ADLEEPOWER®

INSTRUCTION   MANUAL

GENERAL-PURPOSE   INVERTER

MS2-102 ~ MS2-137

THANK YOU VERY MUCH FOR YOUR PURCHASE
OF ADLEE INVERTER MS SERIES.
PLEASE READ THIS INSTRUCTION MANUAL
BEFORE INSTALLATION OF THE INVERTER.

PREFACE

This general-purpose inverter made by ADLEE Powertronic., Ltd.
Read this instruction manual throughly before operation.
This manual will be helpful in the installation, parameter setting,
troubleshooting, and daily maintenance of the AC motor drives. To
guarantee safe operation of the equipment, read the following safety
guidelines before connecting power to the AC drives. Keep this oper-
ating manual handy and distribute to all users for reference.

A. General Precaution

1. There are some covers and shields on this inverter.
   Make sure all covers and shields are replaced befor operating this
   product.
2. This manual may be modified when necessary because of improve-
   ment of the product or changes in specification.
3. Contact your ADLEE representative to order a copy of this manual,
   if your manual has been damaged or lost.
4. ADLEE is not responsible for any modification of the product made
   by the user, since that will void your guarantee.

B. Safety symbols

Symbols which may appear on the manual
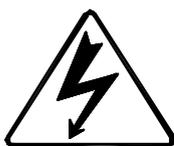
WARNING
Indicates a potentially hazardous situation
which, if not avoided, could result in
death or serious injury to personnel.

CAUTION
Indicates a potentially hazardous
situation which, if not avoided, may
result in minor or moderate injury to
personnel and damage to equipment.

RECEIVING

CAUTION

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

INSTALLATION

⚠ CAUTION

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

INSTALLATION

WARNING

* Only commence wiring after verifying that the power supply is turned OFF.
  Failure to observe this warning can result in an electrical shock or a fire.
* Wiring should be performed only by qualified personnel.
  Failure to observe this warning can result in an electrical shock or a fire.
* Make sure to ground the ground terminal.
  Ground resistance : 100 Ohm or less.
  Failure to observe this warning can result in an electrical shock or a fire.

CAUTION

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

OPERATION

⚠ WARNING

* Only turn ON the input power supply after replacing the front cover.
  Do not remove the cover while current is flowing.
  Failure to observe this warning can result in an electrical shock.

⚠ CAUTION

* Since it is easy to change. operation speed from low to high speed, verify the safe working range of the motor and machine before operation.
  Failure to observe this caution can result in personal injury and machine damage.
* Do not change signals during operation.
  The machine or the inverter may be damaged.
* All the constants of the inverter have been preset at the factory.
  Do not change the settings unnecessary.

MAINTENANCE AND INSPECTION

WARNING

* Never touch high-voltage terminals in the driver.
  Failure to observe this warning can result in an electrical shock.
* Replace all protective covers before powering up the inverter.
  To remove the cover, make sure to shut OFF the molded-case circuit breaker.
  Failure to observe this warning can result in an electrical shock.
* Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turnned OFF.
  The capacitors are still charged and can be dangerous.
* Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.
  Failure to observe this warning can result in an electrical shock.

CAUTION

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

OTHERS

⚠ WARNING

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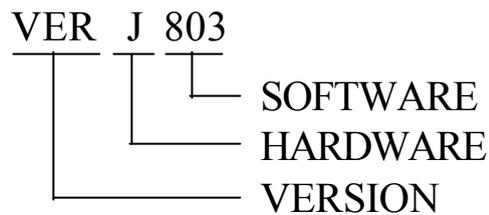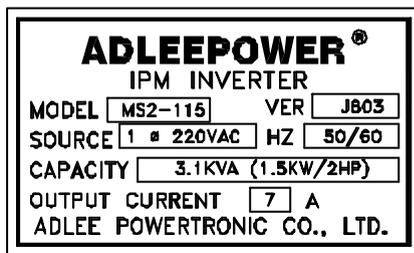
CONTENTS

1. RECIEVING

This MS series AC drive has gone through rigorous quality control tests at the factory before shipment. After receiving the AC drive, please check for the following :

(1) No damage is found on each product after shipping.

(2) The product is as ordered (check the nameplate, voltage and frequency).

(3) A set of inverter unit and instruction manual is contained in the package.

For any irregularity, contact the sales shop where you purchased immediately.

(4) Description of name plate

```
ADLEEPOWER®
IPM INVERTER
MODEL  MS2-115    VER  J803
SOURCE 1 ø 220VAC  HZ  50/60
CAPACITY    3.1KVA (1.5KW/2HP)
OUTPUT CURRENT    7  A
ADLEE POWERTRONIC CO., LTD.
```

VER J 803
          └── SOFTWARE
      └──── HARDWARE
└─────────── VERSION

MODEL : MS 2 - 115

MS series ─┘

Voltage class : ─┘
1 : 110V
2 : 220V

Max Applicable motor(4 pole)
Single Phase :
102 : 0.2KW   104 : 0.4KW   107 : 0.75KW
115 : 1.5KW   122 : 2.2KW   137 : 3.7KW

2. SPECIFICATIONS

Model	MS1		MS2					
Voltage	1 110VAC ± 10%		1 220VAC ± 10%					
Model No	MS1-104	MS1-107	MS2-102	MS2-104	MS2-107	MS2-115	MS2-122	MS2-137
Input Frequency	50HZ~ 60HZ ± 10%							
Output Voltage	3 220VAC							
Output Frequency	0.5 ~ 1200HZ							
Output Rated current (A)	2.5 A	4.1 A	1.4 A	2.5 A	4.1 A	7 A	10 A	16 A
Capacity (KVA)	1.0 KVA	1.6 KVA	0.6 KVA	1.1 KVA	1.9 KVA	3.1 KVA	4.2 KVA	6.5 KVA
Largest motor KW (4 poles)	0.4 KW	0.75 KW	0.2KW	0.4KW	0.75KW	1.5KW	2.2KW	3.7KW
Control	Sine wave pulse width modulation							
Braking	Regenerative discharge braking							
Over current Capacity	150% of rated current (1 minute)							
Acceleration time	0.1 ~ 6000 SEC							
Deceleration time	0.1 ~ 6000 SEC							
Frequency setting — Digital	Use keyboard ▲ ▼ ◀ for setting and confirm by PROG							
Frequency setting — Analog	By frequency knob							
Display type	LED Digits							
Cooling Method	Self-cooled	Air-cooled	Self-cooled	Self-cooled	Self-cooled	Air-cooled	Air-cooled	Air-cooled
Dimension drawing	Fig 1	Fig 2	Fig1	Fig 1	Fig 1	Fig 2	Fig 2	Fig 3
Weight (NW . KG)	1.2KG	1.3KG	1.2KG	1.2KG	1.3KG	1.3KG	1.4KG	4.0 KG

3. DIMENSION DRAWINGS

Unit : mm

101

150

4-Ø5.5XØ10.5X5.5H

163

100

107

113

Fig 1

Unit : mm

104

152

4-φ5.5

165.5

142

149

115.5

Fig 2

4

Unit : mm

140

2−⌀5.5

268.5

5.5

283.5

174.7

181 7

154

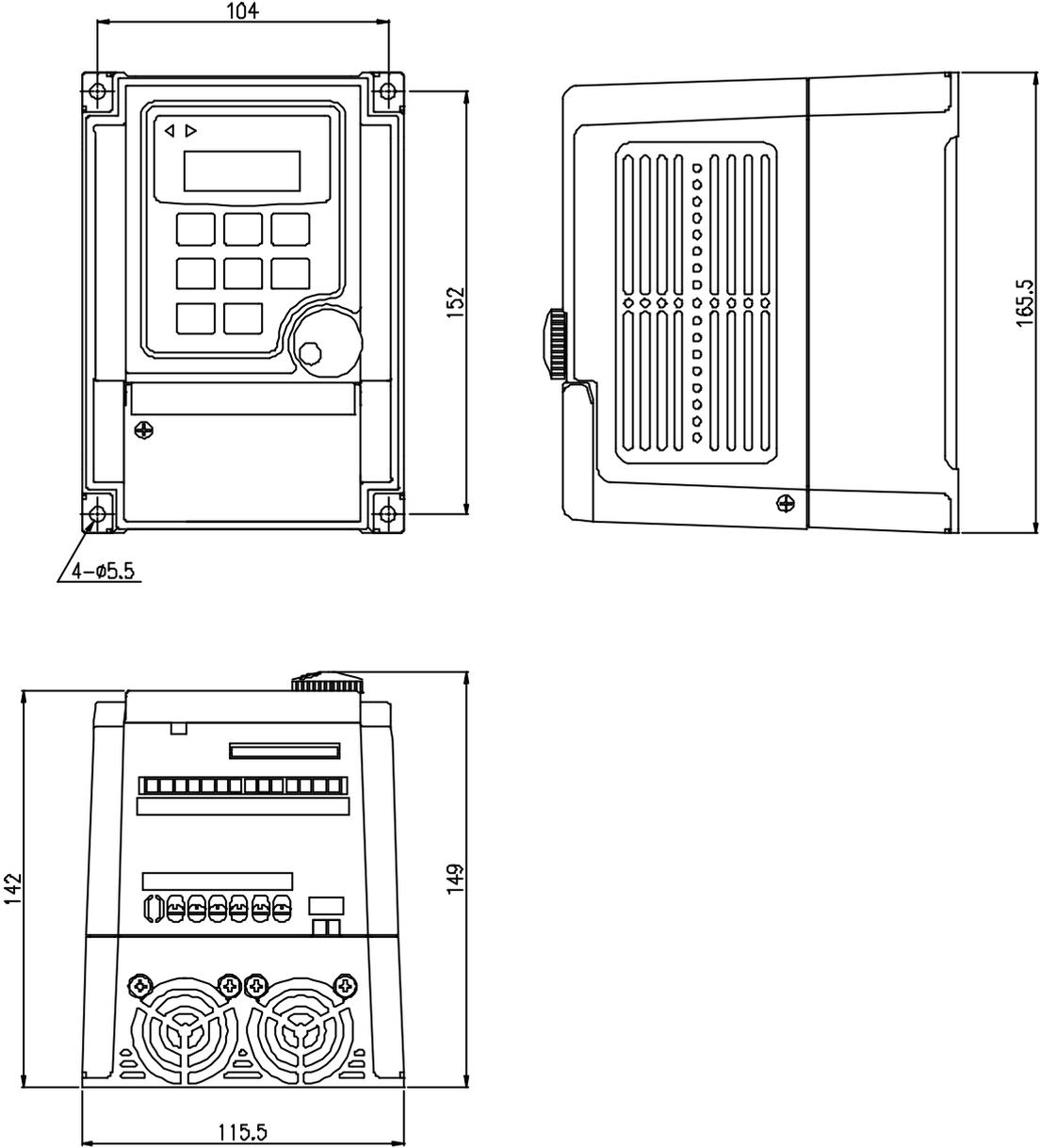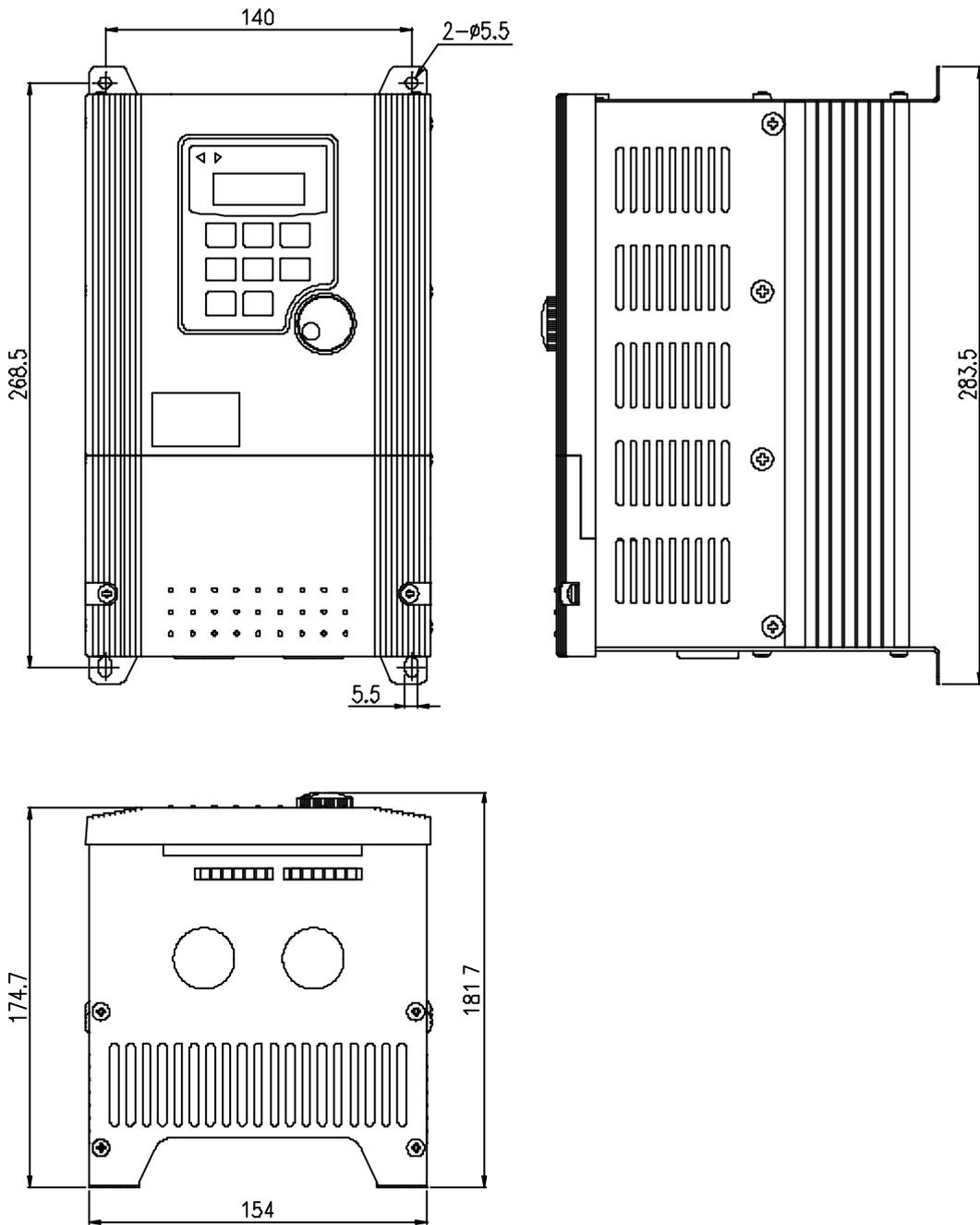**Fig 3**

5
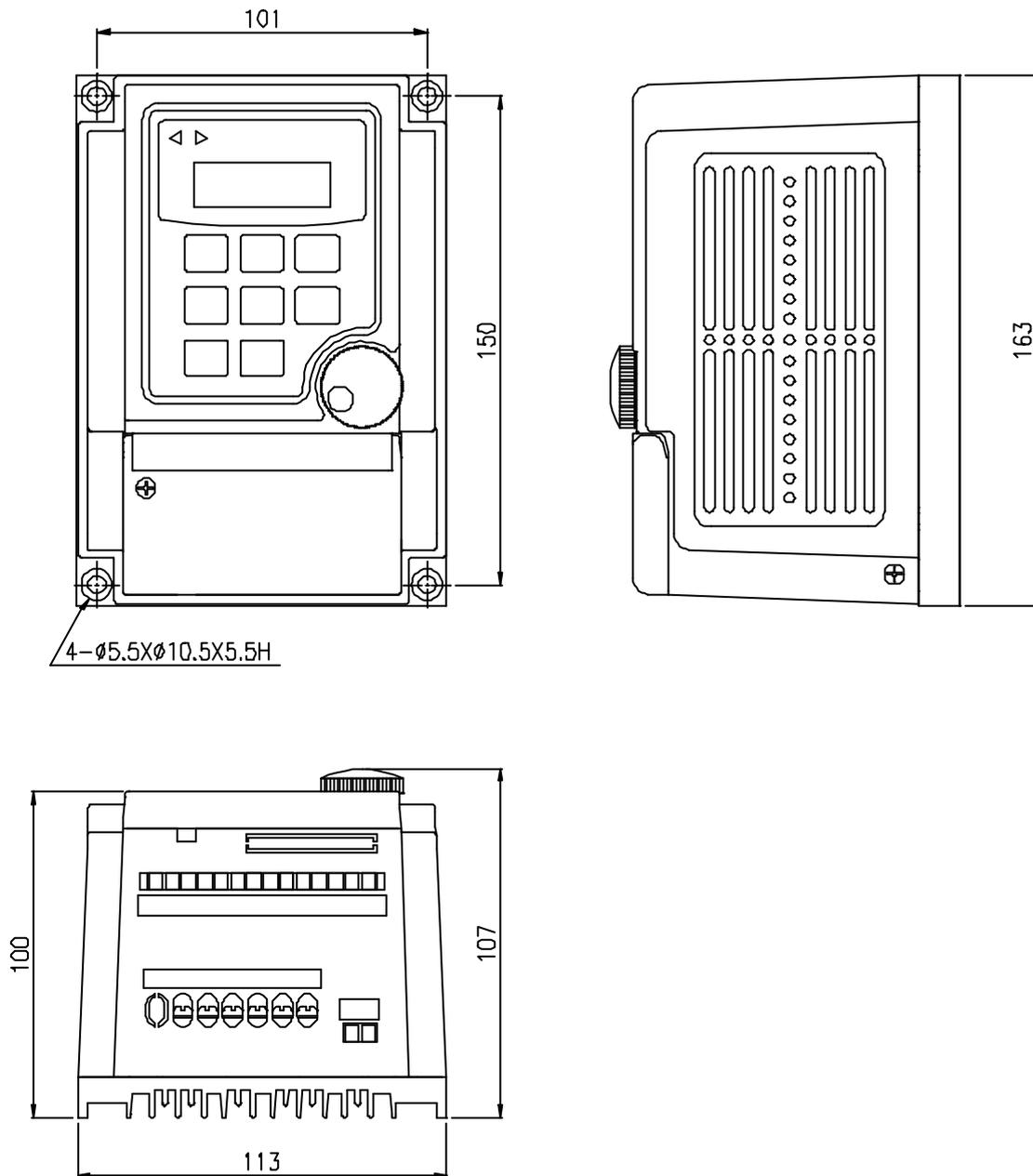
4. INSTALLATION

Inadequate environment around installation site and installation surface can result in damage to the inverter.

Before operating the MS series inverter, please check the following points :

(1) Avoid high temperature, high humidity, easy-to-dew ambient environment. Don't expose to dust or dirt, corrosive gas, and coolant mist, and direct sunlight. Place the unit in a well-ventilated room.

(2) Avoid a place subjected to substantial vibration.

(3) When installing the unit within the cabinet. Please pay attention to ventilation and limit the ambient temperature in between -10 ~ 45 . (14 ~ 113).

(4) Use a nonflammable material, such a steel sheet on the wall for installation. (The rear side will generate heat)

(5) Install the unit always vertically with a marginal spacing around.

AIR FLOW

6
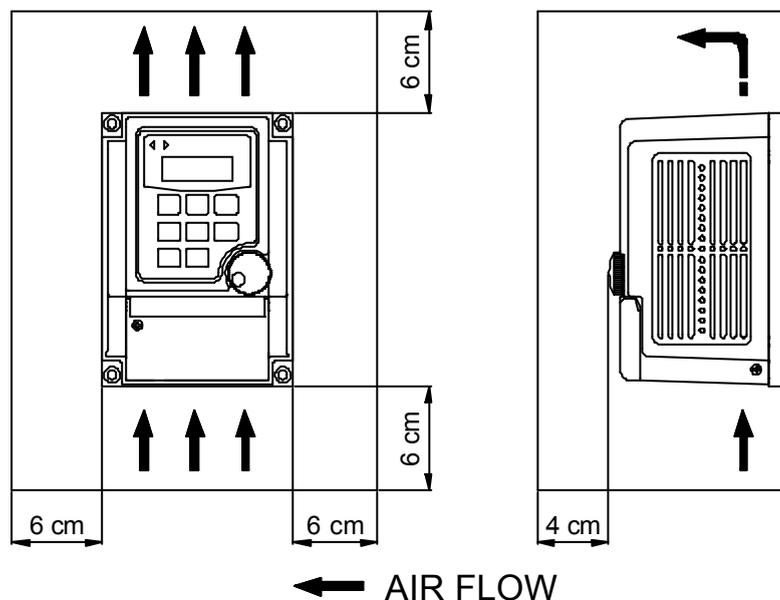
5. DESCRIPTION OF TERMINALS

(1) Main circuit connection diagram

GROUND

POWER
SOURCE

MOTOR

External braking resistor
Refer to the appendix A
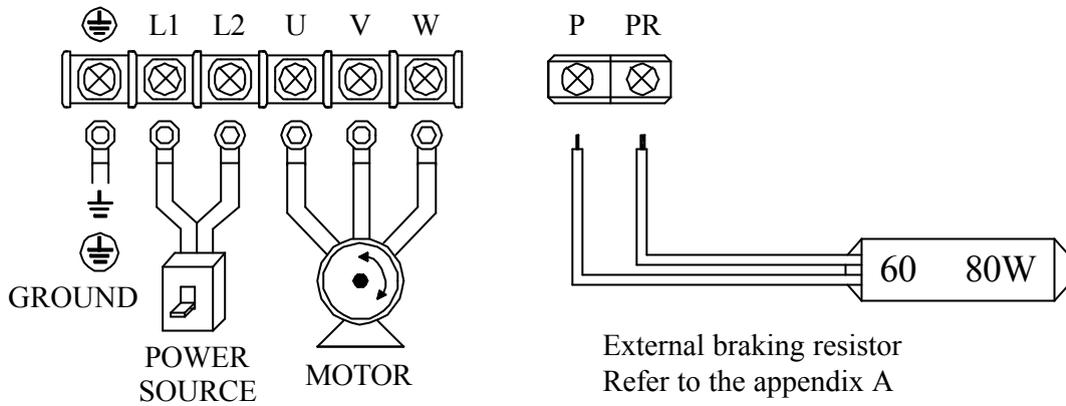
Main circuit terminal			
No.	Symbol	Description	Terminal name
1	⏚	Ground	Ground(Earth) Terminal
2	L1	Connect power supply	(L1,L2) Single Phase 220VAC± 10% 110VAC± 10% 50/60HZ± 10%
3	L2		
4	U	Inverter output	Terminals connected to motor
5	V		
6	W		
7	P	Dynamic brake	Terminals connected to braking Resistor
8	PR		

(2) Control circuit terminal

MA	CF3	MC	A/B	C	VCC	FA1	GND	FWD	REV	FT1	FT2	MT	COM
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Fault Relay
Contact rating
1A 240VAC
1A 30VDC

FM
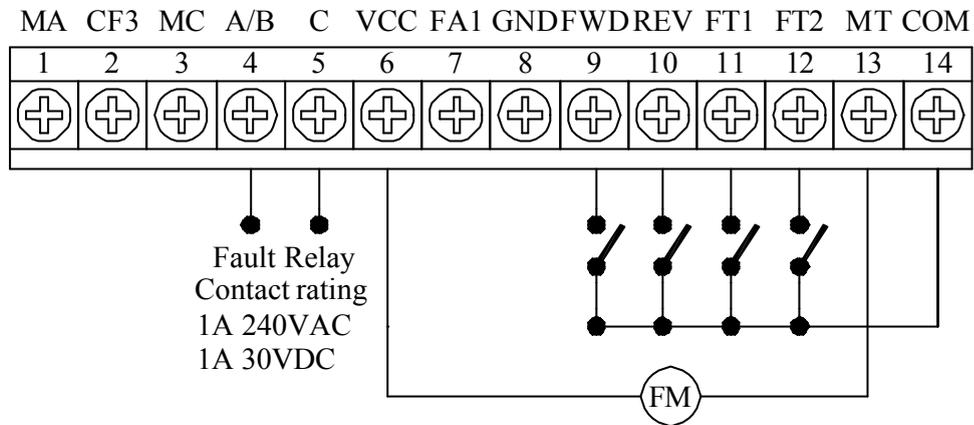
Running relay terminal			
No	Symbol	Terminal name	Description
1	MA	Running signal A	Running contact (normal open)
2	CF3	Running signal B / multi-function terminal	Running contact (normal close) / 5-8th speed terminal
3	MC	Running signal C	Running contact (common)

Alarm terminal			
No	Symbol	Terminal name	Description
4	A/B	Alarm output B	Fault alarm contact A(normal open) / B(normal close)
5	C	Alarm output C	Fault alarm contact (common)

Multi function analog terminal			
No	Symbol	Terminal name	Description
6	VCC	Analog source	Power source +10V of analog terminals
7	FA1	Free analog terminal 1	See CD44 & 3-1 J7
8	GND	Analog common terminal	Common terminal of free analog terminals

Control circuit terminal			
No	Symbol	Terminal name	Description
9	FWD	Forward operation	Forward operation / stop terminal
10	REV	Reverse operation	Reverse operation / stop terminal
11	FT1	Multi function terminal 1	See functions description (CD42)
12	FT2	Multi function terminal 2	See functions description (CD43)
13	MT	Multi function output terminal	Open collector output 50mA MAX RUN : Operating indicator MET : Connect to frequency meter, refer to CD07 description ARR : Frequency arrived indicator, refer to CD55 description
14	COM	Common terminal	Common terminal of control terminals

(3) Description of Hardware setting
MS1-104~107, MS2-102~122

MS2-137

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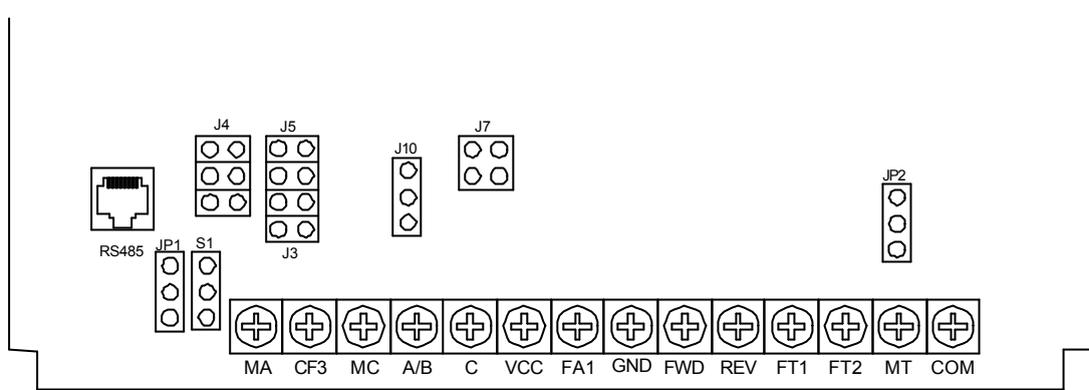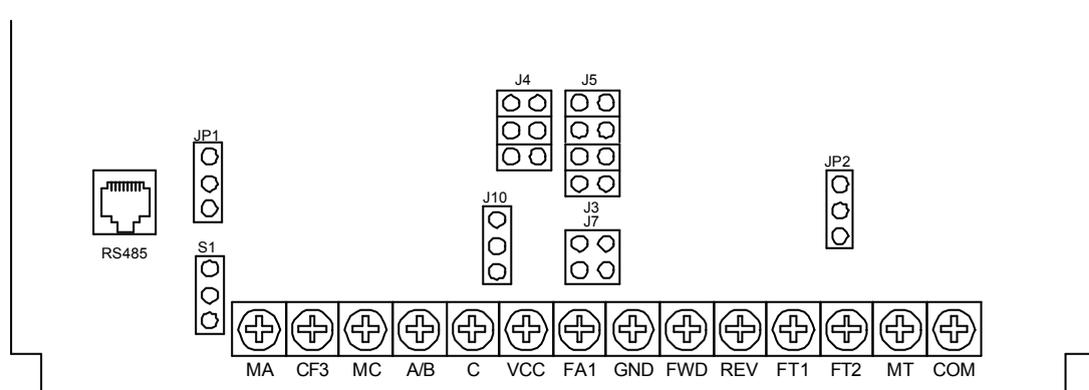
3-1 Jumper setup

1. JP1 : VR on panel / VR on F306

    VR on panel   VR on F306

2. S1 : MB / CF3 selection

    2 and 3 short CF3   1 and 2 short CF3
    Running relay MB   5-8th speed terminal
                                       (Refer Example 05)
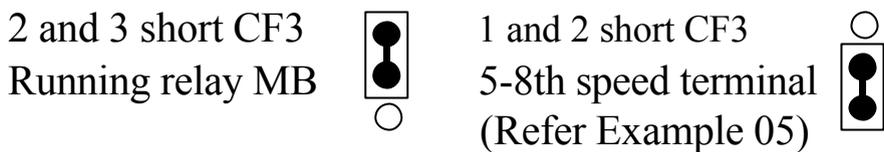
3. J4 : RST / FT2 / CF2 selection

    RST   FT2   CF2
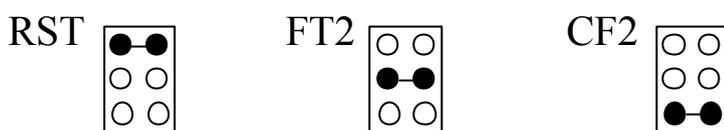
4. J5 : FT1 / CF1 selection

    FT1   CF1

5. J3 : ARR / MET selection

    ARR   MET

6. J10 : Fault A / Fault B terminal

    Fault A   Fault B

7. J7

    0~10V   0~5V   4~20mA

8. JP2 : MET output signal selection

    Analog   Meter
    0~10VDC
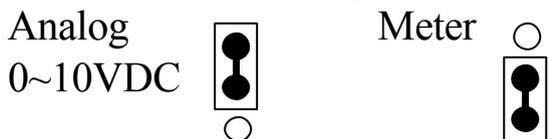
(4) WIRING
4-1 Wiring of main circuit

4-2 Wiring equipments

Select the wiring equipment and wiring size, refer to the table below.

1. On the input power side, a molded case circuit breaker (MCCB) to protect inverter primary wiring should be installed.
2. A leakage current breaker threshold of 200mA and above, or of inverter use is recommended.
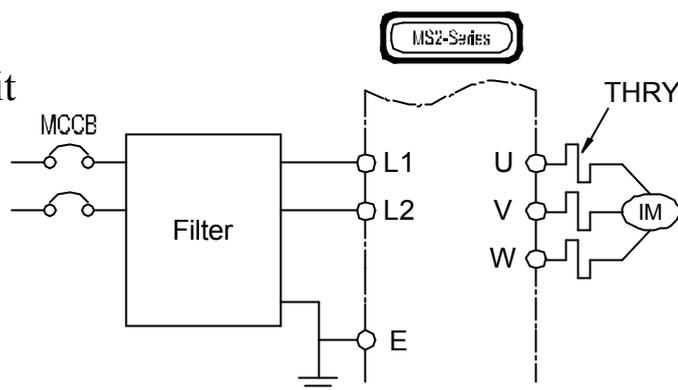3. Use of input side magnetic contactor. An input MC can be used to prevent an automatic restart after recovery from an external power loss during remote control operation. However, do not use the MC reduced reliability.
4. In general, magnetic contactors on the output of the inverter, Should not be used for motor control. Starting a motor with the inverter running will cause large surge currents and the inverter overcurrent protector to trigger.

Model	MS1		MS2					
Model No	104	107	102	104	107	115	122	137
Capacity (KVA)	1.0	1.6	0.6	1.1	1.9	3.1	4.2	6.5
Current (A)	2.5	4.1	1.4	2.5	4.1	7	10	16
Circuit Breaker (MCCB) (A)	15	15	6	10	10	15	20	20
Electro-Magnetic Contactor (A)	12	12	8	12	12	12	12	18
Thermal relay RC value (A)	4.8	7.6	1.2	2.4	3.8	6.8	9	15

4-3 Surge absorber

In order to prevent malfunction, provide the surge absorber on the coils of the electromagnetic contactors, relays and other devices which are to be used adjacent of the inverter.

4-4 Cable size and length

If the inverter is connected to a distant motor (especially when low frequency is output), motor torque decreases because of voltage drop in the cable. Use sufficiently heavy wire.
Changing the carrier frequency reduce RF1 noise and leakage current. (Refere to the table below)

Distance INVERTER MOTOR	under 25M	under 50M	under 100M	above 100M
MS2 SERIES	under 16KHZ	under 10KHZ	under 5KHZ	under 2.5KHZ

4-5 Wiring and cautionary points
A. Main circuit
   1. Don't connect the cables of the power supply side to the U, V and W output terminals for the motor.
   2. Don't connect any electromagnetic contactor between the inverter and motor. If it is inevitable, turn on the contactor when both the inverter and motor are both at stand still.
   3. Don't put the advance phase capacitor between the inverter and motor.
   4. Put MCCB in the input power supply.

B. Control signal circuit
  1. Separate the power cables of main circuit etc. from the control
     cables of the sequence and analog signals by passing the cables
     through the different ducts.
  2. Use twisted pair shielded wire for control signal and connect the
     shield to earth terminal at on end, COMMON terminal of
     control board. Leave the other end of shielding open.
  3. Avoid common Ground leads between high and low level
     voltage equipment.

C. Grounding
  1. Be sure ground both the inverter and motor.
  2. Keep grounded leads as short as possible.
  3. Shield cables used to protect low-level signal leads should
     grounded at one end point.
  4. Provide class 3 grounding (0.1   or less) for a terminal.
  5. When grounding several inverters, make connections as shown
     below, no loop is produced as shown in FIG "a " , FIG "b" .

(a)   (b)   (c)
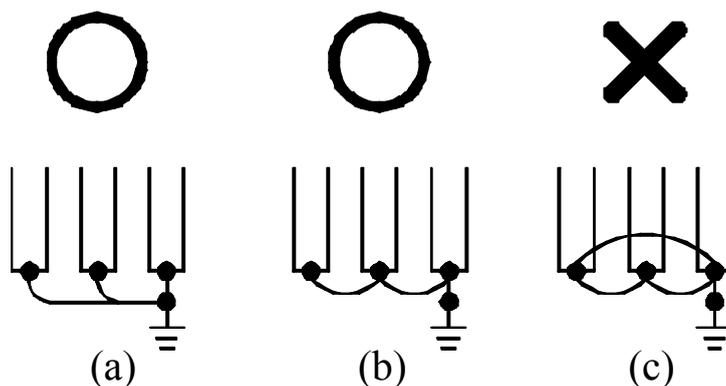
6. DIGITAL OPERATION PANEL

LED Operating Indication

Model Indication

Digital Indication

LED Operating Indication

Digital Indication
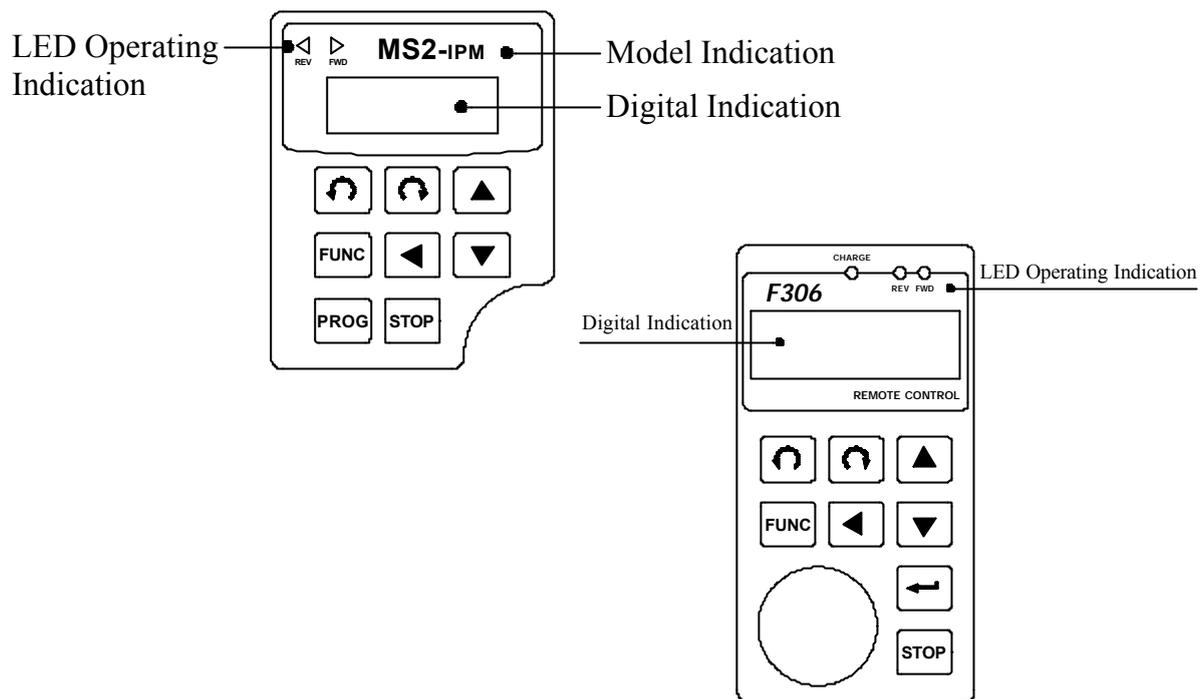
Operation key	Key function	Description
FWD RUN	**Forward run**	**Commands forward run**
REV RUN	**Reverse run**	**Commands reverse run**
SHIFT	**Cursor movement**	**Select the digit**
DOWN	**Down**	**Decrease the parameter value**
UP	**Up**	**Increase the parameter value**
PROG	**Memory storage**	**Saves the setting vaule**
FUNC	**Function**	**Press once to select function CDxx and press again to change its content**
STOP	**Stop**	**Stop operation / Escape to standby mode**

7. FUNCTIONS DESCRIPTION

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD00	First speed setting	60.0HZ
		50.0HZ
CD01	Parameter lock	0
CD02	Acceleration time 1	10.0Sec
CD03	Deceleration time 1	10.0Sec
CD04	Jogging frequency	5.0HZ
CD05	Start frequency	0.5HZ
CD06	Jog mode	0
CD07	Analog output gain	120.0HZ
		100.0HZ
CD08	CW or CCW or CW / CCW	0
CD09	Reserved	
CD10	Analog / digital frequency input	1
CD11	Dynamic brake / Free running	0
CD12	Terminal / Keypad command	0
		1
CD13	Source operation command	0
CD14	Maximum frequency limit	120.0HZ
		50.0HZ
CD15	Minimum frequency limit	0.0
CD16	Frequency display Scale	1.0
		30.0
CD17	1st Maximum voltage frequency	60.0HZ
		50.0HZ

ADJUST RANGE	UNIT	USER SETTING	REMARK
0.0 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region
0 or 1			0 = lock 1 = Unlock
0.1 ~ 6000.0Sec	0.1Sec		
0.1 ~ 6000.0Sec	0.1Sec		
0.0 ~ 1200HZ	0.1HZ		
0.5 ~ 30.0HZ	0.1HZ		
0 or 1			0 = Normal 1 = Jog
30.0 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region
0 or 1 or 2			0 = CW/CCW 1 = CW 2 = CCW
0 or 1			0 = Digital 1 = Analog
0 or 1			0 = Dynamic brake 1 = Free running
0 or 1			60HZ region : Keypad
			50HZ region : Terminal
0 ~ 2			0 = Normal 1 = F306 2 = RS485 communication
0.5 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region
0.0 ~ 1200HZ	0.1HZ		
0.1 ~ 500.0	0.1		60HZ region
			50HZ region
25.0 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD18	V/F pattern setting	0
CD19	DC braking time	1.0Sec
CD20	DC braking power	10
CD21	Torque boost	0.0%
CD22	Second speed setting	20.0HZ
CD23	Third speed setting	30.0HZ
CD24	Fourth speed setting	40.0HZ
CD25	Acceleration time 2	10.0Sec
CD26	Deceleration time 2	10.0Sec
CD27	Carrier frequency	16.0K
CD28	Output voltage gain	100.0%
CD29	Frequency jump 1	0.0
CD30	Frequency jump 2	0.0
CD31	Freuqency jump 3	0.0
CD32	Jump range	0.5HZ
CD33	Frequency reference bias	0.0
CD34	Frequency reference bias direction	0
CD35	Frequency gain	100.0%
CD36	The latest error record	NONE
CD37	Errors record 1	NONE

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 ~ 2			0 : Constant torque 1 : (Frequency) 2.0 2 : (Frequency) 3.0
0.0 ~ 25.0Sec	0.1Sec		
0 ~ 250	1		
0.0 ~ 25.0%	0.1%		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.1 ~ 6000.0Sec	0.1Sec		
0.1 ~ 6000.0Sec	0.1Sec		
1.0K ~ 16.0K	0.1 K		
50.0 ~ 100.0%	0.1%		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.5 ~ 3.0HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0 or 1			0 = Positive 1 = Negative
40.0 ~ 200.0%	1%		

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD38	Errors record 2	NONE
CD39	Errors record 3	NONE
CD40	Clear errors record	0
CD41	HZ / RPM Display	0
CD42	FT1 Multi-Function Terminal 1	0
CD43	FT2 Multi-Function Terminal 2	0
CD44	FA1 Free Analog Terminal 1	0
CD45	Reserved	
CD46	Reserved	
CD47	5th speed setting	25.0HZ
CD48	6th speed setting	35.0HZ
CD49	7th speed setting	45.0HZ
CD50	8th speed setting	55.0HZ
CD51	Dynamic Braking Energy Limit	100
CD52	Version selector	F60.0
CD53	S curve	0
CD54	4 ~ 20mA speed command	0
CD55	Frequency arrive signal range	10.0%
CD56	2nd Maximum voltage frequency	60.0HZ
CD57	Reserved	
CD58	Auto running mode	0
CD59	1st step timer	0.01

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 or 1			1 = Clear
0 ~ 1			0 = HZ Display 1 = RPM Display
0 ~ 15			
0 ~ 15			
0 ~ 15			
0.0 ~ 120.0 HZ	0.1 HZ		
0.0 ~ 120.0 HZ	0.1 HZ		
0.0 ~ 120.0 HZ	0.1 HZ		
0.0 ~ 120.0 HZ	0.1 HZ		
0 ~ 300%	1%		0 = Auto tuning
F 60.0 / F 50.0			60HZ region
			50HZ region
0 ~ 10			
0 ~ 3			
0.0 ~ 100.0%	0.1%		
25.0 ~ 120.0 HZ	0.1 HZ		
0 ~ 6			
0 ~ 15 Hr	hr:min		

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD60	2st step timer	0.00
CD61	3st step timer	0.00
CD62	4st step timer	0.00
CD63	5st step timer	0.00
CD64	Timer unit selector	0
CD65~ CD73	Reserved	
CD74	Address setting	1
CD75	Transmission speed	0
CD76	Transmission fault treatment	3
CD77	Reserved	
CD78	Communicator protocol	0
CD79~ CD99	Reserved	

To change version see description of CD52.

This function provides different standard setting values for 50/60HZ power region.

F50.0 : 50HZ power region.

F60.0 : 60HZ power region.

CD13 after finished parameter setting, please repower " ON".

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 ~ 15Hr	hr.min		
0 ~ 15Hr	hr.min		
0 ~ 15Hr	hr.min		
0 ~ 15Hr	hr.min		
0 or 1			
1 ~ 255			
0 ~ 3			
0 ~ 3			
0 ~ 7			

Communication address description

CODE	FUNCTION	DEFAULT VALUE
100	Speed command for RS485	3
101	Frequency data output for RS485	
102	Reserved	
103	Fault code for RS485	

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 ~4			
	0.1HZ		

7-1. Function setting

Before starting test run, check carefully the following points :

(1) Be sure to connect the power supply to L1, L2 (input terminals) and the motor to U.V.W. (output terminals). (Wrong connections will damage the inverter.)

(2) Check that the input power supply coincide with input voltage and input phase of the inverter.

(3) Check the signal lines for correct wiring.

(4) Be sure to ground an earth terminal for personnel safety.

(5) Check that other terminals other than earth terminal are not grounded.

(6) Check that the inverter is mounted on the wall on non-flammable material.

(7) For operation start and stop, use ⟨↺⟩ ⟨↻⟩ STOP and FWD / REV terminals. Never use input power supply to switch ON/OFF.

Operating

1-1. Pannel

Action : (a) Press 〔🔄〕〔🔄〕 for forward / reverse operation.

Speed : (a) Using 〔▲〕〔▼〕 to change motor speed with 1HZ
increment step. or 〔◀〕 to select the digit for quick
setting and confirm by 〔PROG〕

Standby : (a) Press 〔STOP〕 back to standby mode after trip or function
setting mode.

1-2. F306

Set CD13=1 and repower "ON", operation same as 1-1 pannel.

1-3. RS485 communication control

Set CD13=2 and set CD74~CD78. (Refer to CD74~CD78).

Using 06H function write command to address 100(64H).

1 : CW, 2 : CCW, 3 : Stop, 4 : Clear fault.

1-4. Terminal control

Set CD12=1, writing refer to control circuit terminal wiring
digaram.

First speed setting	Setting Range	0.0 ~ 1200HZ
	60HZ region	60.0HZ
CD00	50HZ region	50.0HZ

Press ▲ ▼ key for increase or decrease the speed.

Press ◀ key to select the digit for quick setting.

Press PROG to save the setting value.

Parameter lock	Setting Range	0 or 1
CD01	Default value	0

0 : Lock   1 : Unlock
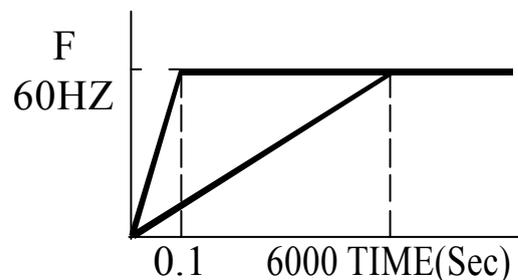
Function to prevent inadequate setting.

To change the contents CD, set CD01=1 and press PROG first.

To lock the data set CD01=0 and press PROG .

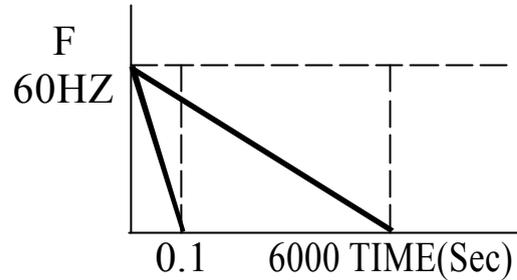| Acceleration time 1	Setting Range	0.1 ~ 6000.0Sec
CD02	Default value	10.0Sec

CD02 value corresponds to the time of acceleration from 0 to 60HZ.(For 120Hz. setting, the arrival time to 120Hz is double.)

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Deceleration time 1	**Setting Range**	**0.1 ~ 6000.0Sec**
CD03	**Default value**	**10.0Sec**

CD03 value corresponds to the time of deceleration from 50/60HZ to 0.

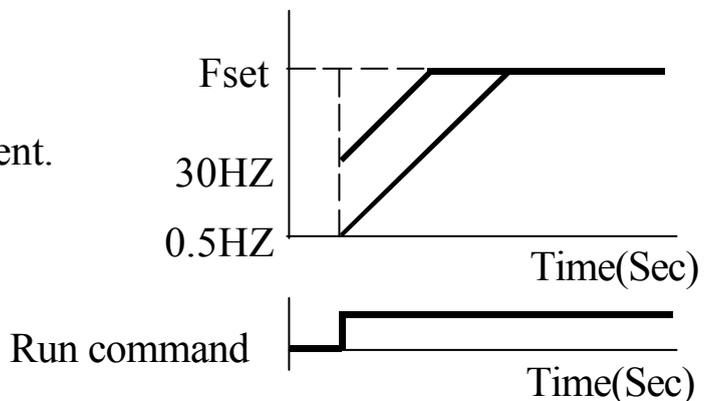| **Jogging frequency**	**Setting Range**	**0.0 ~ 1200HZ**
CD04	**Default value**	**5.0HZ**

Use terminal control refer to CD12 and CD42 setting, keyboard control refer to CD06.
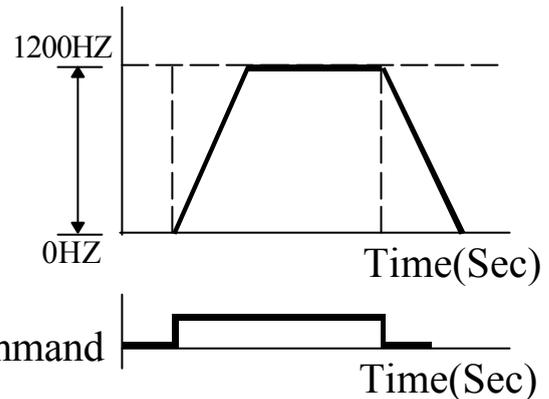
Start frequency	**Setting Range**	**0.5 ~ 30.0HZ**
CD05	**Default value**	**0.5HZ**

When setting this value, pay attention to the starting current.

Jog mode	Setting Range	0 or 1
CD06	Default value	0

0 : Normal　　1 : Jog Mode

1. Set jogging operation from key panel ⟨Ω⟩ & ⟨Ω⟩ .

2. ⟨Ω⟩⟨Ω⟩ LED blinking in JOG mode.
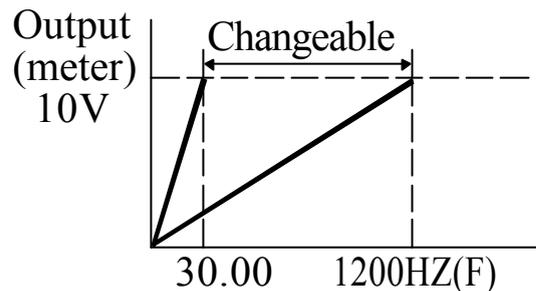
Note : Refer to CD12 & CD42 for using jog mode by terminal control.

Frequency meter correspond	Setting Range	30.0 ~ 1200HZ
	60HZ region	120.0HZ
CD07	50HZ region	100.0HZ

The specification of the output meter is 10V(i.e. 1mA) full scale rating.

Set by CD07 the value will be correspond to maximum correspond of MET terminal output meter.

Output (meter) 10V — Changeable

30.00　　1200HZ(F)

CW or CCW or CW/CCW	Setting Range	0 ~ 2
CD08	Default value	0

0 : CW/CCW operation

1 : CW only

2 : CCW only

If inadequate operation, the "OPE2" warning message will be indicated.

Analog / Digital frequency input	Setting Range	0 or 1
CD10	Default value	1

0 : Operation frequency change by using [▲] or [▼] key and confirm by [PROG] .

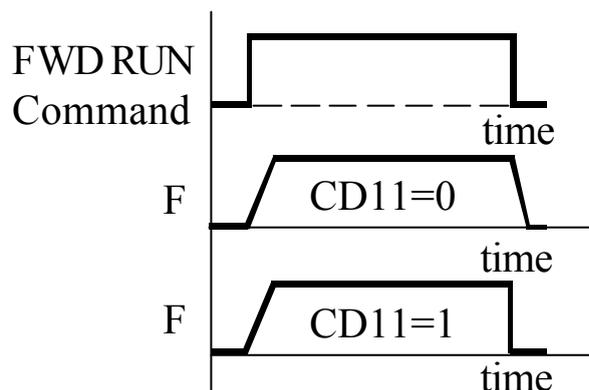1 : Operation frequency depends on the analog of the knob.

  Note : Using [▲][▼] key to change motor speed when CD01=1, the "OPE3" warning message will be indicated.

Dynamic brake / Free running	Setting Range	0 or 1
CD11	Default value	0

0 : Activates dynamic brake function when deceleration.

1 : Output cut off when accept a stop command to be free running.

Terminal / Keypad command	Setting Range	0 or 1
	60HZ region	0
CD12	50HZ region	1

0 : RUN/STOP Command from operation panel.

1 : RUN/STOP Command from control terminal.

Note : If inadequate operation, the "OPE4" warning message will be indicated.

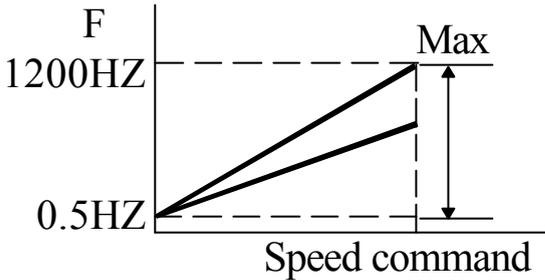| Source operation command		Setting Range	0 ~ 2
CD13		Default value	0

0 : Normal
1 : F306
2 : RS485 communication
Note : After finished this parameter setting, please repower " ON ".

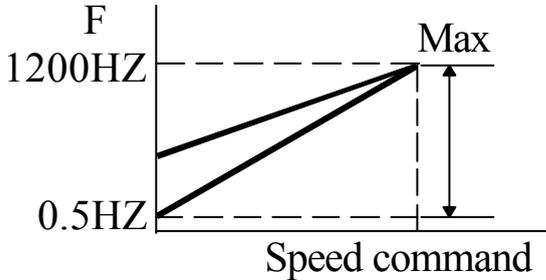| Maximum frequency limit		Setting Range	0.5 ~ 1200HZ
		60HZ region	120.0HZ
CD14		50HZ region	50.0HZ

Minimum frequency limit		Setting Range	0.0 ~ 1200HZ
CD15		Default value	0.0

Frequency display scale	Setting Range	0.1 ~ 500.0
	60HZ region	1.0
CD16	50HZ region	30.0

Use the following equation to calculate the mechanical shaft speed in rpm.

RPM = HZ × Scale setting

When RPM > 9999 display $\boxed{-\ -\ E\ -}$ for over range warning in this condition.

Setting CD41=1 for display shown RPM.

Pole	Synchronous speed		Scale setting
	50HZ	60HZ	
2	3000	3600	60
4	1500	1800	30
6	1000	1200	20
8	750	900	15
10	600	720	12
12	500	600	10

1st Maximum voltage frequency	Setting Range	25.0 ~ 1200HZ
	60HZ region	60.0HZ
CD17	50HZ region	50.0HZ

Use 2nd V/F to set CD42(43)=7 and terminal FT1(2) close. 2nd V/F setting is at CD56.

V | Constant power

Constant torque

V | setting range
100%
25HZ   400HZ
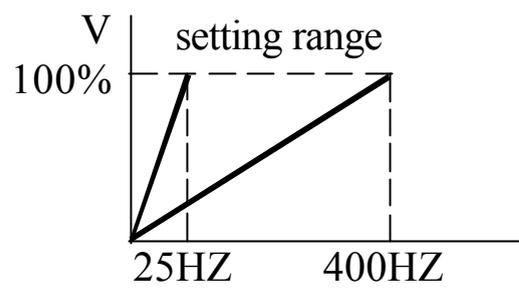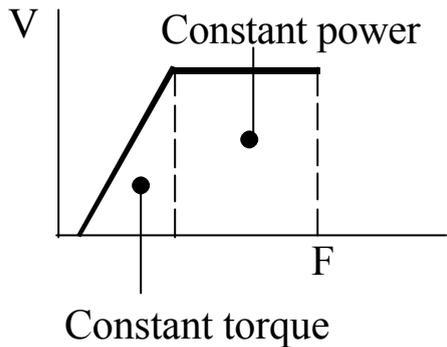
V/F pattern setting		Setting Range	0 ~ 2
CD18		Default value	0

0 = Constant torque curve
1 = Reduce torque curve $F^{2.0}$
2 = Reduce torque curve $F^{3.0}$

Volt
100%

1200(Hz)
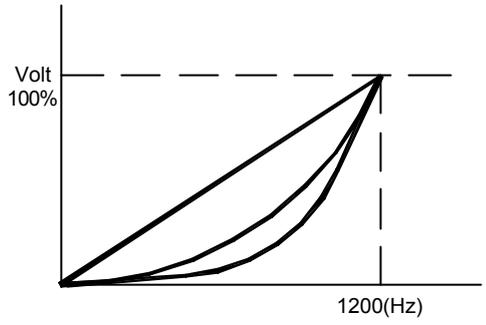
DC braking time		Setting Range	0.0 ~ 25.0Sec
CD19		Default value	1.0Sec

DC brake starting at
frequency under 0.5HZ.

F
(HZ)

DC

0   25sec
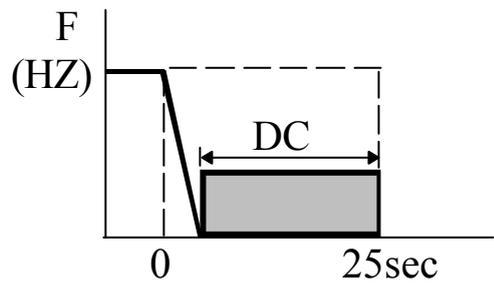
DC braking power		Setting Range	0 ~ 250
CD20		Default value	10

CD20 setting DC voltage gain various braking power.

DC F (HZ)

DC Voltage

250

0

25sec
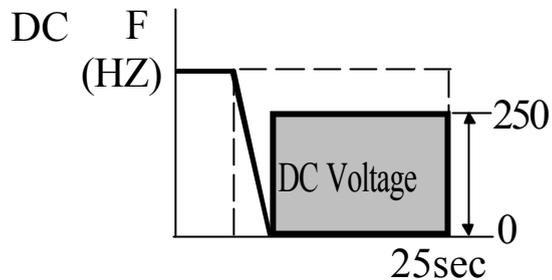
Torque boost		Setting Range	0.0 ~ 25.0%
CD21		Default value	0.0%

Torque boosting is used to compensate the torque lost due to stator resistance. Over boosting will cause over current and high acoustic noise.

V
100%

25%

0%

0.5(CD17) (CD17)
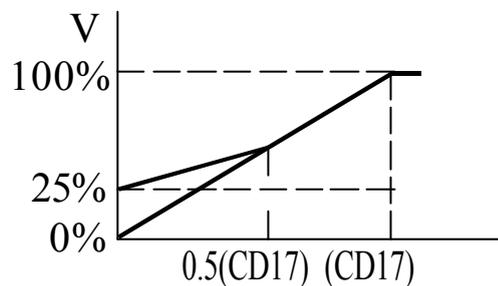
Second speed settting		Setting Range	0.0 ~ 1200HZ
CD22		Default value	20.0HZ

Third speed setting		Setting Range	0.0 ~ 1200HZ
CD23		Default value	30.0HZ

Fourth speed setting	Setting Range	0.0 ~ 1200HZ
CD24	Default value	40.0HZ
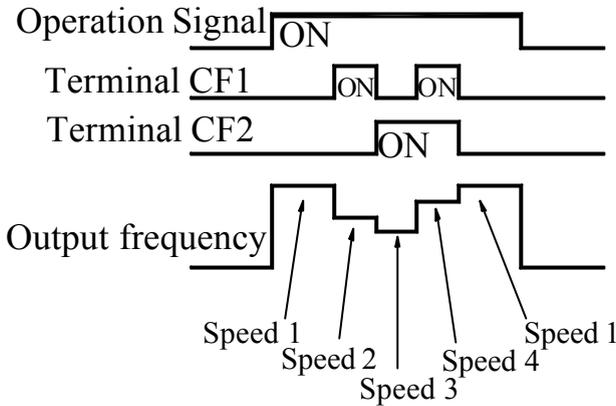
Terminal order SPEED	CF1	CF2
SPEED - 1	OFF	OFF
SPEED - 2	ON	OFF
SPEED - 3	OFF	ON
SPEED - 4	ON	ON

Acceleration time 2	Setting Range	0.1 ~ 6000.0Sec
CD25	Default value	10.0Sec

CD42 or CD43 setting FT1 or FT2=3, then CD25 or CD26 can be set.

Deceleration time 2	Setting Range	0.1 ~ 6000.0Sec
CD26	Default value	10.0Sec
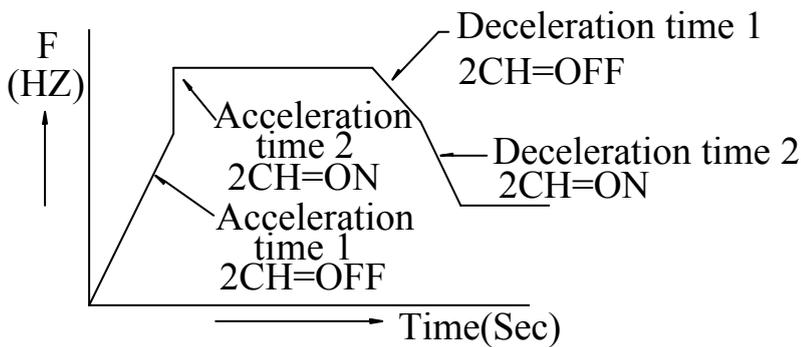
Description	2CH
Acceleration time 1	OFF
Deceleration time 1	
Acceleration time 2	ON
Deceleration time 2	

To operate inverter with 2CH function, check to see CD42 or CD43=3. 2CH command inputs from FT1 or FT2 terminal.

Carrier frequency	Setting Range	1.0 ~ 16.0K
CD27	Default value	16.0K

Increase the carrier frequency would reduce motor noise but efficiency might be decreased.

Reduce the carrier frequency would increase noise and reduce motor current, and gain better efficiency.
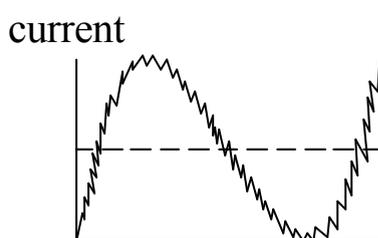
Low carrier frequency   High carrier frequency
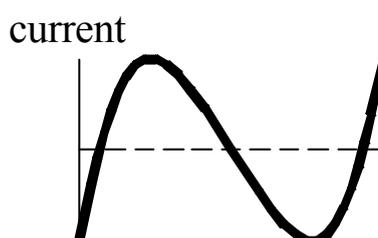
Output voltage gain	Setting Range	50.0 ~ 100.0%
CD28	Default value	100.0%

Reduce output voltage for energy saving operation.
Setting CD44=12 for FA1 terminal control.

Frequency jump 1	Setting Range	0.0 ~ 1200HZ
CD29	Default value	0.0HZ

Frequency jump 2	Setting Range	0.0 ~ 1200HZ
CD30	Default value	0.0HZ

Frequency jump 3	Setting Range	0.0 ~ 1200HZ
CD31	Default value	0.0HZ

Jump range	Setting Range	0.5 ~ 3.0HZ
CD32	Default value	0.5HZ
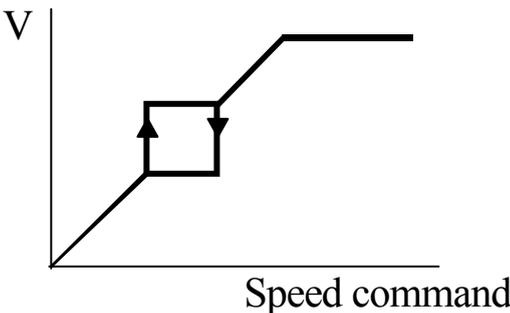
Frequency reference bias		Setting Range	0.0 ~ 1200HZ
CD33		Default value	0.0

Move Frequency bias with same gradient.
Frequency in the range of " -" bias, motor is stop.
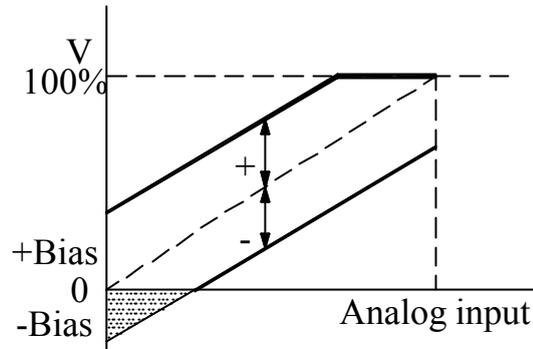
Freq. ref. bias direction		Setting Range	0 or 1
CD34		Default value	0

0 = Positive "+ "
1 = Negative "-"
Polarity setting for (CD33) frequency referance bias.
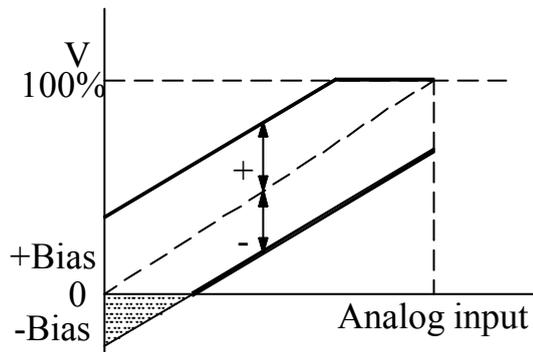
Frequency gain		Setting Range	40.0 ~ 200.0%
CD35		Default value	100.0%

FA1 analog input gain, refer to application example.
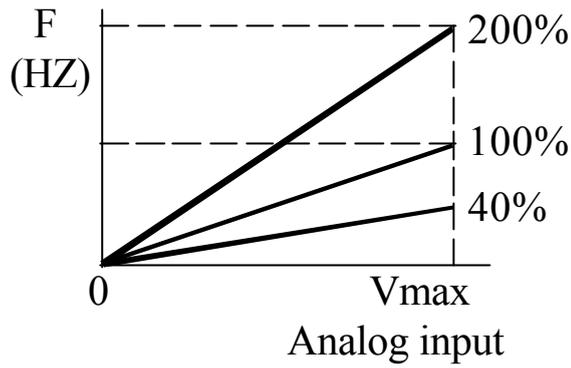
The latest error record
CD36

Error record 1
CD37

Error record 2
CD38

Error record 3
CD39

Errors record flow-chart when Error occur. The new content will shift the other contents to one higher CD code and the highest one will be dropped.

Error occur → CD36 → CD37 → CD38 → CD39 → Loss

Clear errors record		Setting Range	0 or 1
CD40		**Default value**	**0**

Set CD40=1 and PROG clear CD36 ~ CD39 Error record the contents in CD36 ~ CD39 are " NONE "

HZ/RPM Display		Setting Range	0 ~ 1
CD41		**Default value**	**0**

0 = HZ Display   1 = RPM Display

Setting corrent scale CD16 for R.P.M display shown.

FT1 Multi-Function Terminal 1		Setting Range	0 ~ 15
CD42		**Default value**	**0**

FT1 FT2	Symbol	Function description
0	--------	--------
1	JOGF	Jog operation FWD command
2	JOGR	Jog operation REV command
3	2CH	ACC/DEC time 2 command
4	FRS	Free running command
5	3 - WIRE	3 - wire sequence mode
6	CF3	5 - 8 Speed Setting Terminal
7	VF2	2nd V/F curve setting (CD56)
8		Reserved
9	OH	External over temperature command
10~15		Reserved

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Note :

1. Set jumper J4 and J5 to appropriate location before using FT1/FT2 functions.
2. To operate at 8 speeds function, all FT1/FT2/CF3 terminals set as FT1=CF1, FT2=CF2 and CF3=CF3.

3 - WIRE CIRCUIT CONNECTION DIAGRAM (terminal latch function)

CD42=5	FWD(REV) COMMAND
	STOP COMMAND
	MS2 OUTPUT
CD12=1	FWD(REV) COMMAND
	MS2 OUTPUT

Application circuit   with latch function
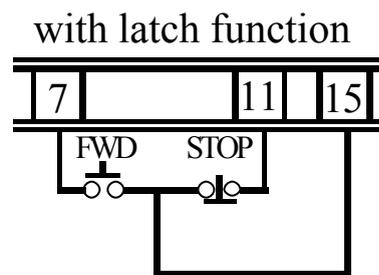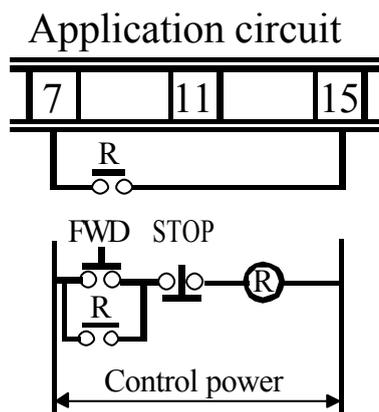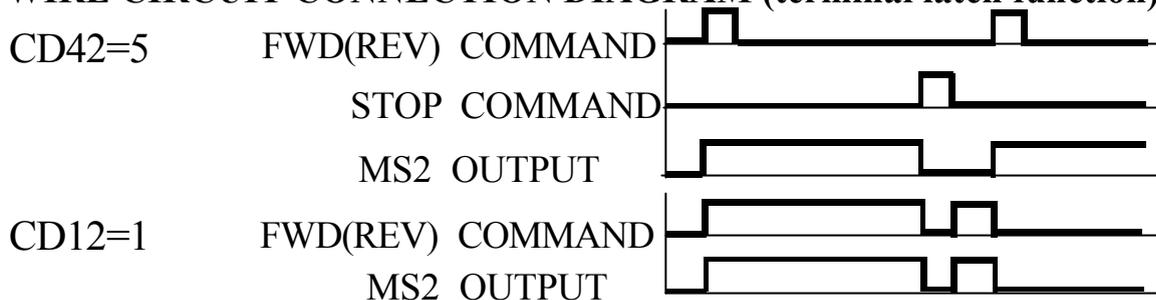
Ⓡand CONTROL POWER not necessary
Remark: STOP command entry from control
terminal⑪FT1 or ⑫FT2, and
set CD42(FT1)=5 or CD43(FT2)=5
before operation.

FT2 Multi-Function Terminal 2		Setting Range	0 ~ 15
CD43		Default value	0

Refer to CD42 description.

Free analog terminal 1	Setting Range	0 ~ 15
CD44	Default value	0

FA1	Function	Setting Range Min-------Max
0	----------	----------
1	Acceleration time 1	0 ~ CD02 Content
2	Deceleration time 1	0 ~ CD03 Content
3	Acceleration time 2	0 ~ CD25 Content
4	Deceleration time 2	0 ~ CD26 Content
5	Boost setting	0.0 ~ 25%
6	DC Brake time	0 ~ 25Sec
7	DC Brake Energy	0 ~ 250
8	Speed 2	F-min ~ CD22 Contect
9	Speed 3	F-min ~ CD23 Contect
10	Speed 4	F-min ~ CD24 Contect
11	Fmax	F-min ~ CD14 content
12	Output voltage gain	50% ~ 100%
13	Speed 1	F-min ~ CD00 Contect
14	Reserved	
15	Reserved	

	5th speed setting
	CD47

	6th speed setting
	CD48

	7th speed setting
	CD49

	8th speed setting
	CD50

Dynamic braking energy limit
CD51

SPEED	CF3	CF2	CF1
1th speed setting	OFF	OFF	OFF
2th speed setting	OFF	OFF	ON
3th speed setting	OFF	ON	OFF
4th speed setting	OFF	ON	ON
5th speed setting	ON	OFF	OFF
6th speed setting	ON	OFF	ON
7th speed setting	ON	ON	OFF
8th speed setting	ON	ON	ON

For example, set 8th speed as follows :
1. CD12=1 (Terminal function)
2. CD42 or CD43=6 (Function command)
                (FT1 or FT2   CF3)

Setting Range	**0 ~ 300%**
Default value	**100**

The higher the percentage, the more braking energy.
The lower the percentage, the lower braking energy.
Description of regenerative discharge braking active period.
0 : Auto-adjust
1 ~ 100% Deceleration period
101 ~ 200% Braking active period of
        (Decel/accel/constant frequency)
201 ~ 300% Braking active period of
        (Decel/accel/constant frequency/stand-by)
Remark : No. 1, 2, 3 are different working situations, but their braking energy ranges are 1~100%.

Version selector	Setting Range	F50.0 / F60.0
	60HZ region	F60.0
CD52	50HZ region	F50.0

Select function CD52, then use UP/Down key to select F50.0/F60.0 Version. Press PROG to save it. System will return to the factory setting and go into standby mode.

S curve	Setting Range	0 ~ 10
CD53	Default value	0

Setting S curve non-Linear Accel/Decel Operation from 1 to 10.
Setting 0 is normal operation without S curve.

○ S Curve period
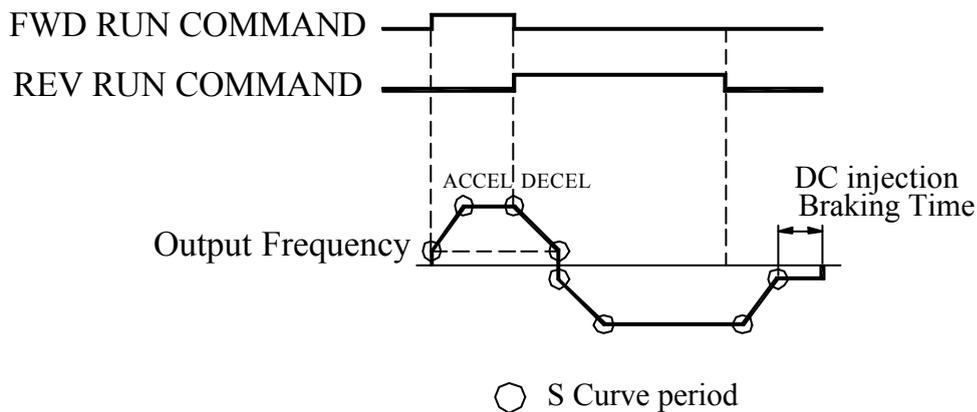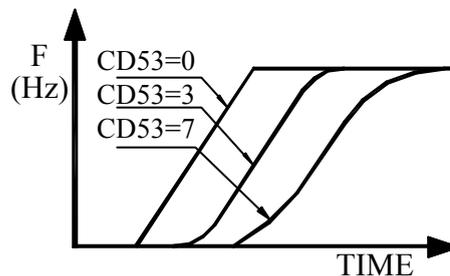
4 ~ 20 mA speed command	Setting Range	0 ~ 3
CD54	Default value	0

Set FA1 for current signal (4 ~ 20mA). This function only effects in CD44=8,9,10,13

0 : NO current signal application
1 : Current signal in terminal FA1
2~3 : Reserved
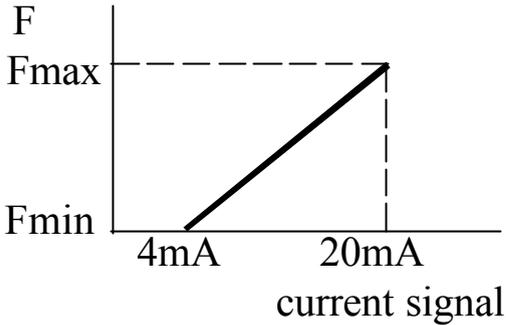
Note : Refer to FA1 terminal setting for 4-20mA signal.

Frequency arrive signal range	Setting Range	0.0 ~ 100.0%
CD55	Default value	10.0%

1. Signal output at running F. setting F.x(1-CD55%) for acceleration.
2. Signal output at running F. setting F.x(1+CD55%) for deceleration.
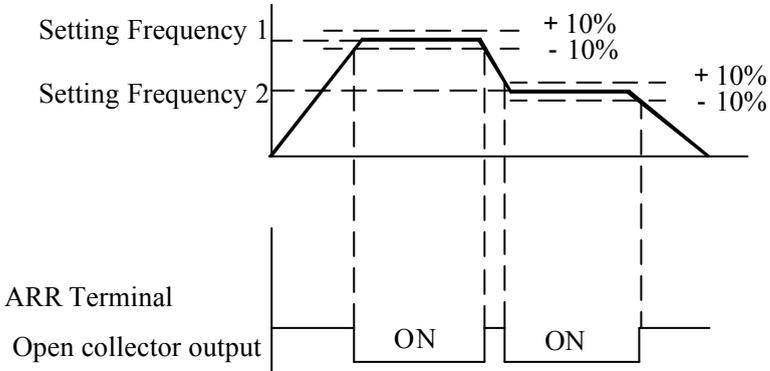
2nd Maximum Voltage frequency	Setting Range	25.0 ~ 1200HZ
CD56	Default value	60.0HZ

Set CD42(CD43)=7 define FT1(FT2) terminal for hardware V/F curve switcher.

Open : select the 1st V/F curve preset in CD17

Close : select the 2nd V/F curve preset in CD56
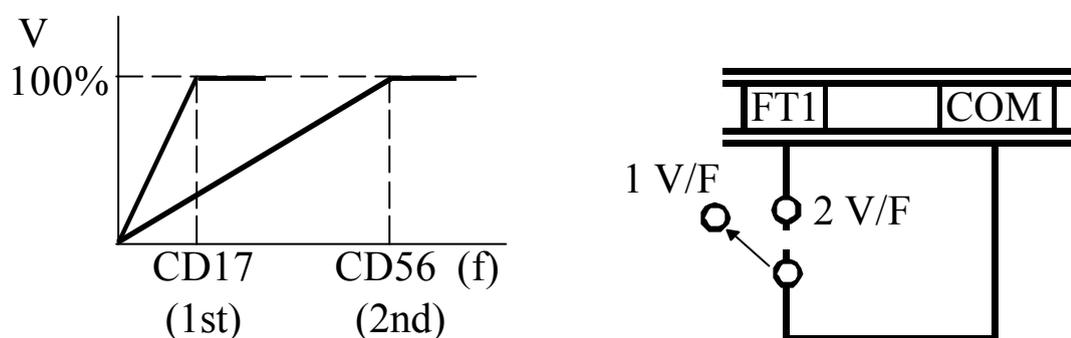
Auto running mode	Setting Range	0 ~ 6
CD58	Default value	0

System can operate at digital panel control only when set at auto-running mode. CD10=1 and CD12=1 are inactive.

SPEED	1st	2nd	3rd	4th	Master / suspend	VALUE RANGE	UNIT
SPEED SETTING	CD47	CD48	CD49	CD50	CD00	0 ~ 1200	Hz
TIMER SETTING	CD59	CD60	CD61	CD62	CD63	0 ~ 15.00	hr.min

CD58	Auto running mode
0	Speed with timing control disable
1	Sequence running then constant speed running
2	Sequence running then stop and repeat from 1st step for cycling
3	Sequence running then stop and repeat from 1st step in reversed direction for cycling
4	Sequence running, and repeat for cycling
5	Sequence running then perform reverse direction and repeat for cycling
6	Sequence running then stop

START

1st SPEED	→	2nd SPEED	→	3rd SPEED	→	4th SPEED	→	Master speed / suspend	→
1st step		2nd step		3rd step		4th step		5th step	

CD58=1

CD58=2

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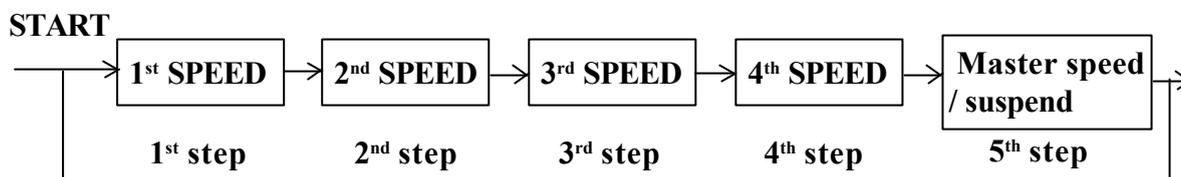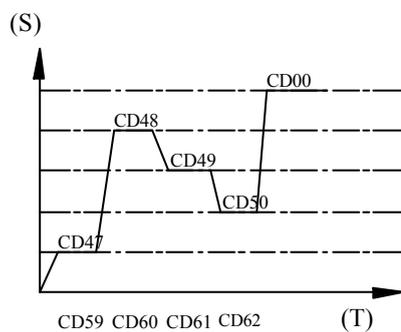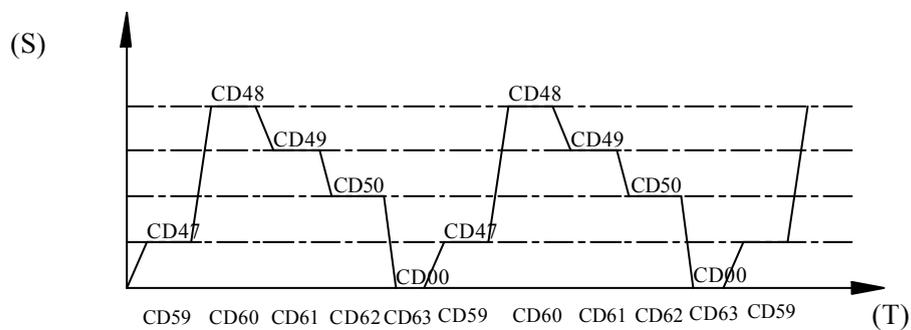
CD58=3
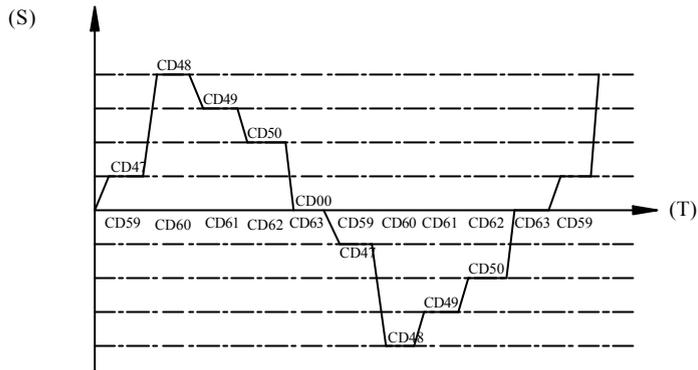
CD58=4
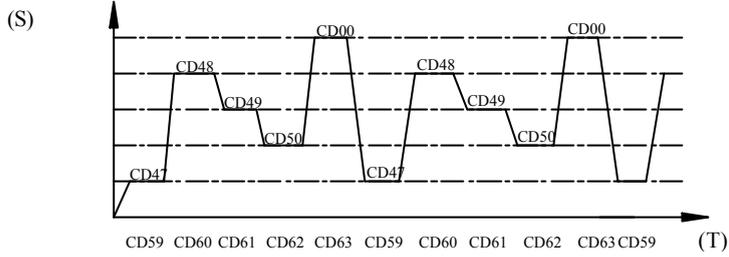
CD58=5
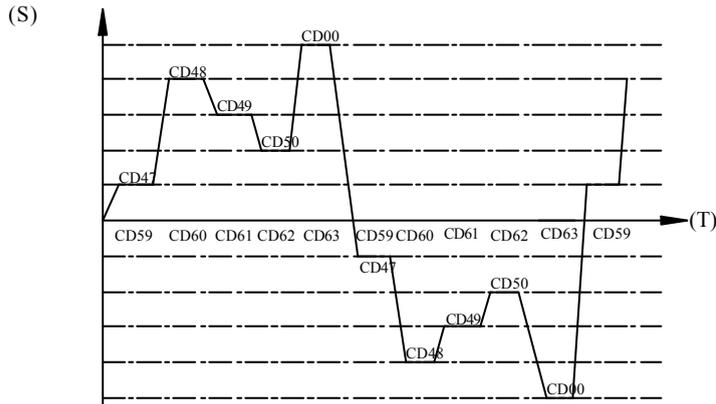
CD58=6
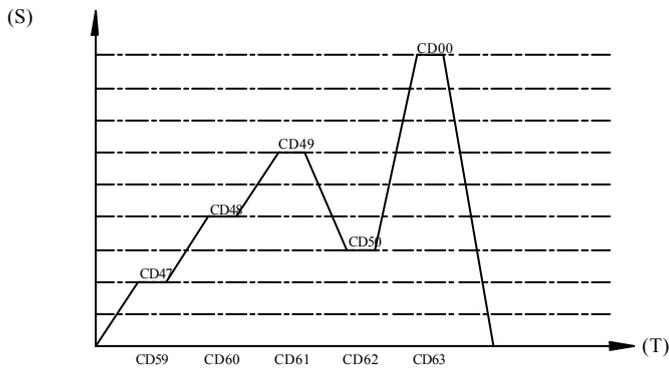
One time sequence running then stop.

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1st step timer		Setting Range	0 ~ 15 Hr
CD59		Default value	0.01 Hr.min

Setting running time for 1th speed.(CD47)

2st step timer		Setting Range	0 ~ 15Hr
CD60		Default value	0.00Hr.min

Setting running time for 2th speed.(CD48)

3st step timer		Setting Range	0 ~ 15Hr
CD61		Default value	0.00Hr.min

Setting running time for 3th speed.(CD49)

4st step timer		Setting Range	0 ~ 15Hr
CD62		Default value	0.00Hr.min

Setting running time for 4th speed.(CD50)

5st step timer		Setting Range	0 ~ 15Hr
CD63		Default value	0.00Hr.min

Setting running time for 1th speed.(CD00)

Timer unit selector	Setting Range	0 ~ 1
CD64	Default value	0

0 : hr.min

1 : min.sec

Note 1 : CD64 cannot be reset to default value by CD52. Set CD64 as needs separately.

Note 2 : In RS485 communication input, CD59~CD63 need to tranfer minimum unit. Ex CD64=0, CD59=2.3 CD59 contant for RS485 communication is 2×60+30=150(0096H)

Address setting	Setting Range	1 ~ 255
CD74	Default Value	1

Each drive must have unique identified addrss if they are controlled by RS485 communication. Each address connot be duplicated.

0 : broadcast to all inverter.

Transmission speed	Setting Range	0 ~ 3
CD75	Default Value	0

Setting the transmission speed between computer and drive.

0 : 2400 bits/second.

1 : 4800 bits/second.

2 : 9600 bits/second.

3 : 19200 bits/second.

Transmission fault treatment	Setting Range	0 ~ 3
CD76	Default Value	0

0 : Alarm and keep operation.
1 : Alarm and decelerate to stop.
2 : Alarm and free to stop.
3 : No alarm and keep operation.

Communicator protocol	Setting Range	0 ~ 7
CD78	Default Value	0

A. Date format

0 : 8,N,1 RTU (1 start bit+8 data bits+1 stop bit)
   8,N,1 RTU (10-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit

1 : 8,N,2 RTU (1 start bit+8 data bits+2 stop bit)
   8,N,2 RTU (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit

2 : 8,E,1 RTU (1 start bit+8data bits+1 Even bit+1 stop bit)
   8,E,1 RTU (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Even Parity	Stop bit

3 : 8,O,1 RTU (1 start bit+8data bits+1 Odd bit+1 stop bit)
   8,O,1 RTU (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Odd Parity	Stop bit

4 : 8,N,1 ASCII (1 start bit+8data bits+1 stop bit)
   8,N,1 ASCII (10-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit

5 : 8,N,2 ASCII (1 start bit+8data bits+2 stop bit)
   8,N,2 ASCII (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit

6 : 8,E,1 ASCII (1 start bit+8data bits+1 Eveb bit+1 stop bit)
   8,E,1 ASCII (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Even Parity	Stop bit

7 : 8,O,1 ASCII (1 start bit+8data bits+1 Odd bit+1 stop bit)
   8,O,1 ASCII (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Odd Parity	Stop bit

B. Communication protocol
Data contents are in hexadecimal with postive and negative format.

1. RTU

Start	A silent interval of more than 10ms
Address	8-bit address
Function	8-bit command
Data (n-1)	
...	Contents of data : n*8-bit data, n　16
Data 0	
CRC CHK Low	Check sum (CRCL)
CRC CHK High	Check sum (CRCH)
End	A silent interval of more than 10ms

2. ASCII

STX	Start character=' : ' (3AH)
Address Hi	Communication address :
Address Lo	8-bit address consists of 2 ASCII codes.
Function Hi	Command code :
Function Lo	8-bit command consists of 2 ASCII codes.
Data (n-1)	
...	Contents of data : n*8-bit data consist of 2n ASCII codes.
Data 0	
LRC CHK High	LRC check sum :
LRC CHK Low	8-bit check sum consists of 2 ASCII codes.
END Hi	End characters : END Hi=CR(0DH)
END Lo	END Lo=LF(0AH)

C. ASCII code description

Character	"0"	"1"	"2"	"3"	"4"	"5"	"6"	"7"
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	"8"	"9"	"A"	"B"	"C"	"D"	"E"	"F"
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

D. Function code

  1. 03H : Read AC drive's setting

  2. 06H : Write parameter setting into AC drive

  3. 08H : Communication loop detection

(1) 03H : Read AC drive's setting	

Computer command message
  D1 : Communication address
  D2 : Function code
  D3 : Parameter number (H)
  D4 : Parameter number (L)
  D5 : Quantity of parameter (H) (word count)
  D6 : Quantity of parameter (L) (word count)
  D7 : CRCL
  D8 : CRCH
	(00~FFh)
	(03h)
	(00h)
	(0~67h)
	(00h)
	(00~10h)
	(0~FFh)
	(0~FFh)

AC drive response message
  D1 : Communication address
  D2 : Function code
  D3 : Quantity of parameter (byte count)
  D4 : Content of data (H)
  D5 : Content of data (L)
  ...
  Dn-1 : CRCL
  Dn : CRCH
	(01~FFh)
	(03h)
	(00~20h)
	(0~FFh)
	(0~FFh)
	
	(0~FFh)
	(0~FFh)

Example : Read two parameters of AC drive address 52(34H) from CD22. CD22=20.00(07D0H) CD23=30.00(0BB8H).

1. RTU

	Computer command message			AC drive response message	
D1	Address	34H	D1	Address	34H
D2	Function	03H	D2	Function	03H
D3	Start address (H)	00H	D3	Quantity of data (count by byte)	04H
D4	Start address (L)	16H	D4	CD22 content (H)	07H
D5	# of data (H)	00H	D5	CD22 content (L)	D0H
D6	# of data (L)	02H	D6	CD23 content (H)	0BH
D7	CRCL	CRCL	D7	CD23 content (L)	B8H
D8	CRCH	CRCH	D8	CRCL	CRCL
			D9	CRCH	CRCH

2. ASCII

	Computer command message			AC drive response message	
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '3'	33		Function '3'	33
D3	Start address '0'	30	D3	# of data '0'	30
	Start address '0'	30		count by byte '4'	34
D4	Start address '1'	31	D4	CD22 content '0'	30
	Start address '6'	36		CD22 content '7'	37
D5	# of data '0'	30	D5	CD22 content 'D'	44
	# of data '0'	30		CD22 content '0'	30

Computer command message			AC drive response message		
D6	# of data '0'	30	D6	CD23 content '0'	30
	# of data '2'	32		CD23 content 'B'	42
	count by word '2'		D7	CD23 content 'B'	42
D7	LRC HI	LRC HI		CD23 content '8'	38
D8	LRC LO	LRC LO	D8	LRC HI	LRC HI
	END HI	0D	D9	LRC LO	LRC LO
	END LO	0A		END HI	0D
				END LO	0A

Note 1 : The parameter values can be in integer and decimal. Each value
has different process to read and write.
Refer to 8-1 lists to find out the minimum unit and value range
for each parameter.
The following value processing description (Note2~3), each hexa
decimal value has 4 numbers. First two numbers are D4, last two
numbers are D5.

Note 2 : Processing integer number
Transfer value into hexadecimal value. The first two numbers
is D4 and the last two numbers is D5.
Ex. Speed=1710 rpm
1710(decimal)=06AE(hexadecimal)
D4=06H
D5=AEH

Note 3 : Processing decimal number

    Using following methods to process if the minimum parameter value is decimal number.

    Minimum unit by 1st decimal number : The original value times 10 to be a new number.

    Minimum unit by 2nd decimal number : The original value times 100 to be a new number.

    Then,

    Use this new number to tansfer value into hexadecimal value.

  Returning numbers to original value, the numbers need to divide by 10 or 100 if they have been timed by 10 or 100.

    The first two numbers is D4 and the last two numbers is D5.

    Ex. Acc. time 1 CD02=60.0 sec

     $60.0 \times 10 = 600$(decimal)=0258(hexadecimal)

     D4=02H

     D5=58H

     The value needs to divide by 10 when it returns to original shape.

(2) 06H : Write parameter setting into AC drive

Computer command message	
D1 : Communication address	(00~FFh)
D2 : Function code	(06h)
D3 : Parameter number (H)	(00h)
D4 : Parameter number (L)	(0~4Eh)
D5 : Content of data (H)	(0~FFh)
D6 : Content of data (L)	(0~FFh)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)
AC drive response message	
D1 : Communication address	(01~FFh)
D2 : Function code	(06h)
D3 : Parameter number (H)	(00h)
D4 : Parameter number (L)	(0~4Eh)
D5 : Content of data (H)	(0~FFh)
D6 : Content of data (L)	(0~FFh)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)

Computer write CD00 content (60.00HZ) to inverter address=52

1. RTU

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

AC drive response message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

2. ASCII

	Computer command message			AC drive response message	
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '6'	36		Function '6'	36
D3	Number of parameter '0'	30	D3	Number of parameter '0'	30
	Number of parameter '0'	30		Number of parameter '0'	30
D4	Number of parameter '0'	30	D4	Number of parameter '0'	30
	Number of parameter '0'	30		Number of parameter '0'	30
D5	CD00 content '1'	31	D5	CD00 content '1'	31
	CD00 content '7'	37		CD00 content '7'	37
D6	CD00 content '7'	37	D6	CD00 content '7'	37
	CD00 content '0'	30		CD00 content '0'	30
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

Computer command message inverter address=52 foward run at 60.00HZ
1. RTU
 Step 1. Write CD00=60.00HZ (6000=1770H) to AC drive address=52
 Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

 AC drive response message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

 Step 2. Write address 100 (64H)=1
 Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	64H	00H	01H	CRCL	CRCH

 AC drive response message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	64H	00H	01H	CRCL	CRCH

 Note : When address 100=1, speed is depended on terminal setting
 (CF1, CF2, CF3)

2. ASCII
 Step 1. Write CD00(60.00HZ) to inverter address=52

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '6'	36		Function '6'	36

	Computer command message			AC drive response message	
D3	Number of parameter '0' Number of parameter '0'	30 30	D3	Number of parameter '0' Number of parameter '0'	30 30
D4	Number of parameter '0' Number of parameter '0'	30 30	D4	Number of parameter '0' Number of parameter '0'	30 30
D5	CD79 content '1' CD79 content '7'	31 37	D5	CD79 content '1' CD79 content '7'	31 37
D6	CD79 content '7' CD79 content '0'	37 30	D6	CD79 content '7' CD79 content '0'	37 30
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

Step 2. Write address 100 (64H)=1

	Computer command message			AC drive response message	
	STX	3A		STX	3A
D1	Address '3' Address '4'	33 34	D1	Address '3' Address '4'	33 34
D2	Function '0' Function '6'	30 36	D2	Function '0' Function '6'	30 36
D3	Content of data '0' Content of data '0'	30 30	D3	Content of data '0' Content of data '0'	30 30
D4	Content of data '6' Content of data '4'	36 34	D4	Content of data '6' Content of data '4'	36 34
D5	CD31 content '0' CD31 content '0'	30 30	D5	CD31 content '0' CD31 content '0'	30 30

Computer command message			AC drive response message		
D6	CD31 content '0'	30	D6	CD31 content '0'	30
	CD31 content '1'	31		CD31 content '1'	31
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

(3) 08H : Communication loop detection	

Computer command message
  D1 : Communication address
  D2 : Function code
  D3 : Data 1
  D4 : Data 2
  D5 : Data 3
  D6 : Data 4
  D7 : CRCL
  D8 : CRCH
	(0~FFh)
	(08h)
	(0~FFh)
	(0~FFh)
	(0~FFh)
	(0~FFh)
	(0~FFh)
	(0~FFh)

AC drive response message
  D1 : Communication address
  D2 : Function code
  D3 : Data 1
  D4 : Data 2
  D5 : Data 3
  D6 : Data 4
  D7 : CRCL
  D8 : CRCH
	(0~FFh)
	(08h)
	(0~FFh)
	(0~FFh)
	(0~FFh)
	(0~FFh)
	(0~FFh)
	(0~FFh)

 AC drive response messages need to be same as command message when do communication loop detection.

Ex. Write data data 1=11, data 2=22, data 3=33 and data 4=44 to AC drive address 52(34H)

1. RTU

	Computer command message			AC drive response message	
D1	Address	34H	D1	Address	34H
D2	Function	08H	D2	Function	08H
D3	Data 1	11H	D3	Data 1	11H
D4	Data 2	22H	D4	Data 2	22H
D5	Data 3	33H	D5	Data 3	33H
D6	Data 4	44H	D6	Data 4	44H
D7	CRCL	CRCL	D7	CRCL	CRCL
D8	CRCH	CRCH	D8	CRCH	CRCH

2. ASCII

	Computer command message			AC drive response message	
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '8'	38		Function '8'	38
D3	Content1 '1'	31	D3	Content1 '1'	31
	Content1 '1'	31		Content1 '1'	31
D4	Content2 '2'	32	D4	Content2 '2'	32
	Content2 '2'	32		Content2 '2'	32
D5	Content3 '3'	33	D5	Content3 '3'	33
	Content3 '3'	33		Content3 '3'	33
D6	Content4 '4'	34	D6	Content4 '4'	34
	Content4 '4'	34		Content4 '4'	34

Computer command message			AC drive response message		
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

CRC(Cyclical Redundancy Check) is calculated by the following steps:

Step 1. Load a 16-bit register (called CRC register) with FFFFH.

Step 2. Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC register.

Step 3. Shift the CRC registers one bit to the right with MSB zero filling. Extract and examine the LSB.

Step 4. If the LSB of CRC register is 0, repeat step 3, else Exclusive OR the CRC register with the polynomial value A001H.

Step 5. Repeat step 3 and 4 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed.

Step 6. Repeat steps 2 to 5 for the next 8-bit byte of the command message. Continue doing this until all bytes have been processed. The final contents of the CRC register are the CRC value.

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, the values of the bytes from Address to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example, refer to 06H at CD00=60.00HZ

    34+06+00+00+17+70=C1H

    the 2's-complement negation of C1H is 3FH

E. Communication error respond

Once communication error happened, inverter will respond "Function code and 80H" and communication error code to master system.

Communication error code definition

Error code	Description
01H	Function code error, only 03/06/08 available
02H	Illegal data value (data value outside limit value)
03H	Illegal data address (data address is not available)
04H	Illegal operation command
05H	Check sum error
06H	Drive busy (Inteval time between two data structures are too short)
07H	Drive fault, check AC drive
0BH	Data structure too short
0CH	Data structure too long
0DH	No start code or end code in ASCII communication

1. RTU

Once communication error happend, AC drive respond as follow.

D1	D2	D3	D4	D5
Address	Function code & 80H	Error code	CRCL	CRCH

2. ASCII

Start code	3A
Address (01)	30 31
Function code & 80H (86)	38 36
Error code (02)	30 32
LRC (77)	37 37
End code H	0D
End code L	0A

Ex. Write CD00=1500HZ(3A98H), but maximum value of CD00 is 1200HZ.

1. RTU

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
01H	06H	00H	00H	3AH	98H	CRCL	CRCH

AC drive response message

D1	D2	D3	D4	D5
01H	86H	02H	CRCL(C3H)	CRCH(A1H)

2. ASCII

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '0'	30	D1	Address '0'	30
	Address '1'	31		Address '1'	31
D2	Function '0'	30	D2	Function '8'	38
	Function '6'	36		Function '6'	36
D3	Address content '0'	30	D3	Error code '0'	30
	Address content '0'	30		Error code '2'	32
D4	Address content '0'	30	D4	LRC HI '7'	37
	Address content '0'	30		LRC LO '7'	37
D5	CD00 content '3'	33		END HI	0D
	CD00 content 'A'	41		END LO	0A
D6	CD00 content '9'	39			
	CD00 content '8'	38			
D7	LRC HI	LRC HI			
D8	LRC LO	LRC LO			
	END HI	0D			
	END LO	0A			

Communication address description

Speed command of RS485		Setting Range	0 ~ 4
100		Default Value	3

0 : Normal
1 : Forward run
2 : Reverse run
3 : Stop
4 : Fail mode reset
Note : 1.Fail mode reset by writting address 100 content=4. It will fall into EEP1 error mode if any operation command is set before reset the fail mode. It needs to re-power ON to remove this error.
2. Speed command is CD00, or using CF1/CF2/CF3 terminal to select 2nd~8th speed (CD22~CD24, CD47~CD50).

Frequency data output for RS485		Unit	0.1HZ
101			

To know output frequency, using function 03H to read address 101 content.

Fault code for RS485
103

Using 03H function to read address 103(67H) content to know the cause of fault if fault occurred.

01H : EP0
02H : PF01
03H : PF02
04H : PF03
05H : PF04
07H : OH
08H : OL
09H : EEP1
0AH : EEP2
31H : OPE1
32H : OPE2
34H : OPE4
35H : OPE5
36H : OPE6
37H : OPE7
38H : OPE8
39H : OPE9

7-2. Operation key-in sequence

EXAMPLE : CHANGE acceleration time

Setting sequence	Display indicator	Description
	𝟔𝟎𝟎𝟎	In waiting mode, the display is blinking
FUNC	Cd 0	Enter function mode
▲	Cd 1	Select function number 1 (parameter lock)
FUNC	0	Press "FUNC" again to change the parameter value
▲	1	Enable to change parameter
PROG	𝟔𝟎𝟎𝟎	Press "PROG" to save the parameter and back to standby mode
FUNC	Cd 1	Enter function mode
▲	Cd 2	Select function number 2 (acceleration time)
FUNC	00	Press "FUNC" again to change the parameter value
◄	0100	Select the first digit
▲ ▲ ▲	0103	Increase the value to 3
◄	0103	Select the second digit
▲ ▲	0123	Increase the value to 2
PROG	𝟔𝟎𝟎𝟎	Press "PROG" to save CD02=12.3 and back to standby mode.

CHANGE maximum frequency limit

Setting sequence	Display indicator	Description
FUNC	`Cd 2`	Enter function mode
▲ ▲	`Cd 4`	Increase the value to 4
◄ ◄	`Cd04`	Select the second digit
▲	`Cd14`	Increase the value to 1
FUNC	`1200`	Press "FUNC" again to change the Maximum frequency limit
◄ ◄ ◄	`1200`	Select the second digit
▼ ▼ ▼	`900`	Decrease the value to 90HZ
PROG	`6000`	Press "PROG" to save CD14=90HZ and back to standby mode

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8. DISPLAY ERROR CODES
A. Inverter self-checking errors

Internal protection
CPU

Noise protection.
Self test failure protection

Program check sum error
EP0

EEPROM access error
EEP1

EEPROM check-sum error
EEP2

Power device failure 1
PF01

Power device failure during acceleration

Power device failure 2
PF02

Power device failure during constant frequency

Power device failure 3
PF03

Power device failure during deceleration (stopping)

Power device failure 4
PF04

Power device failure during stand-by

B. Operation errors

Parameter Locked
OPE1

To change the contents of CD02~CD52 set CD01=press PROG first

FWD or REV only
OPE2

Motor direction limiter.
See function description CD08

Analog signal input only
OPE3

Motor speed command from control terminal only.
Input analog signal by Frequency knob.
See function description CD10

Terminal command only
OPE4

Accept run command from control terminalonly.
Not operation panel.
See function description CD12

Over range error
OPE5

Operating error message ~ over range.

Logic error warning
OPE6

Logic error when setting.
EXAMPLE : Setting F-min > F-max will result an error.

Only changed in standby
OPE7

The parameter can only be changed in standby mode.

Read only parameter
OPE8

The parameter created by system. Unable to be changed by user.

Communication error
OPE9

Over heat
OH

Over temperature for external indicator.
Refer to CD42(FT1) or CD43(FT2).

Over load
OL

9. PRECAUTIONS

9-1 Prior to maintenance, check the following :

    (1) Before maintenance, be sure to turn the power off and wait until the LED digits vanish in the display. However, approx. 50 VDC still remains immediately after the display disappears, so wait a little bit longer.

    (2) When removing or re-installing a connector, do not pull the cable.

    (3) Take special care not to misplace the connector. Carefully note any disconnecting or poor contact. Be sure to tighten the terminals and connectors securely.

9-2 Application precautions

    (1) Before you start operation, thoroughly check for erroneous wiring or short circuits in the motor or in the wiring between your motor and the inverter. Do not ground the neutral point of the motor with a star connection.

    (2) An inverter-driven run generates a certain amount of electromagnetic noise, as compared with that of driven directly by a commercial power supply. Thus you should be aware of such limitation when using an inverter-driven motor at a noise-sensitive site.

    (3) Before setting the maximum frequency at 60HZ or higher, confirm that this operation range is acceptable with that of your motor.

    (4) When you determine an appropriate inverter capacity, ensure that the rated current of the motor does not exceed the inverter's rated current.

    (5) Install a mold-case circuit breaker (MCCB) at the inverter's power supply end to protect the wiring.

10. TROUBLESHOOTING

Display symbol	Cause of fault message contents	Check point	Suggested remedy
No display	Discharge LED extinguished	Review the power system. Check that MCCB has been turned on or no poor contact.	Turned on or Replace MCCB
PF01	Power device failure during acceleration	The acceleration time is too short.	Increase the acceleration time
		Boost voltage too high	Reduce CD21 contents
		Check the motor is locked or the load is too heavy	Reduce the load factor
		Disconnecting the output wiring U.V.W. Restart (Run) the inverter check for the same message	Repair
PF02	Power device failure during constant frequency operation	Check for sudden change in load	Eliminate sudden change in load
		Check that the ambient temperature is too high	Reduce the ambient temperature
PF03	Power device failure during deceleration	The load GD^2 is excessive	Set the deceleration time suitable for load GD^2
		Power supply voltage is too high	Reduce th voltage within specified range
PF04	Power device failure during stand-by	Check around the noise source. Power supply voltage is too high.	Remove the cause Reduce the voltage
EEP1	EEPROM access error	Communication reset error	Refer to address 100 description
		Rework with previous process, if same message happen again.	Repair
EEP2	EEPROM check-sum error	Rework with previous process, if same message happen again.	Repair

11. APPLICATION

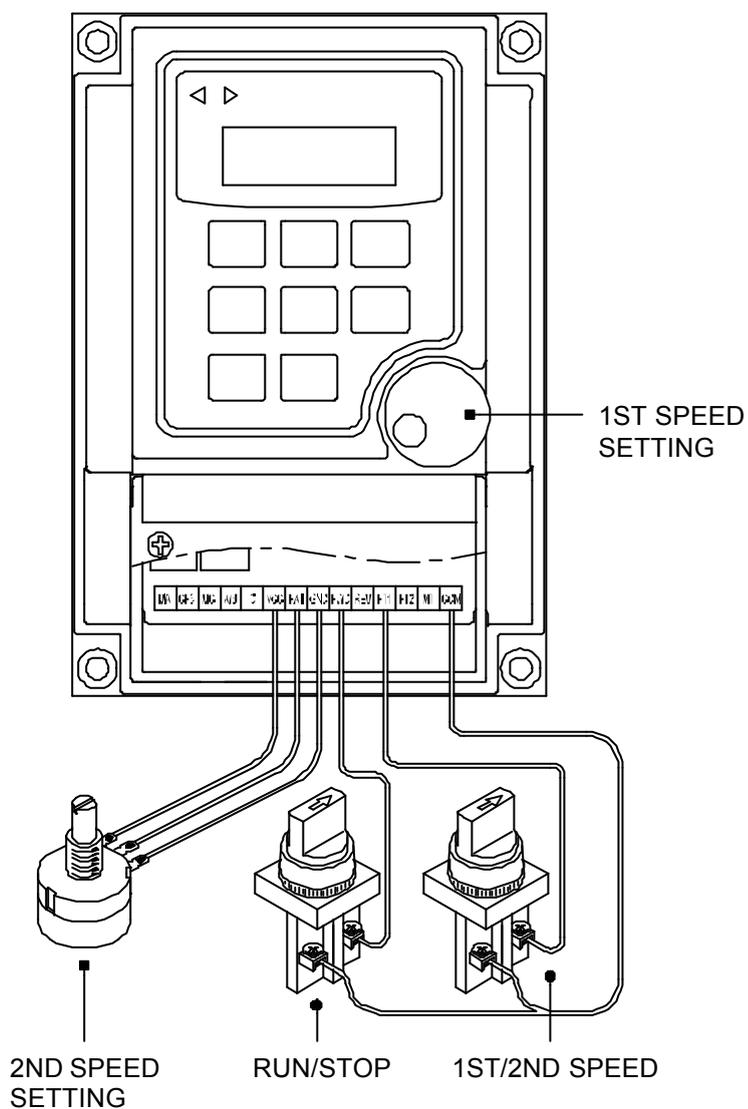**EXAMPLE 01 : Use 2 external variable resistor for multistage speed command input**

DESCRIPTION :

CD10 = 1   **(Use frequency knob for 1st speed setting)**

CD12 = 1   **(External command)**

CD44 = 8   **(2nd speed signal enter from FA1)**

SW1 = RUN / STOP

SW2 = 1st / 2nd SPEED

1ST SPEED SETTING

2ND SPEED SETTING   RUN/STOP   1ST/2ND SPEED

EXAMPLE 02 : Normal / Jog operation
DESCRIPTION :
   CD00 = Normal speed ; User setting
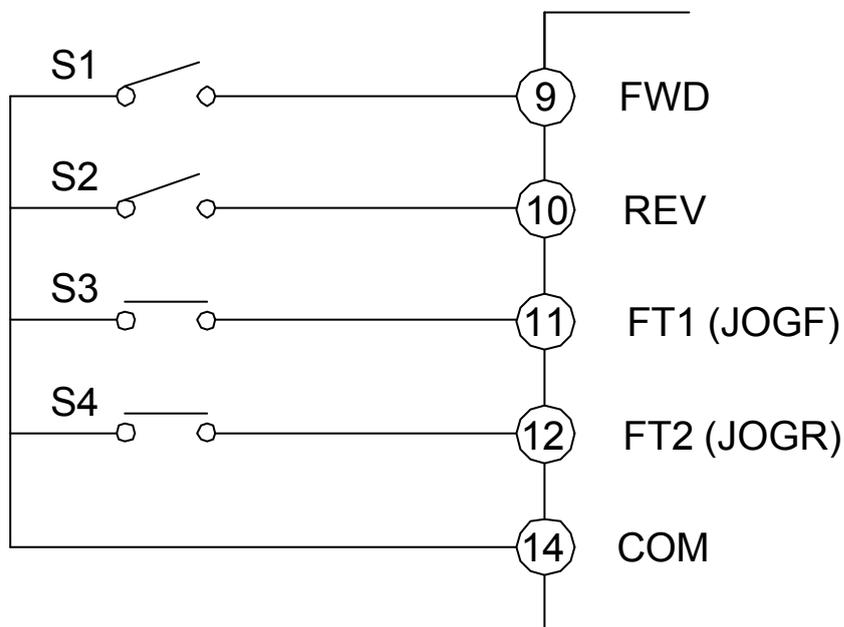   **CD04 = Jog speed   ; User setting**
   CD12 = 1   ; Terminal command (For External)
   CD42 = 1   ; Define FT1 Terminal = JOGF function
   CD43 = 2   ; Define FT2 Terminal = JOGR function
   Set FT1 jumper at FT1 and FT2 jumper at FT2, see 3-2 description on page 10.

NORMAL / JOG
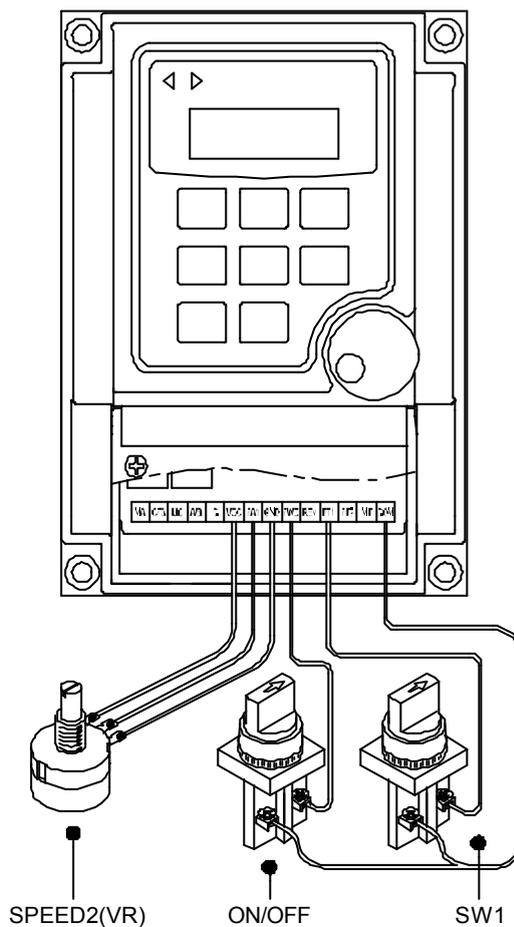   S1 = FWD SW
     S2 = REV SW
     S3 = FWD JOG SW
     S4 = REV JOG SW

EXAMPLE 03 : Using rheostart for 2stage speed setting
DESCRIPTION :
　CD12 = 1　　　　　　　; Terminal command (For External)
　CD44 = 8　　　　　　　; 2nd speed singnal enter from FA1
　Set FT1 jumper at CF1, see 3-1 description.

SPEED	TERMINAL SW1	SPEED COMMAND ENTRY
1	OFF	FREQUENCY KNOB
2	ON	VR2

SPEED2(VR)　　　ON/OFF　　　SW1

EXAMPLE 04 : Auto multi-speed and time programing
DESCRIPTION :
 Speed :CD47=80 (High speed)　　Speed:CD48=12 (Low speed)
 Time:CD59=1.25　　　　　　　**Time:CD60=0.18**

START $\longrightarrow$ | 5th SPEED (80HZ)
1Hr 25min | $\rightarrow$ | 6th SPEED (12HZ)
18min | $\longrightarrow$ (STOP)

CD58	Auto running mode
0	Speed with timing control disable
1	Sequence running then constant speed running
2	Sequence running then stop and repeat from 1st step for cycling
3	Sequence running then stop and repeat from 1st step in reversed direction for cycling
4	Sequence running, and repeat for cycling
5	Sequence running then perform reverse direction and repeat for cycling

Function setting:

1. CD01=1   8. CD21=8

2. CD58=1   9. CD27=1

3. CD47=80   10. CD59=1.25

4. CD48=12   11. CD60=0.18

5. CD49=0   12. CD61=0

6. CD50=0   13. CD62=0

7. CD00=0   14. CD63=0

Remark:
 1. Setting CD27=16, if noise is much.
 2. Setting CD21, if start torque is not enough.

EXAMPLE 05 : 8th speed from terminal control
DESCRIPTION :
  CD12=1
  CD42=6
  CD58=0
        CD00 : 1st speed
        CD22 : 2nd speed
        CD23 : 3rd speed
        CD24 : 4th speed
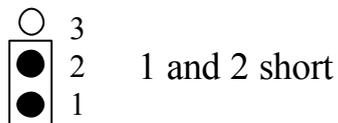   **CD47 : 5th speed**
        CD48 : 6th speed
        CD49 : 7th speed
        CD50 : 8th speed

Jumper S1   Jumper J4
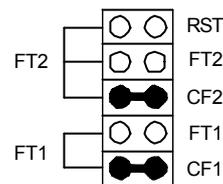
Speed \ Terminal	FT1 (CF1)	FT2 (CF2)	CF3
1st speed	OFF	OFF	OFF
2nd speed	ON	OFF	OFF
3rd speed	OFF	ON	OFF
4th speed	ON	ON	OFF
5th speed	OFF	OFF	ON
6th speed	ON	OFF	ON
7th speed	OFF	ON	ON
8th speed	ON	ON	ON

12. Inverter Selection

Inverter Capacity Check Method

Description		Related factor	
Load characteristics	Load type	Friction load and weight load Liquid(viscous) load inerita load Load with power transmission and accumulation	
	Load speed and torque charcteristics	Constant torque Constant power Descreasing torque	
	Load charcteristics	Motoring Braking or overhanging load Constant load Shock load Repetitive load High-start torque Low-start torque	
Operastion		Continuous operation Long-time operation at medium or low speeds Short-time operation	
Rated output		Maximum required output(instantaneous) Constant output(continuous)	
Rated rpm		Maximum rpm Rated rpm	
Power supply		Power supply transformer capacity and percentage impednace Voltage fluctuations Number of phases, less phase protection Frequency	
Deterioration of load capacity due to age		Mechanical friction, losses in wiring	
		Duty cycle modification	

Speed and Torque Characteristics	Time Ratings	Overload Capacity	Starting torque

13. APPENDIX

A. Option braking resistor
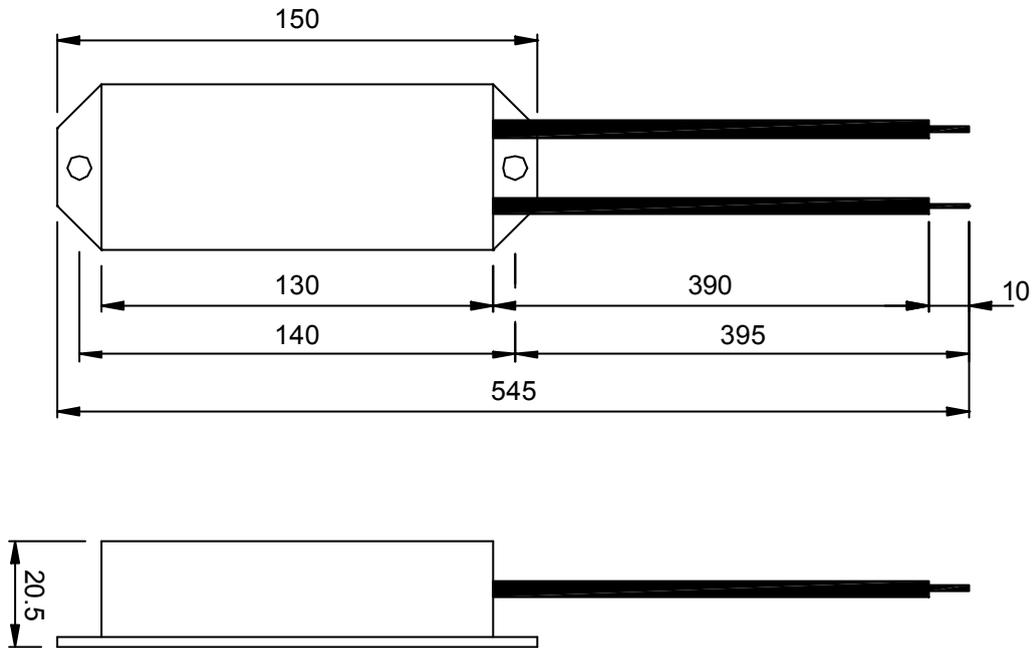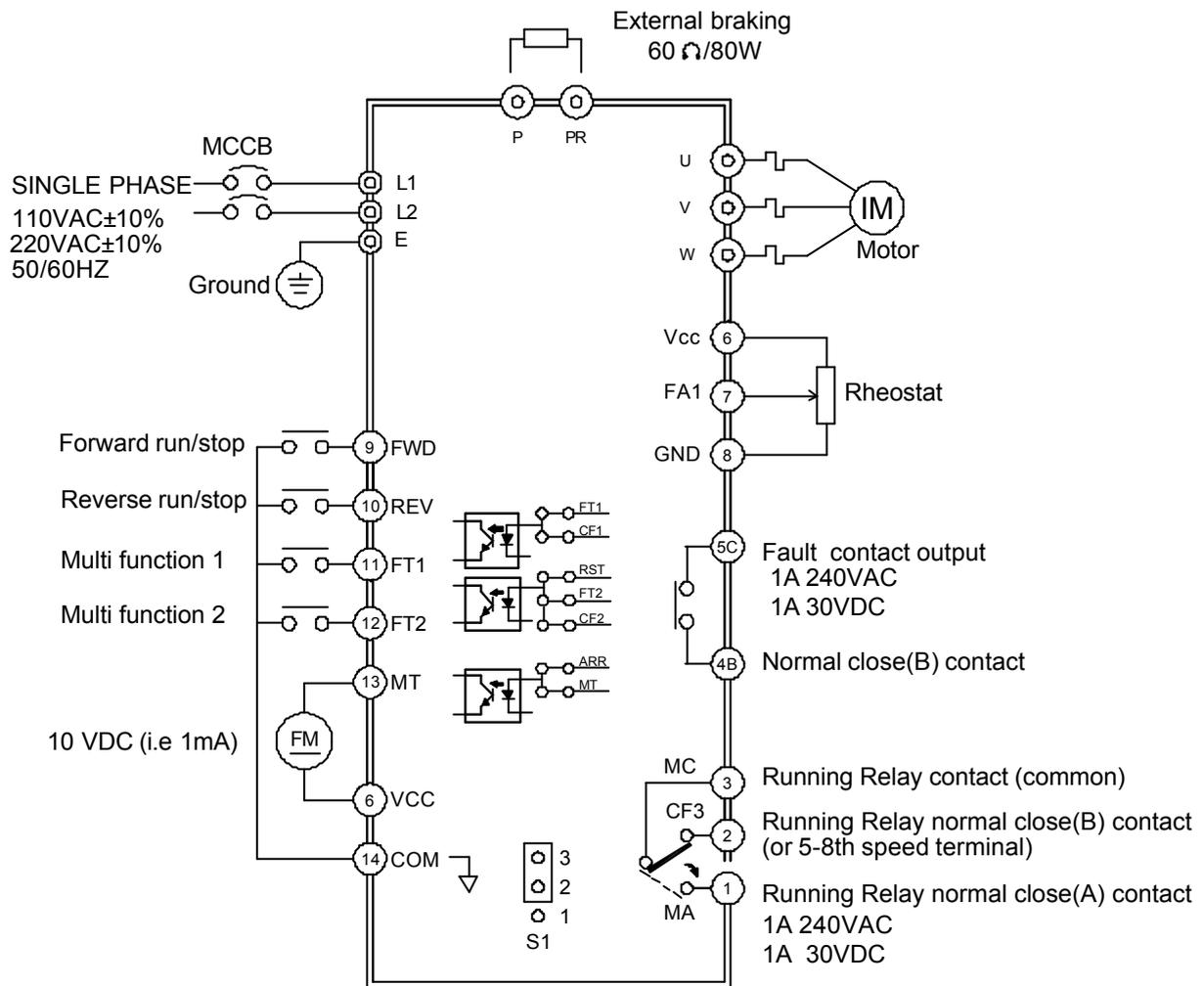

Part no : E-MSAA-008000

Specification : 60　80W

Remove build-in dynamic brake resistor.

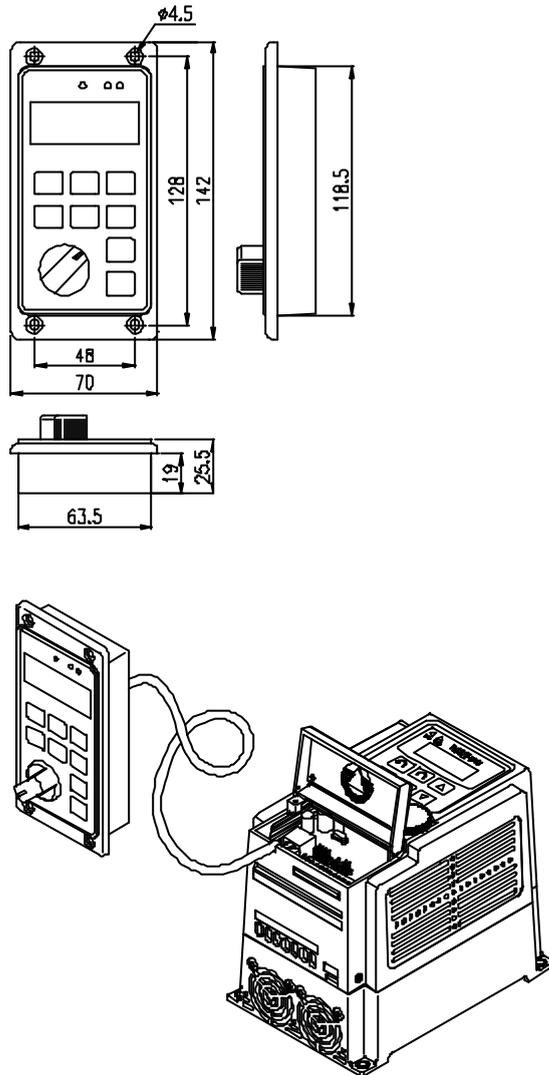Connect a larger capacity resistor, the value should be greater than the table below :

Unit：Ohm

Model No	102	104	107	115	122	137
MS2	60	60	60	60	60	60

B. Terminals wiring diagram

External braking
60 Ω/80W

P   PR

MCCB

SINGLE PHASE — L1
110VAC±10%   L2
220VAC±10%   E
50/60HZ
Ground

U
V
W   Motor   IM

Vcc 6
FA1 7   Rheostat
GND 8

Forward run/stop   9 FWD
Reverse run/stop   10 REV
Multi function 1   11 FT1
Multi function 2   12 FT2
13 MT

FT1
CF1
RST
FT2
CF2
ARR
MT

5C   Fault contact output
1A 240VAC
1A 30VDC

4B   Normal close(B) contact

10 VDC (i.e 1mA)   FM

6 VCC
14 COM

3
2
1
S1

MC
3   Running Relay contact (common)
CF3
2   Running Relay normal close(B) contact
(or 5-8th speed terminal)
1   Running Relay normal close(A) contact
MA   1A 240VAC
1A 30VDC

C. Remote operator

UNIT : M/M

A-0000-F306G3	F306 Remote operator
E-WIAA-G5R001	1 meter extension cable
E-WIAA-G5R003	3 meter extension cable
E-WIAA-G5R005	5 meter extension cable

MEMO

MEMO

MEMO

MEMO

MEMO

MEMO

INSTRUCTION MANUAL
PART NO : E-PHAA-EMSA02
Model : MS series

DEC. 2007 1ˢᵗ edition

ISO 9001
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