GE Consumer & Industrial

GE
AC SPEED CONTROL EQUIPMENT
VAT300

200V System 0.75 to 45kW Normal Duty
400V System 0.75 to 475kW Normal Duty

QUICK STARTING GUIDE

This is a short form manual intended to provide the minimum information for a quick drive installation and test operation. The manual only describes limited information on V/f control normally used for a basic operation.

For further sophisticated functions of the drive, please refer to the VAT300 Instruction Manual No. PCST-3450 found on the CD-ROM supplied with the drive. It is strongly advisable to read the Instruction Manual No. PCST-3450 thoroughly, as it contains essential technical and safety information.

"WARNING − Operation of this equipment requires detailed installation and operation instructions provided in the Installation/Operation manual intended for use with this product. This information is provided on the CD-ROM included in the container this device was packaged in. It should be retained with this device at all times. A hard copy of this information may be ordered to GE Dealer

<Preface>

WARNING

ALWAYS READ THIS MANUAL THOROUGHLY BEFORE USING THE VAT300.

THIS INVERTER CONTAINS HIGH VOLTAGE CIRCUITS THAT MAY BE FATAL TO HUMANS. USE EXTREME CAUTION DURING INSTALLATION. MAINTENANCE MUST BE PERFORMED BY QUALIFIED TECHNICIANS, AND ALL POWER SOURCES MUST BE DISCONNECTED BEFORE ANY MAINTENANCE. SUFFICIENT NOTICE MUST BE GIVEN TO THE GENERAL OPERATORS AND WORKERS BEFORE STARTING.

- ELECTRIC SHOCK MAY OCCUR IF THE FOLLOWING POINTS ARE NOT OBSERVED.
  (1) DO NOT OPEN THE FRONT COVER WHILE THE POWER IS ON.
  (2) A CHARGE STILL REMAINS IN THE INVERTER WHILE THE INDICATOR IS LIT EVEN IF THE POWER HAS BEEN TURNED OFF. DO NOT OPEN THE FRONT COVER IN THIS CASE. WAIT AT LEAST 10 MINUTES AFTER THE INDICATOR GOES OUT.
  (3) DO NOT CONTACT THE ELECTRICAL CIRCUIT WHILE THE "CHARGE" LED ON THE UNIT IS LIT. PERFORM SERVICING, ETC., AFTER WAITING AT LEAST 10 MINUTES AFTER THE LAMP GOES OUT.
  (4) ALWAYS GROUND THE INVERTER CASE. THE GROUNDING METHOD MUST COMPLY WITH THE LAWS OF THE COUNTRY WHERE THE INVERTER IS BEING INSTALLED.

- THE INVERTER MAY BE DESTROYED BEYOND REPAIR IF THE FOLLOWING POINTS ARE NOT OBSERVED.
  (1) OBSERVE THE INVERTER SPECIFICATIONS.
  (2) CONNECT ADEQUATE CABLES TO THE INPUT/OUTPUT TERMINALS.
  (3) ALWAYS KEEP THE INVERTER INTAKE/OUTTAKE PORTS CLEAN, AND PROVIDE ENOUGH VENTILATION.
  (4) ALWAYS OBSERVE THE CAUTIONS LISTED IN THIS INSTRUCTION MANUAL.

- THERE MAY BE SOURCES OF NOISE AROUND THIS INVERTER AND MOTOR DRIVEN BY THIS INVERTER. CONSIDER THE POWER SUPPLY SYSTEM, INSTALLATION PLACE AND WIRING METHOD BEFORE INSTALLATION.
  INSTALL THIS INVERTER AWAY FROM DEVICES THAT HANDLE MINUTE SIGNALS, SUCH AS MEDICAL EQUIPMENT IN PARTICULAR. ALSO SEPARATE THE DEVICES ELECTRICALLY, AND TAKE SUFFICIENT NOISE MEASURES.

- TAKE SUFFICIENT SAFETY MEASURES WHEN USING THIS INVERTER FOR PASSENGER TRANSPORTATION, SUCH AS IN LIFTS (ELEVATORS).

● The safety precautions are ranked as "**DANGER**" and "**CAUTION**" in this instruction manual.

DANGER : When a dangerous situation may occur if handling is mistaken leading to fatal or major injuries.

CAUTION : When a dangerous situation may occur if handling is mistaken leading to medium or minor injuries, or physical damage.

Note that some items described as **CAUTION** may lead to major results depending on the situation. In any case, important information that must be observed is described.

● This instruction manual is written on the premise that the user has an understanding of the inverter. Installation, operation, maintenance and inspection of this product must be done by a qualified person. Even qualified persons must undergo periodic training.

1. Transportation and installation

CAUTION

- Always transport the product with an appropriate amount according to the products weight.
- Install the inverter, dynamic braking unit and resistor, and other peripheral devices on non-combustible material such as metal.
- Do not place the product near inflammable items.
- Do not hold the front cover while transporting the product.
- Do not let conductive materials such as screws or metal pieces and inflammable materials such as oil enter the product.
- Install the product in a place that can withstand the weight of the product, and follow the instruction manual.
- Do not install and operate an inverter that is damaged or that has missing parts.
- Always observe the conditions described in the instruction manual for the installation environment.

2. Wiring

DANGER

- Always turn the device's input power OFF before starting wiring.
- Carry out grounding that complies with the standards of the country where the inverter is being installed.
- When using the PM motor, even if the inverter is stopped, the voltage will be generated at the output terminal (U, V, W) during rotation. Always carry out wiring while the motor is stopped.
- Wiring must always be done by a qualified electrician.
- Always install the device before starting wiring.
- Prepare a breaker such as an MCCB or fuses that matches the capacity for the inverter's power supply side.

CAUTION

- Do not connect an AC power supply to the output terminals (U, V, W).
- Confirm that the product's rated voltage and frequency match the power supply voltage and frequency.
- Install an overheating protection device on the dynamic braking unit and resistor, and shut off the power with this fault signal.
- Do not directly connect a resistor to the DC terminals (between L+1, L+2, and L–).
- Tighten the terminal screws with the designated tightening torque.
- Correctly connect the output side (U, V, W).

3. Operation

DANGER

- Always install the front cover before turning the input power ON. Never remove the cover while the power is ON. There are sections in the front PCB that are charged with high voltages.
- Never touch the switches with wet hands.
- Never touch the inverter’s terminals while the inverter power is ON even if the operation is stopped.
- Selection of the retry function could lead to unexpected restarting when alarm stops. The machine may start suddenly if the power is turned ON when the automatic start function is selected. Do not go near the machine.
  (Design the machine so that physical safety can be ensured even if the machine restarts.)
- The machine may not stop when a stop command is issued if the deceleration stop function is selected and the overvoltage/overcurrent limit function is activated. Prepare a separate emergency stop switch.
- The unit will not suddenly restart even if the alarm is reset with the operation signal input, however, in order to prevent unexpected operation, ensure that the operation signal is no longer being input, and reset the alarm.

CAUTION

- The heat sink and dynamic braking resistor are heated to high temperatures, so never touch them.
- Do not block the inverter’s ventilation holes.
- The inverter operation can easily be set from low speeds to high speeds, so confirm that the operation is within the tolerable range for the motor or machine before making settings.
- Prepare holding brakes when necessary. Holding is not possible with the inverter’s brake functions.
- Confirm the operation of the motor as a single unit before operating the machine.
  Failure to do so could lead to injuries or machine damage due to unforeseen movements.
  Always prepare a safety backup device so that the machine is not placed in a hazardous situation when an error occurs in the inverter or before the inverter becomes ready for operation.

Chapter1 Names of each part

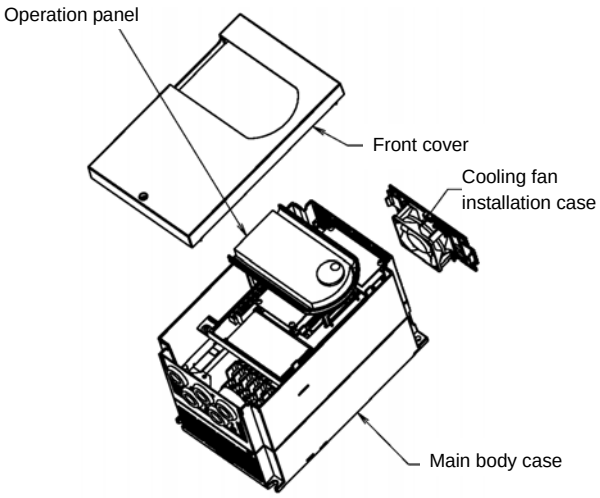


Fig.1-1 For N018K5, H030K0 and smaller

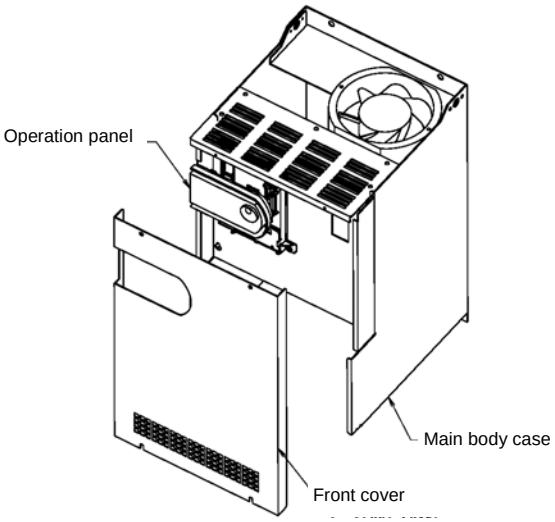


Fig.1-2 For N022K0, X037K0 and larger

The presence and quantity of cooling fans will differ according to the capacity.

Remove the inverter from the packaging, and check the details on the rating nameplate to confirm that the inverter is as ordered. The rating nameplate is on the left side of the unit.

VAT300- U3S N002K2 F B S X 0 0 0

- Control No.
- Type Unit
  U3S : VAT300
- Indicates future Options.
- Input voltage and capacity
  (Refer toAppendix 1)
- Indicates if DB is built in the drive.
  B : Dynamic Braking Built in
  N : Without Built in DB
- Indicates built in EMC filter
  F : EMC filter built in
  S : Without EMC Filter

Chapter 2 Installation and Wiring

2-1 Installation environment

Observe the following points when installing the inverter.

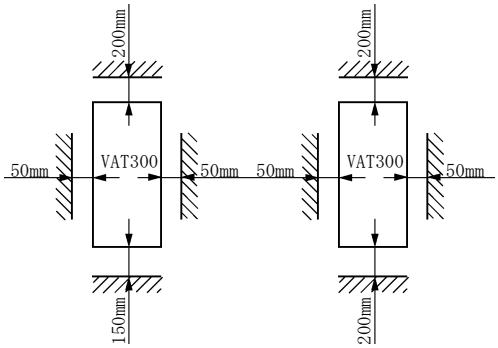
(1) Install the inverter vertically so that the cable lead-in holes face downward.

(2) Make sure that the ambient temperature is –10°C to 50°C.

(3) Avoid installation in the following environment.

- Place subject to direct sunlight
- Place subject to wind, rain or water
- Place with high levels of humidity
- Place subject to oil drops
- Place where dust, cotton lint or iron chips, etc., are present
- Place with high levels of salt
- Place with harmful corrosive or explosive gases or fluids are present
- Place near sources of vibration such as dollies or press machines
- Place where flammable materials are present
- Place with high levels of ambient temperature
- Places with high levels of magnetic noise
- Places where radioactive substances are present

(4) Ensure ventilation space around the inverter. (Refer to Fig. 2-1.)



For N018K5, X030K0 and smaller

For X022K0, X037K0 and larger

Fig. 2-1

2-2 Installation and wiring method

Installation and wiring are carried out with the front cover removed. The operation panel is fixed with the latches for the operation panel mounting holder, so the front cover can be removed with the operation panel attached.

To remove the operation panel, securely hold the panel with a thumb on the lower side and another finger on the top side as shown in Fig. 2-2-a, and pull the panel forward and off. To mount the operation panel, hold it the top and bottom sides with five fingers, and press the panel on horizontally. Confirm that the operation panel is securely fixed with the latches for the operation panel mounting holder.

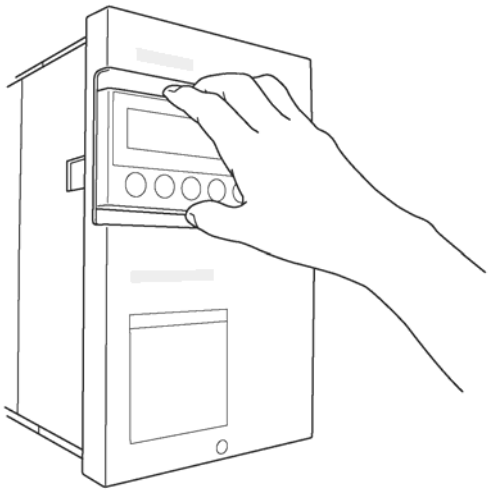


Fig. 2-2-a

Fix the VAT300 at four places when installing. The lower two installation sections are notched.

The operation panel mounting holder is fixed at the right side and the left side can be raised and opened as shown in Fig. 2-2-b. In order to make wiring to the control circuit terminal board, remove the front cover and pull the panel holder forward with slightly pushing its left side to the right direction. Then the left side of the panel holder will be opened. After closing the panel holder, make sure that the panel holder is securely fixed to the PCB protection case.

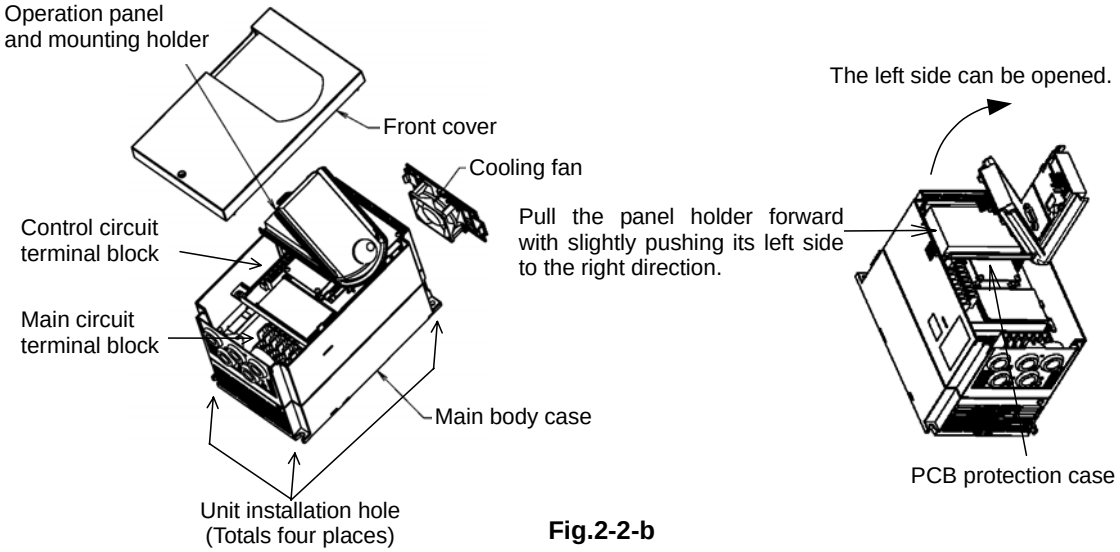
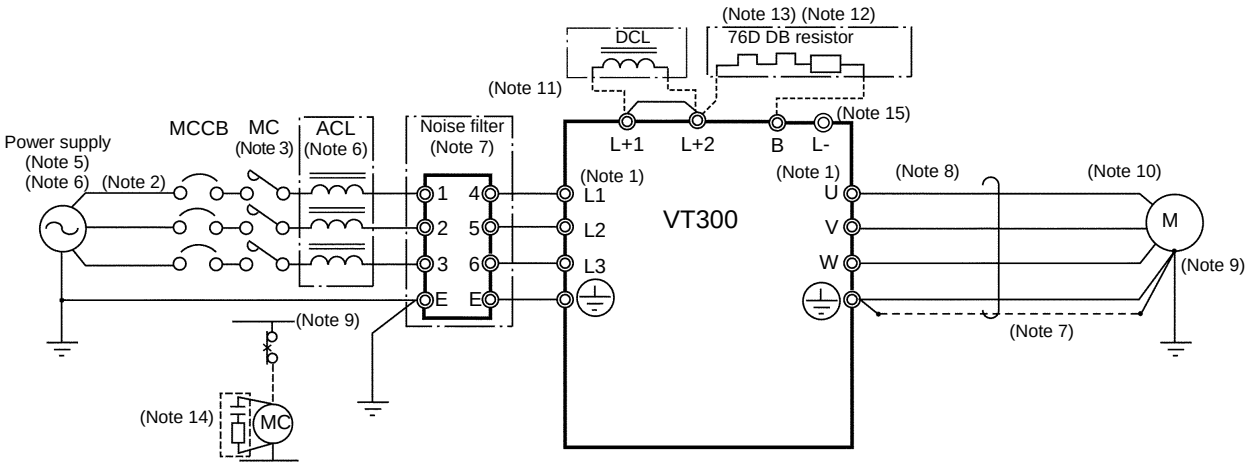


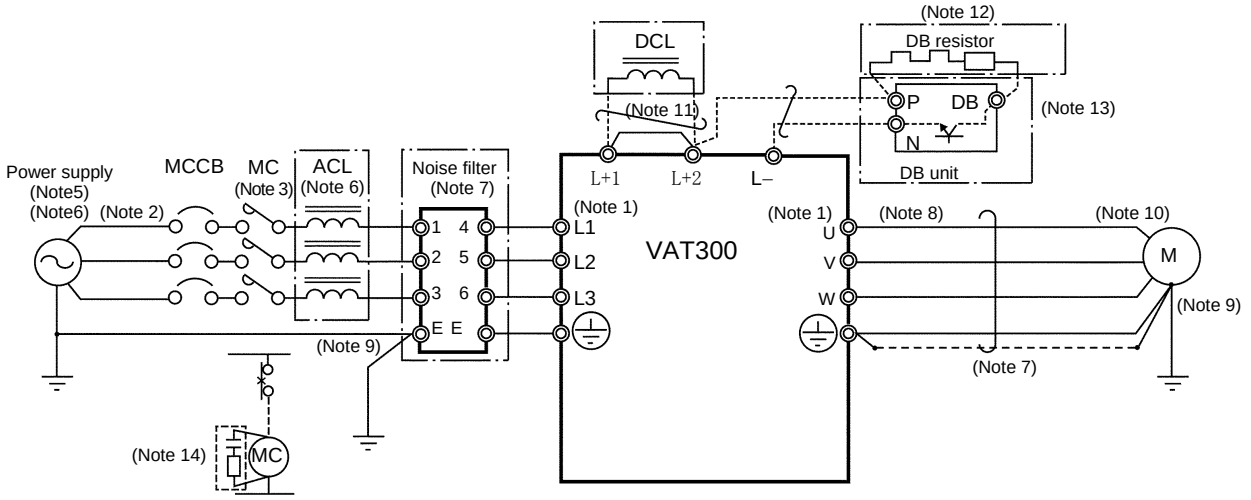
Fig.2-2-b

2-3 Precautions for power supply and motor wiring

(a) N018K5, X022K0 and smaller



(b) N022K0 to N045K0, X030K0 to X055K0



(c) X075K0 to X475K0

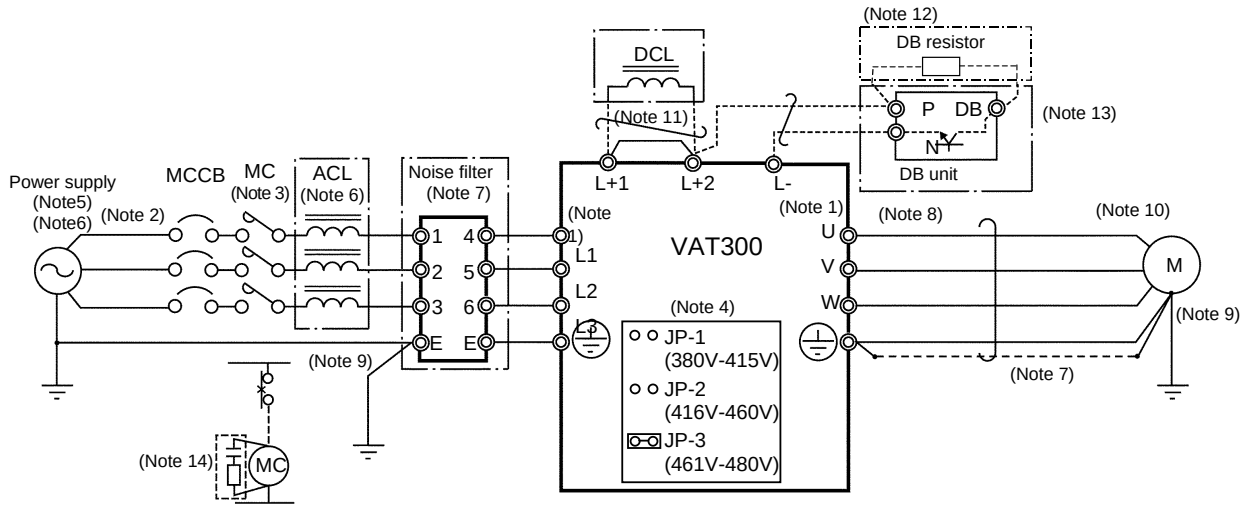
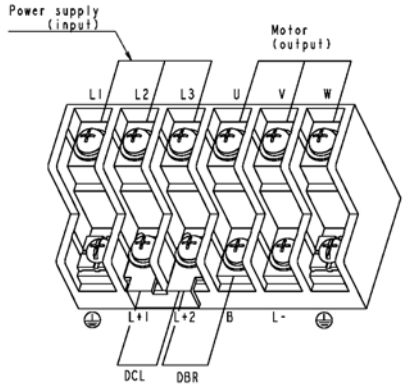
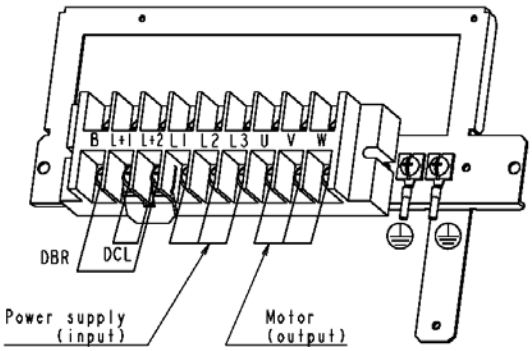


Fig. 2-3-a Example of main circuit wiring

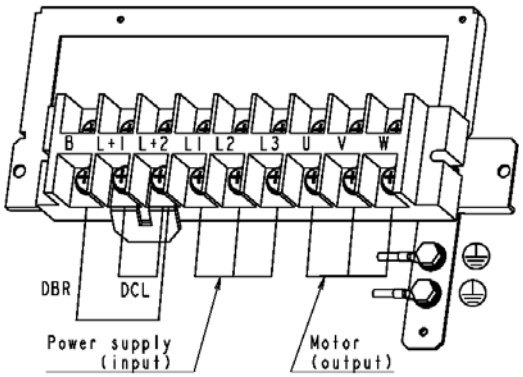
(a) N000K7 to N011K0
X000K7 to X015K0



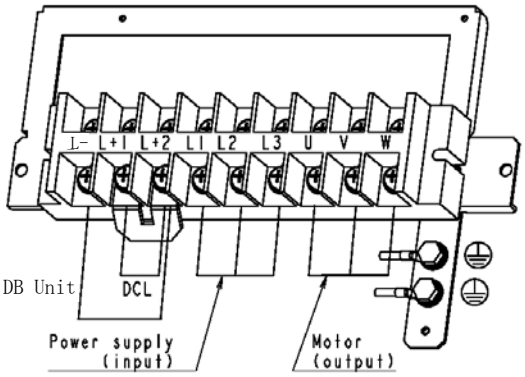
(b) X018K5, X022K0



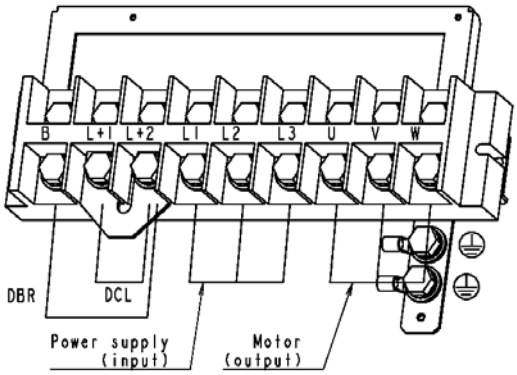
(c) N015K0



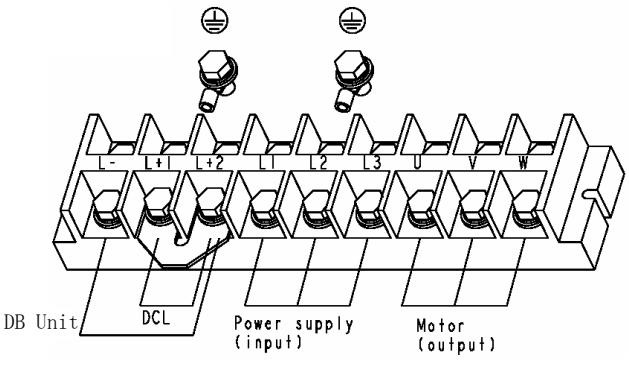
(d) X030K0



(e) N018K5



(f) N022K0, N030K0
X037K0 to X055K0



(g) N037K0, N045K0

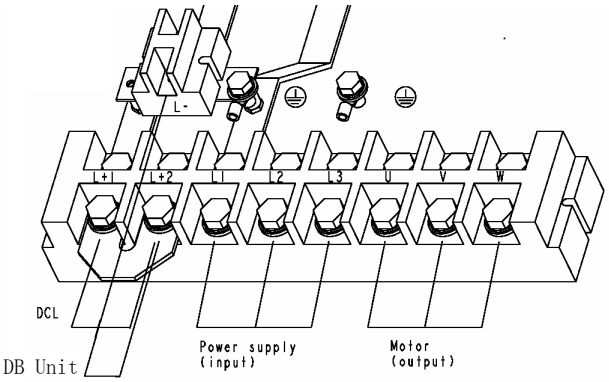
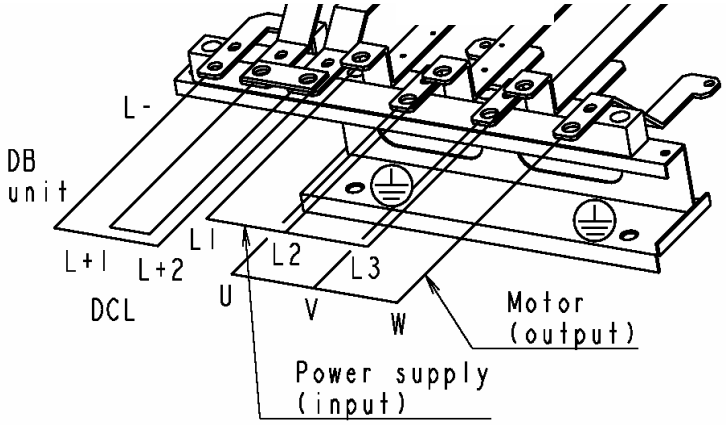
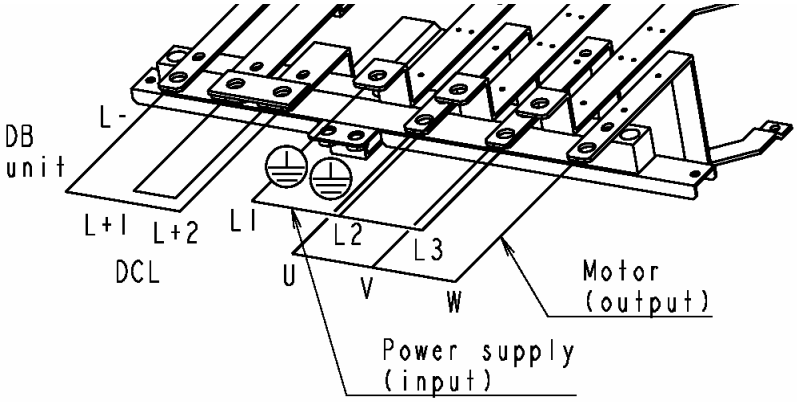


Fig. 2-3-b Terminal block wiring

(h) X075K0, X090K0



(i) X110K0, X132K0



(j) X160K0, X200K0

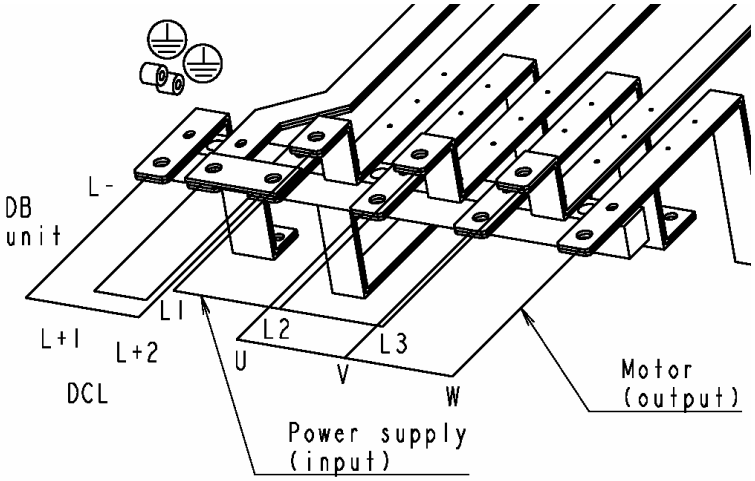
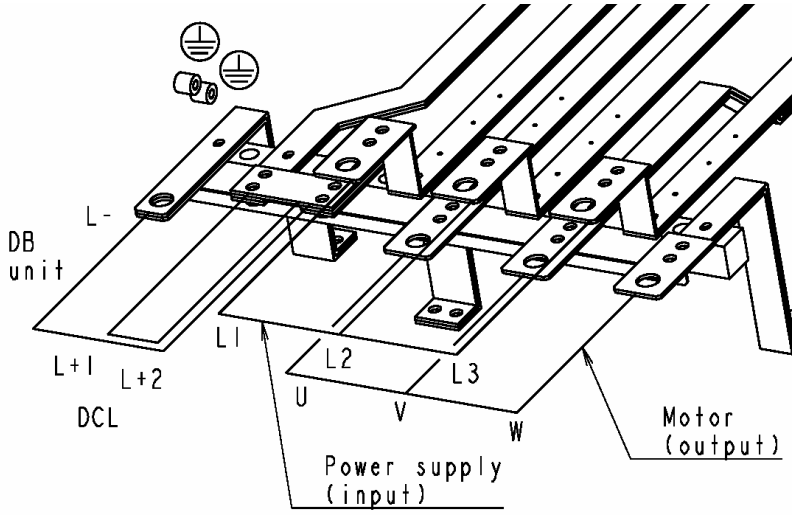


Fig. 2-3-b (cont.) Terminal block wiring

(k) X250K0



(l) X315K0 to X475K0

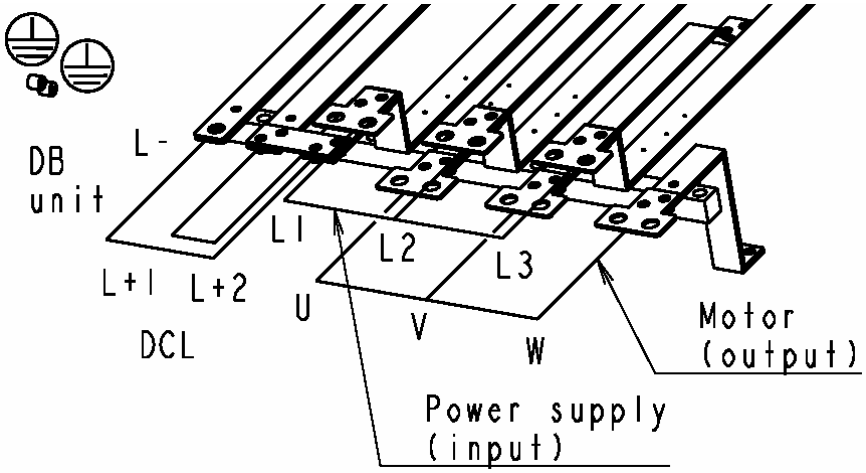


Fig. 2-3-b (cont.) Terminal block wiring

(Note 1) Configuration of inverter's main circuit

The inverter input terminals are L1, L2 and L3. The output terminals to the motor are U, V and W. Do not connect the power supply to the U, V, W terminals. Incorrect wiring will lead to inverter damage or fires.

(Note 2) Wire size

Use wires having the wire size shown in Table 2-3-a and Table 2-3-b for the main circuit wiring shown in Fig. 2-3-a.

Table 2-3 gives the screw sizes, applicable wire sizes and tightening torque for the main circuit terminal shown in Fig. 2-3-b.

Table 2-3-a Terminal and applicable wire (for normal-duty)

Inverter type VAT300-□		Power supply, motor, DCL wiring					Dynamic braking wiring				
		Terminal screw size	Wire size		Tightening torque		Terminal screw size	Wire size		Tightening torque	
			AWG	mm^2	N • m	lb-in		AWG	mm^2	N • m	lb-in
N000K7		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N001K5		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N002K2		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N004K0		M4	10	5.3	1.8	15.9	M4	14	2.1	1.8	15.9
N005K5		M4	8	8.4	1.8	15.9	M4	14	2.1	1.8	15.9
N007K5		M5	8	8.4	3.0	26.5	M5	14	2.1	3.0	26.5
N011K0		M5	6	13.3	3.0	26.5	M5	14	2.1	3.0	26.5
N015K0		M6	3	26.7	4.5	39.8	M6	14	2.1	4.5	39.8
N018K5		M8	2	33.6	9.0	79.7	M8	12	3.3	9.0	79.7
N022K0		M8	1	42.4	9.0	79.7	M8	10	5.3	9.0	79.7
N030K0		M8	1/0×2P	53.5×2P	9.0	79.7	M8	10	5.3	9.0	79.7
N037K0		M10	1/0×2P	53.5×2P	10.0	88.5	M5 (L-) M10 (L+2)	6	13.3	2.0 28.9	17.4 255.7
N045K0		M10	1/0×2P	53.5×2P	10.0	88.5	M5 (L-) M10 (L+2)	6	13.3	2.0 28.9	17.4 255.7
X000K7		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X001K5		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X002K2		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X004K0		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X005K5		M4	12	3.3	1.8	15.9	M4	14	2.1	1.8	15.9
X007K5		M4	10	5.3	1.8	15.9	M4	14	2.1	1.8	15.9
X011K0		M4	8	8.4	1.8	15.9	M4	14	2.1	1.8	15.9
X015K0		M5	8	8.4	3.0	26.5	M5	14	2.1	3.0	26.5
X018K5		M5	6	13.3	2.0	17.4	M5	14	2.1	2.0	17.4
X022K0		M5	6	13.3	2.0	17.4	M5	14	2.1	2.0	17.4
X030K0		M6	4	21.2	4.5	39.8	M6	12	3.3	4.5	39.8
X037K0		M8	2	33.6	9.0	79.7	M8	10	5.3	9.0	79.7
X045K0		M8	1	42.4	9.0	79.7	M8	6	13.3	9.0	79.7
X055K0		M8	1/0	53.5	9.0	79.7	M8	6	13.3	9.0	79.7
X075K0		M10	1/0×2P	53.5×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X090K0		M10	1/0×2P	53.5×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X110K0		M10	1/0×2P	53.5×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X132K0	Power supply	M10	3/0×2P	85.0×2P	28.9	255.7	M10	6	13.3	28.9	255.7
	Motor		2/0×2P	67.4×2P							
X160K0		M10	4/0×2P	107.2×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X200K0		M10	300×2P	152×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X250K0		M16	400×2P	203×2P	125	1106	M16	4	21.2	125	1106
X315K0	Power supply	M16	300×4P	152×4P	125	1106	M16	4	21.2	125	1106
	Motor		4/0×4P	107.2×4P							
X400K0	Power supply	M16	400×4P	203×4P	125	1106	M16	4	21.2	125	1106
	Motor		350×4P	177×4P							
X475K0		M16	400×4P	203×4P	125	1106	M16	4	21.2	125	1106

Table 2-3-b Terminal and applicable wire (for heavy-duty)

Inverter type VAT300-□		Power supply, motor, DCL wiring					Dynamic braking wiring				
		Terminal screw size	Wire size		Tightening torque		Terminal screw size	Wire size		Tightening torque	
			AWG	mm^2	N • m	lb-in		AWG	mm^2	N • m	lb-in
N000K7		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N001K5		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N002K2		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N004K0		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
N005K5		M4	10	5.3	1.8	15.9	M4	14	2.1	1.8	15.9
N007K5		M5	8	8.4	3.0	26.5	M5	14	2.1	3.0	26.5
N011K0		M5	8	8.4	3.0	26.5	M5	14	2.1	3.0	26.5
N015K0		M6	6	13.3	4.5	39.8	M6	14	2.1	4.5	39.8
N018K5		M8	3	26.7	9.0	79.7	M8	14	2.1	9.0	79.7
N022K0		M8	2	33.6	9.0	79.7	M8	12	3.3	9.0	79.7
N030K0		M8	1	42.4	9.0	79.7	M8	10	5.3	9.0	79.7
N037K0		M10	1/0×2P	53.5×2P	10.0	88.5	M5 (L-) M10 (L+2)	10	5.3	2.0 28.9	17.4 255.7
N045K0		M10	1/0×2P	53.5×2P	10.0	88.5	M5 (L-) M10 (L+2)	6	13.3	2.0 28.9	17.4 255.7
X000K7		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X001K5		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X002K2		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X004K0		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X005K5		M4	14	2.1	1.8	15.9	M4	14	2.1	1.8	15.9
X007K5		M4	12	3.3	1.8	15.9	M4	14	2.1	1.8	15.9
X011K0		M4	10	5.3	1.8	15.9	M4	14	2.1	1.8	15.9
X015K0		M5	8	8.4	3.0	26.5	M5	14	2.1	3.0	26.5
X018K5		M5	8	8.4	2.0	17.4	M5	14	2.1	2.0	17.4
X022K0		M5	6	13.3	2.0	17.4	M5	14	2.1	2.0	17.4
X030K0		M6	6	13.3	4.5	39.8	M6	14	2.1	4.5	39.8
X037K0		M8	4	21.2	9.0	79.7	M8	12	3.3	9.0	79.7
X045K0		M8	2	33.6	9.0	79.7	M8	10	5.3	9.0	79.7
X055K0		M8	1	42.4	9.0	79.7	M8	6	13.3	9.0	79.7
X075K0		M10	1/0	53.5	28.9	255.7	M10	6	13.3	28.9	255.7
X090K0		M10	1/0×2P	53.5×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X110K0		M10	1/0×2P	53.5×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X132K0		M10	1/0×2P	53.5×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X160K0	Power supply	M10	3/0×2P	85.0×2P	28.9	255.7	M10	6	13.3	28.9	255.7
	Motor		2/0×2P	67.4×2P							
X200K0		M10	4/0×2P	107.2×2P	28.9	255.7	M10	6	13.3	28.9	255.7
X250K0		M16	300×2P	152×2P	125	1106	M16	6	13.3	125	1106
X315K0		M16	400×2P	203×2P	125	1106	M16	4	21.2	125	1106
X400H0	Power supply	M16	300×4P	152×4P	125	1106	M16	4	21.2	125	1106
	Motor		4/0×4P	107.2×4P							
X475K0	Power supply	M16	400×4P	203×4P	125	1106	M16	4	21.2	125	1106
	Motor		350×4P	177×4P							

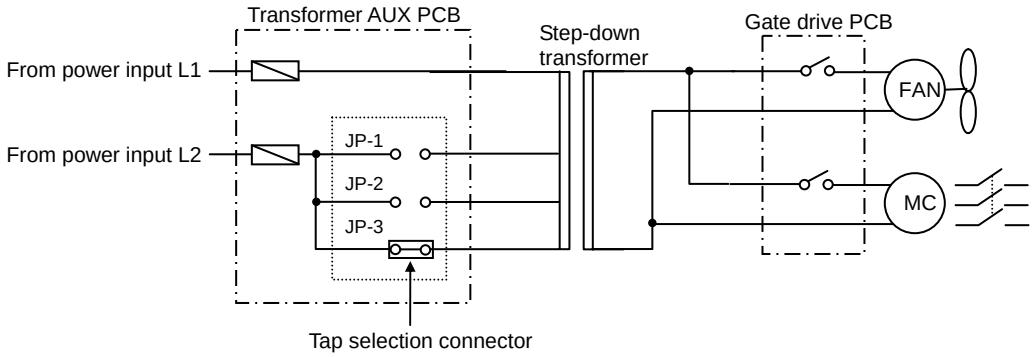
(Note 3) Breaker for wiring

Install a Molded Case Circuit Breaker(MCCB), fuse or magnetic contact (MC) on the inverter's power supply side. Refer to Table 7-1-b of PCST-3450 and select the MCCB or Fuses.
When using as a UL/cUL Standard certified product, install the UL certified MCCB or fuse as explained in section 9-1 of PCST-3450.

(Note 4) Selection of power voltage for auxiliary equipment power supply

For the 400V Series (X075K0 and larger), switch the auxiliary equipment power supply selection connector according to the rated voltage of the power being used. If the following settings do not apply to the power voltage being used, select the closest power voltage.

For 380V to 415V, short circuit across JP-1
For 416V to 460V, short circuit across JP-2
For 461V to 480V, short circuit across JP-3 (factory setting state)



(Note 5) Power voltage/frequency

Prepare the power supply to match the following power voltage and frequency.

Voltage system	Type	Power voltage	Frequency
200V series	N000K7 to N011K0	200 to 240V ± 10%	50/60Hz ± 5%
	N015K0 to N045K0	200 to 230V ± 10%	50/60Hz ± 5%
400V series	X000K7 to X475K0	380 to 480V ± 10%	50/60Hz ± 5%

(Note 6) Power supply capacity

Make sure that capacity of the transformer used as the inverter's power supply is within the following range. (For 4% impedance transformer)

Heavy-duty rating (N045K0, X055K0 and smaller)	500kVA or less
Heavy-duty rating (X075K0 and larger), Normal-duty	Capacity that is 10-times or less inverter capacity

If the above values are exceeded, install an ACL on the inverter's input side.
(Refer to Table 7-1-b of PCST-3450.)

(Note 7) Noise measures

The inverter will generate high harmonic electromagnetic noise, so using the following noise measures is recommended.

a) Use a drive with built-in filter or use noise filter on the input side of the inverter. Refer to Table 7-1-b of PCST-3450 and select the filter. A unit with built-in noise filter is available as an option.
b) Keep the length of the wire between the noise filter and inverter as short as possible, and wire it as far away from the noise filter's power supply side.
c) Use a shield cable for the inverter and motor wiring, and connect the shield to the inverter's ⏚ terminal and motor grounding terminal. Note that if the cable is long, the higher harmonic leakage current may increase, the overcurrent limit function may malfunction, and in extreme cases, the current detector in the unit could be damaged. In this case, lower the carrier frequency as low as possible, and increase the inverter capacity as required.
d) Separate the main circuit wiring from the control circuit wiring. Do not place the wires in the same conduit, lay them in parallel or bundle them, etc. If the wires must be laid in parallel, separate them by 30cm or more, and pass each through a metal conduit. If the wires need to be intersected, make sure that they intersect at a right angle.

(Note 8) Inverter output

a) Do not insert a power factor improvement capacitor on the output side of the inverter.
b) When inserting a magnetic contactor on the output side of the inverter, prepare a sequence control circuit so that the magnetic contactor will not open and close when the inverter runs.
c) Directly connect the motor to the inverter's load. Do not connect other devices such a transformer or Slidac, etc.

(Note 9) Grounding

Always ground the inverter unit grounding terminal and the ground. Ground according to the regulations of the country where the inverter is being used.

(Note 10) Inverter output surge voltage (For 400V series)

If the wiring between the inverter and motor is long (20m or more), the surge voltage applied on the motor will increase, and the motor insulation could deteriorate. In this case, lower the carrier frequency as low as possible (4kHz or less), and use a motor with reinforced insulation for inverter drive, or connect a surge absorber dedicated for the inverter output.

(Note 11) DCL

Always short circuit across L+1 and L+2 when not using the DCL. (Factory setting state)
When connecting the optional DCL, connect it to L+1 and L+2.
Always remove the short-circuit bar at this time.
Twist the wiring to DCL, and keep it as short as possible.

(Note 12) DB (Dynamic Braking) unit (N022K0, X030K0 or more)

When connecting the optional DB unit, follow Fig. 2-3-a (b) (c) and connect the L+2 and L–.
The DB unit and inverter unit will both be damaged if the connection is incorrect.
Twist the wiring to the DB unit, and keep it as short as possible (3m or less).
Refer to Section 7-3 of PCST-3450 for details.

(Note 13) DB resistor protection

When using the thermal relay(76D) or the optional DB unit, use the overload detection reply of the DB unit in order to protect the DB unit and the inverter unit. For the details, please refer to section 7-3 of PCST-3450.

(Note 14) Installation of surge absorber

Install a surge absorber on the magnetic contactor and relay coils installed near the inverter.

(Note 15) L- terminal

N015K0,N018K5,X018K0 and X022K0 doesn't mount L- terminal.

2-4 Precautions for wiring to the control signal

(1) When wiring (control circuit wiring) to the control terminal block, separate the main circuit wiring (terminals L1, L2, L3, L+1, L+2, L–, B, U, V, W) and the other drive wires and power wires. Do not place the wires in the same conduit, lay them in parallel or bundle them, etc.
(2) Use a 0.13 to 0.8mm² wire for wiring to the control circuit.
In this case, tighten TB1 and TB2 with a 0.6N·m tightening torque.
The TB3 tightening torque must be 0.25N·m.
(3) The length of the sequence input/output contact wire must be 30m or less.
(4) The sequence output PSO3 can output the pulse output (max.: 6kHz) by changing DS1-4 and setting the pulse output.
When using the speed detection option, do not set the pulse output if using the pulse output function provided with the option.
(5) Use a twisted pair wire or twisted pair shield wire for wiring to the analog signal circuit such as the setters and meter. (Refer to Fig. 2-4-a.) Connect the shield wire to the TB1 COM terminal of the VAT300.
The wire length must be 30m or less.
(6) The analog output is dedicated for the indicators such as the speedometer and ammeter.
It cannot be used for control signals such as the feedback control.
(7) RY24 and RY0 are designed exclusively for the drive's internal sequence circuits.
These are not designed to supply power to any external devices.
(8) After wiring, always check the mutual wiring.
At this time do not carry out a megger check or buzzer check on the control circuit.
• Are there any wire scraps or foreign matter left around the terminals?
• Are any screws loose?
• Is the wiring correct?
• Is any terminal contacting any other terminal?
• Is the setting of the EL-BIT and the dip switch correct?

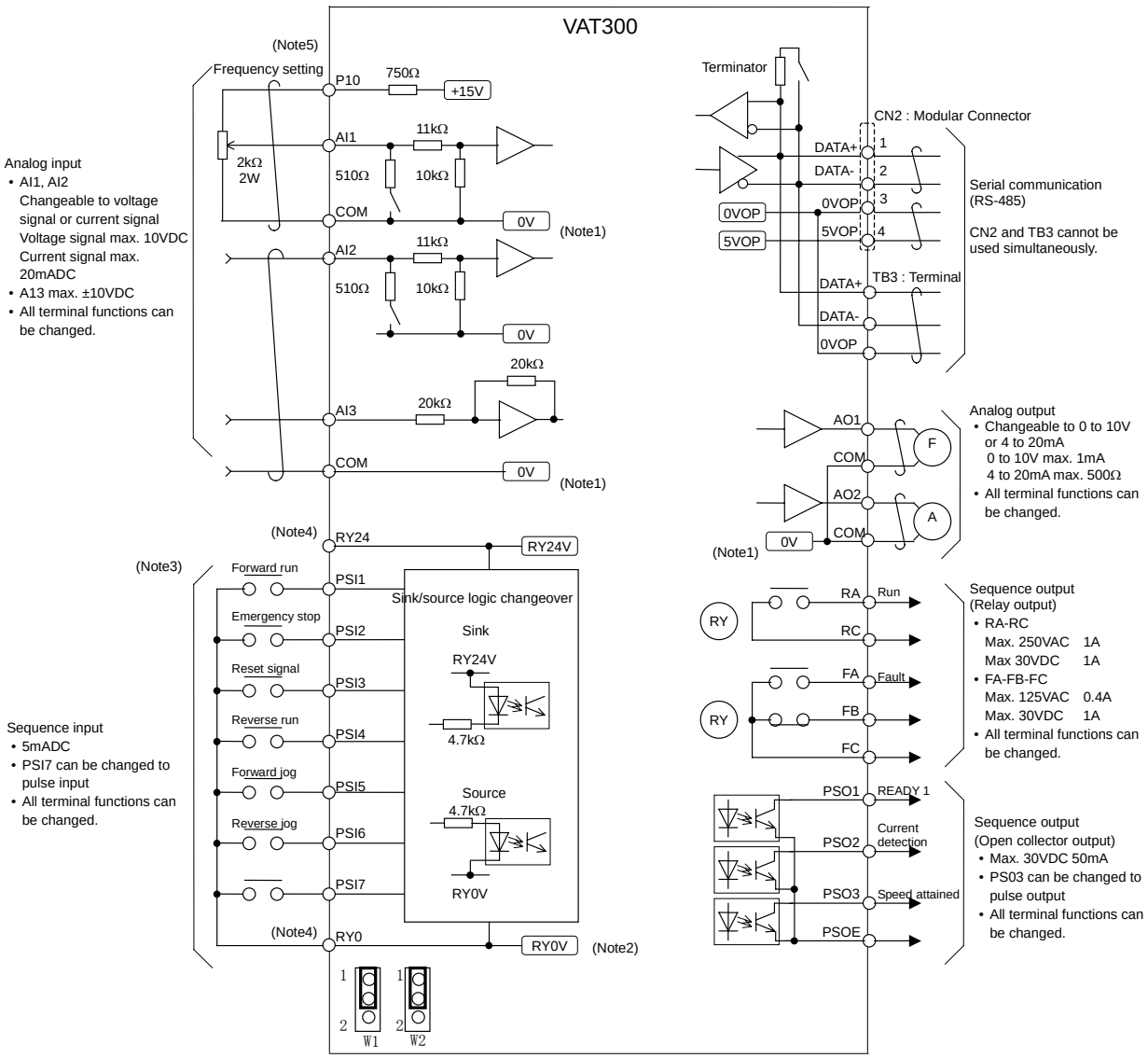


Fig. 2-4-a

(Notes)

1. Four COM terminals are internally connected.
2. No connection shall be made between RY0, COM and 0VOP since this section is insulated.
3. This diagram is an example of the sink logic connection.
4. RY24 and RY0 must not be shorted.
5. P10 and COM must not be shorted.

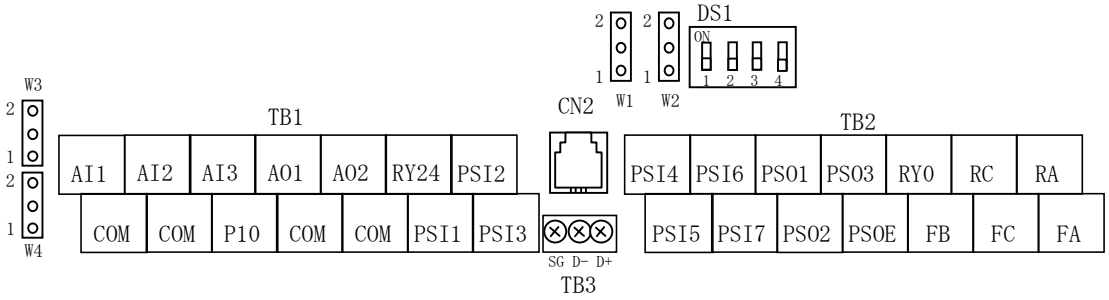


Fig. 2-4-b

1) Control terminal TB1,TB2

- The terminal block is laid out in two rows.
- Terminal screw size is M3.

2) Dip switches DS1

No.	OFF	ON	Signal
1	OPEN	120Ω	Standard serial terminator changeover
2	V1	I1	AI1 voltage, current changeover
3	V2	I2	AI2 voltage, current changeover
4	PS03	PULSE	Sequence output, pulse train output changeover

All switches are set to OFF as the default.

3) EL-BIT W1,W2,W3,W4

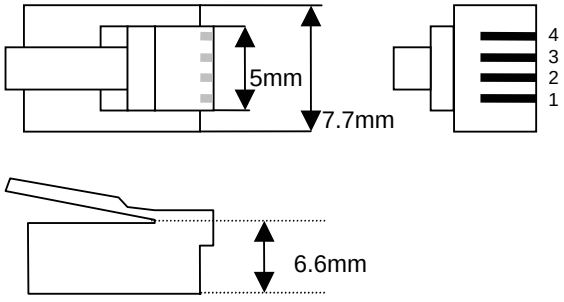
No.	1	2	Signal
W1	SINK	SOURCE	PSI1～6 sink, source changeovers
W2	SINK	SOURCE	PSI7 sink, source changeover
W3	voltage	current	AO1 voltage, current changeover
W4	voltage	current	AO2 voltage, current changeover

All EL-BITs are set to 1 as the default.

4) Standard serial or Modbus transmission
CN2 (Connector type: 4-pole modular, Hirose Electric TM3P-44P or equivalent)

- A signal level is based RS-485. The terminus resistance (120Ω) can set up on/off in DS1-1. ((DS1-1=120Ω): Connected, (DS1-1=OPEN): Not connected)
- The direction of a signal is based on VAT300.
- 5VOP and 0VOP are not designed to supply power to any external devices.

Terminal No.	Signal
1	DATA+
2	DATA-
3	0VOP
4	5VOP

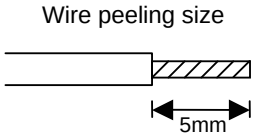


Outline drawing of connector

5) Standard serial or Modbus transmission TB3

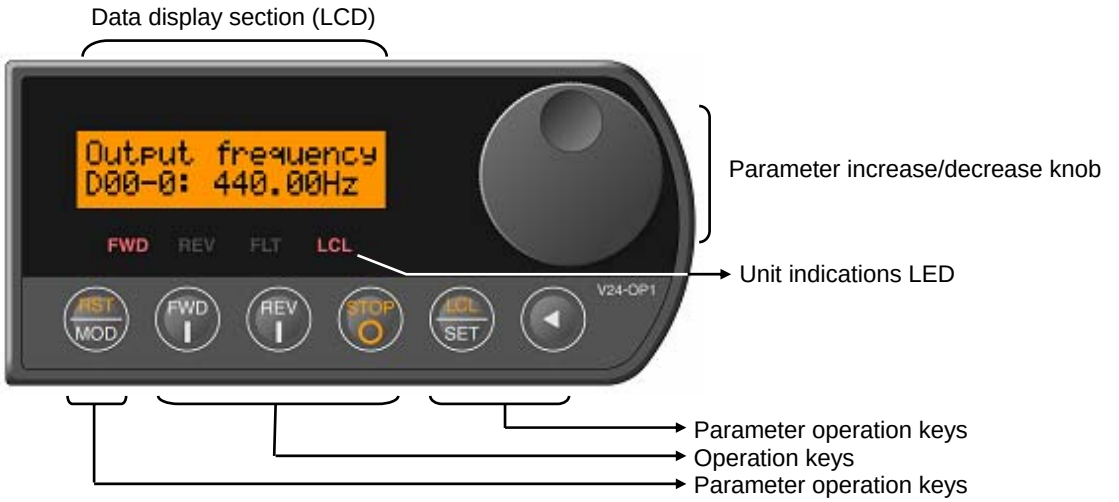
- CN2 and TB3 DATA+, DATA- and 0VOP are connected in the PCB.
- The terminal size is M2.
- The applicable wire size is AWG26 to AWG16.

Terminal No.	Symbol	Signal
1	D+	DATA+
2	D-	DATA-
3	SG	0VOP

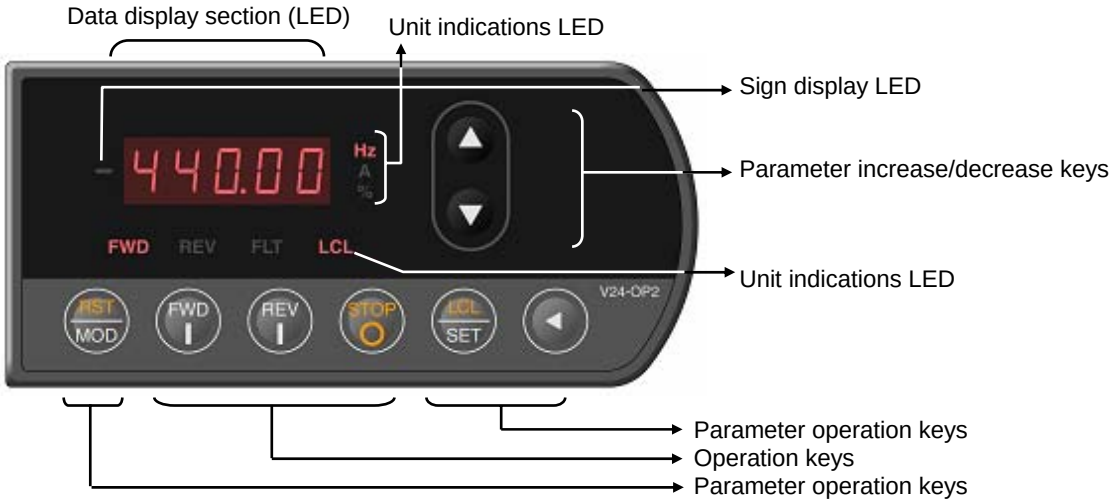


Chapter 3 Outline of operation panel types and functions

LCD operation panel (U30 V24OP1)



LED operation panel (U30 V24OP2)



CAUTION

- A protective sheet is attached to the surface of the panel when shipped. Peel of this sheet before starting use.
- Do not drop the panel. The panel could break if strong impact is applied.
- If the display does not appear even when the inverter power is turned ON, the cable between the panel and inverter might not be connected properly. Check the connection.

Status indications LEDs

FWD (Forward)	The drive is running in the forward direction.	When both LEDs flicker simultaneously, it indicates that DC Brake or pre-excitation is in action. If only the "FWD" or "REV" LED is flickering, this indicates that a command in the reverse direction has been received, and the drive is decelerating.
REV (Reverse)	The drive is running in the reverse direction.	
FLT (Fault)	The drive has detected a fault and has stopped. Turns OFF when the STOP+RST keys are pressed or the sequence input RESET signal is input.	
LCL (Local)	The drive is in the Local Mode and can be operated from the Operation Panel (FWD, REV and STOP only). When LED is off, the drive is in the Remote Mode and can be controlled from the terminal block (sequence input signals). To change Modes between Local and Remote, press STOP+LCL . Change this setting while operation is stopped.	

Unit indication LEDs (LED panel dedicated)		
	Hz・A・%	Indicates the unit of the parameter value shown on the display.
Minus polarity indication LED (LED panel dedicated)		
	——	Lights when the number on the display is a minus number.

Operation keys		
	FWD	Starts the drive in the forward direction. (in Local Mode only)
	REV	Starts the drive in the reverse direction. (in Local Mode only)
	STOP	Stops the drive. The motor will either coast to a stop or ramp down to a stop as selected on C00-1.
	STOP Held down for 2 sec.	When this key is held down for two seconds or longer during operation, the motor will coast to stop regardless of Local Mode or Remote Mode.
	STOP + LCL/SET	Changes control Modes from Local to Remote, or vice-versa. When the drive is in Local Mode, "LCL" LED is on. The drive is default set so that a Local/Remote selection is disabled while the drive is running. Even while the drive is at a stop, this selection cannot be made if operating commands such as RUN, JOG, etc., are being received at the terminal. This lock can be released with Parameter C09-2.
	STOP + RS/MO	Resets a fault, putting out FLT LED.
Parameter operation keys ・ Parameter operation knob		
	RST/MOD	Changes the block No. mode displayed on the indicator in the following order each time the key is pressed: Monitor → Parameter A → Parameter B → Parameter C → Utility Mode U.
	LCL/SET	Fixes Parameter number or set its values.
	◀	Param. Select: When main & sub-No. selection method (C11-7=2) is selected for parameter setting method, moves from sub-No. selection to main No. selection. Valve change: Moves the digit to increment or decrement.
Parameter increase/decrease key, parameter increase/decrease knob		
	▲ or	Increases the parameter No. or parameter setting value.
	▼ or	Decreases the parameter No. or parameter setting value.
	◀ + ▲ or	When the parameter is being set with the sub-No. selection method (C11-7=1), increases the parameter's main No.
	◀ + ▼ or	When the parameter is being set with the sub-No. selection method (C11-7=1), decreases the parameter's main No.

Operations dedicated for LED panel		
	▲ Held down	Increases the parameter No. or setting value at a fast speed.
	▼ Held down	Decreases the parameter No. or setting value at a fast speed.

Chapter 4 Test Operation and Adjustment

The VAT300 has various setting items. Some of these include settings that must be made according to the power supply and motor before actually starting operation.
The methods for the VAT300 basic test operation and adjustment are explained in this section.

4-1 Flow of test operation

Carry out test operation according to the flow shown in Fig. 4-1.
The procedures above the dotted line in Fig. 4-1 are explained in this section.

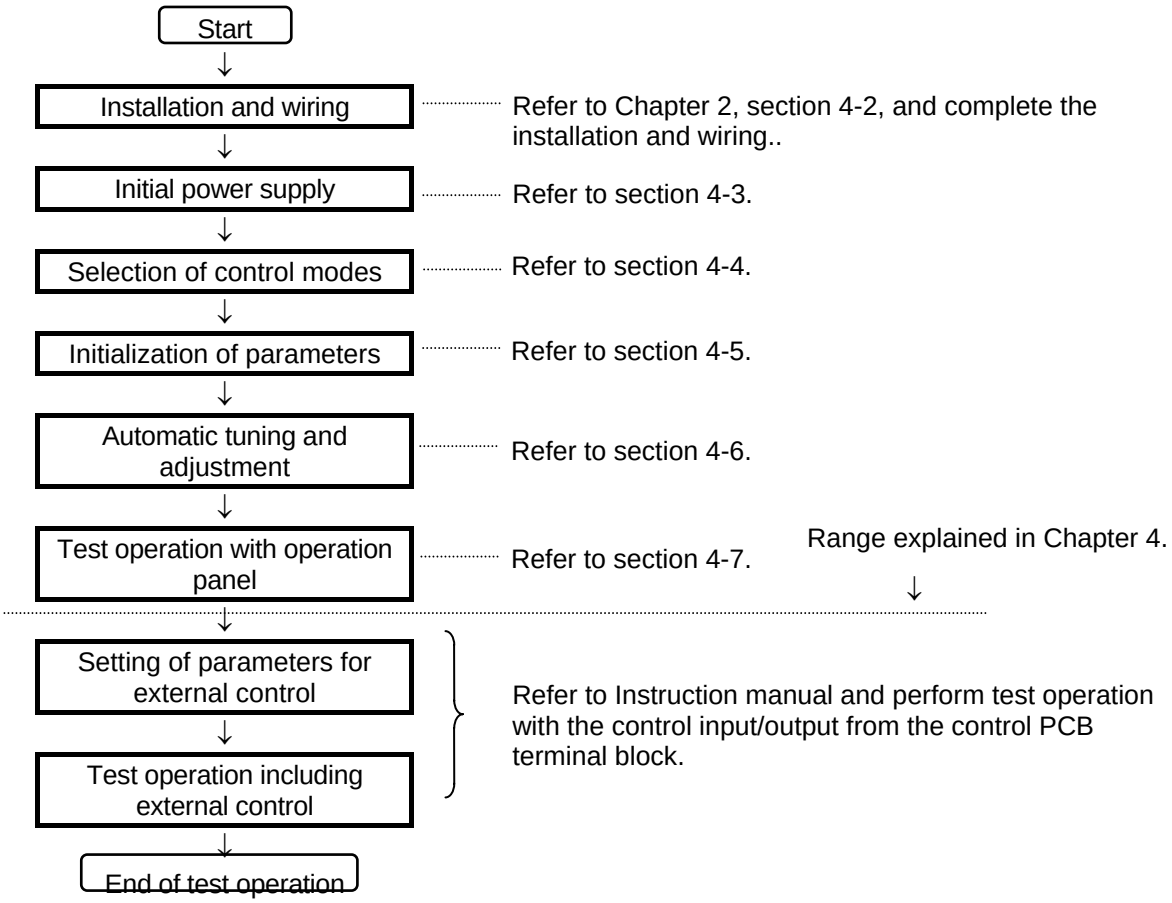


Fig. 4-1 Flow of test operation

4-2 Preparation before turning power ON

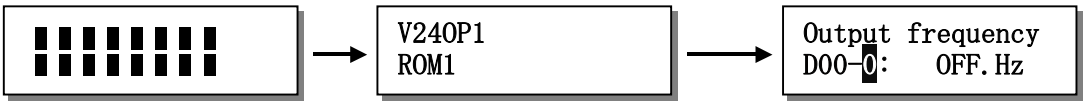
Always confirm the following points before turning ON the power after completing wire.

(1) Remove the coupling and belt coupling the motor and machine, so that the machine can be run as a single unit.
(2) Confirm that the power supply wire is correctly wired to the input terminals (L1, L2, L3).
(3) For the 400V series (X075K0 and larger), confirm that the voltage of the auxiliary equipment power supply is correctly selected (ref. Note 4, page E-11).
(4) Confirm that the power supply voltage is within the range mentioned in Note 5, page E-11.
(5) Refer to section 2-3, and correctly connect the main circuit wiring.
(6) Securely fix the motor with the specified method.
(7) Make sure that none of the terminal section screws are loose.
(8) Make sure that there is no short circuit state in the terminals caused by wire scraps, etc.
(9) Always correctly install the front cover and outer cover before turning the power ON.
(10) Assign an operator, and make sure that he operates the switches in case of emergency.

4-3 Turning the power ON

(1) LCD operation panel (U30 V24OP1)

The LCD operation panel startup screen is shown below.



Checking the operation after power ON

* The value after ROM is the software version

Normal display

(2) LED operation panel (U30 V24OP2)

Turn the power ON.
All LEDs on the numeric display will turn ON for a short time, and then " ----- ", "d00-0" and " oFF " will appear.
The "LCL" and "Hz" LEDs will also turn ON.

4-4 Selection of control modes

With the VAT300, four control modes and two overload modes can be selected. These are set with the parameter C30-0 (control mode selection).
* C30-0 is set with a 2-digit value (f1, f0).

(1) Control modes

There are four VAT300 motor control modes. Refer to the following table, and select the mode which suits the application.

Control mode	Explanation	C30-0 f0
1) V/f control	The IM is controlled keeping the ratio of voltage and frequency constant.	1
2) IM speed sensor-less vector control	The IM is vector-controlled without a speed sensor. The speed can be controlled.	2
3) IM vector control with speed sensor	The IM is vector-controlled with a speed sensor. This mode is used when a fast speed response or torque response is required. The speed detection option 1 is required. **(Note 1)**	3
4) PM motor control with sensor	The PM motor is vector-controlled. The motor can be operated at a higher efficiency than IM. A speed detection option which matches the sensor (encoder) being used is required. **(Note 1)**	4

(Note 1) Refer to Table 7-1-a of ST-3450 for details on the speed detection options.

(2) Device overload mode selection

The following two modes can be selected according to the load being used. If the load and device capacity do not differ, the device could be overloaded. Refer to the following table, and select the mode that matches the load being used.

Control mode	Explanation	C30-0 f1
1) Normal-duty setting	Select this when the maximum load rate in respect to the rated load is low. The overload standard will be 120% of the device's rated current for one minute.	1
2) Heavy-duty setting	Select this when the maximum load rate in respect to the rated load is high. The overload standard will be 150% of the device's rated current for one minute.	2

4-5 Initialization of motor constants

Input the motor rating parameters. Set the parameters shown in Table 4-5-1. Automatic tuning will automatically change the parameters, so it is recommended to write down the values set in Table 4-5-2 or Table 4-5-3.

Table 4-5-1

Applicable mode	Parameter No.	Name	
C30-0 f0 = 1 B19-0 = 1, 2	B00-0	Rated input voltage setting	[No.]
	B00-1	Max/base frequency simple setting	[No.]
	B00-2	Motor rated output	[kW]
	B00-3	Rated output voltage	[V]
	B00-4	Max. frequency **(Note 1)**	[Hz]
	B00-5	Base frequency **(Note 1)**	[Hz]
	B00-6	Motor rated current	[A]
	B00-7	Carrier frequency	

(Note 1) The max. frequency cannot be set below the base frequency, and the base frequency cannot be set above the max. frequency.

Table 4-5-2

Applicable mode	Parameter No.	Name	Explanation
C30-0 f0 = 1 B19-0 = 1	A02-2	Manual torque boost setting	The basic parameters, such as boost voltage and brake voltage, are adjusted without rotating the motor.
	A03-0	DC brake voltage	
	B02-0, 1	R1: Primary resistance	
	B02-4, 5	Lσ: Leakage inductance	

Table 4-5-3

Applicable mode	Parameter No.	Name	Explanation
C30-0 f0 = 1 B19-0 = 2	A02-2	Manual torque boost setting	The parameters related to the slip compensation and max. torque boost are adjusted while rotating the motor. The magnetic saturation characteristics are measured at the voltage boost, and are adjusted to match the max. torque boost.
	A03-0	DC brake voltage	
	B02-0, 1	R1: Primary resistance	
	B02-4, 5	Lσ: Leakage inductance	
	A02-5	Slip compensation gain	
	A02-6	Max. torque boost gain	

4-6 Automatic tuning and test operation

Automatic tuning measures the constants of the connected motor, and automatically adjusts the parameters so that the system is used to the fullest.

The VAT300 automatic tuning function performs differ measurements for each of the four control modes. Carry out automatic tuning each time the motor being used or the applicable control mode is changed. The automatic tuning mode is set with parameter B19-0 (automatic tuning selection).

Control mode	Automatic tuning mode
• V/f control	B19-0 = 1,2
• IM speed sensor-less vector control	B19-0 = 3, 4, 5
• IM vector control with speed sensor	B19-0 = 1, 3, 4,5
• PM motor control with sensor	B19-0 = 6, 7

B19-0	Name
1	Simple adjustment mode
2	V/f control high-function adjustment mode
3	Vector control basic adjustment mode
4	Vector control expanded adjustment mode
5	No-load voltage operation mode
6	Encoder phase adjustment mode **(Note 1)**
7	Magnetic pole position estimation mode **(Note 2)**

(Note 1) B19-0=6 : The encoder phase adjustment mode automatically adjusts the parameters which set the phase angle between the encoder Z phase pulses and PM motor U-phase coil. The motor circuit constants are not adjusted automatically.

(Note 2) B19-0=7 : The magnetic pole position estimation mode is used to adjust the PM motor control magnetic pole position estimation function. This mode does not automatically adjust the parameters.

4-6-1 Automatic tuning operation procedures (V/f control mode)

Carry out V/f mode automatic tuning with the following procedures.
Refer to Chapter 3 for details on using the operation panel.

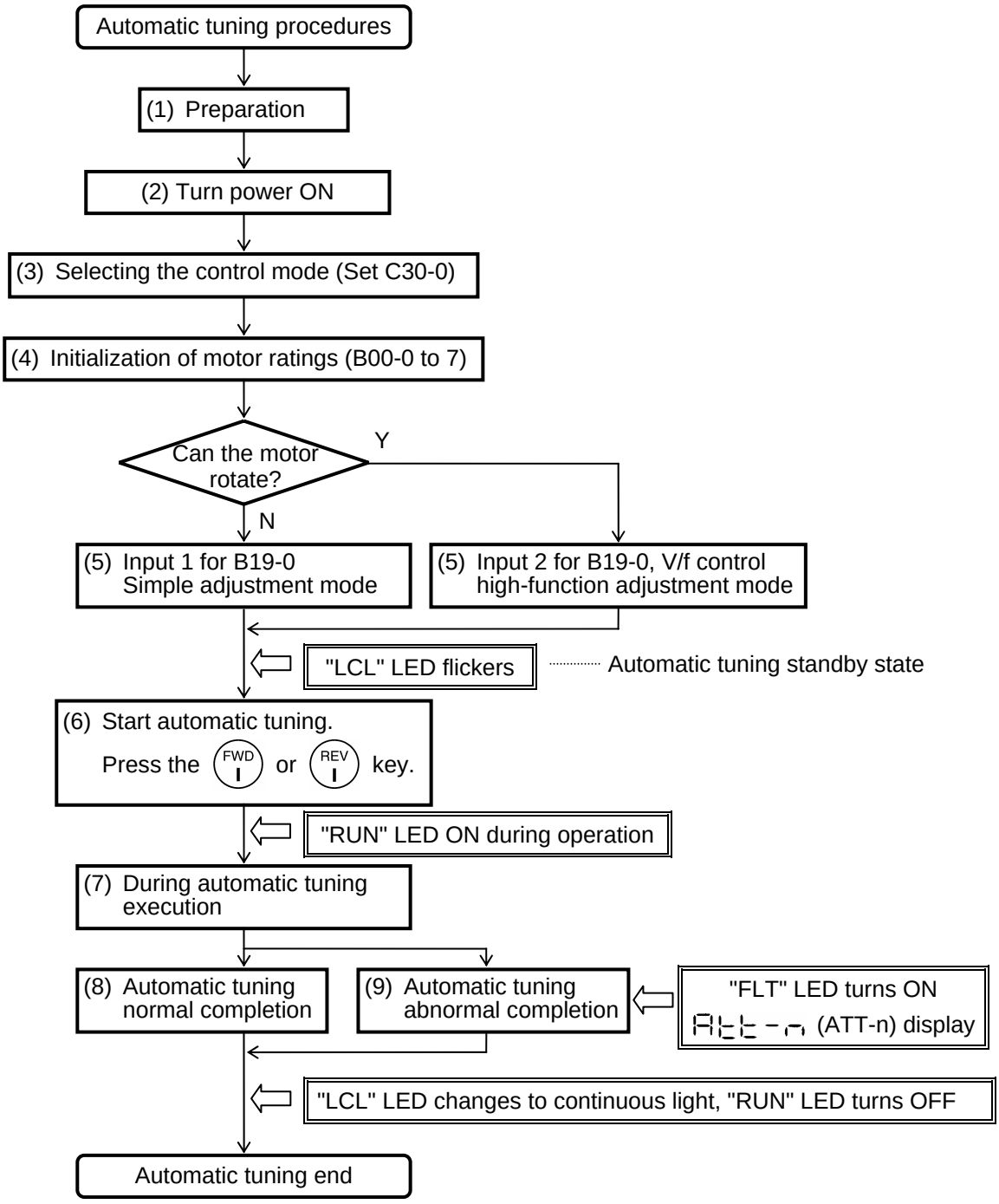


Fig. 4-6-1 V/f control automatic tuning procedures

1) Preparation

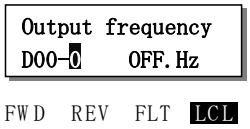
Separate the motor and load, machine, etc., and confirm the safety on the load side.

2) Turning the power ON

Turn the power ON.

(For U30 V24OP1)

After carrying out an initial check of the operation panel for approx. 5 seconds, the display changes as shown on the right. The "LCL" LED will also turn ON.



(For U30 V24OP2)

All LEDs on the numeric display will turn ON for a short time, and then "-----", "d00-0" and " OFF " will appear.

The "LCL" and "Hz" LEDs will also turn ON.

3) Selecting the control mode

- Set A05-2 to 1. (Set the hardware option function display ON.)
- Set the control mode selection: C30-0 f 1 f 0.

  This parameter must be set first. (Note 1)

  V/f control mode is to be used, so set C30-0 f0 =1.

  Set c30-0 f1 f0 as shown below according to the load.

  Normal-duty setting: C30-0 f 1 f 0 = 1 1

  Heavy-duty setting: C30-0 f 1 f 0 = 2 1

  (Note 1) The default value is set to V/f control and Normal-duty setting (C30-0=11). There are some parameters which will change automatically when C30-0 is changed, so also set this first.

4) Initialization of motor constants

Input the motor rating parameters. Set the parameters shown in Table 4-5-1. Automatic tuning will automatically change the parameters, so it is recommended to write down the values set in Table 4-5-2 or Table 4-5-3.

5) Selecting and executing the automatic tuning mode

Select the automatic tuning mode and execute automatic tuning.

- The operation panel's operation mode must be set to "Local" to execute automatic tuning. Make sure that the "LCL" LED is ON. If not, press the LCL/SET + STOP keys, and confirm that the "LCL" LED turns ON.
- Set A05-0 to 1. (Set the expanded setting display ON.)
- Using B19-0 (automatic tuning selection), select the automatic tuning mode according to the working conditions. Refer to section 4-5 and 4-6 for details on the automatic tuning mode.
- The automatic tuning standby state will be entered when the LCL/SET key is pressed.
- During the automatic tuning standby state and the automatic tuning execution state, the "LCL" LED will flicker.
- To exit the automatic tuning standby state, press the STOP key.

6) Starting automatic tuning

Automatic tuning will start when the FWD key or REV key is pressed according to the required rotation direction.

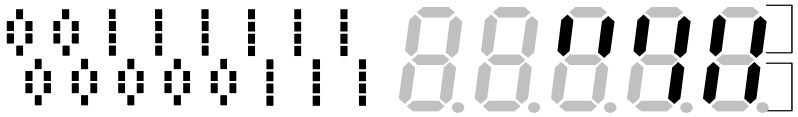
To stop, press the STOP key or input the emergency stop signal (EMS) from the terminal block.

Once automatic tuning starts, all panel operations other than the STOP, RST/MOD and ▲ ▼ keys (knob with U30 V24OP1) are disabled until the operation ends.

7) During automatic tuning execution

The progression state can be confirmed with D22-0.

(For V24-OP1) (For V24-OP2)



Upper level : The steps required for tuning are indicated (lit).

Lower level : The finished steps are indicated (lit). The step currently being executed is indicated with a flicker.

8) Normal completion of automatic tuning

When the automatic tuning ends normally, the "LCL" LED will change from a flicker to a stable light. The "RUN" LED will change from a stable light to the OFF state.
Refer to section 4-5 for the adjustment items.

9) Abnormal completion of automatic tuning

If automatic tuning ends abnormally, the "FLT" LED will turn ON and a message will appear. Investigate and check according to the error codes.
Refer to section 4-6-2 for details on the error codes.

4-6-2 Automatic tuning error messages

If automatic tuning ends abnormally, the following message will appear. Investigate and confirm the state following the error code.

E00:ATT-n (for U30 V24OP1), ATt-n (for U30 V24OP2) n : Automatic tuning step

No.	Cause and remedy
n=1	The motor may not be connected correctly. Check the connection. The B00 and B01 parameters may not be set correctly. Check the parameter setting.
n=2	The B00 and B01 parameters may not be set correctly. Check the parameter setting.
n=3	The load and machine may not be separated. Separate the load and machine. Lengthen the acceleration time (A01-0). Lengthen the deceleration time (A01-1). If the motor vibrates, adjust the torque stabilizing gain (B18-2). Normally, the default value (1.00) is set, but increase the setting value in increments of approx. 0.05 according to the state of hunting. Please return to regulated value (1.00) of a set value once, and reduce it by carving about 0.05 when the hunting phenomenon is not controlled even in case of maximum value (4.00) .
n=4	The load and machine may not be separated. Separate the load and machine. If the motor vibrates, increase the torque stabilizing gain (B18-2). Normally, the default value (1.00) is set, but increase the setting value in increments of approx. 0.05 according to the state of hunting. Please return to regulated value (1.00) of a set value once, and reduce it by carving about 0.05 when the hunting phenomenon is not controlled even in case of maximum value (4.00) .
n=5	When the motor does not stop Increase the acceleration/deceleration time (A01-0, A01-1). When the motor does stop The B00 and B01 parameters may not be set correctly. Check the parameter setting.
n=6	The B00 and B01 parameters may not be set correctly. Check the parameter setting.
n=8	Indicates that the output voltage did not stabilize for 1 second or more during magnetic pole position estimation for the PM motor.
n=9	Indicates that the PM motor magnetic pole estimation did not end normally even after retrying three times.

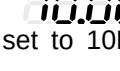
4-7 Test operation (V/f control mode)

When finished with automatic tuning, test run the isolated motor, and make sure that there are no errors.
Use the following procedures to test the operation with the operation panel.
Refer to Chapter 3 for details on using the operation panel.
The case that the maximum frequency (B-004) and base frequency (B-005) are 50Hz is shown here.

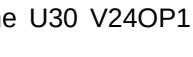
⚠ CAUTION
To prevent incorrect operation during the test operation, make sure that signals are not input into the sequence input terminal.

1) To enable operation with the operation panel, confirm that the "LCL" LED is ON. If not, press the (LCL/SET) + (STOP) keys, and confirm that the "LCL" LED turns ON.
2) Set speed setting input point selection: C02-0= 3 (panel fixed).

⚠ CAUTION
The motor will rotate with the next step. Confirm the safety around the motor before starting the next step.

3) Press the (RST/MOD) and display D00-0 on the monitor. Then press the (FWD) key. Operation will start. The "FWD" lamp will turn ON, and the display will change from "  " to a value display. The value will gradually increase, and after several seconds, will change to "  ". This is because as the factory settings, the direct setting frequency (A00-0) is set to 10Hz and the acceleration ramp time 1 (A01-0) is set to 10sec.

CHECK
1. Did the motor run? 2. Is the run direction correct? Check the wiring and operation if abnormal. 3. Is the rotation smooth?

4) Press the (REV) key and confirm that the motor runs in reverse.
(Note) Do not carry out this step if a load which cannot be run in reverse is connected.
5) Press the (STOP) key and stop the motor.
6) Press the (FWD) key. The motor will forward run at the output frequency 10Hz.
Change the frequency to 50Hz with the following operation.
7) Press the (RST/MOD) key several times. The Display will alternate between "  " and "  " (with the U30 V24OP1, the 0 section of "A00-0: 10.00Hz" will flicker).
8) Press the (LCL/SET) key once.
The display will stop at "  ", and the last digit will flicker.(With the U30 V24OP1, the flicker will move to the 2nd decimal digit of the furequency display.)
This completes the preparation for changing the output frequency. The digit to change can be moved with the (◀) key. The output frequency can be incremented/decremented with the (▲)(▼) keys (knob with U30 V24OP1).

9) Move the digit with the ◀ key, and using the ▲ key (knob with U30 V24OP1), raise the frequency to 50.00Hz. Then, press the LCL/SET key. The output frequency will rise to 50Hz.

(Note) The operation panel frequency change operation is set to "Change in real time" (C11-2=1) with the factory shipment settings. Thus, even if the LCL/SET key is not pressed, the frequency will change in real time using the ▲ ▼ keys (knob with U30 V24OP1).

When the LCL/SET key is pressed, the current setting value will be saved.

⚠ CAUTION

A 10-second acceleration and 20-second deceleration ramp time are set as defaults. The motor will slowly increase its speed to the set value.

When making a setting (using the ▲ ▼ keys, or knob with U30 V24OP1), check that the motor operates correctly at each increment of approx. 10Hz.

10) Press the RST/MOD key several times, and display D00-0. When the output frequency ("D00-0" display) reaches 50Hz, press the STOP key.
The display will decrease to "0.00" in several seconds. The "FWD" or "REV" LED will flicker for two seconds while the DC-brake is applied and the motor will stop.

11) Press the REV key, and test the reverse run at 50Hz.
(Note) Do not carry out this step if a load which cannot be run in reverse is connected.

This completes the test operation with the operation panel.
After this, refer to Chapter 5 and carry out the settings and adjust the load operation to match the user's application.

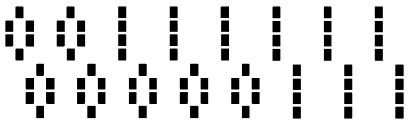
Chapter 5 Parameter Settings

5-1 Monitor parameters

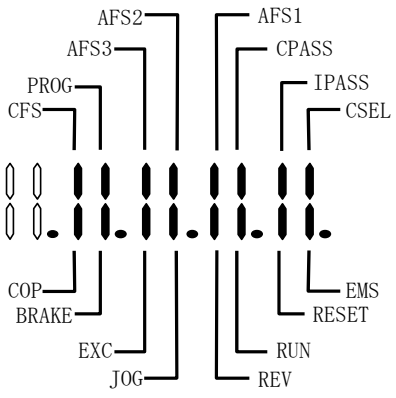
No.	Parameter	Unit	Remarks
D00 – Output frequency monitor			
0	Output frequency in Hz	Hz	OFF will display when the gate is closed. bk displays while the DC brake is in action. PU is displayed during pick up.
1	Output frequency in %	%	
D01 – Frequency setting monitor			
0	Set frequency in Hz	Hz	The currently selected frequency setting value is displayed.
1	Set frequency in %	%	The max. frequency is displayed as 100%.
D02 – Current monitor			
0	Output current (Amps)	A	OFF will display when the gate is closed.
1	Output current (%)	%	The motor rated current is displayed as 100%.
2	Overload (OL-1) monitor	%	OL-1 functions when this value reaches 100%.
3	Motor overload (OL-3) monitor	%	The OL-3 operates when at 100%.
4	Heatsink temperature	°C	Depending on the capacity, OHT.1 functions at 95°C or 120°C or more.
7	U phase output current amps	A	OFF will display when the gate is closed. The correct value is not displayed during pick-up or during automatic tuning.
8	V phase output current amps	A	
9	W phase output current amps	A	
D03 – Voltage monitor			
0	DC voltage	V	Displays the voltage of the DC link circuit in the main circuit.
1	Output voltage (command)	V	Displays output voltage command. The display may differ from the actual output voltage. It depends on the power supply voltage. OFF will display when the gate is closed.
2	Output power	kW	Displays the inverter's output power. OFF will display when the gate is closed.
3	Carrier frequency		The current carrier frequency is displayed.
D04 – Sequence status			
0-3	Sequence status-Input 1 to 4		The ON/OFF state of the internal sequence data will display. The correspondence of each LED/LCD segment and signal is shown in the next page.
4-7	Sequence status-Output 1 to 4		
D05 – Minor fault monitor			
0	Minor fault failure monitor		The internal minor fault status will display.
1	Hardware detection fault status		The status of the fault signal detected by the hardware is displayed.

A state of ON/ off of the internal sequence data is indicated as follows.

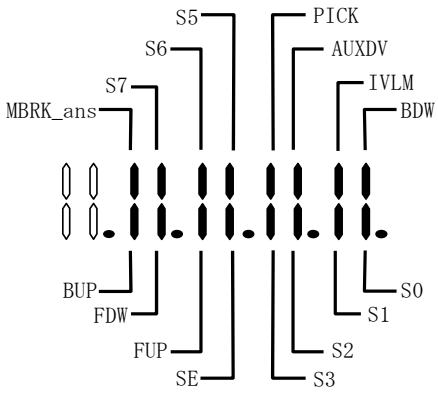
(For V24-OP1)



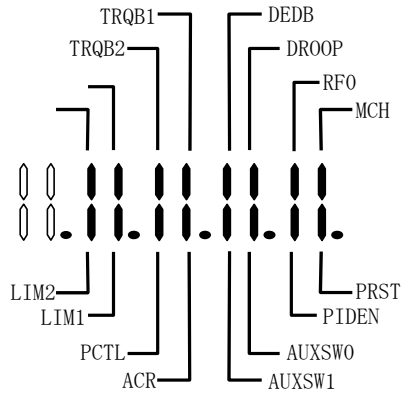
(For V24-OP2)



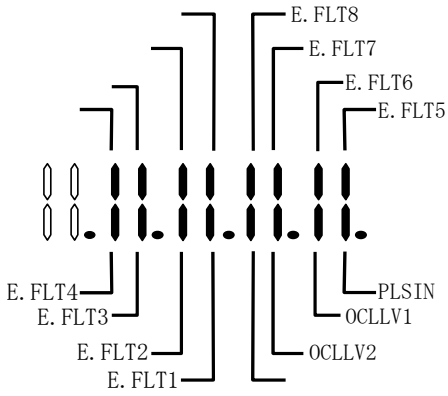
Sequence Input(D04-0)



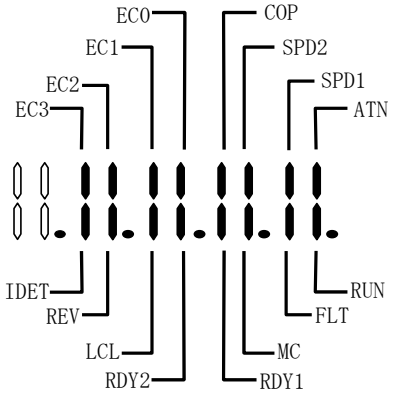
Sequence Input(D04-1)



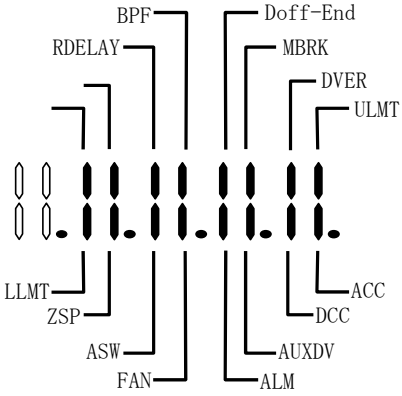
Sequence Input(D04-2)



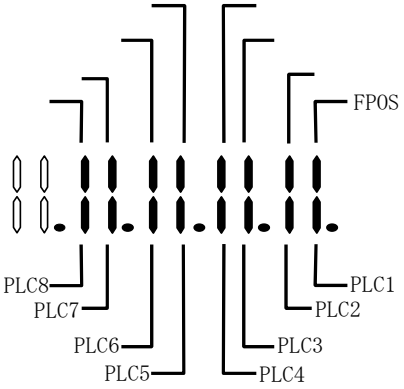
Sequence Input(D04-3)



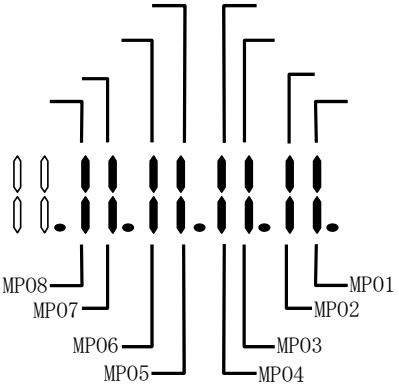
Sequence Output(D04-4)



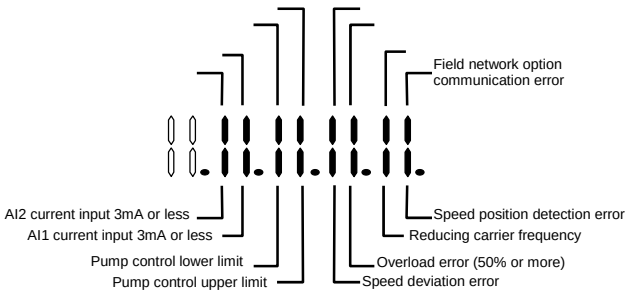
Sequence Output(D04-5)



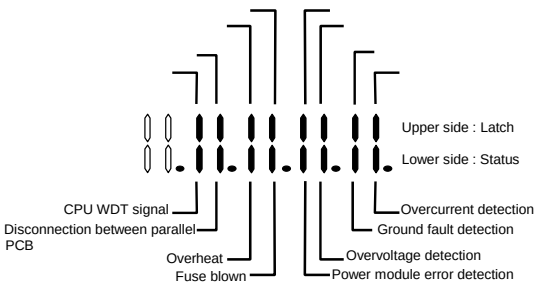
Sequence Output(D04-6)



Sequence Output(D04-7)



Monitor fault (D05-0)



Hardware detection fault status displays (D05-1)

5-2 Block-A parameters

No.	Parameter	Min.	Max.	Default (Unit)	Function	Change is possible during operation.
A00 – Frequency setting						
0	Local frequency setting	0.10	Max. fre-quency	10.00 (Hz)	This is the frequency set from the operation panel.	○
1	Jogging frequency	0.10		5.00 (Hz)	This is the frequency setting for jogging.	○
A01 – Acceleration/deceleration time						
0	Acceleration time – 1	0.1	6000.0	10.0 (s)	The value can be displayed in units of 0.1 or 10 times as set on B10-5. The time to reach the max. frequency or max. speed from 0 is set.	○
1	Deceleration time – 1	0.1	6000.0	20.0 (s)		○
A02 – Torque boost						
0	Manual torque boost selection	1.	2.	2.	1: Disable = 2: Enable	
1	Automatic torque boost selection	1.	2.	1.	1: Disable = 2: Enable	
2	Manual torque boost setting	0.00	20.00	Inverter rating (%)	Set the boost voltage at 0Hz. This is automatically adjusted by the automatic tuning.	○
3	Square reduction torque setting	0.00	25.00	0.00 (%)	Set the reduced voltage at Base frequency/2.	○
4	R1 drop compensation gain	0.0	100.0	100.0 (%)	Set how much to compensate the voltage drop caused by R1 measured with automatic tuning.	○
5	Slip compensation gain	0.00	20.00	0.00 (%)	Set the motor's rated slip. This is automatically adjusted by the automatic tuning.	○
6	Maximum torque boost gain	0.00	50.00	0.00 (%)	This is automatically adjusted by the automatic tuning. The optimum boost amount for outputting the maximum torque is set.	
A03 – DC Brake						
0	DC braking voltage	0.01	20.00	Inverter rating (%)	This is automatically adjusted by the automatic tuning. When setting manually, monitor the output voltage and change the setting in increments of 1% or less.	○
1	DC braking time	0.0	20.0	2.0 (s)	Set the time to apply the DC brakes.	○
2	DC braking current	0.	150.	50. (%)	This is used instead of the DC brake voltage in the vector mode and PM mode. This is not adjusted with automatic tuning.	○

5-3 Block-B parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Min.</th><th>Max.</th><th>Default (Unit)</th><th>Function</th><th>Change is possible during operation.</th></tr>
<tr><td colspan="7">B00 – Output rating (V/f control)</td></tr>
<tr><td>0</td><td>Rated input voltage setting</td><td>1.</td><td>7.</td><td>7.</td><td colspan="2">Select the rated input voltage from the following table.</td></tr>
<tr><td></td><td></td><td colspan="3">When this data is changed, the output voltage data will be changed to the same value.</td><td colspan="2">
<table>
<tr><th rowspan="2">setting</th><th colspan="2">200V system</th><th colspan="2">400V system</th></tr>
<tr><th></th><th>Power supply voltage</th><th></th><th>Power supply voltage</th></tr>
<tr><td>1</td><td>200V</td><td>to 200V</td><td>380V</td><td>to 380V</td></tr>
<tr><td>2</td><td>200V</td><td>to 200V</td><td>400V</td><td>381 to 400V</td></tr>
<tr><td>3</td><td>220V</td><td>201 to 220V</td><td>415V</td><td>401 to 415V</td></tr>
<tr><td>4</td><td>220V</td><td>201 to 220V</td><td>440V</td><td>416 to 440V</td></tr>
<tr><td>5</td><td>230V</td><td>221 to 230V</td><td>460V</td><td>441 to 460V</td></tr>
<tr><td>6</td><td>240V</td><td>231 to 240V</td><td>480V</td><td>461 to 480V</td></tr>
<tr><td>7</td><td>230V</td><td>221 to 230V</td><td>400V</td><td>381 to 400V</td></tr>
</table>
</td></tr>
<tr><td>1</td><td>Max./base frequency simple setting</td><td>0.</td><td>9.</td><td>1.</td><td colspan="2">Select the output frequency rating from the combination below.</td></tr>
<tr><td></td><td></td><td colspan="3"></td><td colspan="2">
<table>
<tr><th>Value</th><th>Fbase[Hz]</th><th>Fmax [Hz]</th></tr>
<tr><td>0</td><td colspan="2">Free setting on B00-4 and B00-5</td></tr>
<tr><td>1</td><td>50</td><td>50</td></tr>
<tr><td>2</td><td>60</td><td>60</td></tr>
<tr><td>3</td><td>50</td><td>60</td></tr>
<tr><td>4</td><td>50</td><td>75</td></tr>
</table>
<table>
<tr><th>Value</th><th>Fbase [Hz]</th><th>Fmax [Hz]</th></tr>
<tr><td>5</td><td>50</td><td>100</td></tr>
<tr><td>6</td><td>60</td><td>70</td></tr>
<tr><td>7</td><td>60</td><td>80</td></tr>
<tr><td>8</td><td>60</td><td>90</td></tr>
<tr><td>9</td><td>60</td><td>120</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Motor rated output</td><td>0.10</td><td>750.00</td><td>Inverter rating(kW)</td><td colspan="2">The motor rated output at the base frequency is set.</td></tr>
<tr><td>3</td><td>Motor rated voltage</td><td>39.</td><td>480.</td><td>230. or 400. (V)</td><td colspan="2">DC-AVR does not operate when set to 39.
The input voltage equals the output voltage at the base frequency.
DC-AVR operates so that the set voltage is attained at the base frequency when not set to 39.
When the rated input voltage setting (B00-0) is changed, this data is also changed to the rated input voltage value.
This cannot be set above the rated input voltage.</td></tr>
<tr><td>4</td><td>Max. frequency</td><td>Fbase or 3.00</td><td>Fbase *7 or 440.00</td><td>50.00 (Hz)</td><td colspan="2" rowspan="2">When "B00-1" is a value other than 0, this will be rewritten with the data set in the simple setting.</td></tr>
<tr><td>5</td><td>Motor Base frequency</td><td>Fmax/7 or 1.00</td><td>Fmax or 440.00</td><td>50.00 (Hz)</td></tr>
<tr><td>6</td><td>Motor rated current</td><td>Inverter rating × 0.3</td><td>Inverter rating</td><td>Inverter rating (A)</td><td colspan="2">This is the reference value for the overcurrent limit, OLT, current % display, analog input and output.</td></tr>
<tr><td>7</td><td>Carrier frequency (Small size : from N000K7 to N045K0 : from X000K7 to X055K0)</td><td>1.0</td><td>21.0</td><td>17.0</td><td colspan="2">The noise can be lowered by changing the PWM carrier frequency and control method, and changing the sound of the magnetic noise generated from the motor. This can be changed while running.
1.0 to 15.0: Monotone sound method
(Carrier frequency: 1.0 to 15.0kHz)
15.1 to 18.0: Soft sound method 1
(Basic carrier frequency: 2.1 to 5.0kHz)
18.1 to 21.0: Soft sound method 2
(Basic carrier frequency: 2.1 to 5.0kHz)</td><td>○</td></tr>
<tr><td>7</td><td>Carrier frequency (Large size : from X075K0 to X475K0)</td><td>1.0</td><td>14.0</td><td>10.0</td><td colspan="2">1.0 to 8.0: Monotone sound method
(Carrier frequency: 1.0 to 8.0kHz)
8.1 to 11.0: Soft sound method 1
(Basic carrier frequency: 2.1 to 5.0kHz)
11.1 to 14.0: Soft sound method 2
(Basic carrier frequency: 2.1 to 5.0kHz)</td><td>○</td></tr>
</table>

5-4 Block-B,C parameters

No.	Parameter	Min.	Max.	Default (Unit)	Function	Change possible during operation.
B02 – Motor circuit constant						
0	R1: Primary resistance (IM: Mantissa section)	0.010	9.999	Inverter rating (mΩ)	The motor circuit constant is set.	○
1	R1: Primary resistance (IM: Exponent section	-3	4	Inverter rating		
2	R2': Secondary resistance (IM : Mantissa section)	0.010	9.999	1.000 (mΩ)		○
3	R2': Secondary resistance (IM: Exponent section)	-3	4	0.		
4	Lσ: Leakage inductance (IM: Mantissa section)	0.100	9.999	1.000 (mH)		○
5	Lσ: Leakage inductance (IM: Exponent section)	-3	4	0.		
B18 – Current limit						
0	Over current limit	50.	300.	125. (%)	The default value is 155. when heavy-duty is set.	○
1	Regenerative current limit	5.	300.	10. (%)	Set to 10% when not using the DBR option.	○
2	Torque stabilization gain	0.00	4.00	1.00	The disturbance symptoms which occur if the current abnormally vibrates after motor operation is suppressed. Increase or decrease by 0.05 units if the motor vibrates.	○
B19 – Automatic tuning function						
0	Automatic tuning selection	0.	7.	0.	=1: Simple adjustment =2: Extended adjustment for V/f Control =3: Basic adjustment for Vector Control =4: Extended adjustment for Vector Control =5: Calculation of no load voltage for Vector Control =6: Encoder phase adjustment (PM) =7: Flux position estimation	
1	Initial proportion compensation gain (Automatic tuning function)	0.	500.	100. (%)	When the motor with special circuit parameters is applied, the initial condition of automatic tuning is set. Change these value if auto tuning is completed incorrectly and try to auto tuning again. Set these values to increase or decrease with 50% step.	
2	Initial time constant compensation gain (Automatic tuning function)	0.	500.	100. (%)		
C11 – Operation panel mode setting						
0	Initial mode	1.	2.	1.	The initial operation mode for when the power is turned ON is set = 1: Local = 2: Remote	○
2	Operation panel frequency change operation	1.	2.	1.	Used to prevent changes to the frequency/rotation speed settings in real time. =1: Change in real time =2: Change using the Set key.	○
C30 – Control mode selection						
0	Control mode selection	11. f1 f0	24.	11.	f0: The control mode is set. =1: V/f control =2: IM speed sensor-less vector control =3: IM speed vector control with sensor =4: PM motor control with sensor f1: The overload mode is set. =1: Normal-duty (120%1min) =2: Heavy-duty (150%1min)	

Chapter 6 EMC Instruction

6-1 Installation environment

Table 6-1 shows the EMC standard conformity table of VAT300. VAT300 supports EN61800-3 Second Environment Category C3 by using either built in or external filters.
However First environment Category C2, is achieved only for drives N000K7 to N002K2 and X000K7 to X005K5, by installing ferrite cores in I/O power cables.
Refer to Tables 6-2 and 6-3 for the EMI filter and ferrite core to apply.

Table 6-1 EMC standard conformity table of VAT300

Conformity standard	First environment (EN61800-3 Category C2)	Second environment (EN61800-3 Category C3)
The view of VAT300	from N000K7 to N002K2 from X000K7 to X005K5	from N004K0 to N045K0 from X007K5 to X475K0

6-2 Installation into a metal cabinet

To clear the levels of the Residential, Commercial, Light Industrial Environments and the Industrial Environment for the drives up to 475kW, the following method of installation is required.

6-2-1 When using drives with built-in EMI filters (N000K7 to N005K5, X000K7 to X030K0)

(1) Install the drive with built-in filters in a metal cabinet. This ensure to meet Second Environment Category C3.

Note that drives from N000K7 to N002K2 and from X000K7 to X005K5, can meet First environment Category C2, by installing 3 pieces of the ferrite cores on the power source cable, one on the motor cable and other on the control cable as shown in Fig. 6-1.
All these 5 ferrites are delivered into the drive package, when order VAT300 with built-in filter.

(2) The power source cable and motor cable outside the metal cabinet should be shielded and made to be as short as possible. Electrically connect the shield to the earth terminal of the motor.
(3) In order to suppress the noise emission from the cables, earth the shield of the power source cable and motor cable to the metal cabinet with metal clamps.
(4) Use the shielded cables for the drive control wiring and earth the shield to the metal cabinet with a metal clamp

6-2-2 When using the external EMI filters (VAT300-N007K5 to N045K0, X037K0 to X475K0)

(1) Install the drive unit in a metal cabinet and put the EMI filter on the power source cable as shown in Fig. 6-2.
(2) The power source cable and motor cable outside the metal cabinet should be shielded and as shortest as possible. Electrically connect the shield to the earth terminal of the motor.
(3) It is not necessary to use shielded cables for the control circuit wiring inside the metal cabinet. However, make the EMI filter power source cable and the motor cable as short as possible, and separate them as far from each other as possible.
(4) In order to suppress the noise emission from the cables, earth the shield of the power source cable and motor cable to the metal cabinet with metal clamps.
(5) Use the shielded cables for the drive control wiring and earth the shield to the metal cabinet with a metal clamp.

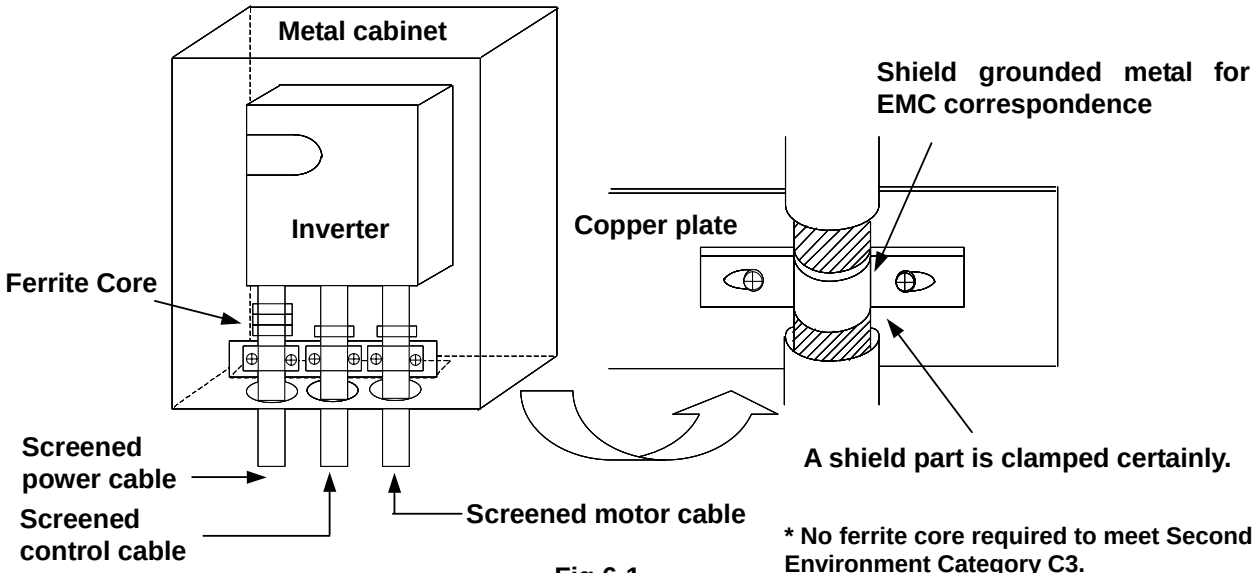


Fig.6-1

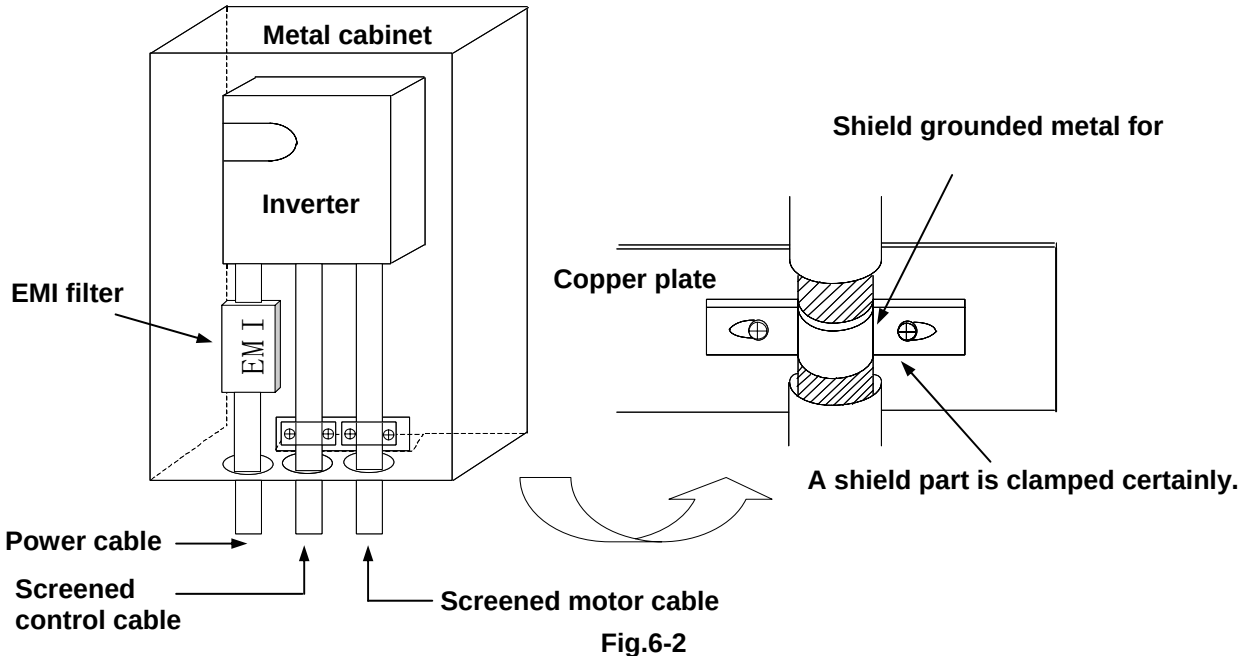


Fig.6-2

Table 6-2 Input filters for VAT300 drives up to N045K0

Series	Size	Output current (A)*1	Category C2		Category C3
			Filter type	Ferrite core type*2	Filter type
200V Series	N000K7	5.0	Built-in	P：ZCAT3035-1330×3 C：ZCAT3035-1330×1 M：ZCAT3035-1330×1	Built-in
	N001K5	8.0			
	N002K2	11.0			
	N004K0	16.0	———	———	
	N005K5	24.0			
	N007K5	33.0			U30F3075EB
	N011K0	46.0			U30F3075EB
	N015K0	61.0			U30F3100EB
	N018K5	76.0			U30F3100EB
	N022K0	88.0			U30F3130EB
	N030K0	118.0			U30F3180EB
	N037K0	146.0			U30F 3250ES
	N045K0	174.0			U30F 3250ES

*1 Data of Normal-Duty

*2 P : Ferrite cores for power cable C : Ferrite cores for control cable
M : Ferrite cores for motor cable

Table 6-3 Input filters for VAT300 drives up to X055K0

Series	Size	Output current (A)*1	Category C2		Category C3
			Filter type	Ferrite core type*2	Filter type
400V Series	X000K7	2.5	Built-in	P：ZCAT3035-1330×3 C：ZCAT3035-1330×1 M：ZCAT3035-1330×1	Built-in
	X001K5	3.6			
	X002K2	5.5			
	X004K0	8.6			
	X005K5	13.0			
	X007K5	17.0	———	———	Built-in
	X011K0	23.0			
	X015K0	31.0			
	X018K5	37.0			
	X022K0	44.0			
	X030K0	60.0			
	X037K0	73.0			U30F3100EB
	X045K0	87.0			U30F3130EB
	X055K0	108.0			U30F3180EB

*1 Data of Nomal-Duty

*2 P : Ferrite cores for power cable C : Ferrite cores for control cable M : Ferrite cores for motor cable

Table 6-5 Input filters for VAT300 drives In size X075K0 or larger

Series	Size	Output current (A)	Category C3
			Filter type
400V Heavy Duty	X075K0	108.0	U30F3180EB
	X090K0	147.0	U30F3250ES
	X110K0	179.0	U30F3320ES
	X132K0	214.0	U30F3320ES
	X160K0	249.0	U30F3400ES
	X200K0	321.0	U30F3600ES
	X250K0	428.0	U30F3600ES
	X315K0	519.0	U30F31000ES
	X400K0	590.0	U30F31000ES
	X475K0	740.0	U30F31000ES
400V Normal Duty	X075K0	147.0	U30F3250ES
	X090K0	179.0	U30F3250ES
	X110K0	214.0	U30F3320ES
	X132K0	249.0	U30F3400ES
	X160K0	293.0	U30F3600ES
	X200K0	382.0	U30F3600ES
	X250K0	479.0	U30F31000ES
	X315K0	590.0	U30F31000ES
	X400K0	740.0	U30F31000ES
	X475K0	870.0	U30F31600ES