ERIC DRIVE®

TRANSISTORIZED INVERTER

AC MOTOR SPEED CONTROLLER

0.75KW~300KW 220V/440V Class

## Flux Vector Control Inverter

# ERIC-9001 Series

## INSTRUCTION MANUAL

BVQi ISO 9002

NATIONAL ACCREDITATION OF CERTIFICATION BODIES

No.18791

RICH ELECTRIC

# PREFACE

ERIC-9001 inverter provided with vector control for standard models in addition to V/f control. This instruction manual describes installation, maintenance and inspection, troubleshooting, and specifications of the ERIC-9001. Read this instruction manual thoroughly before operation.

RICH ELECTRIC CO., LTD.

## General Precautions

- Some drawings in this manual are shown with the protective cover or shields removed, in order to describe detail with more clarity. Make sure all covers and shields are replaced before operating this product.
- This manual may be modified when necessary because of improvement of the product, modification, or changes in specifications.
  Such modifications are denoted by a revised manual No.
- To order a copy of this manual, if your copy has been damaged or lost, contact your RICH ELECTRIC representative.
- RICH ELECTRIC is not responsible for any modification of the product made by the user, since that will void your guarantee.

# NOTES FOR SAFE OPERATION

Read this instruction manual thoroughly before installation, operation, maintenance or inspection of the ERIC-9001. In this manual, NOTES FOR SAFE OPERATION are classified as "WARNING" or "CAUTION".

**⚠ WARNING**

Indicates a potentially hazardous situation visiting,if not avoided, could result in death or serious injury to personnel.

**⚠ CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment.
It may also be used to alert against unsafe practices.

Even items described in ⚠ CAUTION may result in a vital accident in some situations. In either case, follow these important notes.

NOTE : These are steps to be taken to insure proper operation.

## RECEIVING

**⚠ CAUTION**

- Do not install or operate any inverter which is damaged or has missing parts.
  Failure to observe this caution may result in personal injury or equipment damage.

## INSTALLATION

### ⚠ CAUTION

- Lift the cabinet by the base. When moving the unit, never lift by the front cover.
  Otherwise, the main unit may be dropped causing damage to the unit.
- Mount the inverter on nonflammable material (i.e. metal).
  Failure to observe this caution can result in a fire.
- When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 45°C.
  Overheating may cause a fire or damage to the unit.

## WIRING

### ⚠ WARNING

- Only commence wiring after verifying that the power supply is turned OFF.
  Failure to observe this warning can result in an electrical shock or a fire.
- Wiring should be performed only by qualified personnel.
  Failure to observe this warning can result in an electrical shock or a fire.
- When wiring the emergency stop circuit, check the wiring thoroughly before operation.
  Failure to observe this warning can result in personal injury.

- Make sure to ground the ground terminal ⏚.
  (Ground resistance
  220V class: 100Ω or less, 440V class: 10Ω or less)
  Failure to observe this warning can result in an electrical shock or a fire.

## ⚠ CAUTION

- Verify that the inverter rated voltage coincides with the AC power supply voltage.
  Failure to observe this caution can result in personal injury or a fire.
- Do not perform a withstand voltage test of the inverter.
  It may cause semi-conductor elements to be damaged.
- To connect a braking resistor, braking resistor unit or braking unit, follow the procedures described in APPENDIX 3.
  Improper connection may cause a fire.
- Tighten terminal screws to the specified tightening torque.
  Failure to observe this caution can result in a fire.
- Never connect the AC main circuit power supply to output terminals U, V and W.
  The inverter will be damaged and invalidate the guarantee.

## OPERATION

### ⚠ WARNING

- Only turn ON the input power supply after replacing the front cover. Do not remove the cover while current is flowing.
  Failure to observe this warning can result in an electrical shock.
- When the retry function (L5–02) is selected, do not approach the inverter or the load, since it may restart suddenly after being stopped.
  (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.
- Since the stop button can be disabled by a function setting, install a separate emergency stop switch.
  Failure to observe this warning can result in personal injury.
- If an alarm is reset with the operation signal ON, the inverter restarts automatically. Only reset the alarm after verifying that the operation signal is OFF.
  Failure to observe this warning can result in personal injury.

### ⚠ CAUTION

- Never touch the heatsink or discharging resistor since the temperature is very high.
  Failure to observe this caution can result in harmful burns to the body.
- Since it is easy to change operation speed from low to high speed, verify the safe working range of the motor and machine before operation.
  Failure to observe this caution can result in personal injury and machine damage.

- Install a holding brake separately if necessary.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.
- All the constants of the inverter have been preset at the factory. Do not change the settings unnecessarily.
  The inverter may be damaged. For supply voltage, follow Par. 4.3.

## MAINTENANCE AND INSPECTION

### ⚠ WARNING

(Ref. page)

- Never touch high–voltage terminals in the inverter.
  Failure to observe this warning can result in an electrical shock.
- Replace all protective covers before powering up the inverter. To remove the cover, make sure to shut OFF the molded–case circuit breaker.
  Failure to observe this warning can result in an electrical shock.
- Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turned OFF.
  The capacitors are still charged and can be dangerous.
- Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.
  [Remove all metal objects (watches, bracelets, etc.) before operation.]
  (Use tools which are insulated against electrical shock.)
  Failure to observe this warning can result in an electrical shock.

## ⚠ CAUTION

- The control PC board employs CMOS ICs. Do not touch the CMOS elements.
  They are easily damaged by static electricity.
- Do not connect or disconnect wires or connectors while power is applied to the circuit.
  Failure to observe this caution can result in personal injury.

### Others

## ⚠ WARNING

- Never modify the product.
  Failure to observe this warning can result in an electrical shock or personal injury and will invalidate the guarantee.

# CONTENTS

# 1 RECEIVING

> **⚠ CAUTION**
>
> · Do not install or operate any inverter which is damaged or has missing parts.
> Failure to observe this caution may result in personal injury or equipment damage.

This chapter describes how to verify the inverter after delivery to the user.

## 1.1 INSPECTION CHECKPOINTS

### (1) Receiving Checkpoints

Table 1 Checkpoints

| Checkpoints | Description |
|---|---|
| Does the inverter model number correspond with the purchase order? | Check the model number on the nameplate on the side of the ERIC-9001 |
| Are any parts damaged? | Visually check the exterior and verify that there was no damage during transport. |
| Is hardware properly seated and securely tightened? | Remove inverter front cover.<br>Check all visible hardware with appropriate tools. |
| Was an instruction manual received? | ERIC-9001 instruction manual. : TOE-S616-10.10) |

If any of the above checkpoints are not satisfactory, contact your RICH ELECTRIC representative.

### (2) Checking the Nameplate Data

#### (a) Nameplate Data

An example for Types of 3-phase,220V AC 1HP (0.75kw)

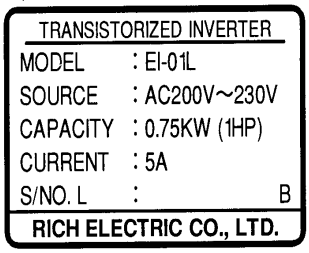



Fig. 1 Nameplate Data

## (b) Model Designation

| EI | −001 | −L |
|---|---|---|
| Eric Inverter | 001=1 Hp | L=220V |
| | 002=2Hp | H=440V |
| | ⋮ | |
| | 005=5Hp | |
| | ⋮ | |

# 2 INSTALLATION

| ⚠ CAUTION |
| --- |
| · Lift the cabinet by the base. When moving the unit, never lift by the front cover.<br>Otherwise, the main unit may be dropped causing damage to the unit.<br>· Mount the inverter on nonflammable material (i.e. metal).<br>Failure to observe this caution can result in a fire.<br>· When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 45°C.<br>Overheating may cause a fire or damage to the unit. |

This chapter describes the configuration, location and space when mounting the ERIC-9001.

## 2.1 CHOOSING A LOCATION TO MOUNT THE INVERTER

To ensure proper performance and long operating life, follow the recommendations below when choosing a location for installing the ERIC-9001.Make sure the inverter is protected from the following conditions:

☐ Extreme cold and heat.
Use only within ambient temperature range: -10°C to +40°C
☐ Rain, moisture. (For enclosed wall-mounted type)
☐ Oil sprays, splashes
☐ Salt spray.
☐ Direct sunlight. (Avoid using outdoors.)
☐ Corrosive gases or liquids.
☐ Dust or metallic particles in the air. (For enclosed wall-mounted type)
☐ Physical shock, vibration.
☐ Magnetic noise. (Example: welding machines, power devices, etc.)
☐ High humidity.
☐ Radioactive materials.
☐ Combustibles: thinners, solvents, etc.

## 2.2 CLEARANCES

Install the ERIC-9001 vertically and allow sufficient clearances for effective cooling as shown in Fig. 3.

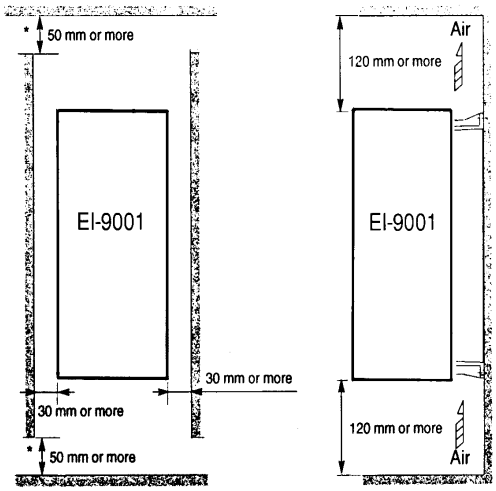



Fig.3 Clearances

NOTE

1.The clearances required at top/bottom and both sides are common in open chassis and enclosed wall-mounted.

2.Allowable intake air temperature to the inverter:

- Open chassis type : − 10℃ to + 45℃
- Enclosed wall-mounted type : − 10℃ to + 40℃

3.Ensure sufficient space for the sections at the upper and lower parts marked with * in order to permit the flow of intake/exhaust air to/from the inverter

# 3 WIRING

## ⚠ WARNING

- Only commence wiring after verifying that the power supply is turned OFF.
  Failure to observe this warning can result in an electrical shock or a fire.
- Wiring should be performed only by qualified personnel.
  Failure to observe this warning can result in an electrical shock or a fire.
- When wiring the emergency stop circuit, check the wiring thoroughly before operation.
  Failure to observe this warning can result in personal injury.

## ⚠ CAUTION

- Verify that the inverter rated voltage coincides with the AC power supply voltage.
  Failure to observe this caution can result in personal injury or a fire.
- Do not perform a withstand voltage test of the inverter.
  It may cause semi-conductor elements to be damaged.
- To connect a braking resistor, braking resistor unit or braking unit, follow the procedures described in APPENDIX 3.
  Improper connection may cause a fire.
- Tighten terminal screws to the specified tightening torque.
  Failure to observe this caution can result in a fire.

This chapter describes the main circuit wiring and the control circuit wiring of the ERIC-9001.

## 3.1 CONNECTION DIAGRAM

Below is a connection diagram of the main circuit and control circuit. Using the digital operator, the motor can be operated by wiring the main circuit only.

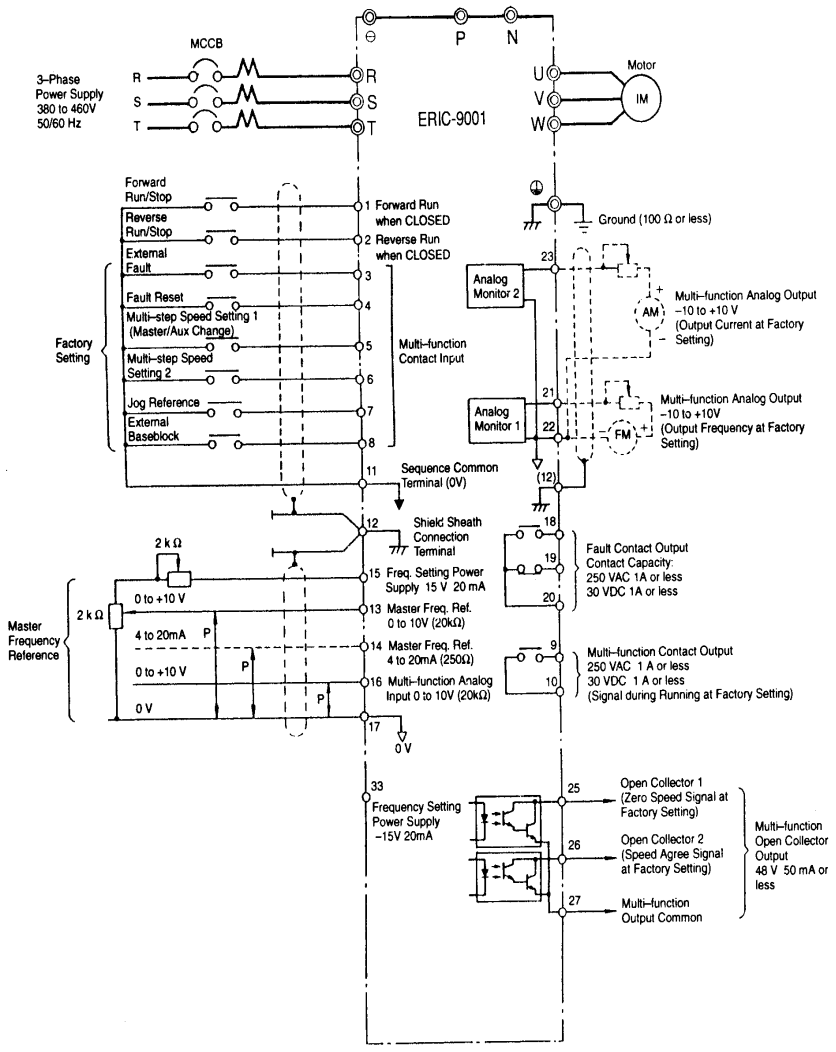
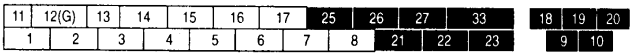



Fig. 4 Connection Diagram

NOTE

Layout of control circuit terminals




NOTE

1. ⏚ indicates shielded wires and ⏚ indicates twisted–pair shielded wires.
2. Either control circuit terminal 13 or 14 can be used. (For simultaneous inputs, the two signals are added internally.)
3. Control circuit terminal 15/33 of +15 V/–15 V has a maximum output current capacity of 20 mA.
4. Multi–function analog output should be used for monitoring meters (e.g. output frequency meter) and should not be used for feedback control system.

## 3 .2 WIRING THE MAIN CIRCUIT

**⚠ WARNING**

- Make sure to ground the ground terminal⏚ .
  (Ground resistance 220V class: 100Ω or less, 440Vclass: 10Ω or less)
  Failure to observe this warning can result in an electrical shock or a fire.

**⚠ CAUTION**

- Never connect the AC main circuit power supply to output terminals U, V and W.
  The inverter will be damaged and invalidate the guarantee.

### (1) Wiring Precautions for Main Circuit Input

#### (a) Installation of Molded–case Circuit Breaker (MCCB)

Make sure to connect MCCBs or fuses between AC main circuit power supply and ERIC-9001 input terminals L1, L2 and L3 to protect wiring.

#### (b) Installation of Ground Fault Interrupter

When connecting a ground fault interrupter to input terminals L1, L2 and L3, select one that is not affected by high frequency.

#### (c) Installation of Magnetic Contactor

Inverters can be used without a magnetic contactor (MC) installed at the power supply side. When the main circuit power supply is shut OFF in the sequence, a magnetic contactor (MC) can be used instead of a molded–case circuit breaker (MCCB). However, when a magnetic contactor is switched OFF at the primary side, regenerative braking does not function and the motor coasts to a stop.

- The load can be operated/stopped by opening/closing the magnetic contactor at the primary side. However, frequent switching may cause the inverter to malfunction.
- When using a braking resistor unit, use a sequencer to break power supply side on overload relay trip contact. If the inverter malfunctions, the braking resistor unit may be burned out.

(d) Terminal Block Connection Sequence

Input power supply phases can be connected to any terminal regardless of the order of L1, L2 and L3 on the terminal block.

(e) Installation of AC Reactor

When connecting an inverter (220V/440V15kW or less) to a large capacity power supply transformer (600kVA or more), or when switching a phase advancing capacitor, excessive peak current flows in the input power supply circuit, which may damage the converter section. In such cases, install a DC reactor (optional) between inverter ⊕1 and ⊕2 terminals or an AC reactor (optional) on the input side. Installation of a reactor is effective for improvement of power factor on the power supply side.

(f) Installation of Surge Suppressor

For inductive loads (magnetic contactors, magnetic relays, magnetic valves, solenoids, magnetic brakes, etc.) connected near the inverter, use a surge suppressor simultaneously.

(g) Prohibition of Installation of Phase Advancing Capacitor

If a phase advancing capacitor or surge suppressor is connected in order to improve the power factor, it may become overheated and damaged by inverter high harmonic components. Also, the inverter may malfunction because of overcurrent.

### (2) Wiring Precautions for Main Circuit Output

#### (a) Connection of Terminal Block and Load

Connect output terminals U, V and W to motor lead wires U, V and W. Verify that the motor rotates in the forward direction (CCW: counterclockwise when viewed from the motor load side) with the forward run command. If the motor rotation is incorrect, exchange any two of output terminals U, V or W.

#### (b) Strict Prohibition of Connection of Input Power Supply to Output Terminals

Never connect the input power supply to output terminals U, V and W.

#### (c) Strict Prohibition of Short Circuiting or Grounding of Output Circuit

Never touch the output circuit directly or put the output line in contact with the inverter case. Otherwise, it may cause an electrical shock or grounding. In addition, never short circuit the output line.

#### (d) Prohibition of Connection of Phase Advancing Capacitor or LC/RC Noise Filter

Never connect a phase advancing capacitor or LC/RC noise filter to the output circuit.

#### (e) Avoidance of Installation of Magnetic Starter

Do not connect a magnetic starter or magnetic contactor to the output circuit. If the load is connected while the inverter is running, the inverter overcurrent protective circuit operates because of inrush current.

#### (f) Installation of Thermal Overload Relay

An electronic overload protective function is incorporated into the inverter. However, connect a thermal overload relay when driving several motors with one inverter or when using a multi–pole motor. When using a thermal overload relay, set inverter constant L1–01 to 0. Additionally, for thermal overload relay, at 50Hz set the same rated current value as that described on the motor nameplate, or at 60Hz 1.1 times larger than the rated current value described on the motor nameplate.

### (g) Wiring Distance between Inverter and Motor

If the total wiring distance between inverter and motor is excessively long and the inverter carrier frequency (main transistor switching frequency) is high, harmonic leakage current from the cable will adversely to affect the inverter and peripheral devices.

If the wiring distance between inverter and motor is long, reduce the inverter carrier frequency as described below. Carrier frequency can be set by constant C6–01.

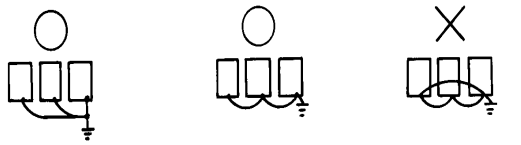
Table 2 Wiring Distance between Inverter and Motor

| Wiring Distance between Inverter and Motor | Up to 50m | Up to 100m | More than 100m |
|---|---|---|---|
| Carrier Frequency (Set value of constant C6–01) | 15kHz or less (15.0) | 10kHz or less (10.0) | 5kHz or less (5.0) |

## (3) Grounding

- Ground resistance
  220V class : 100Ω or less, 440V class : 10Ω or less.
- Never ground ERIC-9001 in common with welding machines, motors, or other large–current electrical equipment. Run all the ground wires in a conduit separate from wires for large–current electrical equipment.

- When using several ERIC-9001 units side by side, ground the units as shown in Fig. 5, (a) or (b). Do not loop the ground wires as shown in (c).



(a) Acceptable (b) Acceptable (c) Not Acceptable

Fig.5 Grounding of Three ERIC-9001 Units

## 3.3 WIRING THE CONTROL CIRCUIT

The following table outlines the functions of the control circuit terminals. Wire according to each terminal function.

### (1) Functions of Control Circuit Terminals

Table 3 Control Circuit Terminals

| Classification | Terminal | Signal Function | Description | | Signal Level |
|---|---|---|---|---|---|
| Sequence Input Signal | 1 | Forward run/stop | Forward run when closed, stop when open | | Photo-coupler insulation Input : +24 VDC 8 mA |
| | 2 | Reverse run/stop | Reverse run when closed, stop when open | | |
| | 3 | External fault input | Fault when closed, normal state when open | Multi-function contact inputs (H1-01 to H1-06) | |
| | 4 | Fault reset input | Reset when closed | | |
| | 5 | Master/Auxiliary change (Multi-step speed reference 1) | Auxiliary frequency reference when closed | | |
| | 6 | Multi-step speed reference 2 | Effective when closed | | |
| | 7 | Jog reference | Jog run when closed | | |
| | 8 | External baseblock | Inv. output stop when closed | | |
| | 11 | Sequence control input common terminal | — | | |
| Analog Input Signal | 15 | +15 V Power supply output | For analog command +15 V power supply | | +15 V (Allowable current 20 mA max.) |
| | 33 | -15 V Power supply output | For analog command -15 V power supply | | -15 V (Allowable current 20 mA max.) |
| | 13 | Master frequency reference | -10 to +10 V/-100% to +100% 0 to +10 V/100% | | -10 to +10 V (20 kΩ), 0 to +10 V/(20 kΩ) |
| | 14 | | 4 to 20 mA/100%. | | 4 to 20mA (250Ω) |
| | 16 | Multi-function analog input | -10 to +10V/-100% to +100% 0 to +10 V/100% | Auxiliary analog input (H3-05) | -10 to +10V (20kΩ), 0 to +10V/(20kΩ) |
| | 17 | Common terminal for control circuit | 0 V | | — |
| | 12 | Connection to shield sheath of signal lead | — | | — |
| Sequence Output Signal | 9 | During running (NO contact) | Closed when running | Multi-function contact output | Dry contact Contact capacity: 250 VAC 1 A or less 30 VDC 1 A or less |
| | 10 | | | | |
| | 25 | Zero speed detection | Makes at min. freq. (E1-09) or less | | Open collector output 48 V 50 mA or less |
| | 26 | Speed agree detection | Makes when the freq. reaches to ±1 Hz of set freq. | | |
| | 27 | Open collector output common | | | — |
| | 18 | Fault contact output (NO/NC contact) | Fault when closed between terminals 18 and 20 Fault when open between terminals 19 and 20 | | Dry contact Contact capacity: 250 VAC 1 A or less 30 VDC 1 A or less |
| | 19 | | | | |
| | 20 | | | | |
| Analog Output Signal | 21 | Frequency meter output | 0 to +10 V/100% freq. | Multi-function analog monitor 1 (H4-01,H4-02) | 0 to ±10 V Max. ±5% 2 mA or less |
| | 22 | Common | | | |
| | 23 | Current monitor | 5 V/inverter rated current | Multi-function analog monitor 2 (H4-04,H4-05) | |

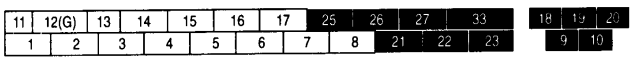



Fig.6 Control Circuit Terminal Arrangement

(2) Precautions on Control Circuit Wiring

- Separate control circuit wires 1 to 33 from main circuit wires L1, L2, L3, B1, B2, U, V, W, ⊖, ⊕1, ⊕2, ⊕3 and other power cables to prevent erroneous operation caused by noise interference.
- Separate control circuit wires 9, 10, 18, 19, 20 (contact output) from wires 1 to 8, 21, 22, 23, 25, 26, 27, 33 and 11 to 17.
- Use twisted shielded or twisted-pair shielded wire for the control circuit line and connect the shielded sheath to the inverter terminal 12. See Fig. 7. Wiring distance should be less than 50 m.

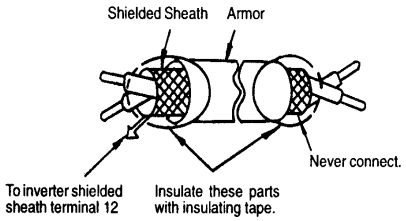



Fig.7 Shielded Wire Termination

## 3.4 WIRING INSPECTION

After completing of installation and wiring, check for the following items. Never use control circuit buzzer check.

☐ Wiring is proper.
☐ Wire clippings or screws are not left in the unit.
☐ Screws are securely tightened.
☐ Bare wire in the terminal does not contact other terminals.

# 4 OPERATION

## ⚠ WARNING

- Only turn ON the input power supply after replacing the front cover. Do not remove the cover while current is flowing.
  Failure to observe this warning can result in an electrical shock.
- When the retry function (L5–02) is selected, do not approach the inverter or the load, since it may restart suddenly after being stopped.
  (Construct machine system, so as to assure safety for personnel, even if the inverter should restart.) Failure to observe this warning can result in personal injury.
- Since the stop button can be disabled by a function setting, install a separate emergency stop switch.
  Failure to observe this warning can result in personal injury.
- If an alarm is reset with the operation signal ON, the inverter restarts automatically. Only reset the alarm after verifying that the operation signal is OFF.
  Failure to observe this warning can result in personal injury.

## ⚠ CAUTION

- Never touch the heatsink or discharging resistor since the temperature is very high.
  Failure to observe this caution can result in harmful burns to the body.
- Since it is easy to change operation speed from low to high speed, verify the safe working range of the motor and machine before operation.
  Failure to observe this caution can result in personal injury and machine damage.
- Install a holding brake separately if necessary.
  Failure to observe this caution can result in personal injury.
- Do not change signals during operation.
  The machine or the inverter may be damaged.
- All the constants of the inverter have been preset at the factory. Do not change the settings unnecessarily.
  The inverter may be damaged. For supply voltage, follow Par. 4.3.

This chapter describes the basic operation procedures of the ERIC-9001.

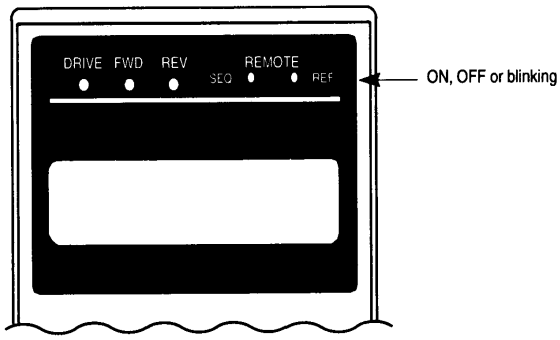
## 4.1 OPERATION MODE SELECTION

The ERIC-9001 has two operation modes, LOCAL and REMOTE, as described below. These two modes can be selected by the digital operator "LOCAL/REMOTE" key only while the operation is stopped. The selected operation mode can be verified by observing the digital operator SEQ and REF LEDs as shown below. The operation mode is set to REMOTE (run by control circuit terminals 13 and 14 frequency reference and run command from a control circuit terminal) prior to shipment. Multi-function contact inputs from control circuit terminals 3 to 8 are enabled in both operation modes LOCAL/REMOTE.

- LOCAL : Both frequency reference and run command are set by the digital operator. SEQ and REF LEDs go OFF.
- REMOTE : Master frequency reference and run command can be selected as described below.

Table 4 Reference Selection in REMOTE Mode

| Con-stant No. | Digital Operator Display | Name | Remarks |
|---|---|---|---|
| B1-01 | Reference Source | Reference selection | 0 : Master frequency reference from operator (D1-01) (Operator REF LED is OFF.)<br>1 : Master frequency reference from control circuit terminals 13 and 14 (Operator REF LED is ON.)<br>2 : Master frequency reference set by transmission (Operator REF LED blinks.)<br>3 : Master frequency reference set by option (Operator REF LED blinks.) |
| B1-02 | Run Source | Operation method selection | 0 : Master frequency reference from operator (D1-01) (Operator REF LED is OFF.)<br>1 : Master frequency reference from control circuit terminals 13 and 14 (Operator REF LED is ON.)<br>2 : Master frequency reference set by transmission (Operator REF LED blinks.)<br>3 : Master frequency reference set by option (Operator REF LED blinks.) |



## 4 .2 TEST RUN CHECKPOINTS

To assure safety, prior to initial operation, disconnect the machine coupling so that the motor is isolated from the machine. If initial operation must be performed while the motor is still coupled to the machine, use great care to avoid potentially hazardous conditions. Check the following items before a test run.

☐ Wiring and terminal connections are correct.
☐ No short circuit caused by wire clippings.
☐ Screw-type terminals are securely tightened.
☐ Motor is securely mounted.
☐ All items are correctly earthed (grounded) .

## 4.3 TEST RUN

### (1) Digital Operator Display at Power-up

When the system is ready for operation, turn ON the power supply. Verify that the inverter power up properly. If any problems are found, turn OFF the power supply immediately. The digital operator display illuminates as shown below when turning the power supply ON.

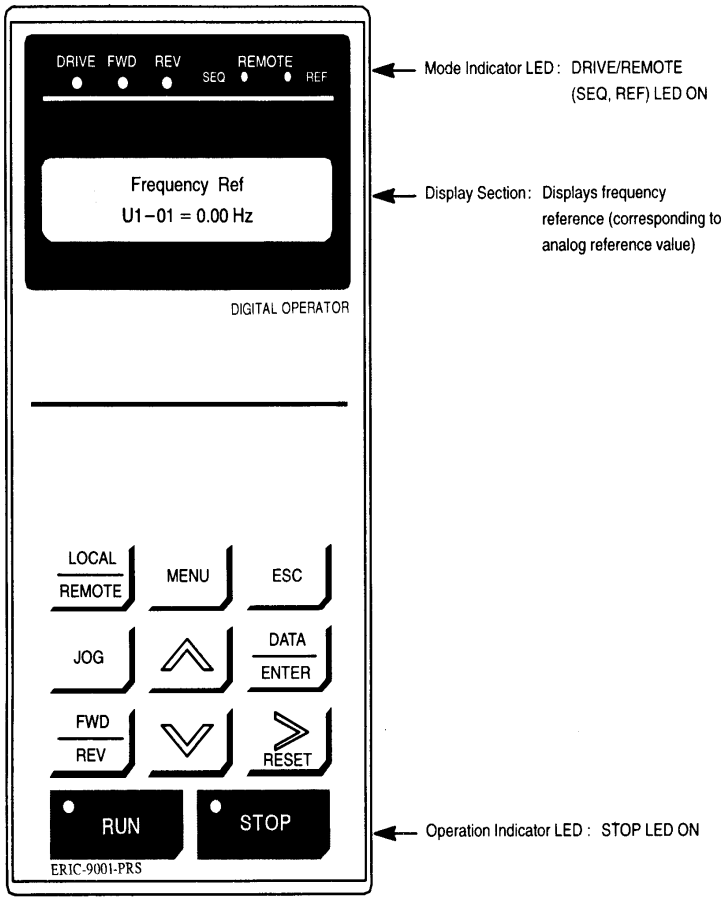



Fig. 8 Digital Operator Display at Power-up

## (2) Operation Check Points

Check the following items during operation.

- ☐ Motor rotates smoothly.
- ☐ Motor rotates in the correct direction.
- ☐ Motor does not have abnormal vibration or noise.
- ☐ Acceleration and deceleration are smooth.
- ☐ Current matches the load flow.
- ☐ Status indicator LEDs and digital operator display are correct.

## (3) Example of Basic Operation

### (a) Operation by Digital Operator

The diagram below shows a typical operation pattern using the digital operator.

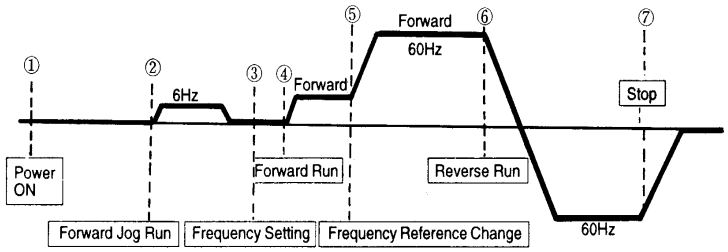



Fig. 9 Operation Sequence by Digital Operator

Table 5 Typical Operation by Digital Operator

| Description | Key Sequence | Digital Operator Display |
|---|---|---|
| ① Power ON<br>· Displays frequency reference value. | | Frequency Ref<br>U1-01 = 0.00 Hz |
| Operation Condition Setting<br>· Select LOCAL mode. | LOCAL/REMOTE | REMOTE LED OFF<br>(SEQ, REF) |
| ② Forward Jog Run<br>(6 Hz)<br>· JOG run procedure<br>(Runs while depressing JOG key.) | JOG | |
| ③ Frequency Setting<br>· Change reference value. | DATA/ENTER | Frequency Ref<br>0 00.00 Hz |
| | | Digit to be changed blinks. |
| | Change the value by depressing | Frequency Ref<br>01 5 .00 Hz |
| | DATA/ENTER | Entry Accepted |
| · Write-in set value. | | Frequency Ref<br>0 15.00 Hz |
| · Select output frequency monitor display. | ESC<br>^ | Output Freq<br>U1-02 = 0.00 Hz |
| ④ Forward Run<br>· Forward run (15 Hz) | RUN | Output Freq<br>U1-02 = 15.00 Hz |
| | | RUN LED lights. FWD LED lights.<br>RUN |

Table 5 Typical Operation by Digital Operator (Cont'd)

| Description | Key Sequence | Digital Operator Display |
|---|---|---|
| ⑤ Frequency Reference Value Change (15 Hz to 60 Hz)<br>· Select frequency reference value display. | ^ DATA ENTER<br>Depress twice. | Frequency Ref<br>0 15.00 Hz |
| · Change set value. | Change the value by depressing v ^ RESET | Frequency Ref<br>060.00 Hz |
| · Write-in set value. | DATA ENTER | Entry Accepted |
| | | Frequency Ref<br>060.00 Hz |
| · Select output frequency monitor display. | ESC<br>^ | Output Freq<br>U1-02 = 60.00 Hz |
| ⑥ Reverse Run<br>· Switch to reverse run. | FWD REV | Output Freq<br>U1-02 = -60.00 Hz<br>REV LED lights. |
| ⑦ Stop<br>· Decelerates to a stop. | STOP | Output Freq<br>U1-02 = 0.00 Hz<br>STOP LED lights.<br>(RUN LED blinks during deceleration.)<br>STOP |

(b) Operation by Control Circuit Terminal Signal

The diagram below shows a typical operation pattern using the control circuit terminal signals.

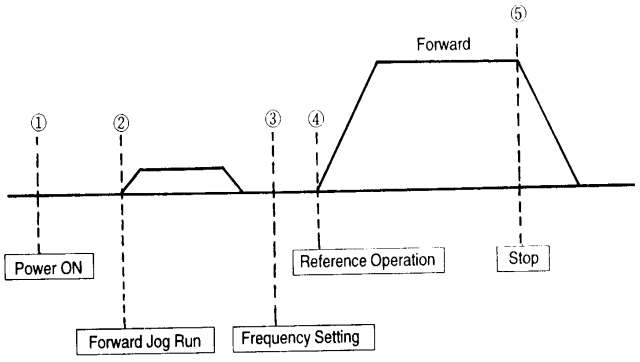


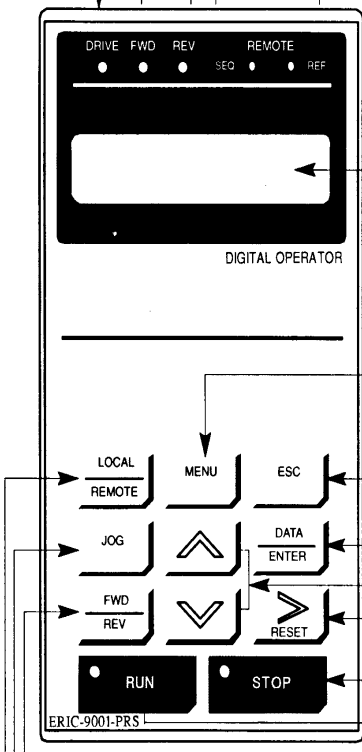

Fig.10 Operation Sequence by Control Circuit Terminal Signal

Table 6 Typical Operation by Control Circuit Terminal Signal

| Description | Key Sequence | Digital Operator Display |
|---|---|---|
| ① Power ON<br>· Displays frequency reference value.<br>REMOTE mode is preset at the factory. | | Frequency Ref<br>U1-01 = 0.00 Hz<br>REMOTE LED lights. (SEQ, REF) |
| Output Frequency Display<br>· Switch to output frequency display. |  | Output Freq<br>U1-02 = 0.00 Hz |
| ② Forward Jog Run<br>(6Hz)<br>· Close between control circuit terminals 1 and 11 with 7 and 11 closed to perform JOG run.<br>· Open between terminals 1 and 11, 7 and 11 after verifying normal operation. | | Output Freq<br>U1-02 = 6.00 Hz<br>RUN LED lights. FWD LED lights.<br>● RUN |
| ③ Frequency Setting<br>· Input frequency reference voltage (current) by control circuit terminal 13 or 14 and verify the input value by the digital operator. |  | Frequency Ref<br>U1-01 = 60.00 Hz<br>For reference voltage 10V |
| Output Frequency Display<br>· Select output frequency monitor display. |  | Output Freq<br>U1-02 = 0.00 Hz |
| ④ Forward Run<br>· Close between control circuit terminals 1 and 11 to perform forward run. | | Output Freq<br>U1-02 = 60.00 Hz<br>RUN LED lights. FWD LED lights.<br>● RUN |
| ⑤ Stop<br>· Open between control circuit terminals 1 and 11 to stop operation. | | Output Freq<br>U1-02 = 0.00 Hz<br>STOP LED lights.<br>(RUN LED blinks during deceleration.)<br>● STOP |

# 5 SETTING OPERATION CONDITIONS

## 5.1 DIGITAL OPERATOR KEY DESCRIPTION




**Mode Indicator LEDs**

Drive Mode Display
Lights when selecting drive mode. OFF when selecting any mode other than drive mode.

Rotating Direction Display
FWD : Lights at forward run.
REV : Lights at reverse run.

Remote Mode
Lights when selecting input mode from the control circuit terminal.
SEQ : Lights when selecting run command from control circuit terminal.
REF : Lights when selecting frequency reference from control circuit terminals 13 and 14.

Display
Displays set values of each function or monitoring values such as frequency and output current. (2 lines × 16 characters)

Menu Key
Displays the menu for mode selection.

Escape Key
Returns to the status entered before [DATA/ENTER] key was depressed.

Write/Read Key
Selects mode, group, function or constant name. Displays each constant set value while displaying a constant name. By depressing this key again, the set value is written in.

Menu/Number Change Keys
Selects mode, group, function, constant name or set value.
∧ : Increment key
∨ : Decrement key

Digit Selection Key
Selects a digit of a set value to be changed. The selected digit blinks. (Resets operation at faults.)

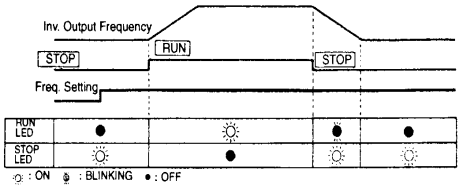
**Operation Command Keys**

Operation command keys operate the inverter. Enabled only in the drive mode.

* STOP : Red LED lights by depressing STOP.
* RUN : Red LED lights by depressing RUN.
FWD/REV : Selects forward or reverse run.
JOG : Jog run is enabled while depressing this key.

Operation Mode Selection Key
The operation mode is alternated between REMOTE and LOCAL (digital operator).

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




Note : Only a digit that is blinking can be changed.

Fig.11 Digital Operator Key Description

## 5 .2 DIGITAL OPERATOR MODE SELECTION

The digital operator of the ERIC-9001 has the following four modes.

Table 7 Digital Operator Modes

| Mode | Description |
|---|---|
| Opetation | Inverter operation is enabled. Displays monitor value, fault trace or faults that occurred previously. |
| Initialize | Sets and reads language displayed on the digital operator, level to set/read constants and control method. |
| Programming | Sets/reads constants. |
| Modified Constants | Sets/reads constants changed from the values preset at the factory. |

Depressing the [MENU] key displays "Operation". Change the mode display by using [^] or [v] key and select a mode by the [DATA/ENTER] key. The following shows typical operation.

Table 8 Typical Operation of Mode Selection

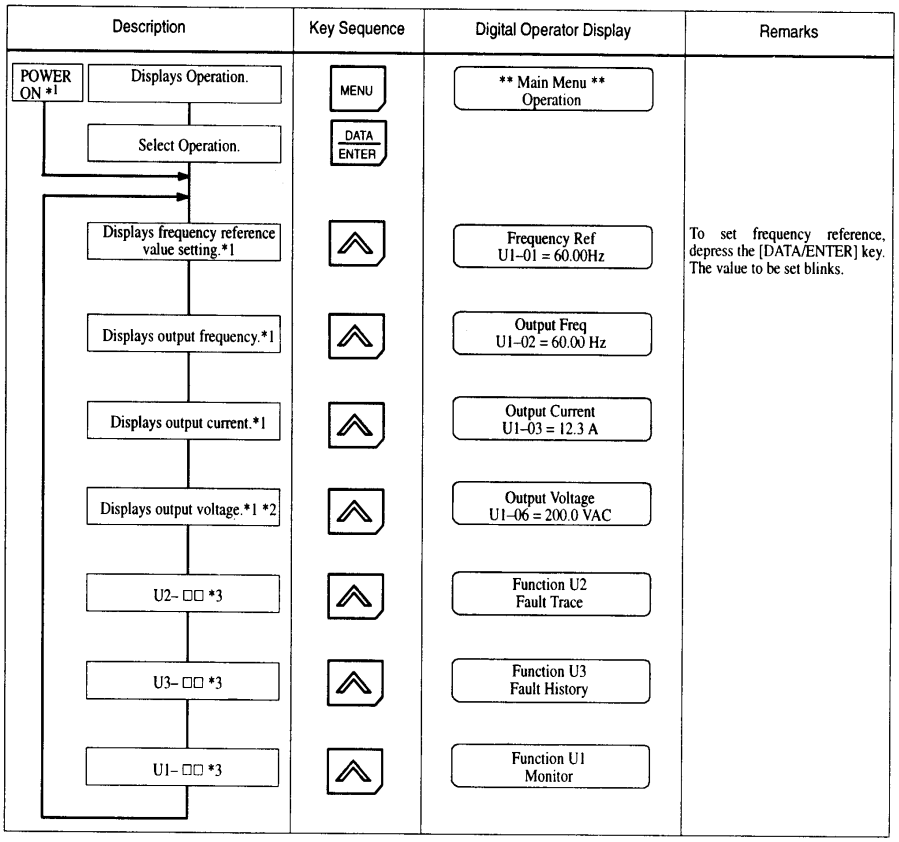
| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displays Operation. | MENU | ** Main Menu ** Operation | |
| · Change the mode. (Displays Initialize.) | ^ | ** Main Menu ** Initialize | |
| · Change the mode. (Displays Programming.) | ^ | ** Main Menu ** Programming | |
| · Change the mode. (Displays Auto-Tuning.) | ^ | ** Main Menu ** Auto-Tuning | |
| · Change the mode. (Displays Modified Consts.) | ^ | ** Main Menu ** Modified Consts | |
| · Select Modified Consts. | DATA ENTER | Accel Time 1 C1-01 = 20.0sec | Displays accel time and its setting when accel time has been changed. |
| · Return the display to Modified Consts. | ESC | ** Main Menu ** Modified Consts | |
| · Change the mode. (Displays Operation.) | ^ | ** Main Menu ** Operation | |

The mode can be changed even during operation. Even if the mode is changed to the programming mode to set/read constants during operation, the inverter continues operation. The inverter does not operate even if the run command is input, when the programming mode is selected and the inverter is stopped.

## 5.3 OPERATION MODE

The inverter can operate in this mode. Operation data or faults can be displayed. Each time when depressing [^] or [v] key, an item to be monitored is changed. If any fault occurs, the digital operator changes to the fault display automatically and returns to the previous display by the [> RESET] key.

Table 9 Typical Operation in Operation Mode




*1 : Data to be displayed after the power supply ON can be selected by setting any constant among frequency reference value, output frequency, output current or selected monitor. (Initial setting is set to the output voltage monitor. )

*2 : Another item to be displayed instead of output voltage can be selected by constant setting.

*3 : For items to be displayed such as U1-□□, U2-□□ and U3-□□, refer to Table A-4 "Monitor Constants List".

### (1) Changing Frequency Reference Value

( Example )

Frequency reference value is changed from 0.00Hz to 60.00Hz using the digital operator.

Table 10 Changing Frequency Reference Value

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| The inverter is in the LOCAL mode. (Can be operated from the keypad. ) | | | |
| · Displays Operation. | MENU | ** Main Menu ** Operation | |
| · Select Operation. (Displays frequency reference.) | DATA ENTER | Frequency Ref U1-01 = 0.00 Hz | |
| · Depress [DATA/ENTER] key. The value to be set blinks. | DATA ENTER | Frequency Ref 0 00.00 Hz | |
| · Change the value to 60.00Hz. | ▽ △ RESET | Frequency Ref 0 6 0.00 Hz | |
| · Write-in the constant. | DATA ENTER | Entry Accepted | |
| | | Frequency Ref 0 6 0.00 Hz | Returns to the frequency reference value display after Entry Accepted is displayed for 0.5 second. |
| | ESC | Frequency Ref U1-01 = 60.00Hz | |

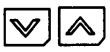
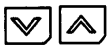
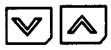
Note : Only the digit that is blinking can be changed.

### (2) Monitor Display

( Example )

Monitoring DC bus voltage (U1-07) during frequency reference display.

Table 11 Typical Monitor Display Operation

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1-01 = 60.00 Hz | |
| · Displays U1-□□ monitor. |  | Function U1<br>Monitor | |
| · Select U1-□□ |  | Frequency Ref<br>U1-01 = 60.00 Hz | |
| · Displays U1-07. |  | DC Bus Voltage<br>U1-07 = 303 VDC | |
| · Returns to U1-□□ display. |  | Function U1<br>Monitor | |
| · Returns to frequency reference display. |  | Frequency Ref<br>U1-01 = 60.00 Hz | |

### (3) Fault Display

When detecting a fault, the ERIC-9001 displays the fault contents on the digital operator and activates fault contact output, the motor coasts to a stop. For the display at fault occurrence or troubleshooting, refer to Table 22 "Fault Diagnosis and Corrective Actions". Since the ERIC-9001 stores the information obtained at fault occurrence in the inverter, the information can be verified. For details, refer to Table A–4 "Monitor Constants List".

( Example )

Verifying the status at fault occurrence and resetting the fault when overcurrent occurs during operation at 60.00Hz.

Table 12 Typical Operation of Fault Display

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1-01 = 60.00 Hz | |
| · Overcurrent occurs. | | OC<br>Over Current | Displays the fault. |
| · Verify the status at fault occurrence. |  | Frequency Ref<br>U2-03 = 60.00 Hz | Displays the status immediately before the fault occurred. |
| |  | Output Freq<br>U2-04 = 60.00 Hz | |
| |  | Output Current<br>U2-05 = 12.3 A | |
| · Reset the fault. |  | Frequency Ref<br>U1-01 = 60.00 Hz | By resetting the fault, the display entered just prior to the fault occurrence is returned. |

## 5.4 INITIALIZE MODE

As described below, the language displayed on the digital operator, the access level to set/read constants or control method (V/f control, vector control) can be selected. Make sure to set this mode before use of the ERIC-9001 . The following table shows the main constants for initialize mode.

Table 13 Initialize Mode

| Con-stant No. | Digital Operator Display | Name | Description |
|---|---|---|---|
| A1-00 | Select Language | Language selection (change enable during run) | 0 : English |
| A1-01 | Access Level | Access level (change enable during run) | 0 : Exclusive for monitoring<br>1 : Constants for user selection (Constants to be set/read can be programmed by operator.)<br>2 : QUICK-START (Constants required for test run are set/read.)<br>3 : BASIC (Normally-used constants are set/read.)<br>4 : ADVANCED (All constants are set/read.) |
| A1-02 | Control Method | Control method selection | 0 : V/f control<br>1 : V/f control with PG feedback<br>2 : Open loop vector<br>3 : Flux vector |
| A1-03 | Init Parameter | Reset to factory defaults. | 0 : No Initialization<br>1110 : Initialization of user setting<br>2220 : 2-wire initialization<br>3330 : 3-wire initialization |
| A1-04 | Enter Password | Password | Password setting |

## (1) Changing Control Method

( Example )

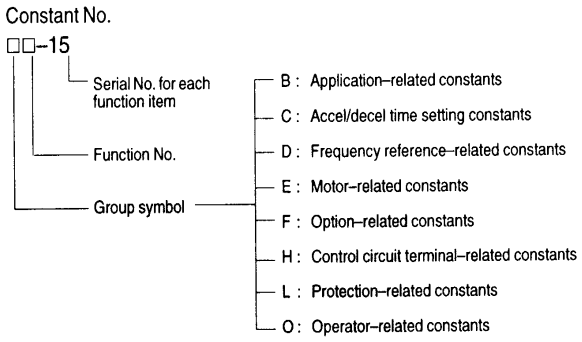
The control method is changed from open loop vector to V/f control.

Table 14 Changing Control Method

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1-01 = 60.00 Hz | |
| · Displays Operation. | MENU | ** Main Menu **<br>Operation | |
| · Displays Initialize. | ∨ ∧ | ** Main Menu **<br>Initialize | |
| · Select Initialize. | DATA ENTER | Select Language<br>English | When selecting Initialize, Select Language is displayed. |
| · Change the constant name.<br>(Displays Control Method.) | ∨ ∧ | Control Method<br>Open Loop Vector | |
| · By depressing DATA/ENTER key, constant No. and set value are displayed. | DATA ENTER | A1-02 = 02 ***<br>Open Loop Vector | |
| · Change the control method.<br>(Displays V/F Control.) | ∨ ∧ | A1-02 = 00<br>V/F Control | |
| · Select V/F Control. | DATA ENTER | Entry Accepted | After displaying Entry Accepted for 0.5 second, returns to the control method display. |
| · Return to Operation. | MENU | ** Main Menu **<br>Operation | |
| · Select Operation to display frequency reference. | DATA ENTER | Frequency Ref<br>U1-01 = 60.00 Hz | |

## 5.5 PROGRAMMING MODE

The constants of the ERIC-9001 are composed of group symbols, function Nos. and serial Nos. for each function item as shown below. Use [▲] or [▼] key to change the group, function or name display and select one by [DATA/ENTER] key. For details of the constants, refer to Table A-5 "Constants List".




According to access level (A1-01) setting, there are four ways to set and read constants as described below.

Table 15 Constant Access Level

| Access Level | Description |
|---|---|
| User Constant Selection | Displays the selected constant from the constant name. |
| QUICK-START Selection | Displays the constant selected by QUICK-START from the constant name. |
| BASIC Selection | Displays the constant selected by QUICK-START and BASIC from the function name. |
| ADVANCED Selection | Displays all constants from the group name. |

( Example 1 )

Select QUICK-START and change the decel time (C1-02) from 10.0 to 20.0 seconds while frequency reference is displayed.

Table 16 Changing Constant Data when QUICK-START is Selected

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1-01 = 60.00 Hz | |
| · Displays Operation. | MENU | ** Main Menu **<br>Operation | |
| · Displays Programming. | ∨ ∧ | ** Main Menu **<br>Programming | |
| · Select Programming. | DATA ENTER | Reference Source<br>Terminal | When selecting Programming, the constant name and setting are displayed. |
| · Change the constant name display.<br>(Displays Decel Time.) | ∨ ∧ | Decel Time 1<br>C1-02 = 10.0 sec | |
| · Depress DATA/ENTER key.<br>The value to be set blinks. | DATA ENTER | Decel Time 1<br>0 010.0 sec | |
| · Change the value to 20.0 seconds. | ∨ ∧ RESET | Decel Time 1<br>00 2 0.0 sec | |
| · Write-in the constant. | DATA ENTER | Entry Accepted | After displaying Entry Accepted for 0.5 second, returns to the decel time display. |
| · Return the display to Programming. | MENU | | |
| · Displays Operation. | ∨ ∧ | ** Main Menu **<br>Operation | |
| · Select Operation to display frequency reference. | DATA ENTER | Frequency Ref<br>U1-01 = 60.00 Hz | |

( Example 2 )

Select BASIC and change the decel time (C1–02) from 10.0 to 20.0 seconds while frequency reference is displayed.

Table 17 Changing Constant Data when BASIC is Selected

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1–01 = 60.00 Hz | |
| · Displays Operation. | MENU | ** Main Menu **<br>Operation | |
| · Displays Programming. | ∨ ∧ | ** Main Menu **<br>Programming | |
| · Select Programming. | DATA ENTER | Function b1<br>Sequence | When selecting Programmig, Function b1 is displayed. |
| · Change the function display.<br>(Displays Accel/Decel.) | ∨ ∧ | Function C1<br>Accel/Decel | Searches for C1. |
| · Select the function (accel/decel time). | DATA ENTER | Accel Time 1<br>C1–01 = 10.0 sec | |
| · Change the name display.<br>(Displays Decel Time.) | ∨ ∧ | Decel Time 1<br>C1–02 = 10.0 sec | Displays C1–02. |
| · Depress DATA/ENTER key.<br>The value to be set blinks. | DATA ENTER | Decel Time 1<br>0 010.0 sec | |
| · Change the value to 20.0 seconds. | ∨ ∧ > RESET | Decel Time 1<br>00 2 0.0 sec | |
| · Write-in the constant. | DATA ENTER | Entry Accepted | After displaying Entry Accepted for 0.5 second, returns to decel time display. |
| · Return to Operation. | MENU | ** Main Menu **<br>Operation | |
| · Select Operation to display frequency reference. | DATA ENTER | Frequency Ref<br>U1–01 = 60.00 Hz | |

( Example 3 )'

Select ADVANCED and change the decel time (C1–02) from 10.0 to 20.0 seconds while frequency reference is displayed.

Table 18 Changing Constant Data when ADVANCED is Selected

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1–01 = 60.00 Hz | |
| · Displays Operation. | MENU | ** Main Menu **<br>Operation | |
| · Displays Programming. | ∨ ∧ | ** Main Menu **<br>Programming | |
| · Select Programming. | DATA ENTER | Group b<br>Application | When selecting the programming mode, the group menu is displayed. |
| · Change the group name.<br>(Displays Tuning.) | ∨ ∧ | Group C<br>Tuning | |
| · Select the group.<br>(Selects Tuning group.) | DATA ENTER | Function C1<br>Accel/Decel | When selecting the group, the function menu is displayed. Select a function name using ∧ or ∨ key if necessary. |
| · Select the function.<br>(Selects accel/decel time.) | DATA ENTER | Accel Time 1<br>C1–01 = 10.0 sec | When selecting the function, the constant name is displayed. |
| · Change the constant name.<br>(Displays Decel Time.) | ∨ ∧ | Decel Time 1<br>C1–02 =10.0 sec | Displays C1–02. |
| · Depress DATA/ENTER key.<br>The value to be set blinks. | DATA ENTER | Decel Time 1<br>0 010.0 sec | |
| · Change the value to 20.0 seconds. | ∨ ∧ RESET | Decel Time 1<br>00 2 0.0 sec | |
| · Write-in the constant. | DATA ENTER | Entry Accepted | After displaying Entry Accepted for 0.5 second, returns to decel time display. |
| · Return to Operation.<br>(Displays Operation.) | MENU | ** Main Menu **<br>Operation | |
| · Select Operation to display frequency reference. | DATA ENTER | Frequency Ref<br>U1–01 = 60.00 Hz | |

## 5.6 MODIFIED CONSTANTS MODE

Compares the constant values preset at the factory with the values changed by the user, and displays the constants changed from the preset constants automatically. In the modified constants mode, constants can be read; in addition, they can also be set or changed.

( Example )

Read the constants C1-01 (accel time) and E1-01 (input voltage) when the factory settings have been changed. In addition, change the setting of E1-01 (input voltage) from 210V to 230V in this mode.

Table 19 Typical Operation in Modified Constants Mode

| Description | Key Sequence | Digital Operator Display | Remarks |
|---|---|---|---|
| · Displaying frequency reference. | | Frequency Ref<br>U1-01 = 60.00 Hz | |
| · Displays Operation. | MENU | ** Main Menu **<br>Operation | |
| · Displays Modified Consts. | ∨ ∧ | ** Main Menu **<br>Modified Consts | |
| · Select the Modified Consts. | DATA ENTER | Accel Time 1<br>C1-01 = 20.0 Sec | When selecting Modified Consts the constants which have been changed from factory settings are displayed. |
| · Displays the next-to-be-changed constant. (Displays input voltage.) | ∨ ∧ | Input Voltage<br>E1-01 = 210 VAC | |
| · Depress DATA/ENTER key. The value to be set blinks. | DATA ENTER | Input Voltage<br>2 10 VAC | |
| · Change the value to 230V. | ∨ ∧ RESET | Input Voltage<br>2 3 0 VAC | |
| · Write-in the constant. | DATA ENTER | Entry Accepted | After displaying Entry Accepted for 0.5 second, returns to input voltage display. |
| · Displays the next-to-be-changed constant. | ∨ ∧ | Accel Time 1<br>C1-01 = 20.0 sec | |
| · Returns to Operation. | MENU | ** Main Menu **<br>Operation | |
| · Select Operation to display frequency reference. | DATA ENTER | Frequency Ref<br>U1-01 = 60.00 Hz | |

# 6 MAINTENANCE AND INSPECTION

## ⚠ WARNING

- Never touch high-voltage terminals in the inverter.
  Failure to observe this warning can result in an electrical shock.
- Replace all protective covers before powering up the inverter. To remove the cover, make sure to shut OFF the molded-case circuit breaker.
  Failure to observe this warning can result in an electrical shock.
- Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turned OFF.
  The capacitors are still charged and can be dangerous.
- Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.
  [Remove all metal objects (watches, bracelets, etc.) before operation.]
  (Use tools which are insulated against electrical shock.)
  Failure to observe this warning can result in an electrical shock.

## ⚠ CAUTION

- The control PC board employs CMOS ICs. Do not touch the CMOS elements.
  They are easily damaged by static electricity.
- Do not connect or disconnect wires or connectors while power is applied to the circuit.
  Failure to observe this caution can result in personal injury.

This chapter describes basic maintenance and inspection procedures for the ERIC-9001.

## 6.1 PERIODIC INSPECTION

The ERIC-9001 will function longer if it is kept clean, cool and dry, while observing the precautions listed in Par. 2.3. Check for tightness of electrical connections, discoloration or other signs of overheating or aging. Use Table 20 as your inspection guide. Before servicing, turn OFF AC main circuit power and be sure that the CHARGE LED is OFF.

Table 20 Periodic Inspection

| Component | Check | Corrective Action |
|---|---|---|
| External Terminals, Unit Mounting Bolts, Connectors, etc. | Loose screws | Tighten. |
| | Loose connectors | Tighten. |
| Heatsink | Build-up of dust and dirt | Blow with dry compressed air of $39.2 \times 10^4$ to $58.8 \times 10^4$ Pa (4 to 6kg·cm$^2$) pressure. |
| Printed Circuit Board | Accumulation of conductive dust or oil. | Blow with dry compressed air of $39.2 \times 10^4$ to $58.8 \times 10^4$ Pa (4 to 6kg·cm$^2$) pressure. If dust and oil cannot be removed, replace the board. |
| Cooling Fan | For abnormal noise and vibration.<br>Whether the cumulative operation time exceeds 20,000 hours or not. | Replace the cooling fan. |
| Power Elements | Accumulation of dust and dirt | Blow with dry compressed air of $39.2 \times 10^4$ to $58.8 \times 10^4$ Pa (4 to 6kg·cm$^2$) pressure. |
| Smoothing Capacitor | Discoloration or odor | Replace the capacitor or inverter unit. |

## 6 .2 PARTS REPLACEMENT SCHEDULE (GUIDELINES)

Replace the following parts periodically, for a long, safe, trouble free working life of ERIC-9001.

Table 21 Parts Replacement Schedule

| Parts | Interval (Approx.) | Remarks |
|---|---|---|
| Cooling Fan | 2 to 3 years | Replace with new one. |
| Smoothing Capacitor | 5 years | Replace with new one. (Decided after inspection.) |
| Breakers or Relays | — | Decided after inspection. |
| Fuse | 10 years | Replace with new one. |
| Aluminum Electrolytic Capacitor on PC Board | 5 years | Replace with new one. (Decided after inspection.) |

NOTE

Operating conditions are as follows:

Ambient temperature : 30°C yearly average

Load factor : 80% or below

Operation rate : 12 hours or below /day

# 7 TROUBLESHOOTING

This chapter describes the inverter fault display and the fault contents caused by motor / machine malfunctions and the corrective actions to be taken.

## 7 .1 FAULT DIAGNOSIS AND CORRECTIVE ACTIONS

(1) When the ERIC-9001 detects a fault, the fault is displayed on the digital operator and activates the fault contact output and the motor coasts to a stop. Check the cause in the table below and take the corrective actions.

(2) If the inspections or corrective actions described cannot solve the problem, contact your RICH ELECTRIC representative immediately.

(3) To restart, turn ON the reset input signal or depress [>RESET] key or shut OFF the main circuit power supply once, to reset the stop status.

Table 22 Fault Diagnosis and Corrective Actions

| Fault Display | Description | Details | Corrective Action | Rank* (Standard Value) |
|---|---|---|---|---|
| UV1<br>DC Bus Undervolt | Main circuit undervoltage (PUV) | Undervoltage in the direct current main circuit during running.<br>Detection level<br>220 V class: Approx. 190 V or less<br>440 V class: Approx. 380 V or less | · Check the power supply wiring.<br>· Correct the line voltage. | A |
| UV2<br>CTL PS Undervolt | Control circuit undervoltage (CUV) | Undervoltage in the control circuit during running. | | A |
| UV3<br>MC Answerback | MC fault | The pre-charge contactor opened during running. | | A |
| UV<br>Under Voltage | Momentary power loss | · The main circuit direct current voltage fell below the PUV level.<br>· The control power source fell below the CUV level.<br>· The pre-charge contactor opened. | — | B |
| OC<br>Overcurrent | Overcurrent (OC) | The inverter output current exceeded the OC level. | · Check the motor coil resistance.<br>· Extend the accel/decel time.<br>· Check the motor insulation.<br>· Multi-meter check | A |
| GF<br>Ground Fault | Grounding (GF)<br>(Earth fault) | Inverter output grounding current exceeded 50% of inverter rated current. | · Check that motor insulation has not deteriorated.<br>· Check that connection between inverter and motor is not damaged. | A |
| OV<br>Overvoltage | Overvoltage (OV) | The main circuit direct current voltage exceeded the OV level.<br>Detection level<br>220 V class: Approx. 440 V<br>440 V class: Approx. 880 V | Extend the deceleration time, add braking circuit. | A |
| SC<br>Short Circuit | Load short-circuit (SC) | Inverter output (load) is short-circuited. | · Check the motor coil resistance.<br>· Check the motor insulation. | A |
| PUF<br>DC Bus Fuse Open | Fuse blown (FU) | · The direct current circuit fuse is blown.<br>· The output transistors were damaged. | Check for damaged transistor, load side short circuit, grounding, etc. | A |
| OH<br>Heatsink Over tmp | Heatsink overheat (OH1) | The transistor heatsink temperature exceeded the allowable value. | Check the fan and ambient temperature. | A |
| OL1<br>Motor Overloaded | Motor overload (OL1) | Inverter output exceeded the motor overload level. | Reduce the load. | A |
| OL2<br>Inv Overloaded | Inverter overload (OL2) | Inverter output exceeded the inverter overload level. | Reduce the load, extend the acceleration time. | A |
| PF<br>Input Pha Loss | Input open-phase | · Inverter input power supply has open-phase.<br>· Large unbalance in input voltage. | · Check the line voltage.<br>· Re-tighten the input terminal screws. | A |
| LF<br>Output Pha Loss | Output open-phase | Inverter output has open-phase. | · Check the output wiring.<br>· Check the motor impedance.<br>· Re-tighten the output terminal screws. | A |

Table 22 Fault Diagnosis and Corrective Actions (Cont'd)

| Fault Display | Description | Details | Corrective Action | Rank* (Standard Value) |
|---|---|---|---|---|
| R R<br>Dyn Brk Transistor | Braking transistor failure | The braking transistor has failed. | Replace the inverter. | A |
| R H<br>Dyn Brk Resistor | Braking resistor unit overheat | The braking resistor unit temperature has exceeded the allowable value.<br>(Protects only inverter built-in type) | Reduce the regenerative load. | A |
| O S<br>Over speed | Overspeed (OS) | The motor speed exceeded the overspeed level. | — | A |
| P G O<br>PG open | PG open circuit (PGO) | The PG line is broken. | · Check the PG line.<br>· Check the condition of the motor lock or the load. | A |
| D E V<br>Speed Deviation | Speed deviation (DEV) | The deviation of the speed reference and speed feedback exceeded the regulation level. | Check the load. | B |
| E F<br>External Fault | Operation reference fault (External) | Both FWD and REV run commands were closed for 500 ms or more. | Check sequence circuit. | B |
| E F 3<br>External Fault 3 | External fault at terminal 3 | Fault occurred in the external control circuit. | Check the condition of the input terminal.<br>If the LED lights when terminal is not connected, replace the inverter. | A |
| E F 4<br>External Fault 4 | External fault at terminal 4 | | | B |
| E F 5<br>External Fault 5 | External fault at terminal 5 | | | B |
| E F 6<br>External Fault 6 | External fault at terminal 6 | | | B |
| E F 7<br>External Fault 7 | External fault at terminal 7 | | | B |
| E F 8<br>External Fault 8 | External fault at terminal 8 | | | B |
| O P E 0 1<br>kVA Selection | kVA selection fault (OPE01) | kVA selection fault | Check and set the constant data. | C |
| O P E 0 2<br>Limit | Constant setting range fault (OPE02) | Constant data is out of range. | Check the constant data settings. | C |
| O P E 0 3<br>Terminal | Multi-function contact input selection fault (OPE03) | · In H1-01 to H1-06 settings:<br>· The same values are set except for F, FF and 20 to 2F.<br>· Both UP/DOWN and HOLD commands are set.<br>· UP and DOWN commands are not set at the same time.<br>· Two or more HOLD, UP/DOWN, sample/hold commands are set.<br>· Two or more external baseblock and speed search 1, 2, 3 commands are set.<br>· In B5-01 setting, both PID control and UP/DOWN commands are set.<br>· In H3-09 setting, terminal 13/14 selection and the value other than "Not used" are set at the same time. | Check the constants. | C |

Table 22 Fault Diagnosis and Corrective Actions (Cont'd)

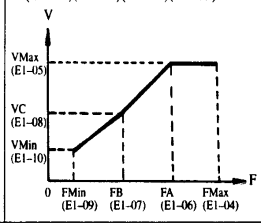
| Fault Display | Description | Details | Corrective Action | Rank* (Standard Value) |
|---|---|---|---|---|
| OPE05<br>Sequence Select | Option reference selection fault (OPE05) | · In B1-01 setting, C-option is not connected although frequency reference from C-option is selected.<br>· In B1-02 setting, C-option is not connected although run command from C-option is selected. | Check the constants. | C |
| OPE06<br>PG Opt Missing | Control method selection fault (OPE06) | In A1-02 setting,<br>· PG is not connected although V/f control with PG feedback is selected.<br>· PG-B is not connected although flux vector control is selected. | Check the constants. | C |
| OPE07<br>Analog Selection | Multi-function analog input selection fault (OPE07) | · In H3-05 and H3-09 settings, the same values are set except for 0 and 1F.<br>· While AI-14B is connected, "0" is set in F2-01 and option/inverter selection is set in multi-function contact input. | Check the constants. | C |
| OPE10<br>V/f | V/f data setting fault (E1-04 to E1-10) | When the settings of E1-04 to E1-10 do not satisfy the following conditions:<br>· FMax. ≧ FA > FB ≧ FMin.<br>(E1-04)(E1-06)(E1-07)(E1-09)<br>  <br> | Check the constants. | C |
| OPE11<br>FC/ On-Dly | Constant setting fault | When one of the following setting fault occurs:<br>· Carrier frequency upper limit (C6-01) > 5kHz, and Carrier frequency lower limit (C6-02) ≦ 5kHz<br>· Carrier frequency proportional gain (C6-03) > 6 and (C6-01) < (C6-02) | Check the constants. | C |
| ERR<br>EEPROM R/W Err | EEPROM writing fault (ERR) | EEPROM internal data did not match when initializing the constant. | Replace the control card. | B |
| CALL<br>Serial Com Call | SI-B transmission error | Control data was not received normally when power supply is turned ON. | Check transmission devices and transmission signals. | C |
| CE<br>Memobus Com Err | Transmission error | Control data was not received normally when power supply is turned ON. | Check transmission devices and transmission signals. | A |
| CPF00<br>COM-ERR(OP&INV) | Control circuit fault 1 (CPF00) (Digital operator transmission fault) | · Transmission between the inverter and digital operator cannot be established 5 seconds after supplying power.<br>· MPU peripheral element check fault (initial) | · Insert the digital operator connector again.<br>· Check the control circuit wiring.<br>· Replace the control card. | A |
| CPF01<br>COM-ERR(OP&INV) | Control circuit fault 2 (CPF01) (Digital operator transmission fault) | · Transmission between the inverter and digital operator is established once after supplying power, but later transmission fault continues for more than 2 seconds.<br>· MPU peripheral element check fault (online) | · Insert the digital operator connector again.<br>· Check the control circuit wiring.<br>· Replace the control card. | A |

Table 22 Fault Diagnosis and Corrective Actions (Cont'd)

| Fault Display | Description | Details | Corrective Action | Rank* (Standard Value) |
|---|---|---|---|---|
| C P F 0 2<br>BB Circuit Err | Baseblock circuit fault (CPF02) | Inverter control unit fault. | Replace the control card. | A |
| C P F 0 3<br>EEPROM Error | EEPROM fault (CPF03) | | | A |
| C P F 0 4<br>Internal A/D Err | CPU internal A/D converter fault (CPF04) | | | A |
| C P F 0 5<br>External A/D Err | CPU external A/D converter fault (CPF05) | | | A |
| C P F 0 6<br>Option Error | Option connection fault (CPF06) | The option card is not installed correctly. | Install the option card again. | A |
| C P F 2 0<br>Option A/D Error | A/D converter fault in analog speed reference card (CPF20) | Option card (AI-14B) A/D converter fault | Replace the option card. | A |

* The ranks are classified as follows:

Rank A: Major fault (Motor coasts to a stop, operator indication lights, and FAULT contact is output.)

Rank B: Fault [Operation continues, operator indication blinks, no FAULT contact is output, and minor fault contact is output (when multi-function output is selected).

Rank C: Warning (Operation cannot be performed, operator indication lights, no FAULT contact is output, no minor fault contact is output.)

## 7 .2 MOTOR FAULTS AND CORRECTIVE ACTIONS

(1) If any of the following faults occurs in the motor, check the cause and provide the relevant corrective action.

(2) If these inspections and corrective actions cannot solve the problem, contact your RICH ELECTRIC representative immediately.

Table 23 Motor Faults and Corrective Actions

| Fault | Check Point | Corrective Action |
|---|---|---|
| Motor does not rotate. | Power supply voltage applied to power supply terminals L1, L2, L3 ? CHARGE LED is ON ? | · Turn ON power supply.<br>· Turn OFF power supply, and then ON again.<br>· Check power supply voltage.<br>· Make sure terminal screws are tight. |
| | Use rectifier type voltmeter to test. Voltage output to output terminals U, V, W correct? | Turn OFF power supply, then turn ON again. |
| | Motor locks due to excessive load? | Reduce the load and release the lock. |
| | Fault displayed in operator display? | Check troubleshooting table. |
| | FWD or REV run command entered? | Check the wiring. |
| | Frequency setting voltage entered? | · Correct the wiring.<br>· Check frequency setting voltage. |
| | Operation mode setting correct? | With the operator, check the operation mode selection. |
| Motor rotation reverses. | Wiring of terminals U, V, W correct? | Match wiring to the phase order of the motor leads U, V, W . |
| | FWD and REV wiring run signals entered? | Correct the wiring. |
| Motor rotates, but variable speed not available. | Wiring of frequency setting circuit correct? | Correct the wiring. |
| | Operation mode setting correct? | With the operator, check the operation mode selection. |
| | Load excessively large? | Reduce the load. |
| Motor r/min too high or too low. | Motor ratings (number of poles, voltage) correct? | Check motor nameplate specifications. |
| | Accel/decel speed change ratio for gears, etc. correct? | Check speed changer (gears, etc.) |
| | Maximum frequency set value correct? | Check the maximum frequency set value. |
| | Use rectifier voltmeter. Voltage between motor terminals not excessively reduced? | Check V/f characteristics values. |
| Motor r/min not stable during operation. | Load excessively large? | Reduce the load. |
| | Load variation excessively large? | · Reduce the load variation.<br>· Increase inverter motor capacity. |
| | 3-phase or single-phase power supply uscd? For 3-phase power supply, open phase? | · For 3-phase power supply, check the wiring if power supply is open phase.<br>· For single-phase power supply, connect AC reactor to the power supply. |

# APPENDIX 1 SPECIFICATIONS

Table A-1 220V Class Specifications

| | Inverter Model EI-□ | 001-L | 002-L | 003-L | 005-L | 007-L | 010-L | 015-L | 020-L | 025-L | 030-L | 040-L | 050-L | 060-L | 075-L | 100-L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max. Applicable Motor output* kw | 1.1 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 |
| Output Characteristics | Inverter Capacity Hp | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 75 | 100 |
| | Rated Output Current A | 6 | 8 | 11 | 17.5 | 25 | 33 | 49 | 64 | 80 | 96 | 130 | 160 | 183 | 224 | 300 |
| | Max. Output Voltage | 3-Phase, 200/208/220/230 V (Proportional to input voltage | | | | | | | | | | | | | | |
| | Rated Output Frequency | Up to 400 Hz available by programming | | | | | | | | | | | | | | |
| Power Supply | Rated Input Voltage and Frequency | 3-Phase 200/208/220 V 50 Hz<br>200/208/220/230 V60 Hz | | | | | | | | | | | | | | |
| | Allowable Voltage Fluctuation | +10%, −15% | | | | | | | | | | | | | | |
| | Allowable Frequency Fluctuation | ±5% | | | | | | | | | | | | | | |
| Control Characteristics | Control Method | Sine wave PWM | | | | | | | | | | | | | | |
| | Starting Torque | 150%/1Hz (150% / or / min withe PG) | | | | | | | | | | | | | | |
| | Speed Control Range | 1:100(1:1000 with PG) | | | | | | | | | | | | | | |
| | Speed Control Accuracy | ±0.2% (±0.02% with PG) | | | | | | | | | | | | | | |
| | Speed Response | 5 Hz (30Hz with PG) | | | | | | | | | | | | | | |
| | Torque Limit | Available (Parameter setting, 4 steps can be changed) | | | | | | | | | | | | | | |
| | Torque Accuracy | ± 5% | | | | | | | | | | | | | | |
| | Torque Response | 20 Hz(40 Hz with PG) | | | | | | | | | | | | | | |
| | Frequency Control Range | 0.1 to 400 Hz | | | | | | | | | | | | | | |
| | Frequency Accuracy | Digital command: 0.01% (−10℃ to +40℃)<br>Analog command: 0.1% (25℃±10℃) | | | | | | | | | | | | | | |
| | Frequency Resolution | Digital operator reference: ±0.01 Hz<br>Analog reference: 0.05 Hz/60 Hz (11 bit+code) | | | | | | | | | | | | | | |
| | Output Frequency Resolution | 0.01 Hz | | | | | | | | | | | | | | |
| | Overload Capacity | 150% of rated output current for 1 minute | | | | | | | | | | | | | | |
| | Frequency Setting Signal | -10 to 10V, 0 to 10V, 4 to 20 mA | | | | | | | | | | | | | | |
| | Accel/Decel Time | 0.01 to 6000.0 sec (Accel/decel time setting independently, 4 steps available) | | | | | | | | | | | | | | |
| | Braking Torque | Approx. 20% | | | | | | | | | | | | | | |
| Protective Functions | Motor Overload Protection | Protected by electronic thermal overload relay | | | | | | | | | | | | | | |
| | Instantaneous Overcurrent | Motor coasts to a stop at approx. 200% of inverter rated current. | | | | | | | | | | | | | | |
| | Blown Fuse Protection | Motor coasts to a stop by blown-fuse. | | | | | | | | | | | | | | |
| | Overload | Motor coasts to a stop after 1 minute at 150% of rated output current. | | | | | | | | | | | | | | |
| | Overvoltage | Motor coasts to a stop if converter output voltage exceeds 410 V. | | | | | | | | | | | | | | |
| | Undervoltage | Motor coasts to a stop if converter output voltage drops to 190 V or below. | | | | | | | | | | | | | | |
| | Momentary Power Loss | Immediately stop by 15 ms and above momentary power loss. (Factory setting)<br>Continuous operation during power loss less than 2 sec is equipped as standard. | | | | | | | | | | | | | | |
| | Heatsink Overheat | Protected by thermistor | | | | | | | | | | | | | | |
| | Stall Prevention | Stall prevention during accel/decel and constant speed operation | | | | | | | | | | | | | | |
| | Ground Fault | Protected by electronic circuit (Overcurrent level) | | | | | | | | | | | | | | |
| | Power Charge Indication | Charge LED stays ON until bus voltage drops below 50 V. | | | | | | | | | | | | | | |
| Environment | Ambient Temperature | −10℃ to +40℃ (Enclosed wall-mounted type)<br>−10℃ to +45℃ (Open chassis type) | | | | | | | | | | | | | | |
| | Humidity | 90% RH or less | | | | | | | | | | | | | | |
| | Storage Temperature | −20℃ to +60℃ | | | | | | | | | | | | | | |
| | Location | Indoor (protected from corrosive gases and dust) | | | | | | | | | | | | | | |
| | Elevation | 1000 m or less | | | | | | | | | | | | | | |
| | Vibration | 9.81m/s²(1G) less than 20 Hz, up to 1.96m/s² (0.2G) at 20 to 50 Hz | | | | | | | | | | | | | | |

# APPENDIX 1 SPECIFICATIONS

Table A-2 440V Class Specifications

| | Inverter Model EI-□ | 001-H | 002-H | 003-H | 005-H | 007-H | 010-H | 015-H | 020-H | 025-H | 030-H | 040-H | 050-H | 060-H | 075-H | 100-H | 150-H | 200-H | 250-H | 300-H | 400-H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max. Applicable Motor output* kw | 1.1 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 110 | 160 | 185 | 220 | 300 |
| Output Characteristics | Inverter Capacity Hp | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 75 | 100 | 150 | 200 | 250 | 300 | 400 |
| | Rated Output Current A | 3.4 | 4.8 | 6.2 | 5 | 14 | 18 | 27 | 34 | 41 | 48 | 65 | 80 | 96 | 128 | 165 | 224 | 302 | 340 | 450 | 605 |
| | Max. Output Voltage | 3-Phase 380/400/415/440/460 V (Proportional to input voltage) | | | | | | | | | | | | | | | | | | | |
| | Rated Output Frequency | Up to 400 Hz available by programming | | | | | | | | | | | | | | | | | | | |
| Power Supply | Rated Input Voltage and Frequency | 3-Phase 380/400/440/460 V 50/60 Hz | | | | | | | | | | | | | | | | | | | |
| | Allowable Voltage Fluctuation | +10%, −15% | | | | | | | | | | | | | | | | | | | |
| | Allowable Frequency Fluctuation | ±5% | | | | | | | | | | | | | | | | | | | |
| Control Characteristics | Control Method | Sine wave PWM | | | | | | | | | | | | | | | | | | | |
| | Starting Torque | 150%/1Hz (150% / or / min withe PG) | | | | | | | | | | | | | | | | | | | |
| | Speed Control Range | 1:100(1:1000 with PG) | | | | | | | | | | | | | | | | | | | |
| | Speed Control Accuracy | ±0.2% (±0.02% with PG) | | | | | | | | | | | | | | | | | | | |
| | Speed Response | 5 Hz (30Hz with PG) | | | | | | | | | | | | | | | | | | | |
| | Torque Limit | Available (Parameter setting, 4 steps can be changed) | | | | | | | | | | | | | | | | | | | |
| | Torque Accuracy | ± 5% | | | | | | | | | | | | | | | | | | | |
| | Torque Response | 20 Hz(40 Hz with PG) | | | | | | | | | | | | | | | | | | | |
| | Frequency Control Range | 0.1 to 400 Hz | | | | | | | | | | | | | | | | | | | |
| | Frequency Accuracy | Digital command: ±0.01% (−10℃ to +40℃) | | | | | | | | | | | | | | | | | | | |
| | | Analog command: ±0.1% (25℃±10℃) | | | | | | | | | | | | | | | | | | | |
| | Frequency Resolution | Digital operator reference: ±0.01 Hz | | | | | | | | | | | | | | | | | | | |
| | | Analog reference: ±0.03 Hz/60 Hz (11 bit+code) | | | | | | | | | | | | | | | | | | | |
| | Output Frequency Resolution | 0.01 Hz | | | | | | | | | | | | | | | | | | | |
| | Overload Capacity | 150% of rated output current for 1 minute | | | | | | | | | | | | | | | | | | | |
| | Frequency Setting Signal | -10 to 10V, 0 to 10V, 4 to 20 mA | | | | | | | | | | | | | | | | | | | |
| | Accel/Decel Time | 0.01 to 6000.0 sec (Accel/decel time setting independently, 4 steps available) | | | | | | | | | | | | | | | | | | | |
| | Braking Torque | Approx. 20% | | | | | | | | | | | | | | | | | | | |
| Protective Functions | Motor Overload Protection | Protected by electronic thermal overload relay | | | | | | | | | | | | | | | | | | | |
| | Instantaneous Overcurrent | Motor coasts to a stop at approx. 200% of inverter rated current. | | | | | | | | | | | | | | | | | | | |
| | Blown Fuse Protection | Motor coasts to a stop by blown-fuse. | | | | | | | | | | | | | | | | | | | |
| | Overload | Motor coasts to a stop after 1 minute at 150% of rated output current. | | | | | | | | | | | | | | | | | | | |
| | Overvoltage | Motor coasts to a stop if converter output voltage exceeds 820 V. | | | | | | | | | | | | | | | | | | | |
| | Undervoltage | Motor coasts to a stop if converter output voltage drops to 380 V or below. | | | | | | | | | | | | | | | | | | | |
| | Momentary Power Loss | Immediately stop by 15 ms and above momentary power loss. (Factory setting)<br>Continuous operation during power loss less than 2 sec is equipped as standard. | | | | | | | | | | | | | | | | | | | |
| | Heatsink Overheat | Protected by thermistor | | | | | | | | | | | | | | | | | | | |
| | Stall Prevention | Stall prevention during accel/decel and constant speed operation | | | | | | | | | | | | | | | | | | | |
| | Ground Fault | Protected by electronic circuit (Overcurrent level) | | | | | | | | | | | | | | | | | | | |
| | Power Charge Indication | Charge LED stays ON until bus voltage drops below 50 V. | | | | | | | | | | | | | | | | | | | |
| Environment | Ambient Temperature | −10℃ to +40℃ (Enclosed wall-mounted type)<br>−10℃ to +45℃ (Open chassis type) | | | | | | | | | | | | | | | | | | | |
| | Humidity | 90% RH or less | | | | | | | | | | | | | | | | | | | |
| | Storage Temperature | −20℃ to +60℃ | | | | | | | | | | | | | | | | | | | |
| | Location | Indoor (protected from corrosive gases and dust) | | | | | | | | | | | | | | | | | | | |
| | Elevation | 1000 m or less | | | | | | | | | | | | | | | | | | | |
| | Vibration | 9.81m/s$^2$(1G) less than 20 Hz, up to 1.96m/s$^2$ (0.2G) at 20 to 50 Hz | | | | | | | | | | | | | | | | | | | |

# APPENDIX 2 DIMENSIONS

Fig.1

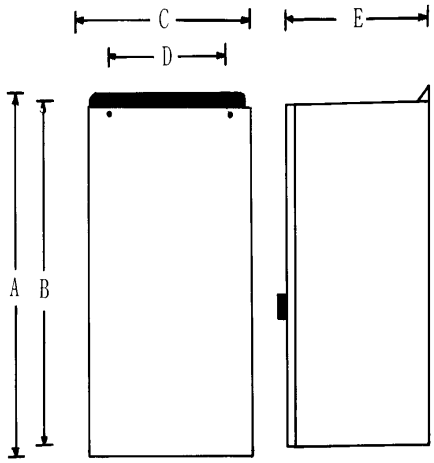
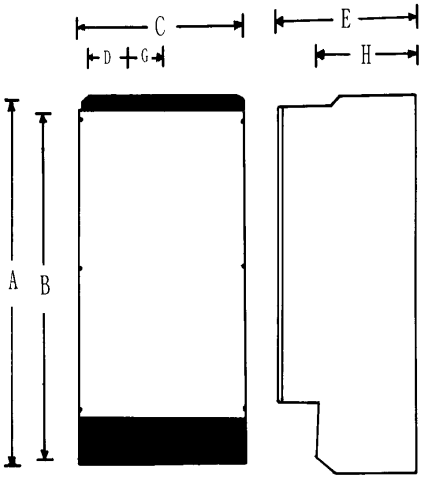



Fig.2



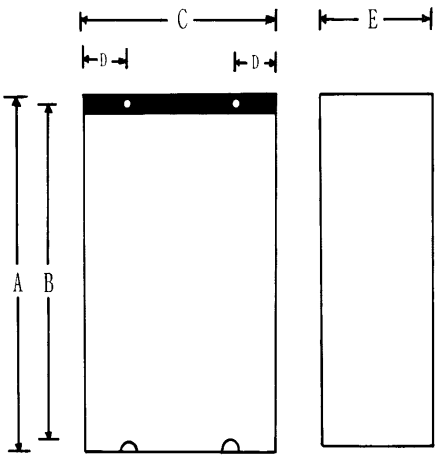




Fig.3

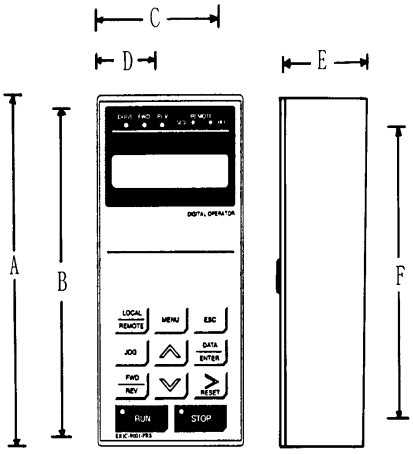
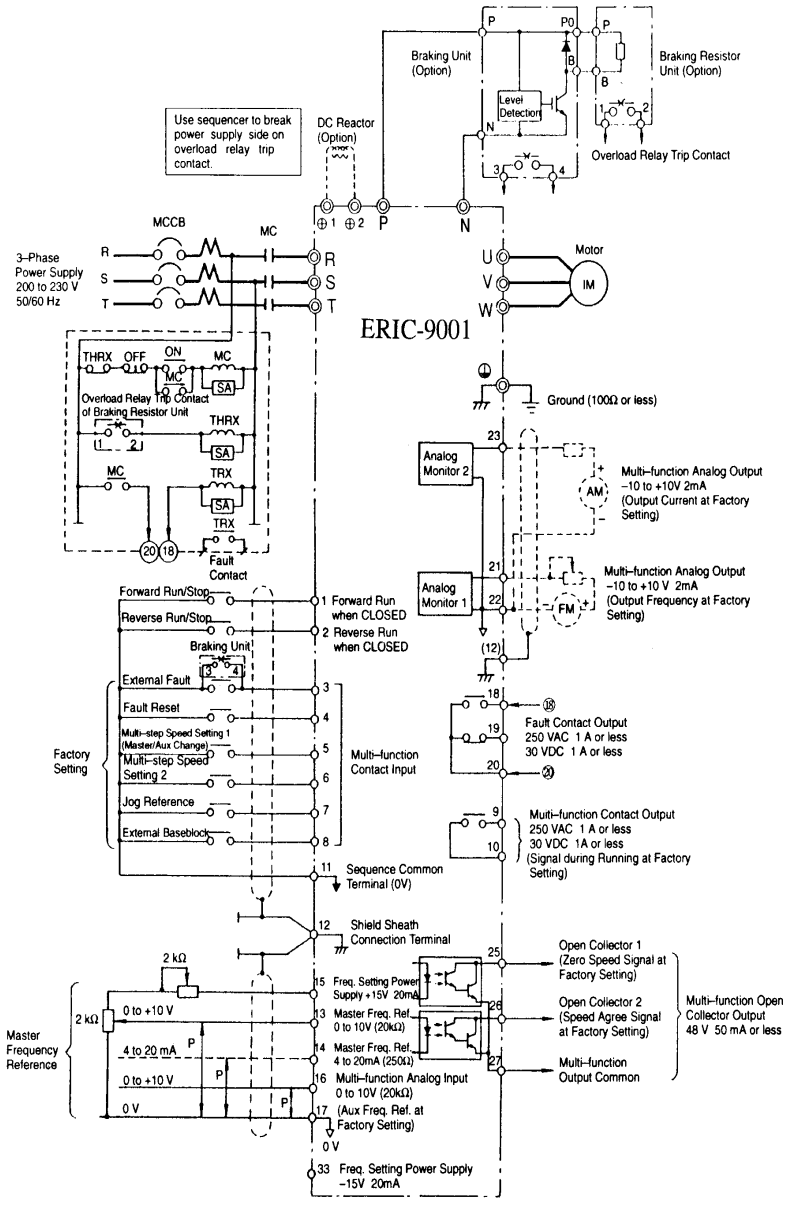



Fig.4

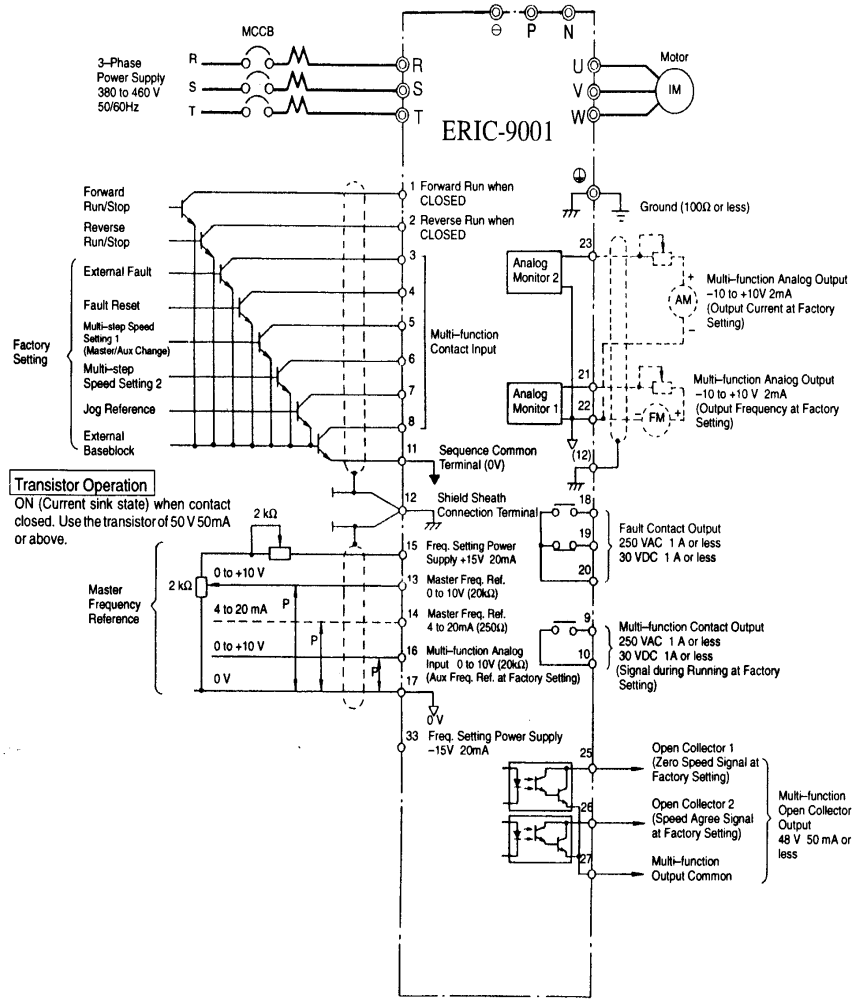
| TYPE FORM | | | DIMENSION mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volt | 220V | 380V | A | B | C | D | E | F | G | H |
| Fig.1 | 1−5 | 1−5 | 360 | 342 | 220 | 202 | 165 | 185 | | |
| | 7 1/2 − 10 | 7 1/2 − 15 | 445 | 430 | 275 | 202 | 210 | 230 | | |
| | 15−25 | 20−30 | 555 | 540 | 275 | 200 | 230 | | | |
| | 30−40 | 40−60 | 695 | 677.5 | 320 | 240 | 380 | | | |
| Fig.2 | 50−60 | 75−125 | 800 | 780 | 395 | 105 | 350 | 320 | 96 | 215 |
| Fig.3 | 75−100 | 150−200 | 1080 | 1020 | 600 | 20 | 400 | | | |
| Fig.4 | REMOTE BOX | | 140 | 130 | 60 | 30 | 40 | 100 | RANEL CUT 56×120 | |

# APPENDIX 3 TYPICAL CONNECTION DIAGRAM

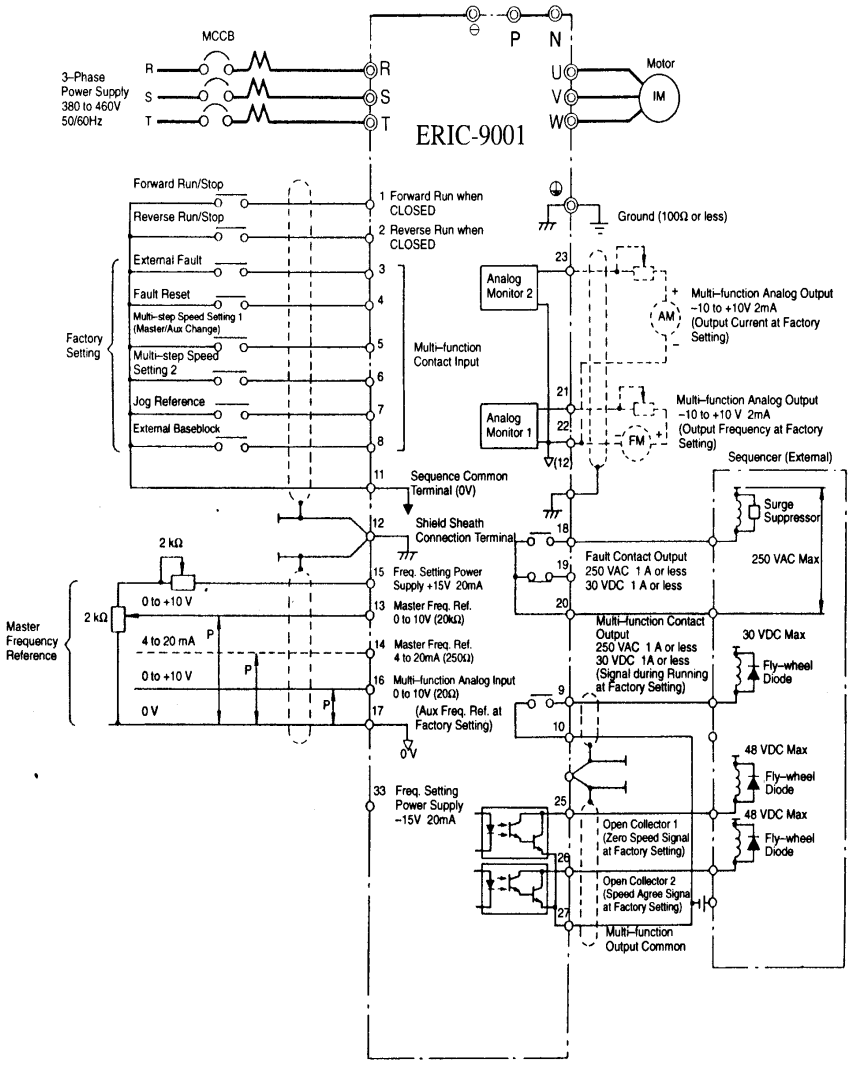
## 3.1 BRAKING UNIT AND BRAKING RESISTOR UNIT



## 3.2 WITH TRANSISTOR OPEN COLLECTOR FOR OPERATION SIGNAL



## 3.3 WITH CONTACT OUTPUT, OPEN COLLECTOR OUTPUT



# APPENDIX 4 CONSTANTS LIST

Table A–4 Monitor Constants List

| Digital Operator Function Display | Digital Operator Display | Constant No. | Constant Name | Unit | Control Method (○=Monitor enable, ×=Monitor disable) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | V/f control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| Monitor | Frequency Ref | U1-01 | Frequency reference | 0.01Hz | ○ | ○ | ○ | ○ |
| | Output Freq | U1-02 | Output frequency | 0.01Hz | ○ | ○ | ○ | ○ |
| | Output Current | U1-03 | Output current | 0.1A | ○ | ○ | ○ | ○ |
| | Control Method | U1-04 | Control method | — | ○ | ○ | ○ | ○ |
| | Motor Speed | U1-05 | Motor speed | 0.01Hz | × | ○ | ○ | ○ |
| | Output Voltage | U1-06 | Output voltage | 0.1V | ○ | ○ | ○ | ○ |
| | DC Bus Voltage | U1-07 | DC bus voltage | 1V | ○ | ○ | ○ | ○ |
| | Output kWatts | U1-08 | Output power | 0.1kW | ○ | ○ | ○ | ○ |
| | Torque Reference | U1-09 | Torque reference (internal) | 0.1% | × | × | ○ | ○ |
| | Input Term Sts | U1-10 | Input terminal status | — | ○ | ○ | ○ | ○ |
| | Output Term Sts | U1-11 | Output terminal status | — | ○ | ○ | ○ | ○ |
| | Int Ctl Sts 1 | U1-12 | Internal control status | — | ○ | ○ | ○ | ○ |
| | Elapsed Time | U1-13 | Cumulative operation time | 1H | ○ | ○ | ○ | ○ |
| | CPU ID No | U1-14 | PROM No. (at FLASH side) | — | ○ | ○ | ○ | ○ |
| Fault Trace | Current Fault | U2-01 | Current fault | — | ○ | ○ | ○ | ○ |
| | Last Fault | U2-02 | Last fault | — | ○ | ○ | ○ | ○ |
| | Frequency Ref | U2-03 | Frequency reference at fault | 0.01Hz | ○ | ○ | ○ | ○ |
| | Output Freq | U2-04 | Output frequency at fault | 0.01Hz | ○ | ○ | ○ | ○ |
| | Output Current | U2-05 | Output current at fault | 0.1% | ○ | ○ | ○ | ○ |
| | Motor Speed | U2-06 | Motor speed at fault | 0.01Hz | × | ○ | ○ | ○ |
| | Output Voltage | U2-07 | Output voltage reference at fault | 0.1V | ○ | ○ | ○ | ○ |
| | DC Bus Voltage | U2-08 | DC bus voltage at fault | 1V | ○ | ○ | ○ | ○ |
| | Output kWatts | U2-09 | Output power at fault | 0.1kW | ○ | ○ | ○ | ○ |
| | Torque Reference | U2-10 | Torque reference at fault | 0.1% | × | × | ○ | ○ |
| | Input Term Sts | U2-11 | Input terminal status at fault | — | ○ | ○ | ○ | ○ |
| | Output Term Sts | U2-12 | Output terminal status at fault | — | ○ | ○ | ○ | ○ |
| | Inverter Status | U2-13 | Operation status at fault | — | ○ | ○ | ○ | ○ |
| | Elapsed Time | U2-14 | Cumulative operation time at fault | 1H | ○ | ○ | ○ | ○ |

Table A–4 Monitor Constants List (Cont'd)

| Digital Operator Function Display | Digital Operator Display | Con-stant No. | Constant Name | Unit | Control Method (○=Monitor enable, ×=Monitor disable) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | V/f control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| Fault History | Last Fault | U3–01 | Most recent fault | — | ○ | ○ | ○ | ○ |
| | Fault Message 2 | U3–05 | Cumulative operation time at fault | 1H | ○ | ○ | ○ | ○ |
| | Fault Message 3 | U3–02 | Second most recent fault | — | ○ | ○ | ○ | ○ |
| | Fault Message 4 | U3–06 | Accumulated time of second fault | 1H | ○ | ○ | ○ | ○ |
| | Elapsed Time 1 | U3–03 | Third most recent fault | — | ○ | ○ | ○ | ○ |
| | Elapsed Time 2 | U3–07 | Accumulated time of third fault | 1H | ○ | ○ | ○ | ○ |
| | Elapsed Time 3 | U3–04 | Fourth / Oldest fault | — | ○ | ○ | ○ | ○ |
| | Elapsed Time 4 | U3–08 | Accumulated time of fourth / oldest fault | 1H | ○ | ○ | ○ | ○ |

Note : If another fault occurs (i.e. fifth fault), then the oldest fault (U3–04) is lost. The fifth fault now becomes the most recent fault (U3–01) and all the other faults move down one step.

Table A–5 Constants List

| Digital Operator Function Display | Digital Operator Display | Constant No. | Constant Name | Setting Range | Factory Setting | Change during Operation (○=Enable, ×=Disable) | Data Selection | Control Method (○=Setting enable ×=Setting disable) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | V/f Control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| Sequence | Reference Source | B1–01 | Reference selection | 0 to 3 | 1 | × | 0 : Operator<br>1 : Terminal<br>2 : Serial Com<br>3 : Option PCB | ○ | ○ | ○ | ○ |
| | Run Source | B1–02 | Operation method selection | 0 to 3 | 1 | × | 0 : Operator<br>1 : Terminal<br>2 : Serial Com<br>3 : Option PCB | ○ | ○ | ○ | ○ |
| | Stopping Method | B1–03 | Stopping method | 0 to 3 | 0 | × | 0 : Ramp to Stop<br>1 : Coast to Stop<br>2 : DCInj to Stop<br>3 : Coast w/ Timer | ○ | ○ | ○ | ○ |
| | Reverse Oper | B1–04 | Prohibition of reverse operation | 0 to 1 | 0 | × | 0 : Reverse Enabled<br>1 : Reverse Disabled | ○ | ○ | ○ | ○ |
| Accel/Decel | Accel Time 1 | C1–01 | Acceleration time 1 | 0 to 6000.0sec | 10.0sec | ○ | | ○ | ○ | ○ | ○ |
| | Decel Time 1 | C1–02 | Deceleration time 1 | 0 to 6000.0sec | 10.0sec | ○ | | ○ | ○ | ○ | ○ |
| | Accel Time 2 | C1–03 | Acceleration time 2 | 0 to 6000.0sec | 10.0sec | ○ | | ○ | ○ | ○ | ○ |
| | Decel Time 2 | C1–04 | Deceleration time 2 | 0 to 6000.0sec | 10.0sec | ○ | | ○ | ○ | ○ | ○ |
| Preset Reference | Reference 1 | D1–01 | Preset reference 1 | 0 to 400.00Hz | 0.0Hz | ○ | | ○ | ○ | ○ | ○ |
| | Reference 2 | D1–02 | Preset reference 2 | 0 to 400.00Hz | 0.0Hz | ○ | | ○ | ○ | ○ | ○ |
| | Reference 3 | D1–03 | Preset reference 3 | 0 to 400.00Hz | 0.0Hz | ○ | | ○ | ○ | ○ | ○ |
| | Reference 4 | D1–04 | Preset reference 4 | 0 to 400.00Hz | 0.0Hz | ○ | | ○ | ○ | ○ | ○ |
| | Jog Reference | D1–09 | Jog reference | 0 to 400.00Hz | 6.0Hz | ○ | | ○ | ○ | ○ | ○ |

Table A–5 Constants List (Cont'd)

| Digital Operator Function Display | Digital Operator Display | Con-stant No. | Constant Name | Setting Range | Factory Setting | Change during Operation (○=Enable, ×=Disable) | Data Selection | Control Method (○=Setting enable ×=Setting disable) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | V/f Control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| V/F Pattern | Input Voltage | E1–01 | Input voltage | 180 to 230V* | 220V* | × | | ○ | ○ | ○ | ○ |
| | Motor Selection | E1–02 | Motor selection | 0 to 2 | 0 | × | 0 : Std Fan Cooled<br>1 : Std BlowerCooled<br>2 : Inv BlowrCooled | ○ | ○ | ○ | ○ |
| | V/F Selection | E1–03 | V/f pattern selection | 0 to 0F | 0F | × | 0 : 50HZ<br>1 : 60HZ Saturation<br>2 : 50HZ Saturation<br>3 : 72HZ<br>4 : 50HZ VT1<br>5 : 50HZ VT2<br>6 : 60HZ VT1<br>7 : 60HZ VT2<br>8 : 50HZ HST1<br>9 : 50HZ HST2<br>A : 60HZ HST2<br>B : 60HZ HST2<br>C : 90HZ<br>D : 120HZ<br>E : 180HZ<br>F : User Defined V/F | ○ | ○ | × 0F fixed | × 0F fixed |
| | Max Frequency | E1–04 | Max. frequency | 50.0 to 400.0Hz | 60.0Hz | × | | ○ | ○ | ○ | ○ |
| | Max Voltage | E1–05 | Max. voltage | 0.0 to 255.0V* | 200.0V* | × | | ○ | ○ | ○ | ○ |
| | Base Frequency | E1–06 | Base frequency | 0.0 to 400.0Hz | 60.0Hz | × | | ○ | ○ | ○ | ○ |
| | Mid Frequency A | E1–07 | Mid. output frequency | 0.0 to 400.0Hz | 3.0Hz | × | | ○ | ○ | × | × |
| | Mid Voltage A | E1–08 | Mid. output voltage | 0.0 to 255.0V* | 10.0V* | × | | ○ | ○ | × | × |
| | Min Frequency | E1–09 | Min. output frequency | 0.0 to 400.0Hz | 0.5Hz | × | | ○ | ○ | ○ | × |
| | Min Voltage | E1–10 | Min. output voltage | 0.0 to 255.0V* | 1.7V* | × | | ○ | ○ | × | × |
| Motor Setup | Motor Rated FLA | E2–01 | Motor rated current | 0.00 to 1500A | † | × | | ○ | ○ | ○ | ○ |
| | Motor Rated Slip | E2–02 | Motor rated slip | 0.00 to 20.00Hz | † | × | | ○ | × | ○ | ○ |
| | No–Load Current | E2–03 | Motor no–load current | 0.00 to 1500A | | × | | ○ | × | ○ | ○ |
| | Number of Poles | E2–04 | Number of motor poles | 2 to 48 | 4 | × | | × | ○ | × | ○ |

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

† Depends on model type.

Table A–5 Constants List (Cont'd)

| Digital Operator Function Display | Digital Operator Display | Constant No. | Constant Name | Setting Range | Factory Setting | Change during Operation (○=Enable, ×=Disable) | Data Selection | Control Method (○=Setting enable ×=Setting disable) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | V/f Contro! | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| PG Option Setup | PG Pulse/Rev | F1–01 | PG constant | 0 to 60000 | 600 | × | | × | ○ | × | ○ |
| | PG Fdbk Loss Sel | F1–02 | Operation selection at PG open circuit | 0 to 3 | 1 | × | 0 : Ramp to Stop<br>1 : Coast to Stop<br>2 : Fast–Stop<br>3 : Alarm Only | × | ○ | × | ○ |
| | PG Overspeed Sel | F1–03 | Operation selection at overspeed | 0 to 3 | 1 | × | 0 : Ramp to Stop<br>1 : Coast to Stop<br>2 : Fast–Stop<br>3 : Alarm Only | × | ○ | × | ○ |
| | PG Deviation Sel | F1–04 | Operation selection at deviation | 0 to 3 | 1 | × | 0 : Ramp to Stop<br>1 : Coast to Stop<br>2 : Fast–Stop<br>3 : Alarm Only | × | ○ | × | ○ |
| | PG Rotation Sel | F1–05 | PG rotation | 0/1 | 0 | × | 0 : Fwd=C.C.W.<br>1 : Fwd=C.W. | × | ○ | × | ○ |
| | PG Output Ration | F1–06 | PG division rate | 1 to 132 | 1 | × | | × | ○ | × | ○ |
| | PG Ramp PI/I Sel | F1–07 | Integral value during accel/decel enable/disable | 0/1 | 0 | × | 0 : Disabled<br>1 : Enabled | × | ○ | × | × |
| AI–14 Setup | AI–14 Input Sel | F2–01 | Bi–polar or uni–polar input selection | 0/1 | 0 | × | 0 : 3ch Individual<br>1 : 3ch Addition | ○ | ○ | ○ | ○ |
| DI–08,16 Setup | DI Input | F3–01 | Digital input option | 0 to 8 | 0 | × | 0 : BCD 1%<br>1 : BCD 0.1%<br>2 : BCD 0.01%<br>3 : BCD 1HZ<br>4 : BCD 0.1HZ<br>5 : BCD 0.01HZ<br>6 : BCD(5DG) 0.01HZ<br>7 : Bn 0.01HZ<br>8 : Binary | ○ | ○ | ○ | ○ |
| AO–08,12 Setup | AO Ch1 Select | F4–01 | CH1 monitor selection* | 1 to 31 | 2 | × | See Table A–4. | ○ | ○ | ○ | ○ |
| | AO Ch1 Gain | F4–02 | CH1 gain | 0 to 2.50 | 1.00 | ○ | | ○ | ○ | ○ | ○ |
| | AO Ch2 Select | F4–03 | CH2 monitor selection* | 1 to 31 | 3 | × | See Table A–4. | ○ | ○ | ○ | ○ |
| | AO Ch2 Gain | F4–04 | CH2 gain | 0 to 2.50 | 1.00 | ○ | | ○ | ○ | ○ | ○ |
| DO–02 Setup | DO–02 Ch1 Select | F5–01 | CH1 output selection | 0 to FF | 0 | × | See Table A–6. | ○ | ○ | ○ | ○ |
| | DO–02 Ch2 Select | F5–02 | CH2 output selection | 0 to FF | 1 | × | See Table A–6. | ○ | ○ | ○ | ○ |
| DO–08 Setup | DO–08 Selection | F6–01 | Output mode selection | 0 to 2 | 0 | × | 0 : 8ch Individual<br>1 : Binary Output | ○ | ○ | ○ | ○ |
| PO–36F Setup | PO–36F Selection | F7–01 | Frequency multiple selection | 0 to 4 | 0 | × | 0 : 1×Output Freq<br>1 : 6×Output Freq<br>2 : 10×Output Freq<br>3 : 12×Output Freq<br>4 : 36×Output Freq | ○ | ○ | ○ | ○ |

* CH1, CH2 = Channel 1, Channel 2

Table A–5 Constants List (Cont'd)

| Digital Operator Function Display | Digital Operator Display | Constant No. | Constant Name | Setting Range | Factory Setting | Change during Operation (○=Enable, ×=Disable) | Data Selection | Control Method (○=Setting enable ×=Setting disable) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | V/f Control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| Digital Inputs | Terminal 3 Sel | H1–01 | Multi–function input (terminal 3) | 00 to FF | 24 | × | (External fault) | ○ | ○ | ○ | ○ |
| | Terminal 4 Sel | H1–02 | Multi–function input (terminal 4) | 00 to FF | 14 | × | (Fault reset) | ○ | ○ | ○ | ○ |
| | Terminal 5 Sel | H1–03 | Multi–function input (terminal 5) | 00 to FF | 3 | × | (Multi–step speed ref. 1) | ○ | ○ | ○ | ○ |
| | Terminal 6 Sel | H1–04 | Multi–function input (terminal 6) | 00 to FF | 4 | × | (Multi–step speed ref. 2) | ○ | ○ | ○ | ○ |
| | Terminal 7 Sel | H1–05 | Multi–function input (terminal 7) | 00 to FF | 6 | × | (Jog reference) | ○ | ○ | ○ | ○ |
| | Terminal 8 Sel | H1–06 | Multi–function input (terminal 8) | 00 to FF | 8 | × | (External baseblock) | ○ | ○ | ○ | ○ |
| Digital Outputs | Terminal 9 Sel | H2–01 | Multi–function output (terminal 9–10) | 00 to FF | 0 | × | (During running) | ○ | ○ | ○ | ○ |
| | Terminal 25 Sel | H2–02 | Multi–function output (terminal 25) | 00 to FF | 1 | × | (Zero speed) | ○ | ○ | ○ | ○ |
| | Terminal 26 Sel | H2–03 | Multi–function output (terminal 26) | 00 to FF | 2 | × | (Frequency agree) | ○ | ○ | ○ | ○ |
| Analog Inputs | Term 13 Signal | H3–01 | Signal level selection (terminal 13) | 0/1 | 0 | × | 0 : 0–10VDC<br>1 : –10+10VDC | ○ | ○ | ○ | ○ |
| | Terminal 13 Gain | H3–02 | Gain (terminal 13) | 0.0 to 1000.0% | 100.0% | ○ | | ○ | ○ | ○ | ○ |
| | Terminal 13 Bias | H3–03 | Bias (terminal 13) | –100.0 to 100.0% | 0.0% | ○ | | ○ | ○ | ○ | ○ |
| | Term 16 Signal | H3–04 | Signal level selection (terminal 16) | 0/1 | 0 | × | 0 : 0–10VDC<br>1 : –10+10VDC | ○ | ○ | ○ | ○ |
| | Terminal 16 Sel | H3–05 | Multi–function analog input selection (terminal 16) | 0 to 1F | 0 | × | See Table A–7. | ○ | ○ | ○ | ○ |
| | Terminal 16 Gain | H3–06 | Gain (terminal 16) | 0.0 to 1000.0% | 100.0% | ○ | | ○ | ○ | ○ | ○ |
| | Terminal 16 Bias | H3–07 | Bias (terminal 16) | –100.0 to 100.0% | 0.0% | ○ | | ○ | ○ | ○ | ○ |
| Analog Outputs | Terminal 21 Sel | H4–01 | Monitor selection (terminal 21) | 1 to 31 | 2 | × | See Table A–6. | ○ | ○ | ○ | ○ |
| | Terminal 21 Gain | H4–02 | Gain (terminal 21) | 0 to 2.50 | 1.00 | ○ | | ○ | ○ | ○ | ○ |
| | Terminal 21 Bias | H4–03 | Bias (terminal 21) | –10 to +10.0% | 0.0% | ○ | | ○ | ○ | ○ | ○ |
| | Terminal 23 Sel | H4–04 | Monitor selection (terminal 23) | 1 to 31 | 3 | × | See Table A–6. | ○ | ○ | ○ | ○ |
| | Terminal 23 Gain | H4–05 | Gain (terminal 23) | 0 to 2.50 | 1.00 | ○ | | ○ | ○ | ○ | ○ |
| | Terminal 23 Bias | H4–06 | Bias (terminal 23) | –10 to +10.0% | 0.0% | ○ | | ○ | ○ | ○ | ○ |
| Motor–Slip Comp | Slip Comp Gain | C3–01 | Slip compensation gain | –2.5 to +2.5 | 0.0 | ○ | | ○ | × | ○ | × |
| Torque Comp | Torq Comp Gain | C4–01 | Torque compensation gain | 0 to 2.50 | 1.00 | ○ | | ○ | × | ○ | × |
| ASR Tuning* | ASR P Gain 1 | C5–01 | ASR proportional gain 1 | 0 to 300.00 | 0.00 | ○ | | × | ○ | × | ○ |
| | ASR I Time 1 | C5–02 | ASR integral time 1 | 0 to 10.000sec | 0.00sec | ○ | | × | ○ | × | ○ |
| | ASR P Gain 2 | C5–03 | ASR proportional gain 2 | 0 to 300.00 | 0.00 | ○ | | × | ○ | × | ○ |
| | ASR I Time 2 | C5–04 | ASR integral time 2 | 0 to 10.000sec | 0.00sec | ○ | | × | ○ | × | ○ |

*ASR = Automatic Speed Regulaton

Table A–5 Constants List (Cont'd)

| Digital Operator Function Display | Digital Operator Display | Constant No. | Constant Name | Setting Range | Factory Setting | Change during Operation (○=Enable, ×=Disable) | Data Selection | Control Method (○=Setting enable ×=Setting disable) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | V/f Control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| Carrier Freq | CarrierFreq Max | C6–01 | Carrier frequency upper limit | 0.4 to 15.0kHz | 15.0kHz | × | | ○ | ○ | ○ | ○ |
| DC Braking* | DCInj Start Freq | B2–01 | Zero speed level (DC braking freq.) | 0.0 to 20.0Hz | 0.5 | × | | ○ | ○ | ○ | ○ |
| | DCInj Current | B2–02 | DC braking current | 0 to 100% | 50% | × | | ○ | ○ | ○ | (○) |
| | DCInj Time@Start | B2–03 | DC braking time at start | 0.00 to 10.00sec | 0.00sec | × | | ○ | ○ | ○ | (○) |
| | DCInj Time@Stop | B2–04 | DC braking time at stop | 0.00 to 10.00sec | 0.50sec | × | | ○ | ○ | ○ | (○) |
| Reference Limit | Ref Upper Limit | D2–01 | Reference upper limit | 0.0 to 100.0% | 100.0% | × | | ○ | ○ | ○ | ○ |
| | Ref Lower Limit | D2–02 | Reference lower limit | 0.0 to 100.0% | 0.0% | × | | ○ | ○ | ○ | ○ |
| Jump frequencies | Jump Freq 1 | D3–01 | Setting jump frequency 1 | 0.0 to 400.0Hz | 0.0Hz | × | | ○ | ○ | ○ | (○) |
| | Jump Freq 2 | D3–02 | Setting jump frequency 2 | 0.0 to 400.0Hz | 0.0Hz | × | | ○ | ○ | ○ | (○) |
| | Jump Freq 3 | D3–03 | Setting jump frequency 3 | 0.0 to 400.0Hz | 0.0Hz | × | | ○ | ○ | ○ | (○) |
| | Jump Bandwidth | D3–04 | Setting jump frequency range | 0.0 to 20.0Hz | 1.0Hz | × | | ○ | ○ | ○ | (○) |
| Motor Overload | MOL Fault Select † | L1–01 | Motor protection selection | 0/1 | 1 | × | 0 : Disabled<br>1 : Coast to Stop | ○ | ○ | ○ | ○ |
| | MOL Time Const | L1–02 | Motor protection time constant | 1.0 to 20.0min | 8.0 | × | | ○ | ○ | ○ | ○ |
| PwrLoss Ridethru | PwrL Selection | L2–01 | Momentary power loss detection | 0 to 2 | 0 | × | 0 : Disabled<br>1 : PwrL RideThru<br>2 : CPU Power Active | ○ | ○ | ○ | ○ |
| | PwrL Ridethru t | L2–02 | Momentary power loss time | 0.0 to 2.0sec | × | × | | ○ | ○ | ○ | ○ |
| | PwrL Baseblock t | L2–03 | Min. baseblock time | 0.0 to 5.0sec | × | × | | ○ | ○ | ○ | ○ |
| Stall Prevention | StallP Accel Sel | L3–01 | Stall prevention selection during accel | 0 to 2 | 1 | × | 0 : Disabled<br>1 : General Purpose<br>2 : Intelligent | ○ | ○ | × | × |
| | StallP Accel Lvl | L3–02 | Stall prevention level during accel | 0 to 200% | 170% | × | | ○ | ○ | × | × |
| | StallP Decel Sel | L3–04 | Stall prevention selection during decel | 0 to 2 | 1 | × | 0 : Disabled<br>1 : General Purpose<br>2 : Intelligent | ○ | ○ | ○ | ○ |
| | StallP Run Sel | L3–05 | Stall prevention selection during running | 0 to 2 | 1 | × | 0 : Disabled<br>1 : Decel Time 1<br>2 : Decel Time 2 | ○ | ○ | × | × |
| | StallP Accel Lvl | L3–06 | Stall prevention level during running | 0 to 200% | 160.0% | × | | ○ | ○ | × | × |
| Ref Detection | Spd Agree Level | L4–01 | Speed agree detection level | 0.0 to 400.0Hz | 0.0Hz | × | | ○ | ○ | ○ | ○ |
| | Spd Agree Width | L4–02 | Speed agree detection width | 0.0 to 20.0Hz | 2.0Hz | × | | ○ | ○ | ○ | ○ |

* DC = Direct Current

† MOL = Motor Overload

Table A–5 Constants List (Cont'd)

| Digital Operator Function Display | Digital Operator Display | Constant No. | Constant Name | Setting Range | Factory Setting | Change during Operation (○=Enable, ×=Disable) | Data Selection | Control Method (○=Setting enable ×=Setting disable) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | V/f Control | V/f with PG Feed-back | Open Loop Vector | Flux Vector |
| Fault Restart | Num of Restarts | L5–01 | No. of auto restart attempts | 0 to 10 | 0 | × | | ○ | ○ | ○ | ○ |
| | Restart Sel | L5–02 | Auto restart operation selection | 0/1 | 0 | × | 0 : No Flt Relay<br>1 : Flt Relay Active | ○ | ○ | ○ | ○ |
| Torque Detection | Torq Det 1 Sel | L6–01 | Torque detection selection | 0 to 4 | 0 | × | 0 : Disabled<br>1 : @SpdAgree–Alm<br>2 : At RUN–Alarm<br>3 : @SpdAgree–Flt<br>4 : At RUN–Fault | ○ | ○ | ○ | ○ |
| | Torq Det 1 Lvl | L6–02 | Torque detection level | 0 to 300% | 160% | × | | ○ | ○ | ○ | ○ |
| | Torq Det 1 Time | L6–03 | Torque detection time | 0.0 to 10.0sec | 0.1sec | × | | ○ | ○ | ○ | ○ |
| Torque Limit | Torq Limit Fwd | L7–01 | Forward torque limit | 0 to 300% | 200% | × | | × | × | ○ | ○ |
| | Torq Limit Rev | L7–02 | Reverse torque limit | 0 to 300% | 200% | × | | × | × | ○ | ○ |
| | Torq Limit Fwd Rgn | L7–03 | Forward regenerative torque limit | 0 to 300% | 10% | × | | × | × | ○ | ○ |
| | Torq Limit Rev Rgn | L7–04 | Reverse regenerative torque limit | 0 to 300% | 10% | × | | ○ | ○ | ○ | ○ |
| Hdwe Protection * | DB Resistor Prot † | L8–01 | Protect selection for internal DB resistor | 0/1 | 0 | × | 0 : Not Provided<br>1 : Provided | × | × | ○ | ○ |
| Monitor Select | Monitor Select | O1–01 | Monitor selection | 4 to 26 | 6 | ○ | See Table A–4. | ○ | ○ | ○ | ○ |
| | Power–On Monitor | O1–02 | Monitor selection after power up | 1 to 4 | 1 | ○ | 1 : Frequency Ref<br>2 : Output Freq<br>3 : Output Current<br>4 : Selected Monitor | ○ | ○ | ○ | ○ |
| | Display Scaling | O1–03 | Freq. units of ref. setting and monitor | 0 to 39999 | 0 | × | | ○ | ○ | ○ | ○ |
| | Display Units | O1–04 | Freq. units of constant setting | 0/1 | 0 | × | 0 : Hertz<br>1 : RPM | × | × | × | ○ |
| Key Select | Local/Remote Key | O2–01 | REMOTE/LOCAL key enable/disable | 0/1 | 1 | × | 0 : Disabled<br>1 : Enabled | ○ | ○ | ○ | ○ |
| | Oper STOP Key | O2–02 | STOP key during external terminal operation (enable/disable) | 0/1 | 1 | × | 0 : Disabled<br>1 : Enabled | ○ | ○ | ○ | ○ |
| | User Default | O2–03 | User constant initial value | 0 to 2 | 0 | × | 0 : No Change<br>1 : Set Default<br>2 : Clear All | ○ | ○ | ○ | ○ |
| | Inverter Model # | O2–04‡ | kVA selection | 0 to FF | — | × | | ○ | ○ | ○ | ○ |

* Hdwe = Hardware

† DB = Dynamic Brake

Table A–6 Multi–digital Output

| Set Value | Function Name | Set Value | Function Name |
|---|---|---|---|
| 00 | During RUN 1 | 10 | Minor Fault |
| 01 | Zero Speed | 11 | Reset Cmd Active |
| 02 | Fref/Fout Agree 1 | 12 | Timer Output |
| 03 | Fref/Set Agree 1 | 13 | Fref/Fout Agree 2 |
| 04 | Freq Detect 1 | 14 | Fref/Set Agree 2 |
| 05 | Freq Detect 2 | 15 | Freq Detect 3 |
| 06 | Inverter Ready | 16 | Freq Detect 4 |
| 07 | DC Bus undervolt | 17 | Trq Det 1 N.C. |
| 08 | BaseBlk 1 | 18 | Trq Det 2 N.O. |
| 09 | Option Reference | 19 | Trq Det 2 N.C. |
| 0A | Remote Operation | 1A | Reverse Dir |
| 0B | Trq Det 1 N.O. | 1B | BaseBlk 2 |
| 0C | Loss of Ref | 1C | Motor 2 Selected |
| 0D | DB Overheat | 1D | Regenerating |
| 0E | Fault | 1E | Restart Enabled |
| 0F | Not Used | 1F | Overload (OL1) |
| — | | 20 | OH Prealarm |
| | | 21–2F | Not Used |
| | | 30 | Current / Trq LIM |
| | | 31 | Speed Limit |
| | | 32 | Not Used |
| | | 33 | Zero Servo End |
| | | 34 | During RUN 2 |
| | | 35–3F | Not Used |

Table A–7 Multi–analog Input

| Set Value | Function Name | Set Value | Function Name |
|---|---|---|---|
| 00 | Aux Reference | 10 | Fwd Torque Limit |
| 01 | Frequency Gain | 11 | Rev Torque Limit |
| 02 | Frequency Bias | 12 | Regen Torq Limit |
| 03 | Voltage Bias | 13 | Torque Reference |
| 04 | Acc/Dec Change | 14 | Torque Comp |
| 05 | DCInj Current | 15 | Speed Limit |
| 06 | OverTorque Level | 16–1F | Not Used |
| 07 | Stall Prev Level | — | |
| 08 | Ref Lower Limit | | |
| 09 | Jump Frequency | | |
| 0A | PID Feedback | | |
| 0B–0F | Not Used | | |

## Table A–8 Constants Array

MENU
- Operation
  - U Monitor
  - A Initialize
  - Programming
    - B Application
    - C Tuning
    - D Reference
    - E Motor
    - F Option
    - H Terminal
    - L Protection
    - O Operator
  - Modified constants
  - Auto-tuning

| Group | Function | Constant No. Q | B | A | F |
|---|---|---|---|---|---|
| U1 | Monitor | 01–14 | 15–19 | 20–29 | |
| U2 | Fault trace | 01–14 | | | |
| U3 | Fault history | 01–08 | | | |
| A1 | Initialize | 00–04 | | | |
| A2 | User constants | | | 01–32 | |
| B1 | Sequence | 01–03 | 04 | 05–07 | |
| B2 | DC braking | | 01–04 | | 05–07 |
| B3 | Speed search | | | 01–03 | 04 |
| B4 | Delay timers | | | 01, 02 | |
| B5 | PID control | | | 01–08 | |
| B6 | Reference hold | | | 01–04 | |
| B7 | Droop control | | | 01, 02 | |
| B8 | Energy saving | | | 01, 02 | |
| B9 | Zero servo | | | 01, 02 | |
| C1 | Accel/decel | 01, 02 | 03, 04, 09 | 05–08, 10, 11 | |
| C2 | S-curve accel/decel | | | 01–04 | |
| C3 | Motor-slip compensation | | 01 | 02–04 | 04 |
| C4 | Torque compensation | | 01 | 02 | |
| C5 | ASR tuning | | 01–04 | 05–07 | |
| C6 | Carrier frequency | | 01 | 02, 03 | |
| C7 | Hunting prevention | | | 01 | 02–04 |
| C8 | Factory tuning | | | | 01–28 |
| D1 | Preset reference | 01–04, 09 | 05–08 | | |
| D2 | Reference limit | | 01, 02 | | |
| D3 | Jump frequency | | 01–04 | | |
| D4 | Sequence | | | 01, 02 | |
| D5 | Torque control | | | 01–04 | |
| E1 | V/f pattern 1 | 01–10 | | 11–13 | |
| E2 | Motor setup 1 | 01–04 | | 05–09 | |
| E3 | Motor 2 control method | | | 01 | |
| E4 | V/f pattern 2 | | | 01–07 | |
| E5 | Motor setup 2 | | | 01–05 | |
| F1 | PG option setup | 01 | 02–07 | 08–13 | |
| F2 | AI–14 setup | | 01 | | |
| F3 | DI–08, 16 setup | | 01 | | |
| F4 | AO–08 setup | | 01–04 | | |
| F5 | DO–02 setup | | 01, 02 | | |
| F6 | DO–08 setup | | 01 | | |
| F7 | PO–36F setup | | 01 | | |
| H1 | Digital inputs | | 01–06 | | |
| H2 | Digital outputs | | 01–03 | | |
| H3 | Analog inputs | | 01–07 | 08–12 | |
| H4 | Analog outputs | | 01–06 | | |
| H5 | Serial communication setup | | | 01–04 | |
| L1 | Motor overload | | 01, 02 | | |
| L2 | Power loss ride-thru | | 01–03 | 04, 05 | |
| L3 | Stall prevention | | 01, 02, 04–06 | 03 | 07, 08 |
| L4 | Reference detection | | 01, 02 | 03–05 | |
| L5 | Fault restart | | 01, 02 | | |
| L6 | Torque detection | | 01–03 | 04–06 | |
| L7 | Torque limit | 01–04 | | | 05, 06 |
| L8 | Hardware protection | | 01 | 02, 03, 05, 07 | 04, 06, 07–13 |
| O1 | Monitor select | | 01–04 | 05 | |
| O2 | Key select | | 01–04 | 05–08 | |