop switch built-in, free-run stop (none in 4-speed operation mode)	

NOTES : Remember these application requirements

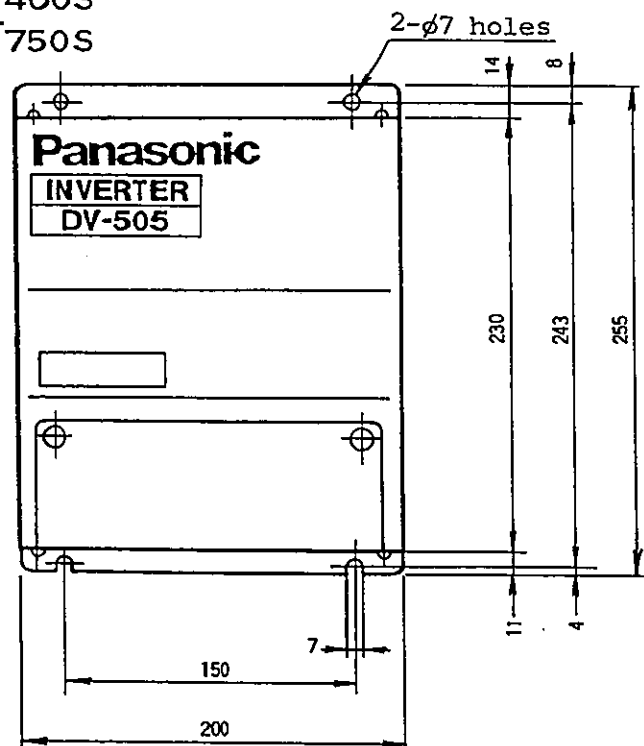
- *1. Always choose an A.C. motor that does not exceed the rating of the inverter.
- *2. Be certain that the output voltage required does not exceed the supply voltage.
- *3. In the case of 0 sec setting, the time when the frequency actually reaches 60 Hz is about 0.05 sec and it takes about 0.1 sec in deceleration.

3.2 Outline dimensional drawing

DV-505E-400P
750P



DV-505E-400S
750S



4. STANDARD CONNECTION AND OPERATION

4.1 Operation mode

The DV-505E has three operation modes. Select a proper mode according to the application. Concerning the parameters mentioned below, see par. 5.2 "Parameters and adjustment."

Function Operation mode	Normal/reverse rotation with acceleration/deceleration time		Dynamic brake	Jogging	Free-run stop	Upper, lower limits	Trip reset
	1 speed	4 speeds					
External command mode (operation mode 0)	o	x	o	o	o	o	o
Internal command mode (operation mode 1)	o	x	o	o	o	o	o
4-speed operation mode (operation mode 2)	o	o	o	x	x	x	o

External command mode (operation mode 0)

This is the most commonly used operation mode.

A voltage of 0 to 5 volts applied between control terminals 2 and 3 from external VR or the like becomes the frequency command. Jogging and free-run stop functions are standard capabilities.

(1) Jogging

This is a function to deliver a low frequency constantly at zero acceleration/deceleration time, and it is ideal for inching and positioning. By operating the normal, reverse rotation switch with the control terminals 8-6 short-circuited, the frequency set by parameter [8] is delivered. It is also possible to transfer from normal operation to jogging, or from jogging to normal operation. Please note, however, that a trip due to excessive current may take place if the jogging frequency is too high.

(2) Free-run stop (spontaneous stop)

Voltage application to the motor is cut off instantly, and the motor "free-runs" and stops. This function is particularly useful when driving brake motor. During free-run stop, however, the motor terminals are not isolated. Do not touch the internal parts or you may get electric shock.

(3) Dynamic brake

This is a function of applying the brake by temporarily passing a direct current into the motor when the inverter is about to stop operation. The DV-505E can select two types of dynamic brake by changing over the dip switch.

1) Dynamic brake under 3 Hz

When a stop command (both normal rotation switch and reverse rotation switch are OFF or ON) is given to the inverter, the operation slows down softly until the output frequency becomes less than 3 Hz. At this point, a direct current is passed into the motor for a specified time. The brake torque (DBI) and brake time (DBT) can be set by parameters. From the jogging operation, a dynamic brake of less than 3 Hz is applied.

NOTE: When the frequency command is set at zero, if the frequency becomes less than 1 Hz instead of 3 Hz, a dynamic brake is applied. At this time, the dynamic brake time and torque are the same as in dynamic brake under 3 Hz.

2) Full range dynamic brake

When a stop command is given to the inverter, direct current is instantly passed into the motor for a specified time. The brake time (DBT) is 8 times that under 3 Hz.

Internal command mode (operation mode 1)

The frequency command is set by internal VR 2 (see 5.1.6), and the external VR and control terminal 2 become invalid. All others are same as in external command mode. To vary the motor speed easily in S type without panel, short-circuit control terminals 5-6 or 6-7.

4-speed operation mode (operation mode 2)

By the operation of control terminals 8, 9 alone, the external frequency command and three built-in parameters, that is, four speeds, can be selected. In this case, it must be noted that the functions of control terminals 8, 9 and meaning of parameters [8], [C], [D] are different from those in the above operation modes 0, 1. Jogging and free-run stop functions are not available, but when either parameter DBI or DBT is set at the minimum to establish full range dynamic brake, free-run stop is caused by stop command.

[Priority of functions]

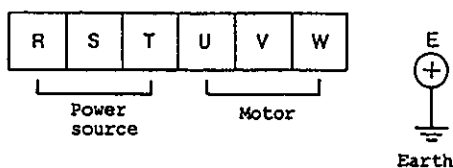
Dynamic brake < normal operation < jogging < free-run stop < trip

Examples

1. When operation command is given during dynamic brake, operation is started up immediately.
2. When free-run stop command is given during jogging, free-run stop is put into effect.
3. If operation command is given during free-run stop, operation is not effected.

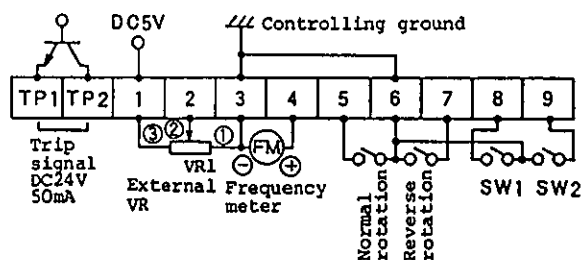
4.2 Description of terminals

[Power terminals]



- SW1 and SW2 vary in function depending on the operation mode.
- In operation mode 0, the external VR1 becomes the frequency command dial.
- Trip signal turns on the transistor when tripping. Although this signal is completely isolated from other terminals, please note that the dielectric strength against controlling ground is DC 50 volts.

[Control terminals]



- Terminals 5, 7, 8, 9 are pulled up to +5 volts inside by means of 4.7 k Ω resistor so that control by contact or open collector output is possible.
- Do not touch the control terminals during operation or damage and malfunctions due to static electricity may occur.

[Table of control terminal functions]

Terminal No.	External command mode (operation mode 0)	Internal command mode (operation mode 1)	4-speed operation mode (operation mode 2)	Remarks
TP1	Trip output (emitter)	←	←	Open collector output DC 24 V 50 mA
TP2	Trip output (collector)	←	←	
1	DC 5 V	←	←	
2	Frequency setting input	Invalid *1	1st speed setting	0 to +5 V
3	Controlling ground	←	←	
4	Frequency meter output	←	←	
5	Normal rotation	←	←	Stopped if both are OFF or ON. But reset if both are ON for more than 0.1 sec when tripping.
6	Controlling ground	←	←	
7	Reverse rotation	←	←	
8	Jog *3	←	4-speed selection *4	
9	Free-run *2 stop	←		

*1 Internal VR is the frequency command dial.

*2 Trip reset is not effected.

*3 By turning on JOG and turning on normal or reverse rotation, jogging is started. The jog command can be accepted during operation.

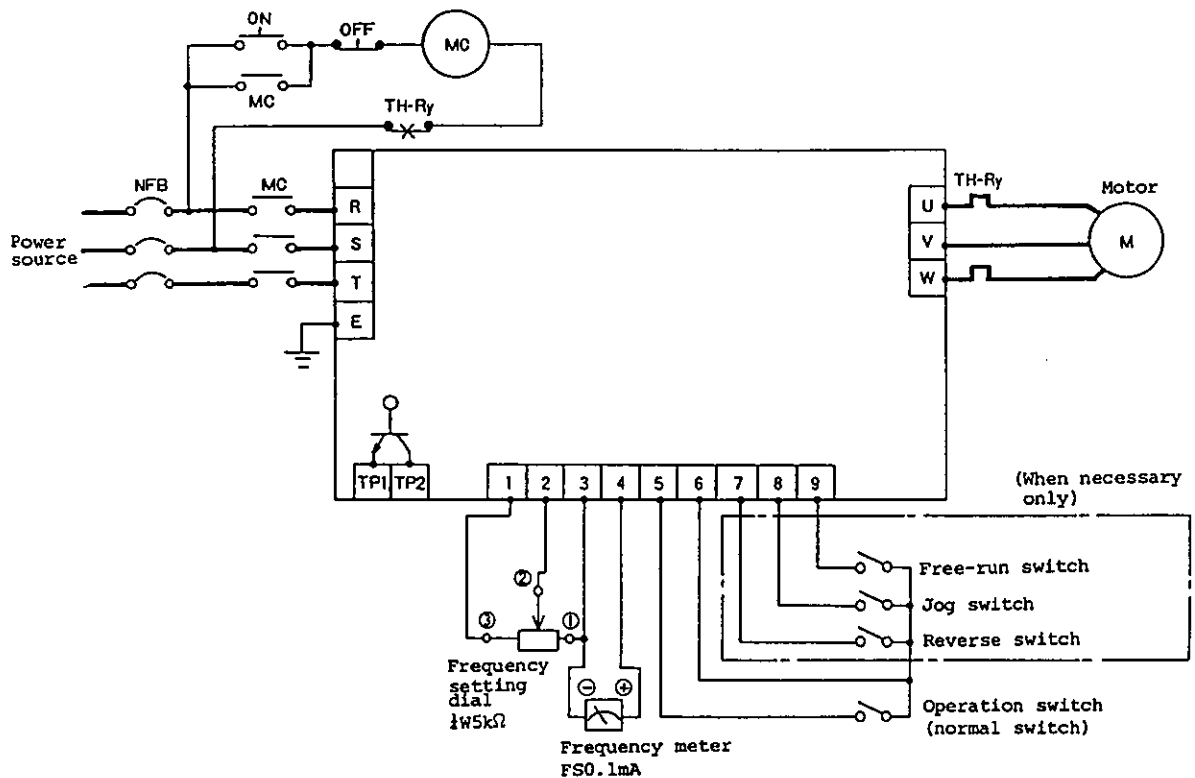
*4

Terminal No.	1st speed	2nd speed	3rd speed	4th speed
8	OFF	ON	OFF	ON
9	OFF	OFF	ON	ON

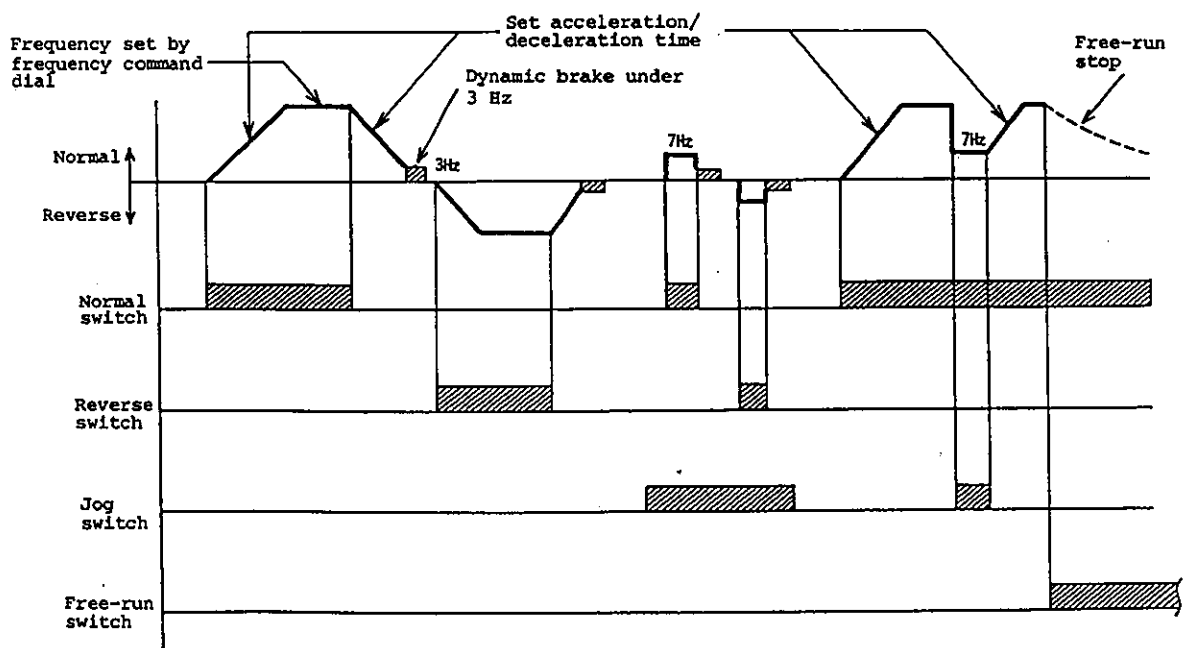
("ON" means to connect to terminal 6.)

4.3 Standard connection of external command mode (operation mode 0)

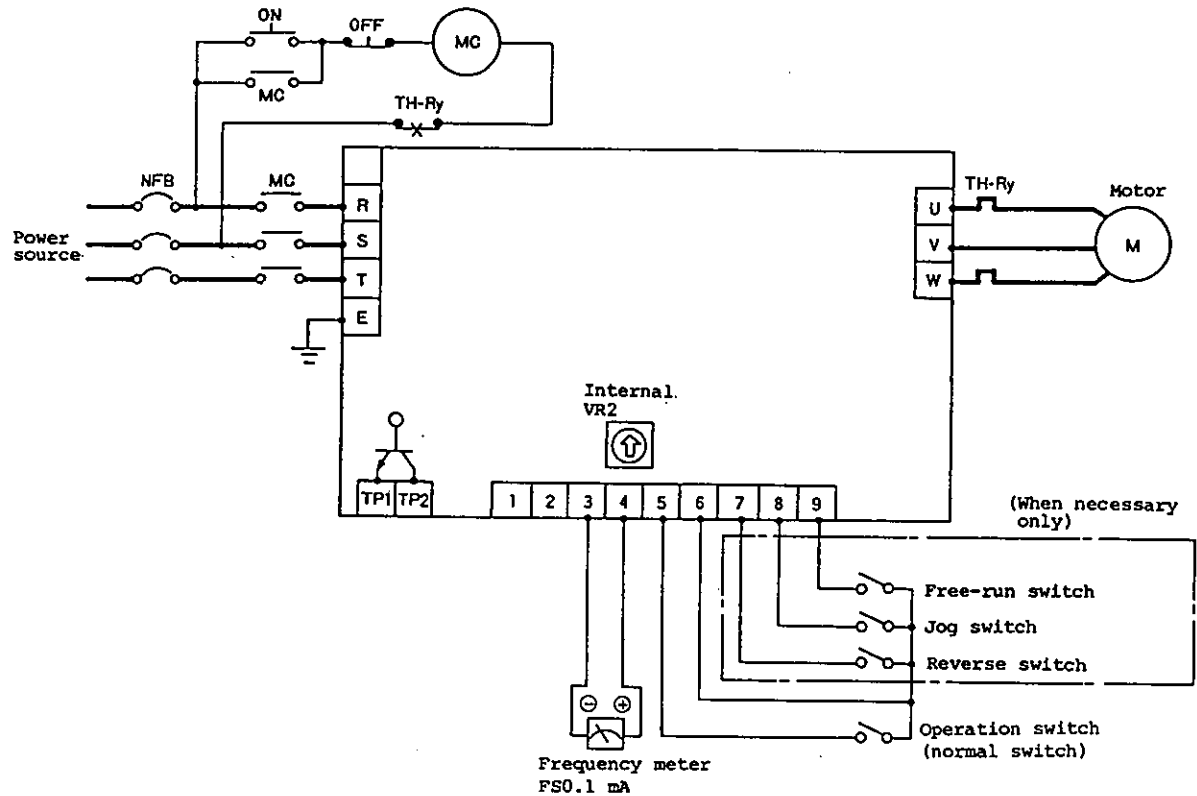
(DV-505E-000S type)



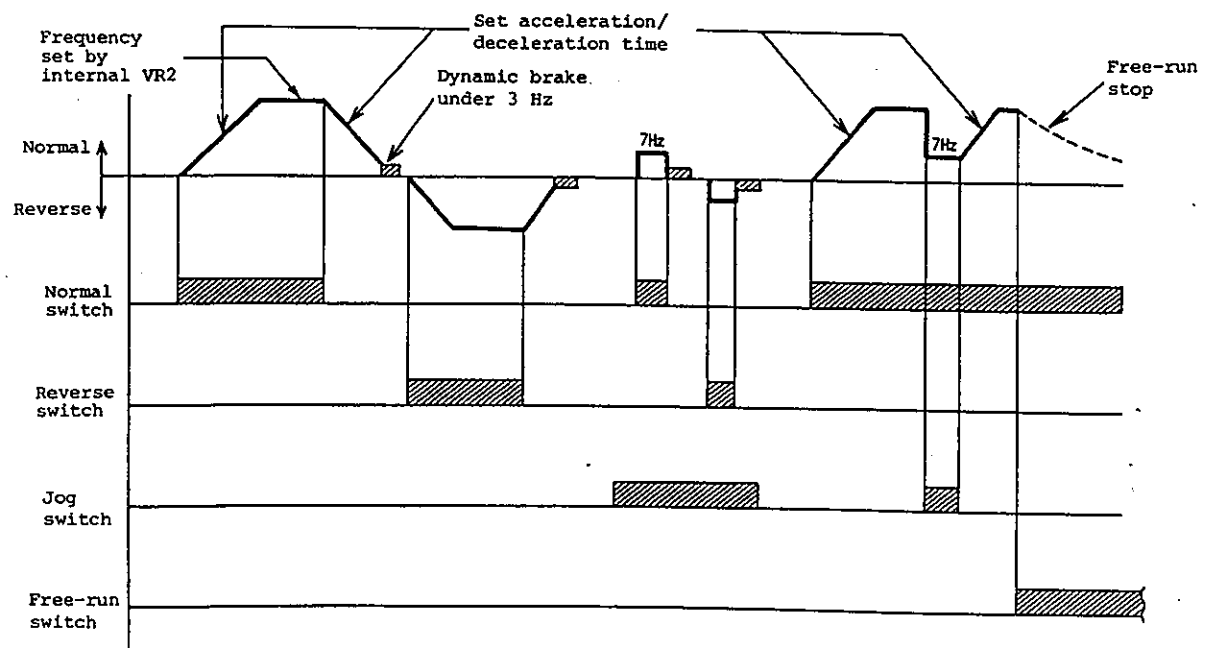
[Operation pattern]



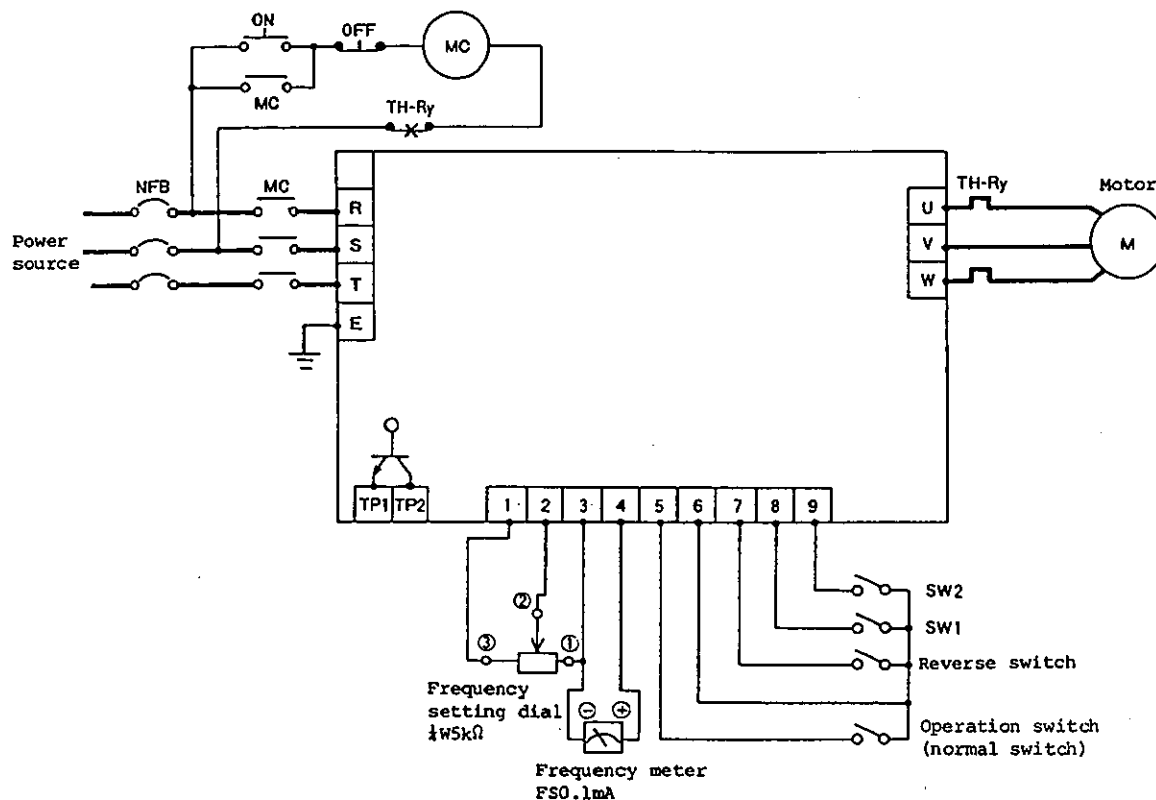
(DV-505E-000S type)



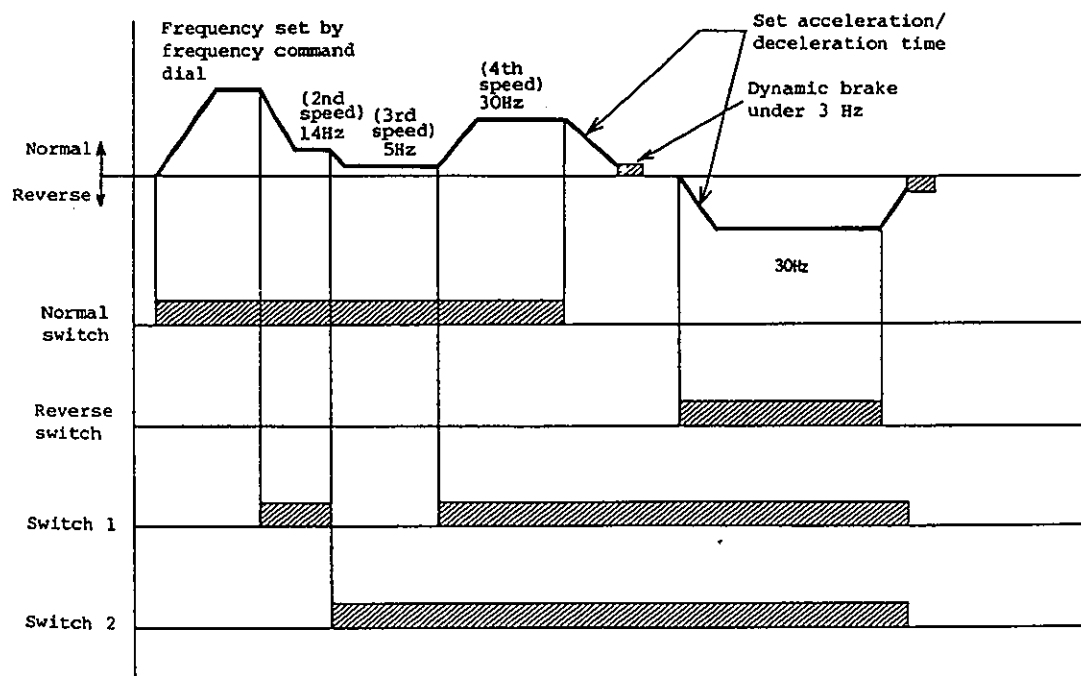
[Operation pattern]



(DV-505E-000S type)

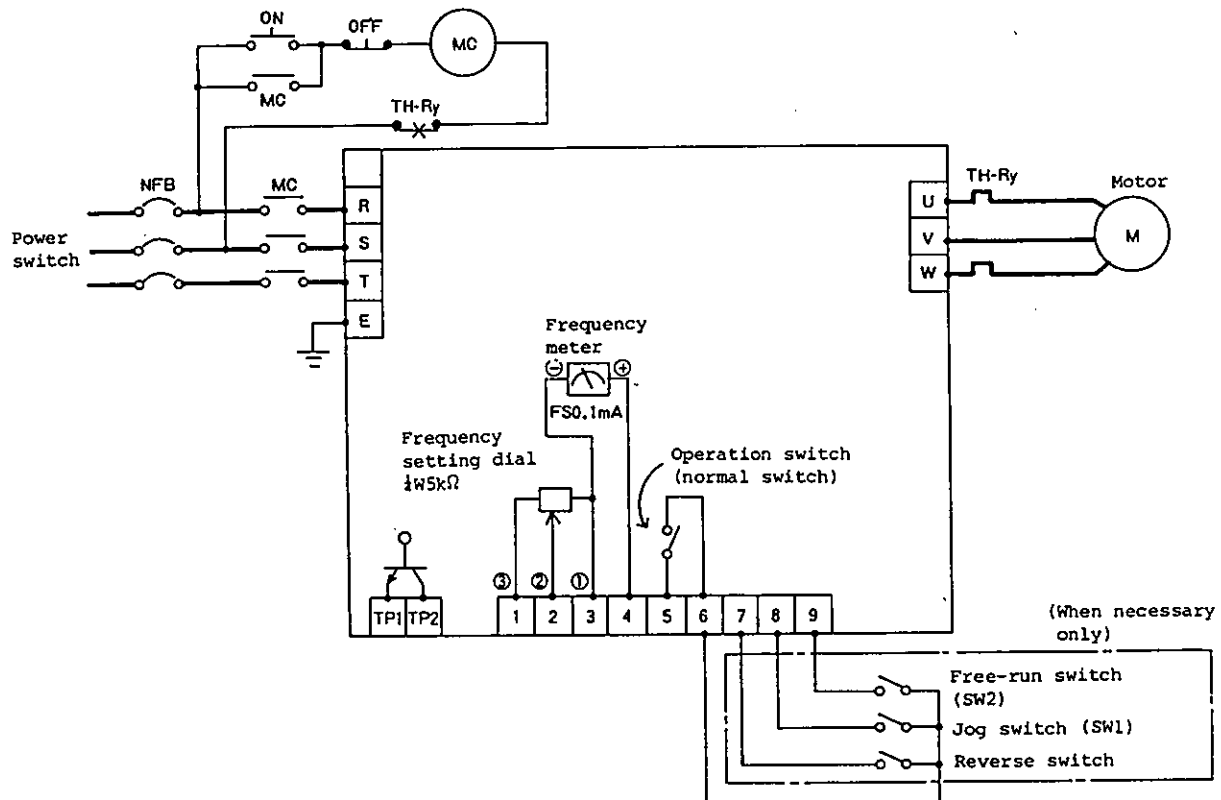


[Operation pattern]



NOTE: 2nd, 3rd, 4th speeds can be set by parameter adjustment
(see par. 5.2).

4.6 Standard connection with operation panel (DV-505E-oooP type)

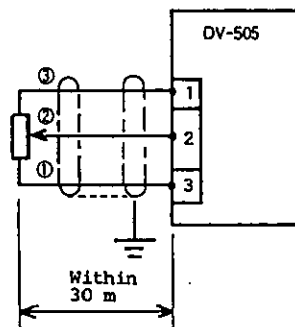


4.7 Cautions for connection

Control circuit terminals

- For connection to control circuit terminals (1, 2, 3, etc.), use twisted wires or shielded wires.
- Separate the wires of control circuit from the power wires.
- Ground the shield of the shielded wire.

[Example]



Avoid miswiring to apply power source to motor output terminals (U, V, W or T1, T2, T3).

CHARGE lamp lights up, but the power transistor is broken the moment the operation switch is turned on.

Phase advancing capacitor

Remove the phase advancing capacitor of existing motor. Otherwise the inverter trips.

Use NFB at power source side.

Ground.

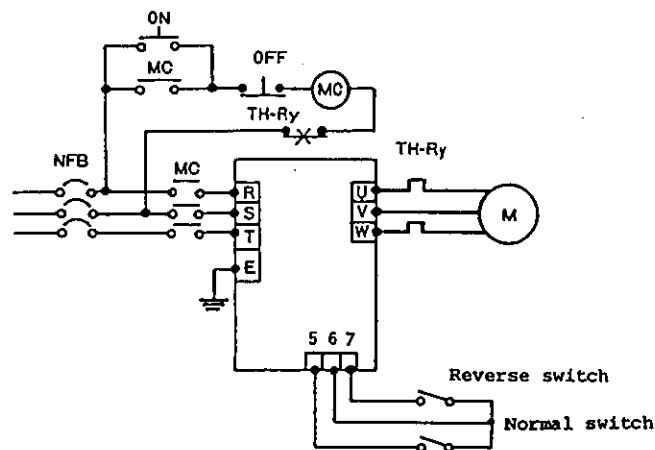
For connection to power terminals (R, S, T, U, V, W, E L1, L2, L3, T1, T2, T3), use solderless terminals with insulation coating.

Misconnections leading to breakdown

- (1) Reverse connection of power source wires R, S, T or L1, L2, L3 and motor wires U, V, W or T1, T2, T3, or ground fault of U, V, W or T1, T2, T3.
- (2) Application of more than DC 24 V, 50 mA to TP1, TP2 terminals, or application of voltage in reverse polarity.
- (3) Application of voltage from outside to frequency command terminals 1 to 9, except No. 2.
- (4) Application of voltage over 5 V to frequency command terminal 2.
- (5) Short circuit of internal power source terminal 1 and controlling ground terminals 3, 6.

4.8 Operation

- Before starting operation, check the connections again.
- Although the operation can be started and stopped by the electromagnetic contactor provided at the inverter power source side, but since it shortens the service life of the inverter by frequent repetition of rush current when turning on the power, use the control terminals (5-6, or 6-7) for starting and stopping operation.
- The DV-505E series does not contain overload protective function. Operate in the load condition so that the inverter output may be always within the rated current. If there is risk of exceeding the rated current even for a moment, install a thermal relay (TH-Ry).

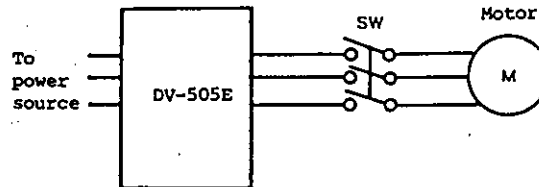


• Setting of operation mode

Determine the operation mode before turning on the power (resetting), and turn the rotary switch (RSW) to desired position of 0 to 2 depending on the operation mode, then turn on the power. After setting the parameter, return to the selected mode 0, 1 or 2.

- (1) If returned to a different operation mode, the operation mode changes automatically when resetting next time.
- (2) If the power is turned on or reset with the rotary switch kept at position 3 to F, the LED2 (green) flickers, and the inverter does not deliver output. In such a case, return the rotary switch to the specified operation mode, and turn on again to clear this state. While the LED2 (green) is flickering, the trip lamp LED3 (red) does not light, but the transistors for trip signal (TP1, TP2) become ON, and abnormality is noticed outside.

4.9 Closing and breaking at inverter output side



- * Do not install electromagnetic contactor between inverter and motor and energize or de-energize it during inverter operation. On start up the inverter, speed is gradually increased from low frequency (1.5 Hz) so that the starting current does not exceed the rated current of the inverter. If the electromagnetic contactor is turned on during inverter operation, a large current flows, which may cause the inverter to trip.

Closing at output side

State of motor before closing State of inverter	While motor is running (free-run)	While motor is stopped
Inverter running	× Closing inhibited (or it trips).	Δ Closing permitted (direct feed current should be inverter rated current × 150% or less).
Inverter stopped	Δ Closing permitted (but motor should be stopped before starting).	○ Closing OK.

Breaking at output side

Breaking is possible, but the motor halts in free-run stop (brake is not applicable).

4.10 Selection of peripheral devices

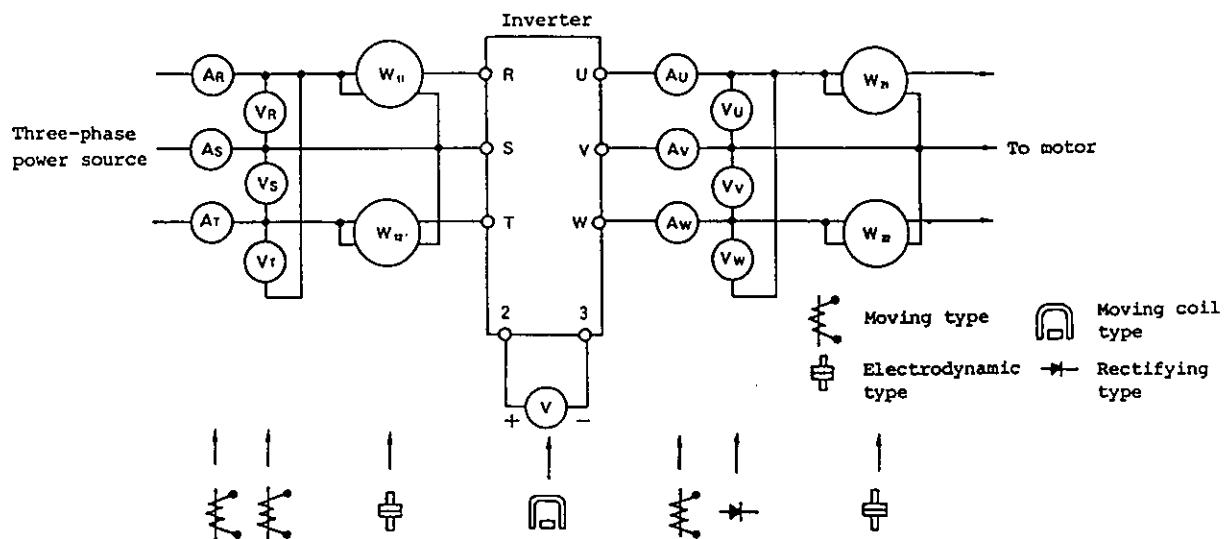
1. Selection of no-fuse breaker, electromagnetic contactor, wire

Inverter type	Applicable motor (kW)	No-fuse breaker Rated current	Electromagnetic contactor (Contact configuration)	Thermal relay (current adjusting range)	Wire (mm ²) (Size according to current requirements)
DV-505E-400 S _P	0.4	BBP3-5 (5 A)	BMF6-10-4-2 (4 a)	BMF9-04 (1.8~3.0 A)	2.0
DV-505E-750 S _P	0.75	BBP3-10 (10 A)	BMF6-10-4-2 (4 a)	BMF9-07 (3~5 A)	2.0

NOTES: The motor wire refers to the distance of within 20 meters between inverter and motor. For longer distance, use wires of larger size.

2. Selection of instrument (Metering)

Since the primary side and secondary side voltages and currents of the inverter vary depending with the instrument being used, because higher harmonics are present. When measuring with an instrument for commercial line frequency, measure by using the instruments and circuits as shown below.



3. Selection of relay

For the relays used on the control terminals 5, 6, 7, 8, 9 and other control circuit functions, use small signal type (minimum guaranteed current 1 mA or less) in order to prevent intermitting faulty contact. Since a current of only several microamperes flows in the control terminal 2 (frequency setting input), a twin contact or gold contact is necessary.

4. Selection of switch for control circuit

When using switch instead of relay, use one for small current in order to prevent faulty contact.

5. Selection of frequency command dial (VR)

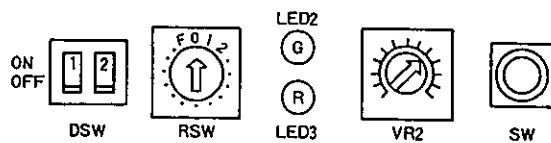
Use enclosed variable resistor of 5 k Ω , B-characteristics, 1/4W or more.

5. ADJUSTMENT

The DV-505E control provides 3 modes of operation and include 12 different functional possibilities for adjustment and/or presetting (soft start time, carrier frequency, etc.).

Each function and adjustment of the DV-505E can be determined and selected by the following methods:

5.1 Adjustment devices



1. Reset pushbutton switch (SW)

Depressing the Reset button while running directly resets the micro-processor, and the inverter will be in the free run stop mode. On releasing the button, the inverter will automatically restart and will accelerate to the original set speed.

PB switch (SW) is also used for the following:

- Inverter trip reset
- Inverter function select
- Inverter maximum frequency change

2. Switch DSW (dip switch)

SW No.	Item	Function	To change	Adj. at factory
1	Max. freq.	ON : 120 Hz OFF: 60 Hz	Only at resetting	60 Hz
2	Dynamic braking torque	ON : Full freq. range OFF: 3 Hz or less	Anytime	3 Hz less

If "No Braking Torque" is required, set either the Dynamic Brake Torque (BDI) or Dynamic Brake Time (DBI) to "0" (zero). (The DBI and DBT adjustments will be explained later).

CAUTION! Do not operate switch DSW when the main power is applied as "electrostatic" interference may cause erroneous operations.

3. RSW (Rotary switch)

The RSW switch is used to select the desired operation mode and inverter operation function.

4. LED 2 (green lamp)

This LED will illuminate as each inverter function is selected. An undervoltage condition will be indicated by a blinking LED 2 (green light).

5. LED 3 (red lamp)

In the event the inverter trips, the LED 3 (red lamp) will illuminate. At the time a trip occurs, the open collector signal which is interconnected to terminals TP1 and TP2 may also be used as a trip signal.

During the trip phase, the motor runs freely. The method for reset of a trip condition is as follows:

- (1) Turn off (disconnect power source), wait 10 seconds, then turn on (reconnect power source).
- (2) Or press the reset pushbutton.
- (3) Or short the both terminals (#5 for forward run command input and #7 for reverse run command input) to the ground terminal (#6) at the same time for more than 0.1 sec (this method is only effective when the inverter trips).

NOTE: When changing operation mode, maximum frequency or resetting the inverter trip, one of the above three methods may be necessary. If the malfunction is caused by external noise and/or static electricity, use only methods (1) or (2).

6. Potentiometer (VR2)

This potentiometer is used to adjust each function. The same potentiometer is also used for setting the output frequency of the inverter when operating in mode 1 (internal command mode).

5.2 Parameters and adjustment

1. Parameter types and functions

RSW	Operation mode & selection for each Parameter	Adj. range *7	Adj. at factory	F meter indicates
0	External command mode (Mode 0)	Switching possible only at resetting	"0"	Output freq.
1	Internal command mode (Mode 1)			
2	4 speeds operation mode (Mode 2)			
☆3	Soft start (time)	0~7	5 sec	Para-meters
☆4	Soft start (magnification)	0.2, 0.5, 1, 2, 10, 20, 100, 200	×1	
☆5	Soft down (time)	0~7	5 sec	
☆6	Soft down (magnification)	0.2, 0.5, 1, 2, 10, 20, 100, 200	×1	
☆7	Carrier frequency	0~7	6	
8	JOG frequency *1 (Determination for 2nd speed)	0~25 Hz *1 (0~max. freq.)	7(14) *1 Hz	
9	Boost *6		—	
A	Dynamic brake time (DBT) *6	0~2.5(20) sec *2	0.5(4)*2 sec	
B	Dynamic brake torque (DBI) *6		—	
C	Upper limit freq. *3 (Determination for 3rd speed) *1	0~max. freq.	5 Hz	
D	Lower limit frequency *3 (Determination for 4th speed) *1	0~max. freq.	30 Hz	
E	Frequency meter compensation *5		—	
F	Not in use			

*1 () Shows when 4 speeds operation mode is selected.

*2 () Shows when SW No. 2 of DSW is set ON (Full frequency range, See 5.1,2).

*3 When you set "Upper limit freq. < lower limit freq.", the limit function will not work.

*4 ☆-Marked parameters can be changed with 8 steps. We will call them as digital parameters. The other will be continuously changed and called as analog parameter.

*5 Frequency meter should be a 100 μ A rating at full scale.

*6 Those parameters are adjusted properly at the factory before shipment. Please do not touch it unless specially needed.

*7 Turn VR2 to the right to increase the parameters.

(1) Acceleration/deceleration time

These time are one which are necessary to vary between 0 (zero) and maximum frequency of an inverters output at acceleration and/or deceleration. These time are adjustable separately.

$$\text{Accel. time} = \text{Soft start time (parameter 3)} \times \text{Soft start magnification (parameter 4)} \times \text{max. freq./60}$$

$$\text{Decel. time} = \text{Soft down time (parameter 5)} \times \text{Soft down magnification (parameter 6)} \times \text{max. freq./60}$$

[Quick reference of accel./decel. time]

(Unit: second)

Max freq.	Soft start/down time		Soft start/down magnification							
			×0.2	×0.5	×1	×2	×10	×20	×100	×200
60 Hz	0	Accel.	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		Decel.	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	1		0.2	0.5	1	2	10	20	100	200
	2		0.4	1.0	2	4	20	40	200	400
	3		0.6	1.5	3	6	30	60	300	600
	4		0.8	2.0	4	8	40	80	400	800
	5		1.0	2.5	5	10	50	100	500	1000
	6		1.2	3.0	6	12	60	120	600	1200
	7		1.4	3.5	7	14	70	140	700	1400
120 Hz	0	Accel.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Decel.	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	1		0.4	1	2	4	20	40	200	400
	2		0.8	2	4	8	40	80	400	800
	3		1.2	3	6	12	60	120	600	1200
	4		1.6	4	8	16	80	160	800	1600
	5		2.0	5	10	20	100	200	1000	2000
	6		2.4	6	12	24	120	240	1200	2400
	7		2.8	7	14	28	140	280	1400	2800

Above data is for accel./decel. operation by the operation switch (rocker switch) of the operation pannel. On the other hand, because of the time lag caused by the internal circuit, accel./decel. time is lagged by 0.5 sec. if accel./decel. is commanded by the frequency commands. In this case, quicker accel./decel. than 0.5 sec. is not available.

2) Carrier frequency (Parameter 7)

The DV-505E uses a sine-coded PWM control system with a constant frequency carrier system. The virtue of this unique system provides motor operation that is both quiet and low in vibration. This feature insures that no harmful resonance is passed on to driven machinery. Increasing parameter 7 results in a higher carrier frequency.

3) Jogging frequency (Parameter 8)

This parameter is used to set jogging frequency when either external operating mode or internal operating mode is selected. When you select the 4 speeds operation mode, use parameter 8 for determination of the 2nd speed, as explained in the note below.

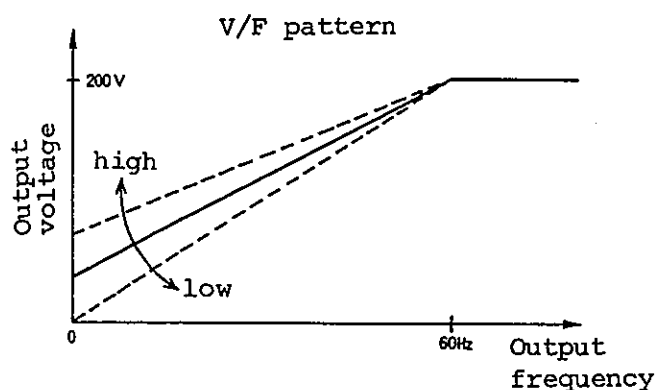
- i) In the 4 speed operation mode, the 2nd speed is preset by parameter 8. This will automatically vary according to the maximum frequency setting by SW No. 1 of DSW.

- ii) An example of the above note is as follows:

At factory, the jogging frequency has been adjusted at 7 Hz by parameter 8. However, when the inverter is operated in the 4 speeds mode and max. freq. is set at 60 Hz, the 2nd freq. becomes 14 Hz. If the max. freq. is 120 Hz, it becomes 28 Hz.

4) Boost (Parameter 9)

This function is to increase the inverter output voltage so as to increase the level of the motor torque in the lower frequency range. Parameter 9 for "boost" has been adjusted before shipment. Do not adjust parameter 9 unless absolutely necessary. Excessively high torque boost raises the motor's no load current, leading to the tripping of the inverter or rapid overheating of the motor.

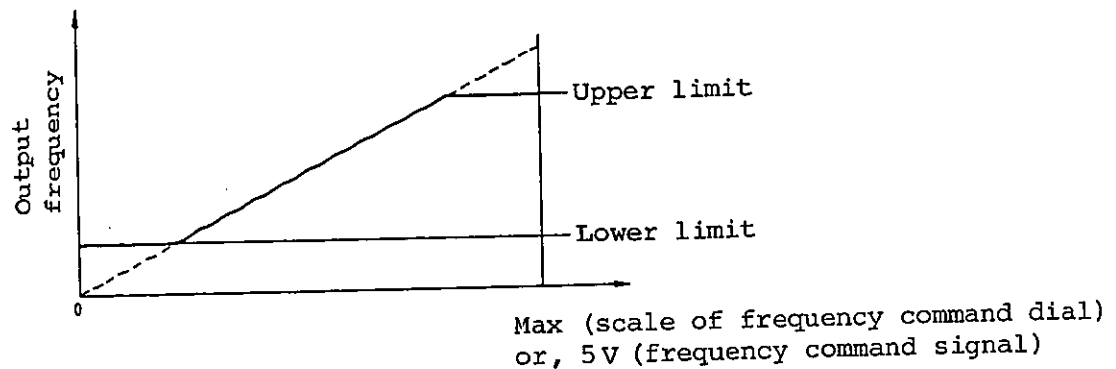


(5) Dynamic braking time and torque (Parameter A, B)

Dynamic braking torque (motor current) and the braking time can be adjusted by these parameters. However, please note that the excessive long braking time and/or large braking torque may cause inverter tripping or overheating of the motor. If the SW No. 2 of DSW is set "ON" (full freq. range) braking time will be 8 times as long as the braking time when SW No. 2 is "OFF", (3 Hz or less).

(6) Upper/lower limit frequency (Parameter C-D)

DV-505E offers the upper/lower limited function as shown below.



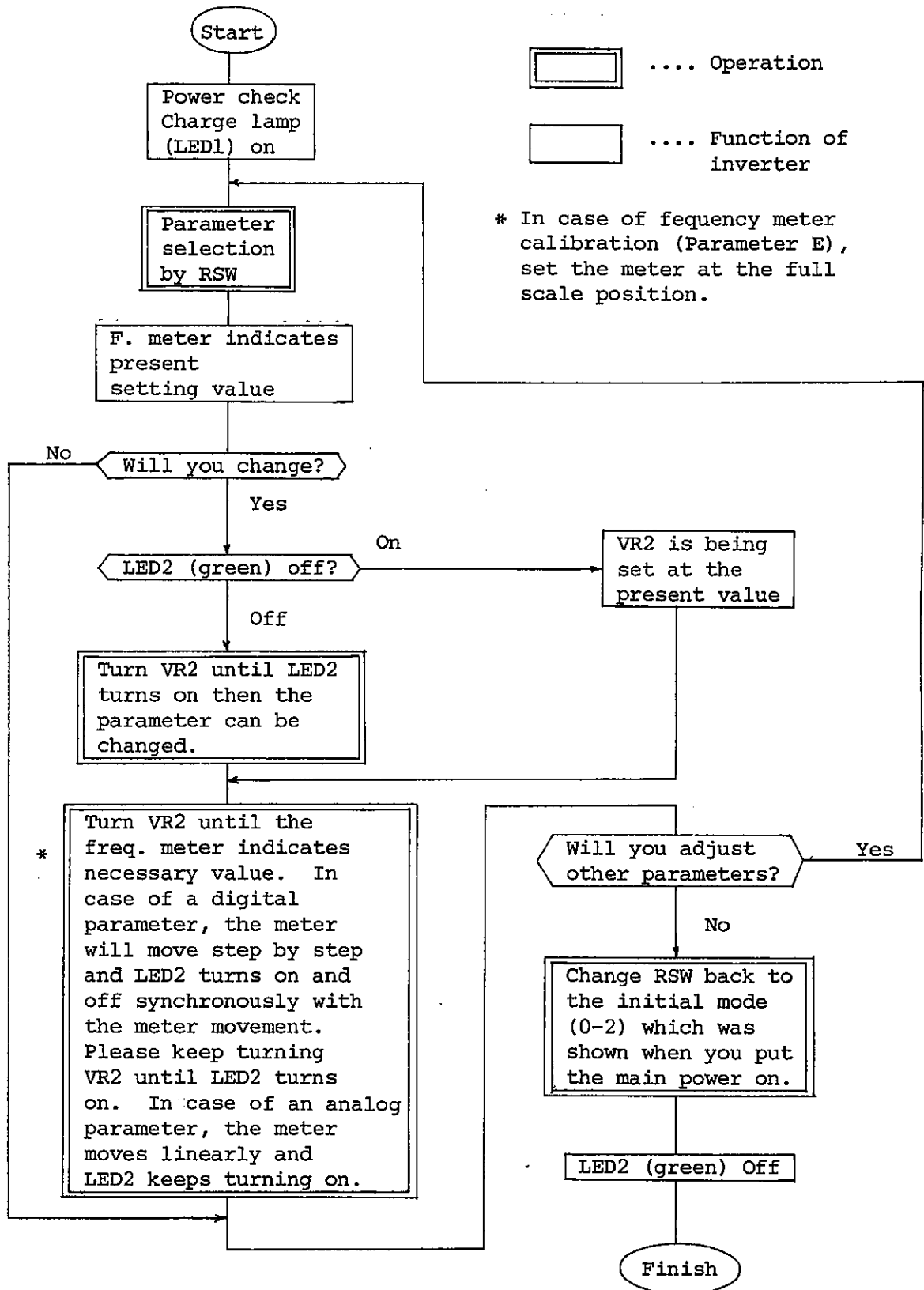
If you set those parameters in reverse, that is upper limit is set as lower than lower limit, those limit functions do not work. (Before shipment these parameters C and D have been adjusted as "Upper limit < Lower limit" to invalidate these functions.) If lower limit frequency is set a 1 Hz or higher you cannot stop the motor by the potentiometer on the panel but you can stop it by the Forward/Reverse rocker switches. If lower limit frequency is set at 1 Hz or lower the lower limit frequency function will cease to be valid. At 4 speeds operation mode, the inverter loses both the upper and lower limit frequency functions. In this case, these parameters, C & D will be used for determining the 3rd speed and 4th speed respectively.

(7) Frequency meter compensation (Parameter E)

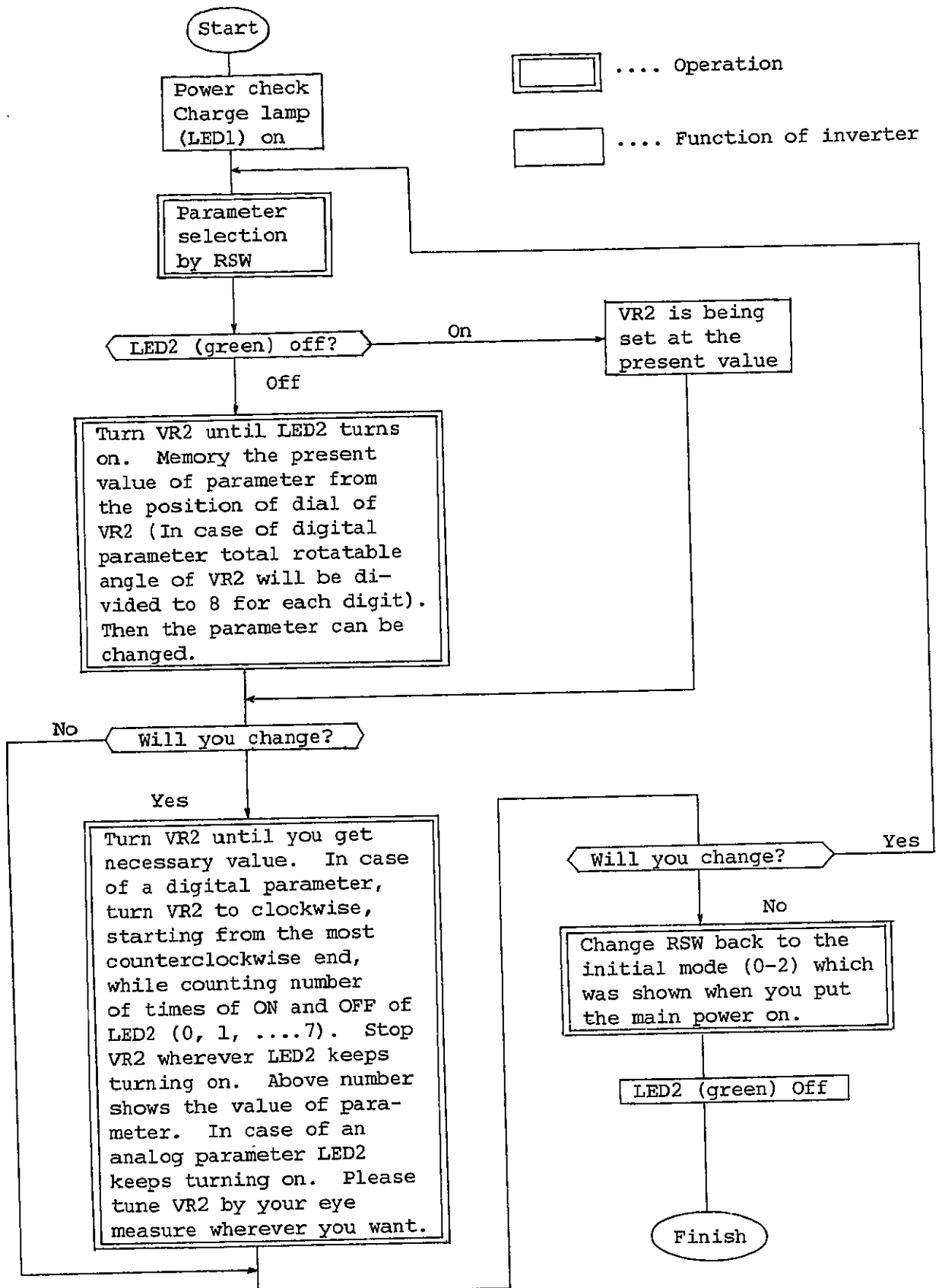
Frequency meter is calibrated by the parameter E. When you put a meter with "S" type (without panel type), please calibrate a frequency meter. A meter can be calibrated whenever the inverter is in operation or stop. In calibration, please set the needle of the meter at full scale point. The frequency meter must be the DC moving coil type having 100 μ A rating at full scale.

2. How to adjust the parameters

(1) In case you have a frequency meter.



(2) In case you don't have a frequency meter.

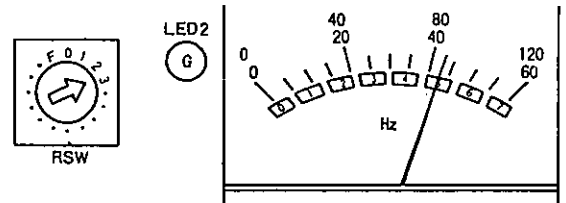


(3) Soft start time adjustment

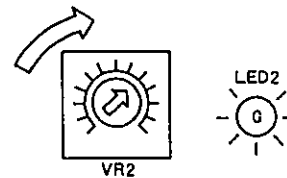
(Example 1: When you have a frequency meter)

- a. To change the soft start time from 5 sec. which has been set at factory to 2 sec.

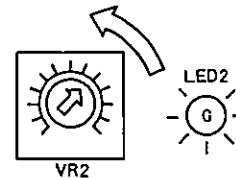
- ① Set RSW at [3]. Then the frequency meter will indicate **5** as a present valve which has been set at factory.



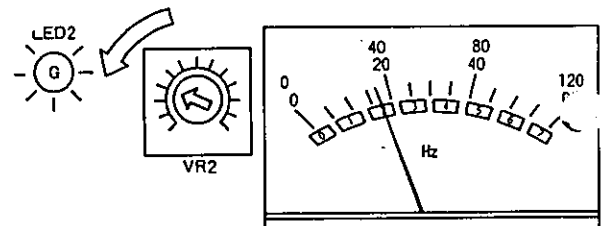
- ② a. In the case where VR2 has been set at the CCW position: turn VR2 slowly to C.W. and find a position where LED2 (green) turns on. The position of VR2 is around 6/8 of full scale of VR2 as shown right.



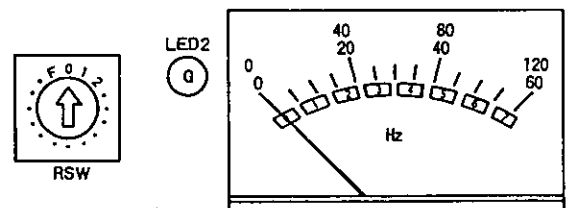
- b. In the case where VR2 has been set at the CW position: turn VR2 slowly to C.C.W., find a position where LED2 (green) turns on. The positions around 2/8 as shown right.



- ③ Turn VR2 C.C.W. At this time, the freq. meter follows the VR2 movement proportionally. When LED2 flashes three times and the meter points to **2**, stop VR2 at that position.



- ④ When finished with the adjusting procedure, please return RSW to [0] or, change it to another position to adjust another parameter.



The meter indicates 0 (zero) output frequency (In static state)

-) Soft start time adjustment
(Example 2: Without a frequency meter)

When the inverter was shipped from the factory, soft start time was adjusted at 5 seconds.
Now you want to change it to 2 seconds.
Operation mode to be external command mode.

- 1 Set RSW at [3]. Turn VR2 slowly to the right or left to find a position where LED2 (green) turns on. In this case, you must find the VR2 stops around 2/8 position of the full scale range from the right.
- 2 Next, turn the VR2 fully to the left. Then, turn VR2 backward to the right slowly counting number of turning on and off of LED2 (green). If it turns off two times and turn on, it is the very position of [2].
- 3 To finish the adjusting procedure, return RSW to the position [0] or change it to other parameter.

Note: Please do not adjust acceleration/deceleration time while the inverter is being accelerated or decelerated.
In the above process ②, when VR2 is turned fully to the left, the inverter may trip because of too short acceleration time.

5) Cautions

- 1 The parameters can be adjusted at both of operation and stop of an inverter.
However, if the main power is not impressed to an inverter, its parameter can not be adjusted.
Please confirm that the charge lamp LED1 (red) is illuminating before you start adjusting a parameter.
When you operate an inverter at operation mode 1 (inner command mode), please adjust the parameters while a motor does not rotate.
- 2 When you use a frequency meter with "S" type (without pannel type) of inverter, please adjust the meter first.
- 3 From starting a parameter adjusting until finishing it, please do not cut the main power and do not reset the inverter.
If an inverter tripped while adjusting a parameter, please return RSW to [0], [1] or [2] (operation modes) and reset the inverter.
In this case, you need to start adjusting the parameter again.

- 4 A frequency meter shows the digits 0 ~ 7 .
Those digits represent the digital parameters.
However as to soft start magnification and soft down magnification,
please read those digit as shown in the following table.

Digit	0	1	2	3
Magnification	×0.2	×0.5	×1	×2

4	5	6	7
×10	×20	×100	×200

- 5 As to the analog parameters:
For parameter 8, C, D and E, please read the frequency meter
directly. (In this case reading value of the meter is subject
to a predetermined max. frequency)
For parameter 9, A and B, please do not change because those
were adjusted properly when the inverte was shipped out of
the factory.

6. PROTECTIVE FUNCTIONS

Overcurrent shut-off	By detecting the output current of converter, the protective circuit is actuated and trips at an overcurrent of 160 to 200% or more of the rated output current of inverter.
Regenerative overvoltage shut-off	The protective circuit is actuated and trips at an excessive output voltage of converter due to regenerative energy. This occurs when the setting of deceleration time is extremely short and the regenerative overvoltage shut-off circuit is put in action. To overcome nuisance tripping set the deceleration time slightly longer (continuous lighting of red trip lamp LED3).
Momentary power failure protection	<p>If a momentary power failure of more than 15 msec occurs, the protective function is available to avoid malfunction, and the output is delivered gradually after recovery of momentary power failure.</p> <p>If the power failure is shorter than 15 msec, the control circuit is designed to operate normally, thanks to the protective circuit.</p>
Undervoltage protection	In the supply voltage drops (below 170 volts), the undervoltage protection lamp LEDs (green) flickers, and the motor is set in free-run state.

NOTE: The trip signal is not held when reset or in the event of power failure.

7. TROUBLES

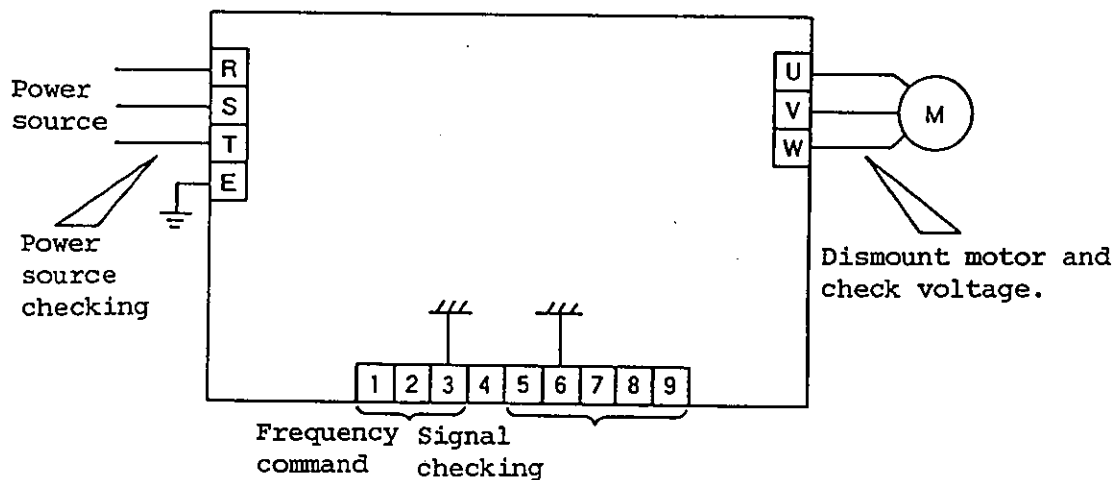
7.1 Trip

- The DV-505E series incorporates protective functions to prevent breakdown of the inverter (see Chapter 6), and the inverter is protected by tripping.
- If tripping, therefore, check for cause and remedy it.
- Trip is indicated by the red lamp LED3 on the printed board.

7.2 Judgement of abnormality

- If the inverter trips upon start-up, or the motor does not run although the inverter has not tripped, check for abnormality of inverter.

[Checking method]



* Detach all connections but power source (R, S, T or L1, L2, L3) and frequency command (1, 2, 3).

- (1) Make sure the supply voltage is 207 to 253 volts.
- (2) Check frequency command (DC 0 to 5 volts) between control terminals 2 and 3. (Or check voltage between 2 and 3 by detaching the VR.)
- (3) Connect voltmeters (or circuit testers) between main circuit terminals U-V, V-W, and W-U or T1-T2, T2-T3, and T3-T1.
- (4) Short-circuit either control terminals 5-6 or 6-7 securely (faulty contact may be also considered in the case of switch).
- (5) Vary the specified voltage at control terminal 2 within permissible range (DC 0 to 5 volts), and make sure voltage is delivered normally in all three phases of U-V, V-W and W-U or T1-T2, T2-T3, and T3-T1.

Delivered ... the inverter is probably normal.

Not delivered ... the inverter is defective.

NOTE: The voltage of output (U, V, W or T1, T2, T3) side varies with the measuring instrument (for details see 4.10-2).

7.3 Trouble due to insufficient capacity of inverter tripping

When the motor is driven by inverter, since a starting current cannot be passed into the motor different from the case of commercial power source (the inverter capacity and motor capacity are identical), it may lead to a trouble.

- (1) If the opposite machine is a cam or crank mechanism, the torque fluctuations are extremely large within one revolution, and an excessive peak current that cannot be measured by an ordinary ammeter may flow to cause the inverter to trip.

Countermeasures: To increase the inverter capacity.

To increase the inertia of the mechanism.

- (2) In the case of electromagnetic clutch motor:

When the load is turned on or off by the clutch while the motor is running continuously, a peak current flows when the clutch is turned on as experienced in (1), and the inverter trips.

Countermeasure: To increase the inverter capacity.

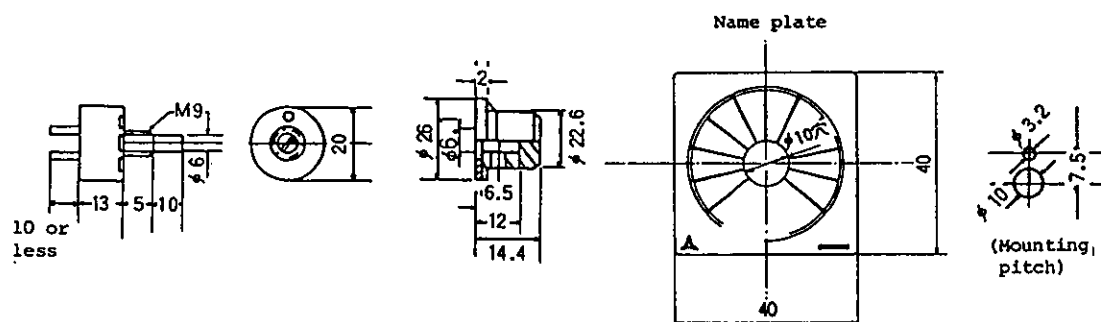
7.4 Reset after malfunction of inverter

If an excessive noise or static electricity is applied to the inverter, the following malfunctions may occur.

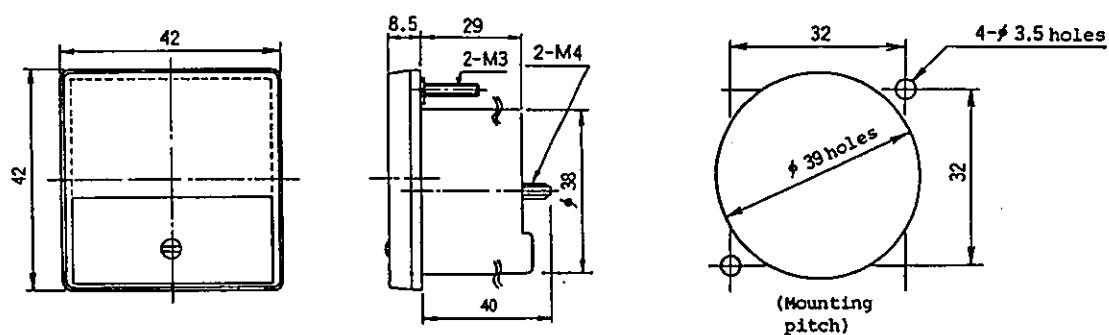
- (1) The trip lamp LED3 (red) flickers and the inverter trips.
- (2) The motor does not stop, or external command is not accepted.
In such cases, press the reset switch, or once turn off the power source, turn it on again after 10 seconds to reset.

8. OPTIONS

Frequency setting dial (DV-OP007)

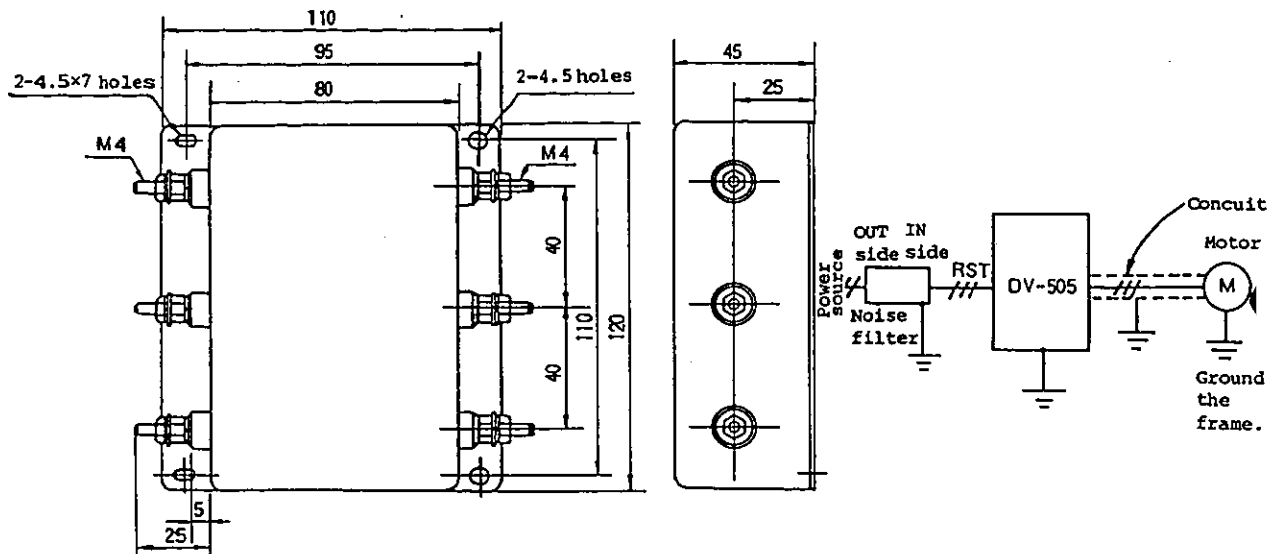


Frequency meter (DV-OP020)



Noise filter (DV-OP016-5)

Option part No.	Applicable motor	Allowable current (A)
DV-OP016-5	0.4 0.75 kW	5



- NOTES: (1) Frequency setting dial (DV-OP007) is same as that in DV-503 series.
- (2) Dimensions are subject to change. For use in design, ask us for firm dimensions.
- (3) Frequency meter and operation panel for DV-503E cannot be used.

[CHECK SHEET]

Enter the results of adjustment of parameters and other conditions.

Item				Result		
Maximum frequency				60 Hz	120 Hz	
Dynamic brake				Under 3 Hz	Full range	
Op. mode	Ext./int. command	4-speed operation	Ext.	Int.	4-speed	
Parameter	3	Soft start time			<div></div>	sec
	4	Soft start magnification		×	<div></div>	
	5	Soft down time			<div></div>	sec
	6	Soft down magnification		×	<div></div>	
	7	Carrier frequency			<div></div>	
	8	Jogging frequency	2nd speed setting		<div></div>	Hz
	9	Boost			<div></div>	
	A	Dynamic brake time			<div></div>	sec
	B	Dynamic brake torque			<div></div>	
	C	Upper limit frequency	3rd speed setting		<div></div>	Hz
	D	Lower limit frequency	4th speed setting		<div></div>	Hz

- MEMO -

[illegible]

For your memo (when inquiring or requesting service)

Date of purchase	
Name of dealer	
	Tel.

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