ADLEEPOWER®

INSTRUCTION MANUAL

GENERAL-PURPOSE INVERTER

AP2G3-137~AP2G3-1185
AP2G3-337~AP2G3-3220
AP4G3-337~AP4G3-3220

THANK YOU VERY MUCH FOR YOUR PURCHASE OF ADLEE INVERTER APxG3 SERIES.
PLEASE READ THIS INSTRUCTION MANUAL BEFORE INSTALLATION OF THE INVERTER.

CONTENTS

1. RECEIVING

Befor installation and wiring, check to see :

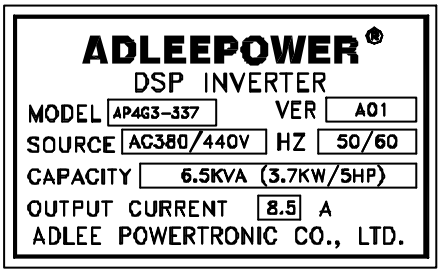
(1) No damage is found on each product after shipping.

(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



VER A 01
- SOFTWARE
- HARDWARE
- VERSION

MODEL : AP 4 G3 - 3 37

AP series

Voltage class :
2 : 200/220V
4 : 380/440V

IPM AC drive

Max Applicable motor(4 pole)
37 : 3.7KW 55 : 5.5KW 75 : 7.5KW
110 : 11KW 150 : 15KW 185 : 18.5KW
220 : 22KW

1 : 1φ
3 : 3φ

2. SPECIFICATIONS

Model		AP2G3												
Voltage		1φ 220VAC ± 10%						3φ 220VAC ± 10%						
Model No		137	155	175	1110	1150	1185	337	355	375	3110	3150	3185	3220
Input Frequency		50HZ/60HZ ±5%												
Output Voltage		3φ 220VAC												
Output Frequency		0.5 ~ 400HZ												
Output Rated current (A)		16	23	30	43	56	70	17	24	33	46	61	76	90
Capacity (KVA)		6.1	8.8	11.4	16.4	21.3	26.7	6.5	9.2	12.6	17.6	23.3	29	34
Largest motor KW (2.4.6 poles)		3.7	5.5	7.5	11	15	18.5	3.7	5.5	7.5	11	15	18.5	22
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												
	Analog	Analog signal input DC 0~5V, 0~10V, 4~20mA												
Output signal		Open collector output 50v 50mA Max												
Cooling Method		Air-cooled												
Dimension drawing		Fig 1			Fig 2			Fig 1			Fig 2			
Weight (KG)		5.5	6.2	6.6	17	18	18.5	5.5	6.2	6.6	17	18	18.5	19

Model		AP4G3						
Voltage		3φ 380/440VAC ±10%						
Model No		337	355	375	3110	3150	3185	3220
Input Frequency		50HZ/60HZ ±5%						
Output Voltage		3φ 380/440VAC						
Output Frequency		0.5 ~ 400HZ						
Output Rated current (A)		8.5	12	16.5	23	31	38	45
Capacity (KVA)		6.5	9.2	12.6	17.6	23.6	29	34
Largest motor KW (2.4.6 poles)		3.7	5.5	7.5	11	15	18.5	22
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						
	Analog	Analog signal input DC 0~5V, 0~10V, 4~20mA						
Output signal		Open collector output 50v 50mA Max						
Cooling Method		Air-cooled						
Dimension drawing		Fig 1				Fig 2		
Weight (KG)		5.5	6.2	6.6	6.8	18	18.5	19.5

3. DIMENSION DRAWINGS

(AP2G3-137 AP2G3-155 AP2G3-175) Unit : mm

(AP2G3-337 AP2G3-355 AP2G3-375)

(AP4G3-337 AP4G3-355 AP4G3-375 AP4G3-3110)

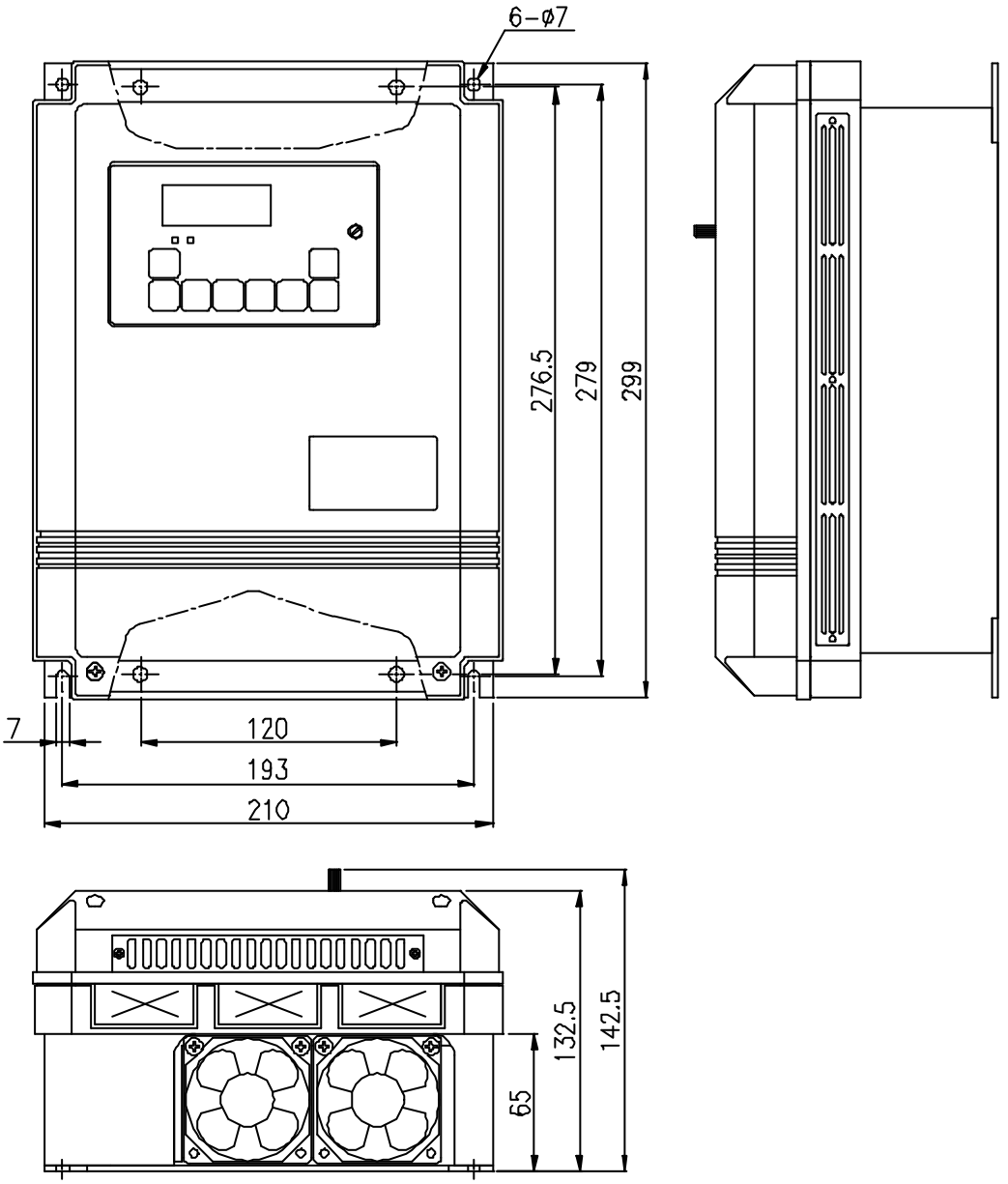


Fig 1

(AP2G3-1110 AP2G3-1150 AP2G3-1185)　　Unit : mm
(AP2G3-3110 AP2G3-3150 AP2G3-3185 AP2G3-3220)
(AP4G3-3150 AP4G3-3185 AP4G3-3220)

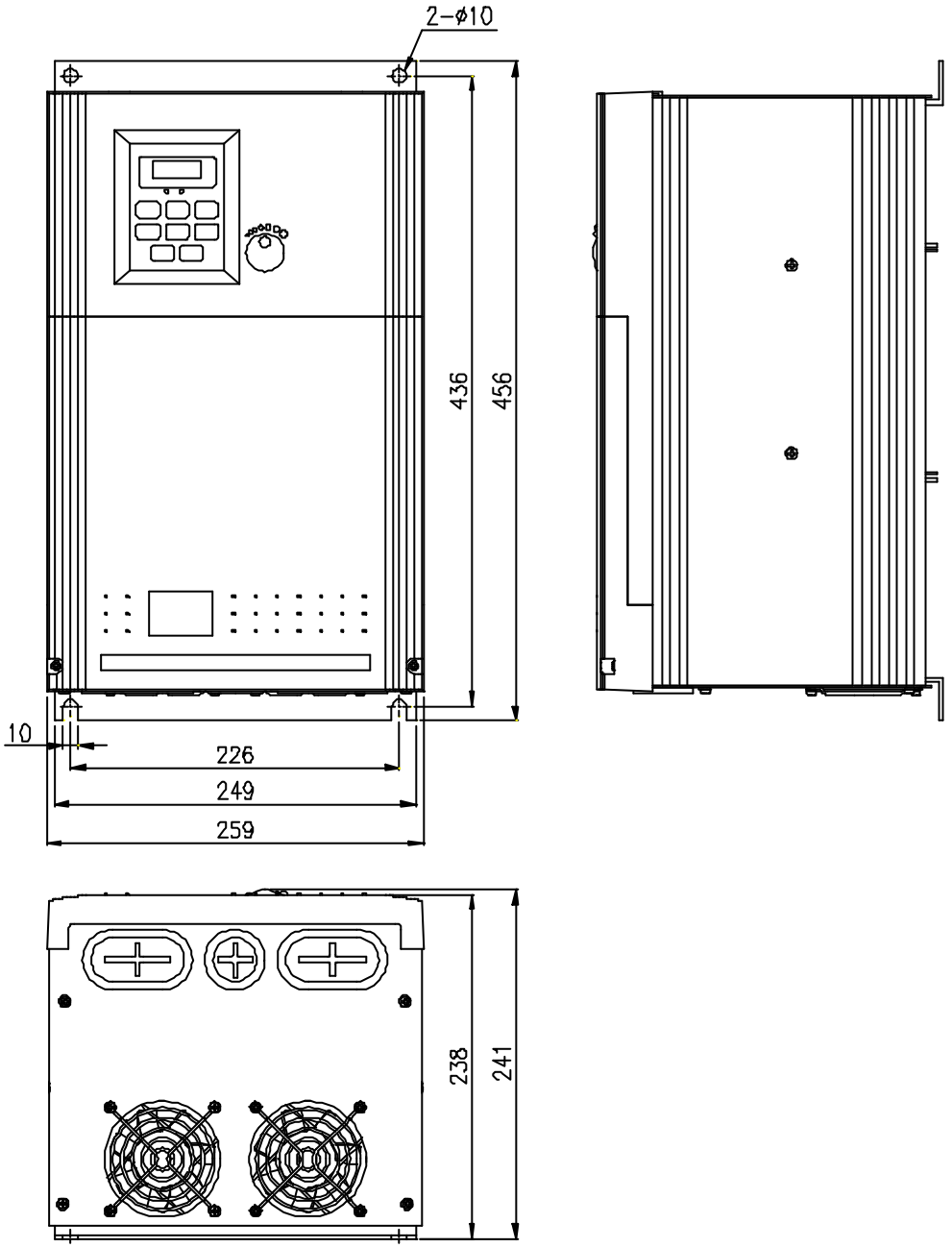


Fig 2

4. INSTALLATION

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

Before operating the APxG3 series inverter, please check the following points :

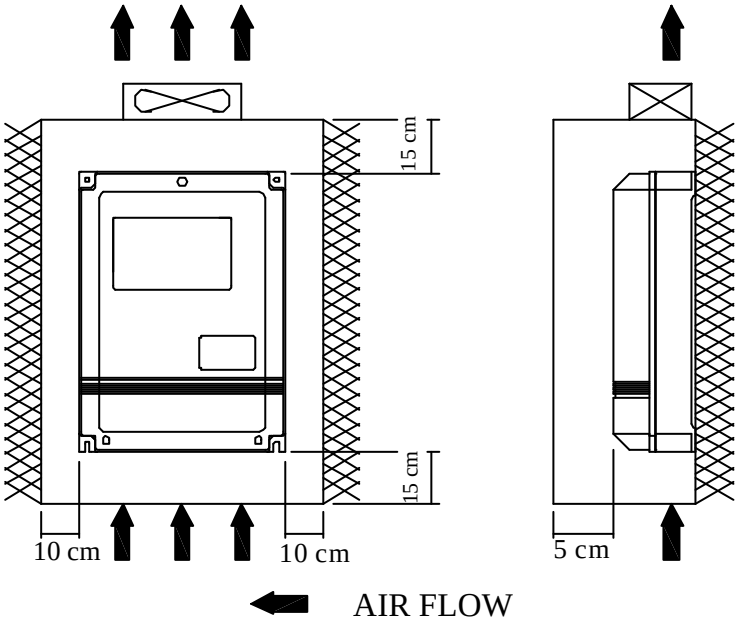
(1) Avoid high temperature, high humidity, easy-to-dew ambient environment. Don't expose to dust or dirt, corrosive gas, and coolant mist, and direct sunlight. Place the unit in a well-ventilated room.

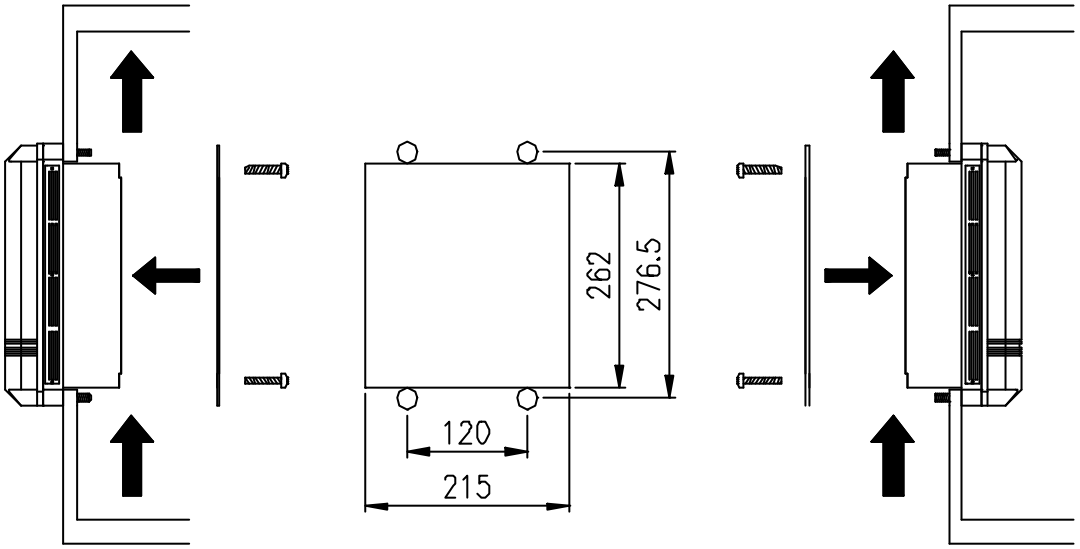
(2) Avoid a place subjected to substantial vibration.

(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.

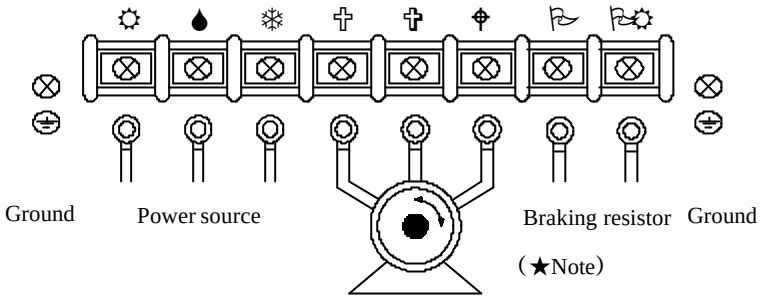




AIR FLOW

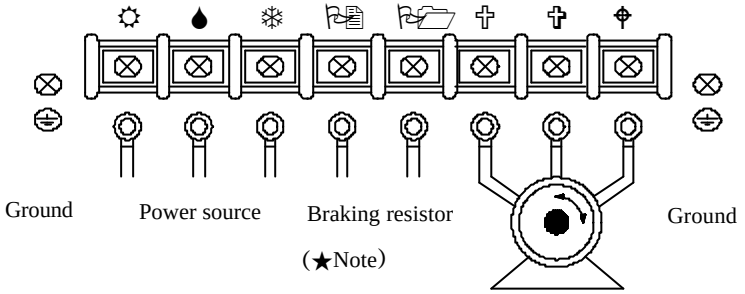
5. DESCRIPTION OF TERMINALS

(1) Main circuit connection diagram



IM

AP2G3-137~175
AP2G3-337~375
AP4G3-337~3110



IM

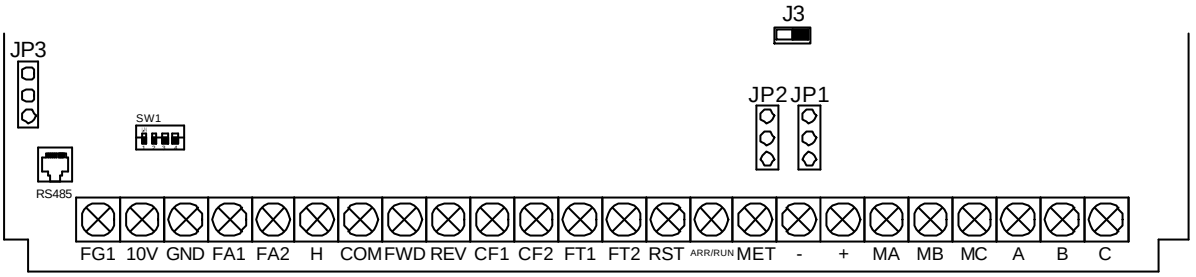
AP2G3-1110~1185
AP2G3-3110~3220
AP4G3-3150~3220

Main circuit terminal		
Symbol	Terminal name	Description
R / L1	Inverter power source	Terminal connecting with power source Single phase input : L1/R, L2/S
S / L2		
T / L3		
U	Inverter output terminal	Terminal connecting with motor
V		
W		
P / P1	DC voltage terminal	Regenerative braking resistor connecting terminal
PR / P2		

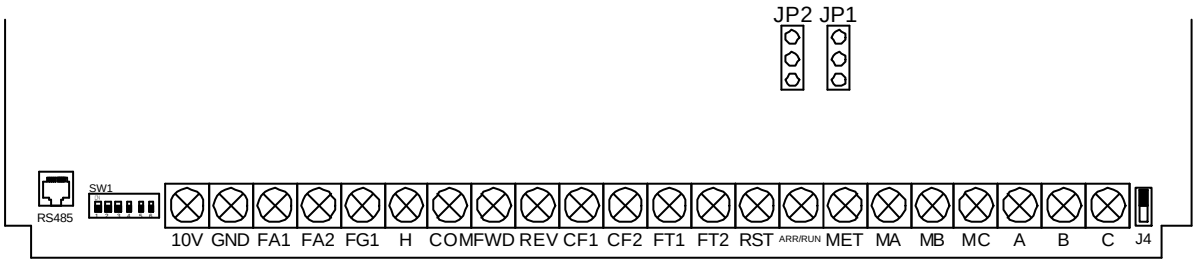
Note : Release the internal braking resistor when connect external braking resistor.

(2) Description of hardware setting

AP2G3-137~AP2G3-175, AP2G3-337~AP2G3-375,
AP4G3-337~AP4G3-3110

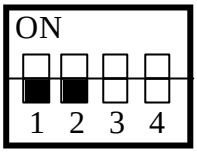
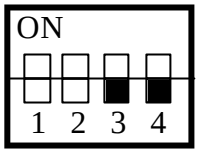
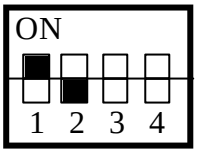
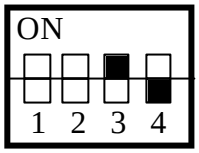
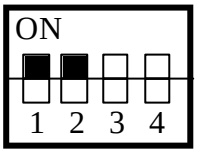
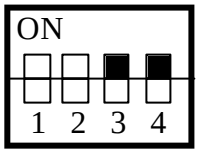
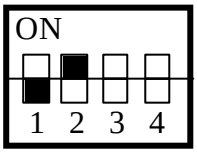
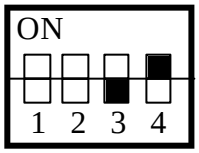


AP2G3-1110~AP2G3-1185, AP2G3-3110~AP2G3-3220,
AP4G3-3150~AP4G3-3220

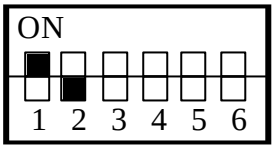
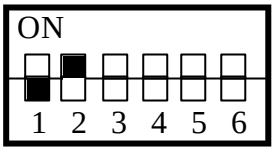
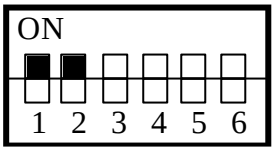
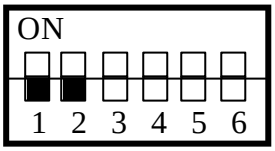


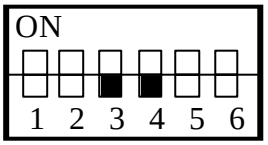
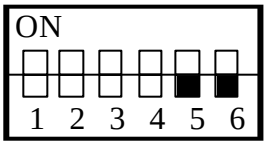
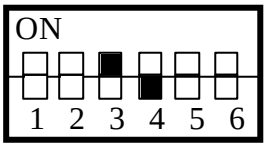
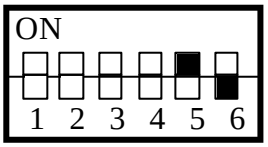
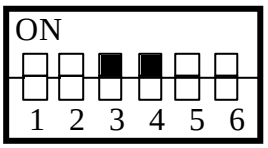
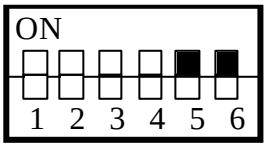
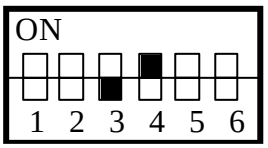
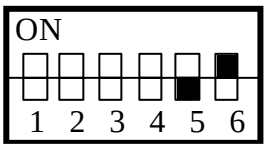
(3) Analog signal switch setting

AP2G3-137~175, AP2G3-337~375, AP4G3-337~3110

SIGNAL	FA1	FA2
0 - 10V		
0 - 5V		
4 - 20mA (★Note 1)		
Error setting		

AP2G3-1110~1185, AP2G3-3110~3220, AP4G3-3150~3220

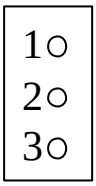
SIGNAL	Keypad VR/F306
Keypad VR	
F306	
Error setting	
Error setting	

SIGNAL	FA1	FA2
0 - 10V		
0 - 5V		
4 - 20mA (★Note 1)		
Error setting		

Note 1 : Input 4-20mA at FA1 or FA2, refer to function CD10/CD12/ CD44/CD45/CD54.

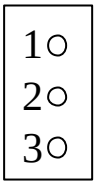
(4) Jumper setting

1. JP1 : FT2 over temperature selection



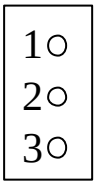
1 and 2 short circuit : PTC temperature switch.
2 and 3 short circuit : NTC temperature switch.

2. JP2 : MET output selection



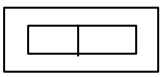
1 and 2 short circuit : Connect to meter.
2 and 3 short circuit : Analog output.
(0~10VDC refer to 0~CD14)

3. JP3 : Pannel VR and F306 VR selection
AP2G3-137~AP2G3-175, AP2G3-337~AP2G3-375,
AP4G3-337~AP4G3-3110



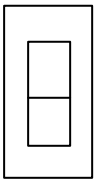
1 and 2 short circuit : Pannel VR.
2 and 3 short circuit : F306 VR.

4. J3 : RUN/ARR Relay selection
AP2G3-137~AP2G3-175, AP2G3-337~AP2G3-375,
AP4G3-337~AP4G3-3110



Left : ARR Relay.
Right : RUN Relay.

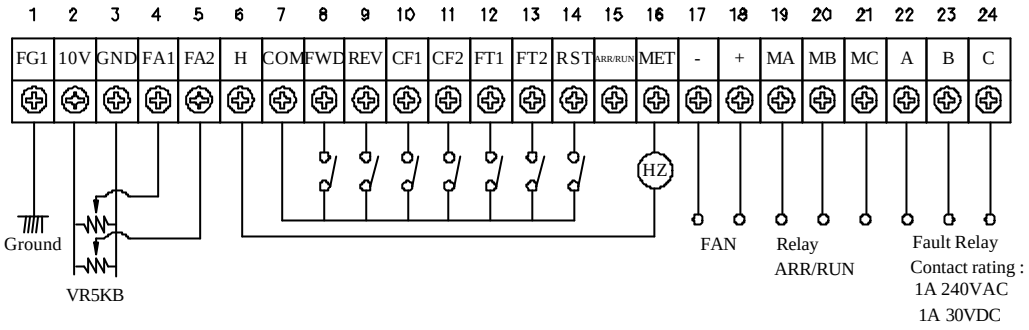
5. J4 : RUN/ARR Relay selection
AP2G3-1110~AP2G3-1185, AP2G3-3110~AP2G3-3220,
AP4G3-3150~AP4G3-3220



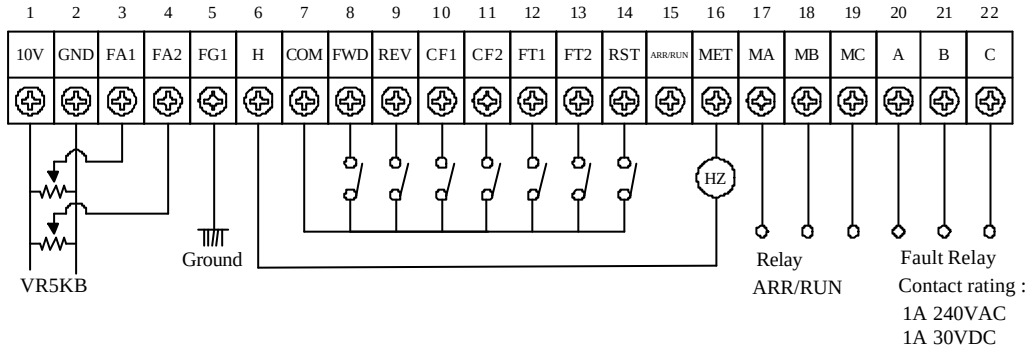
Up : RUN Relay.
Down : ARR Relay.

Note : When J3 or J4 select ARR, ARR/RUN terminal is RUN open collector output and MA/MB/MC Relay is ARR.
When J3 or J4 select RUN, ARR/RUN terminal is ARR open collector output and MA/MB/MC Relay is RUN.

(5) Control circuit terminal



AP2G3-137~175、 AP2G3-337~375、 AP4G3-337~3110



AP2G3-1110~1185、 AP2G3-3110~3220、 AP4G3-3150~3220

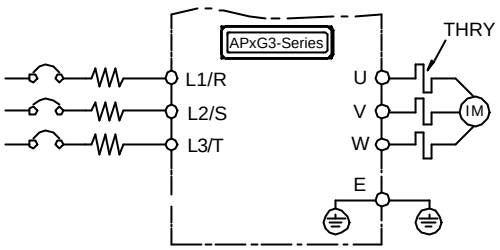
<table>
<tr><th rowspan="2">Symbol</th><th colspan="2">Control circuit terminal</th></tr>
<tr><th>Terminal</th><th>Description</th></tr>
<tr><td>FG1</td><td>Ground terminal 1</td><td>Grounding</td></tr>
<tr><td>10V</td><td>Analog source</td><td>Power source +10V of analog terminals</td></tr>
<tr><td>GND</td><td>Analog common terminal</td><td>Common terminal of free analog terminals</td></tr>
<tr><td>FA1</td><td>Free analog terminal 1</td><td>See functions description (CD44)</td></tr>
<tr><td>FA2</td><td>Free analog terminal 2</td><td>See functions description (CD45)</td></tr>
<tr><td>H</td><td>Ref. voltage</td><td>Basic source (+10V) terminal for frequency</td></tr>
<tr><td>COM</td><td>Common terminal</td><td>Common terminal of control board</td></tr>
<tr><td>FWD</td><td>Forward operation</td><td>Forward operation / stop terminal</td></tr>
<tr><td>REV</td><td>Reverse operation</td><td>Reverse operation / stop terminal</td></tr>
<tr><td>CF1
CF2</td><td>Multistage speed terminal</td><td><table><tr><th>CF1</th><th>CF2</th><th>SPEED</th></tr><tr><td>OFF</td><td>OFF</td><td>SPEED - 1</td></tr><tr><td>ON</td><td>OFF</td><td>SPEED - 2</td></tr><tr><td>OFF</td><td>ON</td><td>SPEED - 3</td></tr><tr><td>ON</td><td>ON</td><td>SPEED - 4</td></tr></table></td></tr>
<tr><td>FT1</td><td>Multi function terminal 1</td><td>See functions description (CD42)</td></tr>
<tr><td>FT2</td><td>Multi function terminal 2</td><td>See functions description (CD43)</td></tr>
<tr><td>RST</td><td>Reset</td><td>Reset</td></tr>
<tr><td>RUN
ARR</td><td>Operation output terminal
Frequency arrival signal</td><td>Open collector output 50Vdc 50mA Max.</td></tr>
<tr><td>MET</td><td>Frequency meter terminal</td><td>0~100% duty open collector output or
0~10VDC output (0~CD14)</td></tr>
<tr><td>A</td><td>Alarm output A</td><td>Fault alarm contact (normal open)</td></tr>
<tr><td>C</td><td>Alarm output C</td><td>Fault alarm contact (common)</td></tr>
<tr><td>B</td><td>Alarm output B</td><td>Fault alarm contact (normal close)</td></tr>
<tr><td>MA</td><td rowspan="3">Relay output RUN/ARR</td><td>Relay output contact (normal open)</td></tr>
<tr><td>MB</td><td>Relay output contact (normal close)</td></tr>
<tr><td>MC</td><td>Relay output contact (common)</td></tr>
</table>

(6) WIRING

6-1 Wiring of main circuit

1.AP2G3 1φ power source terminal connect L1/R and L2/S.

2.AP2G3 3φ and AP4G3 3φ power source terminal connect L1/R, L2/S and L3/T.



6-2 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 frequently for start/stop operation, or will lead to a 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	AP2G3													AP4G3						
Model No	137	155	175	1110	1150	1185	337	355	375	3110	3150	3185	3220	337	355	375	3110	3150	3185	3220
Capacity (KVA)	6.1	8.8	11.4	16.4	21.3	26.7	6.5	9.2	12.6	17.6	23.3	29	34	6.5	9.2	12.6	17.6	23.6	29	34
Current (A)	16	23	30	43	56	70	17	24	33	46	61	76	90	9	12	17	23	31	38	45
Circuit Breaker (MCCB) (A)	20	30	50	75	100	125	20	30	50	75	100	125	150	15	20	30	50	50	75	75
Electro-Magnetic Contactor (A)	18	35	50	65	80	93	18	35	50	65	80	93	93	12	18	18	35	48	50	50
Thermal relay RC value (A)	15	20	28	40	55	67	15	20	28	40	55	67	80	6.8	9	15	20	28	40	40

6-3 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.

6-4 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
APxG3 SERIES	under 16KHZ	under 10KHZ	under 5KHZ	under 2.5KHZ

6-5 Wiring and cautionary points

A. Main circuit

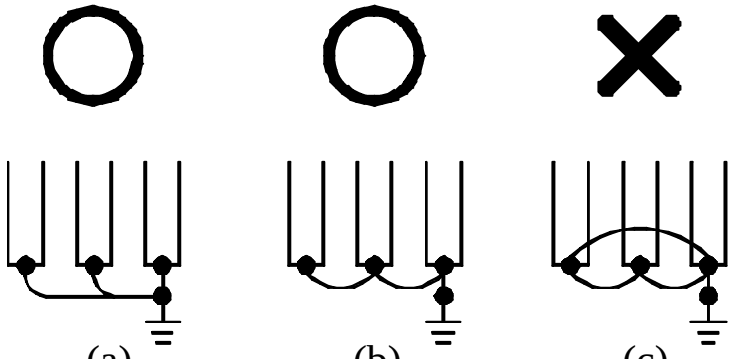
1. Don' t connect the cables of the power supply side (L1/R,L2/S,L3/T) to the U, V and W output terminals for the motor.
2. Don' t connect any electromagnetic contactor between the inverter and motor. If it is inevitable, turn on the contactor when both the inverter and motor are both at stand still.
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.

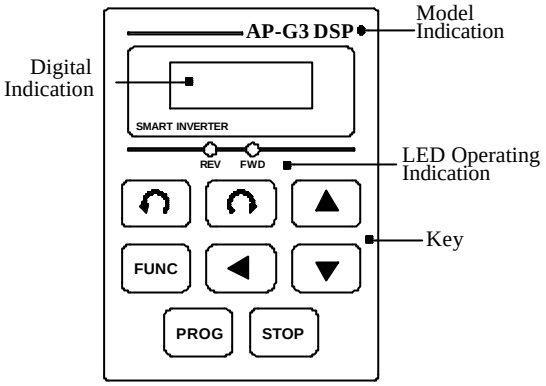
C. Grounding

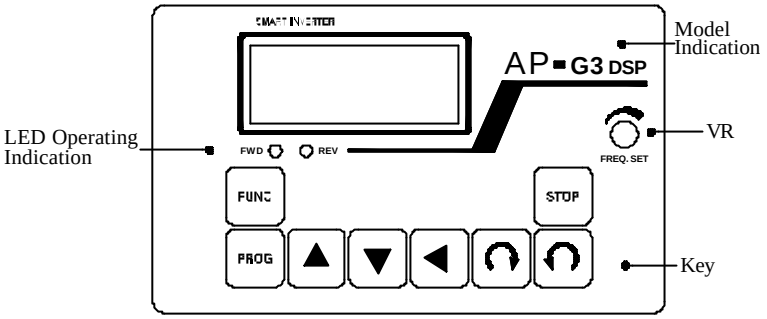
1. Be sure ground both the inverter and motor.
2. Keep grounded leads as short as possible.
3. Shield cables used to protect low-level signal leads should grounded at one end point.
4. Provide class 3 grounding (100Ω or less) for a terminal.
5. When grounding several inverters, make connections as shown below, no loop is produced as shown in FIG "a " , FIG "b" .



(a) (b) (c)

6. DIGITAL OPERATION PANEL





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	**PROG**	**Memory storage**	**Saves the setting vaule**
FUNC	**FUNC**	**Function**	**Press once to select function CDxx and press again to change its content**
STOP	**STOP**	**Stop**	**Stop operation / Escape to standby mode**

7. FUNCTIONS DESCRIPTION

	DISPLAY CODE	FUNCTION	DEFAULT VALUE
☆	CD00	First speed setting	60.00HZ
			50.00HZ
	CD01	Parameter lock	0
	CD02	Acceleration time 1	10.0Sec
	CD03	Deceleration time 1	10.0Sec
	CD04	Jogging frequency	5.00HZ
	CD05	Start frequency	0.50HZ
	CD06	Jog mode	0
☆	CD07	Analog output gain	120.00HZ
			100.00HZ
	CD08	CW or CCW or CW / CCW	0
	CD09	Search speed function	0
	CD10	Analog / digital frequency	1
	CD11	Dynamic brake / Free running	0
☆	CD12	Terminal / Keypad command	0
			1
	CD13	Source operation command	0
☆	CD14	Maximum frequency limit	120.00HZ
			50.00HZ
	CD15	Minimum frequency limit	0.00HZ
☆	CD16	Frequency display Scale	1.00
			30.00

DISPLAY CODE	FUNCTION	DEFAULT VALUE
☆ CD17	1st Maximum voltage frequency	60.00HZ
		50.00HZ
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	20.00HZ
CD23	Third speed setting	30.00HZ
CD24	Fourth speed setting	40.00HZ
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	0.00
CD30	Frequency jump 2	0.00
CD31	Freuqency jump 3	0.00
CD32	Jump range	0.50HZ
CD33	Frequency reference bias	0.00
CD34	Frequency reference bias direction	0
CD35	Frequency gain	100.0 %
CD36	The latest errors record	NONE
CD37	Errors record 1	NONE

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD38	Errors record 2	NONE
CD39	Errors record 3	NONE
CD40	Clear errors record	0
CD41	HZ / RPM / AMP Display	0
CD42	FT1 Multi-Function Terminal 1	0
CD43	FT2 Multi-Function Terminal 2	0
CD44	FA1 Free Analog Terminal 1	0
CD45	FA2 Free Analog Terminal 2	0
CD46	Reserved	
CD47	5th speed setting	25.00HZ
CD48	6th speed setting	35.00HZ
CD49	7th speed setting	45.00HZ
CD50	8th speed setting	55.00HZ
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	60.00HZ
CD57	Reserved	
CD58	Auto running mode	0
CD59	1st step timer	0.01

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	Stall prevention	0
CD66	Overload current stall prevention	170.0%
CD67	Overload detect	0
CD68	Overload setting	150.0%
CD69	Overload time setting	60.0SEC
CD70	2nd stage overload time setting	20.0SEC
CD71	Reserved	
CD72	Communication loss time	0.5SEC
CD73	Communication error counter	3
CD74	Address setting	1
CD75	Transmission speed	0
CD76	Transmission fault treatment	3
CD77	Reserved	
CD78	Communicator protocol	0
CD79~ CD99	Reserved	

Communication address description

DISPLAY CODE	FUNCTION	UNIT
100	**Speed command for RS485**	**3**
101	**Frequency data output for RS485**	**0.01HZ**
102	**Current data output for RS485**	**0.1A**
103	**Fault code for RS485**	

☆ Different initial set value for F50.0 : 50HZ power region and F60.0 : 60HZ power region.
To change version see description of CD52.
This function provides different standard setting values for 50/60HZ power region.
F60.0 : 60HZ region for USA, CANADA etc.
F50.0 : 50HZ region for Europe, Australia, Singapore etc.

☆ CD13 after finished parameter setting, please repower “ON”.

7-1. Function setting

Before starting test run, check carefully the following points :

(1) Be sure to connect the power supply to L1/R, L2/S, L3/T (input terminals) and the motor to U.V.W. (output terminals). (Wrong connections will damage the inverter.)

(2) Check that the input power supply is 220VAC±10%, 50/60HZ±5% for AP2G3 and 380~440VAC±10%, 50/60HZ±5% for AP4G3 series.

(3) Check the signal lines for wrong wiring.

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

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

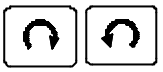
(6) Check that the inverter is mounted on the wall. Also check that non-flammable material, U. V. W.(output terminals). (Wrong connection will damage the inverter.)

(7) For operation start and stop, use 

and FWD / REV terminals. Never use input power supply to switch ON/OFF.

Operation

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  .

Standby : (a) Press  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 5-5 control circuit terminal wiring digaram.

First speed setting
CD00

Setting Range	0.00 ~ 400.00HZ
60HZ region	60.00HZ
50HZ region	50.00HZ

Press ▲ ▼ key for increase or decrease the speed with 1HZ increment .

Press ◀ key to select the digit for quick setting.

Press PROG to save the setting value.

Parameter lock
CD01

Setting Range	0 or 1
Default Value	0

0 : Lock 1 : Unlock

Function to prevent inadequate setting.

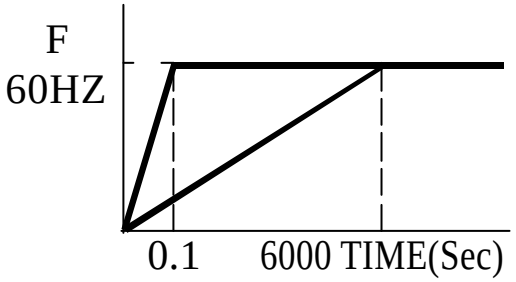
To change the contents data of CD , set CD01=1 and press PROG first.

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

Acceleration time 1
CD02

Setting Range	0.1 ~ 6000.0Sec
Default Value	10.0Sec

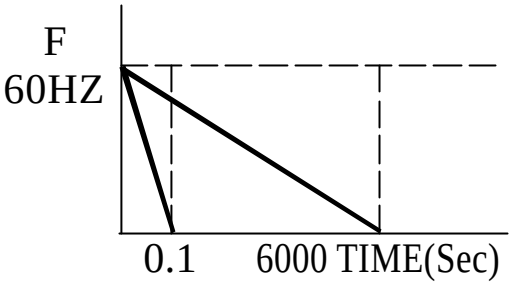
CD02 value corresponds to the time of acceleration from 0 to 50/ 60HZ.(For 120Hz. setting, the arrival time to 120Hz is double.)



Deceleration time 1
CD03

Setting Range	0.1 ~ 6000.0Sec
Default Value	10.0Sec

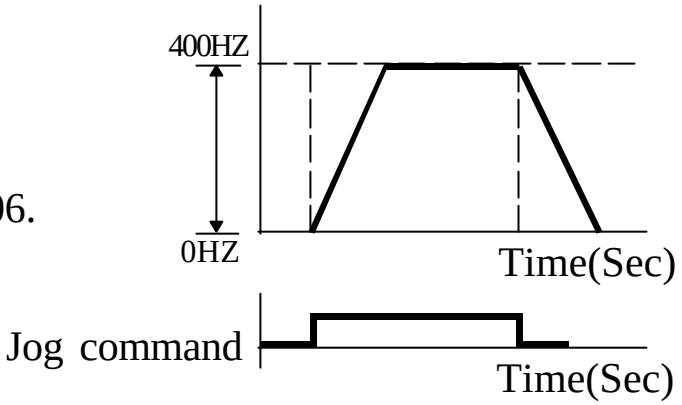
CD03 value corresponds to the time of deceleration from 50/60HZ to 0.



Jogging frequency
CD04

Setting Range	0.00 ~ 400.00HZ
Default Value	5.00HZ

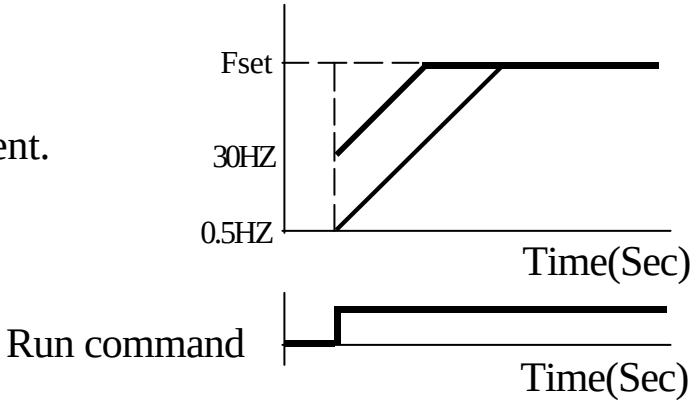
Use terminal control refer to CD12 and CD42 setting, keyboard control refer to CD06.



Start frequency
CD05

Setting Range	0.50 ~ 30.00HZ
Default Value	0.50HZ

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



Jog mode
CD06

Setting Range	0 or 1
Default Value	0

0 : Normal 1 : Jog Mode

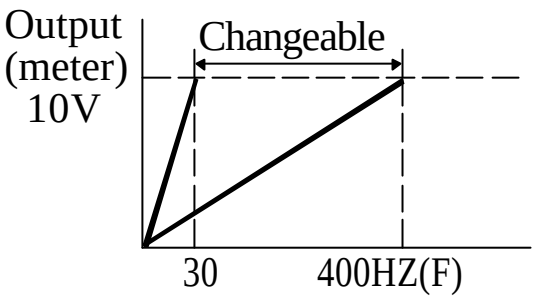
1. Set jogging operation from key panel [RUN] & [STOP] .

2. [RUN] [STOP] LED blinking in JOG mode.

Analog output gain
CD07

Setting Range	30.00 ~ 400.00HZ
60HZ region	120.00HZ
50HZ region	100.00HZ

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 signal.



CW or CCW or CW/CCW
CD08

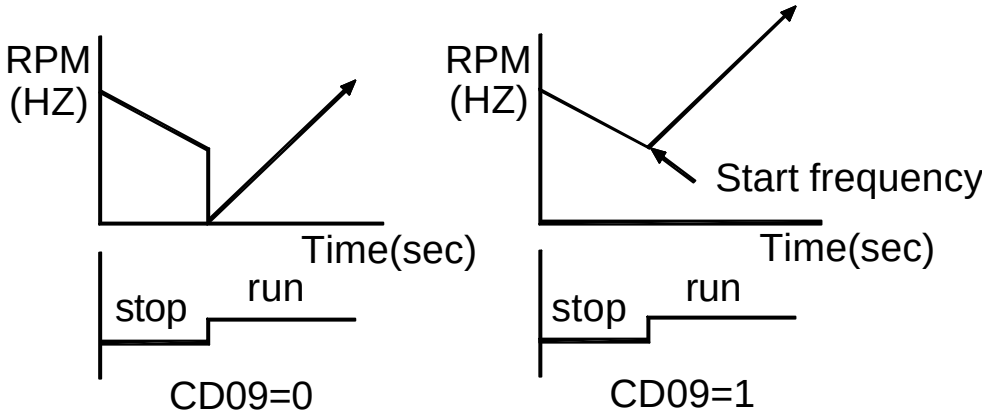
Setting Range	0 ~ 2
Default Value	0

0 : CW/CCW operation
1 : CW only
2 : CCW only
If inadequate operation, the "OPE2" warning message would be indicated.

Search speed function	Setting Range	0 or 1
CD09	Default Value	1

0 : Normal operation.

1 : Search motor speed when start.



Analog / Digtal frequency	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 angle of the knob.

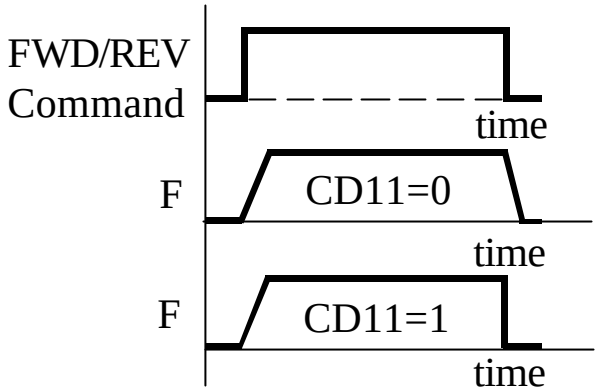
Note : Using ▲ ▼ key to change motor speed when CD01=0, then " OPE3" warning message would be indicated.

Dynamic brake / Free running
CD11

Setting Range	0 or 1
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
CD12

Setting Range	0 or 1
60HZ region	0
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 would be indicated.

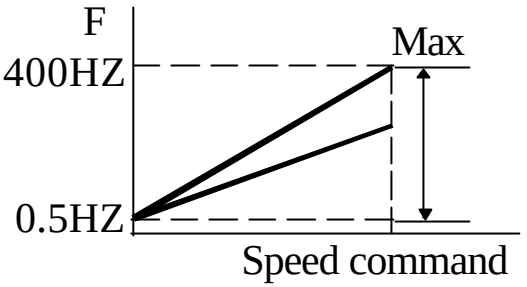
Source operation command
CD13

Setting Range	0 ~ 2
Default Value	0

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

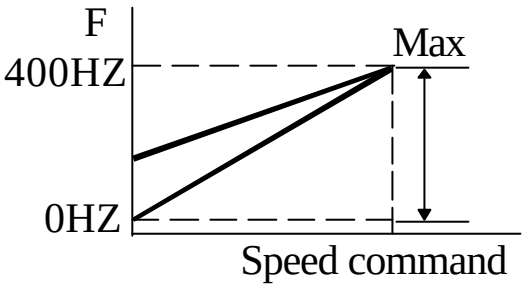
Maximum frequency limit
CD14

Setting Range	0.50 ~ 400.00HZ
60HZ region	120.00HZ
50HZ region	50.00HZ



Minimum frequency limit
CD15

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ



Frequency display scale
CD16

Setting Range	0.01 ~ 500
60HZ region	1.00
50HZ region	30.00

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

RPM = HZ × Scale setting

When RPM > 9999 display  for over range warning. On this condition.

Setting CD41=1 for display shown RPM.

Scale for various motors

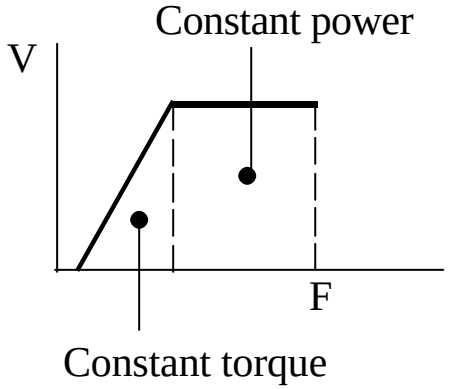
Pole	Synchronous speed		Scale setting
	50HZ	60HZ	
2	3000	3600	60
4	1500	1800	30
6	1000	1200	20
8	750	900	15
10	600	720	12
12	500	600	10

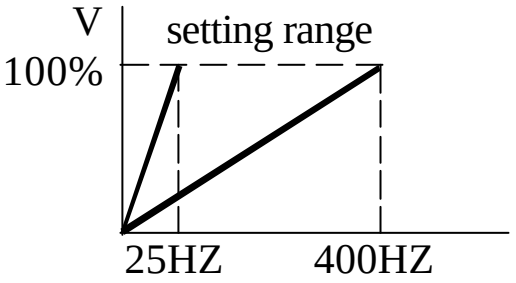
1st Maximum voltage frequency
CD17

Setting Range	25.00 ~ 400.00HZ
60HZ region	60.00HZ
50HZ region	50.00HZ

Use 2nd V/F to setCD42(43)=7 and terminal FT1(2) close.

2nd V/F setting is at CD56.

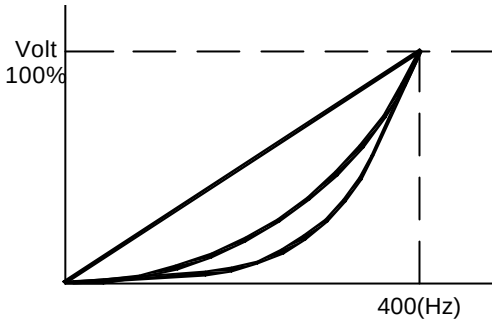




V/F pattern setting
CD18

Setting Range	0 ~ 2
Default Value	0

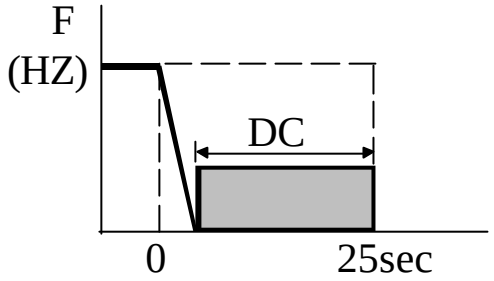
0 = Constant torque curve
1 = Reduce torque curve $F^{2.0}$
2 = Reduce torque curve $F^{3.0}$



DC braking time
CD19

Setting Range	0.0 ~ 25.0Sec
Default Value	1.0Sec

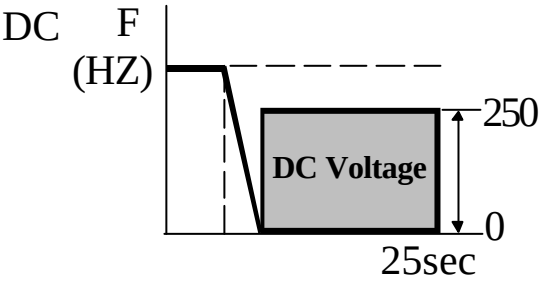
DC brake at frequency under 0.5HZ.



DC braking power
CD20

Setting Range	0 ~ 250
Default Value	10

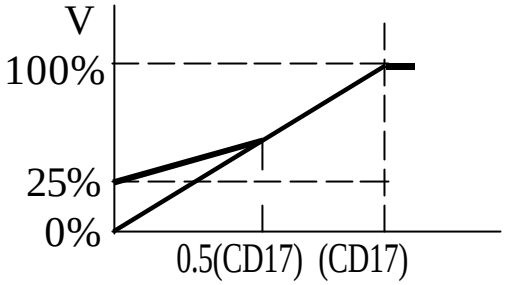
CD20 setting DC voltage gain various braking power.



Torque boost
CD21

Setting Range	0.0 ~ 25.0%
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.



Second speed settting
CD22

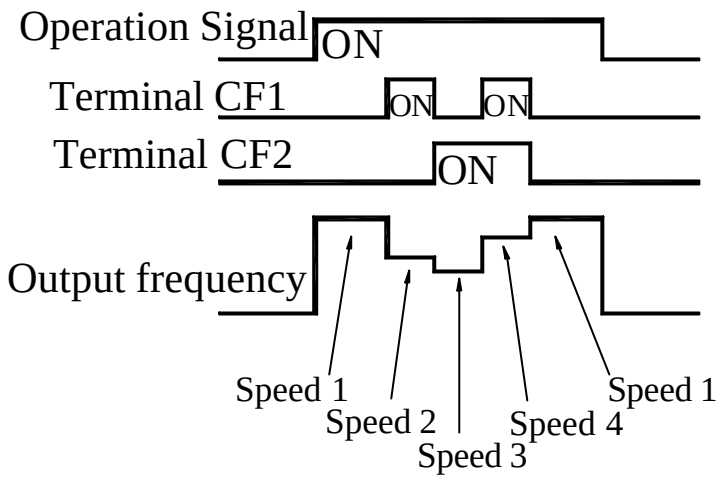
Setting Range	0.00 ~ 400.00HZ
Default Value	20.00HZ

Third speed setting
CD23

Setting Range	0.00 ~ 400.00HZ
Default Value	30.00HZ

Fourth speed setting
CD24

Setting Range	0.00 ~ 400.00HZ
Default Value	40.00HZ



Terminal order / SPEED	CF1	CF2
SPEED - 1	OFF	OFF
SPEED - 2	ON	OFF
SPEED - 3	OFF	ON
SPEED - 4	ON	ON

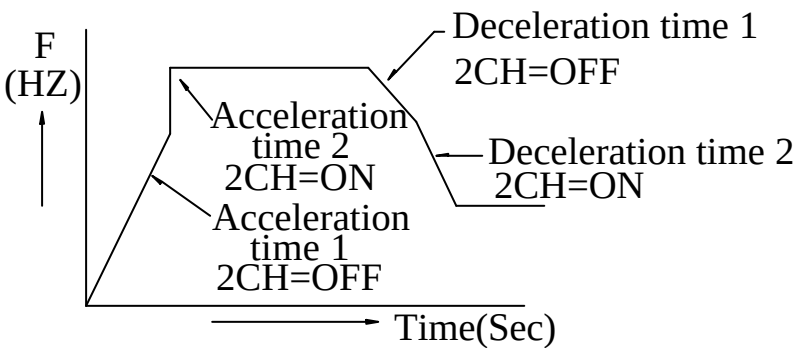
Acceleration time 2
CD25

Setting Range	**0.1 ~ 6000.0SEC**
Default Value	**10.0SEC**

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

Deceleration time 2
CD26

Setting Range	**0.1 ~ 6000.0SEC**
Default Value	**10.0SEC**



Description	2CH
Acceleration time 1	OFF
Deceleration time 1	
Acceleration time 2	ON
Deceleration time 2	

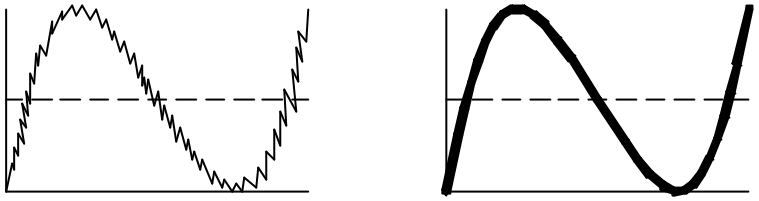
To operate inverter with 2CH function, check to see CD42 or CD43=3. 2CH command inputs from FT1 or FT2 terminal.

Carrier frequency
CD27

Setting Range	1.0 ~ 16.0K
Default Value	16.0K

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

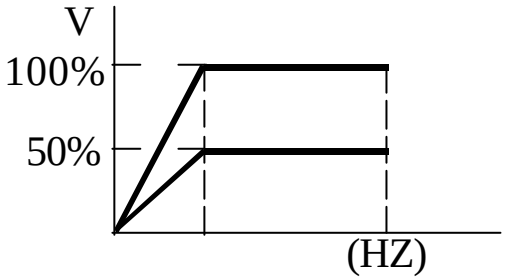
Reduce the carrier frequency would increase noise and reduce motor current, than gain better efficiency.



Output voltage gain
CD28

Setting Range	50.0 ~ 100.0%
Default Value	100.0%

Reduce output voltage for energy saving operation.
Setting CD44(45)=12 for FA1 (FA2) terminal control.



Frequency jump 1
CD29

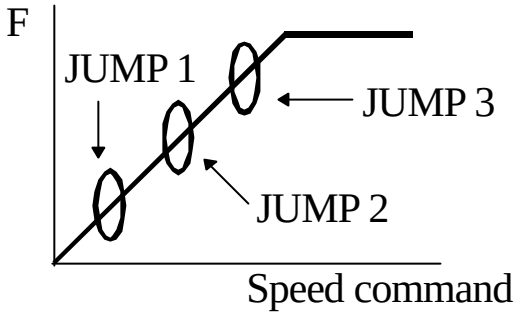
Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ

Frequency jump 2
CD30

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ

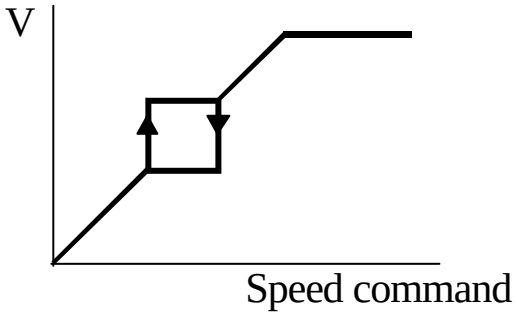
Frequency jump 3
CD31

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ



Jump range
CD32

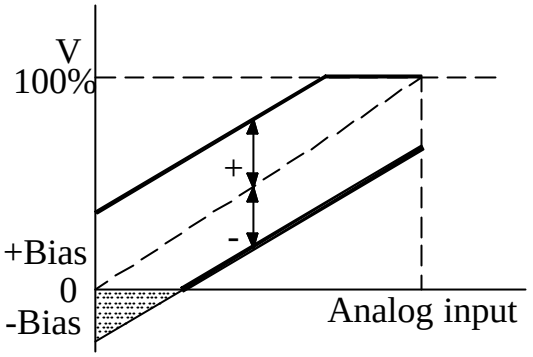
Setting Range	0.50 ~ 3.00HZ
Default Value	0.50HZ



Frequency reference bias
CD33

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00

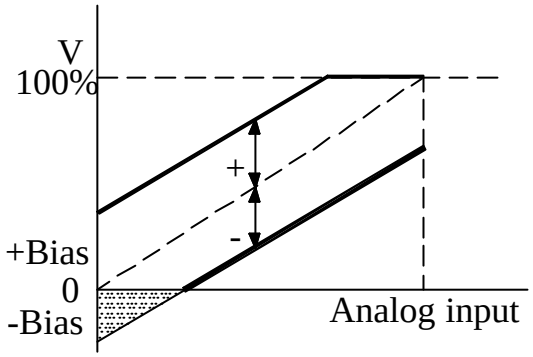
Move Frequency bias with same gradient.
Frequency in the range of " - " bias, motor is stop.



Freq. ref. bias direction
CD34

Setting Range	0 or 1
Default Value	0

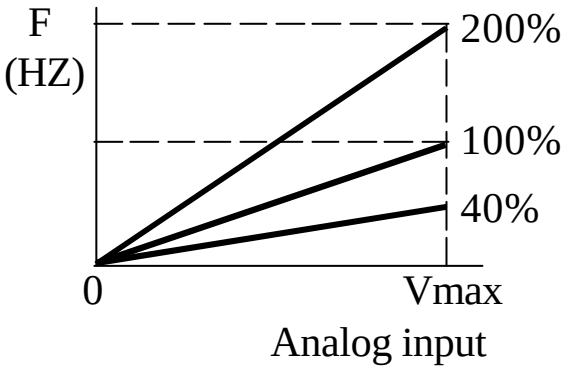
0 = Positive "+ "
1 = Negative "-"
Polarity setting for (CD33) frequency referance bias.



Frequency gain
CD35

Setting Range	40.0 ~ 200.0%
Default Value	100.0%

Refer to application example 03.



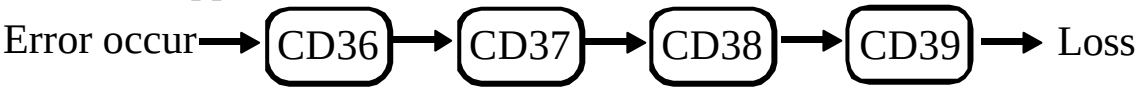
The latest error record
CD36

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.



Clear errors record
CD40

Setting Range	0 or 1
Default Value	0

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

HZ/RPM/AMP Display
CD41

Setting Range	0 ~ 2
Default Value	0

0 = HZ Display 1 = RPM Display 2 = Current Display

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

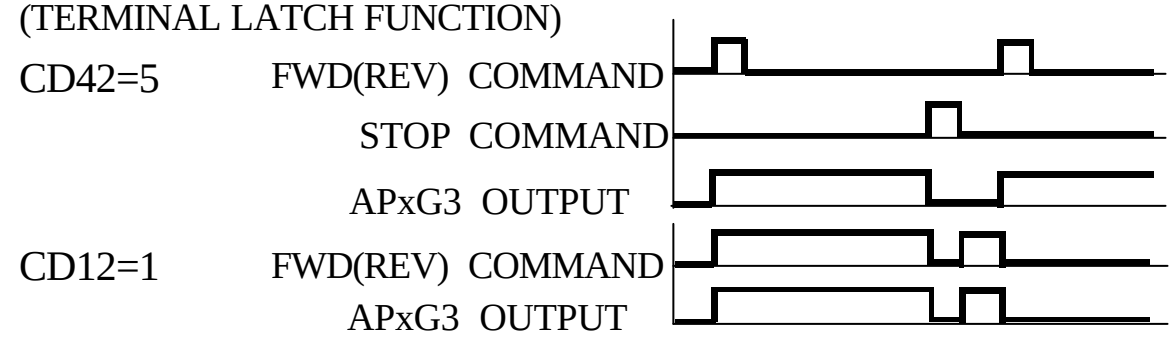
FT1 Multi-Function Terminal 1
CD42

Setting Range	0 ~ 15
Default Value	0

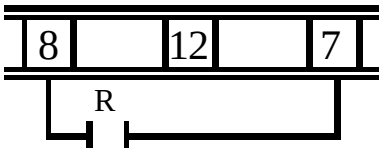
FT1 FT2	Symbol	Function description
0	--------	--------
1	JOGF	Jog operation FWD command
2	JOGR	Jog operation REV command
3	2CH	ACC/DEC time 2 command
4	FRS	Free running command
5	3 - WIRE	3 - wire sequence mode
6	CF3	5 - 8 Speed Setting Terminal
7	VF2	2nd V/F curve setting (CD56)
8		Reserved
9	OH	External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

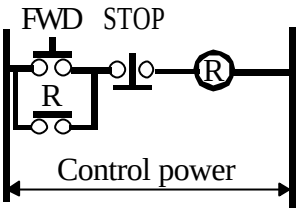
3 - WIRE CIRCUIT CONNECTION DIAGRAM

(TERMINAL LATCH FUNCTION)

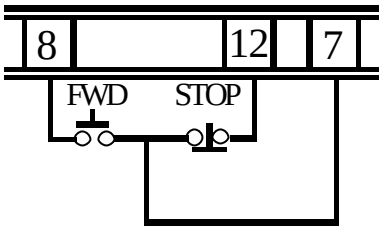


Application circuit





with latch function

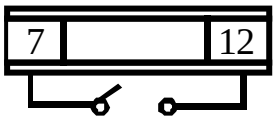


Ⓡand CONTROL POWER not necessary

Remark: STOP command entry from control terminal ⑤ FT1 or ⑥ FT2, and set CD42(FT1)=5 or CD43(FT2)=5 before operation.

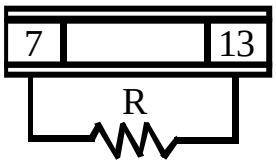
External over temperature command

(1) FT1=9 (Over temperature switch)



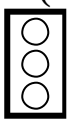
Non-latch trip protect and display " OH" when switch ON.

(2) FT2=9 (Thermistor)



NTC/PTC

JP1(FT2)



Free run when R is less than 1KΩ

Free run when R is higher than 1KΩ

FT2 Multi-Function Terminal 2
CD43

Setting Range	0 ~ 15
Default Value	0

Refer to CD42 description.

Free analog terminal 1
CD44

Setting Range	0 ~ 15
Default Value	0

Refer to CD45 table.

Free analog terminal 2
CD45

Setting Range	0 ~ 15
Default Value	0

Setting NO. 11 to use application of example 03.

FA1 FA2	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 ~ 25 %
6	DC Brake time	0 ~ 25 Sec
7	DC Brake Energy	0 ~ 250
8	Speed 2	F-min ~ CD22 Content
9	Speed 3	F-min ~ CD23 Content
10	Speed 4	F-min ~ CD24 Content
11	Fmax	F-min ~ CD14 Content
12	Output voltage gain	50% ~ 100%
13	Speed 1	F-min ~ CD00 Content
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.

1. 0 ~ 100% Deceleration period
2. 101 ~ 200% Braking active period of
   (Decel/accel/constant frequency)
3. 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 0 ~ 100%.

Version selector
CD52

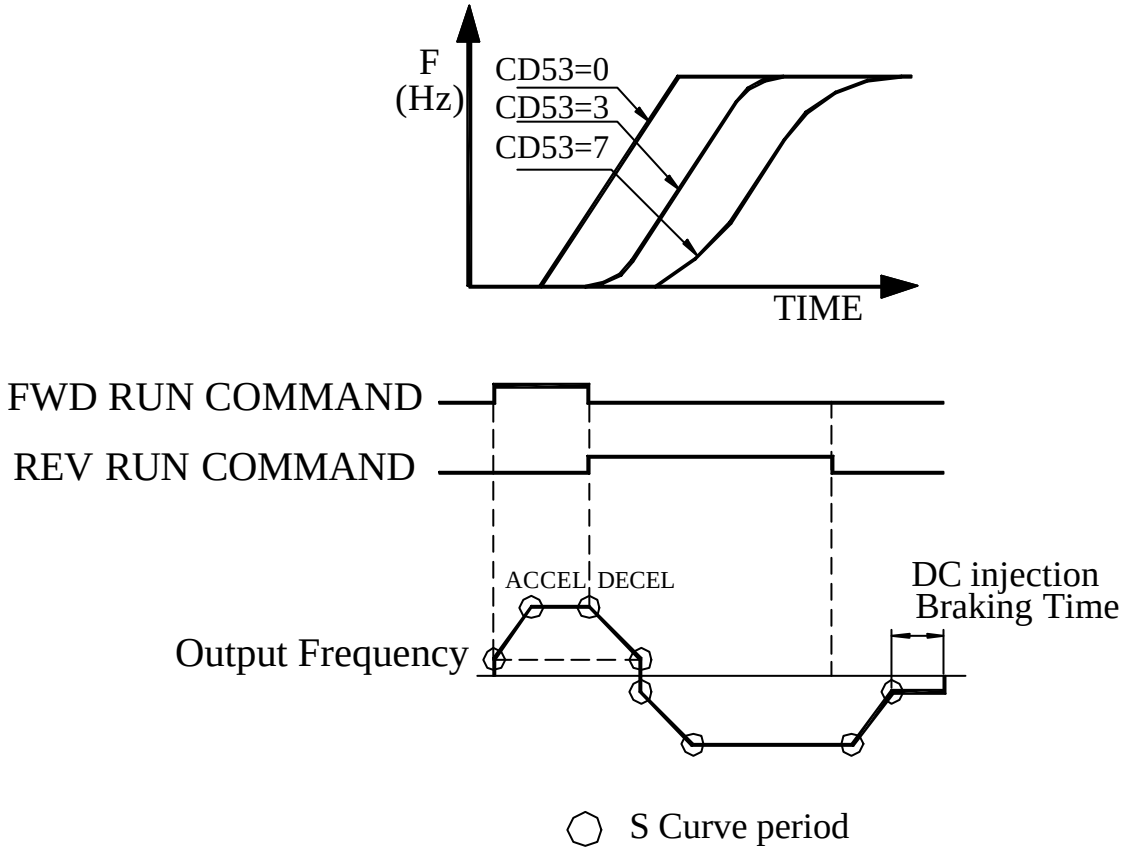
Setting Range	F50.0/F60.0
60HZ region	F60.0
50HZ region	F50.0

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 waiting mode..

S curve
CD53

Setting Range	0 ~ 10
Default Value	0

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

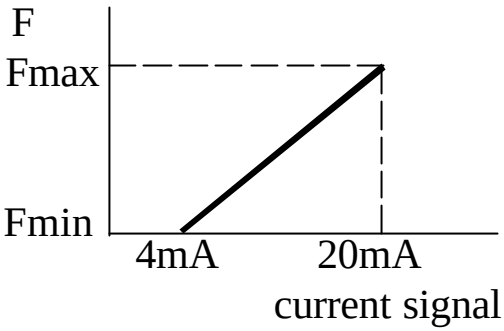


4 ~ 20 mA speed command
CD54

Setting Range	0 ~ 3
Default Value	0

This function only effects in CD44(CD45)=8,9,10,13.
Set FA1(FA2) for current signal (4-20mA).

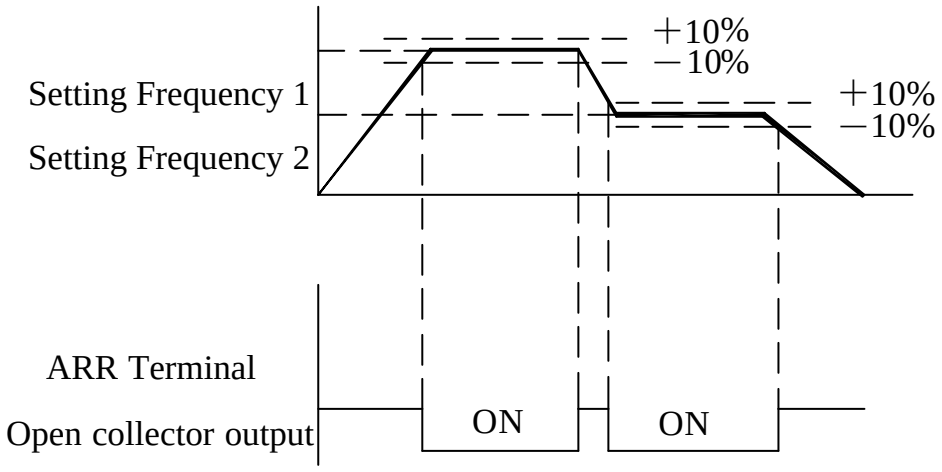
0 : No current signal application
1 : Current signal in terminal FA1
2 : Current signal in terminal FA2
3 : FA1 & FA2 current signal terminal
Note : referenct to FA1(FA2) terminal setting for 4-20mA signal.



Frequency arrive signal range
CD55

Setting Range	0.0 ~ 100.0%
Default Value	10.0%

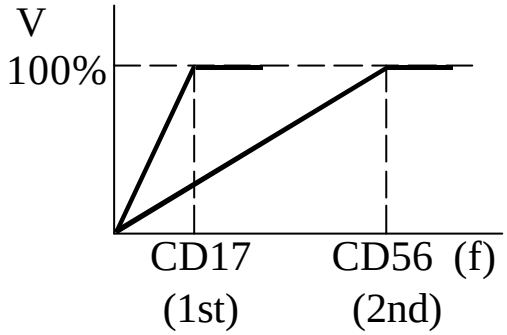
1.Signal output at running F.≧setting F.x(1-CD55%) for acceleration.
2.Signal output at running F.≦setting F.x(1+CD55%) for deceleration.

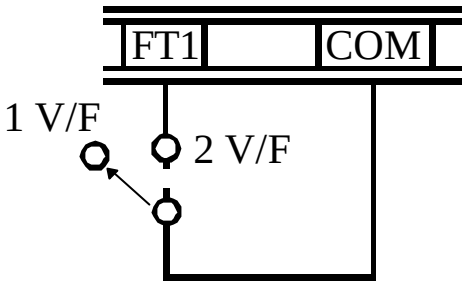


2nd Maximum Voltage frequency
CD56

Setting Range	25.00 ~ 400.00HZ
Default Value	60.00HZ

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





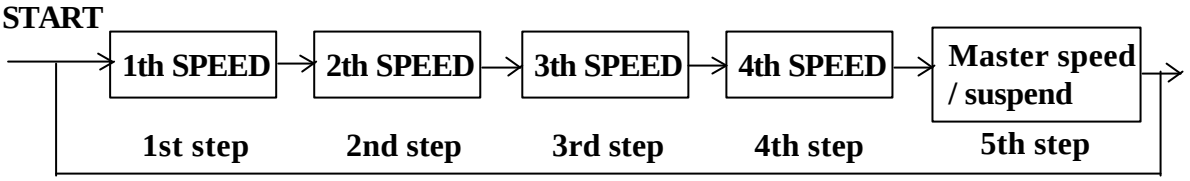
Auto running mode
CD58

Setting Range	0 ~ 5
Default Value	0

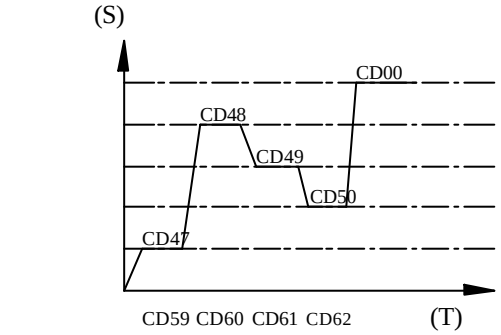
System can operate at digital panel control only when set at auto-running mode. CD10=1 and CD12=1 are inactive.

SPEED	1th	2th	3th	4th	Master / suspend	VALUE RANGE	UNIT
SPEED SETTING	CD47	CD48	CD49	CD50	CD00	0 ~ 400	Hz
TIMER SETTING	CD59	CD60	CD61	CD62	CD63	0 ~ 15.00	hr.min

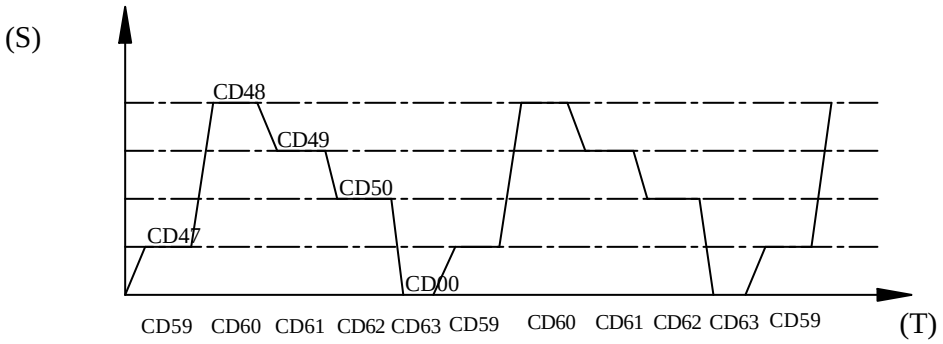
CD58	Auto running mode
0	Speed with timing control disable
1	Sequence running then constant speed running
2	Sequence running then stop and repeat from 1st step for cycling
3	Sequence running then stop and repeat from 1st step in reversed direction for cycling
4	Sequence running, and repeat for cycling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



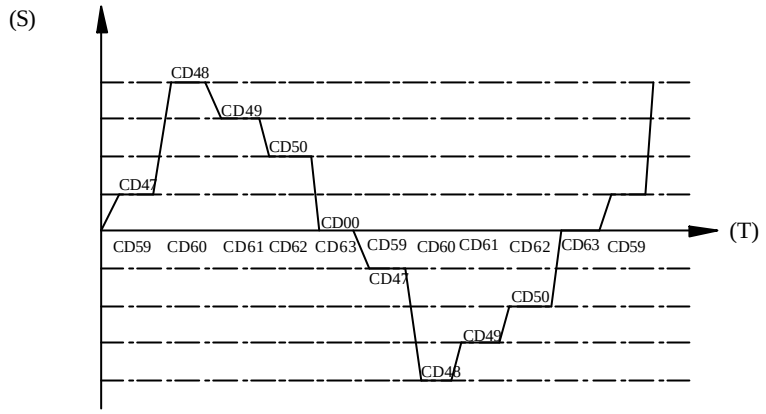
CD58=1



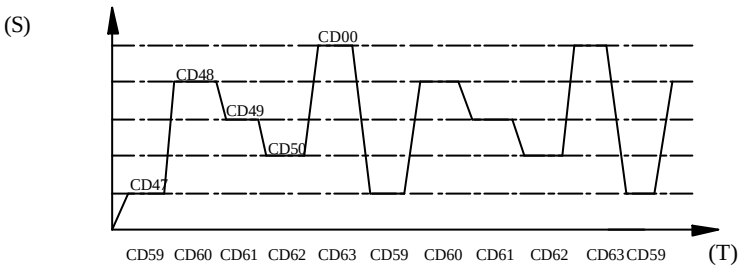
CD58=2



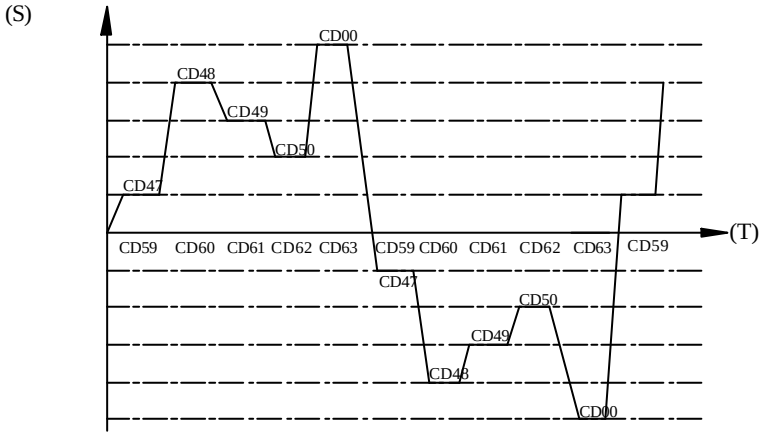
CD58=3



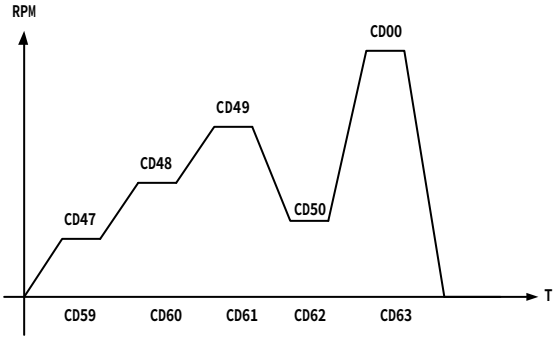
CD58=4



CD58=5



CD58=6



One time sequence running then stop.

1st step timer
CD59

Setting Range	0 ~ 15Hr
Default Value	0.01Hr.min

Setting running time for 1th speed.(CD47)

2st step timer
CD60

Setting Range	0 ~ 15Hr
Default Value	0.00Hr.min

Setting running time for 2th speed.(CD48)

3st step timer
CD61

Setting Range	0 ~ 15Hr
Default Value	0.00Hr.min

Setting running time for 3th speed.(CD49)

4st step timer
CD62

Setting Range	0 ~ 15Hr
Default Value	0.00Hr.min

Setting running time for 4th speed.(CD50)

5st step timer
CD63

Setting Range	0 ~ 15Hr
Default Value	0.00Hr.min

Setting running time for 1th speed.(CD00)

Timer unit selector
CD64

Setting Range	0 ~ 1
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).

Stall prevention
CD65

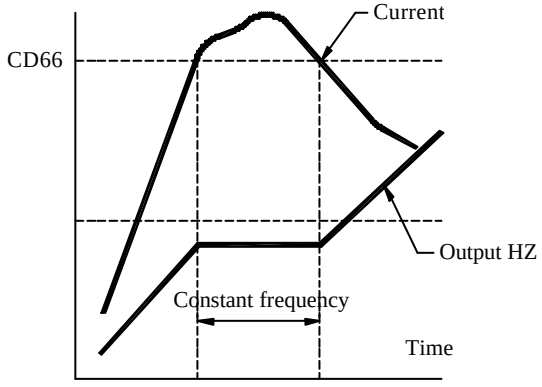
Setting Range	0 ~ 1
Default Value	0

0 : Disable
1 : Enable
When enable CD65, if any overload over CD66 setting value during DEC period, inverter will increase DEC time to prevent inverter to go into fail safe mode.

Overload current stall prevention
CD66

Setting Range	20 ~ 250%
Default Value	170%

During ACC, if ACC time is too short or load is too heavy, the current will reach CD66 value, inverter will stop to ACC until current is lower than CD66 value.



Actual stall current limit=rate current ×CD66 percentage. Rate current number refers to section 2 table.

Overload detect
CD67

Setting Range	0 ~ 2
Default Value	0

0 : Normal

1 : Overload detection and stop

Motor stops operation if load condition is reached CD68 and CD69 setting.

2 : Two stages overload detection and stop (CD68<100% only).

AC drive will limit output current at CD68 setting if load condition is reached CD68 and CD69 setting. And motor will stop operation if timing of limited output current is reached CD70 setting.

Overload setting
CD68

Setting Range	20.0 ~ 200.0%
Default Value	150.0%

Set overload level.

Overload time setting
CD69

Setting Range	0.0 ~ 60.0SEC
Default Value	60.0SEC

Set overload time.

2nd stage overload time setting
CD70

Setting Range	0.0 ~ 120.0SEC
Default Value	20.0SEC

Set 2nd stage overload time.

Communication loss time
CD72

Setting Range	0.1 ~ 100.0SEC
Default Value	0.5SEC

Set communication loss time. When communication loss time over CD72 setting, Inverter will active as CD76 selected.
Note : This function does not effect in standby condition.

Communication error counter
CD73

Setting Range	0 ~ 10
Default Value	3

When communication error continuous time more than CD73 setting. Inverter will active as CD76 selected.

Address setting
CD74

Setting Range	1 ~ 255
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
CD75

Setting Range	0 ~ 3
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
CD76

Setting Range	0 ~ 3
Default Value	3

0 : Alarm and keep operation.
1 : Alarm and decelerate to stop.
2 : Alarm and free to stop.
3 : No alarm and keep operation.
Use panel STOP or write address 100=4 to clear the transmission fault.
Note : Warning means Fault Relay active.

Communicator protocol
CD78

Setting Range	0 ~ 7
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≦30
...	
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 : 8-bit address consists of 2 ASCII codes.
Address Lo	
Function Hi	Command code : 8-bit command consists of 2 ASCII codes.
Function Lo	
Data (n-1)	Contents of data : n*8-bit data consist of 2n ASCII codes.
...	
Data 0	
LRC CHK High	LRC check sum : 8-bit check sum consists of 2 ASCII codes.
LRC CHK Low	
END Hi	End characters : END Hi=CR(0DH) END Lo=LF(0AH)
END Lo	

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

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)
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 address52(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' Address '4'	33 34	D1	Address '3' Address '4'	33 34
D2	Function '0' Function '3'	30 33	D2	Function '0' Function '3'	30 33
D3	Start address '0' Start address '0'	30 30	D3	# of data '0' count by byte '4'	30 34
D4	Start address '1' Start address '6'	31 36	D4	CD22 content '0' CD22 content '7'	30 37
D5	# of data '0' # of data '0'	30 30	D5	CD22 content 'D' CD22 content '0'	44 30
D6	# of data '0' # of data '2'	30 32	D6	CD23 content '0' CD23 content 'B'	30 42
	count by word '2'		D7	CD23 content 'B' CD23 content '8'	42 38
D7	LRC HI	LRC HI			
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 (Note 2~3), each hexadecimal 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 × 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' 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	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	CD00 content '1' CD00 content '7'	31 37	D5	CD00 content '1' CD00 content '7'	31 37
D6	CD00 content '7' CD00 content '0'	37 30	D6	CD00 content '7' CD00 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

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' Address '4'	33	D1	Address '3' Address '4'	33
		34			34
D2	Function '0' Function '6'	30	D2	Function '0' Function '6'	30
		36			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' CD31 content '1'	30 31	D6	CD31 content '0' CD31 content '1'	30 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	(0~FFh)
D2 : Function code	(08h)
D3 : Data 1	(0~FFh)
D4 : Data 2	(0~FFh)
D5 : Data 3	(0~FFh)
D6 : Data 4	(0~FFh)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)
AC drive response message	
D1 : Communication address	(0~FFh)
D2 : Function code	(08h)
D3 : Data 1	(0~FFh)
D4 : Data 2	(0~FFh)
D5 : Data 3	(0~FFh)
D6 : Data 4	(0~FFh)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)

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

Ex. Write 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' Address '4'	33 34	D1	Address '3' Address '4'	33 34
D2	Function '0' Function '8'	30 38	D2	Function '0' Function '8'	30 38
D3	Content1 '1' Content1 '1'	31 31	D3	Content1 '1' Content1 '1'	31 31
D4	Content2 '2' Content2 '2'	32 32	D4	Content2 '2' Content2 '2'	32 32
D5	Content3 '3' Content3 '3'	33 33	D5	Content3 '3' Content3 '3'	33 33
D6	Content4 '4' Content4 '4'	34 34	D6	Content4 '4' Content4 '4'	34 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

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
03H	Illegal data address (data address is not available)
04H	Illegal operation command
05H	Check sum error
31~39H	Data error

1. RTU

Once communication error happend, AC drive respond as follow.

D1 Address	D2 Function code & 80H	D3 Error code	D4 CRCL	D5 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=500HZ(C350H), but maximum value of CD00 is 400HZ.

1. RTU

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
01H	06H	00H	00H	C3H	50H	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' Address '1'	30 31	D1	Address '0' Address '1'	30 31
D2	Function '0' Function '6'	30 36	D2	Function '8' Function '6'	38 36
D3	Address content '0' Address content '0'	30 30	D3	Error code '0' Error code '2'	30 32
D4	Address content '0' Address content '0'	30 30	D4	LRC HI '7' LRC LO '7'	37 37
D5	CD00 content 'C' CD00 content '3'	43 33		END HI END LO	0D 0A
D6	CD00 content '5' CD00 content '0'	35 30			
D7	LRC HI	LRC HI			
D8	LRC LO	LRC LO			
	END HI	0D			
	END LO	0A			

Communication address description

Speed command of RS485
100

Setting Range	0 ~ 4
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.
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
101

Unit	0.01HZ

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

Current data output for RS485
102

Unit	0.1A

To know motor current, using function 03H to read address 102 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
		In waiting mode, the display is blinking
FUNC		Enter function mode
▲		Select function number 1 (parameter lock)
FUNC		Press "FUNC" again to change the parameter value
▲		Enable to change parameter
PROG		Press "PROG" to save the parameter and back to waiting mode
FUNC		Enter function mode
▲		Select function number 2 (acceleration time)
FUNC		Press "FUNC" again to change the parameter value
◀		Select the first digit
▲ ▲ ▲		Increase the value to 3
◀		Select the second digit
▲ ▲		Increase the value to 2
PROG		Press "PROG " to save CD02=12.3 and back to waiting 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
▲	Cd 14	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 waiting mode

8. PROTECTIVE FUNCTION

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 functions description CD10

Terminal command only
OPE4

Accept run command from control terminal only.
Not operation panel.
See functions 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

Load is over rating.

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.

(4) It should be noted that electronic equipment is not resistant to moisture and oil mist, and intrusion of dust or iron powder will damage the insulation, leading to an unexpencted accident.

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

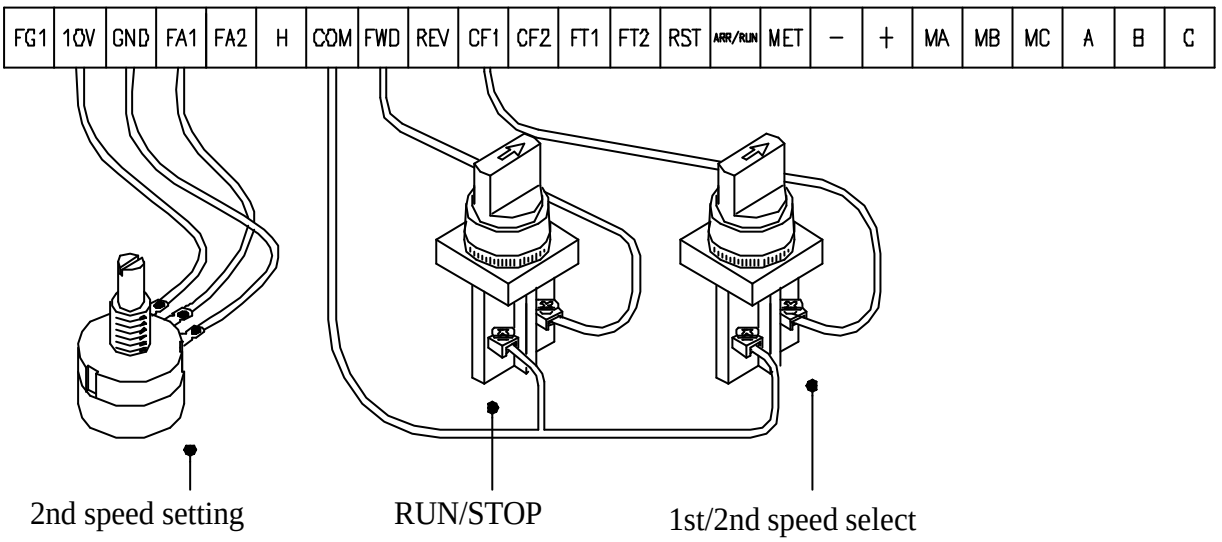
Display symbol	Cause of fault message contents	Check point	Suggested remedy
No display	Discharge LED extinguished	Review the power system. Check that MCCB has been turned on or no poor contact.	Turned on or Replace MCCB
PF01	Power device failure during acceleration	The acceleration time is too short.	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	Rework with previous process. Check for the same message.	Repair
EEP2	EEPROM check-sum error		

11. APPLICATION

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

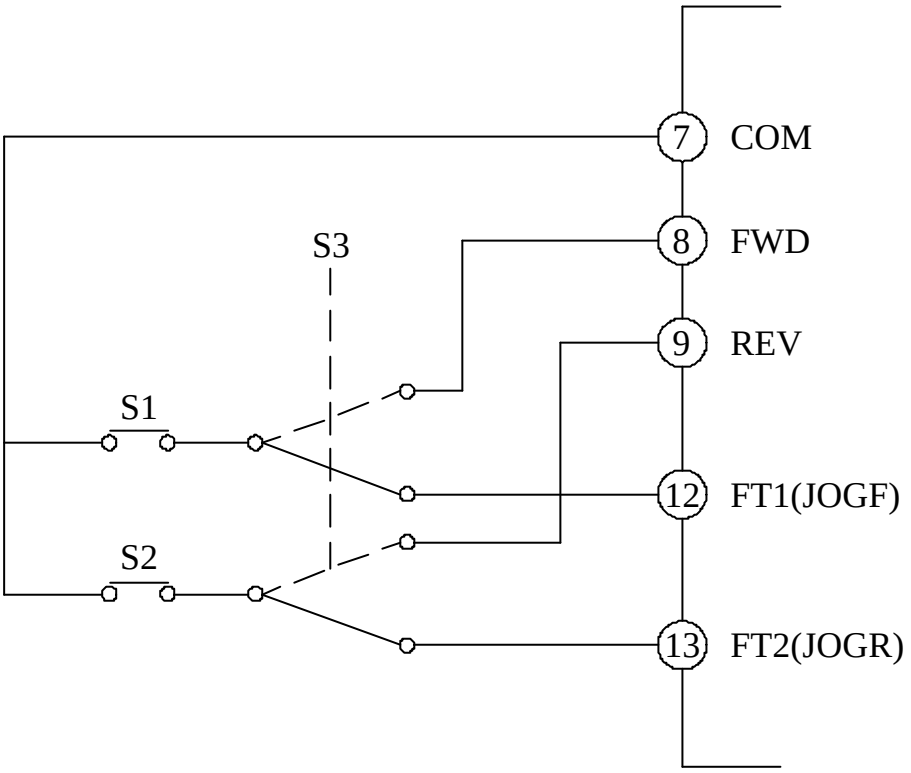
DESCRIPTION :

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



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



NORMAL / JOG

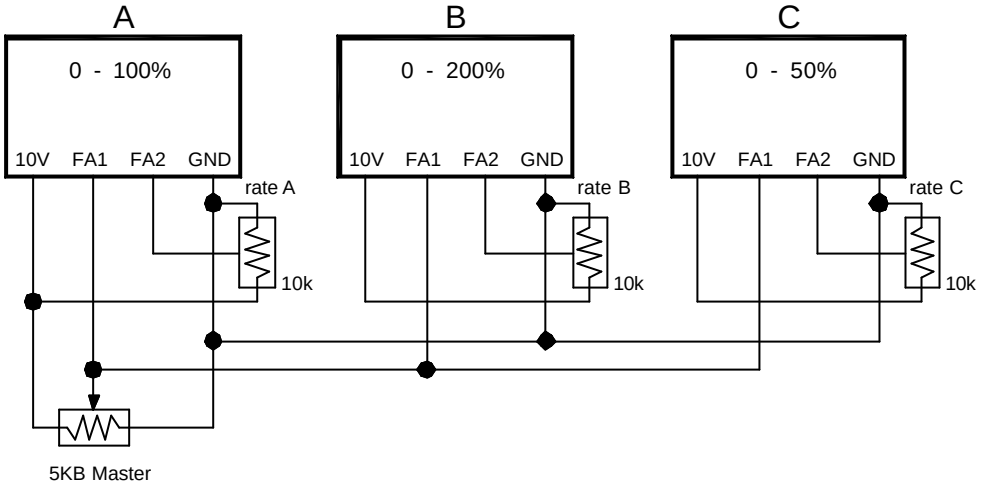
S1 = FWD SW
S2 = REV SW
S3 = Normal/JOG select SW

EXAMPLE 03 : Master/slave driver system

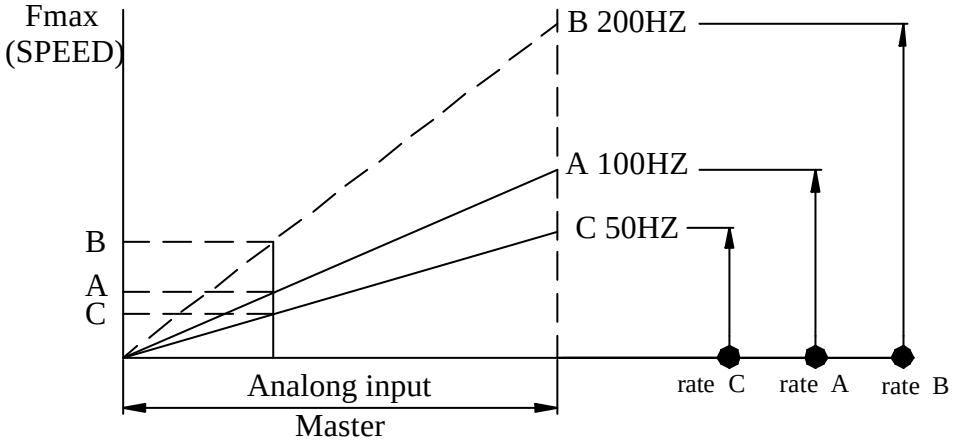
DESCRIPTION :

Set FA1=13 for 1st (Master) speed signal input terminal.

Set FA2=11 for maximum speed setting



Number	A	B	C
Speed rate	1	2	0.5
Function setting	CD12 = 1 CD14 = 100 CD44 = 13 CD45 = 11	CD12 = 1 CD14 = 200 CD44 = 13 CD45 = 11	CD12 = 1 CD14 = 50 CD44 = 13 CD45 = 11



EXAMPLE 04 : Using VR for 3 stages

DESCRIPTION :

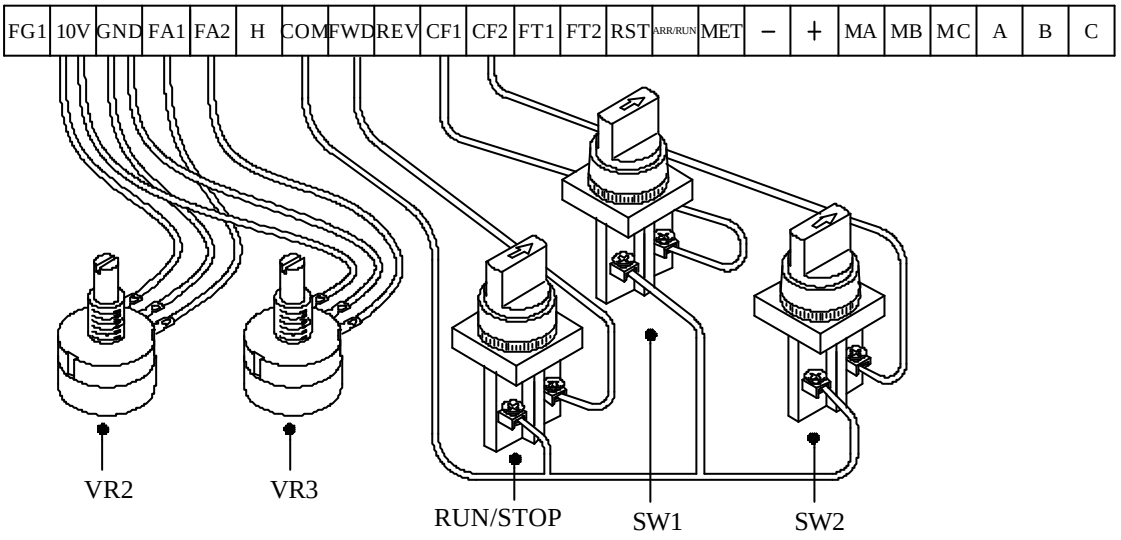
CD10 = 1 ; 1st speed single enter from terminal

CD12 = 1 ; Terminal command (For External)

CD44 = 8 ; 2nd speed single enter from FA1

CD45 = 9 ; 3nd speed signal enter from FA2

SPEED	TERMINAL		SPEED COMMAND ENTRY
	SW2	SW1	
1	OFF	OFF	VR1
2	OFF	ON	VR2
3	ON	OFF	VR3



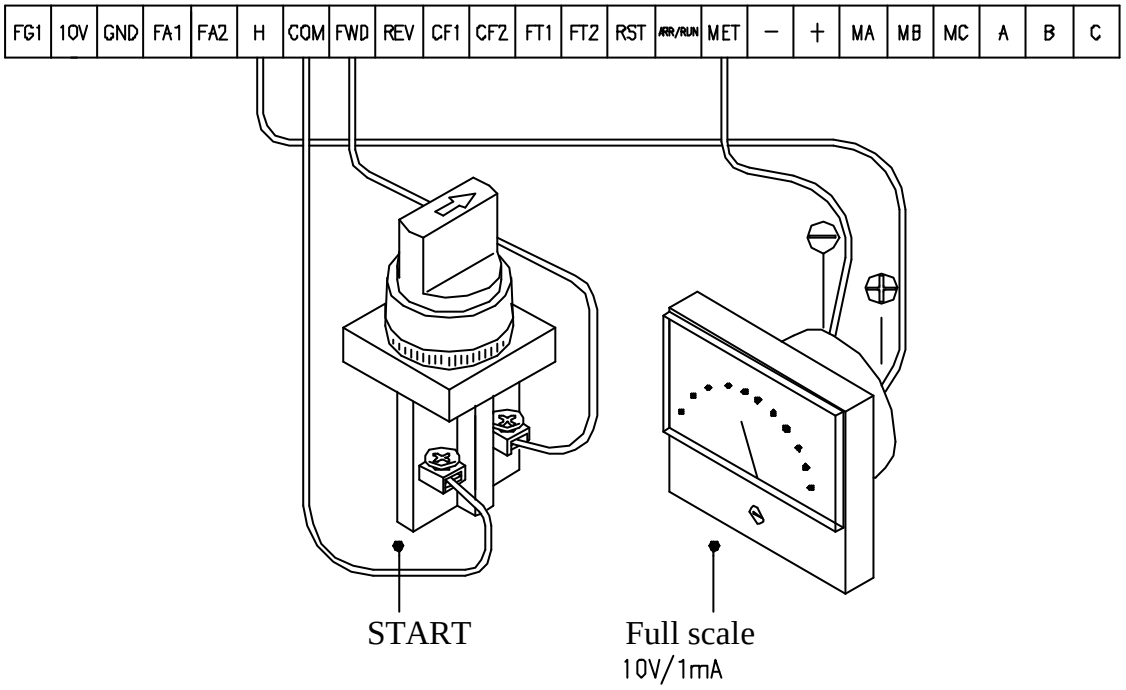
EXAMPLE 05 : Basic external control setup

DESCRIPTION :

CD07 = 120HZ ; See maximum value on the meter

CD10 = 1 ; External analog(Pannel VR or F306 VR)

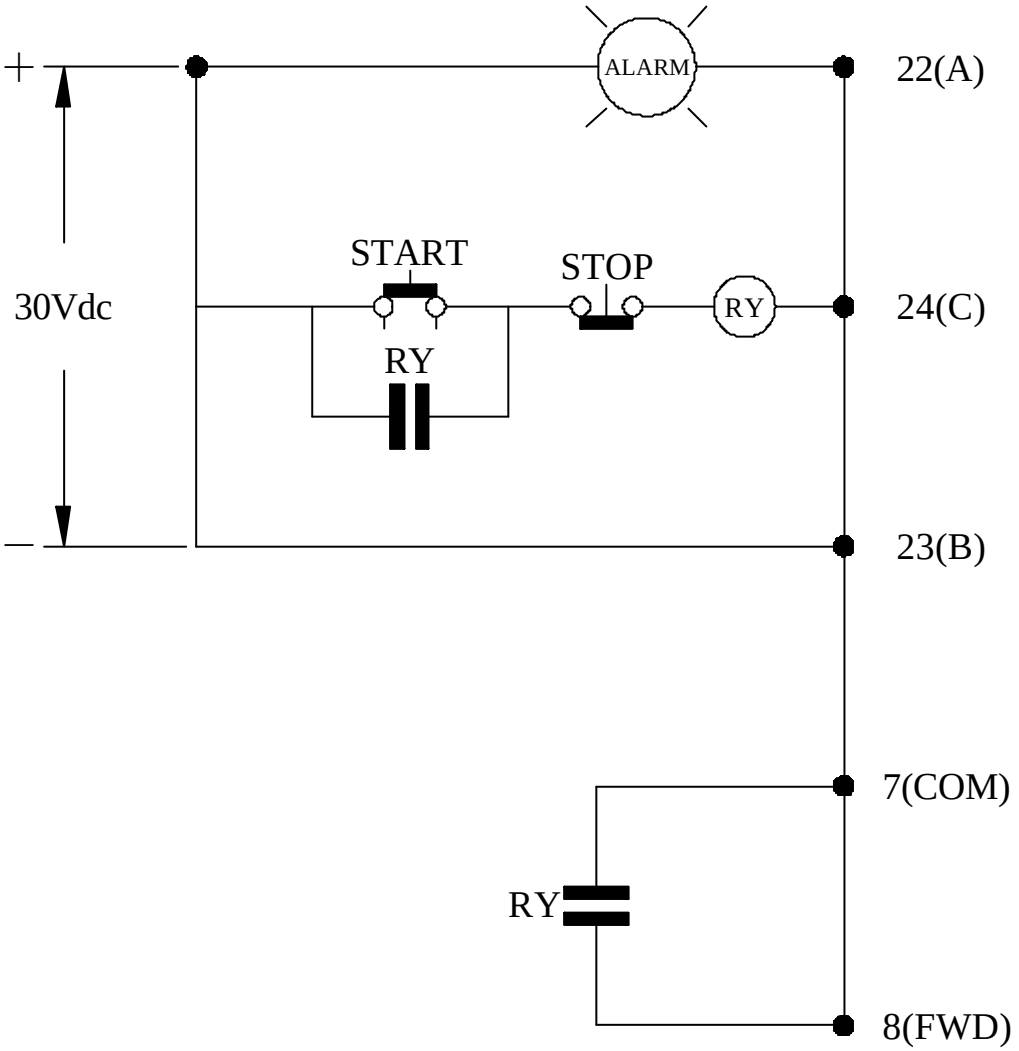
CD12 = 1 ; External command



EXAMPLE 06 : Alarm output

DESCRIPTION :

CD12 = 1 ; External command



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 percentage impednace Voltage fluctuations Number of phases, singla 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
※			※
※	※		
※	※	※	※
	※	※	
※		※	
※			
		※	※
		※	※
	※		

Inverter Capacity Required for Multidriving

Description	Calculated with overload
Starting requirements are within the inverter capacity	Motor acceleration of 1 minute or less
	$\frac{K\,Pm}{\eta\,COS\phi}\left[\,nT + nS\,(\,kS - 1\,)\,\right]$ $= Pc1\left[\,1 + (\,nS\,/\,nT\,)(\,ks - 1\,)\,\right]$ $\leqq 1.5$ Inverter capacity [KVA]
Current within the inverter capacity	$nT\ Im\left[1 + (\,nS\,/\,nT\,)(\,kS - 1)\,\right]$ $\leqq 1.5$ Inverter capacity [A]

Inverter Capacity Required for Continuous Performance

Description	Calculation method
Require output for the load within the allowable range	$K\,Pm\,/\,\eta\,COS\phi \leqq$ Inverter capacity [KVA]
Motor capacity within the inverter ratings	$\sqrt{3}K\,Vm\ Im\ 10^{-3} \leqq$ Inverter capacity [KVA]
Current within the inverter capacity	$K\,Im \leqq$ Inverter capacity [A]

Inverter Capacity Required for Starting

Description	Calculation formula (tA < 60 s)
Total starting capacity within the inverter capacity	$\frac{K\,N}{973\eta\,COS\phi}\left(tL + \frac{GD^2\,N}{375\,tA}\right) \leqq 1.5 \times$ Inverter capacity (KVA)

Description	Calculated of 150% for 1 minute
	Motor acceleration of 1 minute or more
	$\frac{K\,Pm}{\eta\ COS\ \psi}\left[nT + nS\,(kS - 1)\right]$ $= Pc1\left[1 + (nS / nT)(ks - 1)\right]$ $\leqq$ Inverter capacity [KVA]
	$nT\ Im\left[1 + (nS / nT)(kS - 1)\right]$ $\leqq$ Inverter capacity [A]

Symbol description

Pm : Motor shaft output required for the load[kw]

η : Motor efficiency (normally, approx. 0.85)

COS : Motor power factor (normally, approx. 0.75)

Vm : Motor voltage[V]

lm : Motor current[A] (current with commercial power supply)

k : Correction factor calculated from current from factor (1.05 to 1.1, depending on the PWM method.)

Pc1 : Continuous capacity[KVA]

kS : Motor starting current/motor rated current

nT : Number of motors in parallel

nS : Number of simultaneously started motors

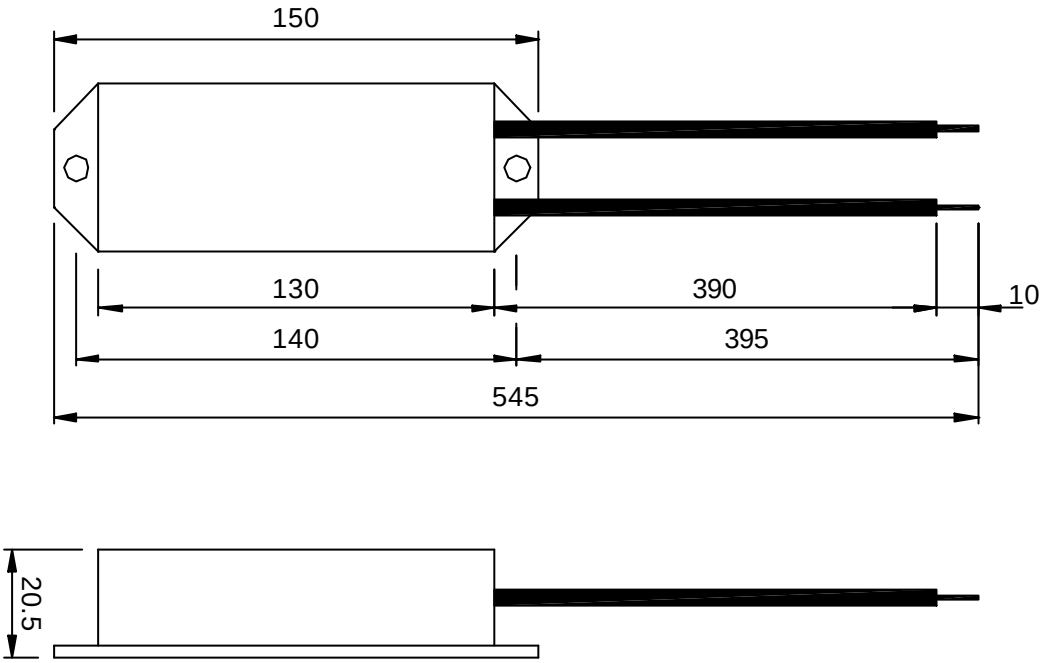
GD^2 : Total (GD^2) converted into motor shaft (kg-m^2)

tL : Load torque(kg-m)

tA : Motor acceleration time

13. APPENDIX

A. Optional braking resistor



Part no : E-MSAA-008000

Specification : 60Ω 80W

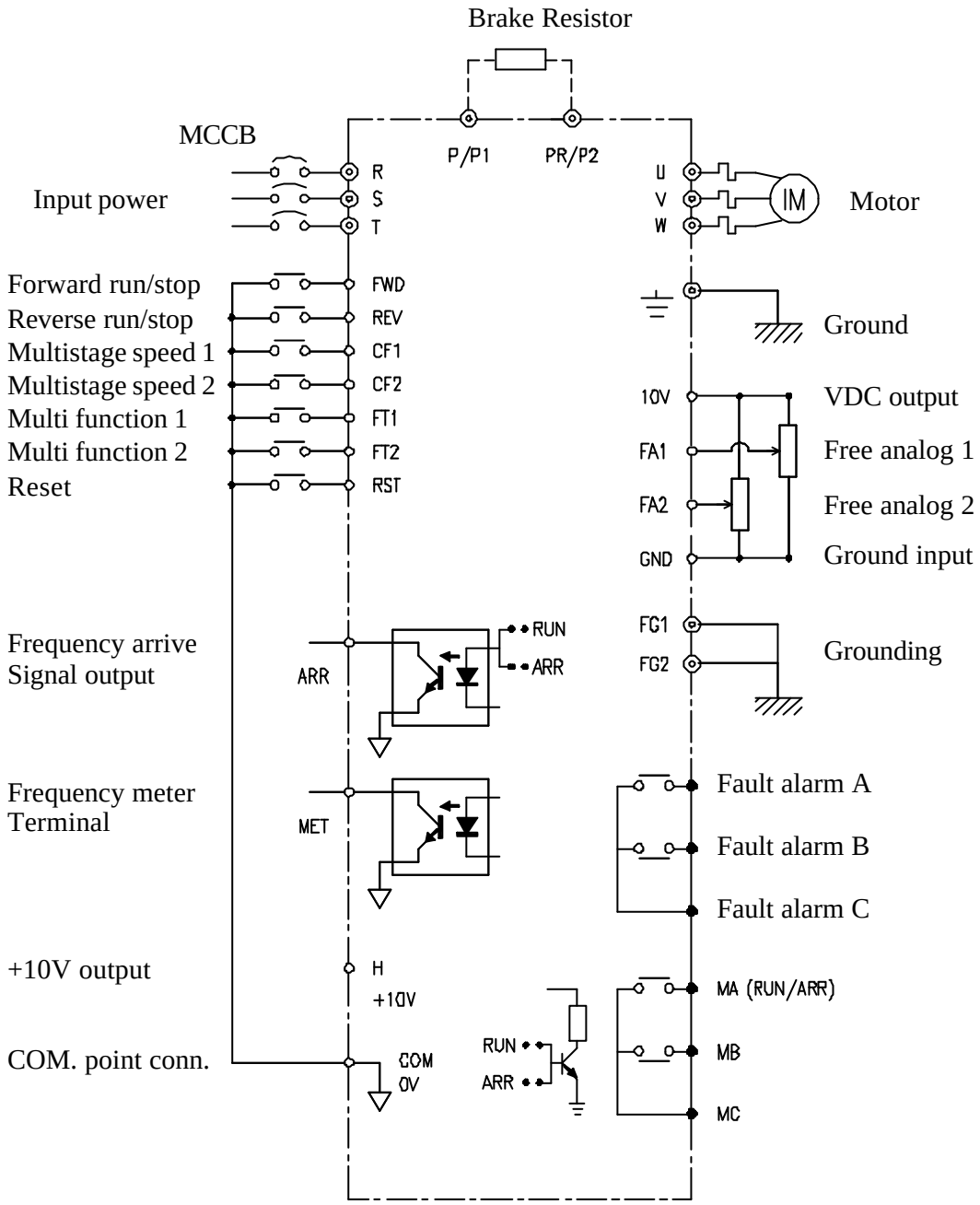
Remove build-in dynamic brake resistor.

Connect a larger capacity resistor, the value bigger than the table below:

Unit : Ohm

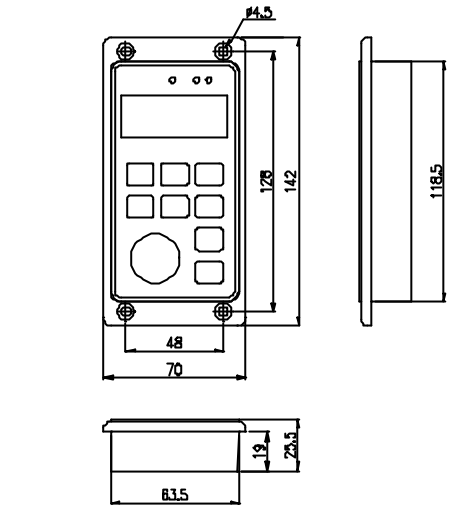
Model No	37	55	75	110	150	185	220
AP2	40	20	15	11	8	8	8
AP4	160	80	60	30	30	22	22

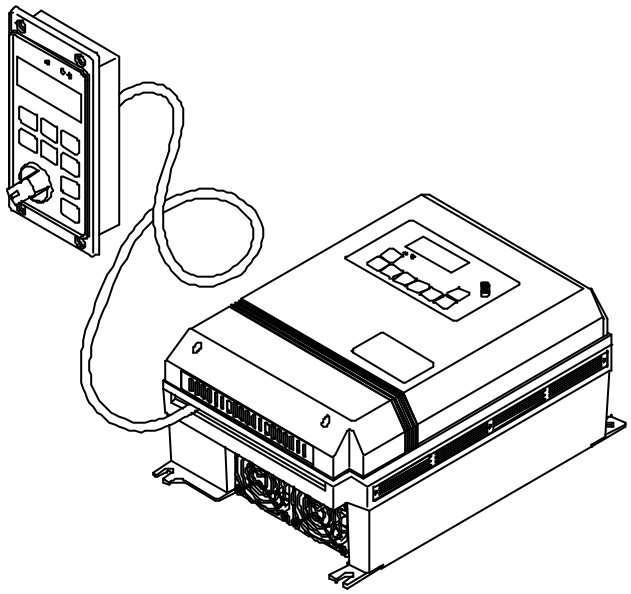
B. Terminals wiring diagram



Note : Select Relay (MA/MB/MC) as RUN or ARR by J3 or J4 (Refer to P12).

C. Remote operator





UNIT : M/M

A-0000-F306G3	F306 Remote operator
E-092A-010200	1 meter extension cable
E-092A-030200	3 meter extension cable
E-092A-050200	5 meter extension cable

MEMO

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INSTRUCTION MANUAL
PART NO : E-PHAA-EAPA03
Model : APxG3 series

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