



Microprocessor Controlled  
IGBT Drive  
Inverter Motor Speed Regulator  
Operating Manual

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|             |      |                             |
|-------------|------|-----------------------------|
| L510 Series | 100V | 0.2~0.75KW<br>(0.53~1.6KVA) |
|             | 200V | 0.2~2.2KW<br>(0.53~4.0KVA)  |

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This manual may be modified when necessary because of improvement of the product, modification, or change in specifications. This manual is subject to change without notice.

# L510

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# Chapter 0 Preface

## 0.1 Preface

To extend the performance of the product and ensure personnel safety, please read this manual thoroughly before using the inverter. Should there be any problem in using the product that cannot be solved with the information provided in the manual, contact our technical or sales representative who will be willing to help you.

### ※Precautions

The inverter is an electrical product. For your safety, there are symbols such as “Danger”, “Caution” in this manual as a reminder to pay attention to safety instructions on handling, installing, operating, and checking the inverter. Be sure to follow the instructions for highest safety.



#### **Danger**

Indicates a potential hazard that could cause death or serious personal injury if misused.



#### **Caution**

Indicates that the inverter or the mechanical system might be damaged if misused.

#### **Danger**

- Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. It is not permissible to open the equipment until 5 minutes after the power has been removed.
- Do not make any connections when the inverter is powered on. Do not check parts and signals on circuit boards during the inverter operation.
- Do not disassemble the inverter or modify any internal wires, circuits, or parts.
- Ground the ground terminal of the inverter properly.

#### **Caution**

- Do not perform a voltage test on parts inside the inverter. High voltage can destroy the semiconductor components.
- Do not connect T1, T2, and T3 terminals of the inverter to any AC input power supply.
- CMOS ICs on the inverter's main board are susceptible to static electricity. Do not touch the main circuit board.

# Chapter 1 Safety Precautions

## 1.1 Before Power Up

### **Danger**

- Make sure the main circuit connections are correct Single phase(L1,L2)/Three phase(L1,L2,L3) are power-input terminals and must not be mistaken for T1, T2 and T3. Otherwise, inverter damage can result.

### **Caution**

- The line voltage applied must comply with the inverter's specified input voltage.(See the nameplate)
- To avoid the front cover from disengaging, or other damage do not carry the inverter by its covers. Support the drive by the heat sink when transpoting. Improper handling can damage the inverter or injure personnel and should be avoided.
- To avoid fire, do not install the inverter on a flammable object. Intall on nonflammable objects such as metal.
- If several inverters are placed in the same control panel, provide heat removal means to maintain the temperature below 50 degree C to avoid overheat or fire.
- When removing or installing the operator, turn the power off first, and follow the instructions in the diagram to avoid operator error or no display caused by bad connections

### **Warning**

- This product is sold subject to IEC 61800-3. In a domestic environment this product may cause radio interference in which case the user may be required to apply corrective measures.

### **Caution**

- Work on the device/system by unqualified personnel or failure to comply with warnings cam result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the device/system.
- Only permanently-wired input power connections are allowed.

## 1.2 During Power Up

### Danger

- When the momentary power loss is longer than 2 seconds, the inverter will not have sufficient stored power for its control circuit. Therefore, when the power is re-applied, the run operation of the inverter will be based on the setup of following parameters:
  - Run parameters. 00-02 or 00-03.
  - Direct run on power up. Parameter. 07-04 and the status of external run switch,

**Note**:- the start operation will be regardless of the settings for parameters 07-00/07-01/07-02.

### Danger. Direct run on power up.

If direct run on power up is enabled and inverter is set to external run with the run FWD/REV switch closed then inverter will restart.  
Prior to use, ensure that all risks and safety implications are considered..

- When the momentary power function is selected and the power loss is short, the inverter will have sufficient stored power for its control circuit.

** Danger : Therefore,when the power is resumed the inverter will automatically restart depending on the setup of parameters for power loss restart 07-00 & &- 7-01.**

Prior to use, ensure that all risks and safety implications are considered.

## 1.3 Before Operation

### Caution

- Make sure the model and inverter capacity are the same as that set in parameter 13-00.

**Note** : On power up the supply voltage set in parameter 01-01 will flash on display for 2 seconds.

## 1.4 During Operation

### **Danger**

- Do not connect or disconnect the motor during operation. Otherwise, the over-current will cause the inverter to trip or damage the unit.

### **Danger**

- To avoid electric shock, do not take the front cover off while power is on.
- The motor will restart automatically after stop when auto-restart function is enabled. In this case, care must be taken while working around the drive and associated equipment.
- The operation of the stop switch is different than that of the emergency stop switch. The stop switch has to be activated to be effective. Emergency stop has to be de-activated to become effective.

### **Caution**

- Do not touch heat-generating components such as heat sinks and brake resistors.
-  The inverter can drive the motor from low speed to high speed. Verify the allowable speed ranges of the motor and the associated machinery.
- Note the settings related to the braking unit.
- Do not check signals on circuit PCB while the inverter is running.

### **Caution**

Risk of electric shock. The DC link capacitors remain charged for five minutes after power has been removed. It is not permissible to open the equipment until 5 minutes after the power has been removed.

## 1.5 During Maintenance

### **Caution**

- The Inverter should be used in environments with temperature range from (14-104°F) Or (-10 to 40°C) and relative humidity of 95%.

### **Inverter Disposal**

### **Caution**

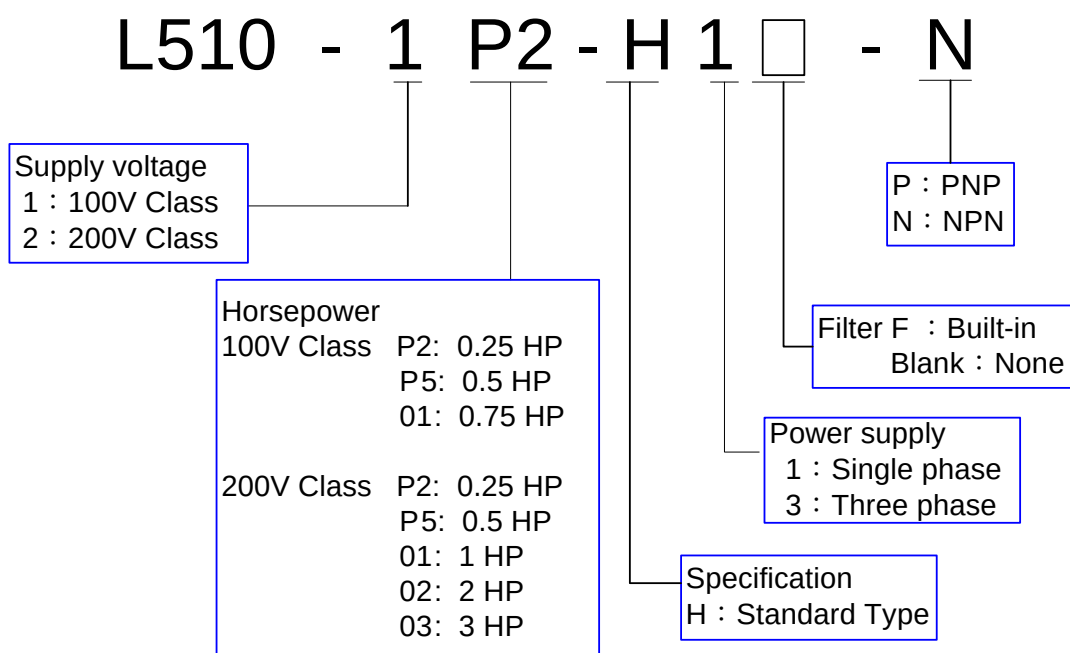
Please dispose of this unit with care as an industrial waste and according to your required local regulations.

- The capacitors of inverter main circuit and printed circuit board are considered as hazardous waste and must not be burnt.
- The Plastic enclosure and parts of the inverter such as the cover board will release harmful gases if burnt.



# Chapter 2 Definition of model

## 2.1 Model



## 2.2 Standard Product Specification

| Model          | Supply<br>voltage (Vac)  | Frequency<br>(Hz) | (Hp) | (KW) | Model |     | VR<br>Built-in | Filter   |      |
|----------------|--------------------------|-------------------|------|------|-------|-----|----------------|----------|------|
|                |                          |                   |      |      | NPN   | PNP |                | Built-in | None |
| L510-1P2-H1-N  | 1ph,100~120V<br>10%/-15% | 50/60Hz           | 0.25 | 0.2  | ⊙     |     | ⊙              |          | ⊙    |
| L510-1P5-H1-N  |                          |                   | 0.5  | 0.4  | ⊙     |     | ⊙              |          | ⊙    |
| L510-101-H1-N  |                          |                   | 1    | 0.75 | ⊙     |     | ⊙              |          | ⊙    |
| L510-2P2-H1F-P | 1ph,200~240V<br>10%/-15% |                   | 0.25 | 0.2  |       | ⊙   |                | ⊙        |      |
| L510-2P5-H1F-P |                          |                   | 0.5  | 0.4  |       | ⊙   |                | ⊙        |      |
| L510-201-H1F-P |                          |                   | 1    | 0.75 |       | ⊙   |                | ⊙        |      |
| L510-202-H1F-P |                          |                   | 2    | 1.5  |       | ⊙   |                | ⊙        |      |
| L510-203-H1F-P |                          |                   | 3    | 2.2  |       | ⊙   |                | ⊙        |      |
| L510-2P2-H1-N  |                          |                   | 0.25 | 0.2  | ⊙     |     | ⊙              |          | ⊙    |
| L510-2P5-H1-N  |                          |                   | 0.5  | 0.4  | ⊙     |     | ⊙              |          | ⊙    |
| L510-201-H1-N  |                          |                   | 1    | 0.75 | ⊙     |     | ⊙              |          | ⊙    |
| L510-202-H1-N  |                          |                   | 2    | 1.5  | ⊙     |     | ⊙              |          | ⊙    |
| L510-203-H1-N  |                          |                   | 3    | 2.2  | ⊙     |     | ⊙              |          | ⊙    |
| L510-2P2-H3-N  | 3ph,200~240V<br>10%/-15% |                   | 0.25 | 0.2  | ⊙     |     | ⊙              |          | ⊙    |
| L510-2P5-H3-N  |                          |                   | 0.5  | 0.4  | ⊙     |     | ⊙              |          | ⊙    |
| L510-201-H3-N  |                          |                   | 1    | 0.75 | ⊙     |     | ⊙              |          | ⊙    |
| L510-202-H3-N  |                          |                   | 2    | 1.5  | ⊙     |     | ⊙              |          | ⊙    |
| L510-203-H3-N  |                          |                   | 3    | 2.2  | ⊙     |     | ⊙              |          | ⊙    |

Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 120/240 volts maximum. The voltage shall be 120 for 100-120 V, 240 for 200-240 V rated units.

# Chapter 3 Installation & Environment

## 3.1 Environment

Installation environment has a direct affect on the correct operation and the life expectancy of the inverter, Install the inverter in an environment complying with the following conditions:

| Protection            |                                                                                                                                                                                                          |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protection class      | IP20                                                                                                                                                                                                     |
| Suitable environment  |                                                                                                                                                                                                          |
| Operating temperature | <b>-10~40°C (-10~50°C with fan)</b><br>If several inverters are installed in the same control panel, Ensure adequate spacing and provide the necessary cooling and ventilation for successful operation. |
| Storage temperature   | <b>-20~60°C</b>                                                                                                                                                                                          |
| Relative Humidity     | Max 95% (without condensation)<br>Notice prevention of inverter freezing up.                                                                                                                             |
| Shock                 | <b>1G. (9.8m/s<sup>2</sup>) for &lt; 20Hz.</b><br><b>0.6G (5.88m/s<sup>2</sup>) 20Hz~50Hz</b>                                                                                                            |

### Installation site

Install in an environment that will not have an adverse effect on the operation of the unit and ensure that there is no exposure to areas such as that listed below:-

- Direct sunlight, Rain or moisture.
- Oil mist and salt
- Dust, lint fibbers, small metal filings and Corrosive liquid and gas.
- Electromagnetic interference from sources such as welding equipment.
- Radioactive and flammable materials.
- Excessive vibration from machines such as stamping, punching machines.
- Add a vibration-proof pads if necessary.

### Tightening torque for terminals:-

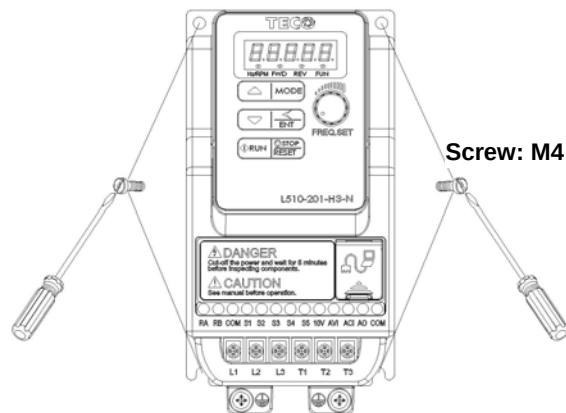
Chart 3-1

| Model         | TM1        |                   |        | TM2        |                   |        |
|---------------|------------|-------------------|--------|------------|-------------------|--------|
|               | Cable Size | Tightening torque |        | Cable Size | Tightening torque |        |
|               |            | kgf.cm            | lbf.in |            | kgf.cm            | lbf.in |
| <b>Frame1</b> | 22~10 AWG  | 14                | 12.15  | 24~12 AWG  | 4.08              | 3.54   |
| <b>Frame2</b> | 22~10 AWG  | 12.24             | 10.62  |            |                   |        |

## 3.2 Installation space

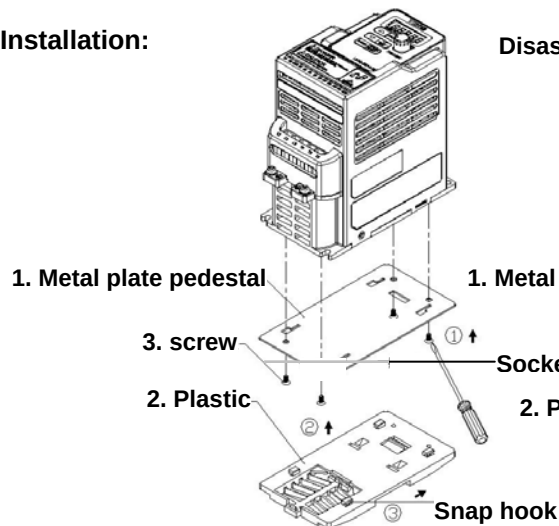
### 3.2.1 Installation

Frame1 Standard installation:

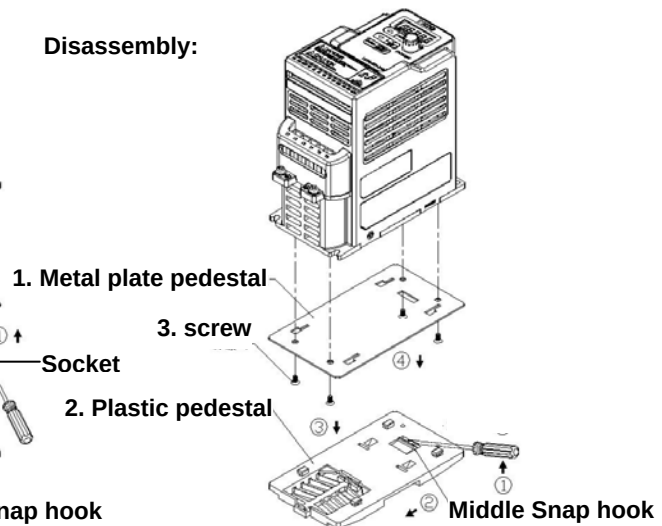


Plastic pedestal:

Installation:

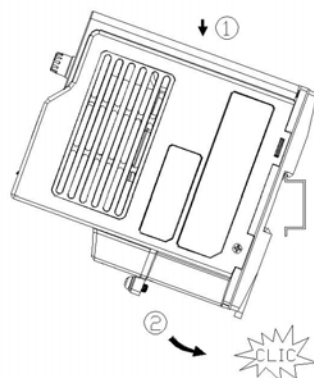


Disassembly:

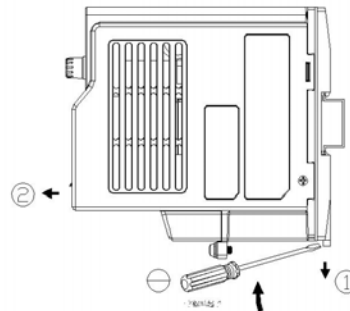


Guide strip:

Installation:



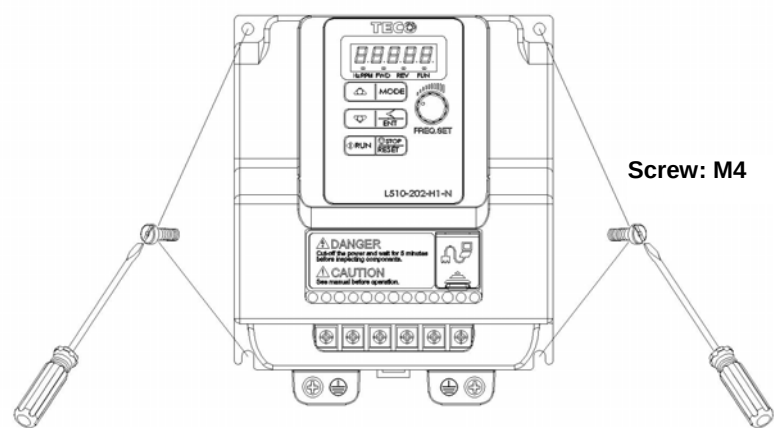
Disassembly:



Note:

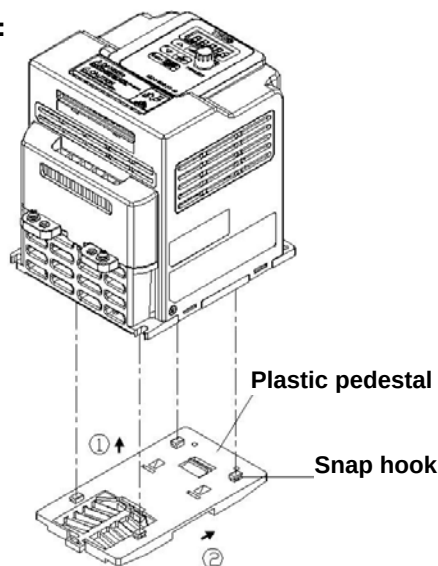
Optional Fitting :1. Metal plate pedestal (4KA76X414T01)  
2. Plastic pedestal (4KA82X442T01)  
3. Chamfer head screw: M3×6

**Frame2 Standard installation:**

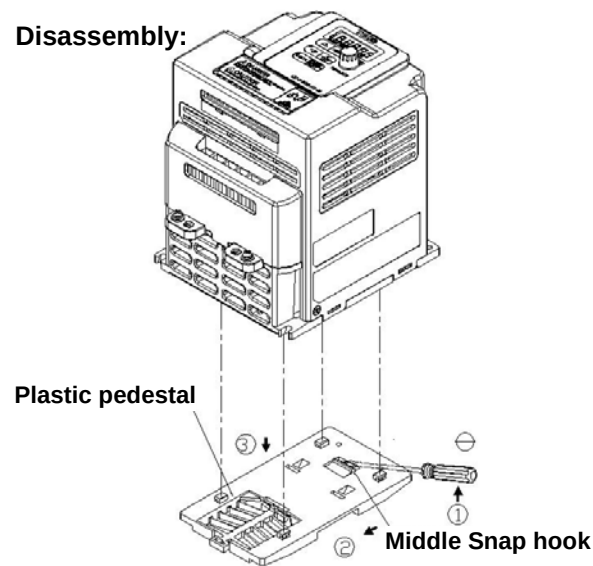


**Plastic pedestal:**

**Installation:**

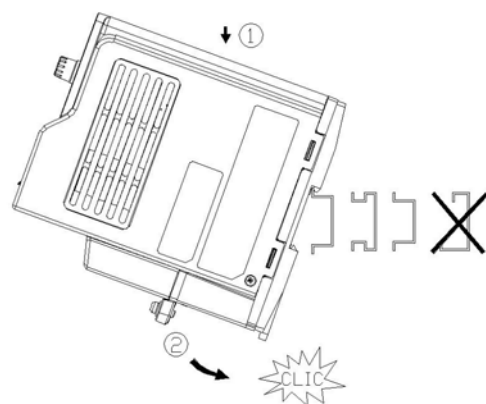


**Disassembly:**

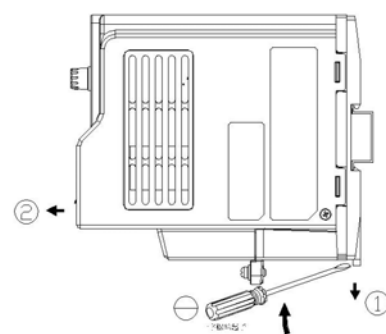


**Guide strip:**

**Installation:**



**Disassembly:**



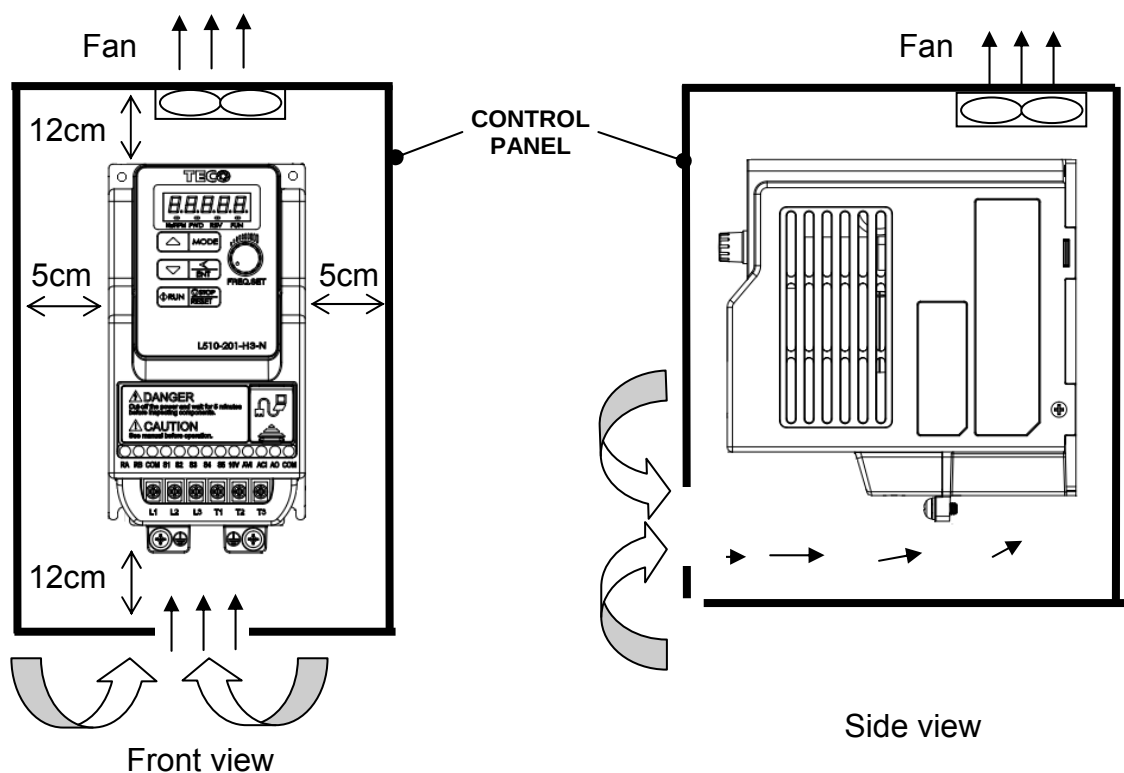
**Note: Frame2: Optional Fitting : Plastic pedestal (4KA82X442T01)**

### 3.2.2 Installation space

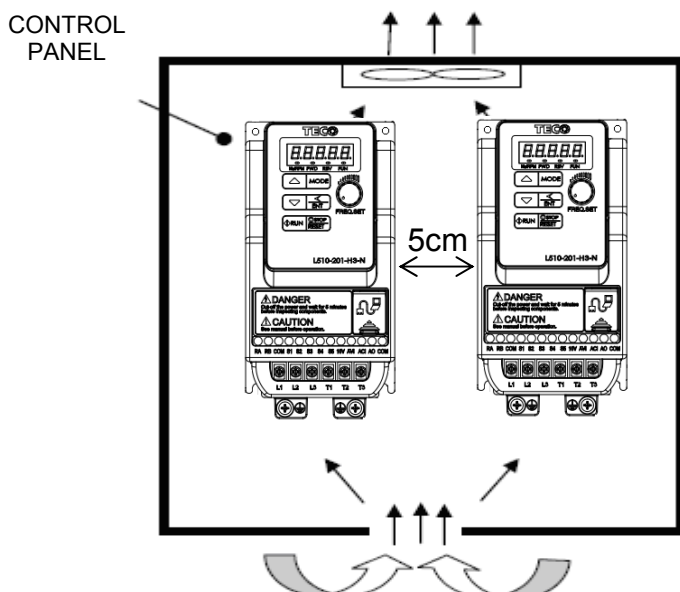
Provide sufficient air circulation space for cooling as shown in examples below.  
(We recommend that the drive is installed on a dissipative surface.)

#### Single unit Installation

In order to ensure good cooling effect, be sure to install the transducer vertical.  
**Frames1 & 2.**



#### Side by side Installation

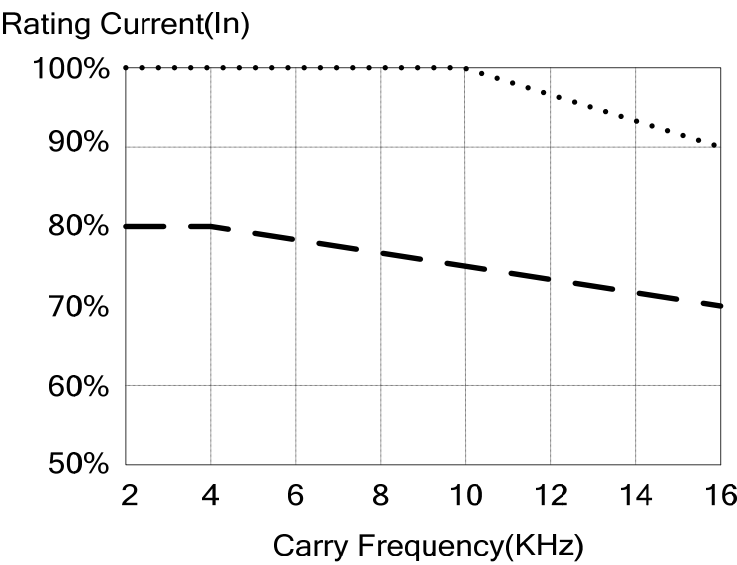


Provide the necessary physical space and cooling based on the ambient temperature and the heat loss in the panel

### 3.2.3 Dual-rating curve

When adjust the carry frequency and rating current, please check the ambient temperature in advance.

Below is the graph for your reference.



Note:

- ..... Dual-rating curve of 40 degrees ambient temperature
- Dual-rating curve of 50 degrees ambient temperature

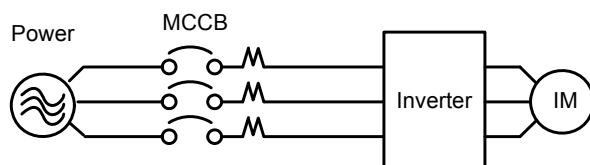
## 3.3 Wiring Guidelines.

### 3.3.1 Power Cables.

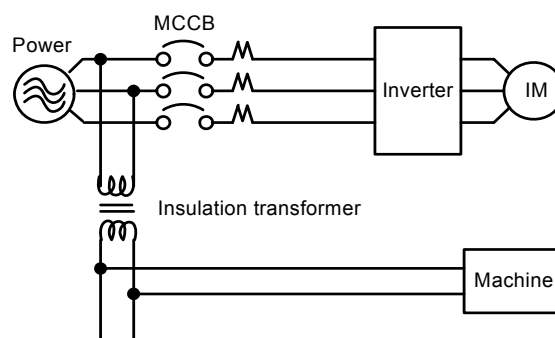
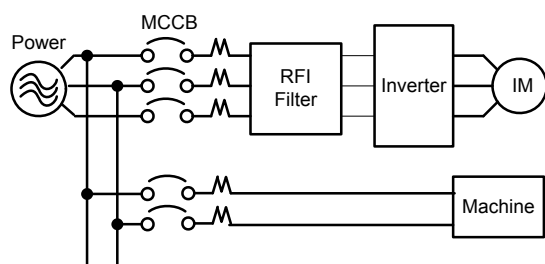
Supply power cable must be connected to TM1 terminal block, terminals L1, L2, L3. Motor cable must be connected to TM1 terminals. T1, T2, T3.

**Warning:-** Connection of Supply line cable to terminals T1, T2 & T3 will result in serious damage to the drive components.

**Example power connections:- Inverter with dedicated power line.**



- Install a Supply RFI filter or Isolation transformer when the power source is shared with other high power electrical equipment as shown below.



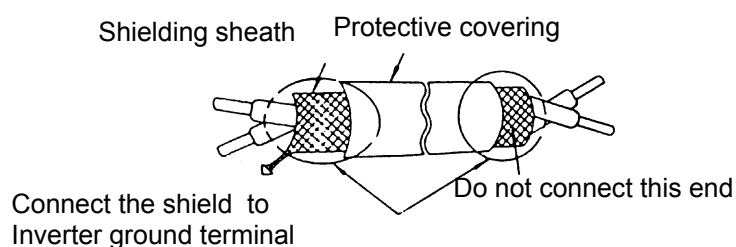
### 3.3.2 Control Cable selection and Wiring.

Control cables should be connected to terminal block TM2.

**Choose power & Control cables according to the following criteria:-**

- Use copper conductors only and size field wire based upon 60/75°C wire only.
- Minimum cable voltage rating for 200V type inverters should be 300VAC.
- Route all cables away from other high voltage or high current power lines to provide good interference suppression.

Use a shielded cable with twisted pairs of wire and connect the shield (screen) wire to the ground terminal at the inverter end only. Cable length should not exceed 50 meters.

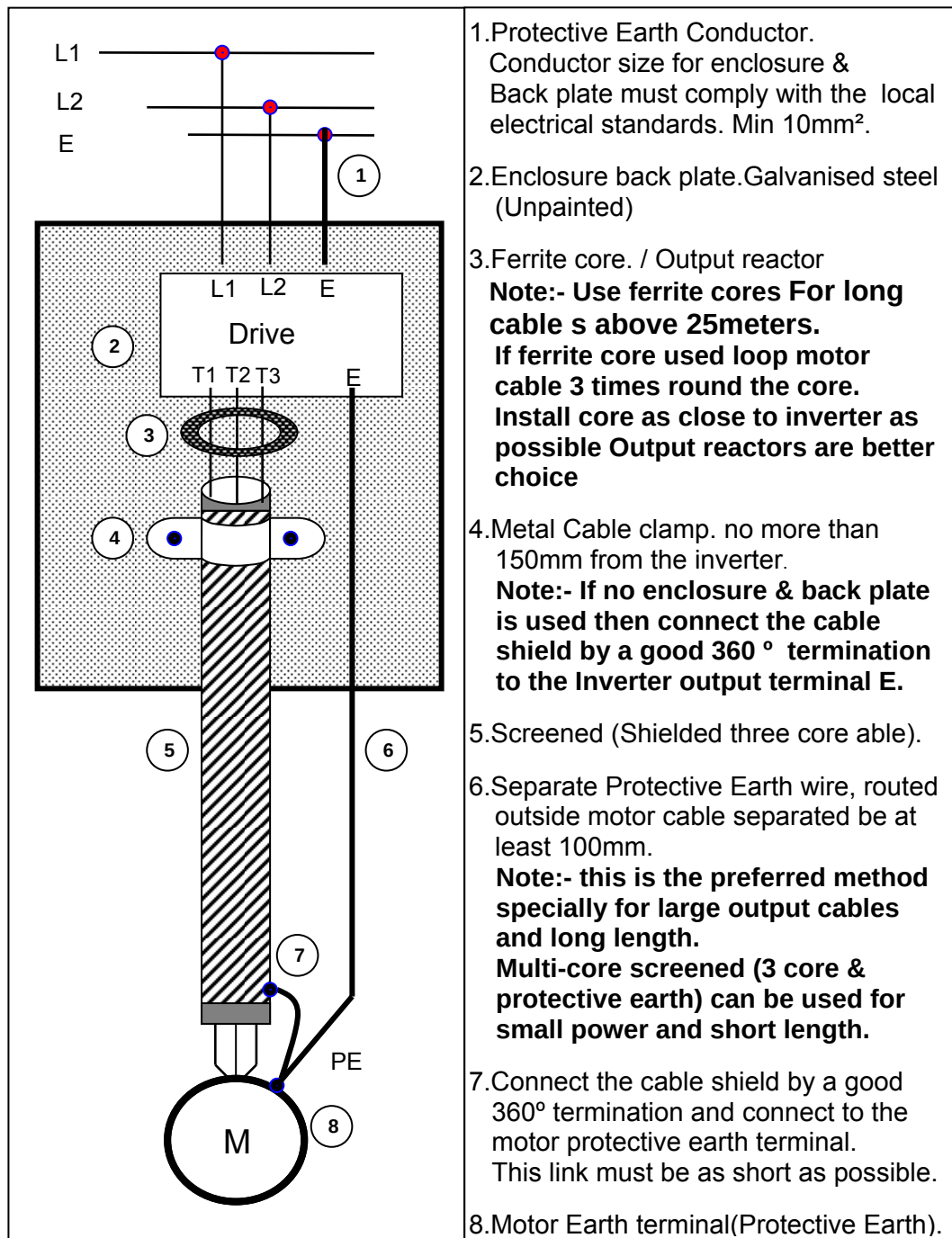


### 3.3.3 Wiring and EMC guidelines:-

- To provide good interference suppression, do not route power and control cables in the same conduit or trucking.

To prevent radiated noise, if possible motor cable should be put in a metal conduit or alternatively armored or shielded type motor cables should be used. To provide effective suppression of radiated noise emissions the cable armour or shield must be grounded at both ends to the motor and the inverter ground terminals. These connections should be as short as possible. Distance between the motor cable and signal lines of other control equipment at the least should be 30 cm.

#### Typical Wiring.





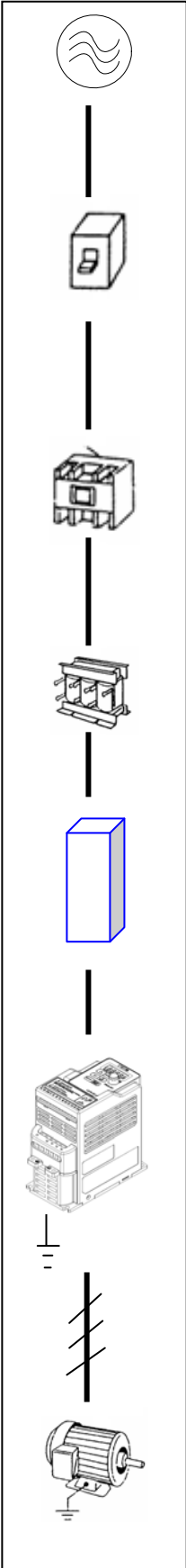
#### **3.3.4 Failure liability:**

- Teco bears no responsibility for any failures or damaged caused to the inverter if the recommendations in this instruction manual have not been followed specifically points listed below,
- If a correctly rated Fuse or Circuit breaker has not been installed. between the power source and the inverter.
- If a magnetic contactor, a phase capacitor, burst absorber and LC or RC circuits have been connected between the inverter and the motor.
- If an incorrectly rated three-phase squirrel cage induction motor has been used

**Note:**

When one inverter is driving several motors, the total current of all motors running simultaneously must be less than the rated current of the inverter, and each motor has to be equipped with a correctly rated thermal overload relay.

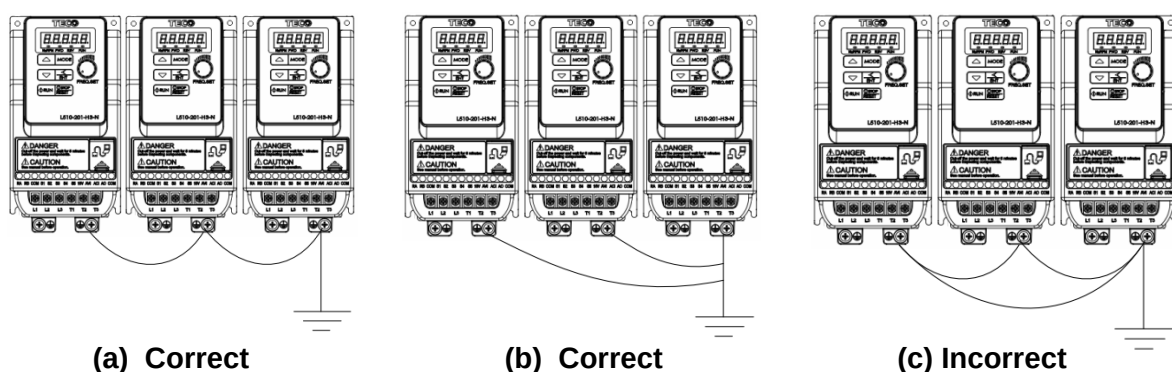
### 3.3.5 Considerations for peripheral equipment

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
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|  | <table border="1"> <tr> <td data-bbox="427 315 659 465">Power</td><td data-bbox="659 315 1394 465">Ensure that the supply voltage is correct.<br/>A molded-case circuit breaker or fused disconnect must be installed between the AC source and the inverter</td></tr> <tr> <td data-bbox="427 465 659 663">Circuit Breaker &amp; RCD</td><td data-bbox="659 465 1394 663">Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter.<br/>Do not use the circuit breaker as the run/stop switch for the inverter.<br/>Residual Current Circuit Breaker</td></tr> <tr> <td data-bbox="427 663 659 987">Magnetic contactor</td><td data-bbox="659 663 1394 987">Normally a magnetic contactor is not needed.<br/>A contactor can be used to perform functions such as external control and auto restart after power failure or when using brake controller.<br/>Do not use the magnetic contactor as the run/stop switch for the inverter.<br/>Current setting should be 200mA or above and the operating time at 0.1 second or longer to prevent malfunctions.</td></tr> <tr> <td data-bbox="427 987 659 1167">AC reactor for power quality improvement</td><td data-bbox="659 987 1394 1167">When a 200V/400V inverter with rating below 15KW is connected to a high capacity power source (600KVA or above) then an AC reactor can be connected for power factor improvement and reducing harmonics.</td></tr> <tr> <td data-bbox="427 1167 659 1346">Input noise filter</td><td data-bbox="659 1167 1394 1346">L510 inverter has a built-in filter to Class "A" first Environment.<br/>To satisfy the required EMC regulations for your specific application you may require an additional EMC filter.</td></tr> <tr> <td data-bbox="427 1346 659 1697">Inverter</td><td data-bbox="659 1346 1394 1697">Connect the single phase power to Terminals, L1&amp; L2.<br/>Warning! Connecting the input terminals T1, T2, and T3 to AC input power will damage the inverter.<br/>Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor.<br/>To reverse the motor rotation direction just swap any two wires at terminals T1, T2, and T3.<br/>Ground the Inverter and motor correctly.<br/>Ground Resistance for 200V power&lt;100 Ohms.</td></tr> <tr> <td data-bbox="427 1697 659 2051">Motor</td><td data-bbox="659 1697 1394 2051">Three-phase induction motor. Voltage drop on motor due to long cable can be calculated.<br/><b>Volts drop should be &lt; 10%.</b><br/>Phase-to-phase voltage drop (V) = <math>\sqrt{3} \times \text{resistance of wire } (\Omega/\text{km}) \times \text{length of line (m)} \times \text{current} \times 10^{-3}</math>.</td></tr> </table> | Power | Ensure that the supply voltage is correct.<br>A molded-case circuit breaker or fused disconnect must be installed between the AC source and the inverter | Circuit Breaker & RCD | Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter.<br>Do not use the circuit breaker as the run/stop switch for the inverter.<br>Residual Current Circuit Breaker | Magnetic contactor | Normally a magnetic contactor is not needed.<br>A contactor can be used to perform functions such as external control and auto restart after power failure or when using brake controller.<br>Do not use the magnetic contactor as the run/stop switch for the inverter.<br>Current setting should be 200mA or above and the operating time at 0.1 second or longer to prevent malfunctions. | AC reactor for power quality improvement | When a 200V/400V inverter with rating below 15KW is connected to a high capacity power source (600KVA or above) then an AC reactor can be connected for power factor improvement and reducing harmonics. | Input noise filter | L510 inverter has a built-in filter to Class "A" first Environment.<br>To satisfy the required EMC regulations for your specific application you may require an additional EMC filter. | Inverter | Connect the single phase power to Terminals, L1& L2.<br>Warning! Connecting the input terminals T1, T2, and T3 to AC input power will damage the inverter.<br>Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor.<br>To reverse the motor rotation direction just swap any two wires at terminals T1, T2, and T3.<br>Ground the Inverter and motor correctly.<br>Ground Resistance for 200V power<100 Ohms. | Motor | Three-phase induction motor. Voltage drop on motor due to long cable can be calculated.<br><b>Volts drop should be &lt; 10%.</b><br>Phase-to-phase voltage drop (V) = $\sqrt{3} \times \text{resistance of wire } (\Omega/\text{km}) \times \text{length of line (m)} \times \text{current} \times 10^{-3}$ . |
| Power                                                                              | Ensure that the supply voltage is correct.<br>A molded-case circuit breaker or fused disconnect must be installed between the AC source and the inverter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
| Circuit Breaker & RCD                                                              | Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter.<br>Do not use the circuit breaker as the run/stop switch for the inverter.<br>Residual Current Circuit Breaker                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
| Magnetic contactor                                                                 | Normally a magnetic contactor is not needed.<br>A contactor can be used to perform functions such as external control and auto restart after power failure or when using brake controller.<br>Do not use the magnetic contactor as the run/stop switch for the inverter.<br>Current setting should be 200mA or above and the operating time at 0.1 second or longer to prevent malfunctions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
| AC reactor for power quality improvement                                           | When a 200V/400V inverter with rating below 15KW is connected to a high capacity power source (600KVA or above) then an AC reactor can be connected for power factor improvement and reducing harmonics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
| Input noise filter                                                                 | L510 inverter has a built-in filter to Class "A" first Environment.<br>To satisfy the required EMC regulations for your specific application you may require an additional EMC filter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
| Inverter                                                                           | Connect the single phase power to Terminals, L1& L2.<br>Warning! Connecting the input terminals T1, T2, and T3 to AC input power will damage the inverter.<br>Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor.<br>To reverse the motor rotation direction just swap any two wires at terminals T1, T2, and T3.<br>Ground the Inverter and motor correctly.<br>Ground Resistance for 200V power<100 Ohms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |
| Motor                                                                              | Three-phase induction motor. Voltage drop on motor due to long cable can be calculated.<br><b>Volts drop should be &lt; 10%.</b><br>Phase-to-phase voltage drop (V) = $\sqrt{3} \times \text{resistance of wire } (\Omega/\text{km}) \times \text{length of line (m)} \times \text{current} \times 10^{-3}$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                                                                                                                                          |                       |                                                                                                                                                                                                                  |                    |                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                                                                                                                                                                                          |                    |                                                                                                                                                                                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                               |

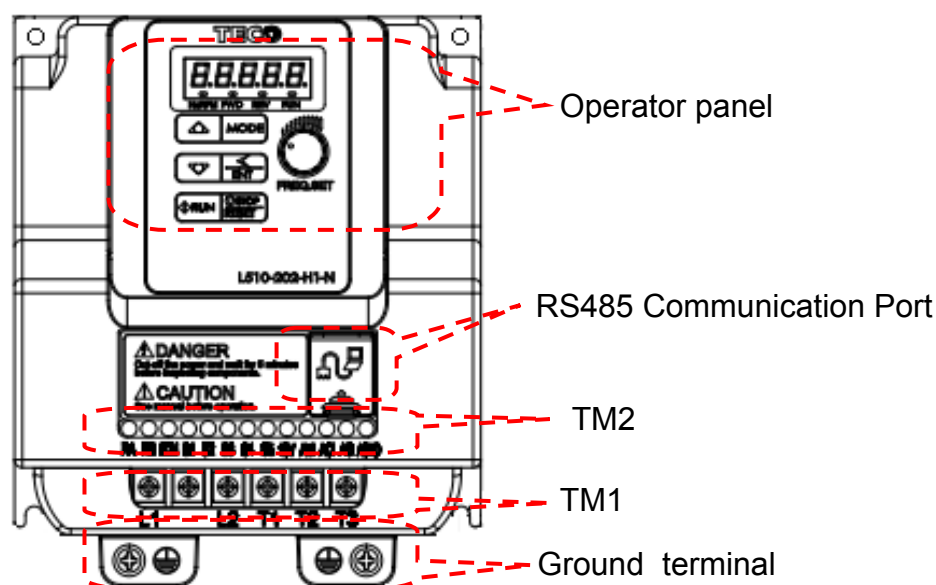
### 3.3.6 Ground connection

Inverter Ground terminal must be connected to installation ground correctly and according to the required local wiring regulations.

- Ground cable size must be according to the required local wiring regulations.  
Ground connection should be as short as possible.
- Do not share the ground of the inverter with other high current loads (Welding machine, high power motors). Ground each unit separately.
- Ensure that all ground terminals and connections are secure.
- Do not make ground loops when several inverters share a common ground point.



### 3.3.7 Inverter exterior



## 3.4 Product Specifications

### 3.4.1 Product Specifications

110V Class : Single phase

|                                         |                                               |      |      |
|-----------------------------------------|-----------------------------------------------|------|------|
| Model : L510-□□□-H1-N                   | 1P2                                           | 1P5  | 101  |
| Horse power (HP)                        | 0.25                                          | 0.5  | 1    |
| Suitable motor capacity (KW)            | 0.2                                           | 0.4  | 0.75 |
| Rated output current (A)                | 1.8                                           | 2.6  | 4.3  |
| Rated capacity (KVA)                    | 0.68                                          | 1.00 | 1.65 |
| Input voltage range(V)                  | Single Phase : 100~120V<br>(+10%-15%),50/60HZ |      |      |
| Output voltage range(V)                 | Three phase 0~240V                            |      |      |
| Input current (A)                       | 9.5                                           | 13   | 19   |
| Allowable momentary power loss time (S) | 1.0                                           | 1.0  | 1.0  |
| Enclosure                               | IP20                                          |      |      |

220V Class : Single phase.

F : Standards for built-in filter

|                                           |                                               |      |      |      |      |
|-------------------------------------------|-----------------------------------------------|------|------|------|------|
| Model : L510-□□□-H1-N<br>(L510-□□□-H1F-P) | 2P2                                           | 2P5  | 201  | 202  | 203  |
| Horse power (HP)                          | 0.25                                          | 0.5  | 1    | 2    | 3    |
| Suitable motor capacity (KW)              | 0.2                                           | 0.4  | 0.75 | 1.5  | 2.2  |
| Rated output current (A)                  | 1.8                                           | 2.6  | 4.3  | 7.5  | 10.5 |
| Rated capacity (KVA)                      | 0.68                                          | 1.00 | 1.65 | 2.90 | 4.00 |
| Input voltage range(V)                    | Single Phase : 200~240V<br>(+10%-15%),50/60HZ |      |      |      |      |
| Output voltage range(V)                   | Three phase 0~240V                            |      |      |      |      |
| Input current (A)                         | 4.9                                           | 7.2  | 11   | 15.5 | 21   |
| Allowable momentary power loss time (S)   | 1.0                                           | 1.0  | 1.0  | 2.0  | 2.0  |
| Enclosure                                 | IP20                                          |      |      |      |      |

220V Class : Three phase

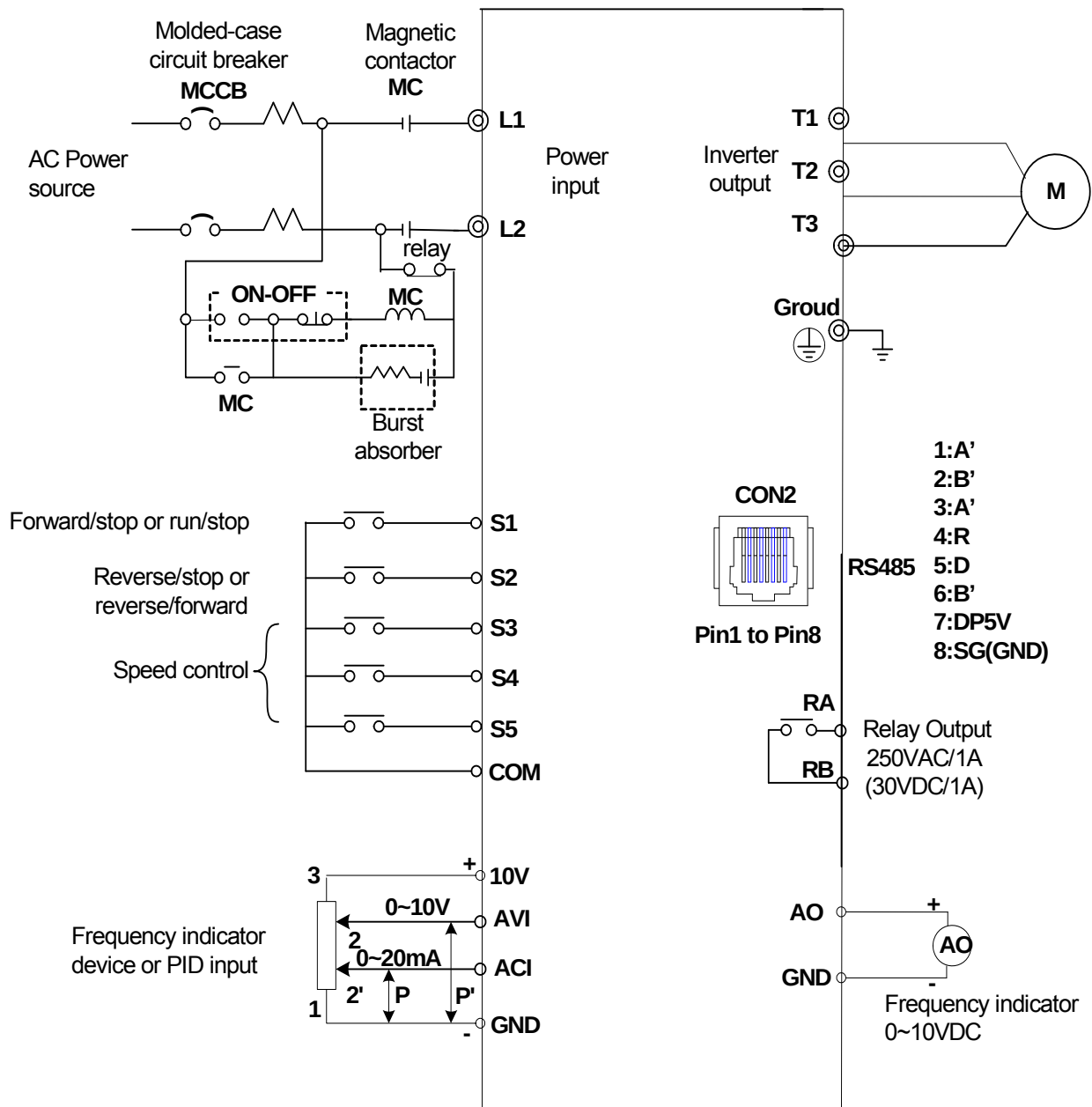
|                                        |                                              |      |      |      |      |
|----------------------------------------|----------------------------------------------|------|------|------|------|
| Model L510-□□□-H3-N                    | 2P2                                          | 2P5  | 201  | 202  | 203  |
| Horse power (HP)                       | 0.25                                         | 0.5  | 1    | 2    | 3    |
| Suitable motor capacity (KW)           | 0.2                                          | 0.4  | 0.75 | 1.5  | 2.2  |
| Rated output current (A)               | 1.8                                          | 2.6  | 4.3  | 7.5  | 10.5 |
| Rated capacity (KVA)                   | 0.68                                         | 1.00 | 1.65 | 2.90 | 4.00 |
| Input voltage range(V)                 | Three phase : 200~240V<br>(+10%-15%),50/60HZ |      |      |      |      |
| Output voltage range(V)                | Three phase 0~240V                           |      |      |      |      |
| Input current (A)                      | 3.0                                          | 4.0  | 6.4  | 9.4  | 12.2 |
| Allowable momentary power loss time(S) | 1.0                                          | 1.0  | 1.0  | 2.0  | 2.0  |
| Enclosure                              | IP20                                         |      |      |      |      |

### 3.4.2 General Specifications

| Item                        |                                       | L510                                                                                                                                                                                                                                        |
|-----------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Control Mode</b>         |                                       | <b>V/F Control +Auto-torque compensation function</b>                                                                                                                                                                                       |
| <b>Frequency</b>            | Range                                 | <b>0.01~650.00Hz</b>                                                                                                                                                                                                                        |
|                             | Setting resolution                    | Digital input : <b>0.01Hz</b><br>Analog input : <b>0.06Hz/60Hz</b>                                                                                                                                                                          |
|                             | Setting                               | Keypad : Set directly with ▲ ▼ keys or the VR (Potentiometer) on the keypad<br>External Input Terminas:-.<br>AVI(0/2~10V), ACI(0/4~20mA)input<br>Multifunction input up/down function(Group3)<br>Setting frequency by Communication method. |
|                             | Frequency limit                       | Lower and upper frequency limits<br>3 skip frequency settings.                                                                                                                                                                              |
|                             | Frequency limit                       | Lower and upper frequency limits<br>3 skip frequency settings.                                                                                                                                                                              |
| <b>Run</b>                  | Operation set                         | Keypad run, stop button                                                                                                                                                                                                                     |
|                             |                                       | External terminals:<br>Multi- operation-mode 2 / 3 wire selection<br>Jog operation                                                                                                                                                          |
|                             |                                       | Run signal by communication method.                                                                                                                                                                                                         |
| <b>Commonly Control</b>     | V / F curve setting                   | 6 fixed curve, One programmable.                                                                                                                                                                                                            |
|                             | Carrier frequency                     | 1~16KHz(default 5KHz)                                                                                                                                                                                                                       |
|                             | Acceleration and deceleration control | 2 off Acc / dec time parameters.<br>4 off S curve parameters.                                                                                                                                                                               |
|                             | Multifunction input                   | 19 functions (refer to description on group3)                                                                                                                                                                                               |
|                             | Multifunction output                  | 14 functions (refer to description on group3)                                                                                                                                                                                               |
|                             | Multifunction analog output           | 5 functions (refer to description on group3)                                                                                                                                                                                                |
|                             | Main features                         | Overload Detection, 8 preset speeds, Auto-run, Acc/Dec Switch (2 Stages), Main/Alt run Command select, Main/Alt Frequency Command select, PID control, torque boost, V/F start Frequency ,Fault reset, Firemode.                            |
| <b>Display</b>              | LED                                   | Display: parameter/parameter value/frequency/line speed/DC voltage/output voltage/output current/PID feedback/input and output terminal status/Heat sink temperature/Program Version/Fault Log.                                             |
|                             | LED Status Indicator                  | For run/stop/forward and reverse.                                                                                                                                                                                                           |
| <b>Protective Functions</b> | Overload Protection                   | Integrated motor and Inverter overload protection.                                                                                                                                                                                          |
|                             | Over voltage                          | Over 410V                                                                                                                                                                                                                                   |
|                             | Under voltage                         | Under 190V                                                                                                                                                                                                                                  |
|                             | Momentary Power Loss Restart          | Inverter auto-restart after a momentary power loss.                                                                                                                                                                                         |
|                             | Stall Prevention                      | Stall prevention for Acceleration/ Deceleration/ and continuous Run.                                                                                                                                                                        |
|                             | Short-circuit output terminal         | Electronic Circuit Protection                                                                                                                                                                                                               |
|                             | Grounding Fault                       | Electronic Circuit Protection                                                                                                                                                                                                               |

## 3.5 Standard wiring

### 3.5.1 Single phase(NPN):



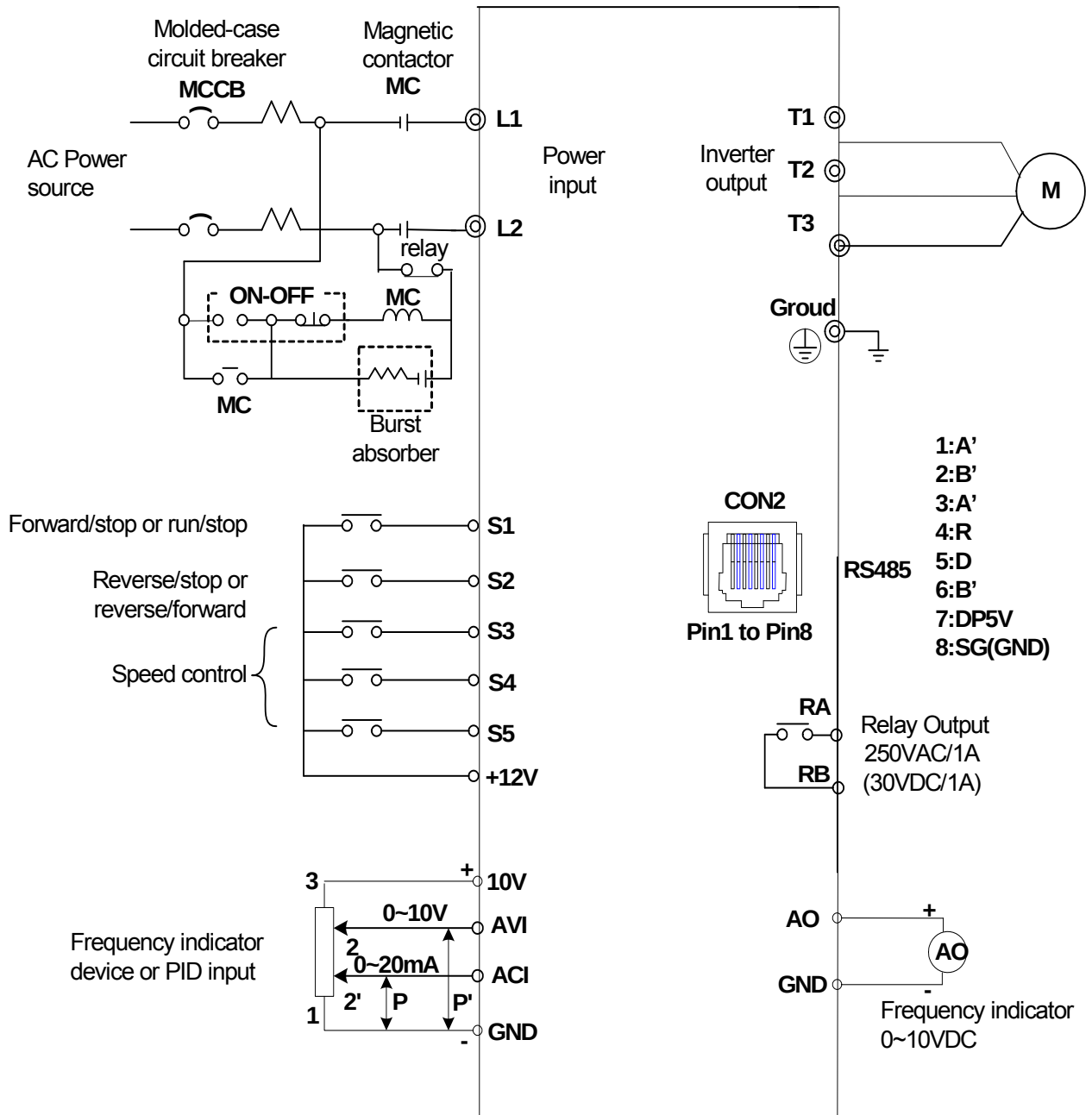
#### Model:

100V : L510-1P2-H1-N / L510-1P5-H1-N / L510-101-H1-N

200V : L510-2P2-H1-N / L510-2P5-H1-N / L510-201-H1-N

L510-202-H1-N / L510-203-H1-N

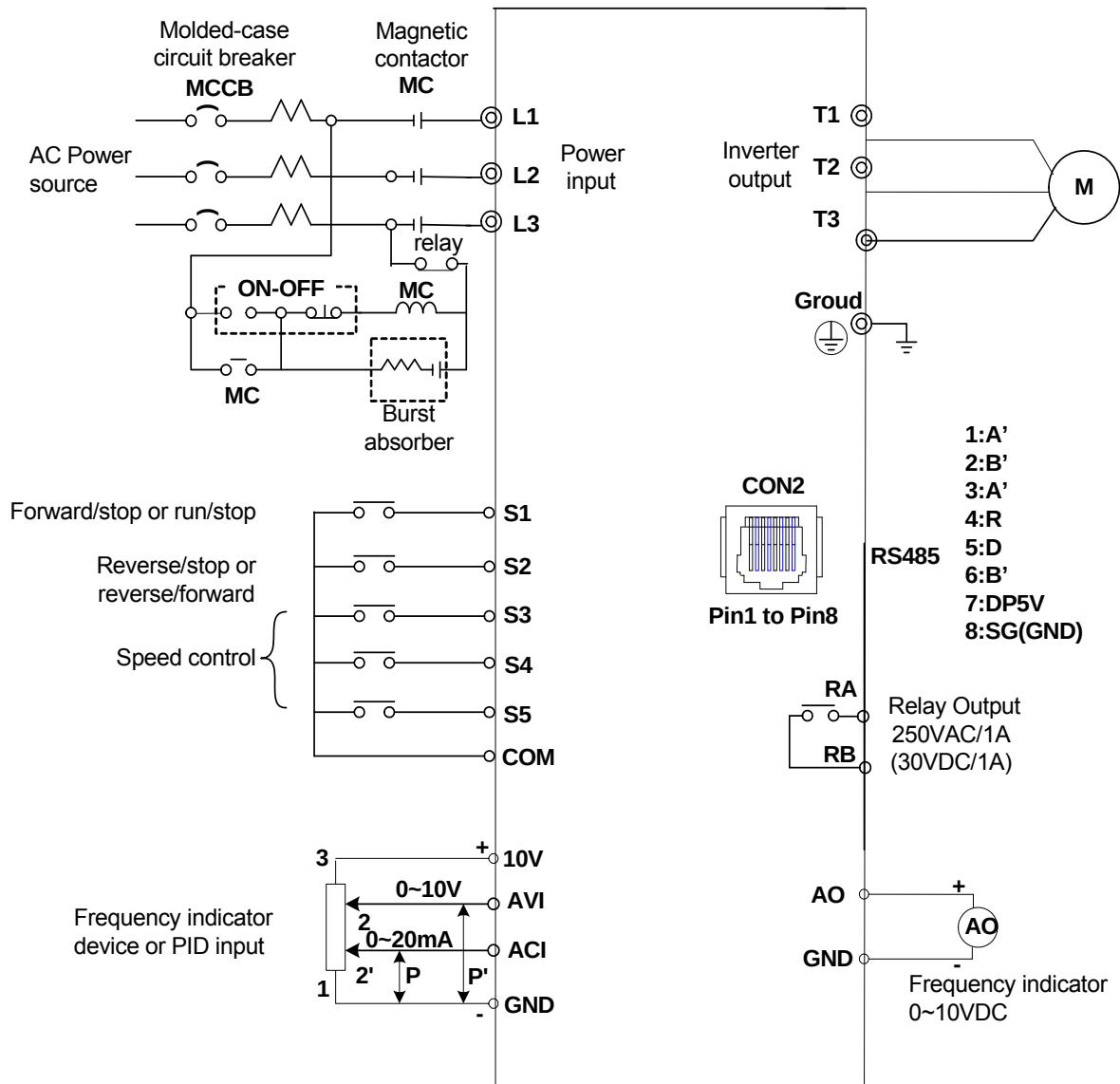
### 3.5.2 Single phase(PNP) :



**Model :**

**200V : L510-2P2-H1F-P / L510-2P5-H1F-P / L510-201-H1F-P  
L510-202-H1F-P / L510-203-H1F-P**

### 3.5.3 Three phrase(NPN):



**Model:**

**200V : L510-2P2-H3-N / L510-2P5-H3-N / L510-201-H3-N**  
**L510-202-H3-N / L510-203-H3-N**

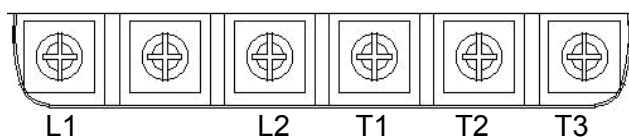


## 3.6 Terminal Description

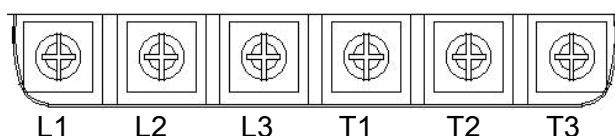
### 3.6.1 Description of main circuit terminals

| Terminal symbols                                                                  | TM1 Function Description                                          |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|
| L1                                                                                | Main power input : Single-phase : L1/L2<br>Three-phase : L1/L2/L3 |
| L2                                                                                |                                                                   |
| L3                                                                                |                                                                   |
| T1                                                                                | Inverter output, connect to U, V, W port of motor                 |
| T2                                                                                |                                                                   |
| T3                                                                                |                                                                   |
|  | Ground terminal                                                   |

#### Single phase



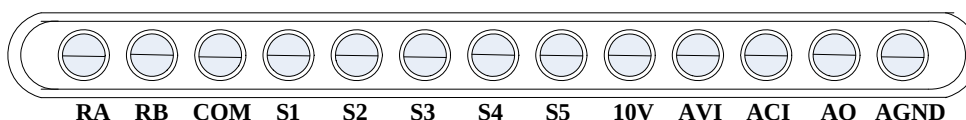
#### Three phase



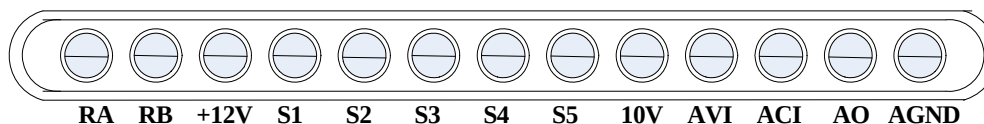
### 3.6.2 Control circuit terminal description

| Terminal symbols | TM1 Function Description                                        |
|------------------|-----------------------------------------------------------------|
| RA               | Relay output terminal, Specification: 250VAC/1A(30VDC/1A)       |
| RB               |                                                                 |
| COM              | S1~S5 (COMMON) 【NPN】                                            |
| +12V             | S1~S5 (COMMON) 【PNP】                                            |
| S1               | Multi-function input terminals(refer to group3)                 |
| S2               |                                                                 |
| S3               |                                                                 |
| S4               |                                                                 |
| S5               |                                                                 |
| 10V              | Built in Power for an external speed potentiometer              |
| AVI              | Analog voltage input, Specification : 0~10VDC/ 2-10V            |
| ACI              | Analog current input, Specification : 0/4~20mA                  |
| AO               | Multi function analog output terminal. Maximum output 10VDC/1mA |
| AGND             | Analog ground terminal                                          |

#### NPN:

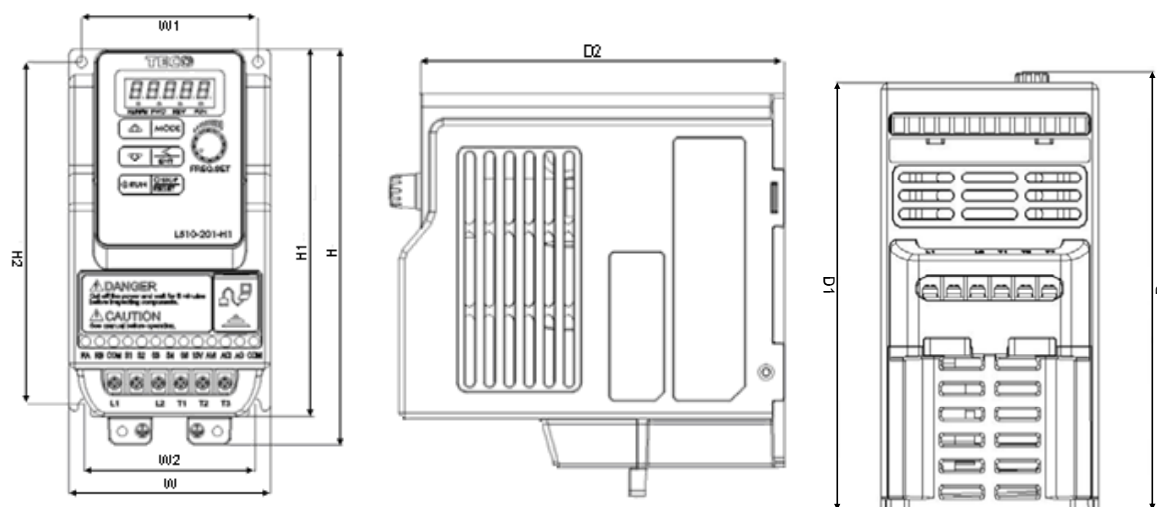


#### PNP:



### 3.7 Outline Dimensions (unit: mm)

#### Frame1

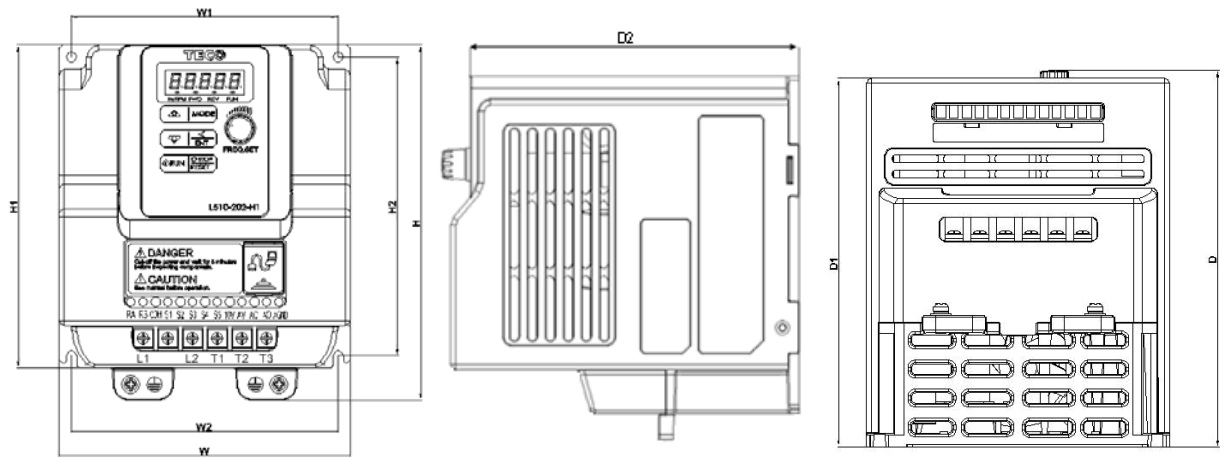


Unit : mm(inch)

| Model          | W        | W1       | W2       | H         | H1        | H2        | D           | D1        |
|----------------|----------|----------|----------|-----------|-----------|-----------|-------------|-----------|
| L510-1P2-H1    | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-1P5-H1    | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-2P2-H1(F) | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-2P5-H1(F) | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-201-H1(F) | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-2P2-H3    | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-2P5-H3    | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |
| L510-201-H3    | 72(2.83) | 63(2.48) | 61(2.40) | 141(5.55) | 131(5.16) | 122(4.80) | 139.2(5.48) | 136(5.35) |

F : Built-in EMC filter

Frame2



Unit : mm(inch)

| Model          | W         | W1        | W2        | H         | H1        | H2        | D           | D1          |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|-------------|
| L510-101-H1    | 118(4.65) | 108(4.25) | 108(4.25) | 144(5.67) | 131(5.16) | 121(4.76) | 147.3(5.80) | 144.2(5.68) |
| L510-202-H1(F) | 118(4.65) | 108(4.25) | 108(4.25) | 144(5.67) | 131(5.16) | 121(4.76) | 147.3(5.80) | 144.2(5.68) |
| L510-203-H1(F) | 118(4.65) | 108(4.25) | 108(4.25) | 144(5.67) | 131(5.16) | 121(4.76) | 147.3(5.80) | 144.2(5.68) |
| L510-202-H3    | 118(4.65) | 108(4.25) | 108(4.25) | 144(5.67) | 131(5.16) | 121(4.76) | 147.3(5.80) | 144.2(5.68) |
| L510-203-H3    | 118(4.65) | 108(4.25) | 108(4.25) | 144(5.67) | 131(5.16) | 121(4.76) | 147.3(5.80) | 144.2(5.68) |

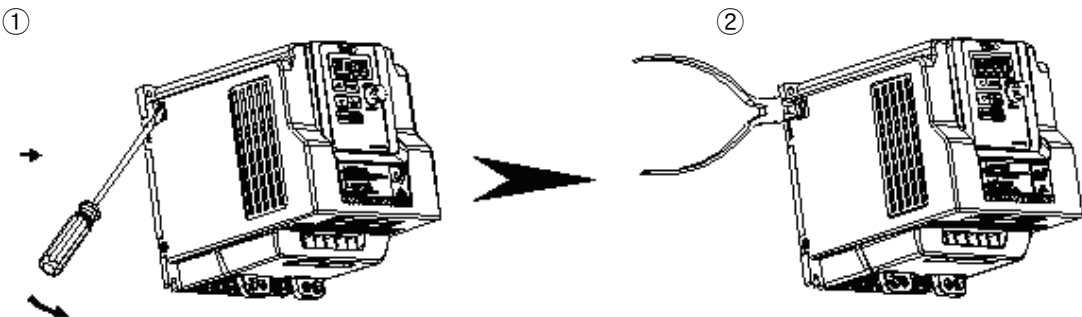
F : Built-in EMC filter

3.8 EMC filter link to earth

You can cut off the EMC filter, if you have some problem with earth leakage current.

Remove steps :

1. Remove EMC filter protection cover by screwdriver.
2. Remove EMC line by pliers.



Warning:

Inverter drives with built-in EMC filter are not suitable for connection to certain type of supply connections, such as listed below, in these cases the RFI filter can be disabled. In all such cases consult your local electrical standards requirements.

IT type supply systems (ungrounded), Corner grounded type TN systems  
Certain supply systems for medical equipment.

For European type supply systems. The following link is very useful, please see section 3.8 mains type.

# Chapter4 Software Index

## 4.1 Keypad Description

### 4.1.1 Operator Panel Functions



| Type                   | Item                                                                                                    | Function                                                                                                                                                                                                                                                                                                                                                 |
|------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital display & LEDs | Main digital displays                                                                                   | Frequency Display, Parameter, voltage, Current, Temperature, Fault messages.                                                                                                                                                                                                                                                                             |
|                        | LED Status                                                                                              | <p>Hz/RPM: ON when the frequency or line speed is displayed. OFF when the parameters are displayed.</p> <p>FWD: ON while the inverter is running forward. Flashes while stopped.</p> <p>REV: ON while the inverter is running reverse. Flashes while stopped.</p> <p>FUN: ON when the parameters are displayed. OFF when the frequency is displayed.</p> |
| Variable Resistor      | FREQ SET                                                                                                | Used to set the frequency                                                                                                                                                                                                                                                                                                                                |
| Keys On Keypad         | RUN                                                                                                     | RUN: Run at the set frequency.                                                                                                                                                                                                                                                                                                                           |
|                        | STOP/RESET<br>(Dual function keys)                                                                      | <p>STOP: Decelerate or Coast to Stop.</p> <p>RESET: Use to Reset alarms or resettable faults.</p>                                                                                                                                                                                                                                                        |
|                        | ▲                                                                                                       | Increment parameter number and preset values.                                                                                                                                                                                                                                                                                                            |
|                        | ▼                                                                                                       | Decrement parameter number and preset values.                                                                                                                                                                                                                                                                                                            |
|                        | MODE                                                                                                    | Switch between available displays                                                                                                                                                                                                                                                                                                                        |
|                        | </ENTER<br>(Dual function keys, a short press for left shift function, a long press for ENTER function) | <p>“&lt;” Left Shift:<br/>Used while changing the parameters or parameter values</p> <p>ENTER:<br/>Used to display the preset value of parameters and for saving the changed parameter values.</p>                                                                                                                                                       |

4.1.2 Digital display Description

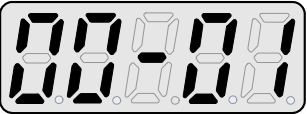
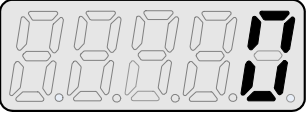
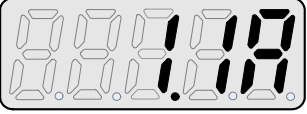
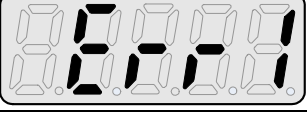
Alpha numerical display format

| Digit | LED | Letter | LED | Letter | LED | Symbol | LED |
|-------|-----|--------|-----|--------|-----|--------|-----|
| 0     |     | A      |     | n      |     | -      |     |
| 1     |     | b      |     | o      |     | °      |     |
| 2     |     | C      |     | P      |     | _      |     |
| 3     |     | d      |     | q      |     | .      |     |
| 4     |     | E      |     | r      |     |        |     |
| 5     |     | F      |     | S      |     |        |     |
| 6     |     | G      |     | t      |     |        |     |
| 7     |     | H      |     | u      |     |        |     |
| 8     |     | J      |     | V      |     |        |     |
| 9     |     | L      |     | Y      |     |        |     |

Digital display indication formats

| Actual output frequency    | Set frequency          |                         |
|----------------------------|------------------------|-------------------------|
| Digits are lit Continually | Preset digits flashing | Selected digit flashing |
|                            |                        |                         |

## LED display examples

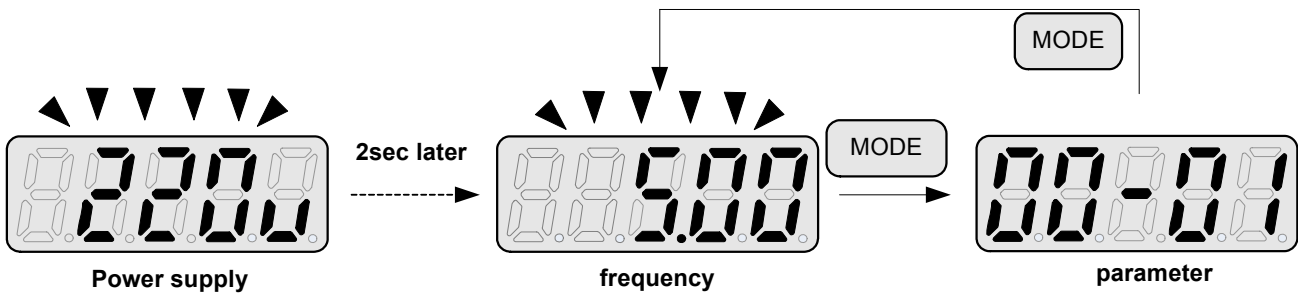
| Display                                                                             | Description                                                                           |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    | In stop mode shows the set frequency<br>In run mode shows the actual output frequency |
|    | Selected Parameter                                                                    |
|    | Parameter Value                                                                       |
|    | Output Voltage                                                                        |
|    | Output Current in Amps                                                                |
|    | DC Bus voltage                                                                        |
|   | Temperature                                                                           |
|  | PID feedback value                                                                    |
|  | Error display                                                                         |
|  | Analogue Current / Voltage ACID / AVI . Range ( 0~1000)                               |

## LED Status description

|                                  | LED Indicator light Status                                                                    |                                                 |                                                                                              |                                         |
|----------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------|
| Frequency / line speed Indicator | <br>Hz/RPM | On                                              |                                                                                              |                                         |
| Menu mode indicator              | <br>Run    | On while not displaying frequency or line speed |                                                                                              |                                         |
| FWD indicator                    | <br>FWD    | On while running forward                        | <br>FWD | Flashing while stopped in Forward mode. |
| REV indicator light              | <br>REV    | On while running reverse                        | <br>REV | Flashing while stopped in Reverse mode  |

### 4.1.3 Digital display set up

On power up digital display screens will be as shown below.

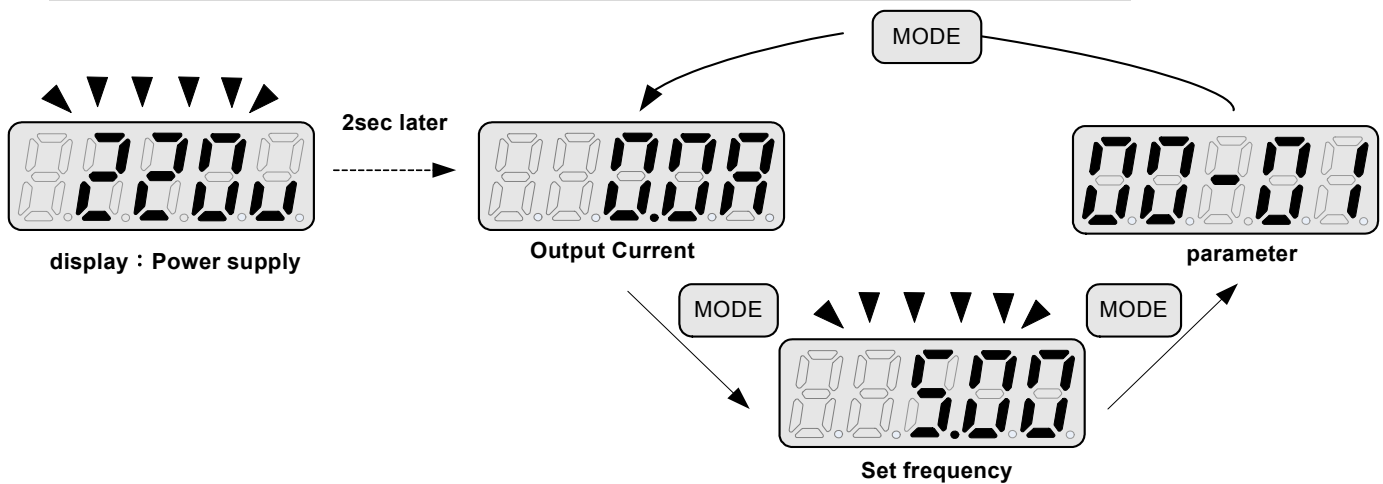


**User selectable display formats:**

| 12- 00 | Display Mode                                                                     |
|--------|----------------------------------------------------------------------------------|
| Range  | 0 0 0 0 0                                                                        |
|        | high Low                                                                         |
|        | Each of the above 5 digits can be set to any of the selections below from 0 to 7 |
|        | [0] :Disable display [1] :output Current                                         |
|        | [2] :output Voltage [3] :DC voltage                                              |
|        | [4] :Temperature [5] :PID feedback                                               |
|        | [6] :AVI [7] :ACI                                                                |

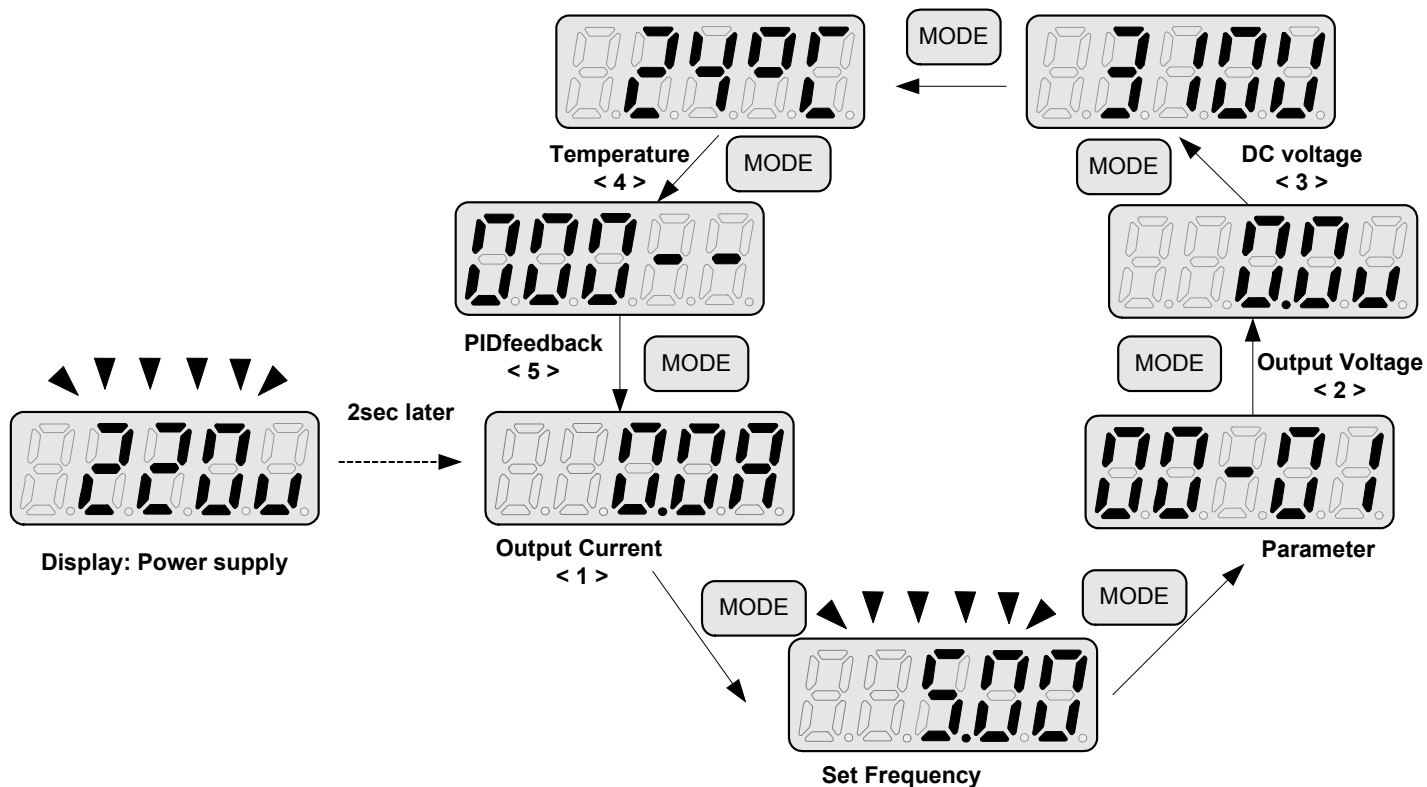
The highest bit of 12-00 sets the power on destined menu, other bits set user setting menus

**Example1: Set parameter 12- 00= 【10000】 to obtain display format shown below.**



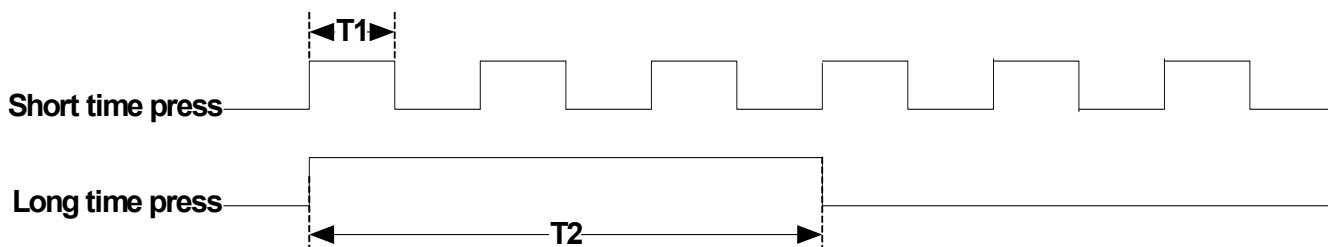


**Example 2. Set parameter 2: 12- 00= 【12345】 to obtain the display format shown below.**



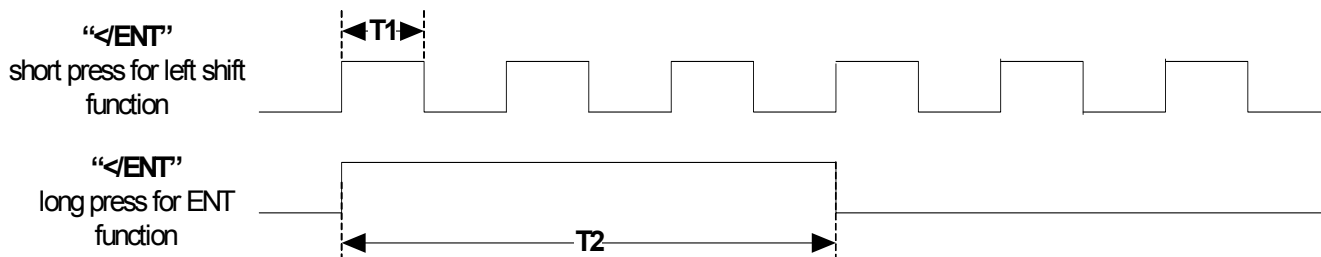
**Increment/ Decrement key functions:**

**1. “▲”/ “▼” :**



Quick pressing of these keys will Increment or Decrement the selected digit by one. Extended pressing will Increment or Decrement the selected digit continuously.

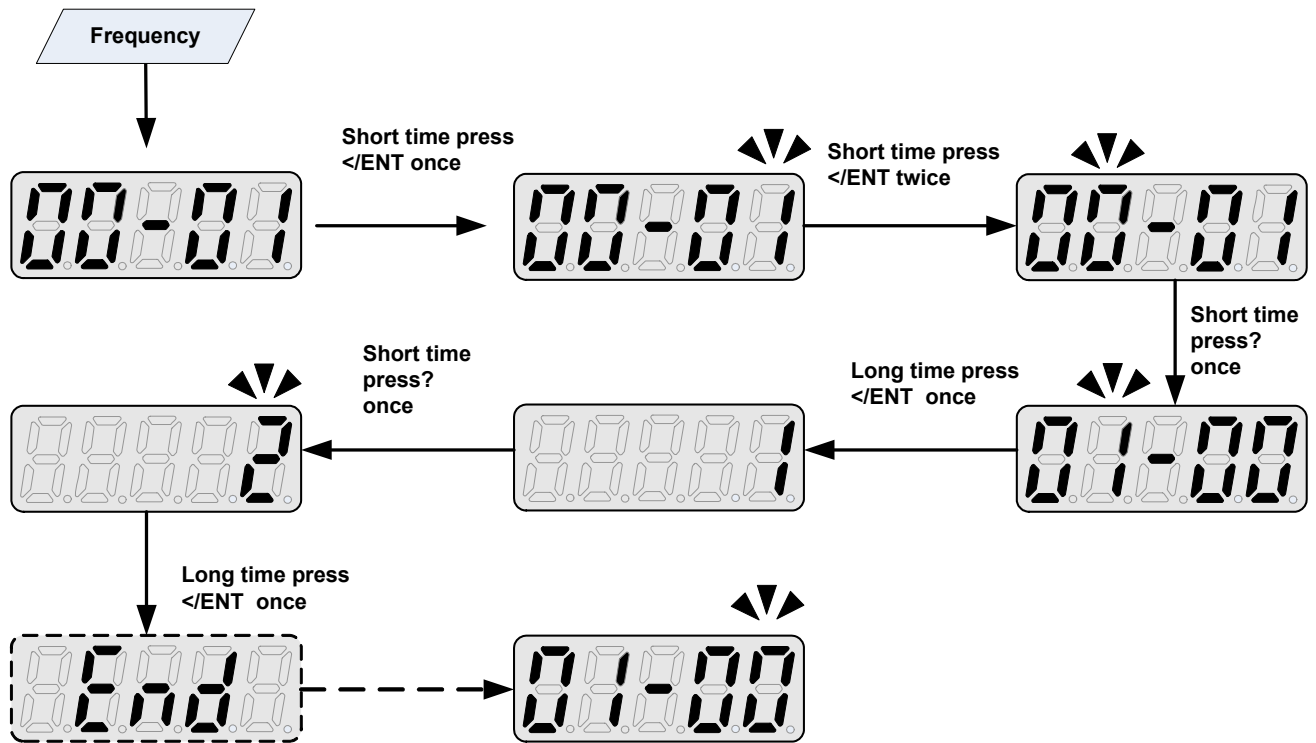
**2. “</ENT” Key functions :**



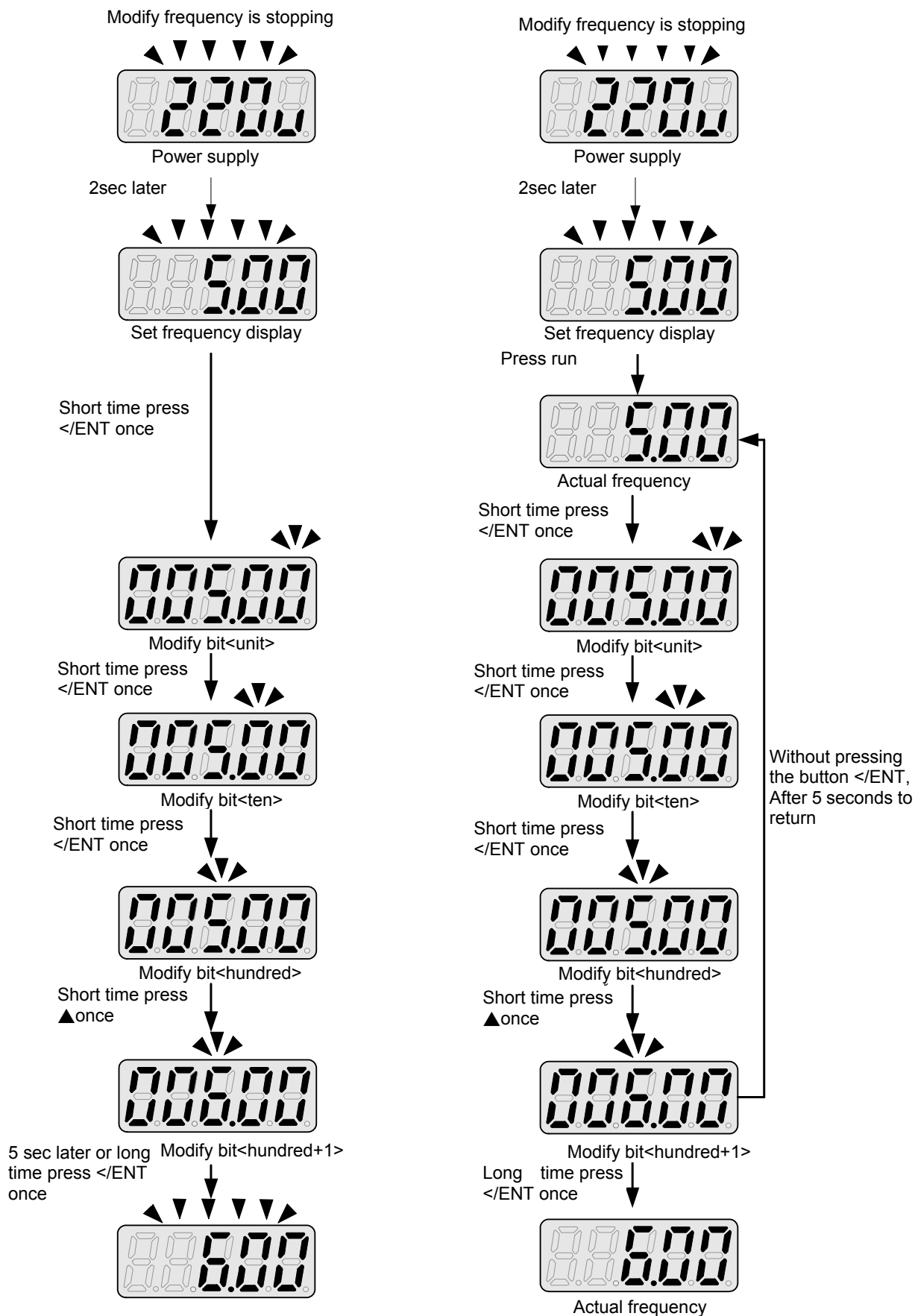
Quick pressing of this key will display the preset value of the parameter selected. Extended pressing of this key will save the altered value of the selected parameter.

#### 4.1.4 Example of keypad operation

### Example1: Modifying Parameters

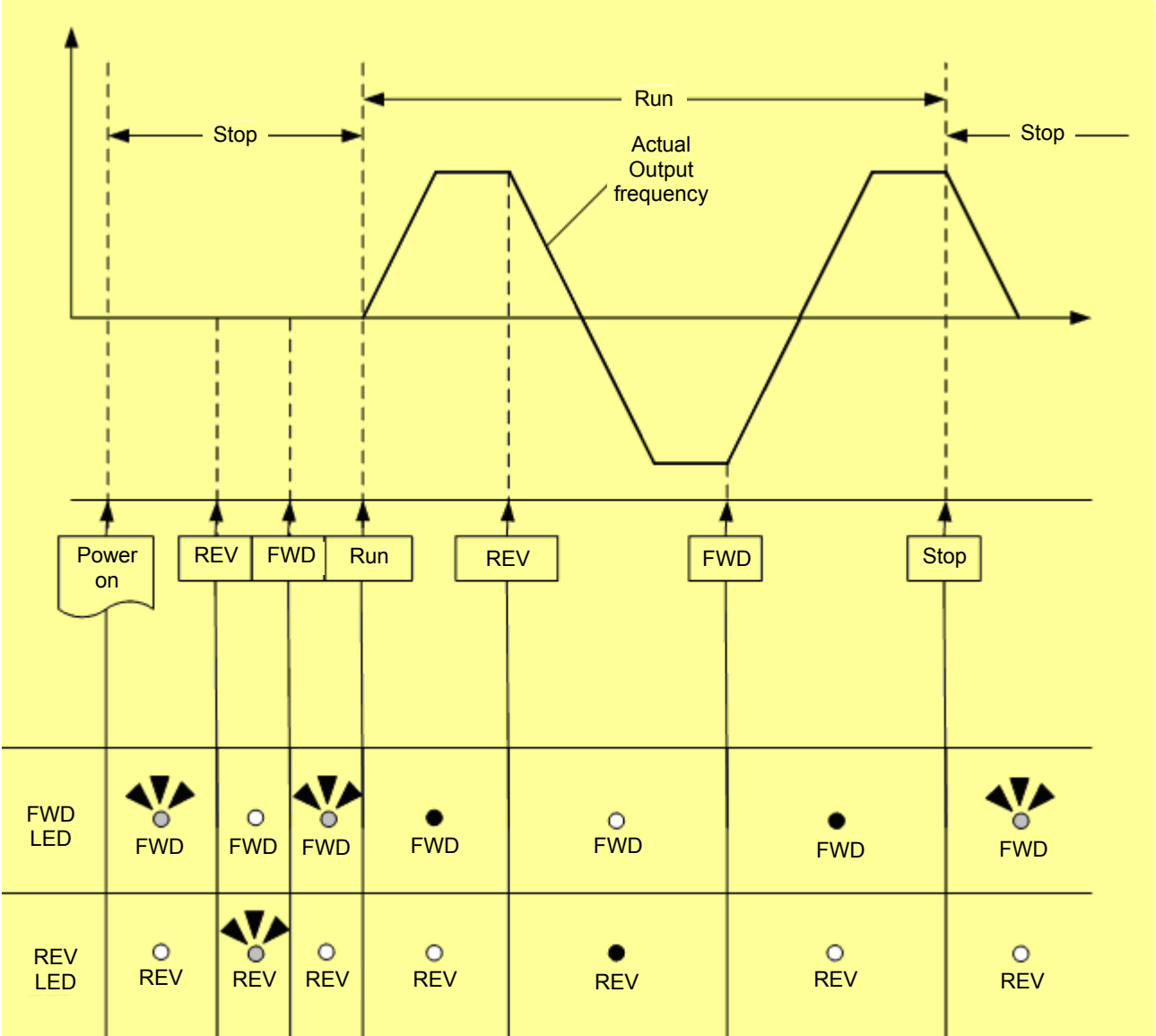


## Example2: Modifying the frequency from keypad in run and stop modes.



Note: frequency command setting will be limited to the range set by parameters for lower & upper frequency.

4.1.5 Operation Control



## 4.2 Programmable Parameter Groups

| Parameter Group No. | Description                           |
|---------------------|---------------------------------------|
| Group 00            | Basic parameters                      |
| Group 01            | V/F Pattern selections & setup        |
| Group 02            | Motor parameters                      |
| Group 03            | Multi function digital Inputs/Outputs |
| Group 04            | Analog signal inputs/ Analog output   |
| Group 05            | Preset Frequency Selections.          |
| Group 06            | Auto Run(Auto Sequencer) function     |
| Group 07            | Start/Stop command setup              |
| Group 08            | Drive and motor Protection            |
| Group 09            | Communication function setup          |
| Group 10            | PID function setup                    |
| Group 11            | Performance control functions         |
| Group 12            | Digital Display & Monitor functions   |
| Group 13            | Inspection & Maintenance function     |

| Parameter notes for Parameter Groups |                                               |
|--------------------------------------|-----------------------------------------------|
| <b>*1</b>                            | Parameter can be adjusted during running mode |
| <b>*2</b>                            | Cannot be modified in communication mode      |
| <b>*3</b>                            | Does not change with factory reset            |
| <b>*4</b>                            | Read only                                     |

| Group 00- The basic parameters group |                                                  |                                                                              |                 |      |      |
|--------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------|-----------------|------|------|
| No.                                  | Description                                      | Range                                                                        | Factory Setting | Unit | Note |
| 00-00                                | Reserved                                         |                                                                              |                 |      |      |
| 00-01                                | Motor rotation                                   | 0:Forward<br>1:Reverse                                                       | 0               | -    | *1   |
| 00-02                                | Main Run Source Selection                        | 0:Keypad                                                                     | 0               | -    |      |
|                                      |                                                  | 1:External Run/Stop Control                                                  |                 |      |      |
|                                      |                                                  | 2:Communication                                                              |                 |      |      |
| 00-03                                | Alternative Run Source Selection                 | 0:Keypad                                                                     | 0               | -    |      |
|                                      |                                                  | 1:External Run/Stop Control                                                  |                 |      |      |
|                                      |                                                  | 2:Communication                                                              |                 |      |      |
| 00-04                                | Operation modes for external terminals           | 0: Forward/Stop-Reverse/Stop                                                 | 0               | -    |      |
|                                      |                                                  | 1: Run/Stop-Reverse/Forward                                                  |                 |      |      |
|                                      |                                                  | 2: 3-Wire Control Mode-Run/Stop                                              |                 |      |      |
| 00-05                                | Main Frequency Source Selection                  | 0:Keypad                                                                     | 0               | -    |      |
|                                      |                                                  | 1:Potentiometer on Keypad                                                    |                 |      |      |
|                                      |                                                  | 2:External AVI Analog Signal Input                                           |                 |      |      |
|                                      |                                                  | 3:External ACI Analog Signal Input                                           |                 |      |      |
|                                      |                                                  | 4:External Up/Down Frequency Control                                         |                 |      |      |
|                                      |                                                  | 5:Communication setting Frequency                                            |                 |      |      |
|                                      |                                                  | 6:PID output frequency                                                       |                 |      |      |
| 00-06                                | Alternative Frequency Source Selection           | 0:Keypad                                                                     | 4               | -    |      |
|                                      |                                                  | 1:Potentiometer on Keypad                                                    |                 |      |      |
|                                      |                                                  | 2:External AVI Analog Signal Input                                           |                 |      |      |
|                                      |                                                  | 3:External ACI Analog Signal Input                                           |                 |      |      |
|                                      |                                                  | 4:External Up/Down Frequency Control                                         |                 |      |      |
|                                      |                                                  | 5:Communication setting Frequency                                            |                 |      |      |
|                                      |                                                  | 6:PID output frequency.                                                      |                 |      |      |
| 00-07                                | Main and Alternative Frequency Command modes     | 0: Main Or Alternative Frequency<br>1: Main frequency+Alternative Frequency  | 0               | -    |      |
| 00-08                                | Communication Frequency Command                  | 0.00~650.00                                                                  |                 | Hz   | *4   |
| 00-09                                | Frequency command Save mode (Communication mode) | 0:Save the frequency before power down<br>1:Save the communication frequency | 0               | -    |      |
| 00-10                                | Initial Frequency Selection ( keypad mode)       | 0:by Current Frequency Command                                               | 0               | -    |      |
|                                      |                                                  | 1:by 0 Frequency Command                                                     |                 |      |      |
|                                      |                                                  | 2:by 00-11                                                                   |                 |      |      |
| 00-11                                | Initial Frequency Keypad mode                    | 0.00~650.00                                                                  | 50.00/60.00     | Hz   |      |
| 00-12                                | Frequency Upper Limit                            | 0.01~650.00                                                                  | 50.00/60.00     | Hz   |      |
| 00-13                                | Frequency Lower Limit                            | 0.00~649.99                                                                  | 0.00            | Hz   |      |
| 00-14                                | Acceleration Time 1                              | 0.1~3600.0                                                                   | 10.0            | Sec  | *1   |
| 00-15                                | Deceleration Time 1                              | 0.1~3600.0                                                                   | 10.0            | Sec  | *1   |
| 00-16                                | Acceleration Time 2                              | 0.1~3600.0                                                                   | 10.0            | Sec  | *1   |
| 00-17                                | Deceleration Time 2                              | 0.1~3600.0                                                                   | 10.0            | Sec  | *1   |
| 00-18                                | Jog Frequency                                    | 1.00~25.00                                                                   | 2.00            | Hz   | *1   |
| 00-19                                | Jog Acceleration Time                            | 0.1~25.5                                                                     | 0.5             | Sec  | *1   |
| 00-20                                | Jog Deceleration Time                            | 0.1~25.5                                                                     | 0.5             | Sec  | *1   |

| Group 01- V/F Pattern selection & Setup |                                            |               |                 |      |      |
|-----------------------------------------|--------------------------------------------|---------------|-----------------|------|------|
| No.                                     | Description                                | Range         | Factory Setting | Unit | Note |
| 01-00                                   | Volts/Hz Patterns                          | 1~7           | 1/4             | -    |      |
| 01-01                                   | V/F Max voltage                            | 198.0~256.0   | 220.0           | Vac  |      |
| 01-02                                   | Max Frequency                              | 0.20 ~ 650.00 | 50.00/60.00     | Hz   |      |
| 01-03                                   | Max Frequency Voltage Ratio                | 0.0 ~ 100.0   | 100.0           | %    |      |
| 01-04                                   | Mid Frequency 2                            | 0.10 ~ 650.00 | 25.00/30.00     | Hz   |      |
| 01-05                                   | Mid Frequency Voltage Ratio 2              | 0.0 ~ 100.0   | 50.0            | %    |      |
| 01-06                                   | Mid Frequency 1                            | 0.10 ~ 650.00 | 10.00/12.00     | Hz   |      |
| 01-07                                   | Mid Frequency Voltage Ratio 1              | 0.0 ~ 100.0   | 20.0            | %    |      |
| 01-08                                   | Min Frequency                              | 0.10 ~ 650.00 | 0.50/0.60       | Hz   |      |
| 01-09                                   | Min Frequency Voltage Ratio                | 0.0 ~ 100.0   | 1.0             | %    |      |
| 01-10                                   | Volts/Hz Curve Modification (Torque Boost) | 0 ~ 10.0      | 0.0             | %    | *1   |
| 01-11                                   | V/F start Frequency                        | 0.00~10.00    | 0.00            | Hz   |      |

| Group 02- Motor parameters |                               |             |                 |      |      |
|----------------------------|-------------------------------|-------------|-----------------|------|------|
| No.                        | Description                   | Range       | Factory Setting | Unit | Note |
| 02-00                      | Motor No Load Current         | ----        |                 | A    | *3   |
| 02-01                      | Motor Rated Current (OL1)     | ----        |                 | A    |      |
| 02-02                      | Motor rated Slip Compensation | 0.0 ~ 100.0 | 0.0             | %    | *1   |
| 02-03                      | Motor Rated Speed             | ----        |                 | Rpm  |      |

| Group 03- Multi function Digital Inputs/Outputs |                              |                                                                                                                   |                 |       |      |
|-------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------|-------|------|
| No.                                             | Description                  | Range                                                                                                             | Factory Setting | Unit  | Note |
| 03-00                                           | Multifunction Input Term. S1 | 0:Forward/Stop Command or Run /Stop                                                                               | 0               | -     |      |
| 03-01                                           | Multifunction Input Term. S2 | 1:Reverse/Stop Command Or REV/FWD                                                                                 | 1               | -     |      |
| 03-02                                           | Multifunction Input Term. S3 | 2:Preset Speed 0 (5-02)                                                                                           | 8               | -     |      |
| 03-03                                           | Multifunction Input Term. S4 | 3:Preset Speed 1 (5-03)                                                                                           | 9               | -     |      |
| 03-04                                           | Multifunction Input Term. S5 | 4:Preset Speed 2 (5-05)                                                                                           | 17              | -     |      |
|                                                 |                              | 6:Jog Forward Command                                                                                             |                 |       |      |
|                                                 |                              | 7:Jog Reverse Command                                                                                             |                 |       |      |
|                                                 |                              | 8:Up Command                                                                                                      |                 |       |      |
|                                                 |                              | 9:Down Command                                                                                                    |                 |       |      |
|                                                 |                              | 10:Acc/Dec 2                                                                                                      |                 |       |      |
|                                                 |                              | 11:Acc/Dec Disabled                                                                                               |                 |       |      |
|                                                 |                              | 12:Main/Alternative Run Command select                                                                            |                 |       |      |
|                                                 |                              | 13:Main/Alternative Frequency Command select                                                                      |                 |       |      |
|                                                 |                              | 14:Rapid Stop ( Decel to stop)                                                                                    |                 |       |      |
|                                                 |                              | 15:Base Block                                                                                                     |                 |       |      |
|                                                 |                              | 16:Disable PID Function                                                                                           |                 |       |      |
|                                                 |                              | 17:Reset                                                                                                          |                 |       |      |
|                                                 |                              | 18:Auto Run Mode enable                                                                                           |                 |       |      |
| 03-05                                           | Reserved                     |                                                                                                                   |                 |       |      |
| 03-06                                           | Up/Down frequency band       | 0.00~5.00                                                                                                         | 0.00            | Hz    |      |
| 03-07                                           | Up/Down Frequency modes      | 0:When Up/Down is used, the preset frequency is held as the inverter stops, and the UP/Down function is disabled. | 0               | -     |      |
|                                                 |                              | 1:When Up/Down is used, the preset frequency is reset to 0 Hz as the inverter stops.                              |                 |       |      |
|                                                 |                              | 2:When Up/Down is used, the preset frequency is held as the inverter stops, and the UP/Down is available.         |                 |       |      |
| 03-08                                           | S1~S5 scan confirmation      | 1~400. Number of Scan cycles                                                                                      | 20              | 1mSec |      |
| 03-09                                           | S1~ S5 switch type select    | xxxx0:S1 NO    xxxx1:S1 NC                                                                                        | 00000           | -     |      |
|                                                 |                              | xxx0x:S2 NO    xxx1x:S2 NC                                                                                        |                 |       |      |
|                                                 |                              | xx0xx:S3 NO    xx1xx:S3 NC                                                                                        |                 |       |      |
|                                                 |                              | x0xxx:S4 NO    x1xxx:S4 NC                                                                                        |                 |       |      |
|                                                 |                              | 0xxxx:S5 NO    1xxxx:S5 NC                                                                                        |                 |       |      |
| 03-10                                           | Reserved                     |                                                                                                                   |                 |       |      |
| 03-11                                           | Output Relay(RY1)            | 0:Run                                                                                                             | 0               | -     |      |
|                                                 |                              | 1:Fault                                                                                                           |                 |       |      |
|                                                 |                              | 2:setting Frequency                                                                                               |                 |       |      |
|                                                 |                              | 3:Frequency Reached (3-13±3-14)                                                                                   |                 |       |      |
|                                                 |                              | 4:Frequency Threshold Level (> 3-13) - Frequency Reached                                                          |                 |       |      |
|                                                 |                              | 5:Frequency Threshold Level (< 3-13) - Frequency Reached                                                          |                 |       |      |
|                                                 |                              | 6:Auto Restart                                                                                                    |                 |       |      |
|                                                 |                              | 7:Momentary AC Power Loss                                                                                         |                 |       |      |
|                                                 |                              | 8:Rapid Stop Mode                                                                                                 |                 |       |      |
|                                                 |                              | 9:Base Block Stop Mode                                                                                            |                 |       |      |
|                                                 |                              | 10:Motor Overload Protection(OL1)                                                                                 |                 |       |      |
|                                                 |                              | 11:Drive Overload Protection(OL2)                                                                                 |                 |       |      |
|                                                 |                              | 13:Output current Reached                                                                                         |                 |       |      |
|                                                 |                              | 14:Brake control                                                                                                  |                 |       |      |



|              |                                       |                                             |      |     |    |
|--------------|---------------------------------------|---------------------------------------------|------|-----|----|
| <b>03-12</b> | Reserved                              |                                             |      |     |    |
| <b>03-13</b> | Output frequency detection level (Hz) | 0.00~650.00                                 | 0.00 | Hz  | *1 |
| <b>03-14</b> | Frequency Detection band              | 0.00~30.00                                  | 2.00 | Hz  | *1 |
| <b>03-15</b> | Output current detection level.       | 0.1~15.0                                    | 0.1  | A   |    |
| <b>03-16</b> | Output current detection period.      | 0.1~10.0                                    | 0.1  | Sec |    |
| <b>03-17</b> | External Brake Release level          | 0.00~20.00                                  | 0.00 | Hz  |    |
| <b>03-18</b> | External Brake Engage Level           | 0.00~20.00                                  | 0.00 | Hz  |    |
| <b>03-19</b> | Relay Output function type            | 0:A (Normally open)<br>1:B (Normally close) | 0    | -   |    |

※ “NO”: Normal open, “NC”: Normal close.

| Group 04- Analog signal inputs/ Analogue output functions |                                         |                                                                                                           |                 |       |      |
|-----------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------|-------|------|
| No.                                                       | Description                             | Range                                                                                                     | Factory Setting | Unit  | Note |
| <b>04-00</b>                                              | AVI/ACI analog Input signal type select | AVI ACI                                                                                                   | 0               | -     |      |
|                                                           |                                         | 0:0~10V 0~20mA                                                                                            |                 |       |      |
|                                                           |                                         | 1:0~10V 4~20mA                                                                                            |                 |       |      |
|                                                           |                                         | 2:2~10V 0~20mA                                                                                            |                 |       |      |
|                                                           |                                         | 3:2~10V 4~20mA                                                                                            |                 |       |      |
| <b>04-01</b>                                              | AVI Signal Verification Scan rate       | 1~400                                                                                                     | 100             | 1mSec |      |
| <b>04-02</b>                                              | AVI Gain                                | 0 ~ 1000                                                                                                  | 100             | %     | *1   |
| <b>04-03</b>                                              | AVI Bias                                | 0 ~ 100                                                                                                   | 0               | %     | *1   |
| <b>04-04</b>                                              | AVI Bias Selection                      | 0: Positive 1: Negative                                                                                   | 0               | -     | *1   |
| <b>04-05</b>                                              | AVI Slope                               | 0: Positive 1: Negative                                                                                   | 0               | -     | *1   |
| <b>04-06</b>                                              | ACI Signal Verification Scan rate       | 1~400                                                                                                     | 100             | 1mSec |      |
| <b>04-07</b>                                              | ACI Gain                                | 0 ~ 1000                                                                                                  | 100             | %     | *1   |
| <b>04-08</b>                                              | ACIBias                                 | 0 ~ 100                                                                                                   | 0               | %     | *1   |
| <b>04-09</b>                                              | ACI Bias Selection                      | 0: Positive 1: Negative                                                                                   | 0               | -     | *1   |
| <b>04-10</b>                                              | ACI Slope                               | 0: Positive 1: Negative                                                                                   | 0               | -     | *1   |
| <b>04-11</b>                                              | Analog Output mode(AO)                  | 0: Output Frequency<br>1: Frequency Command<br>2: Output Voltage<br>3: DC Bus Voltage<br>4: Motor Current | 0               | -     | *1   |
| <b>04-12</b>                                              | Analog Output AO Gain (%)               | 0 ~ 1000                                                                                                  | 100             | %     | *1   |
| <b>04-13</b>                                              | Analog Output AO Bias (%)               | 0 ~ 1000                                                                                                  | 0               | %     | *1   |
| <b>04-14</b>                                              | AO Bias Selection                       | 0: Positive<br>1: Negative                                                                                | 0               | -     | *1   |
| <b>04-15</b>                                              | AO Slope                                | 0: Positive<br>1: Negative                                                                                | 0               | -     | *1   |

| Group 05- Preset Frequency Selections. |                                     |                                                                                                          |                 |      |      |
|----------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------|------|------|
| No.                                    | Description                         | Range                                                                                                    | Factory Setting | Unit | Note |
| 05-00                                  | Preset Speed Control mode Selection | 0: Common Accel/Decel<br>Accel/Decel 1 or 2 apply to all speeds                                          | 0               | -    |      |
|                                        |                                     | 1: Individual Accel/Decel<br>Accel/ Decel 0-7 apply to the selected preset speeds (Acc0/Dec0~ Acc7/Dec7) |                 |      |      |
| 05-01                                  | Preset Speed 0 (Keypad Freq)        | 0.00 ~ 650.00                                                                                            | 5.00            | Hz   |      |
| 05-02                                  | Preset Speed1 (Hz)                  |                                                                                                          | 5.00            | Hz   | *1   |
| 05-03                                  | Preset Speed2 (Hz)                  |                                                                                                          | 10.00           | Hz   | *1   |
| 05-04                                  | Preset Speed3 (Hz)                  |                                                                                                          | 20.00           | Hz   | *1   |
| 05-05                                  | Preset Speed4 (Hz)                  |                                                                                                          | 30.00           | Hz   | *1   |
| 05-06                                  | Preset Speed5 (Hz)                  |                                                                                                          | 40.00           | Hz   | *1   |
| 05-07                                  | Preset Speed6 (Hz)                  |                                                                                                          | 50.00           | Hz   | *1   |
| 05-08                                  | Preset Speed7 (Hz)                  |                                                                                                          | 50.00           | Hz   | *1   |
| 05-09 ~ 05-16                          | Reserved                            |                                                                                                          |                 |      |      |
| 05-17                                  | Preset Speed0-Acctime               | 0.1 ~ 3600.0                                                                                             | 10.0            | Sec  | *1   |
| 05-18                                  | Preset Speed0-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-19                                  | Preset Speed1-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-20                                  | Preset Speed1-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-21                                  | Preset Speed2-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-22                                  | Preset Speed2-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-23                                  | Preset Speed3-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-24                                  | Preset Speed3-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-25                                  | Preset Speed4-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-26                                  | Preset Speed4-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-27                                  | Preset Speed5-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-28                                  | Preset Speed5-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-29                                  | Preset Speed6-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-30                                  | Preset Speed6-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |
| 05-31                                  | Preset Speed7-Acctime               |                                                                                                          | 10.0            | Sec  | *1   |
| 05-32                                  | Preset Speed7-Decetime              |                                                                                                          | 10.0            | Sec  | *1   |

| Group 06- Auto Run(Auto Sequencer) function |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |      |      |
|---------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------|
| No.                                         | Description                           | Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Factory Setting | Unit | Note |
| 06-00                                       | Auto Run (sequencer) mode selection   | 0: Disabled.<br>1: Single cycle.<br>(Continues to run from the Unfinished step if restarted).<br>2: Periodic cycle.<br>(Continues to run from the unfinished step if restarted).<br>3: Single cycle, then holds the speed Of final step to run.<br>(Continues to run from the unfinished step if restarted).<br>4: Single cycle.<br>(Starts a new cycle if restarted).<br>5: Periodic cycle.<br>(Starts a new cycle if restarted).<br>6: Single cycle, then hold the speed of final step to run<br>(Starts a new cycle if restarted). | 0               | -    |      |
| 06-01                                       | Auto _ Run Mode frequency command 1   | 0.00~650.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.00            | Hz   | *1   |
| 06-02                                       | Auto _ Run Mode frequency command 2   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00            | Hz   | *1   |
| 06-03                                       | Auto _ Run Mode frequency command 3   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00            | Hz   | *1   |
| 06-04                                       | Auto _ Run Mode frequency command 4   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00            | Hz   | *1   |
| 06-05                                       | Auto _ Run Mode frequency command 5   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00            | Hz   | *1   |
| 06-06                                       | Auto _ Run Mode frequency command 6   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00            | Hz   | *1   |
| 06-07                                       | Auto _ Run Mode frequency command 7   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.00            | Hz   | *1   |
| 06-08 ~ 06-15                               | Reserved                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |      |      |
| 06-16                                       | Auto_ Run Mode running time setting 0 | 0.0 ~ 3600.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.0             | Sec  |      |
| 06-17                                       | Auto_ Run Mode running time setting 1 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.0             | Sec  |      |
| 06-18                                       | Auto_ Run Mode running time setting 2 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.0             | Sec  |      |
| 06-19                                       | Auto_ Run Mode running time setting 3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.0             | Sec  |      |
| 06-20                                       | Auto_ Run Mode running time setting 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.0             | Sec  |      |
| 06-21                                       | Auto_ Run Mode running time setting 5 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.0             | Sec  |      |
| 06-22                                       | Auto_ Run Mode running time setting 6 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.0             | Sec  |      |
| 06-23                                       | Auto_ Run Mode running time setting 7 | 0.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Sec             |      |      |
| 06-24 ~ 06-31                               | Reserved                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |      |      |
| 06-32                                       | Auto_ Run Mode running direction 0    | 0: Stop<br>1: Forward                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0               | -    |      |
| 06-33                                       | Auto_ Run Mode running direction 1    | 2: Reverse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0               | -    |      |

|              |                                      |  |   |   |  |
|--------------|--------------------------------------|--|---|---|--|
| <b>06-34</b> | Auto_Run Mode<br>running direction 2 |  | 0 | - |  |
| <b>06-35</b> | Auto_Run Mode<br>running direction 3 |  | 0 | - |  |
| <b>06-36</b> | Auto_Run Mode<br>running direction 4 |  | 0 | - |  |
| <b>06-37</b> | Auto_Run Mode<br>running direction 5 |  | 0 | - |  |
| <b>06-38</b> | Auto_Run Mode<br>running direction 6 |  | 0 | - |  |
| <b>06-39</b> | Auto_Run Mode<br>running direction 7 |  | 0 | - |  |

| <b>Group 07- Start/Stop command setup</b> |                                                      |                                                                                               |                        |             |             |
|-------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------|-------------|-------------|
| <b>No.</b>                                | <b>Description</b>                                   | <b>Range</b>                                                                                  | <b>Factory Setting</b> | <b>Unit</b> | <b>Note</b> |
| <b>07-00</b>                              | Momentary Power Loss and Restart                     | 0: Momentary Power Loss and Restart disable<br>1: Momentary power loss and restart enable     | 0                      | -           |             |
| <b>07-01</b>                              | Auto Restart Delay Time                              | 0.0~800.0                                                                                     | 0.0                    | Sec         |             |
| <b>07-02</b>                              | Number of Auto Restart Attempts                      | 0~10                                                                                          | 0                      | -           |             |
| <b>07-03</b>                              | Reset Mode Setting                                   | 0: Enable Reset Only when Run Command is Off<br>1: Enable Reset when Run Command is On or Off | 0                      | -           |             |
| <b>07-04</b>                              | Direct Running After Power Up                        | 0: Enable Direct run on power up<br>1: Disable Direct run on power up                         | 1                      | -           |             |
| <b>07-05</b>                              | Delay-ON Timer                                       | 1.0~300.0                                                                                     | 1.0                    | Sec         |             |
| <b>07-06</b>                              | DC Injection Brake Start Frequency (Hz) In Stop mode | 0.10 ~ 10.00                                                                                  | 1.5                    | Hz          |             |
| <b>07-07</b>                              | DC Injection Brake Level (%) In stop mode            | 0 ~20                                                                                         | 5                      | %           |             |
| <b>07-08</b>                              | DC Injection Brake Time (Seconds) In stop mode       | 0.0 ~ 25.5                                                                                    | 0.5                    | Sec         |             |
| <b>07-09</b>                              | Stopping Method                                      | 0: Deceleration to stop<br>1: Cost to stop                                                    | 0                      |             |             |

| Group 08- Drive & Motor Protection functions |                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                             |      |
|----------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------|------|
| No.                                          | Description                                         | Range                                                                                                                                                                                                                                                                                                                                                                                                                    | Factory Setting | Unit                        | Note |
| 08-00                                        | Trip Prevention Selection                           | xxxx0: Enable Trip Prevention During Acceleration<br>xxxx1: Disable Trip Prevention During Acceleration<br>xxx0x: Enable Trip Prevention During Deceleration<br>xxx1x: Disable Trip Prevention During Deceleration<br>xx0xx: Enable Trip Prevention in Run Mode<br>xx1xx: Disable Trip Prevention in Run Mode<br>x0xxx: Enable over voltage Prevention in Run Mode<br>x1xxx: Disable over voltage Prevention in Run Mode | 00000           | -                           |      |
| 08-01                                        | Trip Prevention Level During Acceleration (%)       | 50 ~ 200                                                                                                                                                                                                                                                                                                                                                                                                                 | 200             | Inverter Rated Current 100% |      |
| 08-02                                        | Trip Prevention Level During Deceleration (%)       | 50 ~ 200                                                                                                                                                                                                                                                                                                                                                                                                                 | 200             |                             |      |
| 08-03                                        | Trip Prevention Level In Run Mode (%)               | 50 ~ 200                                                                                                                                                                                                                                                                                                                                                                                                                 | 200             |                             |      |
| 08-04                                        | over voltage Prevention Level in Run Mode           | 350~390                                                                                                                                                                                                                                                                                                                                                                                                                  | 380             | VDC                         |      |
| 08-05                                        | Electronic Motor Overload Protection Operation Mode | 0: Enable Electronic Motor Overload Protection<br>1: Disable Electronic Motor Overload Protection                                                                                                                                                                                                                                                                                                                        | 0               | -                           |      |
| 08-06                                        | Operation After Overload Protection is Activated    | 0: Coast-to-Stop After Overload Protection is Activated<br>1: Drive Will Not Trip when Overload Protection is Activated (OL1)                                                                                                                                                                                                                                                                                            | 0               | -                           |      |
| 08-07                                        | Over heat Protection (cooling fan control)          | 0: Auto (Depends on temp.)<br>1: Operate while in RUN mode<br>2: Always Run<br>3: Disabled                                                                                                                                                                                                                                                                                                                               | 1               | -                           |      |
| 08-08                                        | AVR Function (Auto Voltage Regulation)              | 0: AVR function enable                                                                                                                                                                                                                                                                                                                                                                                                   | 4               | -                           |      |
|                                              |                                                     | 1: AVR function Disable                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                             |      |
|                                              |                                                     | 2: AVR function disable for stop                                                                                                                                                                                                                                                                                                                                                                                         |                 |                             |      |
|                                              |                                                     | 3: AVR function disable for deceleration                                                                                                                                                                                                                                                                                                                                                                                 |                 |                             |      |
|                                              |                                                     | 4: AVR function disable for stop and deceleration.                                                                                                                                                                                                                                                                                                                                                                       |                 |                             |      |
|                                              |                                                     | 5: When VDC>360V, AVR function disable for stop and deceleration.                                                                                                                                                                                                                                                                                                                                                        |                 |                             |      |
| 08-09                                        | Input phase lost protection                         | 0: Disabled<br>1: Enabled                                                                                                                                                                                                                                                                                                                                                                                                | 0               | -                           |      |

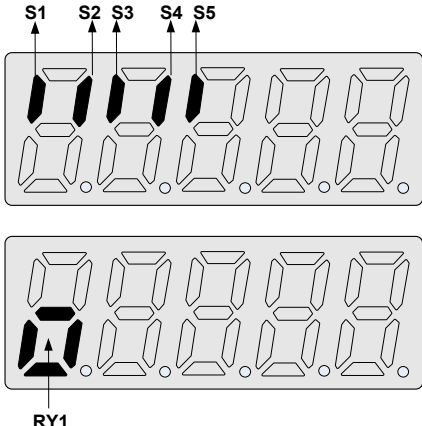
| Group 09- Communication function setup |                                            |                                                                                                                                                               |                 |      |      |
|----------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------|
| No.                                    | Description                                | Range                                                                                                                                                         | Factory Setting | Unit | Note |
| 09-00                                  | Assigned Communication Station Number      | 1 ~ 32                                                                                                                                                        | 1               | -    | *2*3 |
| 09-01                                  | RTU code /ASCII code select                | 0:RTU code<br>1:ASCII code                                                                                                                                    | 0               | -    | *2*3 |
| 09-02                                  | Baud Rate Setting (bps)                    | 0:4800<br>1:9600<br>2:19200<br>3:38400                                                                                                                        | 2               | bps  | *2*3 |
| 09-03                                  | Stop Bit Selection                         | 0:1 Stop Bit<br>1:2 Stop Bits                                                                                                                                 | 0               | -    | *2*3 |
| 09-04                                  | Parity Selection                           | 0:Without Parity<br>1:With Even Parity<br>2:With Odd Parity                                                                                                   | 0               | -    | *2*3 |
| 09-05                                  | Data Format Selection                      | 0: 8-Bits Data<br>1: 7-Bits Data                                                                                                                              | 0               | -    | *2*3 |
| 09-06                                  | Communication time-out detection time      | 0.0 ~ 25.5                                                                                                                                                    | 0.0             | Sec  |      |
| 09-07                                  | Communication time-out operation selection | 0:Deceleration to stop<br>(00-15: Deceleration time 1)<br>1:Coast to stop<br>2: Deceleration to stop<br>(00-17: Deceleration time 2)<br>3: continue operating | 0               | -    |      |
| 09-08                                  | Error 6 verification time.                 | 1 ~ 20                                                                                                                                                        | 3               |      |      |
| 09-09                                  | Drive Transmit delay Time (ms)             | 5 ~ 65                                                                                                                                                        | 5               | mSec |      |

| Group10- PID function Setup |                                                                              |                                                                                                                                                                                                                                        |                 |      |      |
|-----------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------|
| No.                         | Description                                                                  | Range                                                                                                                                                                                                                                  | Factory Setting | Unit | Note |
| 10-00                       | PID target value selection<br>(when 00-03\00-04=6, this function is enabled) | 0: Potentiometer on Keypad<br>1: Analog Signal Input. (AVI)<br>2: Analog Signal Input. (ACI)<br>3: Frequency set by communication<br>4: KeyPad Frequency parameter 10-02                                                               | 1               | -    | *1   |
| 10-01                       | PID feedback value selection                                                 | 0: Potentiometer on Keypad<br>1: Analog Signal Input. (AVI)<br>2: Analog Signal Input. (ACI)<br>3: Frequency set by communication<br>4: KeyPad Frequency parameter 10-02                                                               | 2               | -    | *1   |
| 10-02                       | PID Target (keypad input)                                                    | 0.0~100.0                                                                                                                                                                                                                              | 50.0            | %    | *1   |
| 10-03                       | PID Mode Selection                                                           | 0: Disabled<br>1: Deviation D Control. <b>FWD Characteristic.</b><br>2: Feedback D Control <b>FWD Characteristic.</b><br>3: Deviation D Control <b>Reverse Characteristic.</b><br>4: Feedback D Control <b>Reverse Characteristic.</b> | 0               | -    |      |
| 10-04                       | Feedback Gain Coefficient                                                    | 0.00 ~ 10.00                                                                                                                                                                                                                           | 1.00            | %    | *1   |
| 10-05                       | Proportional Gain                                                            | 0.0 ~ 10.0                                                                                                                                                                                                                             | 1.0             | %    | *1   |
| 10-06                       | Integral Time                                                                | 0.0 ~ 100.0                                                                                                                                                                                                                            | 10.0            | Sec  | *1   |
| 10-07                       | Derivative Time                                                              | 0.00 ~ 10.00                                                                                                                                                                                                                           | 0.00            | Sec  | *1   |
| 10-08                       | PID Offset                                                                   | 0: Positive<br>1: Negative                                                                                                                                                                                                             | 0               | -    | *1   |
| 10-09                       | PID Offset Adjust                                                            | 0 ~ 109                                                                                                                                                                                                                                | 0               | %    | *1   |
| 10-10                       | PID Output Lag Filter Time                                                   | 0.0 ~ 2.5                                                                                                                                                                                                                              | 0.0             | Sec  | *1   |
| 10-11                       | Feedback Loss Detection Mode                                                 | 0: Disabled<br>1: Enabled - Drive Continues to Operate After Feedback Loss<br>2: Enabled - Drive "STOPS" After Feedback Loss                                                                                                           | 0               | -    |      |
| 10-12                       | Feedback Loss Detection Level                                                | 0 ~ 100                                                                                                                                                                                                                                | 0               | %    |      |
| 10-13                       | Feedback Loss Detection Delay Time                                           | 0.0 ~ 25.5                                                                                                                                                                                                                             | 1.0             | Sec  |      |
| 10-14                       | Integration Limit Value                                                      | 0 ~ 109                                                                                                                                                                                                                                | 100             | %    | *1   |
| 10-15                       | Integral Value Resets to Zero when Feedback Signal Equals the Target Value   | 0: Disabled<br>1: 1 Second<br>30: 30 Seconds(0 ~ 30)                                                                                                                                                                                   | 0               | -    |      |
| 10-16                       | Allowable Integration Error Margin (units)(1unit = 1/8192)                   | 0 ~ 100                                                                                                                                                                                                                                | 0               | -    |      |
| 10-17                       | PID Sleep Frequency Level                                                    | 0.00~650.00                                                                                                                                                                                                                            | 0.00            | Hz   |      |
| 10-18                       | PID Sleep Function Delay Time                                                | 0.0 ~ 25.5                                                                                                                                                                                                                             | 0.0             | Sec  |      |
| 10-19                       | PID Wake up frequency Level                                                  | 0.00 ~ 650.00                                                                                                                                                                                                                          | 0.00            | Hz   |      |
| 10-20                       | PID Wake up function Delay Time                                              | 0.0 ~ 25.5                                                                                                                                                                                                                             | 0.0             | Sec  |      |
| 10-21                       | Max PID Feedback Setting                                                     | 0 ~ 999                                                                                                                                                                                                                                | 100             | -    | *1   |
| 10-22                       | Min PID Feedback Setting                                                     | 0 ~ 999                                                                                                                                                                                                                                | 0               | -    | *1   |

| Group11- Performance Control functions |                                                 |                                                                                                              |                 |      |      |
|----------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------|------|------|
| No.                                    | Description                                     | Range                                                                                                        | Factory Setting | unit | Note |
| 11-00                                  | Reverse operation control                       | 0: Reverse command is enabled<br>1: Reverse command is disabled                                              | 0               | -    |      |
| 11-01                                  | Carrier Frequency (kHz)                         | 1~16                                                                                                         | 5               | KHz  |      |
| 11-02                                  | Carrier mode Selection                          | 0: Mode0, 3phase PWM modulation<br>1: Mode1, 2phase PWM modulation<br>2: Mode2, 2phase random PWM modulation | 0               | -    |      |
| 11-03                                  | Carrier Frequency Reduction by temperature rise | 0:disabled<br>1:enabled                                                                                      | 0               | -    |      |
| 11-04                                  | S-Curve Acc 1                                   | 0.0 ~ 4.0                                                                                                    | 0.00            | Sec  |      |
| 11-05                                  | S-Curve Acc 2                                   | 0.0 ~ 4.0                                                                                                    | 0.00            | Sec  |      |
| 11-06                                  | S-Curve Dec 3                                   | 0.0 ~ 4.0                                                                                                    | 0.00            | Sec  |      |
| 11-07                                  | S-Curve Dec 4                                   | 0.0 ~ 4.0                                                                                                    | 0.00            | Sec  |      |
| 11-08                                  | Skip Frequency 1                                | 0.00 ~ 650.00                                                                                                | 0.00            | Hz   | *1   |
| 11-09                                  | Skip Frequency 2                                | 0.00 ~ 650.00                                                                                                | 0.00            | Hz   | *1   |
| 11-10                                  | Skip Frequency 3                                | 0.00 ~ 650.00                                                                                                | 0.00            | Hz   | *1   |
| 11-11                                  | Skip Frequency Bandwidth (±)                    | 0.00 ~ 30.00                                                                                                 | 0.00            | Hz   | *1   |

| Group12 Digital Display & Monitor Monitor functions |                                        |                                                  |                 |      |      |
|-----------------------------------------------------|----------------------------------------|--------------------------------------------------|-----------------|------|------|
| No.                                                 | Description                            | Range                                            | Factory Setting | Unit | Note |
| 12-00                                               | Extended Display Mode                  | 00000 ~77777.<br>Each digit can be set to 0 to 7 | 00000           | -    | *1   |
|                                                     |                                        | 0: Default display (frequency&parameters)        |                 |      |      |
|                                                     |                                        | 1:Output Current                                 |                 |      |      |
|                                                     |                                        | 2:Output Voltage                                 |                 |      |      |
|                                                     |                                        | 3:DC voltage                                     |                 |      |      |
|                                                     |                                        | 4:Temperature                                    |                 |      |      |
|                                                     |                                        | 5:PID feedback                                   |                 |      |      |
|                                                     |                                        | 6: Analog Signal Input. (AVI)                    |                 |      |      |
|                                                     |                                        | 7: Analog Signal Input. (ACI)                    |                 |      |      |
| 12-01                                               | PID Feedback Display format            | 0: Integer (xxx)                                 | 0               | -    | *1   |
|                                                     |                                        | 1:One decimal Place (xx.x)                       |                 |      |      |
|                                                     |                                        | 2:Two Decimal Places (x.xx)                      |                 |      |      |
| 12-02                                               | PID Feedback Display Unit Setting      | 0:xxx--                                          | 0               | -    | *1   |
|                                                     |                                        | 1:xxxpb (pressure)                               |                 |      |      |
|                                                     |                                        | 2:xxxfl (flow)                                   |                 |      |      |
| 12-03                                               | Custom Units (Line Speed) Value        | 0~65535                                          | 1500/1800       | RPM  | *1   |
| 12-04                                               | Custom Units (Line Speed) Display Mode | 0:Drive Output Frequency is Displayed            | 0               | -    | *1   |
|                                                     |                                        | 1:Line Speed. Integer.(xxxxx)                    |                 |      |      |
|                                                     |                                        | 2:Line Speed..One Decimal Place (xxxx.x)         |                 |      |      |
|                                                     |                                        | 3:Line Speed.Two Decimal Places (xxx.xx)         |                 |      |      |
|                                                     |                                        | 4:Line Speed.Three Decimal Places (xx.xxx)       |                 |      |      |



|       |                                                                |                                                                                   |   |   |    |
|-------|----------------------------------------------------------------|-----------------------------------------------------------------------------------|---|---|----|
| 12-05 | Inputs and output<br>Logic status display<br>( S1 to S5) & RY1 |  | - | - | *4 |
|-------|----------------------------------------------------------------|-----------------------------------------------------------------------------------|---|---|----|

| Group 13 Inspection & Maintenance functions |                                 |                                                                                                                                                                                    |                 |      |           |
|---------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|-----------|
| No.                                         | Description                     | Range                                                                                                                                                                              | Factory Setting | unit | attribute |
| 13-00                                       | Drive Horsepower Code           | ----                                                                                                                                                                               | -               | -    | *3        |
| 13-01                                       | Software Version                | ----                                                                                                                                                                               | -               | -    | *3*4      |
| 13-02                                       | Fault Log (Last 3 Faults)       | ----                                                                                                                                                                               | -               | -    | *3*4      |
| 13-03                                       | Accumulated Operation Time1 1   | 0~23                                                                                                                                                                               | -               | hour | *3        |
| 13-04                                       | Accumulated Operation Time1 2   | 0~65535                                                                                                                                                                            | ----            | day  | *3        |
| 13-05                                       | Accumulated Operation Time Mode | 0:Time Under Power<br>1:Run Mode Time Only                                                                                                                                         | 0               | -    | *3        |
| 13-06                                       | Parameter Lock                  | 0: Enable all Functions<br>1: Preset speeds 05-01~05-08 cannot be changed<br>2: All Functions cannot be changed<br>Except for Preset speeds 05-01~05-08<br>3: Disable All Function | 0               | -    |           |
| 13-07                                       | Parameter password              | 00000~65535                                                                                                                                                                        | 00000           | -    |           |
| 13-08                                       | Reset Drive to Factory Settings | 1150: Reset to factory setting. 50Hz system.<br>1160: Reset to factory setting. 60Hz system.                                                                                       | 00000           | -    |           |

## 4.3 Parameter Function Description

### 00- Basic parameter group

|               |                                              |
|---------------|----------------------------------------------|
| <b>00- 01</b> | <b>Motor Direction Control</b>               |
| <b>Range</b>  | <b>[0] : Forward</b><br><b>[1] : Reverse</b> |

➤ 00 - 01 Is valid in key pad mode only.

※Note: When Reverse function is disabled by parameter 11- 00=1 setting 00-01 to 1 ." LOC" will be displayed

|               |                                                                                             |
|---------------|---------------------------------------------------------------------------------------------|
| <b>00- 02</b> | <b>Main Run Command Source selection</b>                                                    |
| <b>00- 03</b> | <b>Alternative Run Command Source selection</b>                                             |
| <b>Range</b>  | <b>[0] : Keypad</b><br><b>[1] : External Run/Stop Control</b><br><b>[2] : Communication</b> |

➤ Parameter 00 - 02/00- 03 sets the inverter operation command source. For switching between 00-02 and 00-03, use any of the external inputs S1 to S5 and set the relevant parameter (03-00~03-04) to [12]. refer to parameter group3.

|               |                                                                                                                               |
|---------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>00- 04</b> | <b>Operation modes for external terminals</b>                                                                                 |
| <b>Range</b>  | <b>[0] : Forward/stop-reverse/stop</b><br><b>[1] : Run/stop-forward/reverse</b><br><b>[2] : 3-wire control mode -run/stop</b> |

➤ 00-04 Is valid when Run command is set to External mode by 00- 02/00- 03 =1.

#### 2-wire operation mode:

Set 00-04= [0/1] first, before setting (03-00,03-04) to[0] or [1]

00-04= [0] Set external terminals (03-00 to 03-04) function to 0 for FWD/Stop or Set to 1 for REV/Stop.

00-04= [1] Set external terminals (03-00 to 03-04) function to 0 for Run/Stop or Set to 1 for FWD/REV.

#### 3-wire operation mode:

00-04 = [2] Terminals S1, S2, S3 are used in a combination to enable 3 wire run/stop mode.

Settings for 03-00, 03-01, 03-02 will not be effective. (refer to Group 03)

|               |                                                                                                                                                                                                                                                                                                           |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>00- 05</b> | <b>Main Frequency Command Source Selection</b>                                                                                                                                                                                                                                                            |
| <b>00- 06</b> | <b>Alternative Frequency Command Source Selection</b>                                                                                                                                                                                                                                                     |
| <b>Range</b>  | <b>[0] :UP/DOWN of Keypad</b><br><b>[1] :Potentiometer on Keypad</b><br><b>[2] :External AVI Analog Signal Input</b><br><b>[3] :External ACI Analog Signal Input</b><br><b>[4] :External Up/Down Frequency Control</b><br><b>[5] :Communication setting Frequency</b><br><b>[6] :PID Output frequency</b> |

➤ When 00-06 =[6], frequency command source is output of the PID.

|               |                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------|
| <b>00- 07</b> | <b>Main and Alternative Frequency Command Modes</b>                                              |
| <b>Range</b>  | <b>[0] :Main Or Alternative Frequency.</b><br><b>[1] :Main frequency + Alternative Frequency</b> |

➤ When 00-07= [0] , the frequency source is set by the **Main frequency** parameter 00-05 (Default) Or by the **Alternative frequency** parameter 00-06.

Use any of the external terminals S1 to S5 and set the relevant parameter 03-00 to 03-04 = [13] to switch from **main** to **Alternative** source.

➤ When 00 - 07 = [1]

|               |                                        |
|---------------|----------------------------------------|
| <b>00- 08</b> | <b>Communication Frequency Command</b> |
| <b>Range</b>  | <b>【0.00~650.00】 Hz</b>                |

- This parameter can be used to set frequency command
- This parameter can be used to read the set frequency in communication mode
- This parameter is only effective in the communication mode.

|               |                                                                  |
|---------------|------------------------------------------------------------------|
| <b>00- 09</b> | <b>Frequency Command save on power down (Communication mode)</b> |
| <b>Range</b>  | <b>【0】 :disable<br/>【1】 :enable</b>                              |

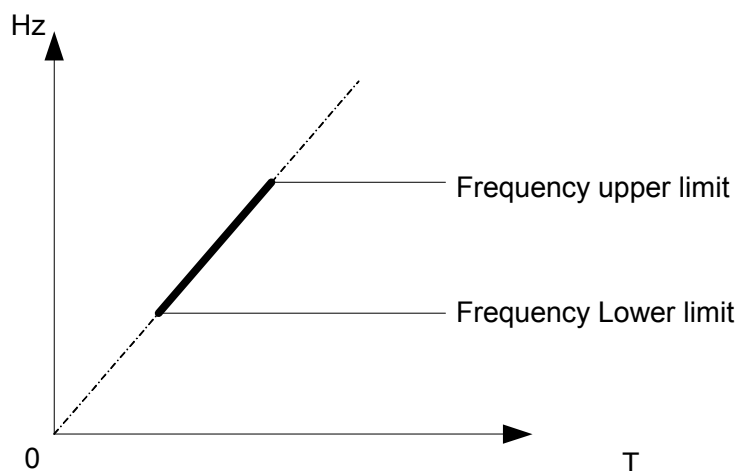
- 00-09= **【0】** Keypad frequency is saved.
- 00-09= **【1】** **Frequency set by communication is saved.**

|              |                                                                                     |
|--------------|-------------------------------------------------------------------------------------|
| <b>00-10</b> | <b>Initial Frequency Selection</b>                                                  |
| <b>Range</b> | <b>【0】 :By Current Freq Command<br/>【1】 :By Zero Freq Command<br/>【2】 :By 00-11</b> |
| <b>00-11</b> | <b>Initial Frequency Setpoint</b>                                                   |
| <b>Range</b> | <b>【0.00~650.00】 Hz</b>                                                             |

- This parameter is only effective in keypad mode..
- When 00-10= **【0】** ,the initial frequency will be current frequency.
- When 00-10= **【1】** ,the initial frequency will be 0.
- When 00-10= **【2】** ,the initial frequency will be as set by parameter 00-11.

|              |                              |
|--------------|------------------------------|
| <b>00-12</b> | <b>Frequency Upper limit</b> |
| <b>Range</b> | <b>【0.01~650.00】 Hz</b>      |
| <b>00-13</b> | <b>Frequency Lower limit</b> |
| <b>Range</b> | <b>【0.00~649.99】 Hz</b>      |

- When 00-13 and the command frequency are both set to 0.00, if RUN is pressed " Stpo" is displayed.
- When Frequency command is > than preset in 00-13 inverter output will ramp up from 0.00 to the command frequency.
- When 00-13> 0, and the frequency command value ≤ 00-13, inverter output will ramp up from preset in lower limit to the command frequency.

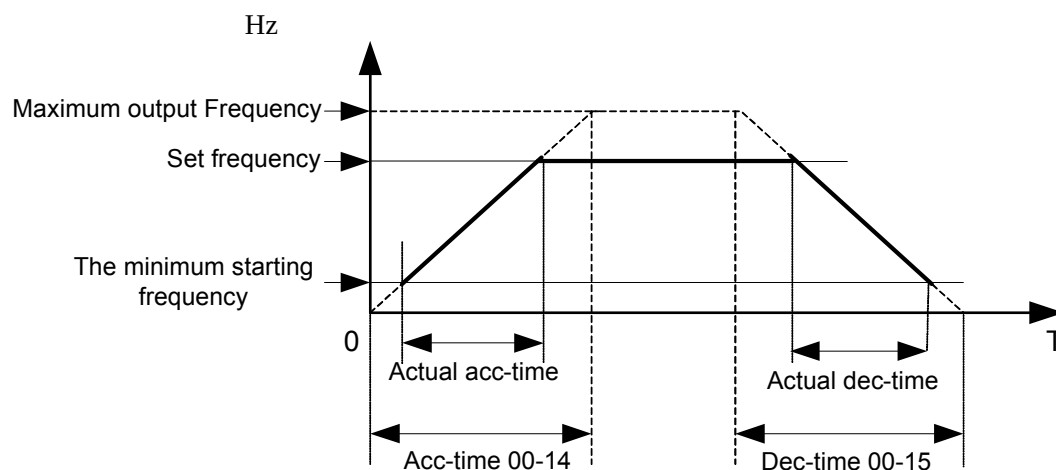


|              |                            |
|--------------|----------------------------|
| <b>00-14</b> | <b>Acceleration time 1</b> |
| <b>Range</b> | <b>【0.1~3600.0】 Sec</b>    |
| <b>00-15</b> | <b>Deceleration time 1</b> |
| <b>Range</b> | <b>【0.1~3600.0】 Sec</b>    |
| <b>00-16</b> | <b>Acceleration time 2</b> |
| <b>Range</b> | <b>【0.1~3600.0】 Sec</b>    |
| <b>00-17</b> | <b>Deceleration time 2</b> |
| <b>Range</b> | <b>【0.1~3600.0】 Sec</b>    |

- Preset Acceleration and Deceleration times by above parameters are the time taken for the output frequency to ramp up or ramp down between the Upper and the lower frequency limits.
- Actual acceleration and deceleration time is calculated as follows:
- 

$$\text{Actual acceleration time} = \frac{(00-14) \times (\text{set frequency} - \text{the minimum starting frequency})}{\text{Maximum output frequency}}$$

$$\text{Actual deceleration time} = \frac{(00-15) \times (\text{set frequency} - \text{the minimum starting frequency})}{\text{Maximum output frequency}}$$



|              |                              |
|--------------|------------------------------|
| <b>00-18</b> | <b>Jog Frequency</b>         |
| <b>Range</b> | <b>【1.00~25.00】 Hz</b>       |
| <b>00-19</b> | <b>Jog Acceleration Time</b> |
| <b>Range</b> | <b>【0.1~3600.0】 Sec</b>      |
| <b>00-20</b> | <b>Jog Deceleration Time</b> |
| <b>Range</b> | <b>【0.1~3600.0】 Sec</b>      |

- The JOG function is operational by using the multi-function input terminals S1 to S5 and setting the relevant parameters 03-00~03-04 to 【6】 JOG FWD or 【7】 JOG REV. Refer to parameter group 3.

| 01-V/F command group |                         |
|----------------------|-------------------------|
| 01- 00               | Volts/Hz Patterns (V/F) |
| Range                | 【1~7】                   |

- Set 01-00 to one of the following preset V/f selections 【1~6】 according to the required application.
- Parameters 01-02~01-09 are not applicable.
- Six fixed V/f patterns are shown below. 【1~3】 for 50 Hz systems and 【4~6】 for 60 Hz.

| TYPE              | 50Hz  |             | 60Hz  |             |
|-------------------|-------|-------------|-------|-------------|
| Function          | 01-00 | V/F pattern | 01-00 | V/F pattern |
| General Use       | = 【1】 |             | = 【4】 |             |
| High start torque | = 【2】 |             | = 【5】 |             |
| Decreasing torque | = 【3】 |             | = 【6】 |             |

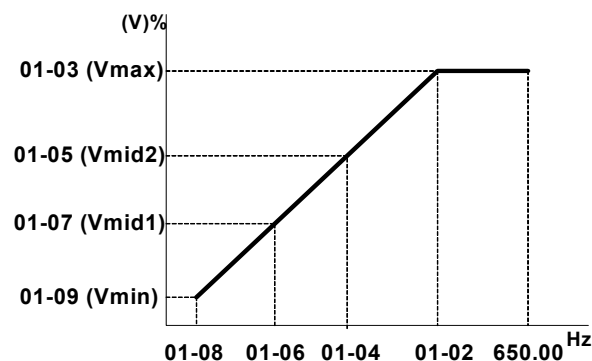
- (V) 100% is the maximum output voltage. B, C point preset % settings will be as table below:-

| 01- 00 | B(Xb) | C(Xc) |
|--------|-------|-------|
| 1/4    | 10%   | 8%    |
| 2/5    | 15%   | 10.5% |
| 3/6    | 25%   | 7.7%  |

- Setting 01-00 =[7] provides a flexible V/F curve which can be selected by experienced users by setting parameters (01-02~01-09).

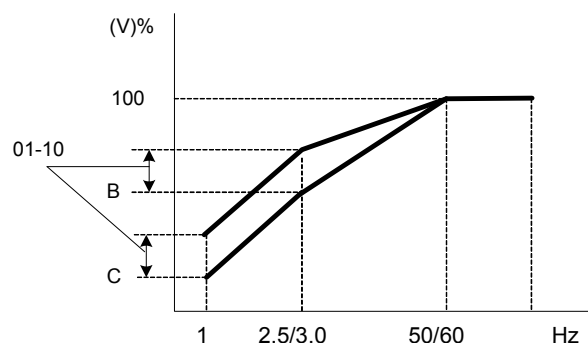
|               |                                         |
|---------------|-----------------------------------------|
| <b>01- 01</b> | <b>v/f Maximum voltage</b>              |
| <b>Range</b>  | <b>【198.0~256.0】 V</b>                  |
| <b>01- 02</b> | <b>Maximum Frequency</b>                |
| <b>Range</b>  | <b>【0.20 ~ 650.00】 Hz</b>               |
| <b>01- 03</b> | <b>Maximum Frequency Voltage Ratio</b>  |
| <b>Range</b>  | <b>【0.0 ~ 100.0】 %</b>                  |
| <b>01- 04</b> | <b>Medium Frequency 2</b>               |
| <b>Range</b>  | <b>【0.10 ~ 650.00】 Hz</b>               |
| <b>01- 05</b> | <b>Medium Frequency Voltage Ratio 2</b> |
| <b>Range</b>  | <b>【0.0 ~ 100.0】 %</b>                  |
| <b>01- 06</b> | <b>Medium Frequency 1</b>               |
| <b>Range</b>  | <b>【0.10 ~ 650.00】 Hz</b>               |
| <b>01- 07</b> | <b>Medium Frequency Voltage Ratio 1</b> |
| <b>Range</b>  | <b>【0.0 ~ 100.0】 %</b>                  |
| <b>01- 08</b> | <b>Minimum Frequency</b>                |
| <b>Range</b>  | <b>【0.10 ~ 650.00】 Hz</b>               |
| <b>01- 09</b> | <b>Minimum Frequency Voltage Ratio</b>  |
| <b>Range</b>  | <b>【0.0 ~ 100.0】 %</b>                  |

- Max output frequency depends on parameter 01=00 , for 01-00= 【7】 It can be set by parameter 01-02.
- For 01-00 ≠ 【7】 , the maximum output frequency is fixed to 50.00HZ or 60.00HZ de[pending on default supply frequency. ( Parameter 01-02 is not applicable)



|              |                                                   |
|--------------|---------------------------------------------------|
| <b>01-10</b> | <b>Volts/Hz Curve Modification (Torque Boost)</b> |
| <b>Range</b> | <b>【0 ~ 10.0】 %</b>                               |

- Inverter output V / F curve settings for points B, C can be adjusted by parameter 01-10 to improve the output torque.
- Calculation of B, C point voltage: B point voltage =  $X_b \times \text{maximum output voltage}$ , C point voltage =  $X_c \times \text{maximum output voltage}$  ( $X_b$ ,  $X_c$  see Page 4-16). When 01-10 = 0, the torque improvement is disabled.



|              |                            |
|--------------|----------------------------|
| <b>01-11</b> | <b>V/F start Frequency</b> |
| <b>Range</b> | <b>【0.00 ~10.00】 Hz</b>    |

## 02- Motor parameter group

|               |                                      |
|---------------|--------------------------------------|
| <b>02- 00</b> | <b>Motor no load current</b>         |
| <b>Range</b>  | <b>----</b>                          |
| <b>02- 01</b> | <b>Motor Rated Current</b>           |
| <b>Range</b>  | <b>----</b>                          |
| <b>02- 02</b> | <b>Motor rated Slip Compensation</b> |
| <b>Range</b>  | <b>【0.0 ~ 100.0】 (%)</b>             |
| <b>02- 03</b> | <b>Motor Rated Speed</b>             |
| <b>Range</b>  | <b>----</b>                          |

- When the load causes the actual motor speed to be reduced below the speed set by inverter output frequency (Slip) , parameter 02-02 Slip compensation can be used to correct the speed.

$$\text{Slip compensation boost} = \frac{\text{Output Current}-(02-00)}{(02-01)-(02-00)} \times (02-02) \times \text{Rate motor slip}$$

Motor slip = Motor synchronous speed- Motor Rated Speed

$$(02-02)\text{approximate Value} = \frac{\text{Motor synchronization speed}-\text{Rated speed}}{\text{Motor synchronization speed}}$$

$$\text{Motor synchronization speed(RPM)} = \frac{120}{\text{Motor Poles}} \times \text{Motor rate frequency(50/60Hz)}$$

$$\text{Example: 4 poles, 60Hz induction motor synchronization speed} = \frac{120}{4} \times 60 = 1800(\text{RPM})$$

※Note: 02- 00/02- 01 differs with the inverter capacities (13- 00),It should be regulated according to actual conditions.

### 03- External digital inputs & Realy Output functions

|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 03- 00 | Multifunction Input Term. S1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03- 01 | Multifunction Input Term. S2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03- 02 | Multifunction Input Term. S3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03- 03 | Multifunction Input Term. S4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03- 04 | Multifunction Input Term. S5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Range  | <p> <b>【0】</b> :Forward/Stop Command----- (Parameters 00- 02/00-03=1 &amp; 00-04)<br/> <b>【1】</b> :Reverse/Stop Command----- (Parameters 00-02/00-03=1 &amp; 00-04)<br/> <b>【2】</b> :Preset Speed 0 (5- 02)----- (Parameter Group5)<br/> <b>【3】</b> :Preset Speed 1 (5- 03)----- (Parameter Group5)<br/> <b>【4】</b> :Preset Speed 2 (5- 05) ----- (Parameter Group5)<br/> <b>【6】</b> :JOG Forward Command----- (Parameters 00-18~00-20)<br/> <b>【7】</b> :JOG Reverse Command----- (Parameters 00-18~00-20)<br/> <b>【8】</b> :Up Command----- (Parameters 00- 05/00- 06=4&amp; 03-06/03-07)<br/> <b>【9】</b> :Down Command----- (Parameters 00- 05/00- 06=4&amp; 03-06/03-07)<br/> <b>【10】</b> : 2<sup>nd</sup> Acc/Dec times<br/> <b>【11】</b> : Disable Acc/Dec<br/> <b>【12】</b> : Main/ Alternative run source Select----- (Parameters 00- 02/00- 03)<br/> <b>【13】</b> : Main/Alternative Frequency Command Select---- (Parameters 00- 05/00- 06)<br/> <b>【14】</b> : Rapid Stop (controlled deceleration stop)<br/> <b>【15】</b> : Base Block (Coast to stop)<br/> <b>【16】</b> : Disable PID Function.----- (Parameter Goup10)<br/> <b>【17】</b> : Reset<br/> <b>【18】</b> : Enable Auto Run Mode----- (Parameter Group 6) </p> |

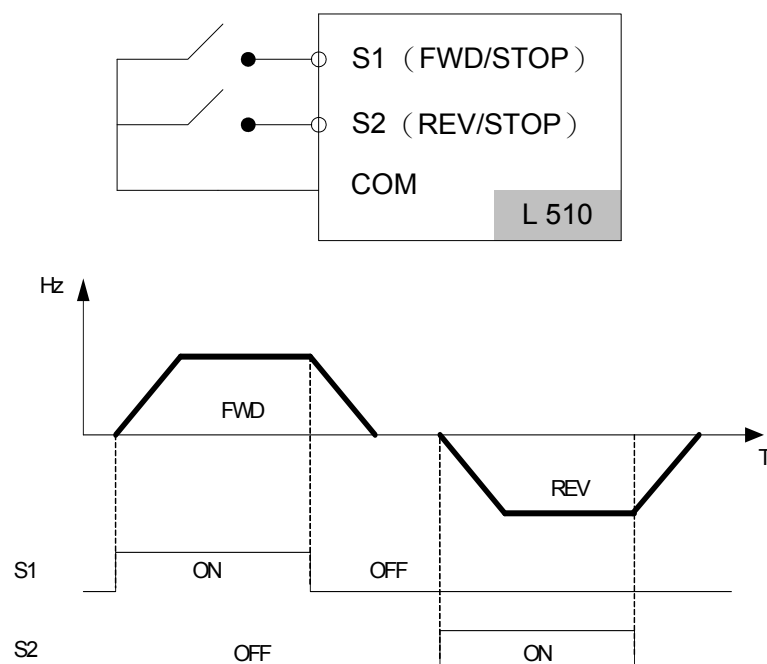
Various example settings and descriptions for Parameters 03-00 to 03-04 are noted in the following pages sections 1 to 13.

1) For setting parameters 03- 00~03- 04 to **【0, 1】** External Run/Stop Control, refer to 00- 04.

1A) 2-wire method. Mode 1.

Example: FWD/STOP and REV/STOP from two inputs ( S1&S2)

Set 00- 04= **【0】** , S1: 03- 00= **【0】** (FWD/STOP) , S2: 03- 01= **【1】** (REV/STOP);



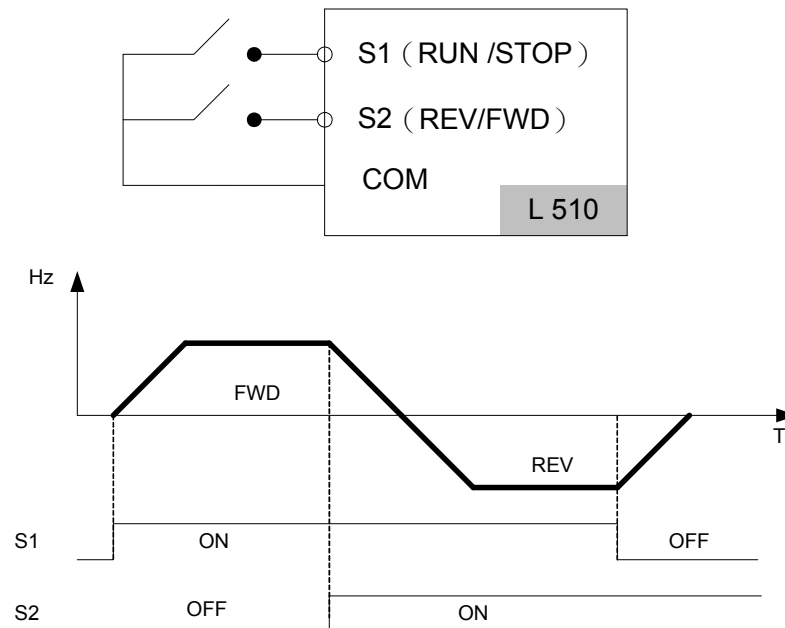
※ **Note:** If both forward and reverse commands are ON, it will be treated as a STOP.



### 1B) 2-wire method. Mode 2.

**Example: RUN/STOP and REV/FWD from two inputs ( S1&S2)**

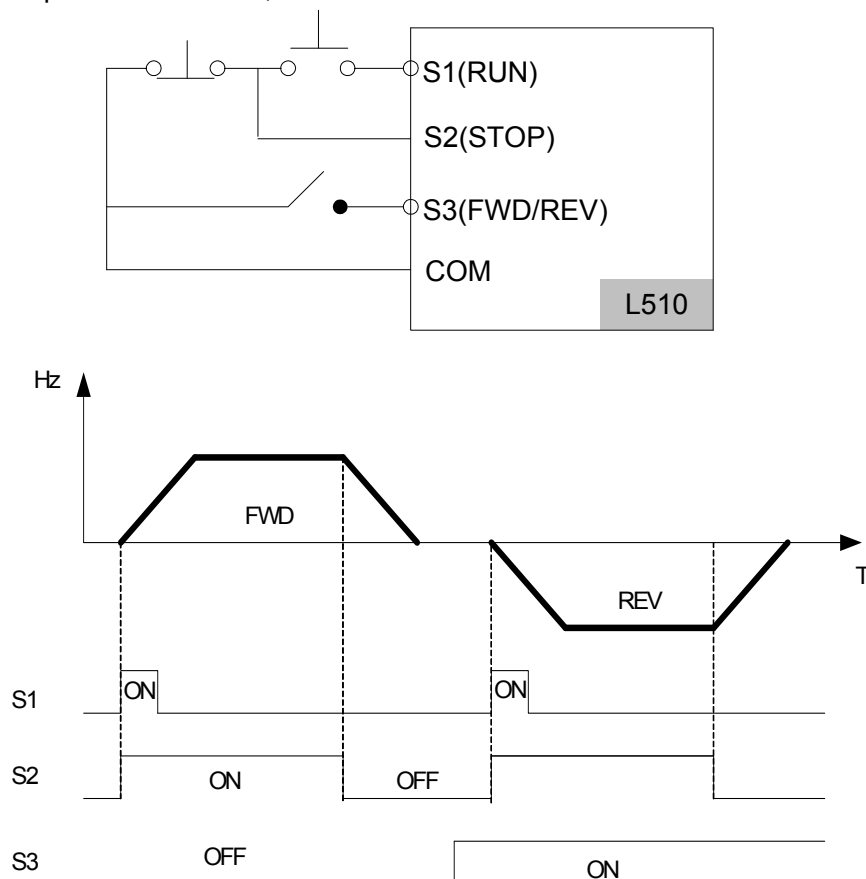
**Set 00- 04= [1] ; S1: 03- 00= [0] (RUN/STOP); S2:03- 01= [1] (REV/FWD);**



### 1C) 3-wire method.

**Example:- Two separate push buttons for RUN & STOP and a two position switch for FWD/ REV**

Set 00- 04 =2.( 3 wire control mode), then terminals S1, S2 and S3 are dedicated to this function and Preset selections for parameters 03-00, 03-01 and 03-02.are not relevant.



## 2) Parameters 03- 00~03- 04= 【2, 3, 4】 Preset speed selections.

Combination of any three terminals from S1~ S5 can be used to select preset speeds 0 to 7 according to the table below.

Preset speed 0-7 and the related acceleration/decelerating times should be set in parameter group 5. For example timing diagram refer to Group 5 description.

| Preset speed | Function setting and state of any three (A,B,C) of terminal S1~S5 |               |               | Frequency | Acc-time | Dec-time |
|--------------|-------------------------------------------------------------------|---------------|---------------|-----------|----------|----------|
|              | terminal A=2                                                      | terminal B =3 | terminal C =4 |           |          |          |
| speed 0      | OFF                                                               | OFF           | OFF           | 05- 01    | 05- 17   | 05-18    |
| speed 1      | OFF                                                               | OFF           | ON            | 05- 02    | 05- 19   | 05-20    |
| speed 2      | OFF                                                               | ON            | OFF           | 05- 03    | 05- 21   | 05-22    |
| speed 3      | OFF                                                               | ON            | ON            | 05- 04    | 05- 23   | 05-24    |
| speed 4      | ON                                                                | OFF           | OFF           | 05- 05    | 05- 25   | 05-26    |
| speed 5      | ON                                                                | OFF           | ON            | 05- 06    | 05- 27   | 05-28    |
| speed 6      | ON                                                                | ON            | OFF           | 05- 07    | 05- 29   | 05-30    |
| speed 7      | ON                                                                | ON            | ON            | 05- 08    | 05- 31   | 05-32    |

## 3) 03- 00~03- 04= 【6 ,7】 Forward/ Reverse JOG

When an input terminal is set to function 【6】 and is turned on, inverter will work in jog forward mode. When an input terminal is set to function 【7】 and is turned on, inverter will work in jog reverse mode. Note: If jog forward and jog reverse function is enabled at the same time, inverter will enter stop mode.

## 4) 03- 00~03- 04= 【8, 9】 UP/DOWN

When an input terminal is set to function 【8】 and is turned on ,frequency command is increased according to the UP/DOWN , increment/decrement step set in parameter 03-06. If the input is kept on continuously, the frequency command increases accordingly until the upper frequency limit is reached.

When an input terminal is set to function 【9】 and is turned on , frequency command decreases according to the UP/DOWN increment/decrement step set in parameter 03-06.

If the input is kept on continuously, the frequency command decreases accordingly and in relation to settings for parameter 03-06 and 3-07 until Zero speed is reached.

Refer to group 3 parameter description.

## 5) 03- 00~03- 04= 【10】 2<sup>nd</sup> Acc/Dec time

When an input terminal is set to function 【10】 and is turned on ,the actual acceleration and deceleration time will be according to the time for 2<sup>nd</sup> Accel/Decel set in parameters 00-16 and 00-17. if the input is turned off, the acceleration and deceleration times will be according to the default accel/decal 1 set in parameters 00-14 & 00-15.

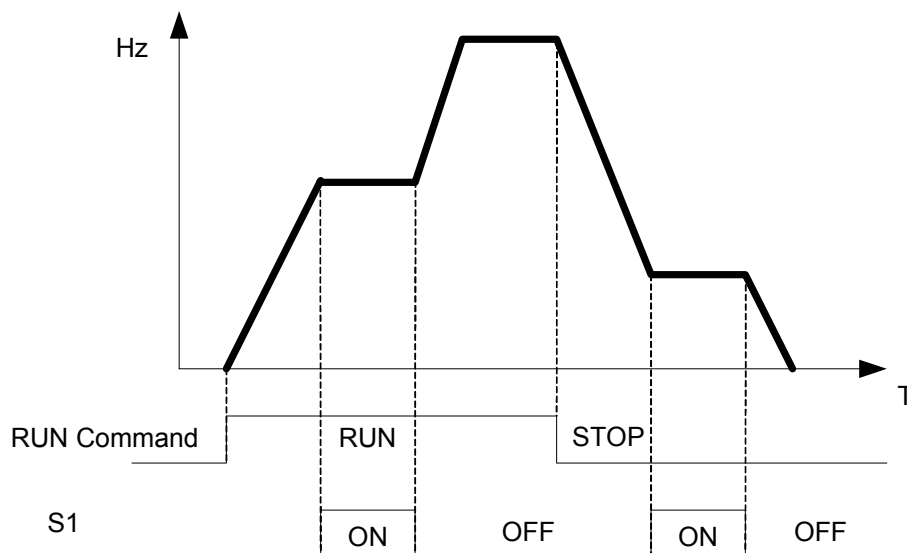
## 6) 03- 00~03- 04= 【11】 Disable Acc/Dec function

When an input terminal is set to function 【11】 and is turned on, acceleration and deceleration function will be disabled and the frequency at the time is maintained. (constant speed mode)

If the input is turned off, acceleration and deceleration function is enabled again.

For an example see the following diagram.

Accel/Decel & Enable/Disable timing diagram using terminal S1 and parameter 03-00 = 11.



**7) 03- 00~03- 04= 【12】 Main/ Alternative run source select.**

When an input terminal is set to function 【12】 and is turned on, the run command source is according to parameter 00-03(Alternative Run source).If the Input is off it will be according to 00-02 ( Main run source).

**8) 03- 00~03- 04= 【13】 Main/ Alternative Frequency source Select**

When an input terminal is set to function 【13】 and is turned on, the frequency source is according to parameter 00-06(Alternative Frequency source).If the Input is off it will be according to 00-05 ( Main Frequency source).

**9) 03- 00~03- 04= 【14】 Rapid Stop (controlled deceleration stop)**

When an input terminal is set to function 【14】 and is turned on , inverter decelerates to stop.

**10) 03- 00~03- 04= 【15】 Base Block (Coast to stop)**

When an input terminal is set to function 【15】 and is turned on, inverter output is turned off.

**11) 03- 00~03- 04= 【16】 Disable PID Function.**

When an input terminal is set to function 【16】 and is turned on, PID functions is disabled, if it is turned off , PID function is enabled again.

**12) 03- 00~03- 04= 【17】 Reset**

When a failure that can be manually reset occurs, turn on a terminal with function 【17】 , the failure will be reset. (Same function as the Reset button on keypad).

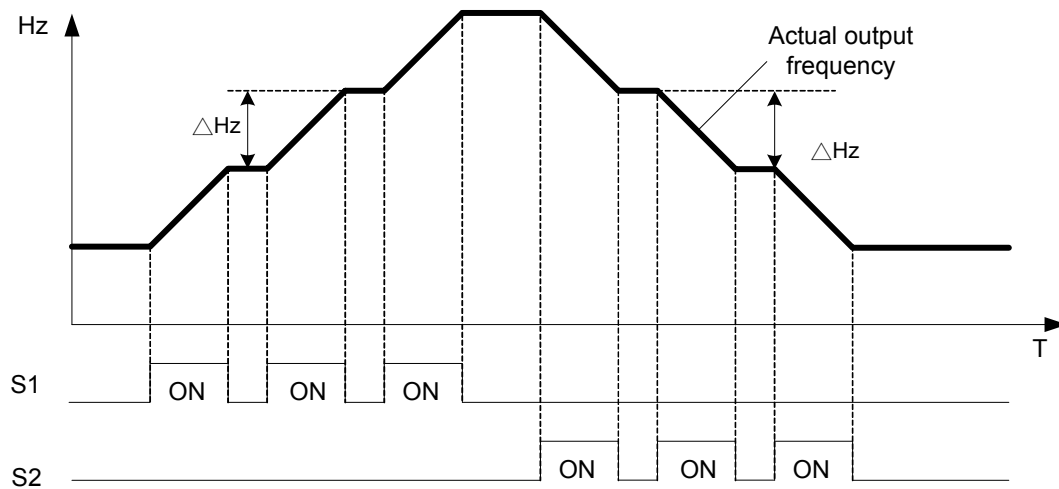
**13) 03- 00~03- 04= 【18】 Auto \_ Run Mode**

When an input terminal is set to function【18】, the programmable auto- sequencer function is enabled, Refer to description of parameter group 6.

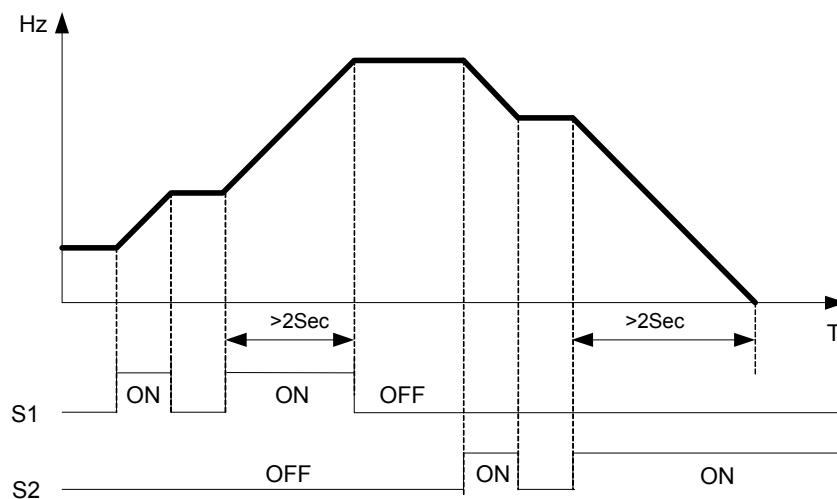
|               |                               |
|---------------|-------------------------------|
| <b>03- 06</b> | <b>Up/Down frequency step</b> |
| <b>Range</b>  | <b>【0.00~5.00】 Hz</b>         |

**Example: S1: 03- 00=【8】 Up frequency command, S2: 03- 01=【9】 Down frequency command, 03- 06=【△】 Hz**

Mode1: If UP or DOWN input terminals are turned on for less than 2 Secs, for every On operation frequency changes by △ Hz.



Mode 2: If UP or DOWN input terminals are turned on for more than 2Sec, the original UP/DOWN mode is restored Output frequency Ramps up or down as long as the input is kept ON. As shown in the diagram below.



| 03- 07 | Up/Down keep Frequency status after a stop command                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Range  | <p><b>[0] :</b> After a stop command in Up/Down mode, the preset frequency is held as the inverter stops, and the UP/Down function is disabled.</p> <p><b>[1] :</b> After a stop command in Up/Down mode, the preset frequency is reset to 0 Hz as the inverter stops.</p> <p><b>[2] :</b> After a stop command in Up/Down mode, the preset frequency is held as the inverter stops, and the UP/Down function remains enabled.</p> |

- 03 - 07 = [0] , [2] When run signal is removed (Stop Command), the output frequency is stored in parameter 05-01( Key pad Frequency).
- 03 - 07 = [0] In stop mode since frequency can not be increased or decreased from Up/Down terminals then keypad can be used to change the frequency by modifying parameter 05-01.
- 03 - 07 = [1] In Up/down frequency mode inverter will ramp up from 0Hz on Run command and Ramp down to 0 Hz on stop command.

|               |                                                |
|---------------|------------------------------------------------|
| <b>03- 08</b> | <b>Multifunction terminals S1~S5 scan time</b> |
| <b>Range</b>  | <b>【1~200】 1mSec</b>                           |

- Multifunction input terminal On/Off periods will be scanned for the number of cycles according to the set value in parameter 03-08. If the signal status for On or off period is less than the set period it will be treated as noise.
- Scan period unit is 1ms.
- Use this parameter if unstable input signal is expected, however setting long scan time periods results in slower response times.

|               |                                                                                                                                                                                                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>03- 09</b> | <b>s1~s5 Input type selection NO &amp; NC</b>                                                                                                                                                                                                                                                 |
| <b>Range</b>  | <div> <div>【xxxx0】 :S1 NO</div> <div>【xxx0x】 :S2 NO</div> <div>【xx0xx】 :S3 NO</div> <div>【x0xxx】 :S4 NO</div> <div>【0xxxx】 :S5 NO</div> </div> <div> <div>【xxxx1】 :S1 NC</div> <div>【xxx1x】 :S2 NC</div> <div>【xx1xx】 :S3 NC</div> <div>【x1xxx】 :S4 NC</div> <div>【1xxxx】 :S5 NC</div> </div> |

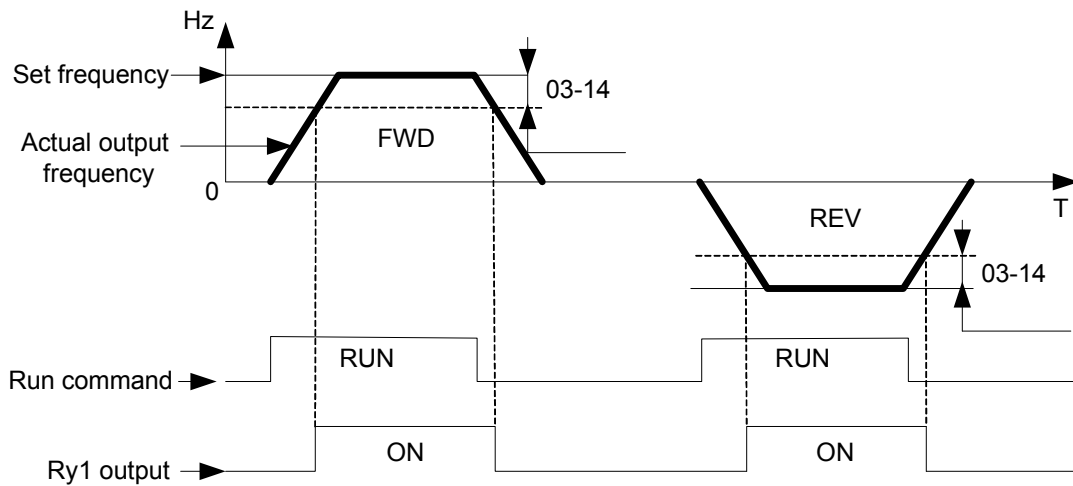
- (NO) Normally open, (NC) Normally closed. Select as required.
- For selecting Normally Open (NO) or Normally Closed (NC) set the relevant digit in parameter 03-09 to 0 or 1 as required.
- Set Parameter 03-09 first before you use the Parameters 00-02/00-03=1 to set the inverter run mode to External multifunction inputs.

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>03-11</b> | <b>Multifunction Output Relay RY functions. ( Terminals RB, RA )</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Range</b> | <div>【0】 :Run</div> <div>【1】 :Fault</div> <div>【2】 :Frequency Reached----- ( refer to 03-13/03-14)</div> <div>【3】 :Set Frequency (3-13±3-14) ----- ( refer to 03-13/03-14)</div> <div>【4】 :Frequency Threshold Level (&gt; 03-13) - Frequency Reached<br/>---(refer to 03-13/03-14)</div> <div>【5】 :Frequency Threshold Level (&lt; 03-13) - Frequency Reached<br/>---(refer to 03-13/03-14)</div> <div>【6】 :Auto-restart</div> <div>【7】 :Momentary AC Power Loss----- ( refer to 07-00)</div> <div>【8】 :Rapid Stop ( Decelerate to Stop)</div> <div>【9】 :Base Block Stop Mode</div> <div>【10】 :Motor Overload Protection ( OL1)</div> <div>【11】 :Drive Overload Protection (OL2)</div> <div>【13】 :Preset Current level Reached----- (refer to 03-15/03-16)</div> <div>【14】 : Preset Brake Frequency Reached----- (refer to 03-17/03-18)</div> |
| <b>03-13</b> | <b>Frequency Reached Preset</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Range</b> | <b>【0.00~650.00】 Hz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>03-14</b> | <b>Frequency Reached detection Range (±)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Range</b> | <b>【0.00~30.00】 Hz</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

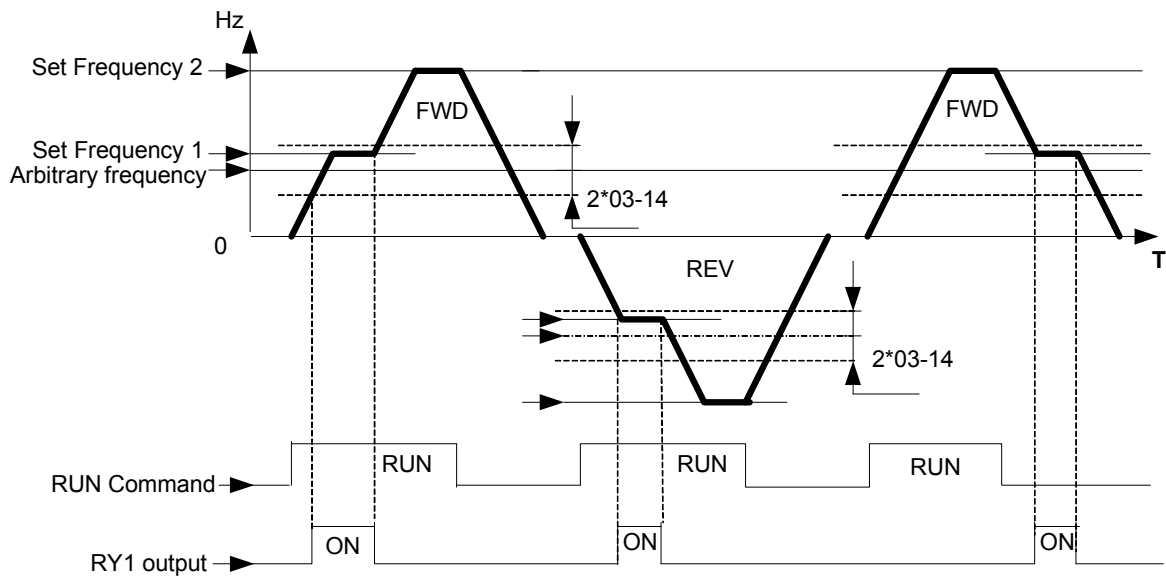
#### Output relay RY1. function descriptions:

- 1) 03-11 = 【0】 . RY1 will be ON with Run signal.
- 2) 03-11 = 【1】 . RY1 will be ON with inverter Faults.
- 3) 03-11 = 【2】 . RY1 will be ON as soon as Preset frequency set by parameters 03-13 is reached.

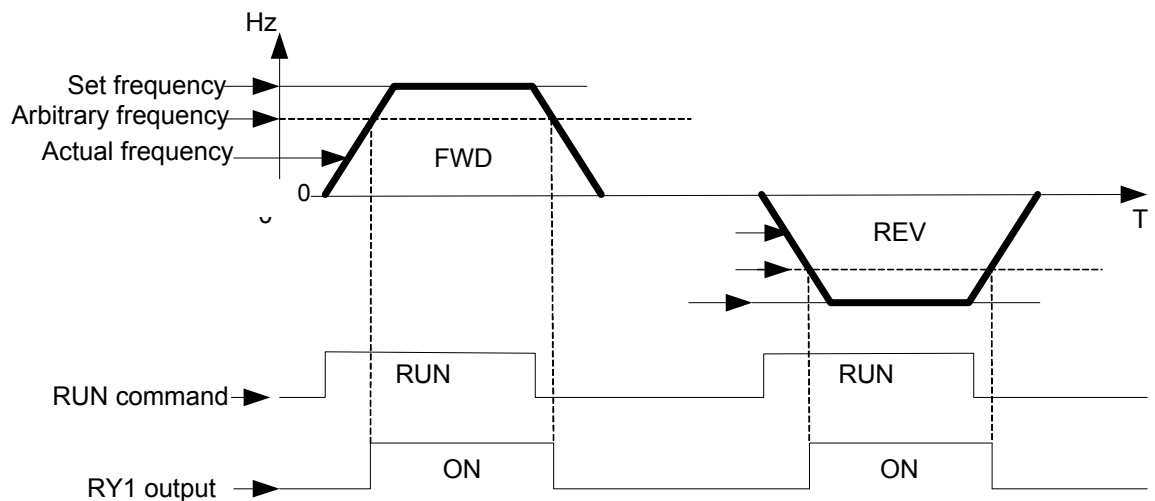
Actual output frequency=(Set frequency-03-14) · RY1 output



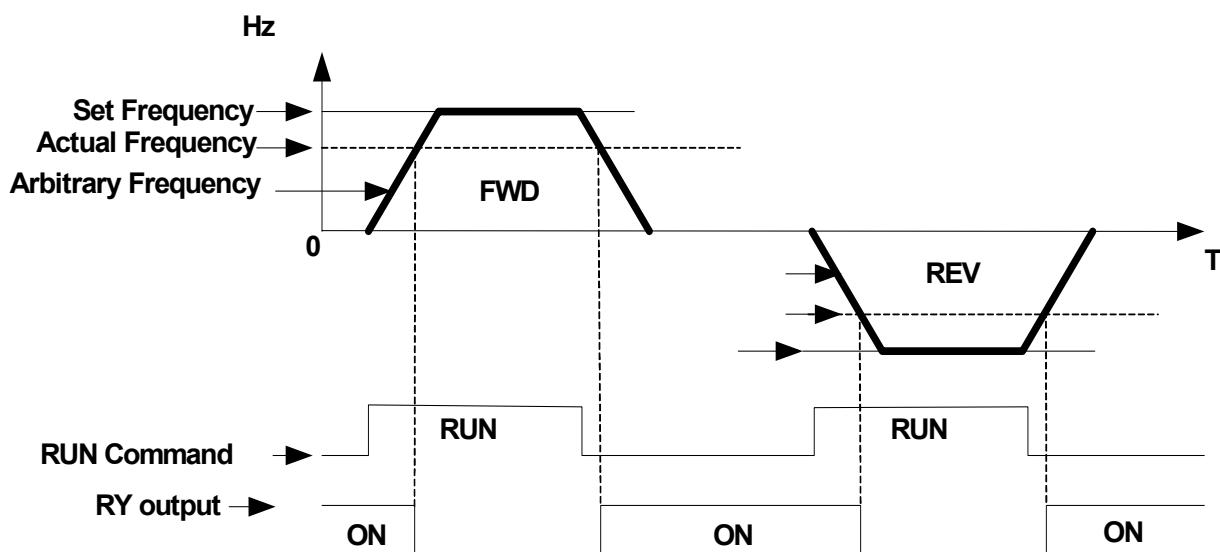
4) 03-11= [ 3 ] RY1 will be on when the preset output frequency set by parameter 03-13 +/- preset frequency range set by parameter 03-14 is reached.



5) 03-11= [ 4 ] . RY1 will be on as soon as the output frequency > Frequency reached, preset by 03-13.

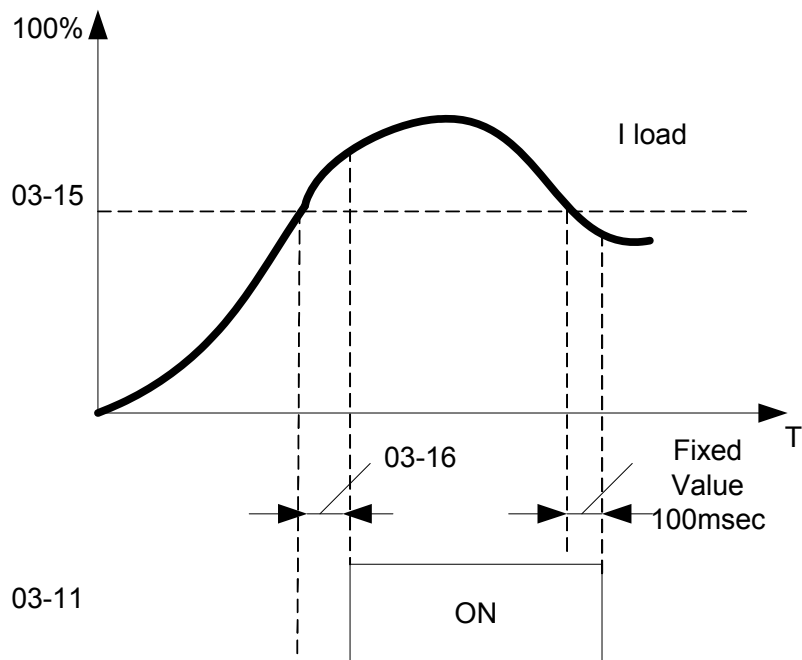


6) 03-11= [ 5 ] . RY1 will be on as soon as the output frequency < Frequency reached, preset by 03-13.



|       |                               |
|-------|-------------------------------|
| 03-15 | Output current Reached Preset |
| Range | [0.1~15.0] A                  |
| 03-16 | Output current detection time |
| Range | [0.1~10.0] Sec                |

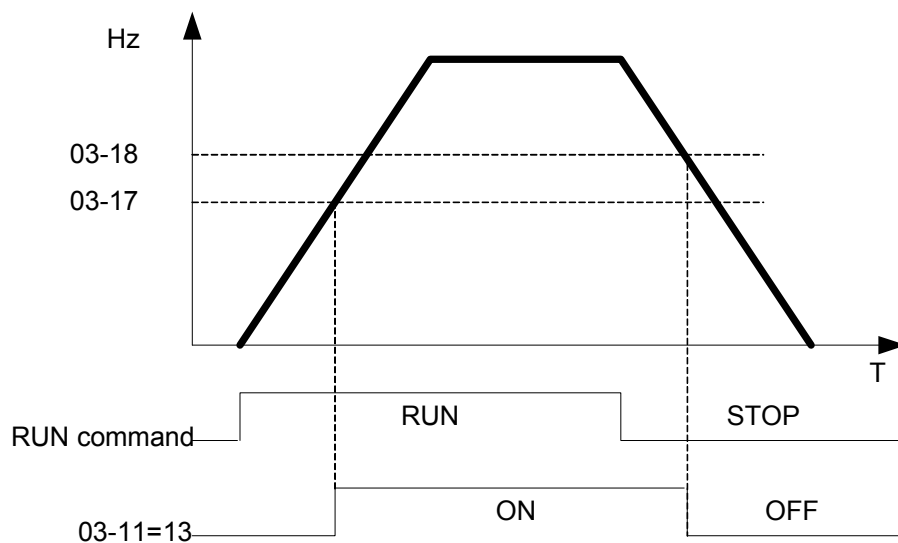
- 03-11= [ 13 ] . RY1 will be on as soon as the output current detection value > Preset level in 03-15.
- 03-15: Setting range (0.1~15.0 Amps) as required according to the rated motor current.
- 01-16: Setting range (0.1~10.0) unit: sec.



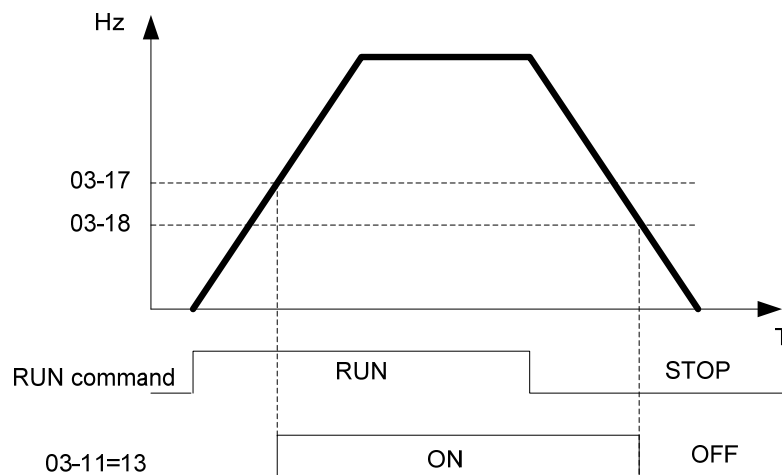
|              |                            |
|--------------|----------------------------|
| <b>03-17</b> | <b>Brake Release Level</b> |
| <b>Range</b> | <b>【0.00~20.00】 Hz</b>     |
| <b>03-18</b> | <b>Brake Engage Level</b>  |
| <b>Range</b> | <b>【0.00~20.00】 Hz</b>     |

- If 03-11 = 【14】
- In accelerating mode, RY1 will be ON as soon as the actual output frequency reaches the external Brake release level set in parameter 03-17.
- In decelerating mode, RY1 will be OFF as soon as the actual output frequency reaches the external Brake engage level set in parameter 03-18.

Timing diagram for 03-17 < 03-18 is shown below:



Timing diagram for 03-17 > 03-18 is shown below:



|               |                                                                 |
|---------------|-----------------------------------------------------------------|
| <b>03- 19</b> | <b>Relay Output Status type</b>                                 |
| <b>Range</b>  | <b>【0】 :A (Normally open)</b><br><b>【1】 :B (Normally close)</b> |



## 04- External analog signal input / output functions

| 04- 00 | Analog Voltage & Current input selections |        |
|--------|-------------------------------------------|--------|
| Range  | AVI                                       | ACI    |
|        | [0] :0~10V                                | 0~20mA |
|        | [1] :0~10V                                | 4~20mA |
|        | [2] :2~10V                                | 0~20mA |
|        | [3] :2~10V                                | 4~20mA |

➤ **Analog Input Scaling formulas:-**

AVI(0~10V), ACI(0~20mA)

$$\text{AVI}(0\sim 10\text{V}):F(\text{Hz})=\frac{V(v)}{10(v)} \times (00-12)$$

$$\text{ACI}(0\sim 20\text{mA}):F(\text{Hz})=\frac{I(\text{mA})}{20(\text{mA})} \times (00-12)$$

AVI(2~10V), ACI(4~20mA)

$$\text{AVI}(2\sim 10\text{V}):F(\text{Hz})=\frac{V-2(v)}{10-2(v)} \times (00-12)$$

$$\text{ACI}(4\sim 20\text{mA}):F(\text{Hz})=\frac{I-4(\text{mA})}{20-4(\text{mA})} \times (00-12)$$

|        |                                   |
|--------|-----------------------------------|
| 04- 01 | AVI signal verification Scan Time |
| Range  | [1~200] 1msec                     |
| 04- 02 | AVIGain                           |
| Range  | [0 ~ 1000] %                      |
| 04- 03 | AVI Bias                          |
| Range  | [0~ 100] %                        |
| 04- 04 | AVI Bias Selection                |
| Range  | [0] : positive [1] : Negative     |
| 04- 05 | AVI Slope                         |
| Range  | [0] : positive [1] : Negative     |
| 04- 06 | ACI signal verification Scan Time |
| Range  | [1~200] 1msec                     |
| 04- 07 | ACIGain                           |
| Range  | [0 ~ 1000] %                      |
| 04- 08 | ACI Bias                          |
| Range  | [0 ~ 100] %                       |
| 04- 09 | ACI Bias Selection                |
| Range  | [0] : positive [1] : Negative     |
| 04-10  | ACI Slope                         |
| Range  | [0] : positive [1] : Negative     |

➤ **Set 04- 01 and 04- 06 for Analog signal verification.**

Inverter reads the average values of A/D signal once per (04- 01/04- 06 x 1ms).

Set scan intervals according to the application and with consideration for signal instability or interference effects on the signal by external sources. Long scan times will result in slower response time.

AVI. Analog Voltage input scaling examples by adjusting Gain, Bias & Slope parameters (04-02~04-05).

(1) **Positive Bias type (04-04= 0) and effects of modifying Bias amount by parameter 04-03 and Slope type with parameter 04-05 are shown in Fig 1&2.**

Figure 1.

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| A | 100%   | 50%    | 0      | 0      |
| B | 100%   | 0%     | 0      | 0      |

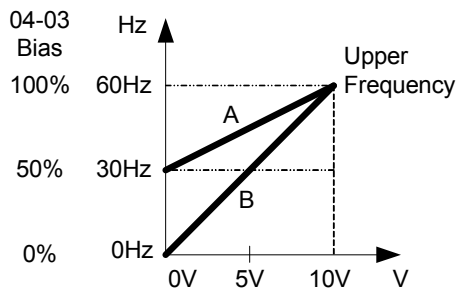
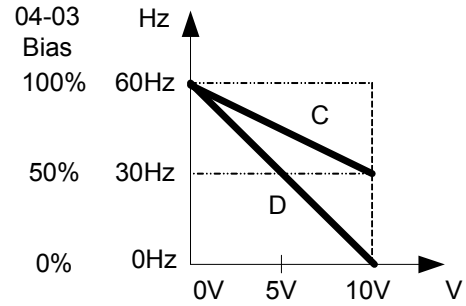


Figure 2.

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| C | 100%   | 50%    | 0      | 1      |
| D | 100%   | 0%     | 0      | 1      |



(2) **Negative Bias type and effects of modifying Bias amount by parameter 04-03 and Slope type with parameter 04-05 are shown in Fig 3&4.**

Figure3:

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| E | 100%   | 20%    | 1      | 0      |

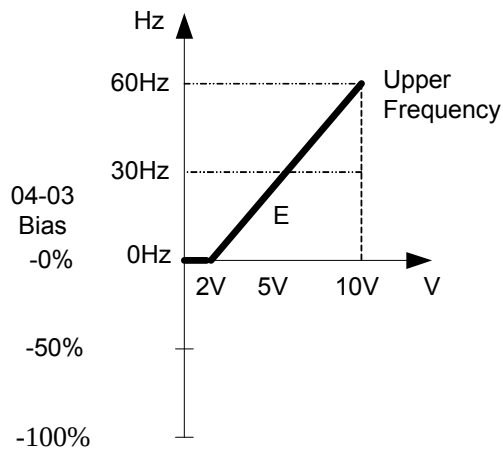
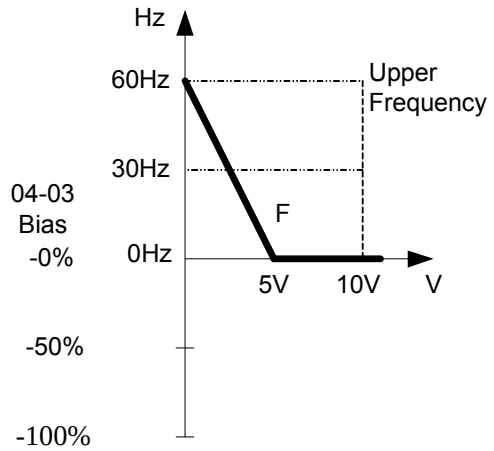


Figure4:

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| F | 100%   | 50%    | 1      | 1      |



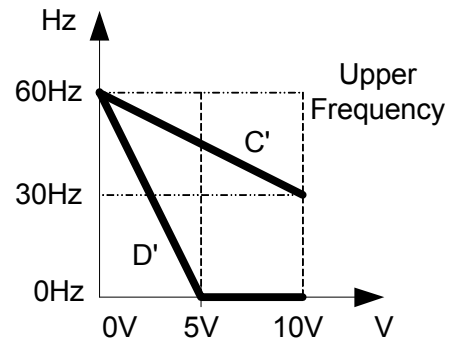
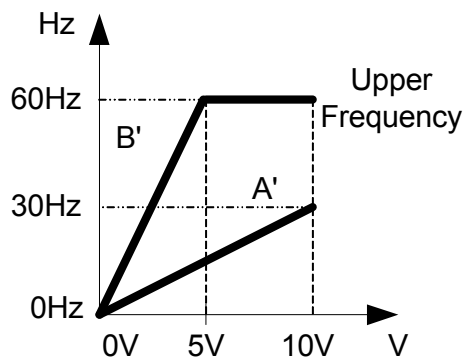
(3) **Offset bias set to 0% (04-03) and effect of modifying Analog Gain ( 04-02), Bias type ( 04-04) and slope type( 04-05) are shown in shown Fig 5&6.**

Figure 5

|    | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|----|--------|--------|--------|--------|
| A' | 50%    | 0%     | 0/1    | 0      |
| B' | 200%   | 0%     | 0/1    | 0      |

Figure 6

|    | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|----|--------|--------|--------|--------|
| C' | 50%    | 0%     | 0/1    | 1      |
| D' | 200%   | 0%     | 0/1    | 1      |



(4) Various other examples of analog input scaling and modification are shown in following figures 7,8,9 & 10.

Figure 7

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| a | 50%    | 50%    | 0      | 0      |
| b | 200%   | 50%    | 0      | 0      |

Figure 8

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| c | 50%    | 50%    | 0      | 1      |
| d | 200%   | 50%    | 0      | 1      |

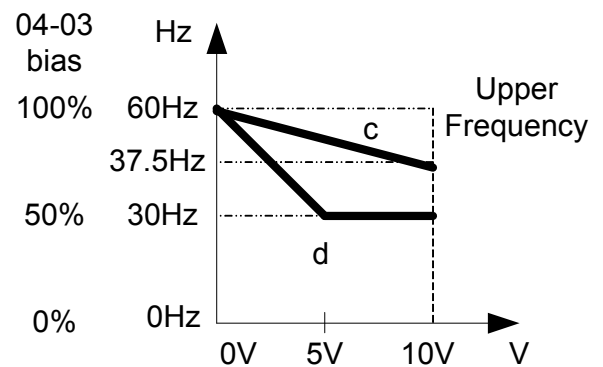
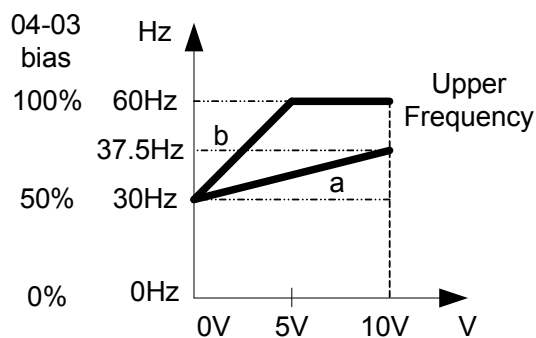
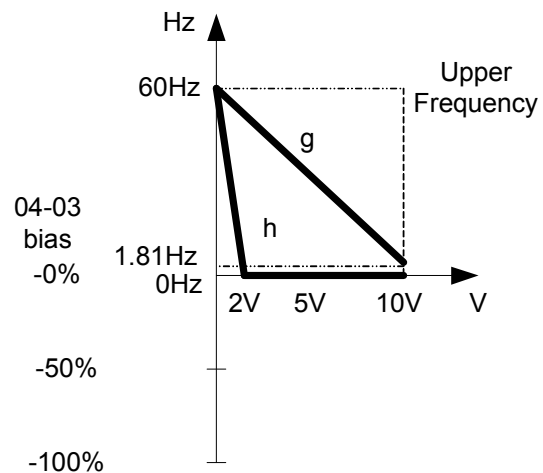
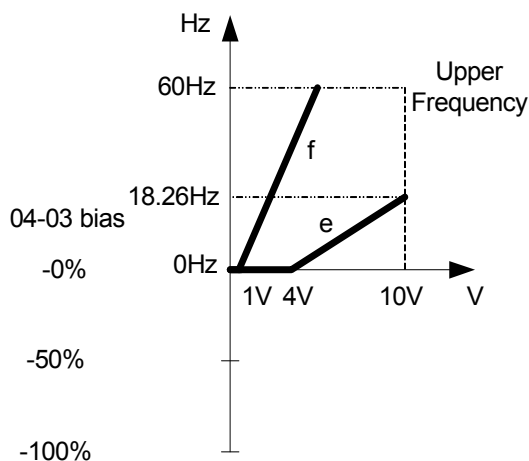


Figure 9

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| e | 50%    | 20%    | 1      | 0      |
| f | 200%   | 20%    | 1      | 0      |

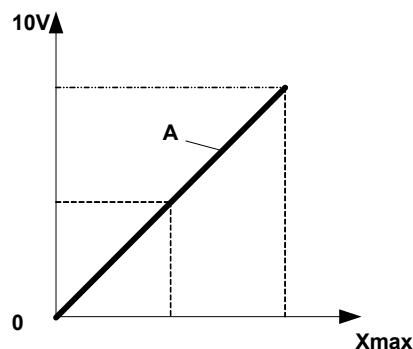
Figure 10

|   | 04- 02 | 04- 03 | 04- 04 | 04- 05 |
|---|--------|--------|--------|--------|
| g | 50%    | 50%    | 1      | 1      |
| h | 200%   | 0%     | 0      | 1      |



|              |                                                                                                                                                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>04-11</b> | <b>Analog Output (AO) function selection.</b>                                                                                                           |
| <b>Range</b> | <b>[0]</b> :Output frequency<br><b>[1]</b> :Frequency Setting<br><b>[2]</b> :Output voltage<br><b>[3]</b> :DC Bus Voltage<br><b>[4]</b> :Output current |

**Example: Set 04-11 required according to the table below.**



| <b>04-11</b> | <b>A</b>                 | <b>Xmax</b>                              |
|--------------|--------------------------|------------------------------------------|
| <b>[0]</b>   | <b>Output frequency</b>  | <b>upper frequency limit</b>             |
| <b>[1]</b>   | <b>Frequency Setting</b> | <b>upper frequency limit</b>             |
| <b>[2]</b>   | <b>Output voltage</b>    | <b>Motor Rated Voltage</b>               |
| <b>[3]</b>   | <b>DC Bus Voltage</b>    | <b>220V: 0~400V</b>                      |
| <b>[4]</b>   | <b>Output current</b>    | <b>2 times rated current of inverter</b> |

|              |                                           |
|--------------|-------------------------------------------|
| <b>04-12</b> | <b>AO Gain</b>                            |
| <b>Range</b> | <b>[0 ~ 1000] %</b>                       |
| <b>04-13</b> | <b>AO Bias</b>                            |
| <b>Range</b> | <b>[0 ~ 100] %</b>                        |
| <b>04-14</b> | <b>AO Bias Selection</b>                  |
| <b>Range</b> | <b>[0] : positive      [1] : Negative</b> |
| <b>04-15</b> | <b>AO Slope</b>                           |
| <b>Range</b> | <b>[0] : positive      [1] : Negative</b> |

- Select the Analog output type for the multifunction analog output on terminal (TM2) as required by parameter 04-11. Output format is 0-10V dc.  
The output voltage level can be scaled and modified by parameters 04-12 to 04-15 if necessary.
- The modification format will be same as the examples shown previously for Analog Voltage Input (AVI) parameters 4-02 to 4-05.

Note: the max output voltage is 10V due to the hardware of the circuit.  
Use external devices that require a maximum of 10V dc signal.

## 05- Preset Frequency Selections.

|               |                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------|
| <b>05- 00</b> | <b>Preset Speed Control mode Selection</b>                                                    |
| <b>Range</b>  | <b>【0】 :Common Accel / Decel.<br/>【1】 : Individual Accel/Decel for each preset speed 0-7.</b> |

|               |                                         |
|---------------|-----------------------------------------|
| <b>05- 01</b> | <b>Preset Speed 0 (Keypad Freq)</b>     |
| <b>05- 02</b> | <b>Preset Speed 1</b>                   |
| <b>05- 03</b> | <b>Preset Speed 2</b>                   |
| <b>05- 04</b> | <b>Preset Speed 3</b>                   |
| <b>05- 05</b> | <b>Preset Speed 4</b>                   |
| <b>05- 06</b> | <b>Preset Speed 5</b>                   |
| <b>05- 07</b> | <b>Preset Speed 6</b>                   |
| <b>05- 08</b> | <b>Preset Speed 7</b>                   |
| <b>Range</b>  | <b>【0.00 ~ 650.00】 Hz</b>               |
| <b>05-17</b>  | <b>Preset Speed 0 Acceleration time</b> |
| <b>05-18</b>  | <b>Preset Speed 0 Deceleration time</b> |
| <b>05-19</b>  | <b>Preset Speed 1 Acceleration time</b> |
| <b>05- 20</b> | <b>Preset Speed 1 Deceleration time</b> |
| <b>05- 21</b> | <b>Preset Speed 2 Acceleration time</b> |
| <b>05- 22</b> | <b>Preset Speed 2 Deceleration time</b> |
| <b>05- 23</b> | <b>Preset Speed 3 Acceleration time</b> |
| <b>05- 24</b> | <b>Preset Speed 3 Deceleration time</b> |
| <b>05- 25</b> | <b>Preset Speed 4 Acceleration time</b> |
| <b>05- 26</b> | <b>Preset Speed 4 Deceleration time</b> |
| <b>05- 27</b> | <b>Preset Speed 5 Acceleration time</b> |
| <b>05- 28</b> | <b>Preset Speed 5 Deceleration time</b> |
| <b>05- 29</b> | <b>Preset Speed 6 Acceleration time</b> |
| <b>05- 30</b> | <b>Preset Speed 6 Deceleration time</b> |
| <b>05- 31</b> | <b>Preset Speed 7 Acceleration time</b> |
| <b>05- 32</b> | <b>Preset Speed 7 Deceleration time</b> |
| <b>Range</b>  | <b>【0.1 ~ 3600.0】 Sec</b>               |

- When 05- 00 = 【0】 Accel /Decl 1 or 2 set by parameters 00-14/00-15 or 00-16/00-17 apply to all speeds.
- When 05- 00 = 【1】 Individual Accel/Decel apply to each preset speed 0-7. Parameters 05-17 to 05-32.
- Formula for calculating acceleration and deceleration time:

$$\text{Actual Acc time} = \frac{\text{Acc time of Accel1 or 2} \times \text{Preset Frequency}}{\text{Max Frequency}}$$

$$\text{Actual Dec time} = \frac{\text{Dec time of Accel1 or 2} \times \text{Preset Frequency}}{\text{Max Frequency}}$$

- Maximum output frequency = parameter 01-02 when programmable V/F is selected by 01- 00= 【7】 .
- Maximum output frequency = 50.00 hz or 60.00 hz when preset V/F patterns are selected. 01-00≠ 【7】 .

Example : 01- 00≠ 【7】 , 01- 02= 【50】 hz, 05- 02= 【10】 hz (preset speed1),  
05-19= 【5】 s(Accel time), 05-20= 【20】 s (Decel time)

$$\text{Preset speed 1 Actual Accel time} = \frac{(05-19) \times 10(\text{Hz})}{01-02} = 1(\text{s})$$

$$\text{Preset speed 1 Actual Decel time} = \frac{(05-20) \times 10(\text{Hz})}{01-02} = 4(\text{s})$$

- **Multi speed run/stop cycles with Individual accel/decal times. 05-00= 【1】**
- Two modes are shown below:-
- Mode1 = On/Off run command
- Mode2= Continuous run command

**Mode1 Example:** 00- 02= 【1】 (External Run/Stop Control).

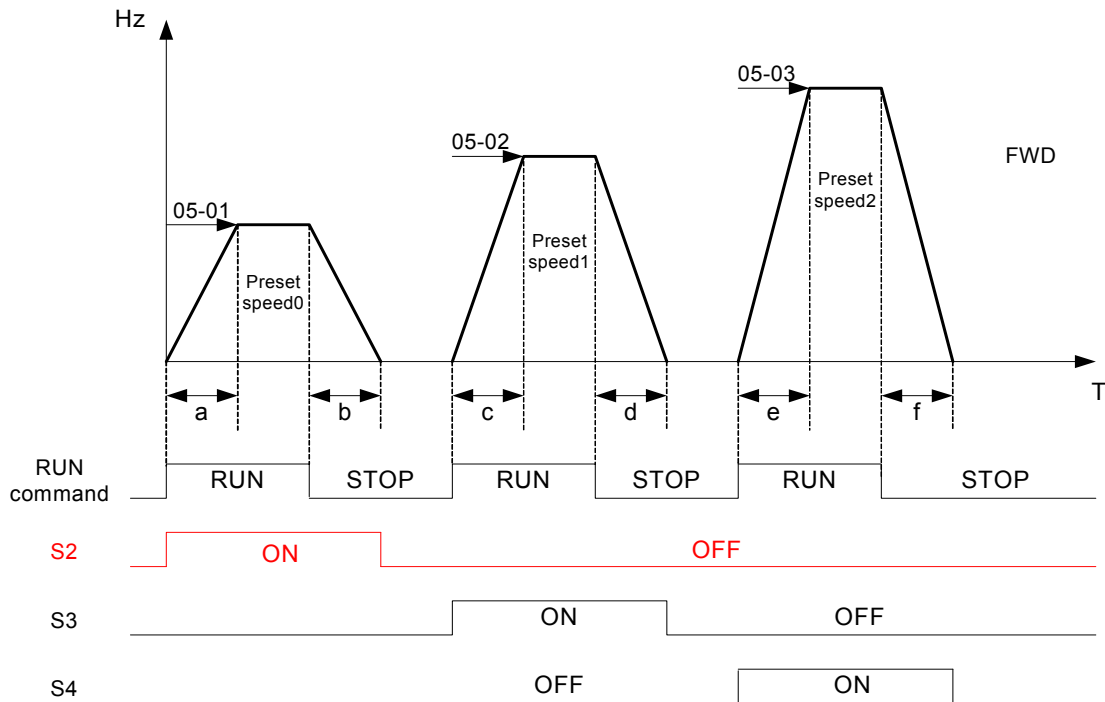
S1: 03- 00= 【0】 (RUN/STOP );

S2: 03- 01= 【1】 (Forward/Reserve);

S3: 03- 02= 【2】 (Preset speed 1);

S4: 03- 03= 【3】 (Preset speed 2);

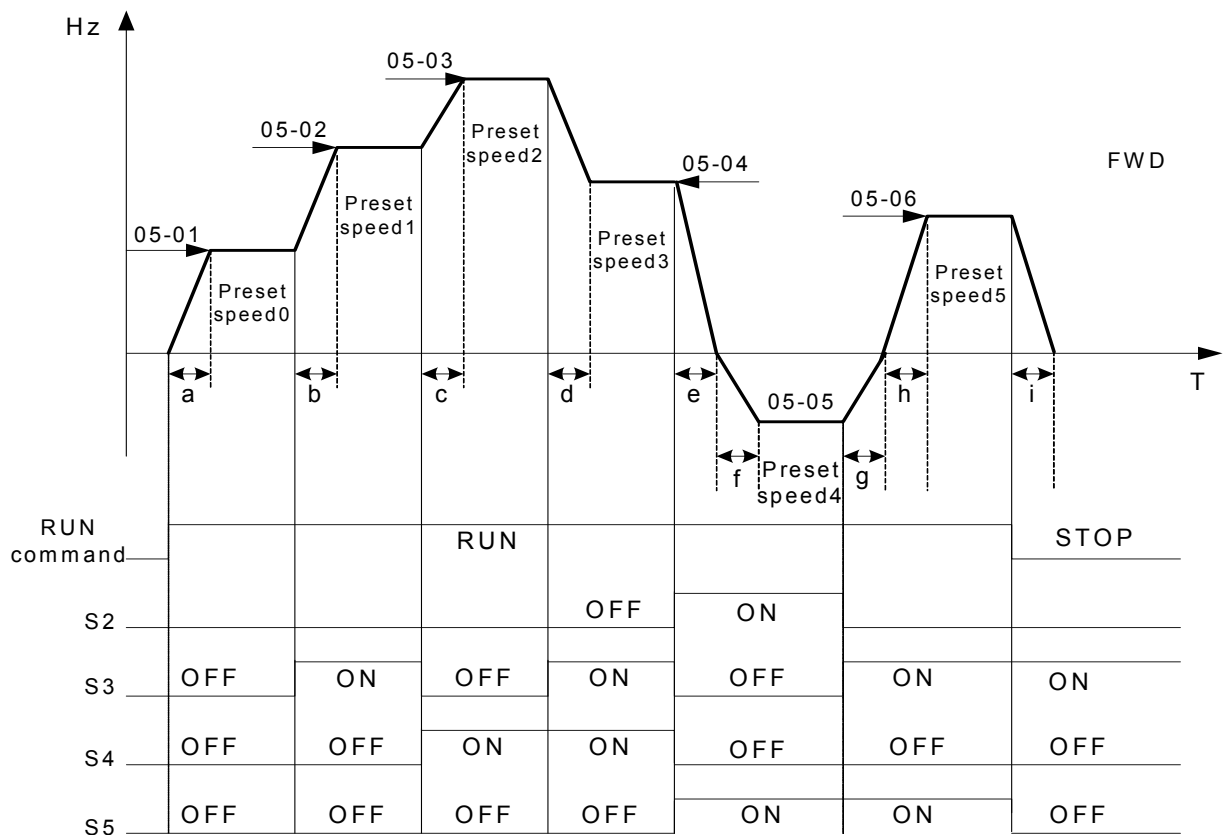
S5: 03- 03= 【4】 (Preset speed 4);



When the run command is On/Off, acceleration and deceleration times for each cycle can be calculated as below:- time unit is in Secs.

$$a = \frac{(05-17) \times (05-01)}{01-02}, b = \frac{(05-18) \times (05-01)}{01-02}, c = \frac{(05-19) \times (05-02)}{01-02}, d = \frac{(05-20) \times (05-02)}{01-02} \dots$$

- **Mode2 Example.** Continuous run command.
- Set S1 for Continuous Run
- Set S2 For Forward /Reverse direction selection
- Set multi function terminals S3,S4 & S5 for setting three different preset speeds



When the run command is continuous, acceleration and deceleration times for each segment can be calculated as below:-

$$\text{Ex] } a = \frac{(05-17) \times (05-01)}{01-02}, b = \frac{(05-19) \times [(05-02) - (05-01)]}{01-02}$$

$$c = \frac{(05-21) \times [(05-03) - (05-02)]}{01-02}, d = \frac{(05-24) \times [(05-03) - (05-04)]}{01-02}$$

$$e = \frac{(05-26) \times (05-05)}{01-02}, f = \frac{(05-28) \times (05-05)}{01-02}, g = \frac{(05-27) \times (05-05)}{01-02}$$

$$h = \frac{(05-29) \times (05-05)}{01-02}, i = \frac{(05-32) \times (05-05)}{01-02} \dots \dots \text{Unit(sec)}$$

## 06- Auto Run(Auto Sequencer) function

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>06- 00</b> | <b>Auto Run( sequencer) mode selection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Range</b>  | <b>【0】 :Disabled</b><br><b>【1】 :Single cycle</b> (Continues to run from the unfinished step if restarted).<br><b>【2】 :Periodic cycle.</b> (Continues to run from the unfinished step if restarted).<br><b>【3】 :Single cycle, then holds the speed of final step to run.</b><br>(Continues to run from the unfinished step if restarted).<br><b>【4】 :Single cycle.</b> (Starts a new cycle if restarted).<br><b>【5】 :Periodic cycle.</b> (Starts a new cycle if restarted).<br><b>【6】 :Single cycle, then hold the speed of final step to run.</b><br>(Starts a new cycle if restarted). |

Frequency of the step 0 is set by parameter 05-01 keypad Frequency.

|               |                                            |
|---------------|--------------------------------------------|
| <b>06- 01</b> | <b>Auto _ Run Mode Frequency Command 1</b> |
| <b>06- 02</b> | <b>Auto _ Run Mode Frequency Command 2</b> |
| <b>06- 03</b> | <b>Auto _ Run Mode Frequency Command 3</b> |
| <b>06- 04</b> | <b>Auto _ Run Mode Frequency Command 4</b> |
| <b>06- 05</b> | <b>Auto _ Run Mode Frequency Command 5</b> |
| <b>06- 06</b> | <b>Auto _ Run Mode Frequency Command 6</b> |
| <b>06- 07</b> | <b>Auto _ Run Mode Frequency Command 7</b> |
| <b>Range</b>  | <b>【0.00 ~ 650.00】 Hz</b>                  |

|               |                                             |
|---------------|---------------------------------------------|
| <b>06- 16</b> | <b>Auto_ Run Mode Running Time Setting0</b> |
| <b>06- 17</b> | <b>Auto_ Run Mode Running Time Setting1</b> |
| <b>06- 18</b> | <b>Auto_ Run Mode Running Time Setting2</b> |
| <b>06- 19</b> | <b>Auto_ Run Mode Running Time Setting3</b> |
| <b>06- 20</b> | <b>Auto_ Run Mode Running Time Setting4</b> |
| <b>06- 21</b> | <b>Auto_ Run Mode Running Time Setting5</b> |
| <b>06- 22</b> | <b>Auto_ Run Mode Running Time Setting6</b> |
| <b>06- 23</b> | <b>Auto_ Run Mode Running Time Setting7</b> |
| <b>Range</b>  | <b>【0.00 ~ 3600.0】 Sec</b>                  |

|               |                                                         |
|---------------|---------------------------------------------------------|
| <b>06- 32</b> | <b>Auto_ Run Mode Running Direction0</b>                |
| <b>06- 33</b> | <b>Auto_ Run Mode Running Direction1</b>                |
| <b>06- 34</b> | <b>Auto_ Run Mode Running Direction2</b>                |
| <b>06- 35</b> | <b>Auto_ Run Mode Running Direction3</b>                |
| <b>06- 36</b> | <b>Auto_ Run Mode Running Direction4</b>                |
| <b>06- 37</b> | <b>Auto_ Run Mode Running Direction5</b>                |
| <b>06- 38</b> | <b>Auto_ Run Mode Running Direction6</b>                |
| <b>06- 39</b> | <b>Auto_ Run Mode Running Direction7</b>                |
| <b>Range</b>  | <b>【0】 : STOP      【1】 : forward      【2】 : reverse</b> |

- Auto Run sequencer mode has to be enabled by using one of the multifunctional inputs S1 to S5 and setting the relevant parameter 03-00 to 03-04 to selection 【18】 .
- Various Auto Run (sequencer) modes can be selected by parameter (06-00) as listed above.
- 7 Auto Run (sequencer) modes can be selected by parameters (06-01~06-39)
- Auto Run frequency commands1 to 7 are set with Parameters (06-01 ~ 06-07),
- Sequence run times are set with parameters (06-17 ~ 06-23)
- FWD/REV Direction for each sequence can be set with parameters (06-33 ~ 06-39).
- Auto sequence 0, frequency is set from keypad by parameter 05-01, sequence run time and direction are set by parameters 06-16 and 06-32.

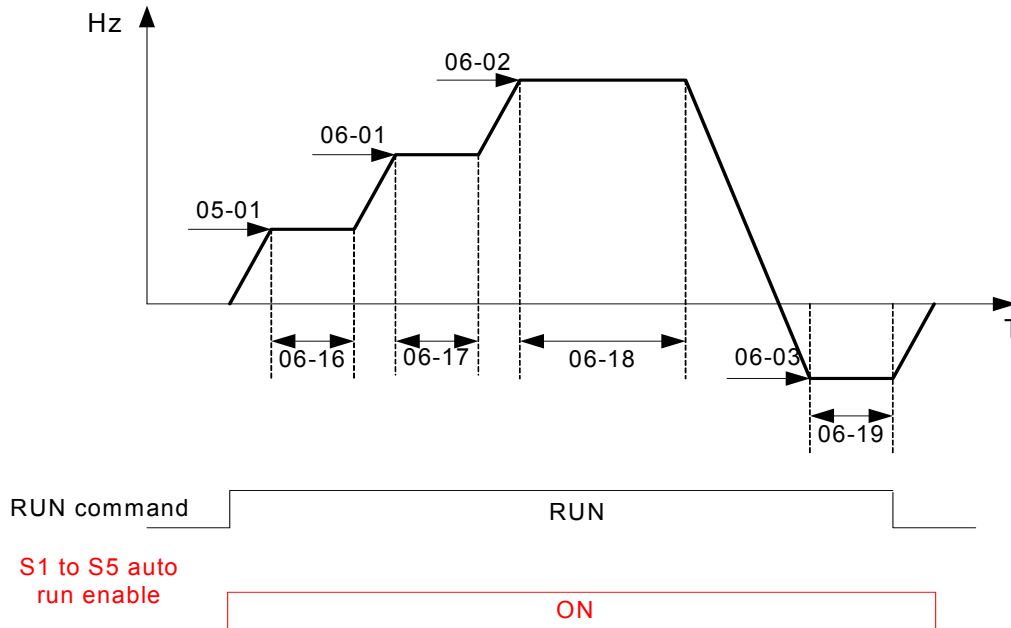


**Auto RUN (Auto Sequencer) examples are shown in the following pages:-**

**Example 1. Single Cycle (06- 00=1,4)**

The inverter will run for a single full cycle based on the specified number of sequences, then it will stop. In this example 4 sequences are set, three in forward direction and one in Reverse.

Auto Run Mode.      06- 00= [ 1 ] or [ 4 ] ,  
Frequency            05- 01= [ 15 ] Hz, 06- 01= [ 30 ] Hz, 06- 02= [ 50 ] Hz, 06- 03= [ 20 ] Hz  
Sequence Run Time   06-16= [ 20 ] s, 06-17 = [ 25 ] s, 06-18= [ 30 ] s, 06-19= [ 40 ] s,  
Direction            06-32= [ 1 ] FWD, 06-33 = [ 1 ] FWD, 06-34= [ 1 ] (FWD), 06-35= [ 2 ] (REV)  
Unused Sequence Parameters   06-04~ 06-07= [ 0 ] Hz , 06-20~06-23= [ 0 ] s , 06-36~06-39= [ 0 ]

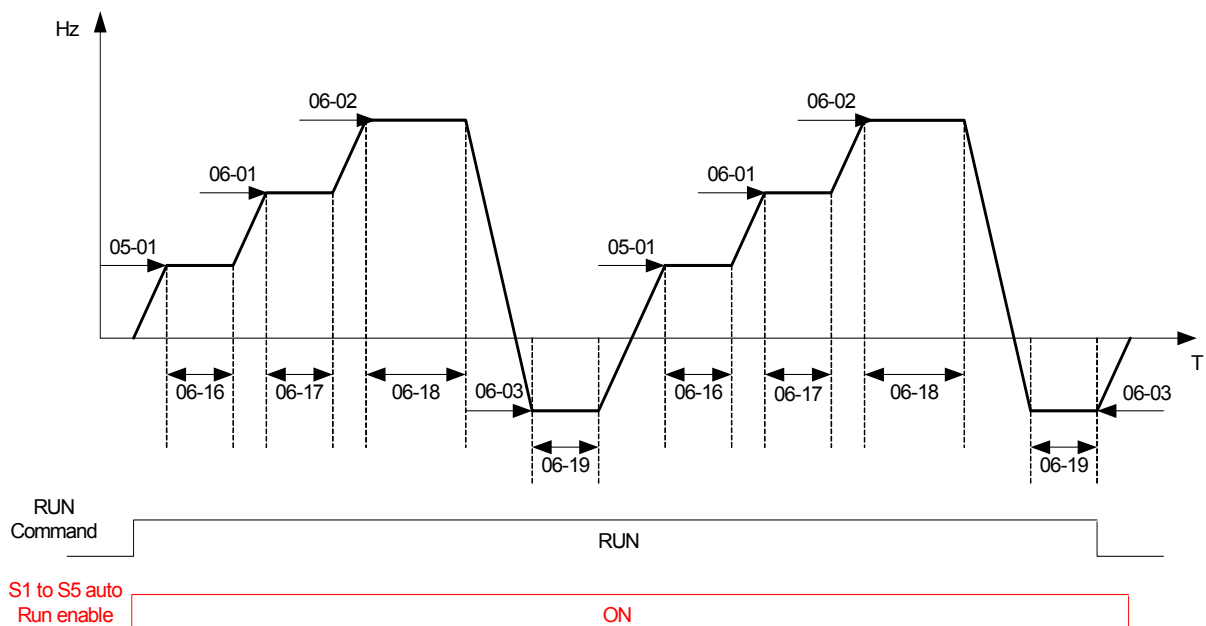


**Example 2. Periodic cycle Run.**

Mode: 06- 00= [ 2 ] or [ 5 ]

The inverter will repeat the same cycle periodically.

All other Parameters are set same as Example 1. shown above.



### Example 3. Auto\_Run Mode for Single Cycle 06-00=【3 or 6】

The speed of final step will be held to run.

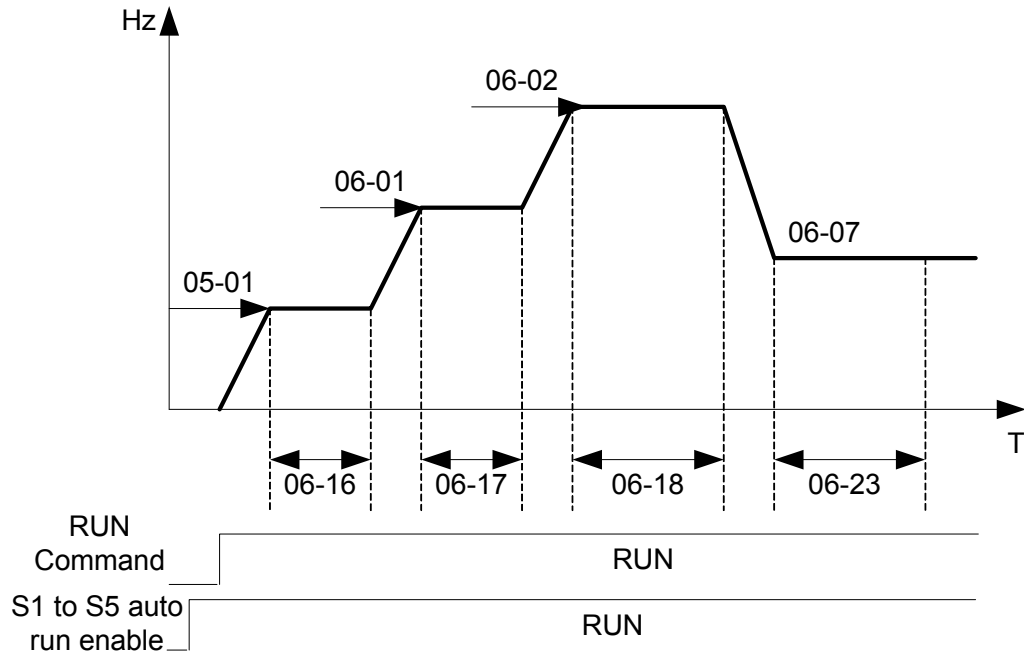
Auto Run Mode. 06- 00 = 【3】 or 【6】

Frequency 05- 01 = 【15】 Hz, 06- 01= 【30】 Hz, 06- 02= 【50】 Hz, 06- 07= 【20】 Hz,

Sequence Run Time 06-16 = 【20】 s, 06-17= 【25】 s, 06-18= 【30】 s, 06-23= 【40】 s,

Direction 06-32 = 【1】 FWD 06-33= 【1】 , 06-34 = 【1】 , 06-39= 【1】 ,

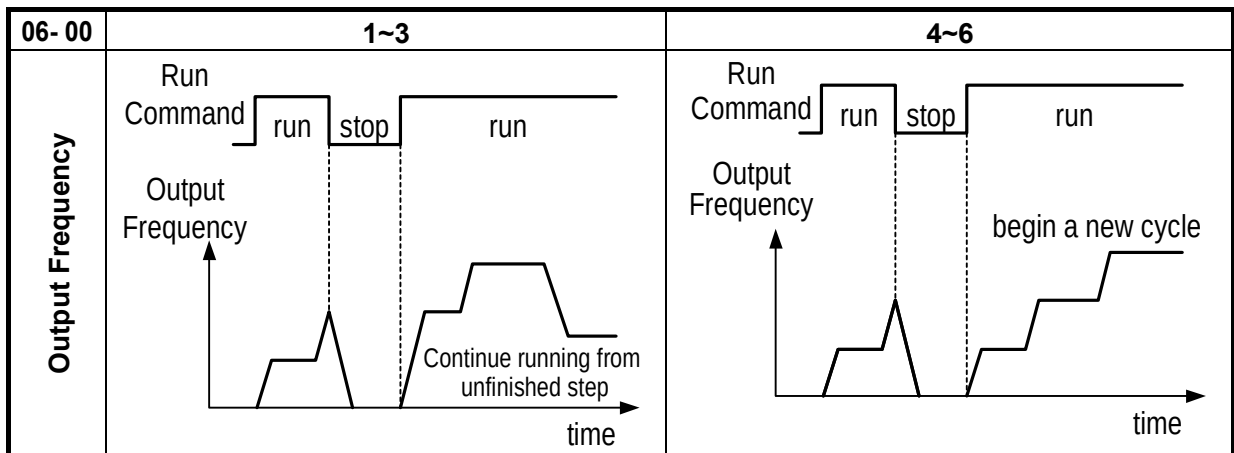
Unused Sequence Parameters 06-03~06- 06= 【0】 Hz, 06-19~06-22= 【0】 s, 06-35~06-38 = 【0】



### Example 4&5 .

**Auto\_Run Mode 06-00=【1~3】** . After a restart continues to run from the unfinished step.

**Auto\_Run Mode 6- 00=【4~6】** . After a restart, it will begin a new cycle.



- ACC/DEC time in Auto run mode will be according to the setting of 00-14/00-15 or 00-16/00-17.
- For Auto sequence 0.The run frequency will be according to keypad frequency set by parameter 05-01.Parameters 06-16 and 06-32 are used to set the sequence Run time and Run direction.

| 07- Start/Stop command setup |                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------|
| 07- 00                       | Momentary power loss and restart                                                                            |
| Range                        | <b>[0] :Momentary Power Loss and Restart disable</b><br><b>[1] :Momentary power loss and restart enable</b> |

- If the input power supply due to sudden increase in supply demand by other equipment results in voltage drops below the under voltage level, the inverter will stop its output at once.
- When 07-00 = [0] .On power loss, the inverter will not start.
- When 07-00 = [1] .After a momentary power loss, inverter will restart in speed search mode, **and there is no limitation on number of restarts.**
- On power loss, as long as the inverter CPU power is not completely lost, the momentary power loss restart will be effective, restart will be according to setting of parameters 00-02 & 07-04 and status of External run switch.

**Caution:-** After any power loss if the Run mode is set to External by parameter 00-02=1 and if Direct start on power up is also selected by parameter 07-04=0, please note that the inverter will run on resumption of power.

To ensure safety of operators and to avoid any damages to the machinery, all necessary safety measure must be considered, including disconnection of power to the inverter.

|        |                                 |
|--------|---------------------------------|
| 07- 01 | Auto Restart Delay Time         |
| Range  | <b>[0.0~800.0] Sec</b>          |
| 07- 02 | Number of Auto Restart Attempts |
| Range  | <b>[0~10]</b>                   |

- 07- 02= [0] : The inverter will not auto restart after trips due to fault.
- 07- 02> [0] , 07- 01= [0] .After a trip due to fault the inverter will run in speed search mode and restarts after an internal delay of 0.5 Secs. While the inverter output is switched off and as the motor Coasts to stop, the speed search function will determine the motor spin speed, Once the rotating speed is determined then it will accelerate or decelerate from this speed to the running speed before the fault occurred.
- 07- 02> [0] , 07- 01> [0] , After a fault trip and speed search function the inverter will Restart with a delay according the preset in parameter 07-01.
- **Note:- Auto restart after a fault will not function while DC injection braking or decelerating to stop**

|        |                                                                                                                 |
|--------|-----------------------------------------------------------------------------------------------------------------|
| 07- 03 | Reset Mode Setting                                                                                              |
| Range  | <b>[0] :Enable Reset Only when Run Command is Off</b><br><b>[1] :Enable Reset when Run Command is On or Off</b> |

- 07-03=0 Once the inverter is detected a fault, please turn Run switch Off and then On again to perform reset, otherwise restarting will not be possible.

|        |                                                                                                       |
|--------|-------------------------------------------------------------------------------------------------------|
| 07- 04 | Direct Running on Power Up                                                                            |
| Range  | <b>[0] :Enable Direct running after power up</b><br><b>[1] :Disable Direct running after power up</b> |
| 07- 05 | Delay-ON Timer (Seconds)                                                                              |
| Range  | <b>[1.0~300.0] Sec</b>                                                                                |

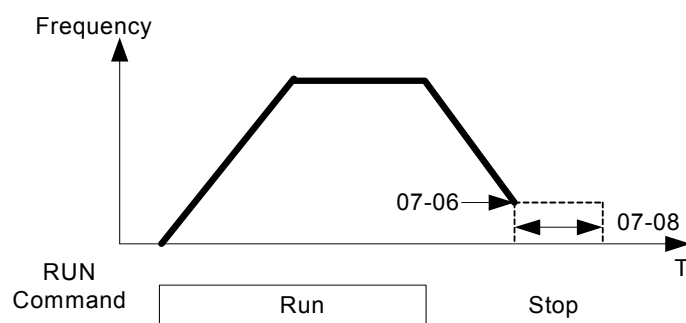
- When direct run on power up is selected by 07-04=0 and the inverter is set to external run by (00-02/00-03=1), if the run switch is ON as power is applied, the inverter will auto start. It is recommend that the power is turned off and the run switch is also off to avoid possibility of injury to operators and damage to machines as the power is reapplied.

**Note: IF this mode is required all safety measures must be considered including warning labels.**

- When direct run on power up is disabled by 07-04=1 and if the inverter is set to external run by (00-02/00-03=1), if the run switch is ON as power is applied, the inverter will not auto start and the display will flash with STP1. It will be necessary to turn OFF the run switch and then ON again to start normally.

|               |                                                         |
|---------------|---------------------------------------------------------|
| <b>07- 06</b> | <b>DC Injection Brake Start Frequency (Hz) @Stopped</b> |
| <b>Range</b>  | <b>【0.10 ~ 10.00】 Hz</b>                                |
| <b>07- 07</b> | <b>DC Injection Brake Level (%)@Stopped</b>             |
| <b>Range</b>  | <b>【0~ 20】 %</b>                                        |
| <b>07- 08</b> | <b>DC Injection Brake Time (Seconds)@stopped</b>        |
| <b>Range</b>  | <b>【0.0 ~ 25.5】 Sec</b>                                 |

- 07- 08/07- 06 set the DC injection brake duration and the brake start frequency as shown below.



|               |                                                          |
|---------------|----------------------------------------------------------|
| <b>07- 09</b> | <b>Stopping Method</b>                                   |
| <b>Range</b>  | <b>【0】 :Deceleration to stop.<br/>【1】 :Cost to stop.</b> |

- 07- 09 = 【0】 : after receiving stop command, the motor will decelerate to stop according to setting of 00-15, deceleration time 1.
- 07- 09 = 【1】 : after receiving stop command, the motor will free-run (Coast) to stop.

| <b>08- Protection function group</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>08- 00</b>                        | <b>Trip Prevention Selection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Range</b>                         | <b>【xxxx0】 :Enable Trip Prevention During Acceleration</b><br><b>【xxxx1】 :Disable Trip Prevention During Acceleration</b><br><b>【xxx0x】 :Enable Trip Prevention During Deceleration</b><br><b>【xxx1x】 :Disable Trip Prevention During Deceleration</b><br><b>【xx0xx】 :Enable Trip Prevention in Run Mode</b><br><b>【xx1xx】 :Disable Trip Prevention in Run Mode</b><br><b>【x0xxx】 :Enable over voltage Prevention in Run Mode</b><br><b>【x1xxx】 :Disable over voltage Prevention in Run Mode</b> |

|               |                                                  |
|---------------|--------------------------------------------------|
| <b>08- 01</b> | <b>Trip Prevention Level During Acceleration</b> |
| <b>Range</b>  | <b>【50 ~ 200】 %</b>                              |

- Trip prevention adjustment level during acceleration to prevent over current (OC-A) trips.
- If trip prevention during acceleration is enabled and an over current occurs due to the load, then the acceleration is interrupted until the over current level is dropped below the setting in 08-01 then the acceleration is resumed.

|               |                                                  |
|---------------|--------------------------------------------------|
| <b>08- 02</b> | <b>Trip Prevention Level During Deceleration</b> |
| <b>Range</b>  | <b>【50 ~ 200】 %</b>                              |

- Trip prevention adjustment level during deceleration to prevent over Voltage (OV-C) trips.
- If trip prevention during deceleration is enabled and an over voltage occurs during stopping due to the load, then the deceleration is interrupted until the over voltage level is dropped below the setting in 08-02 then the deceleration is resumed.

|               |                                                         |
|---------------|---------------------------------------------------------|
| <b>08- 03</b> | <b>Trip Prevention Level during continuous Run Mode</b> |
| <b>Range</b>  | <b>【 50 ~ 200 】 %</b>                                   |

- Trip prevention adjustment level during continuous Run to prevent over current (OC-C) trips.
- If trip prevention during continuous Run is enabled and an over current occurs due the load such as a sudden transient load, then the output frequency is reduced by decelerating to a lower speed until the over current level is dropped below the preset in 08-03, then the output frequency accelerates back to the normal running frequency.

|               |                                                      |
|---------------|------------------------------------------------------|
| <b>08- 04</b> | <b>Over voltage Prevention Level during Run Mode</b> |
| <b>Range</b>  | <b>【 350~390 】 V</b>                                 |

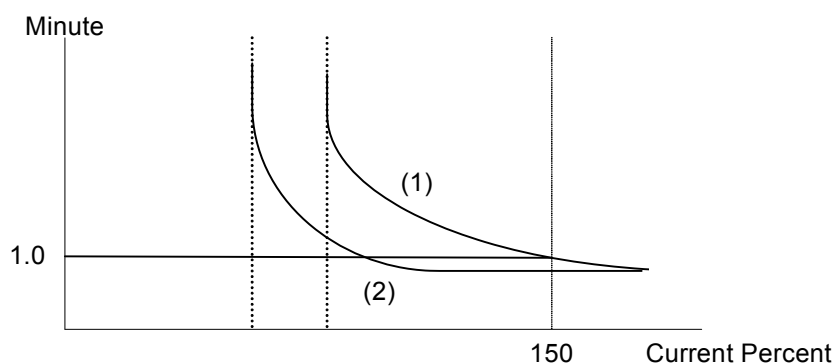
- Over voltage prevention level can be set by parameter 08-04 when necessary.  
When the DC bus voltage is higher than the level set in 08-04, the over voltage fault will occur.

|               |                                                                                                                   |
|---------------|-------------------------------------------------------------------------------------------------------------------|
| <b>08- 05</b> | <b>Electronic Motor Overload Protection Operation Mod (OL1)</b>                                                   |
| <b>Range</b>  | <b>【 0 】 :Enable Electronic Motor Overload Protection<br/>【 1 】 :Disable Electronic Motor Overload Protection</b> |

|               |                                                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>08- 06</b> | <b>Operation After Overload Protection is Activated</b>                                                                                       |
| <b>Range</b>  | <b>【 0 】 :Coast-to-Stop After Overload Protection is Activated<br/>【 1 】 :Drive Will Not Trip when Overload Protection is Activated (OL1)</b> |

- 08- 06 = 【 0 】 : On overload condition the inverter coast to stop as the thermal relay detects the overload and the display will flash OL1.To reset Press the 'Reset' key or use an external reset to continue to run.
- 08- 06 = 【 1 】 : On overload condition the inverter continues to run, display flash with OL1, until the current falls below the overload level.

The heat sinking function will not be as effective when the motor run at low speed. So the thermal action level will decline at the same time. (The curve 1 will change to curve 2)



|               |                                                                                                                                |
|---------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>08- 07</b> | <b>OH over heat Protection</b>                                                                                                 |
| <b>Range</b>  | <b>【 0 】 :Auto (Depends on heat sink temp.)<br/>【 1 】 :Operate while in RUN mode<br/>【 2 】 :Always Run<br/>【 3 】 :Disabled</b> |

- 08- 07= 【 0 】 : Cooling fan runs as the inverter detects temperature rise.
- 08- 07= 【 1 】 : Cooling fan runs while the inverter is running.
- 08- 07= 【 2 】 : Cooling fan runs continuously.
- 08- 07= 【 3 】 : Cooling fan is Disabled.

|               |                                                                                                                                                                                                                                                                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>08- 08</b> | <b>AVR function</b>                                                                                                                                                                                                                                                                                                                                          |
| <b>Range</b>  | <b>[0] :AVR function enable</b><br><b>[1] :AVR function disable</b><br><b>[2] :AVR function disable for stop</b><br><b>[3] :AVR function disable for Deceleration</b><br><b>[4] :AVR function disabled for stop &amp; Deceleration from one speed to another speed.</b><br><b>[5] :when VDC&gt;360V , AVR function is disabled for stop and Deceleration</b> |

- Automatic voltage regulator function provides a level of output voltage stability when there is input voltage instability. So when 08-08=0, Input voltage fluctuations will not effect the output voltage.
- 08-08=1. Input voltage fluctuations will cause fluctuations on output voltage.
- 08-08=2. AVR is disabled during stopping to avoid an increase in stopping time.
- 08-08=3. AVR is disabled only during deceleration from one speed to another speed. This will avoid longer than required deceleration time.

|               |                                             |
|---------------|---------------------------------------------|
| <b>08- 09</b> | <b>Input phase lost protection</b>          |
| <b>Range</b>  | <b>[0] :Disabled</b><br><b>[1] :Enabled</b> |

## 09- Communication function group

|               |                                              |
|---------------|----------------------------------------------|
| <b>09- 00</b> | <b>Assigned Communication Station Number</b> |
| <b>Range</b>  | <b>[ 1 ~ 32 ]</b>                            |

- 09-00 sets the communication station number when there are more that one unit on the communication network. Up to 32 Slave units can be controlled from one master controller such as a PLC.

|               |                                                                                |
|---------------|--------------------------------------------------------------------------------|
| <b>09- 01</b> | <b>RTU code /ASCII code Selection</b>                                          |
| <b>Range</b>  | <b>[0] :RTU</b><br><b>[1] :ASCII</b>                                           |
| <b>09- 02</b> | <b>Baud Rate Setting (bps)</b>                                                 |
| <b>Range</b>  | <b>[0] :4800</b><br><b>[1] :9600</b><br><b>[2] :19200</b><br><b>[3] :38400</b> |
| <b>09- 03</b> | <b>Stop Bit Selection</b>                                                      |
| <b>Range</b>  | <b>[0] :1 stop bit</b><br><b>[1] :2 stop bit</b>                               |
| <b>09- 04</b> | <b>Parity Selection</b>                                                        |
| <b>Range</b>  | <b>[0] :no parity</b><br><b>[1] :odd parity</b><br><b>[2] :even parity</b>     |
| <b>09- 05</b> | <b>Data Format Selection</b>                                                   |
| <b>Range</b>  | <b>[0] :8 bit data</b><br><b>[1] :7 bit data</b>                               |

- Set 09-01~09-05 to configure communication format before starting communication.

|               |                                                                                                                                                                                                                                                                                                                           |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>09- 06</b> | <b>Communication time-out detection time</b>                                                                                                                                                                                                                                                                              |
| <b>Range</b>  | <b>【0.0~25.5】 Sec</b>                                                                                                                                                                                                                                                                                                     |
| <b>09- 07</b> | <b>Communication time-out operation selection</b>                                                                                                                                                                                                                                                                         |
| <b>Range</b>  | <b>【0】 :Stop in deceleration time 1 and show COT after communication timeout</b><br><b>【1】 : Stop in free run mode and show COT after communication timeout</b><br><b>【2】 :Stop in deceleration time 2 and show COT after communication timeout</b><br><b>【3】 : Keep running and show COT after Communication timeout</b> |

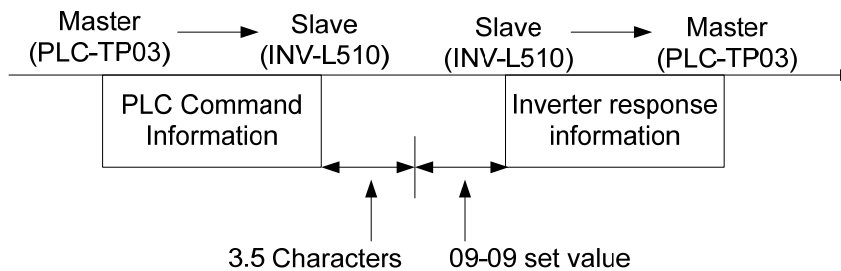
- Time-out detection time: 00.0~25.5sec; setting 00.0 sec: disables time-out function.

|               |                                   |
|---------------|-----------------------------------|
| <b>09- 08</b> | <b>Err6 fault tolerance times</b> |
| <b>Range</b>  | <b>【1~20】</b>                     |

- When communication error time ≥ 09-08 setting, keypad display shows ERR6.

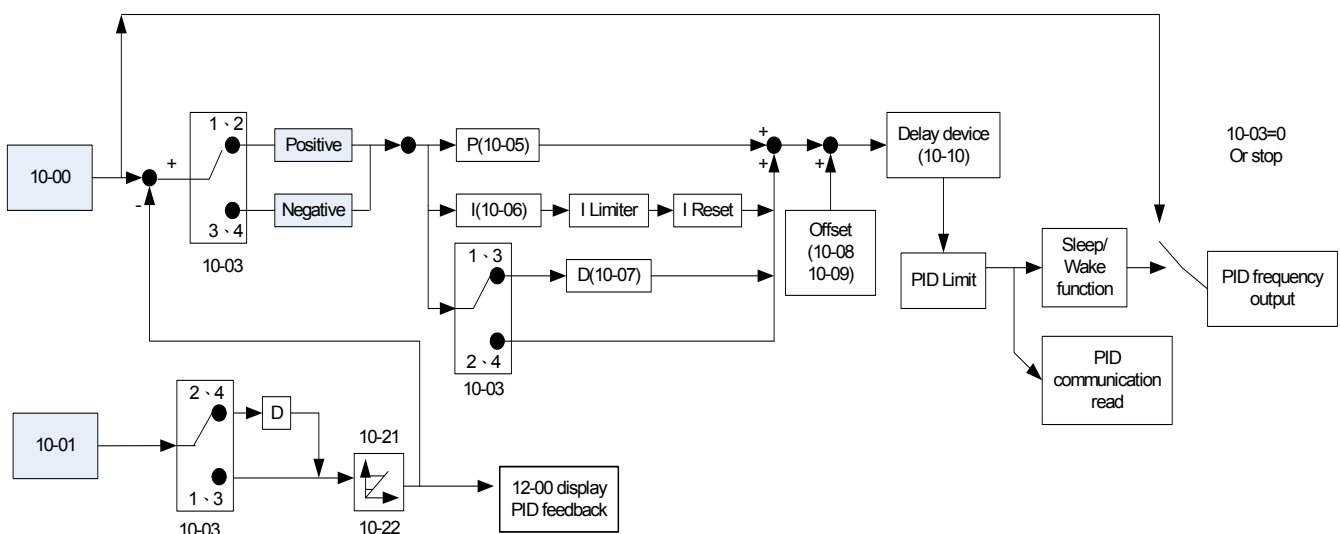
|               |                                 |
|---------------|---------------------------------|
| <b>09- 09</b> | <b>Drive Transmit Wait Time</b> |
| <b>Range</b>  | <b>【5~65】 mSec</b>              |

- This parameter is used to set the converter to receive data from the sending date to the beginning of the time.



## 10-PID function Setup

### PID block diagram



| 10- 00 | PID target value selection                                                                                                                                                                                                                            |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Range  | <b>【0】</b> :Potentiometer on Keypad<br><b>【1】</b> :External AVI Analog Signal Input<br><b>【2】</b> :External ACI Analog Signal Input<br><b>【3】</b> : Target Frequency set by Communication method.<br><b>【4】</b> : Set from keypad by parameter 10-02. |

- 10-00 selections are only effective when frequency source selection is set to PID by parameters 00 - 05 \ 00 - 06= 6.

| 10- 01 | PID feedback value selection                                                                                                                                                       |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Range  | <b>【0】</b> :Potentiometer on Keypad<br><b>【1】</b> :External AVI Analog Signal Input<br><b>【2】</b> :External ACI Analog Signal Input<br><b>【3】</b> :Communication setting Frequency |

- ! Note: 10-00 and 10-01 can not be set to the same value.

| 10- 02 | PID keypad input     |
|--------|----------------------|
| Range  | <b>【0.0~100.0】</b> % |

| 10- 03 | PID operation selection                                                                                                                                                                                                                                                                                     |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Range  | <b>【0】</b> :PID Function disabled<br><b>【1】</b> : FWD Characteristic.      Deviation is D-controlled<br><b>【2】</b> : FWD Characteristic.      Feedback is D-controlled<br><b>【3】</b> : REV Characteristic.      Deviation is D-controlled<br><b>【4】</b> : REV Characteristic.      Feedback is D-controlled |

- 10- 03 = **【1】** .  
Deviation (target/detected value) is derivative controlled in unit time set in parameter 10-07.
- 10- 03 = **【2】**  
Feed back (detected value) is derivative controlled in unit time set in parameter 10- 07.
- 10- 03 = **【3】**  
Deviation (target value –detected value) is derivative controlled in unit time set in parameter 10-07. If the deviation is positive, the output frequency decreases, vice versa.
- 10- 03 = **【4】**  
Feed back (detected value) is derivative controlled in unit time set in parameter 10- 07.  
If the deviation is positive, the output frequency decreases, vice versa.

| 10- 04 | Feedback Gain coefficient |
|--------|---------------------------|
| Range  | <b>【0.00 ~ 10.00】</b>     |

- 10-04 is the calibration gain. Deviation = set point – (feedback signal×10-04)

| 10- 05 | Proportional Gain     |
|--------|-----------------------|
| Range  | <b>【0.0 ~ 10.0】</b> % |

- 10- 05: Proportion gain for P control.

| 10- 06 | Integral Time            |
|--------|--------------------------|
| Range  | <b>【0.0 ~ 100.0】</b> Sec |

- 10- 06: Integration time for I control

| 10- 07 | Derivative Time           |
|--------|---------------------------|
| Range  | <b>【0.00 ~ 10.00】</b> Sec |

- 10- 07: Differential time for D control



|               |                                                                    |
|---------------|--------------------------------------------------------------------|
| <b>10- 08</b> | <b>PID Offset</b>                                                  |
| <b>Range</b>  | <b>[0] : Positive Direction</b><br><b>[1] : Negative Direction</b> |
| <b>10- 09</b> | <b>PID Offset Adjust</b>                                           |
| <b>Range</b>  | <b>[0 ~ 109] %</b>                                                 |

- 10- 08 /10- 09: Calculated PID output is offset by 10-09 (the polarity of offset is according to 10-08)

|              |                                   |
|--------------|-----------------------------------|
| <b>10-10</b> | <b>PID Output Lag Filter Time</b> |
| <b>Range</b> | <b>[0.0 ~ 2.5] Sec</b>            |

- 10-10 : Update time for output frequency.

|              |                                                                                                                                                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>10-11</b> | <b>Feedback Loss Detection Mode</b>                                                                                                                     |
| <b>Range</b> | <b>[0] : Disable</b><br><b>[1] : Enable – Drive Continues to Operate After Feedback Loss</b><br><b>[2] : Enable – Drive “STOPS” After Feedback Loss</b> |

- 10-11= [1] : On feed back loss detection, continue running, and display 'PDER' ;
- 10-11= [2] : On feed back loss detection, stop, and display 'PDER'.

|              |                                      |
|--------------|--------------------------------------|
| <b>10-12</b> | <b>Feedback Loss Detection Level</b> |
| <b>Range</b> | <b>[0 ~ 100]</b>                     |

- 10-12 is the level for signal loss. Error = (Set point – Feedback value). When the error is larger than the loss level setting, the feedback signal is considered lost.

|              |                                           |
|--------------|-------------------------------------------|
| <b>10-13</b> | <b>Feedback Loss Detection Delay Time</b> |
| <b>Range</b> | <b>[0.0 ~25.5] Sec</b>                    |

- 10-13: The minimum time delay before feedback signal loss is determined.

|              |                                |
|--------------|--------------------------------|
| <b>10-14</b> | <b>Integration Limit Value</b> |
| <b>Range</b> | <b>[0 ~ 109] %</b>             |

- 10-14: the Limiter to prevent the PID from saturating.

|              |                                                                                                       |
|--------------|-------------------------------------------------------------------------------------------------------|
| <b>10-15</b> | <b>Integration Value Resets to Zero when Feedback Signal Equals the target Value</b>                  |
| <b>Range</b> | <b>[0] : Disabled</b><br><b>[1] : After 1 Sec</b><br><b>[30] : After 30 Sec ( Range:- 1 ~ 30 Sec)</b> |

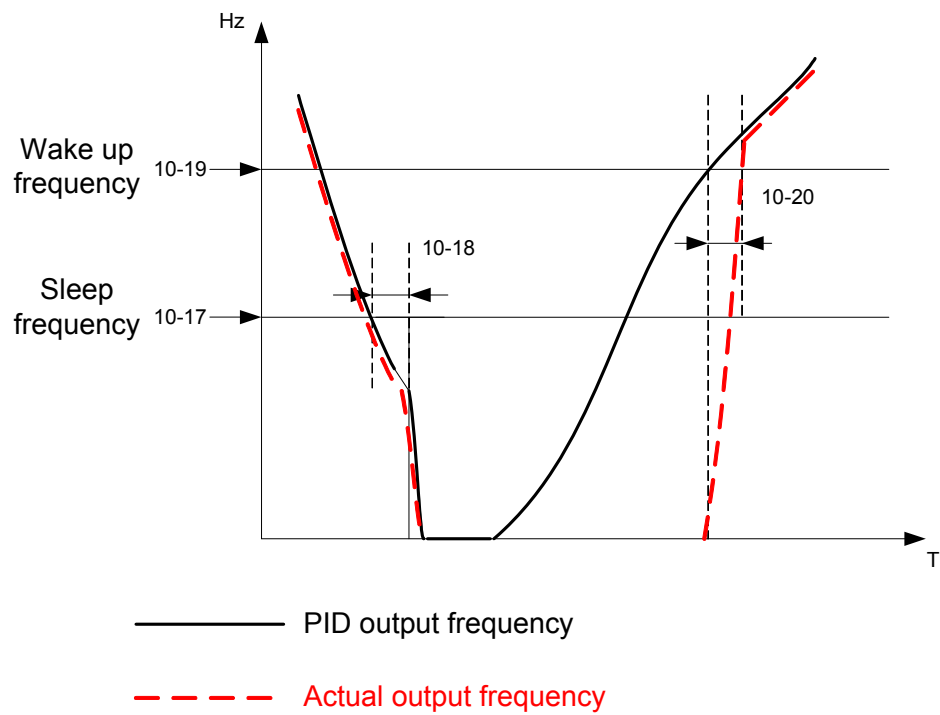
- 10-15=0. As PID feedback value reaches the set point, the integral value will not be reset.
- 10-15= 1~30. As PID feedback value reaches the set point, reset to 0 in 1~30 seconds and inverter stops. The inverter will run again when the feedback value differs from the set point value.

|              |                                                                    |
|--------------|--------------------------------------------------------------------|
| <b>10-16</b> | <b>Allowable Integration Error Margin (Unit) (1 Unit = 1/8192)</b> |
| <b>Range</b> | <b>[0 ~ 100] %</b>                                                 |

- 10-16 = 0 ~ 100% unit value: Restart the tolerance after the integrator reset to 0.

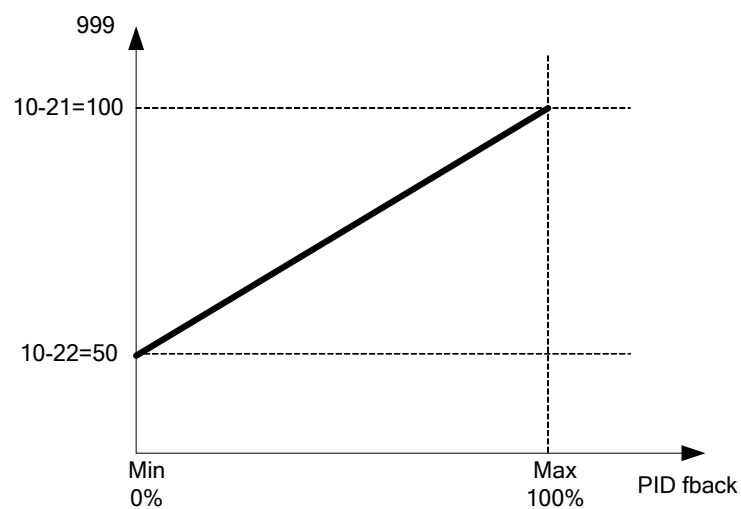
|              |                                        |
|--------------|----------------------------------------|
| <b>10-17</b> | <b>PID Sleep Frequency Level</b>       |
| <b>Range</b> | <b>[0.00~650.00] Hz</b>                |
| <b>10-18</b> | <b>PID Sleep Function Delay Time</b>   |
| <b>Range</b> | <b>[0.0 ~25.5] Sec</b>                 |
| <b>10-19</b> | <b>PID Wake up frequency Level</b>     |
| <b>Range</b> | <b>[0.00 ~ 650.00] Hz</b>              |
| <b>10-20</b> | <b>PID Wake up function Delay Time</b> |
| <b>Range</b> | <b>[0.0 ~ 25.5] Sec</b>                |

- When PID output frequency is less than the sleep threshold frequency and exceeds the time of sleep delay, the inverter will decelerate to 0 and enters PID sleep mode.
- When PID output frequency is larger than the Wake up threshold frequency inverter will enter the PID mode again as shown in the timing diagram below.



|              |                                |
|--------------|--------------------------------|
| <b>10-21</b> | <b>Max PID Feedback Level.</b> |
| <b>Range</b> | <b>[0 ~ 999]</b>               |
| <b>10-22</b> | <b>Min PID Feedback Level.</b> |
| <b>Range</b> | <b>[0 ~ 999]</b>               |

- Example: If 10-21=100 and 10-22=50, actual feedback value variation range, will be scaled to 50 and 100 as Shown below.



## 11 Performance control functions

|               |                                                                                   |
|---------------|-----------------------------------------------------------------------------------|
| <b>11- 00</b> | <b>Prevention of Reverse operation</b>                                            |
| <b>Range</b>  | <b>【0】 :Reverse command is enabled</b><br><b>【1】 :Reverse command is disabled</b> |

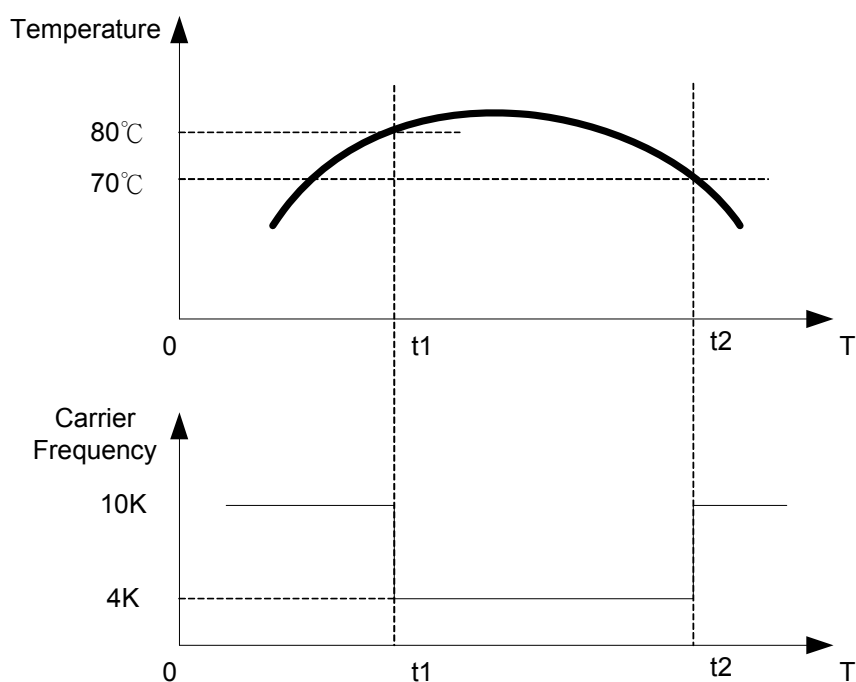
- 11-00=1, the reverse command is **disabled**.

|               |                          |
|---------------|--------------------------|
| <b>11- 01</b> | <b>Carrier Frequency</b> |
| <b>Range</b>  | <b>【1~16】 KHz</b>        |

|               |                                                                                                                                                                                 |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>11- 02</b> | <b>Carrier mode selection</b>                                                                                                                                                   |
| <b>Range</b>  | <b>【0】 :Carrier mode0    3-phase PW M modulation</b><br><b>【1】 :Carrier mode1    2-phase PW M modulation</b><br><b>【2】 :Carrier mode2    2-phase randomized PW M modulation</b> |

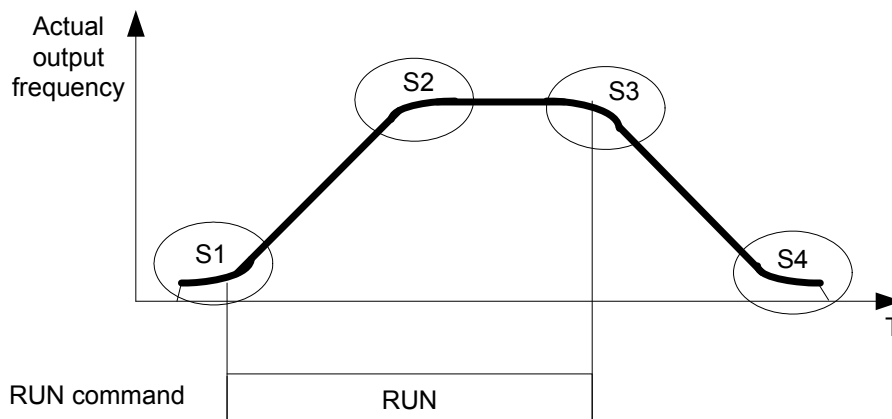
|               |                                                              |
|---------------|--------------------------------------------------------------|
| <b>11- 03</b> | <b>Carrier Frequency auto reduction by temperature raise</b> |
| <b>Range</b>  | <b>【0】 :disable</b><br><b>【1】 :Enable</b>                    |

- When inverter (heatsink) temperature rises above 80°C the Carrier Frequency is reduced by 4K.
- When the temperature falls below less than 70°C, Carrier Frequency is reset to default.
- Temperature can be displayed by setting parameter 11-00=01000.



|               |                        |
|---------------|------------------------|
| <b>11- 04</b> | <b>S-Curve Acc 1</b>   |
| <b>11- 05</b> | <b>S-Curve Acc 2</b>   |
| <b>11- 06</b> | <b>S-Curve Dec 3</b>   |
| <b>11- 07</b> | <b>S-Curve Dec 4</b>   |
| <b>Range</b>  | <b>【0.0 ~ 4.0】 Sec</b> |

- Use S Curve parameters where a smooth acceleration or deceleration action is required, this will prevent possible damage to driven machines by sudden acceleration/deceleration.



Note:

- Regardless of the stall prevention period, actual acceleration and deceleration time = preset acceleration / deceleration time + S curve time.
- Please set the required individual S curve times in the parameters (11-04~11-07).
- When S curve time (11-04~11-07) is set as 0, the S curve function is disabled.
- The calculation of S curve time is based on the Maximum output frequency of motor (01-02), Please refer to the parameters (00-14/00-15).

|        |                                          |
|--------|------------------------------------------|
| 11- 08 | Skip frequency 1                         |
| 11- 09 | Skip frequency 2                         |
| 11-10  | Skip frequency 3                         |
| Range  | 【0.00 ~ 650.00】 Hz                       |
| 11-11  | Skip frequency range. (± frequency band) |
| Range  | 【0.00 ~ 30.00】 Hz                        |

Skip frequency parameters can be used to avoid mechanical resonance in certain applications.  
Example: 11-08=10.00(Hz); 11-09=20.00(Hz); 11-10=30.00(Hz); 11-11=2.00(Hz).



|                           |  |
|---------------------------|--|
| 12 Monitor function group |  |
|---------------------------|--|

| <b>12- 00</b> | <b>Display Mode</b>                                                                                                                                                                                                                                                                                                                                                                           |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Range</b>  | <p>0      0    0    0       0<br/> <b>MSD                        LSD</b><br/> <b>00000~77777     Each digit can be set from 0 to 7 as listed below.</b><br/> <b>[0] :Disable display</b><br/> <b>[1] :output Current</b><br/> <b>[2] :output Voltage</b><br/> <b>[3] :DC voltage</b><br/> <b>[4] :Temperature</b><br/> <b>[5] :PID feedback</b><br/> <b>[6] :AVI</b><br/> <b>[7] :ACI</b></p> |

- MSD= Most significant digit. LSD= Least significant digit.
- Note: MSD of parameter 12-00 sets the power on display, other digits set user selected displays. (refer to P4-4)

|        |                                                                                                                                                       |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12- 01 | PID Feedback Display Mode                                                                                                                             |
| Range  | <b>【0】</b> :Displayed in Integer (xxx)<br><b>【1】</b> :Displayed with One Decimal Place (xx.x)<br><b>【2】</b> :Displayed with Two Decimal Places (x.xx) |
| 12- 02 | PID Feedback Display Unit Setting                                                                                                                     |
| Range  | <b>【0】</b> :xxx--<br><b>【1】</b> :xxxpb(pressure)<br><b>【2】</b> :xxxfl(flow)                                                                           |

|        |                                        |
|--------|----------------------------------------|
| 12- 03 | Custom Units (Line Speed) Display Mode |
| Range  | 【0~65535】 Rpm                          |

- Set motor rated RPM in this parameter if required then the display will show this value when inverter output frequency reaches the motor name plate frequency. 50Hz or 60 Hz as appropriate.
- The line speed display is linearly proportional to the output frequency 0 to 50Hz or 0-60 Hz as appropriate. Motor synchronous speed =  $120 \times \text{Rated frequency} / \text{Number of poles}$ .

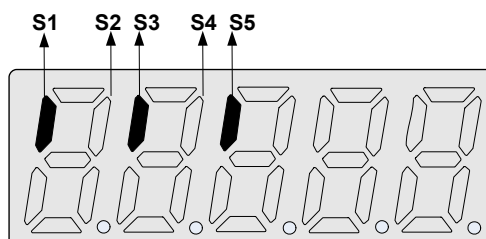
|        |                                                                                                                                                                                                                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12- 04 | Custom Units (Line Speed) Display Mode                                                                                                                                                                                                                                                                                 |
| Range  | <p>【0】 :Drive Output Frequency is Displayed</p> <p>【1】 :Line Speed is Displayed in Integer (xxxxx)</p> <p>【2】 :Line Speed is Displayed with One Decimal Place (xxxx.x)</p> <p>【3】 :Line Speed is Displayed with Two Decimal Places (xxx.xx)</p> <p>【4】 :Line Speed is Displayed with Three Decimal Places (xx.xxx)</p> |

- **12- 04≠0**, line speed is displayed while the inverter is running or stopped.

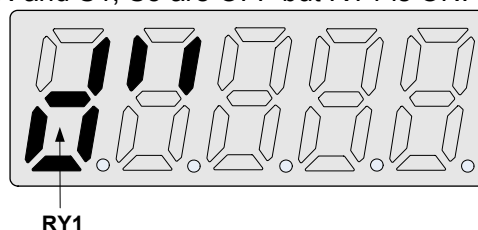
|               |                                                 |
|---------------|-------------------------------------------------|
| <b>12- 05</b> | <b>Input and output terminal status display</b> |
| <b>Range</b>  | <b>Read only(Panel read only)</b>               |

- When any of S1 ~ S5 is turned on, corresponding segments on the digital display digits will be on.
- When relay output RY1 is on, the corresponding digit will be on as shown below.

Example 1: The following figure shows 12 - 05 display status, when S1, S3, S5 Inputs are ON and S2, S4 and RY1 are OFF.



Example 2: The following figure shows 12 - 05 display status when S2, S3, S4 inputs are ON and S1, S5 are OFF but RY1 is ON.



### 13 Inspection & Maintenance functions

|               |                              |
|---------------|------------------------------|
| <b>13- 00</b> | <b>Drive Horsepower Code</b> |
| <b>Range</b>  | ----                         |

| Inverter Model: | 13- 00 show | Inverter Model: | 13- 00 show |
|-----------------|-------------|-----------------|-------------|
| L510-1P2-XXX    | 1P2         | L510-2P2-XXX    | 2P2         |
| L510-1P5-XXX    | 1P5         | L510-2P5-XXX    | 2P5         |
| L510-101-XXX    | 101         | L510-201-XXX    | 201         |
|                 |             | L510-202-XXX    | 202         |
|                 |             | L510-203-XXX    | 203         |

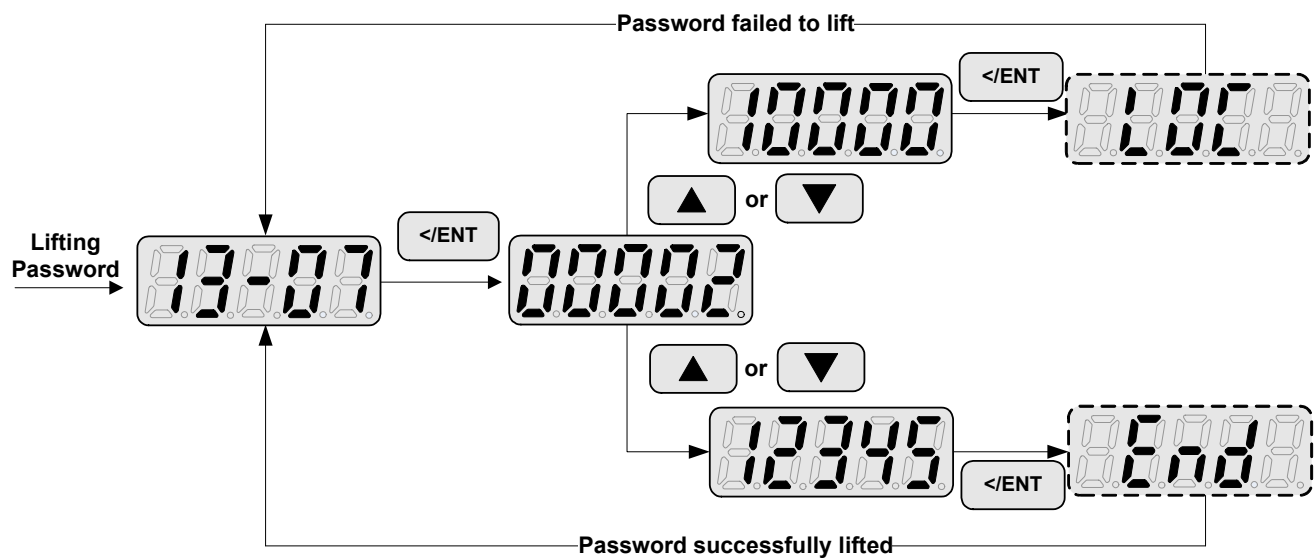
|               |                         |
|---------------|-------------------------|
| <b>13- 01</b> | <b>Software Version</b> |
| <b>Range</b>  | ----                    |

|               |                                            |
|---------------|--------------------------------------------|
| <b>13- 02</b> | <b>Fault Log Display (Latest 3 faults)</b> |
| <b>Range</b>  | ----                                       |

- Last three faults are stored in a stack and whenever there is a new fault the previous faults are pushed down the stack. So the fault stored in 2.xxx will be transferred to 3.xxx, and the one in 1.xxx to 2.xxx. The recent fault will be stored in the empty register 1.xxx.
- Use Up▲ and Down▼ keys to scrole between the fault registers.
- When pressing 'Reset' at 13-02, all three fault registers will be cleared and the display for each register will change to 1. ---, 2. ---, 3. ---.
- E.g. fault log content is '1.OC-C'; this indicates the latest fault is OC-C, etc.



Lifting Password:



|        |                                                                                                          |
|--------|----------------------------------------------------------------------------------------------------------|
| 13- 08 | Reset Drive to Factory Settings                                                                          |
| Range  | <b>【 1150 】</b> :Reset to the 50Hz factory setting<br><b>【 1160 】</b> :Reset to the 60Hz factory setting |

- When a Parameter lock key number has been entered in parameter 13 – 07. This key number must be entered first before parameter 13-08 can be used.



# Chapter 5 Troubleshooting and maintenance

## 5.1 Error display and corrective action

### 5.1.1 Manual Reset and Auto-Reset

| Faults which can not be recovered manually               |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
|----------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                                                  | content                                 | Cause                                                                                                                                                                                                                                | Corrective action                                                                                                                                                                     |
| -oV-                                                     | Voltage too high when stopped           | Detection circuit malfunction                                                                                                                                                                                                        | Return the inverter                                                                                                                                                                   |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| -LV-                                                     | Voltage too low when stopped            | 1. Power voltage too low<br>2. Pre-charge resistor or fuse burnt out.<br>3. Detection circuit malfunction                                                                                                                            | 1.Check if the power voltage is correct<br>2.Replace the pre-charge resistor or the fuse<br>3.Return the inverter                                                                     |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| -oH-                                                     | The inverter is overheated when stopped | 1. Detection circuit malfunction<br>2. Ambient temperature too high or bad ventilation                                                                                                                                               | Return the inverter improve ventilation conditions                                                                                                                                    |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| CtEr                                                     | Current Sensor detection error          | Current sensor error or circuit malfunction                                                                                                                                                                                          | Return the inverter                                                                                                                                                                   |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| EPr                                                      | EEPROM problem                          | Faulty EEPROM                                                                                                                                                                                                                        | Replace EEPROM                                                                                                                                                                        |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| Cot                                                      | Communication error                     | Communications disruption                                                                                                                                                                                                            | Check the wiring                                                                                                                                                                      |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| Faults which can be recovered manually and automatically |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| Display                                                  | content                                 | Cause                                                                                                                                                                                                                                | Corrective action                                                                                                                                                                     |
| oC-A                                                     | Over-current at acceleration            | 1.Acceleration time too short<br>2.The capacity of the motor exceeds the capacity of the inverter<br>3.Short circuit between the motor coil and the case<br>4.Short circuit between motor wiring and ground<br>5.IGBT module damaged | 1.Set a longer acceleration time<br>2.Replace inverter with one that has the same rating as that of the motor<br>3.Check the motor<br>4.Check the wiring<br>5.Replace the IGBT module |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| oC-C                                                     | Over-current at fixed speed             | 1. Transient load change<br>2. Transient power change                                                                                                                                                                                | 1.Increase the capacity of the inverter<br>2.Install inductor on the power supply input side                                                                                          |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| oC-d                                                     | Over-current at deceleration            | The preset deceleration time is too short.                                                                                                                                                                                           | Set a longer deceleration time                                                                                                                                                        |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |
| oC-S                                                     | Over current at start                   | 1.Short circuit between the motor coil and the case<br>2.Short circuit between motor coil and ground<br>3.IGBT module damaged                                                                                                        | 1.Inspect the motor<br>2.Inspect the wiring<br>3.Replace the transistor module                                                                                                        |
|                                                          |                                         |                                                                                                                                                                                                                                      |                                                                                                                                                                                       |

|                                                              |                                                  |                                                                                                              |                                                                                                                       |
|--------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| oV-C                                                         | Excessive Voltage during operation/ deceleration | 1.Deceleration time setting too short or excessive load inertia<br>2.Power voltage varieswidely (fluctuates) | 1.Set a longer deceleration time<br>2.Add a brake resistor or brake module<br>3.Add a reactor at the power input side |
| ou-[-                                                        |                                                  |                                                                                                              |                                                                                                                       |
| Faults which can be recovered manually but not automatically |                                                  |                                                                                                              |                                                                                                                       |
| Display                                                      | content                                          | Cause                                                                                                        | Corrective action                                                                                                     |
| oC                                                           | Over-current during stop                         | Detection circuit malfunction                                                                                | Return the inverter for repair                                                                                        |
| o[-                                                          |                                                  |                                                                                                              |                                                                                                                       |
| oL1                                                          | Motor overload                                   | loading too large                                                                                            | Increase the Motor capacity                                                                                           |
| oL1                                                          |                                                  |                                                                                                              |                                                                                                                       |
| oL2                                                          | Inverter overload                                | Excessive Load                                                                                               | Increase the inverter capacity                                                                                        |
| oL2                                                          |                                                  |                                                                                                              |                                                                                                                       |
| LV-C                                                         | Voltage too low during operation                 | 1.Power voltage too low<br>2.Power voltage varies widely (fluctuates)                                        | 1.Improve power quality<br>2.Add a reactor at the power input side                                                    |
| LU-[-                                                        |                                                  |                                                                                                              |                                                                                                                       |

### 5.1.2 Keypad Operation Error Instruction

|         |                                                                                                |                                                                                                                                                                                   |                                                                                                                       |
|---------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Display | content                                                                                        | Cause                                                                                                                                                                             | Corrective action                                                                                                     |
| LoC     | 1.Parameter already locked<br>2.Motor direction locked<br>3.Parameter password (13-07) enabled | 1.Attempt to modify frequency parameter while 13-06>0.<br>2.Attempt to reverse direction when 11- 00=1。<br>3.Parameter (13 - 07) enabled, set the correct password will show LOC. | 1.Adjust 13-06<br>2.Adjust 11-00                                                                                      |
| Lo[-    |                                                                                                |                                                                                                                                                                                   |                                                                                                                       |
| Err1    | Keypad operation error                                                                         | 1.Press ▲ or ▼ while 00-05/00-06>0 or running at preset speed.<br>2.Attempt to modify the Parameter.Can not be modified during operation (refer to the parameter list)            | 1.The ▲ or ▼ is available for modifying the parameter only when 00-05/00-06=0<br>2.Modify the parameter in STOP mode. |
| Err1    |                                                                                                |                                                                                                                                                                                   |                                                                                                                       |
| Err2    | Parameter setting error                                                                        | 1.00-13 is within the range of (11-08 ±11-11) or (11-09 ±11-11) or (11-10 ±11-11)<br>2.00- 12 ≤ 00-13                                                                             | 1.Modify 11-08~11-10 or 11-11 Set 00-12>00-13                                                                         |
| Err2    |                                                                                                |                                                                                                                                                                                   |                                                                                                                       |
| Err5    | Modification of parameter is not available in communication                                    | 1.Control command sent during communication.<br>2.Attempt to modify the function 09-02~ 09-05 during communication                                                                | 1.Issue enable command before communication<br>2.Set parameters 09-02~ 09-05 function before communication            |
| Err5    |                                                                                                |                                                                                                                                                                                   |                                                                                                                       |
| Err6    | Communication failed                                                                           | 1.Wiring error<br>2.Communication parameter setting error.<br>3.Incorrect communication protocol                                                                                  | 1.Check hardware and wiring<br>2.Check Functions(09-00~ 09- 05).                                                      |
| Err6    |                                                                                                |                                                                                                                                                                                   |                                                                                                                       |

|      |                    |                                                                                                         |                                                       |
|------|--------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Err7 | Parameter conflict | 1. Attempt to modify the function 13-00/13-08.<br>2. Voltage and current detection circuit is abnormal. | If reset is not possible, please Return the inverter. |
| Err7 |                    |                                                                                                         |                                                       |

### 5.1.3 Special conditions

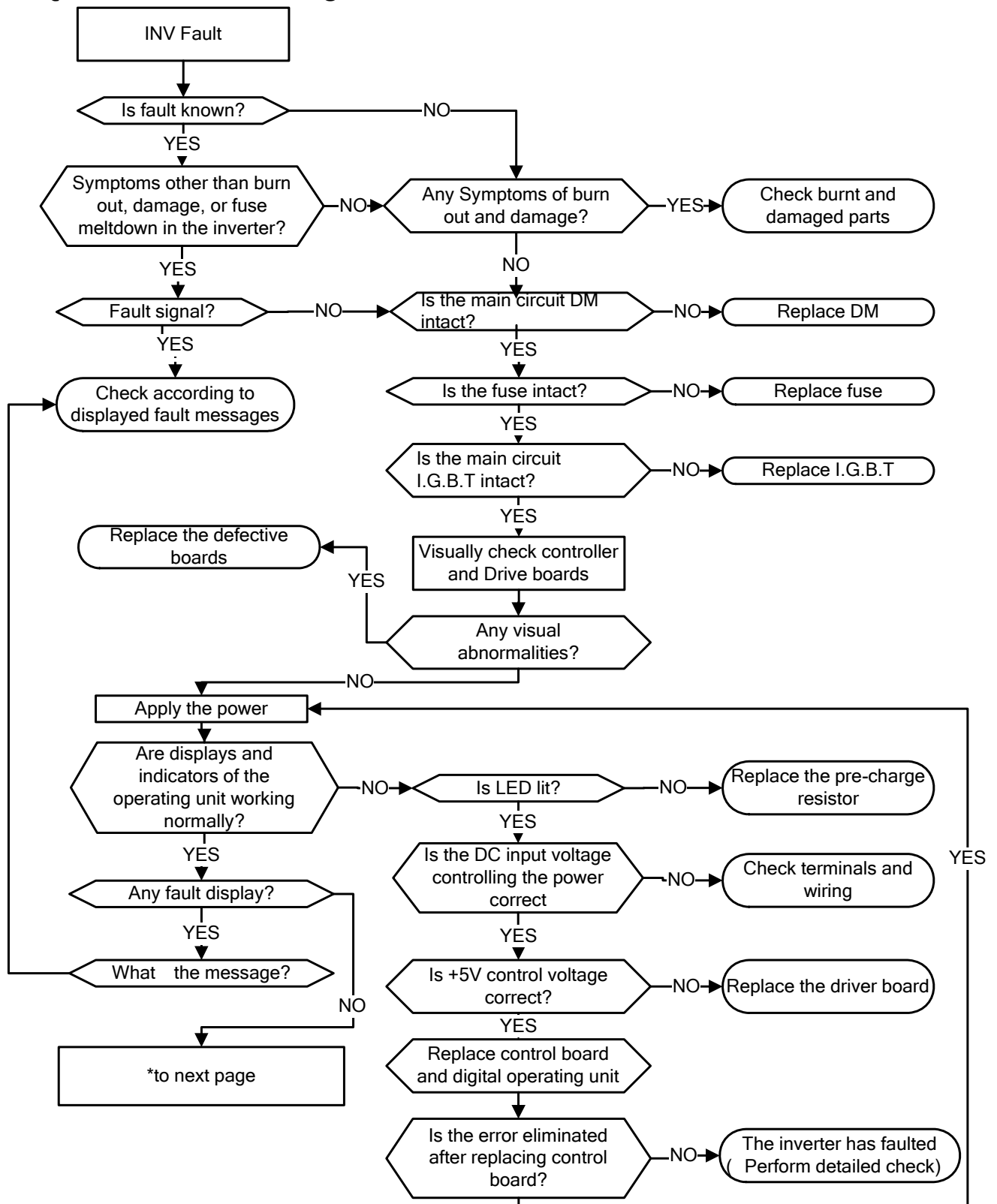
| Display | Fault                                                           | Description                                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| StP0    | Zero speed at stop                                              | Occurs when preset frequency <0.1Hz                                                                                                                                                                                                                        |
| StP0    |                                                                 |                                                                                                                                                                                                                                                            |
| StP1    | Fail to start directly<br>On power up.                          | 1. If the inverter is set for external terminal control mode (00-02/00-03=1) and direct start is disabled (07-04=1)<br>2. The inverter cannot be started and will flash STP1.<br>3. The run input is active at power-up, refer to descriptions of (07-04). |
| StP1    |                                                                 |                                                                                                                                                                                                                                                            |
| StP2    | Keypad Stop<br>Operated when inverter in external Control mode. | 1. If the Stop key is pressed while the inverter is set to external control mode (00-02/00-03=1) then 'STP2' flashes after stop.<br>2. Release and re-activate the run contact to restart the inverter.                                                    |
| StP2    |                                                                 |                                                                                                                                                                                                                                                            |
| E.S.    | External Rapid stop                                             | The inverter will decelerate to stop and then flash E.S., when input external rapid stop signal via the multifunctional input terminal activates                                                                                                           |
| E.S.    |                                                                 |                                                                                                                                                                                                                                                            |
| b.b.    | External base block                                             | The inverter stops immediately and then flashes b.b., when external base block is input by the multifunctional input terminals.                                                                                                                            |
| b.b.    |                                                                 |                                                                                                                                                                                                                                                            |
| PdEr    | PID feedback loss                                               | PID feedback loss detect                                                                                                                                                                                                                                   |
| PdEr    |                                                                 |                                                                                                                                                                                                                                                            |

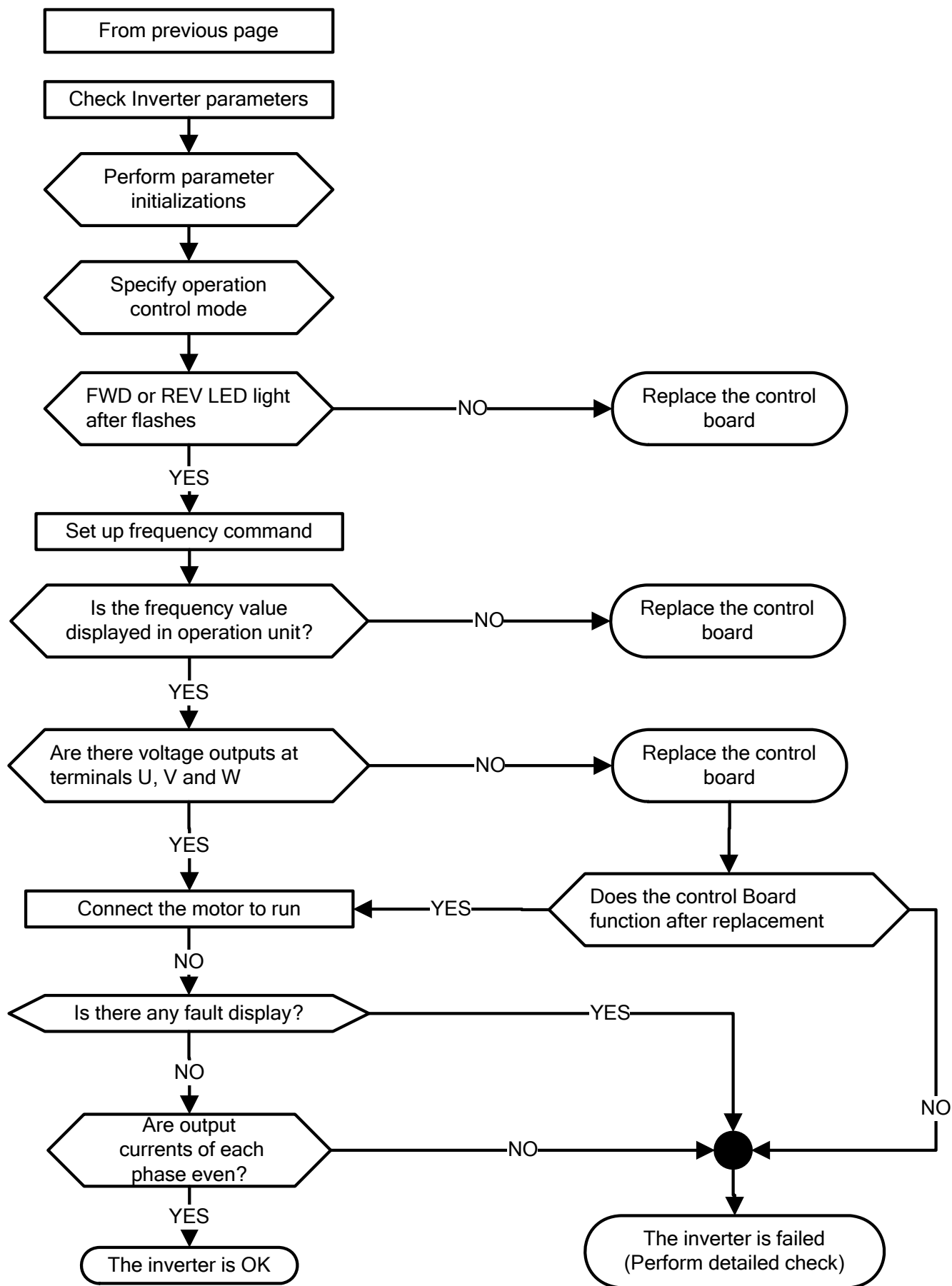
## 5.2 General troubleshooting

| Status                                         | Checking point                                                                                  | Remedy                                                                                                                                                    |
|------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Motor runs in wrong direction</b>           | Is the wiring for the output terminals correct?                                                 | Wiring must match U, V, and W terminals of the motor.                                                                                                     |
|                                                | Is the wiring for forward and reverse signals correct?                                          | Check for correct wiring.                                                                                                                                 |
| <b>The motor speed can not be regulated.</b>   | Is the wiring for the analog frequency inputs correct?                                          | Check for correct wiring.                                                                                                                                 |
|                                                | Is the setting of operation mode correct?                                                       | Check the operation mode of the operator.                                                                                                                 |
|                                                | Is the load too excessive?                                                                      | Reduce the load.                                                                                                                                          |
| <b>Motor running speed too high or too low</b> | Check the motor specifications (poles, voltage...) correct?                                     | Confirm the motor specifications.                                                                                                                         |
|                                                | Is the gear ratio correct?                                                                      | Confirm the gear ratio.                                                                                                                                   |
|                                                | Is the setting of the highest output frequency correct?                                         | Confirm the highest output frequency                                                                                                                      |
| <b>Motor speed varies unusually</b>            | Is the load too excessive?                                                                      | Reduce the load.                                                                                                                                          |
|                                                | Does the load vary excessively?                                                                 | 1. Minimize the variation of the load.<br>2. Increase capacities of the inverter and the motor.                                                           |
|                                                | Is the input power erratic or is there a phase loss ?                                           | 1. Add an AC reactor at the power input side if using single-phase power.<br>2. Check wiring if using three-phase power                                   |
| <b>Motor can not run</b>                       | Is the power connected to the correct L1, L2, and L3 terminals? is the charging indicator lit ? | 1 Is the power applied?<br>2.Turn the power OFF and then ON again.<br>3.Make sure the power voltage is correct.<br>4.Make sure screws are secured firmly. |
|                                                | Is there voltage across the output terminals T1, T2, and T3?                                    | Turn the power OFF and then ON again.                                                                                                                     |
|                                                | Is overload causing the motor to stall?                                                         | Reduce the load so the motor will run.                                                                                                                    |
|                                                | Are there any abnormalities in the inverter?                                                    | See error descriptions to check wiring and correct if necessary.                                                                                          |
|                                                | Is there a forward or reverse run command ?                                                     |                                                                                                                                                           |
|                                                | Has the analog frequency signal been input?                                                     | 1.Is analog frequency input signal wiring correct?<br>2.Is voltage of frequency input correct?                                                            |
|                                                | Is the operation mode setting correct?                                                          | Operate through the digital keypad                                                                                                                        |

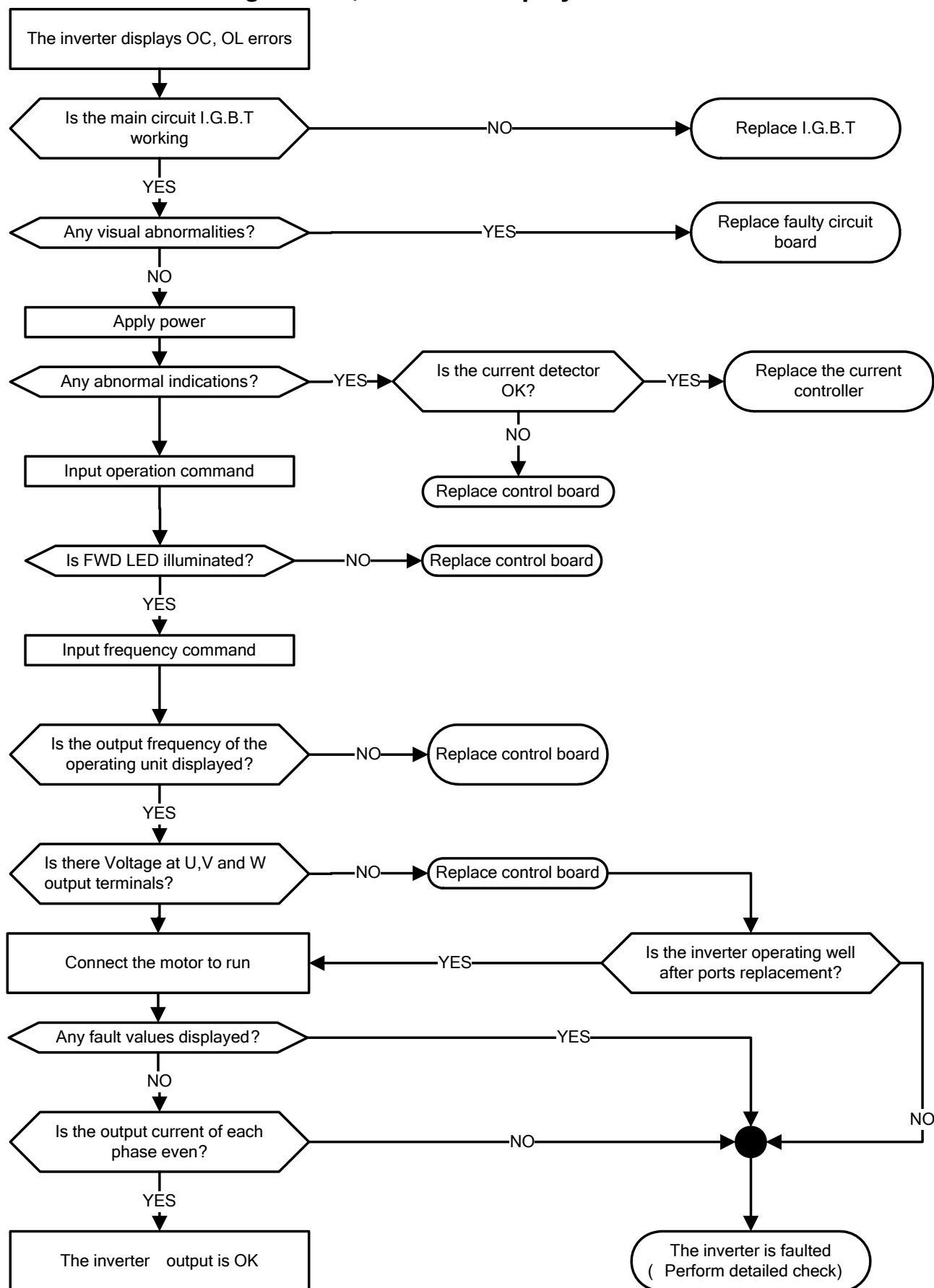
## 5.3 Troubleshooting of Inverter

### 5.3.1 Quick troubleshooting of Inverter

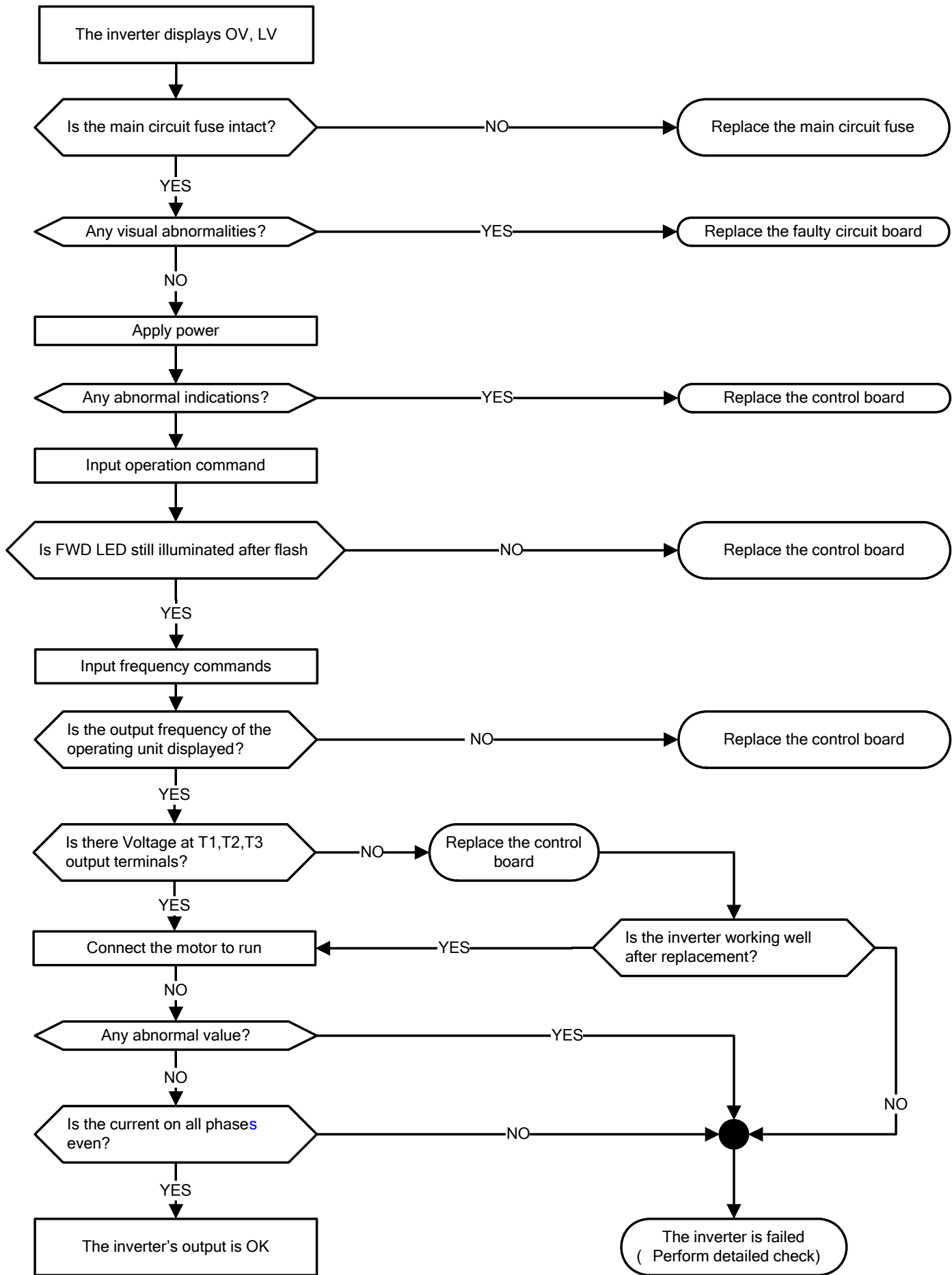




### 5.3.2 Troubleshooting for OC, OL error displays

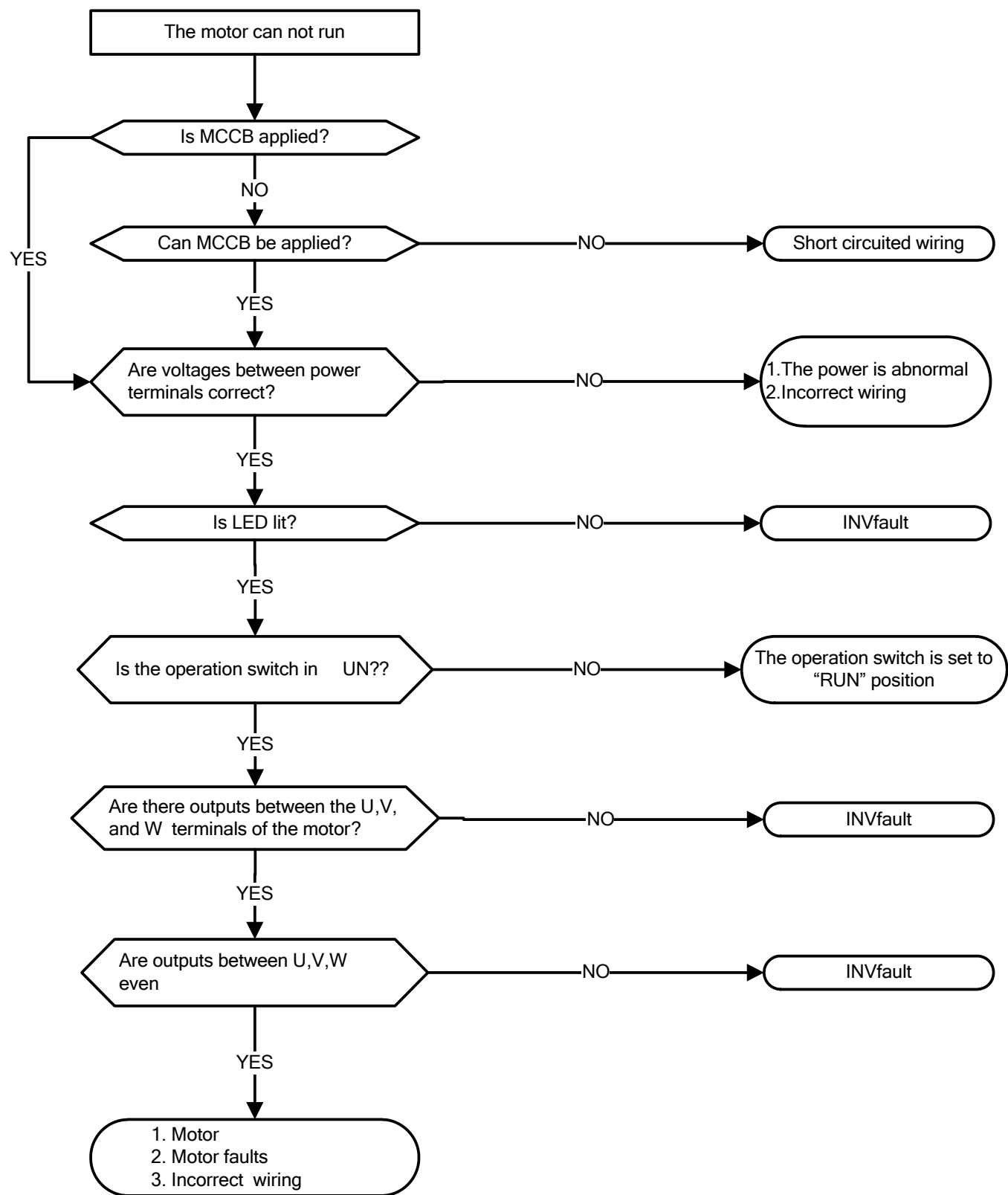


5.3.3 Troubleshooting for OV, LV error

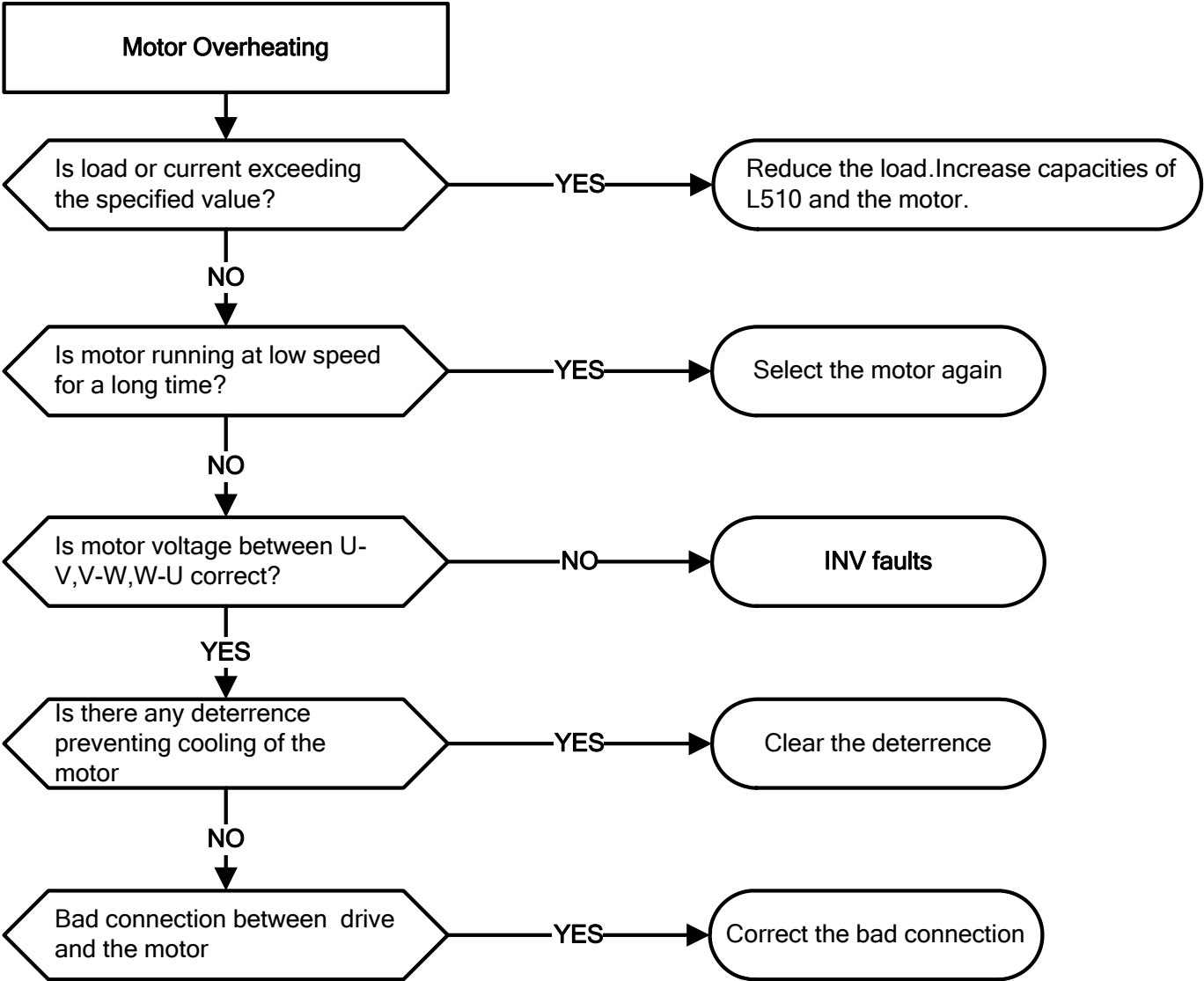




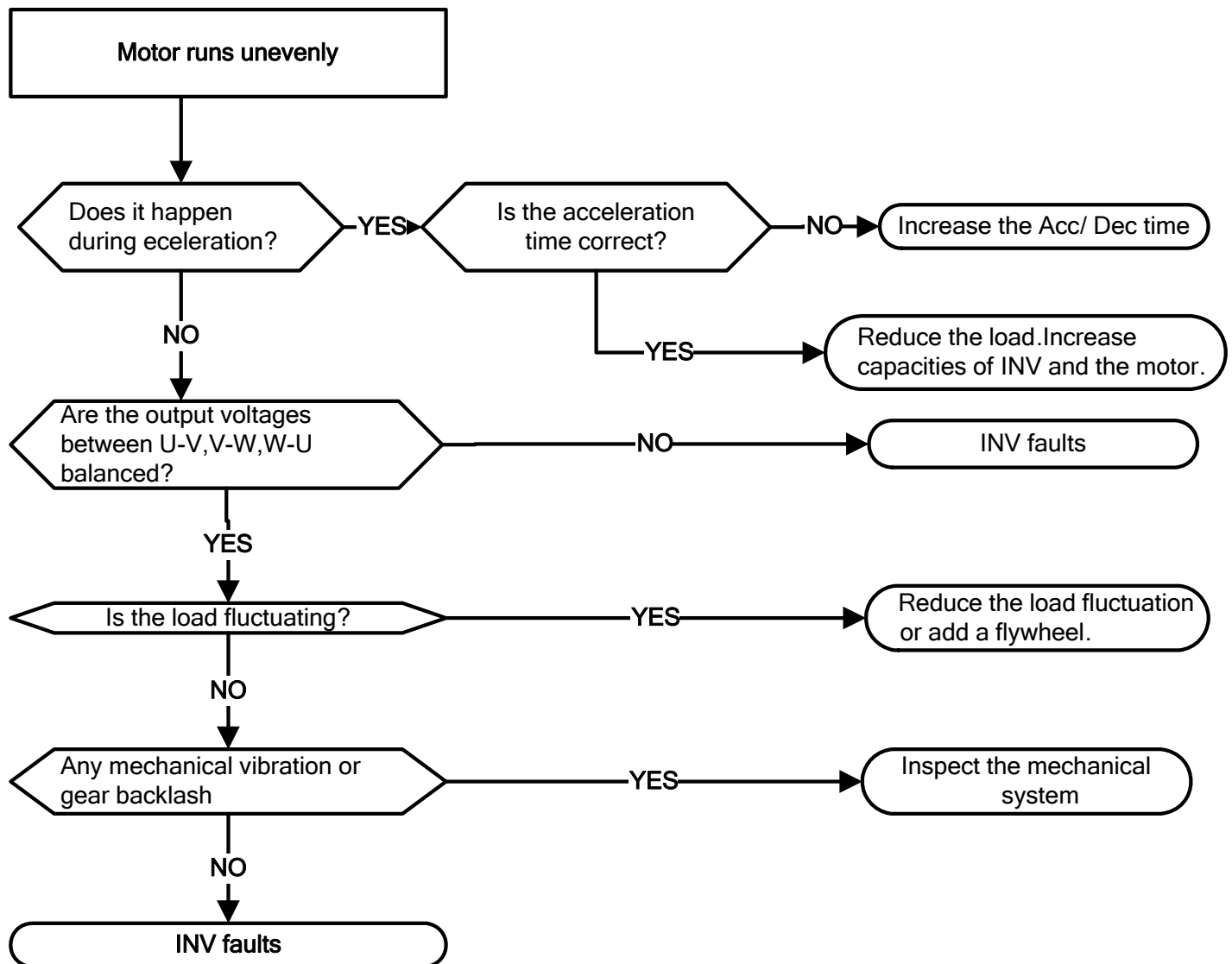
5.3.4 The motor can not run



5.3.5 Motor Overheating



### 5.3.6 Motor runs unbalanced



## 5.4 Routine and periodic inspection

To ensure stable and safe operations, check and maintain the inverter at regular intervals.

Use the check list below to carry out inspection.

Disconnect power and wait for 5 minutes and until the "Charge" indicator goes off before it is asfe to do any inspection.

| Items                                 | Details                                             | Checking period |       | Methods                                 | Criteria                                                  | Remedies                                                    |
|---------------------------------------|-----------------------------------------------------|-----------------|-------|-----------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------|
|                                       |                                                     | Daily           | 1Year |                                         |                                                           |                                                             |
| Environment                           |                                                     |                 |       |                                         |                                                           |                                                             |
| Ambient conditions around the machine | Confirm the temperature and humidity at the machine | ☉               |       | Measure with thermometer and hygrometer | Temperature: -10 ~40℃ (14~120°F)<br>Humidity: Below 95%RH | Improve the ambient or relocate the drive to a better area. |
|                                       | Are there inflammable materials in the vicinity?    | ☉               |       | Visual check                            | Keep area clear                                           |                                                             |
| Installation and grounding of         | Any unusual vibration from the machine              | ☉               |       | Visual, hearing check                   | Keep area clear                                           | Secure screws                                               |

|                                          |                                                     |   |   |                                            |                                                          |                                     |                               |
|------------------------------------------|-----------------------------------------------------|---|---|--------------------------------------------|----------------------------------------------------------|-------------------------------------|-------------------------------|
| the inverter                             | Is the grounding resistance correct?                |   | ⊙ | Measure the resistance with a multi-tester | 200Vclass: below 100Ω                                    | Improve the grounding               |                               |
| External terminals                       |                                                     |   |   |                                            |                                                          |                                     |                               |
| External terminals                       | Any loose parts?                                    |   | ⊙ | Visual check<br>Check with a screwdriver   | Secure terminals and no rust                             | Secure or send back for repair      |                               |
|                                          | Is the terminal base damaged?                       |   | ⊙ |                                            |                                                          |                                     |                               |
|                                          | Visual rust stains present?                         |   | ⊙ |                                            |                                                          |                                     |                               |
| internal mounting screws of the inverter | Any unusual bends or breaks?                        |   | ⊙ | Visual check                               | No abnormalities                                         | Replace or send back for repair     |                               |
|                                          | Any damage to the wire insulation?                  |   | ⊙ |                                            |                                                          |                                     |                               |
| voltage                                  |                                                     |   |   |                                            |                                                          |                                     |                               |
| Input power voltage                      | Is the voltage of the main circuit correct?         | ⊙ |   | Measure the voltage with a multi-tester    | Voltage must conform with the spec.                      | Improve input voltage               |                               |
| Circuit boards and components            |                                                     |   |   |                                            |                                                          |                                     |                               |
| Printed circuit board                    | Excessive conductive metal shavings or oil sludge   |   | ⊙ | Visual check                               | No abnormalities                                         | Clean or replace the circuit board  |                               |
|                                          | Discolored, overheated, or burned parts             |   | ⊙ |                                            |                                                          |                                     |                               |
| Capacitor                                | Any unusual odor or leakage                         | ⊙ |   |                                            |                                                          |                                     | Replace capacitor or inverter |
|                                          | Any deformity or protrusion                         | ⊙ |   |                                            |                                                          |                                     | Clean component               |
| Power component                          | Excessive dust or debris                            |   | ⊙ | Measure with a multi-tester                | No short circuit or broken circuit in three phase output | Replace power component or inverter |                               |
|                                          | Check resistance between each terminals             |   | ⊙ |                                            |                                                          |                                     |                               |
| Peripheral device                        |                                                     |   |   |                                            |                                                          |                                     |                               |
| Rheostat                                 | Whether something smells stench or insulator breaks |   | ⊙ | Nose, Visual check                         | No abnormalities                                         | Replacement rheostat                |                               |
|                                          | Whether rheostat wiring or connector are damaged    |   | ⊙ | Visual check                               |                                                          |                                     |                               |
| Electromagnetic Contactor                | Check contacts and connections for any abnormality. | ⊙ |   |                                            |                                                          | Replacement Contactor               |                               |
|                                          | Unusual vibration and noise?                        | ⊙ |   | hearing check                              |                                                          |                                     |                               |
| Reactor                                  | Is there any abnormalities?                         | ⊙ |   | Visual check                               |                                                          | Replacement Reactor                 |                               |
| Cooling System                           |                                                     |   |   |                                            |                                                          |                                     |                               |
| Cooling fan                              | Unusual vibration and noise                         |   | ⊙ | Visual or hearing check                    | No abnormalities                                         | Replace the cooling fan             |                               |
|                                          | Excessive dust or debris                            | ⊙ |   | Visual check                               |                                                          | Clean fan                           |                               |
| Heat sink                                | Excessive dust or debris                            | ⊙ |   |                                            |                                                          | Clean up debris or dust             |                               |
| Ventilation Path                         | Is the ventilation path blocked?                    | ⊙ |   |                                            |                                                          | Clean                               |                               |

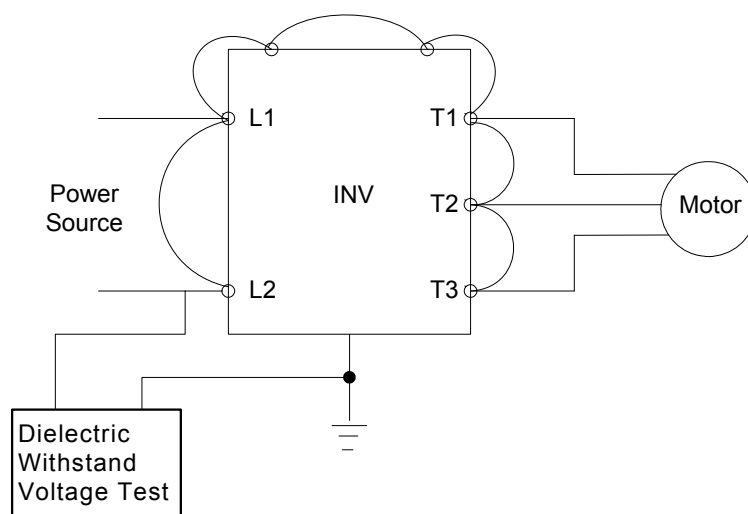
## 5.5 Maintenance

To ensure long-term reliability, follow the instructions below to perform regular inspection. Turn the power off and wait for the charge indicator (LED) to go out before inspection to avoid potential shock hazard from the charge stored in high-capacity capacitors.

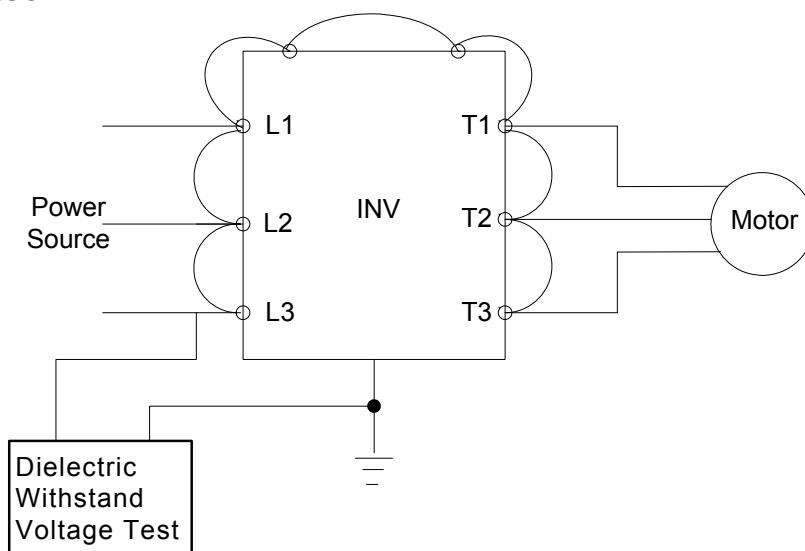
### 1. Maintenance Check List.

|                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------|
| ➤ Ensure that temperature and humidity around inverters is suitable, and there is good ventilation, also keep away from any sources of heat. |
| ➤ Check the inside of the inverter, replace aged or damaged elements in time.                                                                |
| ➤ Clean up the accumulation of any dust inside the inverter.                                                                                 |
| ➤ Check and ensure that the ground connections are secure and correct.                                                                       |
| ➤ Terminal screws must be tight, especially the power input and output of the inverter.                                                      |

### 2. Insulation test Method . Single Phase



### Three Phase



Do not perform any insulation test on the control circuit.

# Chapter 6 Peripherals Components

## 6.1 Reactor Specifications

| Model: L510-□□□-XXX-X | Specification |                 |
|-----------------------|---------------|-----------------|
|                       | Current (A)   | Inductance (mH) |
| 2P2                   | 3.0           | 7.0             |
| 2P5                   | 5.2           | 4.2             |
| 201                   | 9.4           | 2.1             |
| 202                   | 19.0          | 1.1             |
| 203                   | 25.0          | 0.71            |

## 6.2 Electromagnetic Contactor and No fuse circuit breaker

| Model: L510-□□□-XXX-X | Molded-case circuit breaker made by TECO | Magnetic contactor (MC) made by TECO |
|-----------------------|------------------------------------------|--------------------------------------|
| 1P2/1P5/2P2/2P5       | TO-50E 15A                               | CN-11                                |
| 101/201/202           | TO-50E 20A                               |                                      |
| 203                   | TO-50E 30A                               |                                      |

## 6.3 Fuse Specification

| Model: L510-□□□-XXX-X | HP   | KW   | Rating       |
|-----------------------|------|------|--------------|
| 1P2                   | 0.25 | 0.2  | 10A , 300VAC |
| 1P5                   | 0.5  | 0.4  | 10A , 300VAC |
| 101                   | 1    | 0.75 | 20A , 300VAC |
| 2P2                   | 0.25 | 0.2  | 10A , 300VAC |
| 2P5                   | 0.5  | 0.4  | 10A , 300VAC |
| 201                   | 1    | 0.75 | 20A , 300VAC |
| 202                   | 2    | 1.5  | 30A , 300VAC |
| 203                   | 3    | 2.2  | 30A , 300VAC |

## 6.4 Fuse Specification(UL Model Recommended)

| Model           | Manufacture | Type      | Rating          |
|-----------------|-------------|-----------|-----------------|
| L510-1P2-H1X    | Bussmann    | 16CT      | 16A, 690VAC     |
| L510-1P5-H1X    | Bussmann    | 20CT      | 20A, 690VAC     |
| L510-101-H1X    | Bussmann    | 25ET      | 25A, 690VAC     |
| L510-2P2-H1/H1F | Bussmann    | 10CT      | 10A, 690VAC     |
| L510-2P5-H1/H1F | Bussmann    | 10CT/16CT | 10A/16A, 690VAC |
| L510-201-H1/H1F | Bussmann    | 16CT/20CT | 16A/20A, 690VAC |
| L510-202-H1/H1F | Bussmann    | 30FE      | 30A, 690VAC     |
| L510-203-H1/H1F | Bussmann    | 50FE      | 50A, 690VAC     |
| L510-2P2-H3     | Bussmann    | 10CT      | 10A, 690VAC     |
| L510-2P5-H3     | Bussmann    | 10CT      | 10A, 690VAC     |
| L510-201-H3     | Bussmann    | 10CT      | 10A, 690VAC     |
| L510-202-H3     | Bussmann    | 16CT      | 16A, 690VAC     |
| L510-203-H3     | Bussmann    | 20CT      | 20A, 690VAC     |

# Appendix I L510 parameters setting list

|                |                 |                |                 |                |                 |                |                 |
|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| Customer       |                 |                |                 |                | Inverter Model  |                |                 |
| Using Site     |                 |                |                 |                | Contact Phone   |                |                 |
| Address        |                 |                |                 |                |                 |                |                 |
| Parameter Code | Setting Content | Parameter Code | Setting Content | Parameter Code | Setting Content | Parameter Code | Setting Content |
| 00-00          |                 | 03-04          |                 | 05-17          |                 | 07-01          |                 |
| 00-01          |                 | 03-05          |                 | 05-18          |                 | 07-02          |                 |
| 00-02          |                 | 03-06          |                 | 05-19          |                 | 07-03          |                 |
| 00-03          |                 | 03-07          |                 | 05-20          |                 | 07-04          |                 |
| 00-04          |                 | 03-08          |                 | 05-21          |                 | 07-05          |                 |
| 00-05          |                 | 03-09          |                 | 05-22          |                 | 07-06          |                 |
| 00-06          |                 | 03-10          |                 | 05-23          |                 | 07-07          |                 |
| 00-07          |                 | 03-11          |                 | 05-24          |                 | 07-08          |                 |
| 00-08          |                 | 03-12          |                 | 05-25          |                 | 08-00          |                 |
| 00-09          |                 | 03-13          |                 | 05-26          |                 | 08-01          |                 |
| 00-10          |                 | 03-14          |                 | 05-27          |                 | 08-02          |                 |
| 00-11          |                 | 03-15          |                 | 05-28          |                 | 08-03          |                 |
| 00-12          |                 | 03-16          |                 | 05-29          |                 | 08-04          |                 |
| 00-13          |                 | 03-17          |                 | 05-30          |                 | 08-05          |                 |
| 00-14          |                 | 03-18          |                 | 05-31          |                 | 08-06          |                 |
| 00-15          |                 | 03-19          |                 | 05-32          |                 | 08-07          |                 |
| 00-16          |                 | 04-00          |                 | 06-00          |                 | 08-08          |                 |
| 00-17          |                 | 04-01          |                 | 06-01          |                 | 08-09          |                 |
| 00-18          |                 | 04-02          |                 | 06-02          |                 | 09-00          |                 |
| 00-19          |                 | 04-03          |                 | 06-03          |                 | 09-01          |                 |
| 00-20          |                 | 04-04          |                 | 06-04          |                 | 09-02          |                 |
| 01-00          |                 | 04-05          |                 | 06-05          |                 | 09-03          |                 |
| 01-01          |                 | 04-06          |                 | 06-06          |                 | 09-04          |                 |
| 01-02          |                 | 04-07          |                 | 06-07          |                 | 09-05          |                 |
| 01-03          |                 | 04-08          |                 | 06-16          |                 | 09-06          |                 |
| 01-04          |                 | 04-09          |                 | 06-17          |                 | 09-07          |                 |
| 01-05          |                 | 04-10          |                 | 06-18          |                 | 09-08          |                 |
| 01-06          |                 | 04-11          |                 | 06-19          |                 | 09-09          |                 |
| 01-07          |                 | 04-12          |                 | 06-20          |                 | 10-00          |                 |
| 01-08          |                 | 04-13          |                 | 06-21          |                 | 10-01          |                 |
| 01-09          |                 | 04-14          |                 | 06-22          |                 | 10-02          |                 |
| 01-10          |                 | 04-15          |                 | 06-23          |                 | 10-03          |                 |
| 01-11          |                 | 05-00          |                 | 06-32          |                 | 10-04          |                 |
| 02-00          |                 | 05-01          |                 | 06-33          |                 | 10-05          |                 |
| 02-01          |                 | 05-02          |                 | 06-34          |                 | 10-06          |                 |
| 02-02          |                 | 05-03          |                 | 06-35          |                 | 10-07          |                 |
| 02-03          |                 | 05-04          |                 | 06-36          |                 | 10-08          |                 |
| 03-00          |                 | 05-05          |                 | 06-37          |                 | 10-09          |                 |
| 03-01          |                 | 05-06          |                 | 06-38          |                 | 10-10          |                 |
| 03-02          |                 | 05-07          |                 | 06-39          |                 | 10-11          |                 |
| 03-03          |                 | 05-08          |                 | 07-00          |                 | 10-12          |                 |

| Parameter Code | Setting Content | Parameter Code | Setting Content | Parameter Code | Setting Content | Parameter Code | Setting Content |
|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| 10-13          |                 | 11-02          |                 | 12-03          |                 |                |                 |
| 10-14          |                 | 11-03          |                 | 12-04          |                 |                |                 |
| 10-15          |                 | 11-04          |                 | 12-05          |                 |                |                 |
| 10-16          |                 | 11-05          |                 | 13-00          |                 |                |                 |
| 10-17          |                 | 11-06          |                 | 13-01          |                 |                |                 |
| 10-18          |                 | 11-07          |                 | 13-02          |                 |                |                 |
| 10-19          |                 | 11-08          |                 | 13-03          |                 |                |                 |
| 10-20          |                 | 11-09          |                 | 13-04          |                 |                |                 |
| 10-21          |                 | 11-11          |                 | 13-05          |                 |                |                 |
| 10-22          |                 | 12-00          |                 | 13-06          |                 |                |                 |
| 11-00          |                 | 12-01          |                 | 13-07          |                 |                |                 |
| 11-01          |                 | 12-02          |                 | 13-08          |                 |                |                 |
|                |                 |                |                 |                |                 |                |                 |