

INSTRUCTION MANUAL

GENERAL-PURPOSE INVERTER

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.

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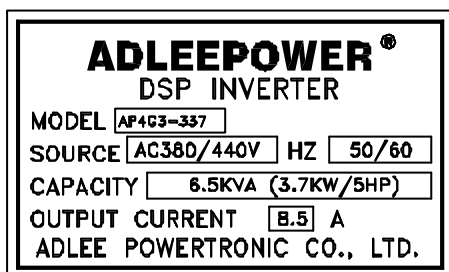
1. RECEIVING

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



MODEL : AP 4 G3 - 3 37

AP series

Voltage class :

2 : 200/240V

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

3 : 3 ϕ

2. SPECIFICATIONS

Model		AP2G3						
Voltage		3 ϕ 200~240VAC ± 10%						
Model No		337	355	375	3110	3150	3185	3220
Input Frequency		50HZ/60HZ ±5%						
Output Voltage		3 ϕ 220VAC						
Output Frequency		0.5 ~ 400HZ						
Output Rated current (A)		17	24	33	46	61	76	90
Capacity (KVA)		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	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 						
	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	17	18	18.5	19

Model		AP4G3						
Voltage		3 ϕ 380/440VAC ±10%						
Model No		337	355	375	3110	3150	3185	3220
Input Frequency		50HZ/60HZ ±5%						
Output Voltage		3 ϕ 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 						
	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

(AP2G3-337 AP2G3-355 AP2G3-375)

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

Unit : mm

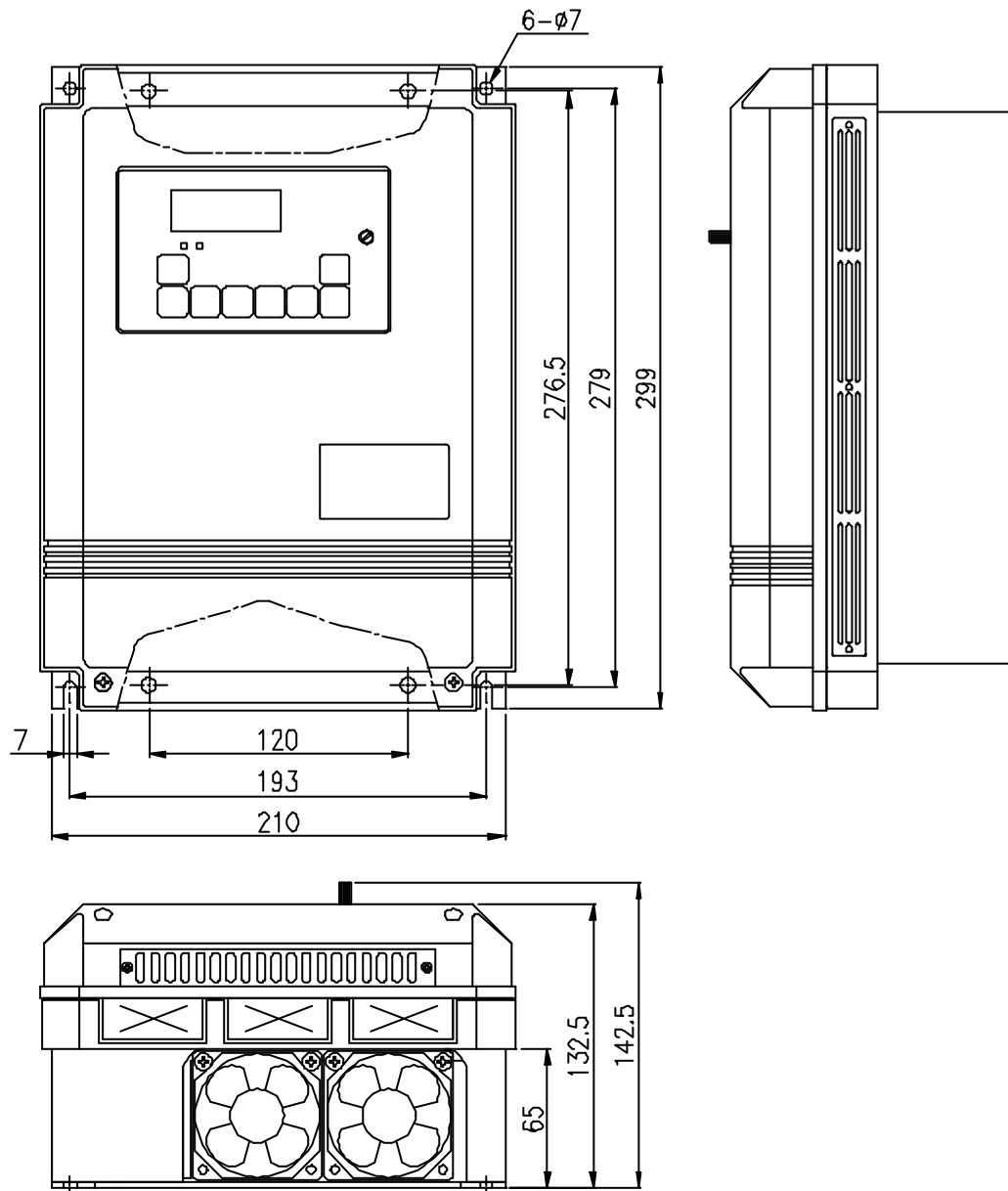


Fig 1

(AP2G3-3110 AP2G3-3150 AP2G3-3185 AP2G3-3220)
 (AP4G3-3150 AP4G3-3185 AP4G3-3220)

Unit : mm

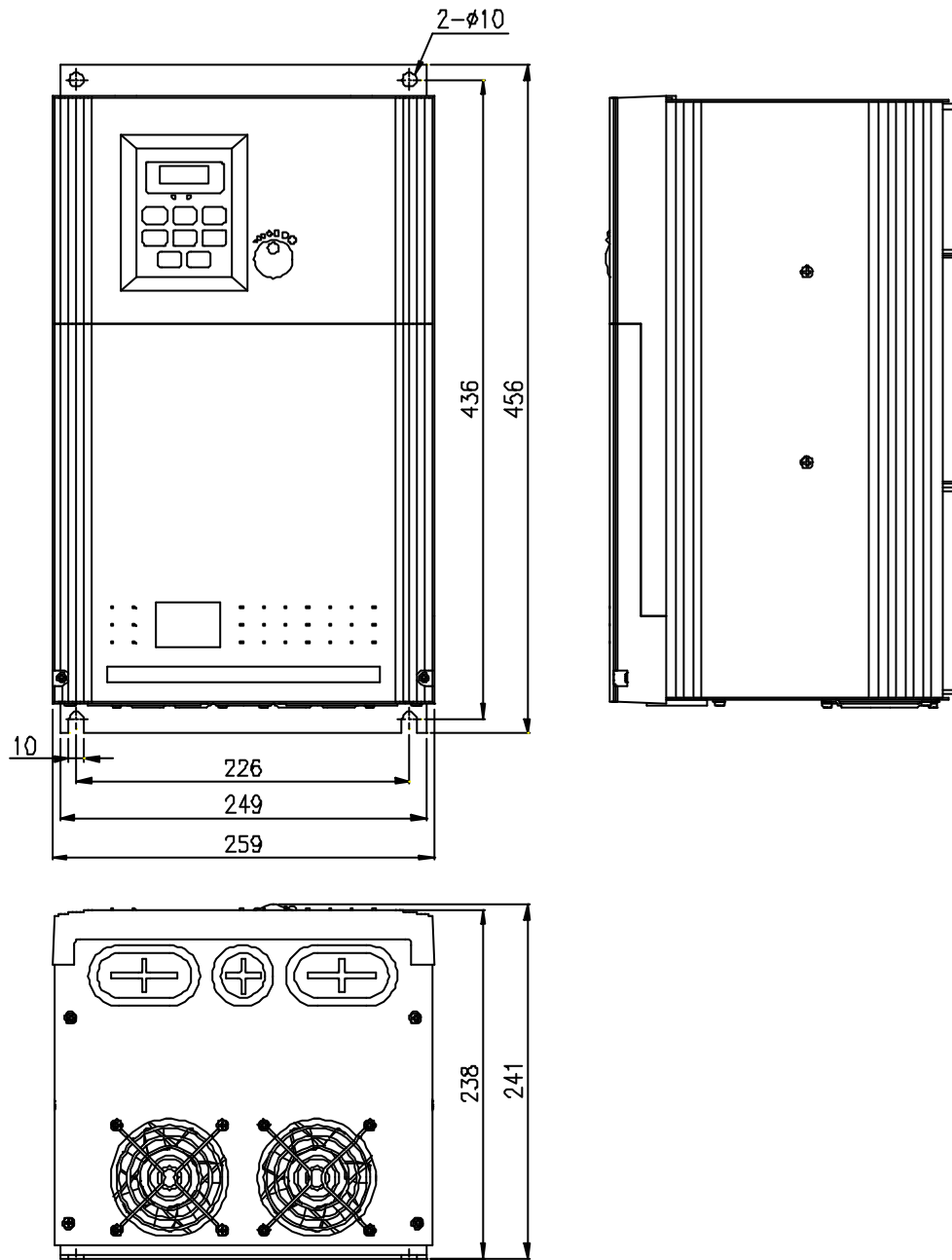


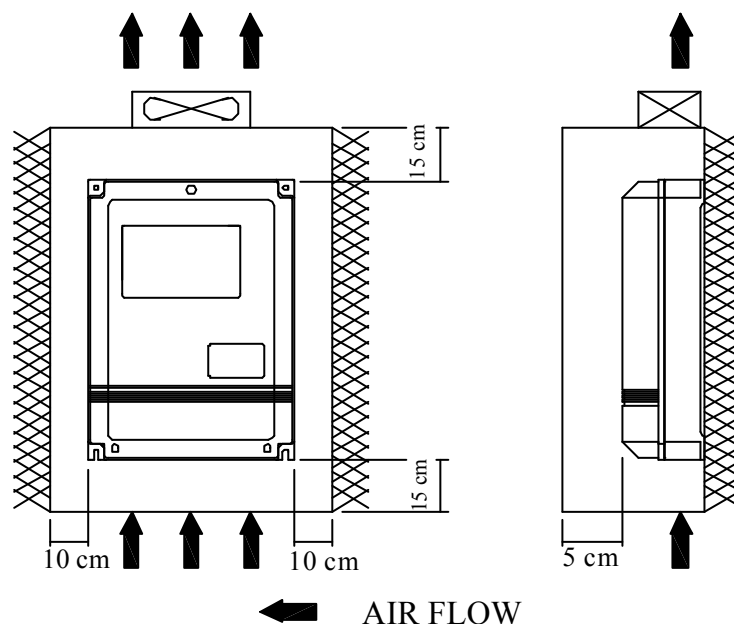
Fig 2

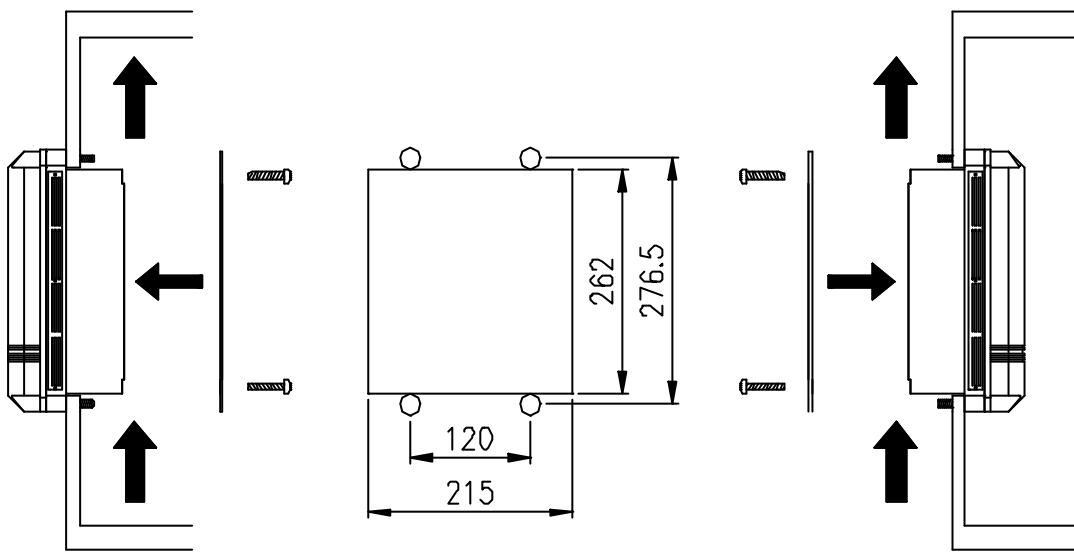
4. INSTALLATION

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 $-10^{\circ}\text{C} \sim 45^{\circ}\text{C}$. ($14^{\circ}\text{F} \sim 113^{\circ}\text{F}$).
- (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.

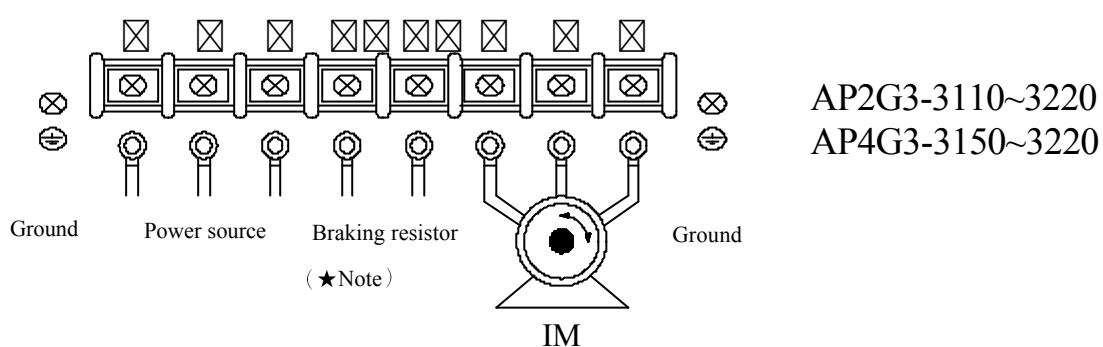
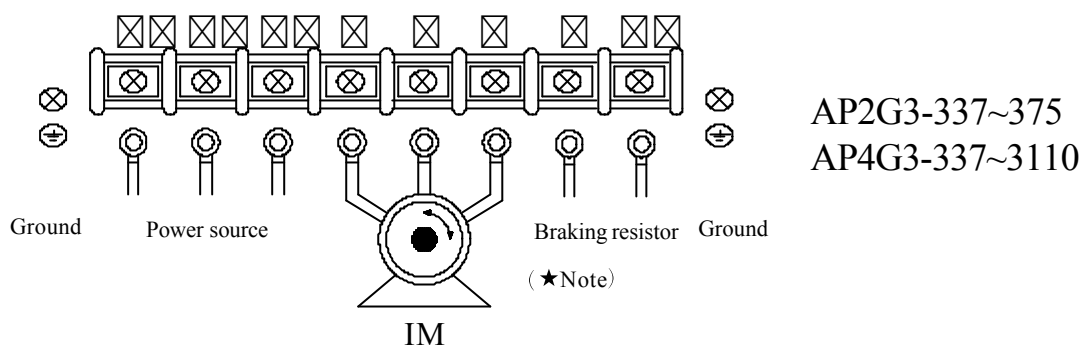




← AIR FLOW

5. DESCRIPTION OF TERMINALS

(1) Main circuit connection diagram

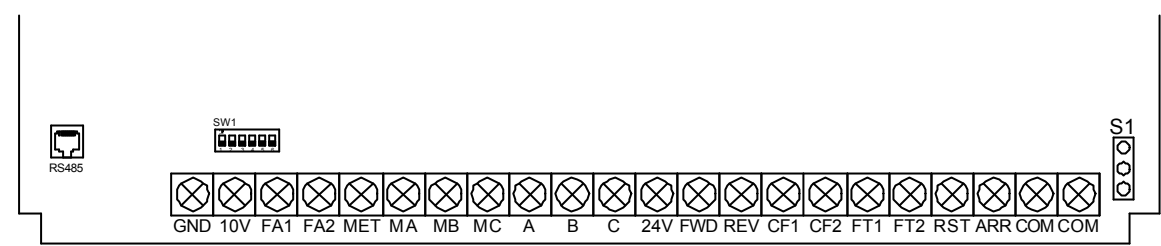


Main circuit terminal		
Symbol	Terminal name	Description
R / L1	Inverter power source	Terminal connecting with power source Single phase input : R, S
S / L2		
T / L3		
U	Inverter output terminal	Terminal connecting with motor
V		
W		
P / P2	DC voltage terminal	Regenerative braking resistor connecting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

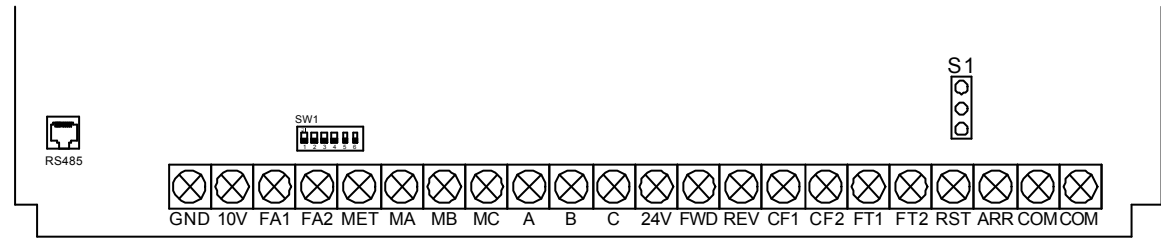
Note : Release the internal braking resistor when connect external braking resistor.

(2) Description of hardware setting

AP2G3-337~375 AP4G3-337~3110



AP2G3-3110~3220 AP4G3-3150~3220



(3) RS485 connector

	NO	8	7	6	5	4	3	2	1
	Color	Black	Red	Orange	Yellow	Green	Blue	Purple	Brown
	Symbol	GND	VCC	GND	A	RFA0	B	VCC	
	Connect to F306 or RS485								

※ This connector is for RS485. Set CD13 for selection.

(4) Analog signal switch setting

SIGNAL	Keypad VR / F306VR
Keypad VR	
F306 VR	
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.

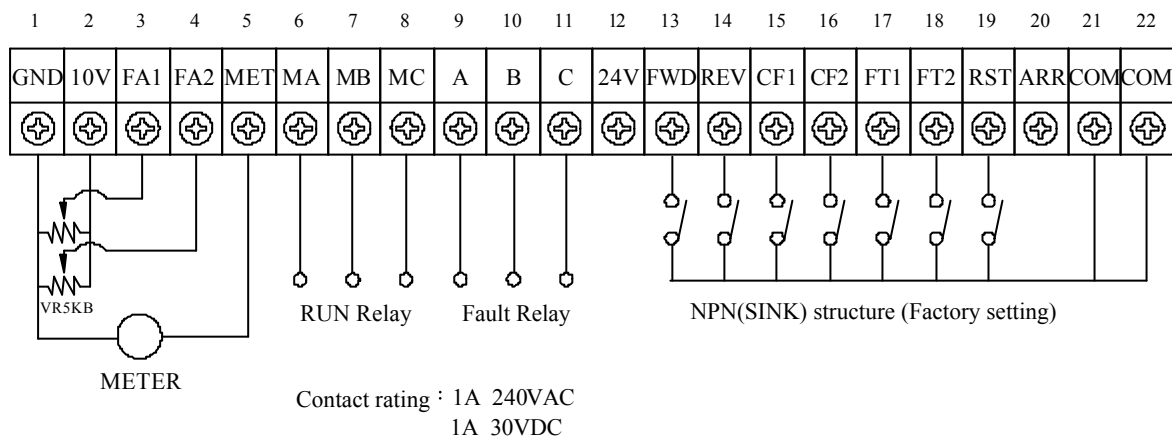
(5) Jumper setting

S1 terminal control structure

1○	1 and 2 short circuit :
2○	External terminal NPN(SINK) structure.
3○	(Factory setting)
	2 and 3 short circuit :
	External terminal PNP(SOURCE) structure.

(6) Control circuit terminal

AP2G3-337~3220 AP4G3-337~3220

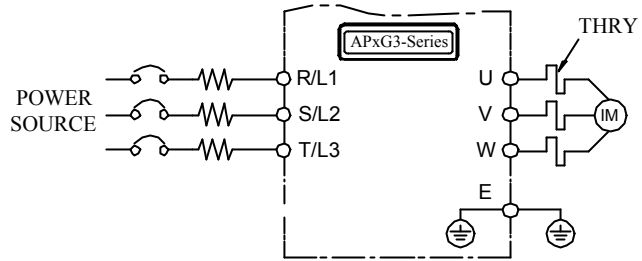


Symbol	Control circuit terminal																	
	Terminal	Description																
GND	Analog common terminal	Common terminal of free analog terminals																
10V	Analog source	Power source +10V of analog terminals																
FA1	Free analog terminal 1	See functions description (CD44)																
FA2	Free analog terminal 2	See functions description (CD45)																
MET	Frequency meter terminal	0~100% duty open collector output or 0~10VDC / 2mAoutput (0~CD14)																
MA	Relay output RUN	Relay output contact (normal open)																
MB		Relay output contact (normal close)																
MC		Relay output contact (common)																
A	Alarm output A	Fault alarm contact (normal open)																
B	Alarm output B	Fault alarm contact (normal close)																
C	Alarm output C	Fault alarm contact (common)																
24V	Source terminal	Source terminal of control board																
FWD	Forward operation	Forward operation / stop terminal																
REV	Reverse operation	Reverse operation / stop terminal																
CF1	Multistage speed terminal	<table><tr><td>CF1</td><td>CF2</td><td>SPEED</td></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>		CF1	CF2	SPEED	OFF	OFF	SPEED - 1	ON	OFF	SPEED - 2	OFF	ON	SPEED - 3	ON	ON	SPEED - 4
CF1		CF2	SPEED															
OFF		OFF	SPEED - 1															
ON		OFF	SPEED - 2															
OFF		ON	SPEED - 3															
ON	ON	SPEED - 4																
CF2																		
FT1	Multi function terminal 1	See functions description (CD42)																
FT2	Multi function terminal 2	See functions description (CD43)																
RST	Reset	Reset																
ARR	Operation output terminal Frequency arrival signal	Photocoupler output 48VDC/50mA(MAX)																
COM	Common terminal	Common terminal of control board																

(7) WIRING

7-1 Wiring of main circuit

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



7-2 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	337	355	375	3110	3150	3185	3220	337	355	375	3110	3150	3185	3220
Capacity (KVA)	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)	17	24	33	46	61	76	90	8.5	12	16.5	23	31	38	45
Circuit Breaker (MCCB) (A)	20	30	50	75	100	125	150	15	20	30	50	50	75	75
Electro-Magnetic Contactor (A)	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	80	6.8	9	15	20	28	40	40

7-3 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.

7-4 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

7-5 Wiring and cautionary points

A. Main circuit

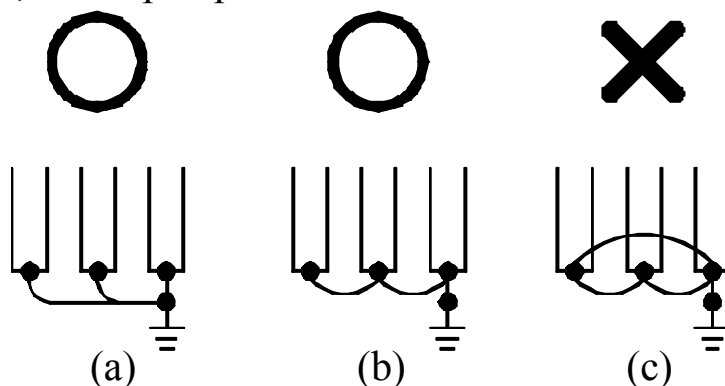
1. Don't connect the cables of the power supply side (R/L1,S/L2,T/L3) to the U, V and W output terminals for the motor.
2. Don't connect any electromagnetic contactor between the inverter and motor. If it is inevitable, turn on the contactor when both the inverter and motor are both at stand still.
3.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

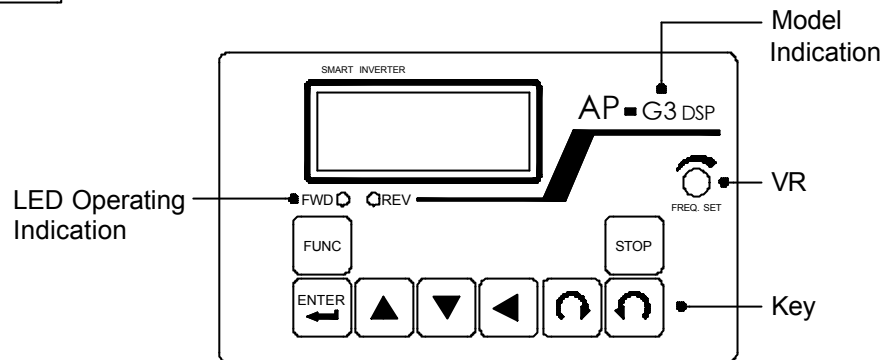
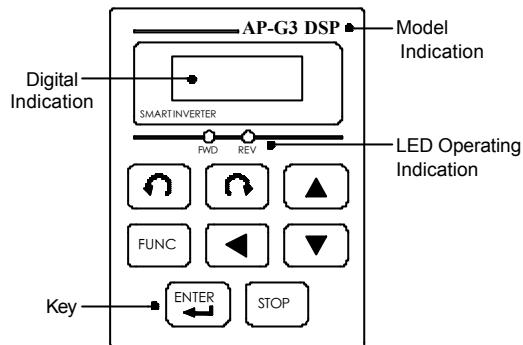
1. Be sure ground both the inverter and motor.
2. Keep grounded leads as short as possible.
3. Shield cables used to protect low-level signal leads should be grounded at one end point.
4. Provide class 3 grounding ($0.1\ \Omega$ or less) for a terminal.
5. When grounding several inverters, make connections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



7-6 Main circuit terminals

	Wire	Wire type	Torque
AP2G3-337~375 AP4G3-337~3110 Input (R/L1,S/L2,T/L3) Output(U,V,W,P,PR)	10AWG (5.5mm ²)	Stranded copper only (600V/80°C)	18Kg-cm (15.6lb-in)
AP2G3-3110~3220 AP4G3-3150~3220 Input (R/L1,S/L2,T/L3) Output(U,V,W,P,PR)	2AWG (38mm ²)	Stranded copper only (600V/80°C)	61.1Kg-cm (53.03lb-in)
External control signal terminals	24AWG~14AWG (0.5mm ² ~2.0mm ²)	Stranded copper only (300V/80°C)	5.1Kg-cm (4.42lb-in)

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
	ENTER	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	60.00HZ
			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	Reserved	
	CD08	CW or CCW or CW / CCW	0
	CD09	Search speed function	1
	CD10	Analog / digital frequency	1
	CD11	Dynamic brake / Free running	0
☆	CD12	Terminal / Keypad command	0
			1
	CD13	Source operation command	2
☆	CD14	Maximum frequency limit	120.00HZ
			50.00HZ
	CD15	Minimum frequency limit	0.00
☆	CD16	Frequency display Scale	1.00
			30.00
☆	CD17	1st Maximum voltage frequency	60.00HZ
			50.00HZ
	CD18	V/F pattern setting	0
	CD19	DC braking time	1.0Sec

DISPLAY CODE	FUNCTION	DEFAULT VALUE
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	15.0K
		10.0K
CD28	Output voltage gain	100.0%
CD29	Frequency jump 1	0.00
CD30	Frequency jump 2	0.00
CD31	Frequency 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
CD38	Errors record 2	NONE
CD39	Errors record 3	NONE
CD40	Clear errors record	0
CD41	HZ / RPM / AMP / DC bus Display	0
CD42	FT1 Multi-Function Terminal 1	0
CD43	FT2 Multi-Function Terminal 2	0



DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD44	FA1 Free Analog Terminal 1	0
CD45	FA2 Free Analog Terminal 2	0
CD46	Run frequency setting	60.0HZ
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	Timer FWD/REV setting	0
CD58	Auto running mode	0
CD59	1st step timer	0.01
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	1
CD66	Overload current stall prevention	170.0%
CD67	Overload detect	0
CD68	Overload setting	150.0%

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD69	Overload time setting	60.0SEC
CD70	2nd stage overload time setting	20.0SEC
CD71	Auto voltage regulation (AVR)	0
CD72	Communication loss time	0.5SEC
CD73	Communication error counter	3
CD74	Address setting	1
CD75	Transmission speed	3
CD76	Transmission fault treatment	3
CD77	Reserved	
CD78	Communicator protocol	4
CD79	Auto carrier frequency & boost setting	9
CD80	Power on start lock (External terminal only)	0
CD81	MT output signal selection	0
CD82	MT output gain	100%
CD83	FT3 Multi-Function Terminal 3	1
CD84	FT2 Multi-Function Terminal 2 (Active mode setting)	1
CD85~CD90	Reserved	
CD91	RUN terminal	0
CD92	ARR terminal	1
CD93	U.V.W open protection	1
CD94	Dead time compensation	0
CD95	Reserved	
CD98~CD99	Reserved	

Communication address description

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD96	Model code	
CD97	Version of program	
100	Speed command for RS485	3
101	Frequency data output for RS485	
102	Current data output for RS485	
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 $\pm 10\%$, 50/60HZ $\pm 5\%$ for AP2G3 and 380~440VAC $\pm 10\%$, 50/60HZ $\pm 5\%$ 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  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.

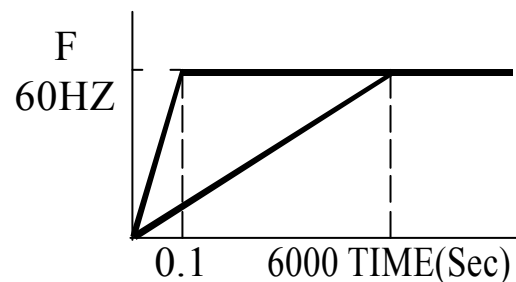
To change the contents data of CD , set CD01=1 and press  first.

To lock the data set CD01=0 and press  .

Acceleration time 1
CD02

Setting Range	0.1 ~ 6000.0Sec
Default Value	10.0Sec

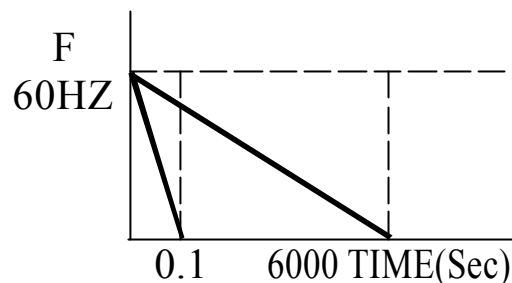
CD02 value corresponds to the time of acceleration from 0 to 50/60HZ.(For 120Hz. setting, the arrival time to 120Hz is double.)



Deceleration time 1
CD03

Setting Range	0.1 ~ 6000.0Sec
Default Value	10.0Sec

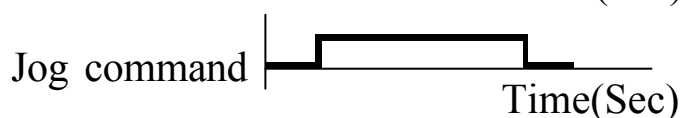
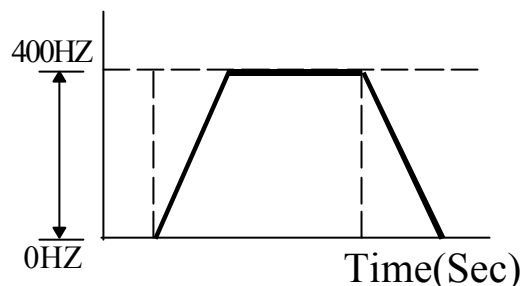
CD03 value corresponds to the time of deceleration from 50/60HZ to 0.



Jogging frequency
CD04

Setting Range	0.00 ~ 400.00HZ
Default Value	5.00HZ

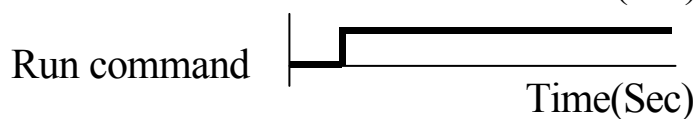
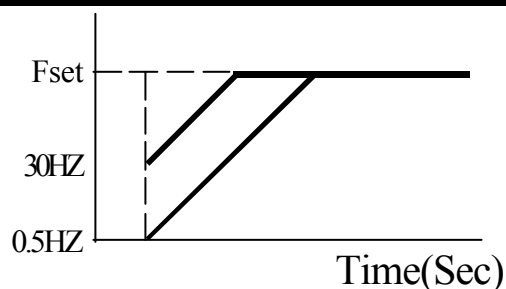
Use terminal control refer to CD12 and CD42 setting,
keyboard control refer to CD06.



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  &  .
2.   LED blinking in JOG mode.

CW or CCW or CW/CCW
CD08

Setting Range	0 ~ 2
Default Value	0

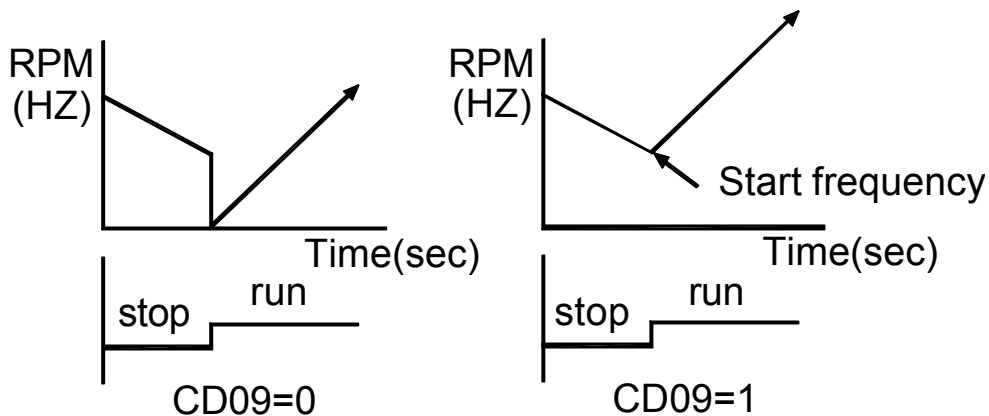
- 0 : CW/CCW operation
 1 : CW only
 2 : CCW only

If inadequate operation, the “OPE2“ warning message would be indicated.

Search speed function
CD09

Setting Range	0 or 1
Default Value	1

- 0 : Normal operation.
 1 : Search motor speed when start.



Analog / Digital frequency
CD10

Setting Range	0 or 1
Default Value	1

0 : Operation frequency change by using  or  key and confirm by .

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

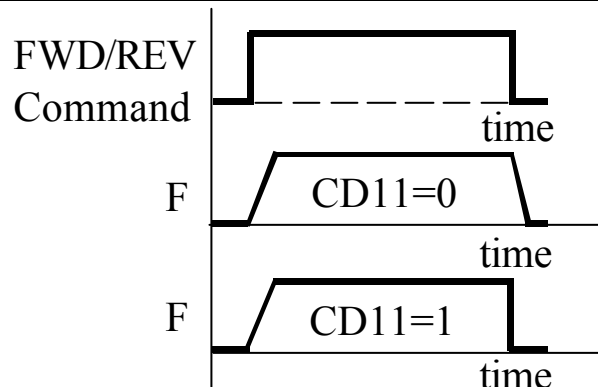
Note : Using   key to change motor speed when CD01=0, then "OPE3" warning message would be indicated.

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	2

0 : Normal

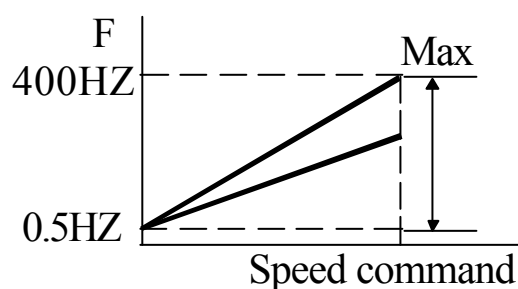
1 : F306

2 : RS485 communication

Note : After finished this parameter setting, please repower “ON”.

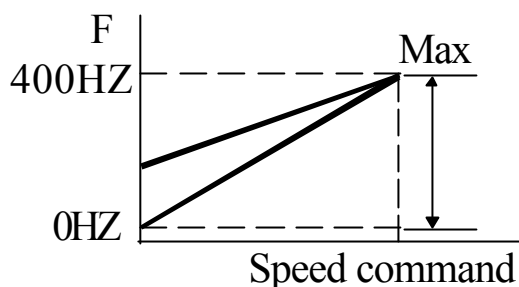
Maximum frequency limit
CD14

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.

$$\text{RPM} = \text{HZ} \times \text{Scale setting}$$

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

Setting CD41=1 for display shown RPM.

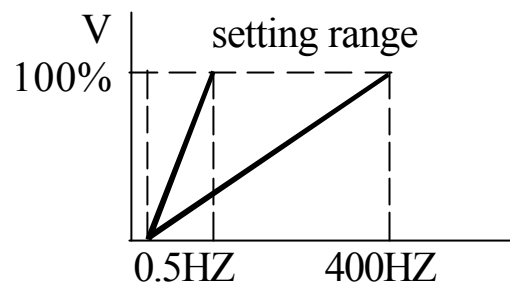
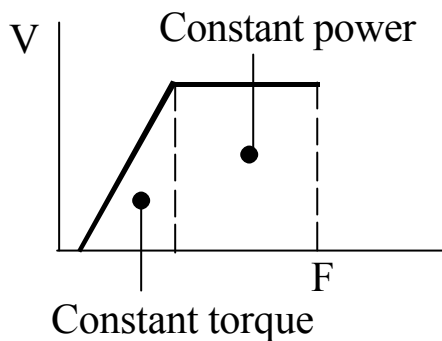
Scale for various motors

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

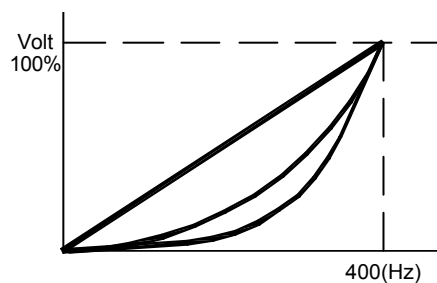
Use 2nd V/F to set CD42(43)=7 and terminal FT1(2) close.
2nd V/F setting is at CD56.



V/F pattern setting
CD18

Setting Range	0 ~ 2
Default Value	0

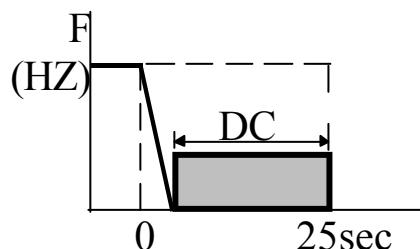
0 = Constant torque curve
1 = Reduce torque curve $F^{2.0}$
2 = Reduce torque curve $F^{3.0}$



DC braking time
CD19

Setting Range	0.0 ~ 25.0Sec
Default Value	1.0Sec

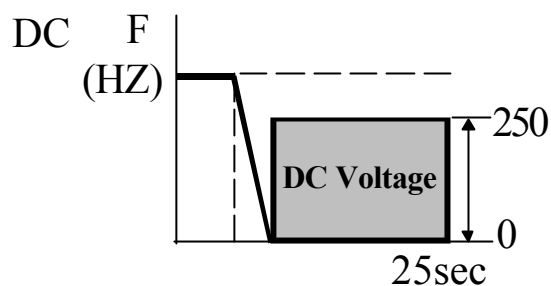
DC brake at frequency
under 0.5HZ.



DC braking power
CD20

Setting Range	0 ~ 250
Default Value	10

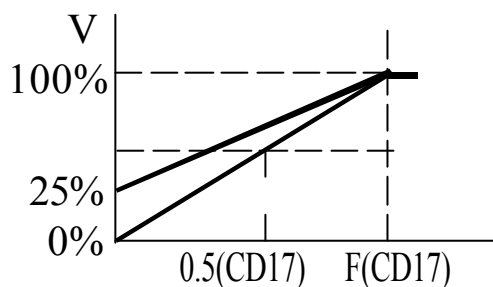
CD20 setting DC voltage gain various braking power.



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 setting
CD22

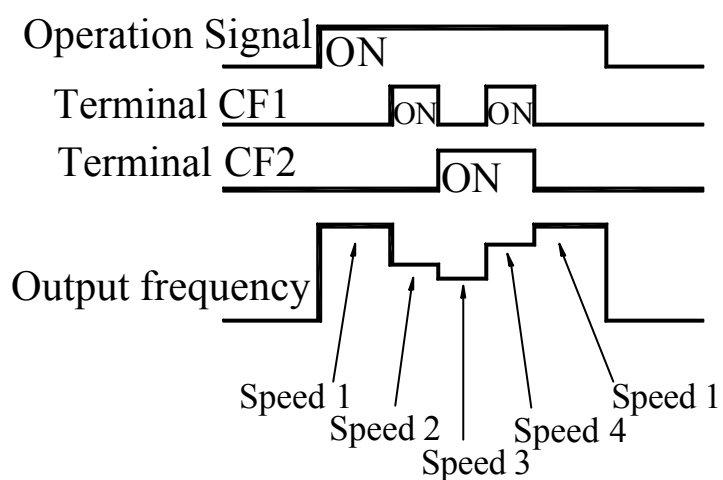
Setting Range	0.00 ~ 400.00HZ
Default Value	20.00HZ

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	CF1	CF2
SPEED		
SPEED - 1	OFF	OFF
SPEED - 2	ON	OFF
SPEED - 3	OFF	ON
SPEED - 4	ON	ON

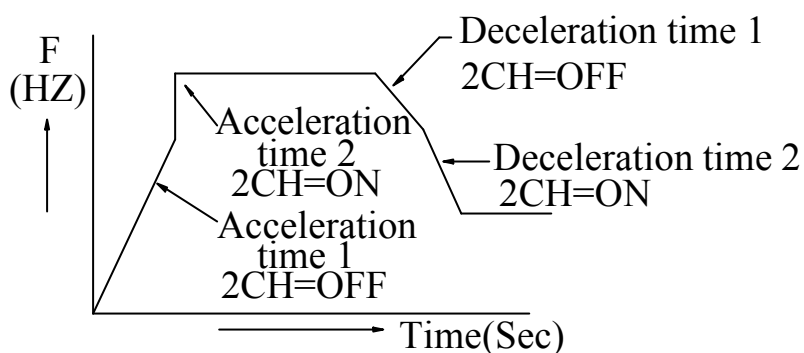
Acceleration time 2
CD25

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	

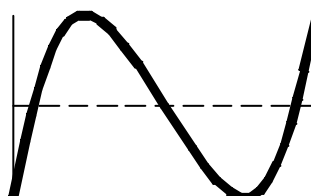
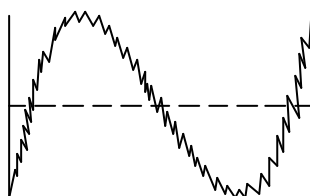
To operate inverter with 2CH function, check to see CD42 or CD43=3.
2CH command inputs from FT1 or FT2 terminal.

Carrier frequency
CD27

AP2G3-337~375 AP4G3-337~3110	Setting Range	1.0~15.0K
	Default Value	15.0K
AP2G3-3110~3220 AP4G3-3150~3220	Setting Range	1.0~10.0K
	Default Value	10.0K

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.

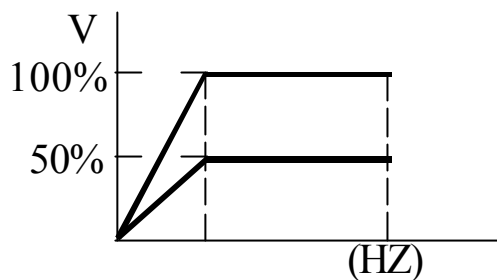


Output voltage gain
CD28

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

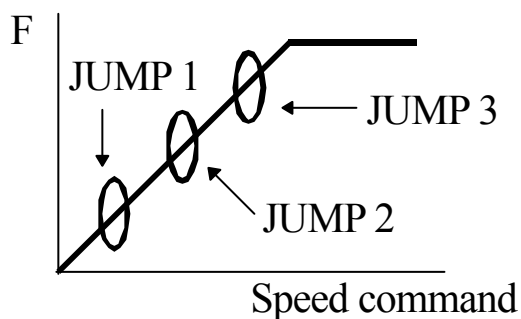
Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ

Frequency jump 2
CD30

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ

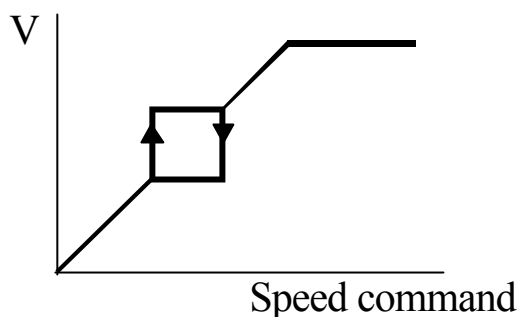
Frequency jump 3
CD31

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00HZ



Jump range
CD32

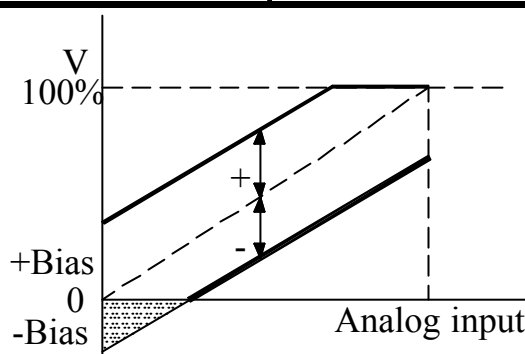
Setting Range	0.50 ~ 3.00HZ
Default Value	0.50HZ



Frequency reference bias
CD33

Setting Range	0.00 ~ 400.00HZ
Default Value	0.00

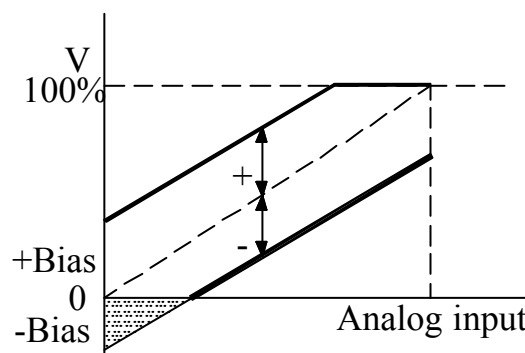
Move Frequency bias with same gradient.
Frequency in the range of “ - ” bias, motor is stop.



Freq. ref. bias direction
CD34

Setting Range	0 or 1
Default Value	0

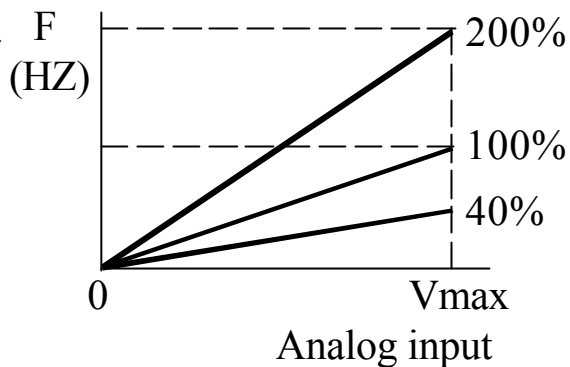
0 = Positive “+”
1 = Negative “-”
Polarity setting for (CD33) frequency reference bias.



Frequency gain
CD35

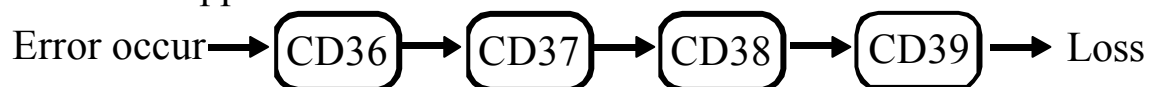
Setting Range	40.0 ~ 200.0%
Default Value	100.0%

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  clear CD36 ~ CD39 Error record the contents in CD36 ~ CD39 are “ NONE “

HZ / RPM / AMP / DC bus Display
CD41

Setting Range	0 ~ 3
Default Value	0

0 = HZ Display

1 = RPM Display

2 = Current Display

3 = DC bus Display

Setting current scale CD14 for R.P.M. display shown.

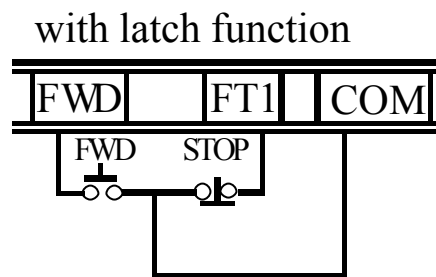
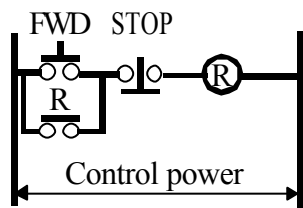
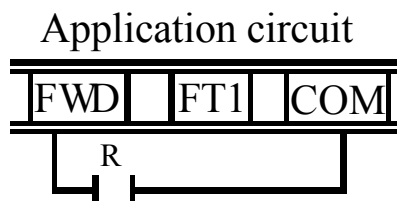
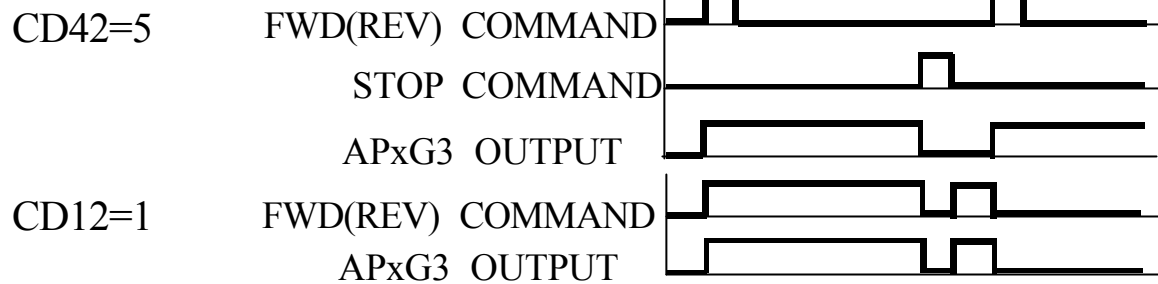
FT1 Multi-Function Terminal 1
CD42

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	Timer	Timer RUN Trigger
11~15		Reserved

3 - WIRE CIRCUIT CONNECTION DIAGRAM

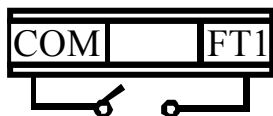
(TERMINAL LATCH FUNCTION)



Ⓡ and CONTROL POWER not necessary
 Remark: STOP command entry from control terminal FT1 or 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.

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

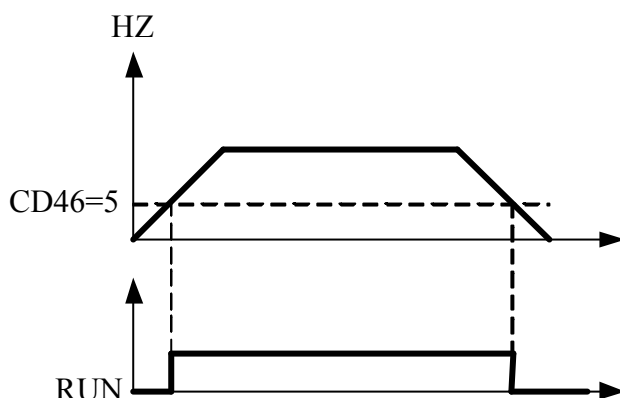
Setting NO. 11 to use application of example 03.

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 ~ CD14 Content
14	Reserved	
15	Reserved	

Run frequency setting
CD46

Setting Range	0.5 ~ 1200HZ
Default Value	60.0HZ

Run terminal output signal if frequency reaches setting value.



5th speed setting
CD47

6th speed setting
CD48

7th speed setting
CD49

8th speed setting
CD50

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)

Dynamic braking energy limit
CD51

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

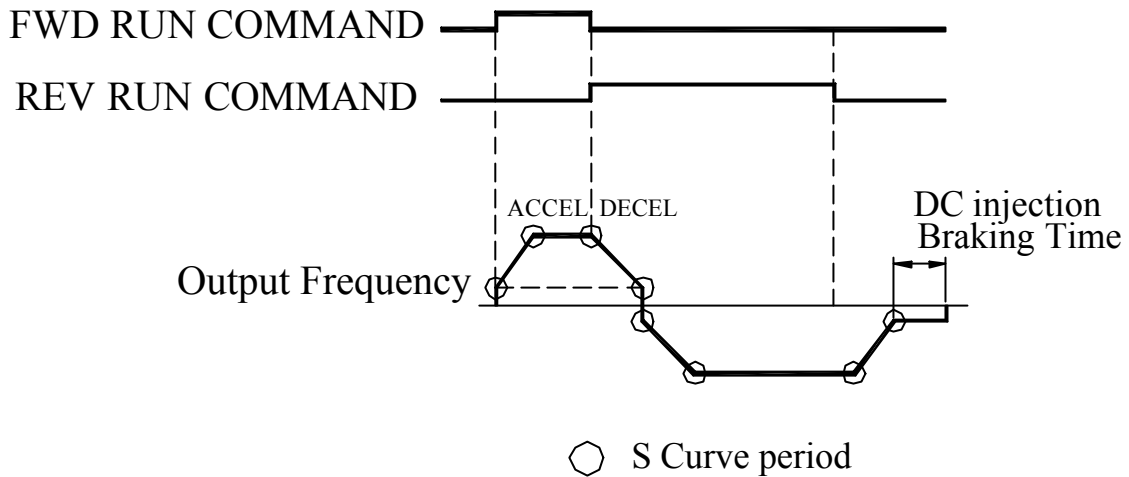
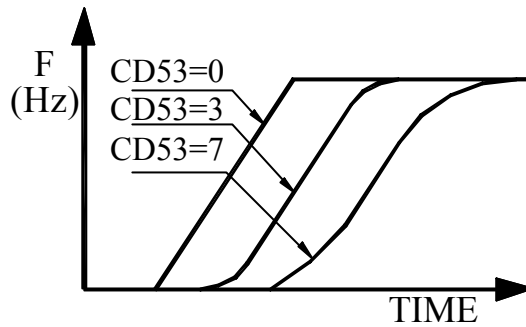
Version. Press  to save it. System will return to the factory setting and go into waiting mode..

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

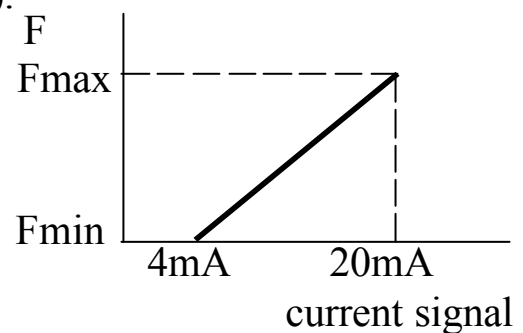
Setting Range	0 ~ 3
Default Value	0

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

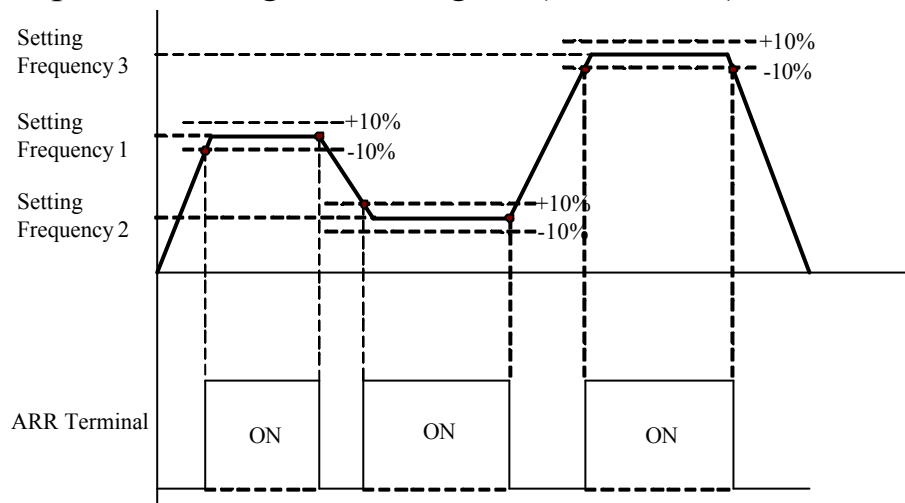
Note : referent to FA1(FA2) terminal setting for 4-20mA signal.



Frequency arrive signal range
CD55

Setting Range	0.0 ~ 100.0%
Default Value	10.0%

- 1.Signal output at running $F. \geq \text{setting } F.x(1-CD55\%)$ for acceleration.
- 2.Signal output at running $F. \leq \text{setting } F.x(1+CD55\%)$ for deceleration.



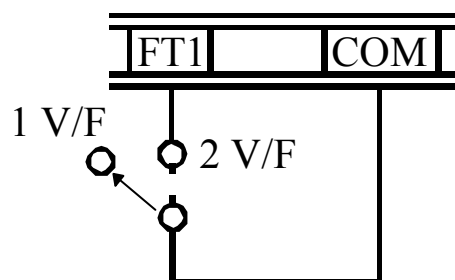
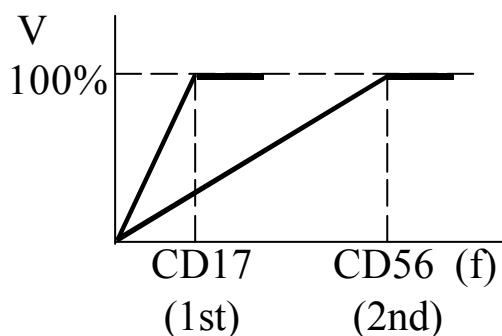
2nd Maximum Voltage frequency
CD56

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



Timer FWD/REV setting
CD57

Setting Range	0 ~ 31
Factory Setting	0

CD57 setting value	Binary	CD47	CD48	CD49	CD50	CD00
31	11111	REV	REV	REV	REV	REV
30	11110	FWD	REV	REV	REV	REV
29	11101	REV	FWD	REV	REV	REV
28	11100	FWD	FWD	REV	REV	REV
27	11011	REV	REV	FWD	REV	REV
26	11010	FWD	REV	FWD	REV	REV
25	11001	REV	FWD	FWD	REV	REV
24	11000	FWD	FWD	FWD	REV	REV
23	10111	REV	REV	REV	FWD	REV
22	10110	FWD	REV	REV	FWD	REV
21	10101	REV	FWD	REV	FWD	REV
20	10100	FWD	FWD	REV	FWD	REV
19	10011	REV	REV	FWD	FWD	REV
18	10010	FWD	REV	FWD	FWD	REV
17	10001	REV	FWD	FWD	FWD	REV
16	10000	FWD	FWD	FWD	FWD	REV
15	01111	REV	REV	REV	REV	FWD
14	01110	FWD	REV	REV	REV	FWD
13	01101	REV	FWD	REV	REV	FWD
12	01100	FWD	REV	REV	REV	FWD
11	01011	REV	REV	FWD	REV	FWD
10	01010	FWD	REV	FWD	REV	FWD
9	01001	REV	FWD	FWD	REV	FWD
8	01000	FWD	FWD	FWD	REV	FWD
7	00111	REV	REV	REV	FWD	FWD
6	00110	FWD	REV	REV	FWD	FWD
5	00101	REV	FWD	REV	FWD	FWD
4	00100	FWD	FWD	REV	FWD	FWD
3	00011	REV	REV	FWD	FWD	FWD
2	00010	FWD	REV	FWD	FWD	FWD
1	00001	REV	FWD	FWD	FWD	FWD
0	00000	FWD	FWD	FWD	FWD	FWD

Note : This parameter effects in timer mode only.

Auto running mode
CD58

Setting Range	0 ~ 4
Factory Setting	0

SPEED	1th	2th	3th	4th	5th	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

CD12=0, use keypad to control timer

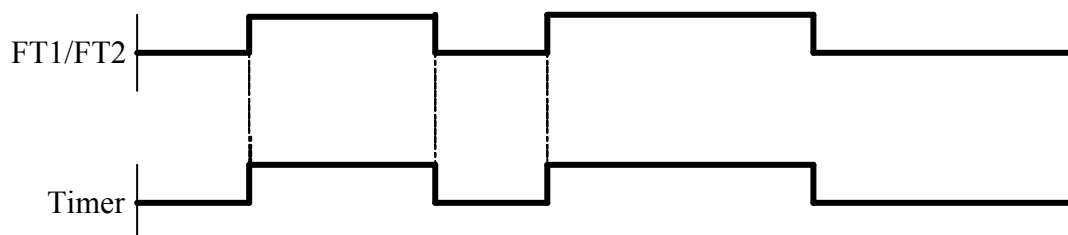
CD12=0 and CD13=2, use RS485 to control timer

CD42 or CD43=10, use FT1 or FT2 terminal to control timer

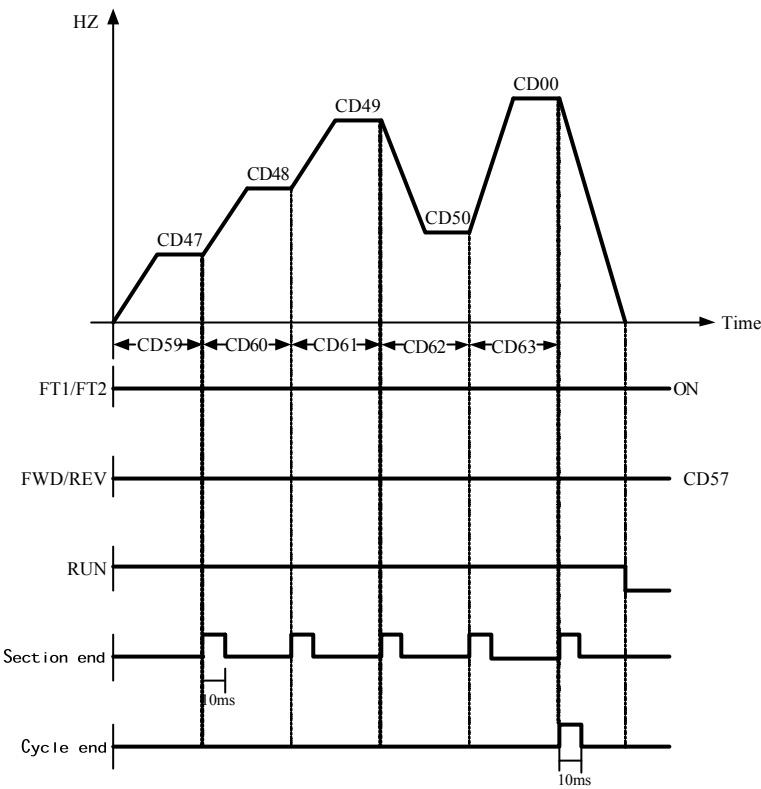
Value	Description
0	Timer disable
1	Speeds with timer for one cycle then stop
2	Speeds with timer for running continually until receive stop command
3	Speeds with timer for one cycle then stop. There is a stop between each speed.
4	Speeds with timer for running continually until receive stop command. There is a stop between each speed.

FT1/FT2 “ON”, for timer RUN.

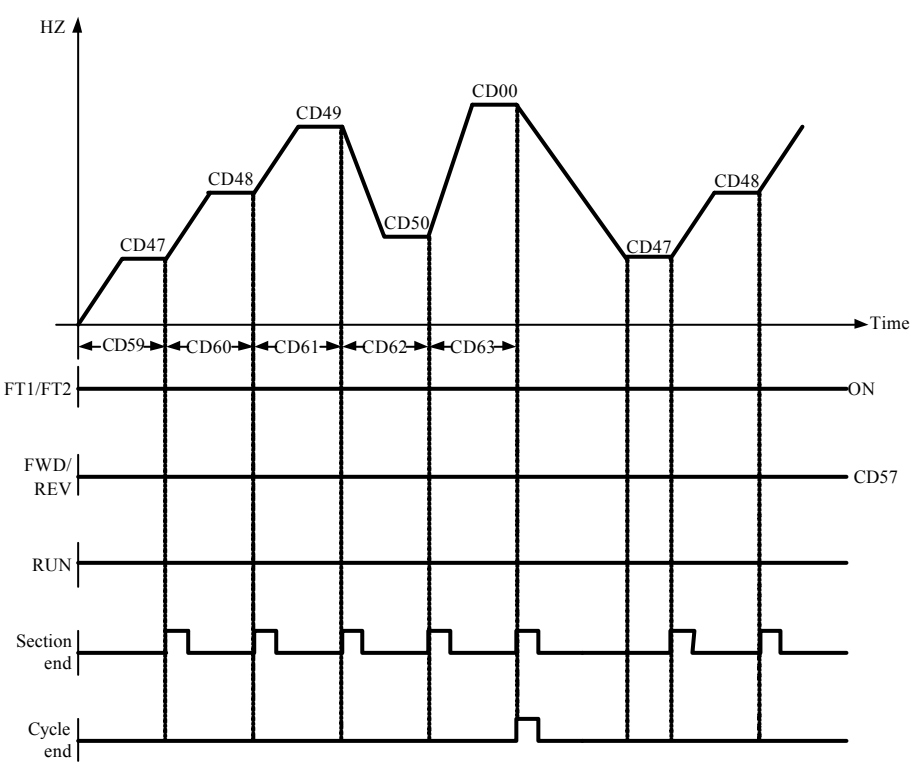
FT1/FT2 “OFF”, for timer STOP.



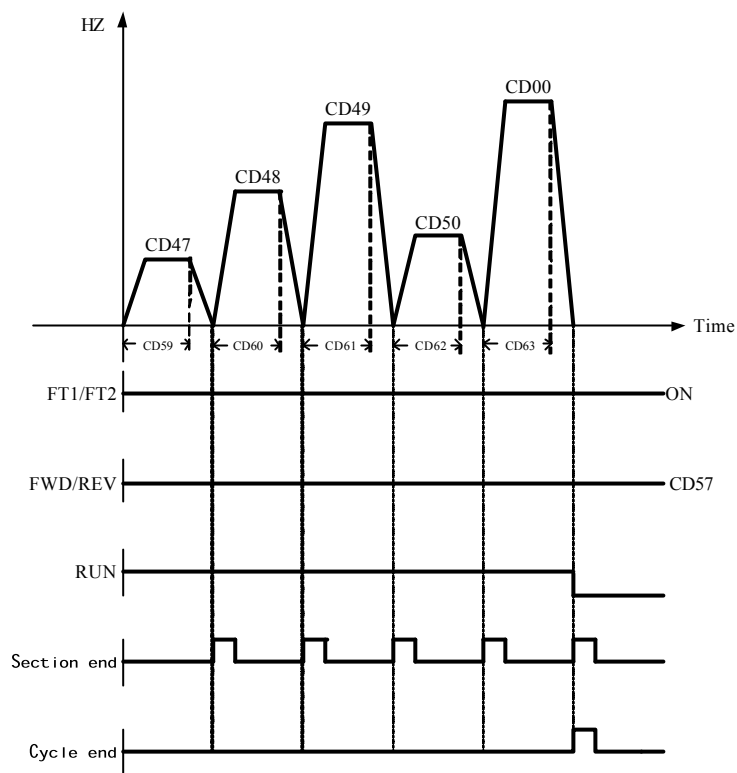
CD58=1



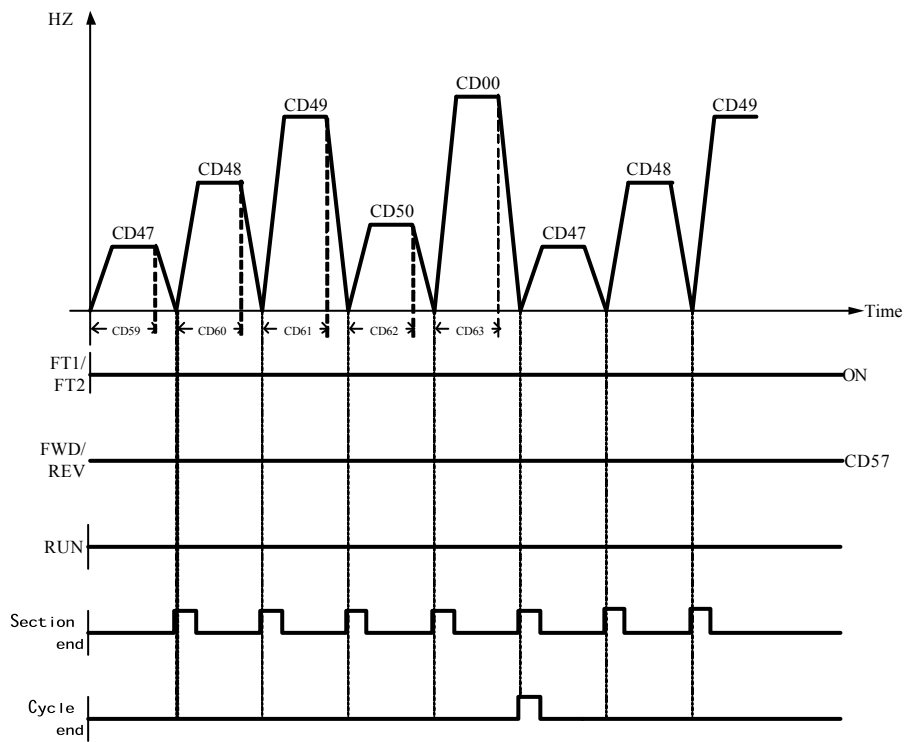
CD58=2



CD58=3



CD58=4



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 transfer minimum unit. Ex CD64=0, CD59=2.3 CD59 constant for RS485 communication is $2 \times 60 + 30 = 150$ (0096H).

Stall prevention
CD65

Setting Range	0 ~ 1
Default Value	1

0 : Disable

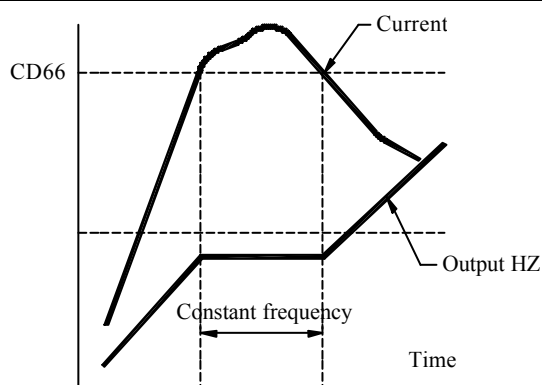
1 : Enable

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 $\times$ 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.

Auto voltage regulation (AVR)
CD71

Setting Range	0 ~ 3
Default Value	0

0 : Disable.

1 : Enable.

2 : Disable AVR during deceleration speed.

3 : Disable AVR during stop.

Note 1 : Enable AVR may cause acceleration or deceleration status change, depend on actual status adjust is needed.

Note 2 : When 380V type motor is used for 440V $\pm$ 10% power system. Please adjust CD28=95~80 to reduce AVR output.

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 address if they are controlled by RS485 communication. Each address cannot be duplicated.

0 : broadcast to all inverter.

Transmission speed
CD75

Setting Range	0 ~ 3
Default Value	3

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 or write address 100=4 to clear the transmission fault.

Note : Warning means Fault Relay active and display "LOSE" .

Communicator protocol
CD78

Setting Range	0 ~ 7
Default Value	4

A. Character 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 Even 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 positive 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 : $n \times 8\text{-bit data}, n \leq 16$
...	
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 : 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 : $n \times 8\text{-bit data consist of } 2n \text{ ASCII codes.}$
...	
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	

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	(00~FFh)
D2 : Function code	(03h)
D3 : Parameter number (H)	(00h)
D4 : Parameter number (L)	(0~67h)
D5 : Quantity of parameter (H) (word count)	(00h)
D6 : Quantity of parameter (L) (word count)	(00~10h)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)
Drive response message	
D1 : Communication address	(01~FFh)
D2 : Function code	(03h)
D3 : Quantity of parameter (byte count)	(00~20h)
D4 : Content of data (H)	(0~FFh)
D5 : Content of data (L)	(0~FFh)
...	
Dn-1 : CRCL	(0~FFh)
Dn : CRCH	(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'	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
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 (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 transfer 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, forward 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'	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	CD79 content '1'	31	D5	CD79 content '1'	31
	CD79 content '7'	37		CD79 content '7'	37
D6	CD79 content '7'	37	D6	CD79 content '7'	37
	CD79 content '0'	30		CD79 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

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

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	Content of data '0'	30	D3	Content of data '0'	30
	Content of data '0'	30		Content of data '0'	30
D4	Content of data '6'	36	D4	Content of data '6'	36
	Content of data '4'	34		Content of data '4'	34
D5	CD31 content '0'	30	D5	CD31 content '0'	30
	CD31 content '0'	30		CD31 content '0'	30

Computer command message			AC drive response message		
D6	CD31 content '0' CD31 content '1'	30	D6	CD31 content '0' CD31 content '1'	30
		31			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 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	D1	Address '3' Address '4'	33
		34			34
D2	Function '0' Function '8'	30	D2	Function '0' Function '8'	30
		38			38
D3	Content1 '1' Content1 '1'	31	D3	Content1 '1' Content1 '1'	31
		31			31
D4	Content2 '2' Content2 '2'	32	D4	Content2 '2' Content2 '2'	32
		32			32
D5	Content3 '3' Content3 '3'	33	D5	Content3 '3' Content3 '3'	33
		33			33
D6	Content4 '4' Content4 '4'	34	D6	Content4 '4' Content4 '4'	34
		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

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 (Interval 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=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	D1	Address '0' Address '1'	30
		31			31
D2	Function '0' Function '6'	30	D2	Function '8' Function '6'	38
		36			36
D3	Address content '0' Address content '0'	30	D3	Error code '0' Error code '2'	30
		30			32
D4	Address content '0' Address content '0'	30	D4	LRC HI '7' LRC LO '7'	37
		30			37
D5	CD00 content 'C' CD00 content '3'	43		END HI	0D
		33		END LO	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			

Auto carrier frequency & boost setting
CD79

Setting Range	1 ~ 10
Default Value	9

If you adjust this parameter will effect the vibration and noise of motor.

	Auto carrier frequency range	Boost	Remark
CD79=1	Less than 22HZ	2/300	
CD79=2	Less than 22HZ	3/300	
CD79=3	Less than 22HZ	4/300	
CD79=4	Less than 22HZ	5/300	
CD79=5	Less than 22HZ	6/300	
CD79=6	Less than 22HZ	7/300	
CD79=7	Less than 22HZ	8/300	
CD79=8	Less than 22HZ	9/300	
CD79=9	Less than 22HZ	10/300	The lowest vibration
CD79=10	Less than 4HZ	10/300	Reduce motor noise less than 22HZ

Power on start lock (External terminal only)
CD80

Setting Range	0 ~ 3
Default Value	0

CD80	Start lock (Run when power on)	Operation status when operation command source is changed
0	CD12=1, operation switch="ON" AC motor drive will run	CD12=1 → CD12=0, OPE7
1	CD12=1, operation switch="ON" AC motor drive doesn't run	CD12=1 → CD12=0 Keep previous status
2	CD12=0, operation switch="ON" AC motor drive will run	CD12=0 → CD12=1, AC motor drive will run
3	CD12=0, operation switch="ON" AC motor drive doesn't run	CD12=0 → CD12=1, AC motor drive doesn't run. operation switch need "OFF" then "ON". AC motor drive will run.

MT output signal selection
CD81

Setting Range	0 or 1
Default Value	0

0 : Analog frequency meter. (Mix output is CD14' s setting value)

1 : Analog current meter. (When CD82=100, MT mix. Output(10V) is
250% of rated AC motor drive current)

Note : 1V represent how mach current depend model.

Example : When CD82=100 & AP2G3-337 output 17A (rated AC motor
drive current), MT output 4V.

MT output gain
CD82

Setting Range	1 ~ 200%
Default Value	100%

FT3 Multi-Function Terminal 3
CD83

Setting Range	0 or 1
Default Value	1

0 : Disable .

1 : Software RESET.

FT2 Multi-Function Terminal 2 (Active mode setting)
CD84

Setting Range	0 or 1
Default Value	1

0 : Active high, FT2 terminal and COM terminal OFF active.

1 : Active low, FT2 terminal and COM terminal ON active.

RUN terminal
CD91

Setting Range	0 ~ 3
Default Value	0

ARR terminal
CD92

Setting Range	0 ~ 3
Default Value	1

0 : RUN(CD46).

1 : ARR(CD55).

2 : Section ending signal : Terminal output 10ms long signal if each speed is finished.

3 : Cycle ending signal : Terminal output 10ms long signal if each cycle is finished.

U.V.W. open protection
CD93

Setting Range	0 or 1
Default Value	1

0 : Disable.

1 : Enable.

Note 1 : CD93=1, display “UPLO” when U.V.W. open.

Note 2 : If output current is less than 20% (output rated current) or operation under circumstance of high frequency, we suggest canceling CD93.

Dead time compensation
CD94

Setting Range	0 or 1
Default Value	0

0 : Enable.

1 : Disable.

Communication address description

Model code
CD96

To know model code, using function 03H to read address 96(60H) content.

Version of program
CD97

To know version of program, using function 03H to read address 97(61H) content.

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
		Enter function mode
		Select function number 1 (parameter lock)
		Press "FUNC" again to change the parameter value
		Enable to change parameter
		Press "ENTER" to save the parameter and back to waiting mode
		Enter function mode
		Select function number 2 (acceleration time)
		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
		Press "ENTER" to save CD02=12.3 and back to waiting mode

CHANGE maximum frequency limit

Setting sequence	Display indicator	Description
		Enter function mode
 		Increase the value to 4
 		Select the second digit
		Increase the value to 1
		Press "FUNC" again to change the Maximum frequency limit
  		Select the second digit
  		Decrease the value to 90HZ
		Press "ENTER" 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 first.



FWD or REV only
OPE2

**Motor direction limiter.
See functions 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.

Low voltage
LOLO

U.V.W. open
UPLO

Communication loss or error
LOSE

DC braking mode
dcbr

This is normal.

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 unexpected 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 the 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		
LOLO	Low voltage	Input voltage is too low. The load is excessive.	Increase input voltage Reduce the load
UPLO	U.V.W. open	Output U.V.W. open	Check output U.V.W. circuit or setting CD93=0
LOSE	Communication loss or error		Check communication circuit or communication code
dcbr	DC braking mode	This is normal	Setting CD19

11. APPLICATION

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

DESCRIPTION :

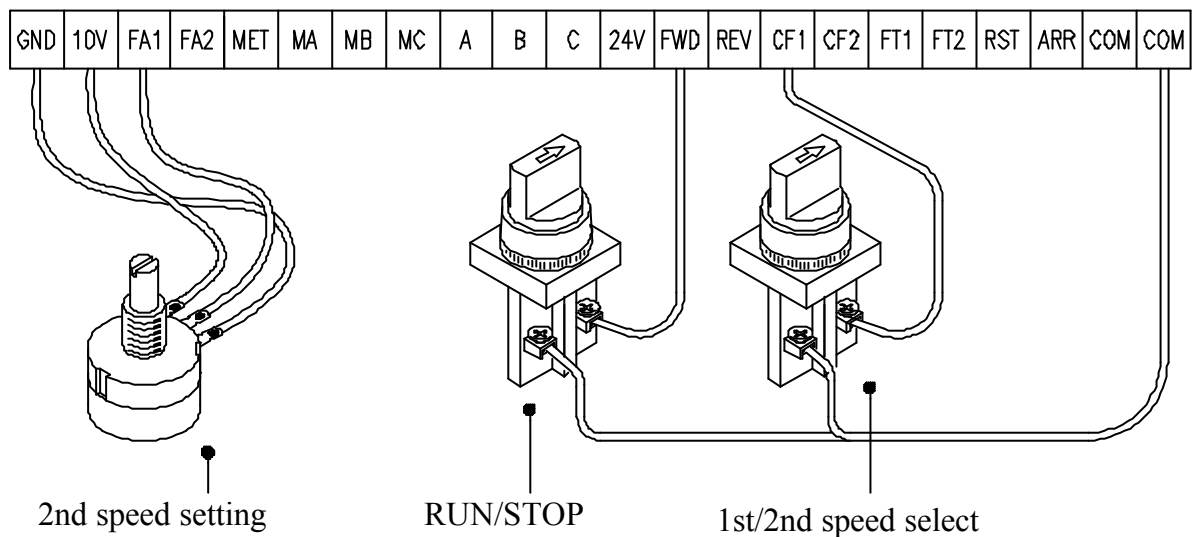
CD10 = 1 (Use frequency knob for 1st speed setting)

CD12 = 1 (External command)

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

SW1 = RUN / STOP

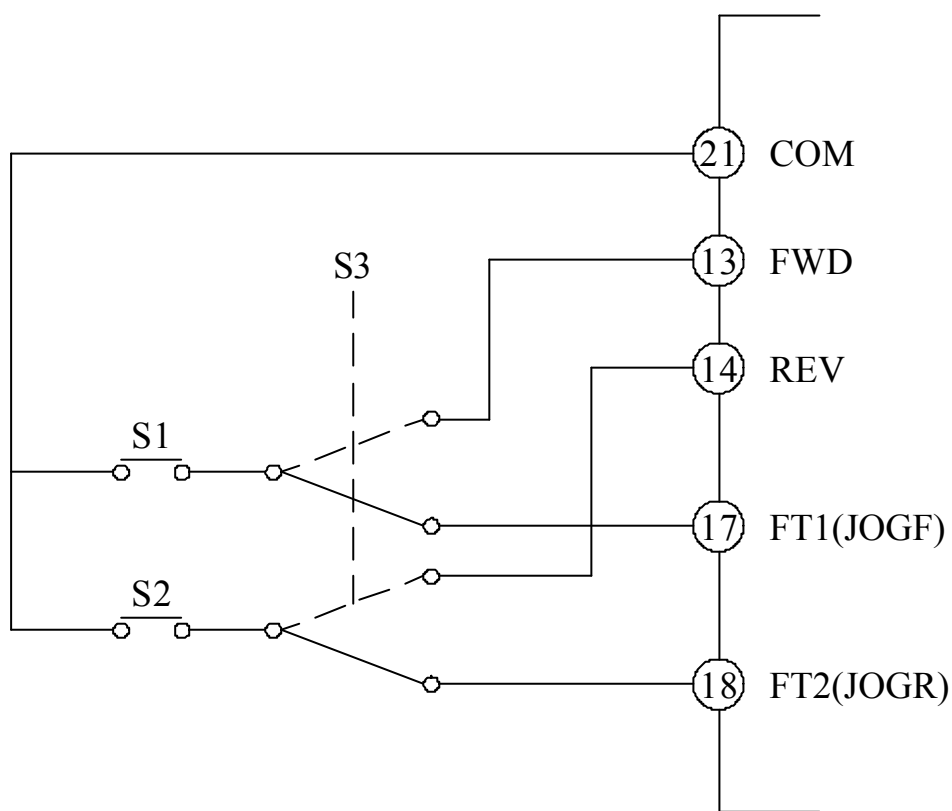
SW2 = 1st / 2nd speed



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

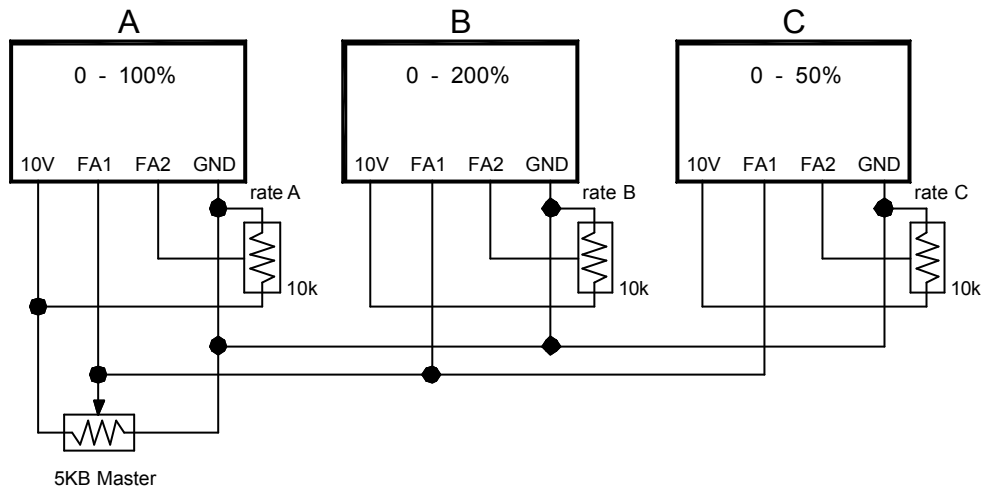
S3 = Normal/JOG select SW

EXAMPLE 03 : Master/slave driver system

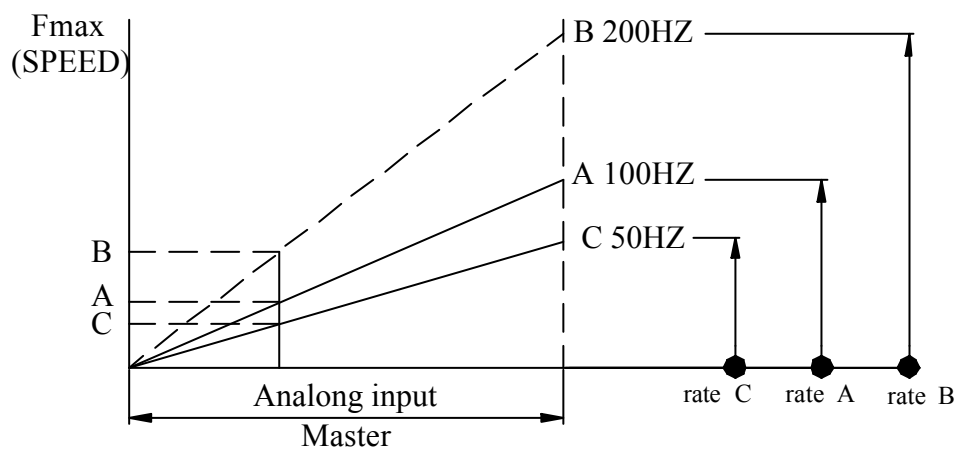
DESCRIPTION :

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

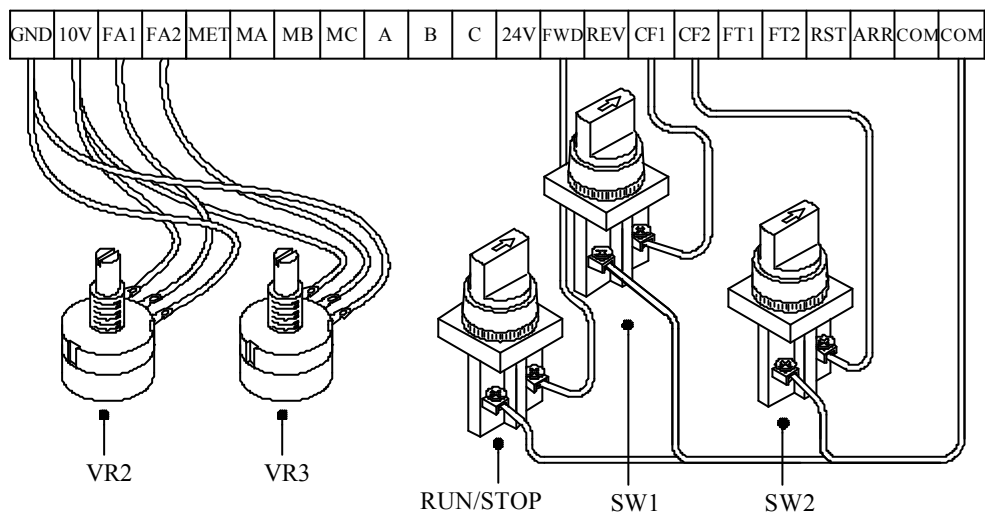


EXAMPLE 04 : Using VR for 3 stages

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 ; 3rd speed signal enter from FA2

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



EXAMPLE 05 : Basic external control setup

DESCRIPTION :

CD07 = 120HZ

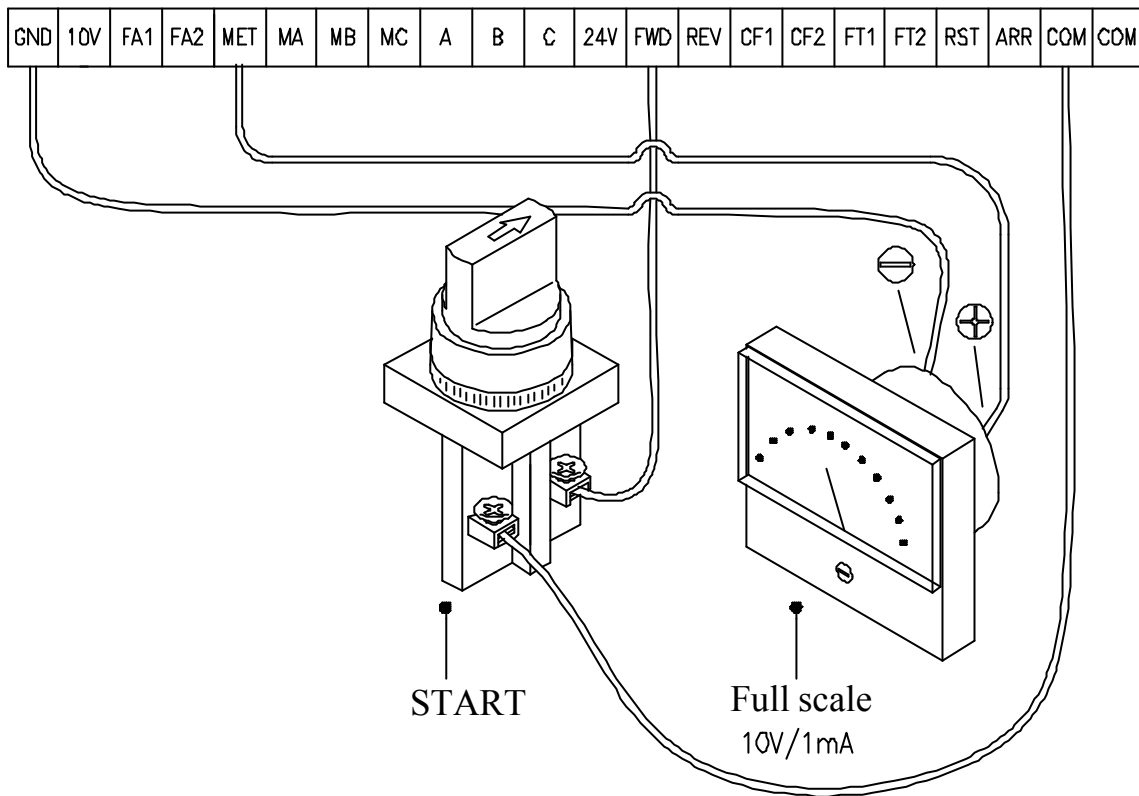
; See maximum value on the meter

CD10 = 1

; External analog(Pannel VR)

CD12 = 1

; External command

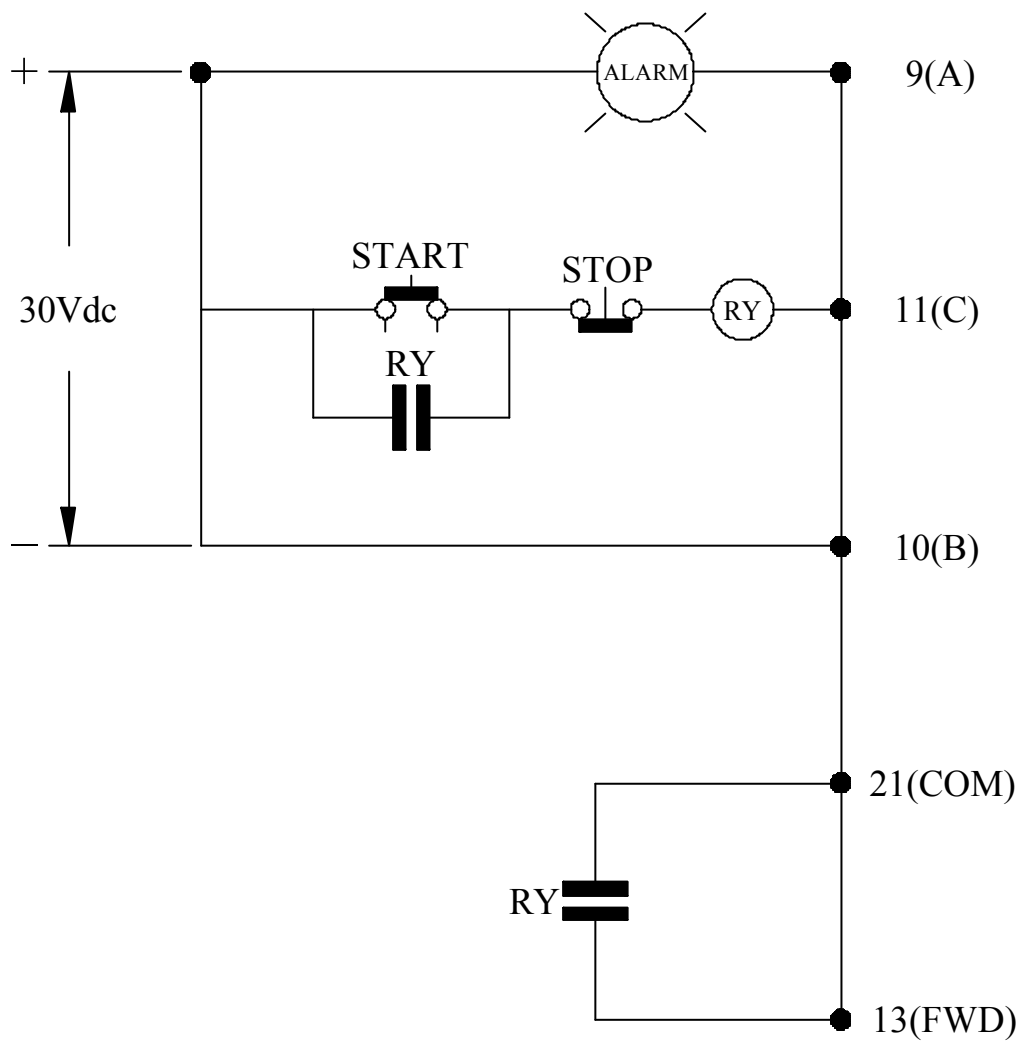


EXAMPLE 06 : Alarm output

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 inertia load Load with power transmission and accumulation
	Load speed and torque characteristics	Constant torque Constant power Decreasing torque
	Load characteristics	Motoring Braking or overhanging load Constant load Shock load Repetitive load High-start torque Low-start torque
Operation	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 impedance Voltage fluctuations Number of phases, single 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

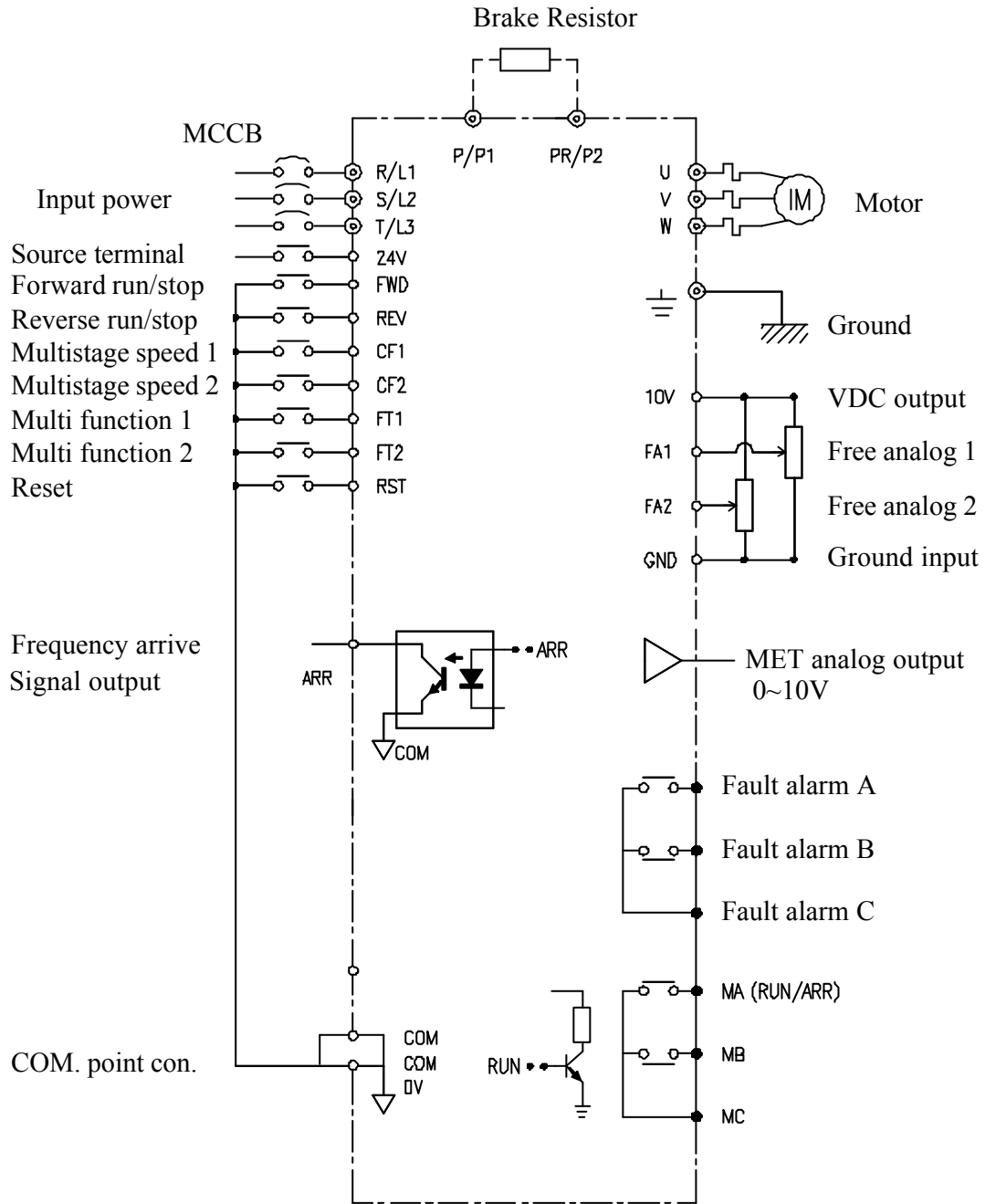
A. Optional braking resistor

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

Unit : Ohm

Model No	37	55	75	110	150	185	220
AP2	20	12	12	11	8	8	8
AP4	100	40	40	24	30	22	22

B. Terminals wiring diagram



MEMO

MEMO

MEMO

MEMO

MEMO

MEMO

INSTRUCTION MANUAL

PART NO : E-PHAA-EAPA08

Model : APxG3 series

JUL. 2018 8^h edition

ISO 9001 



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