Chapter 3

Wiring

3.1 Internal Block Diagram

3.2 Power Board Wring

3.3 Timing Diagram

3.4 Wiring control Signal

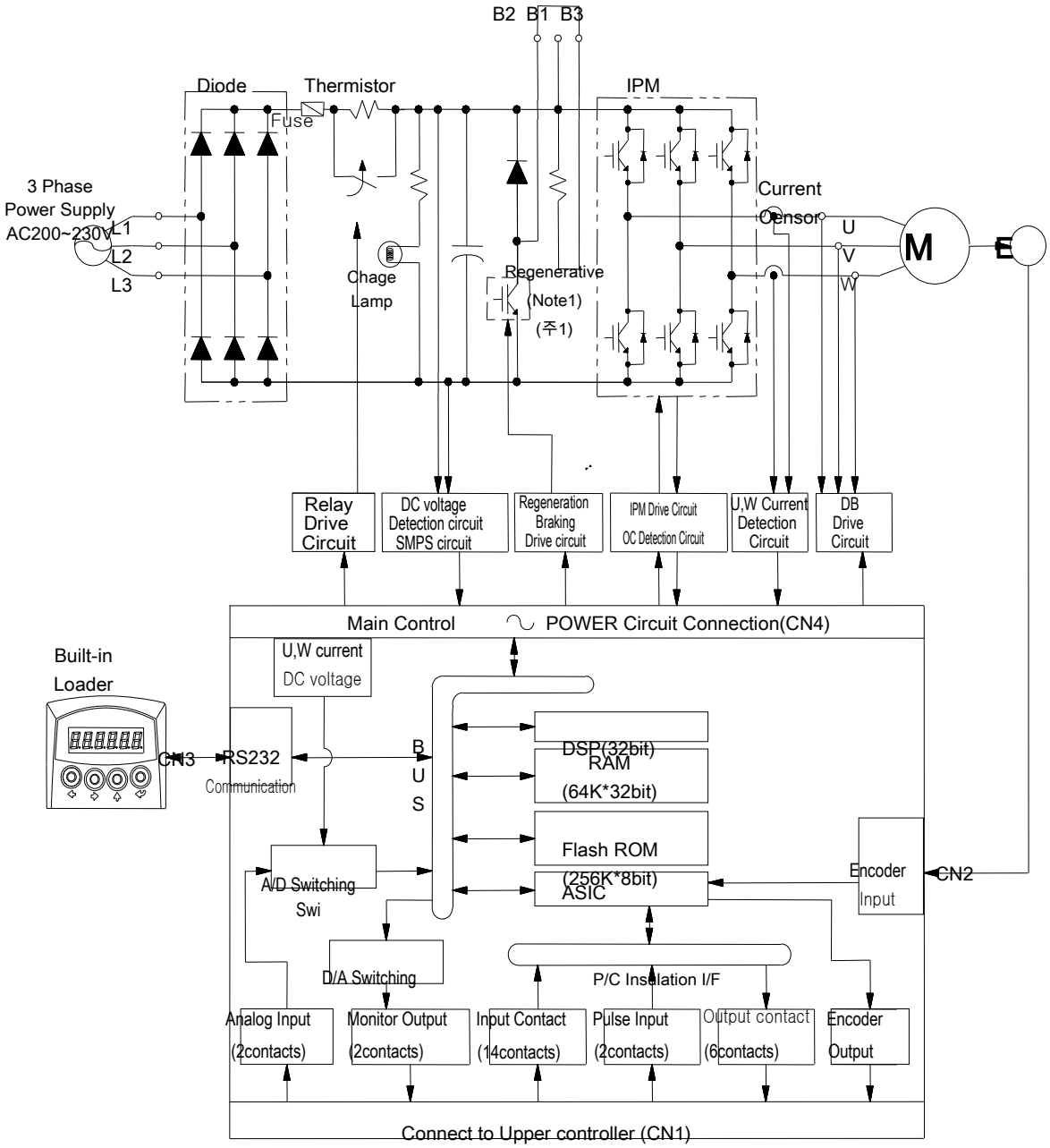
3.5 Incremental Encoder Signal (CN2) Wiring

3.6 Absolute Encoder Signal (CN2) Wiring

3.7 Communication (Option) Signal Wiring

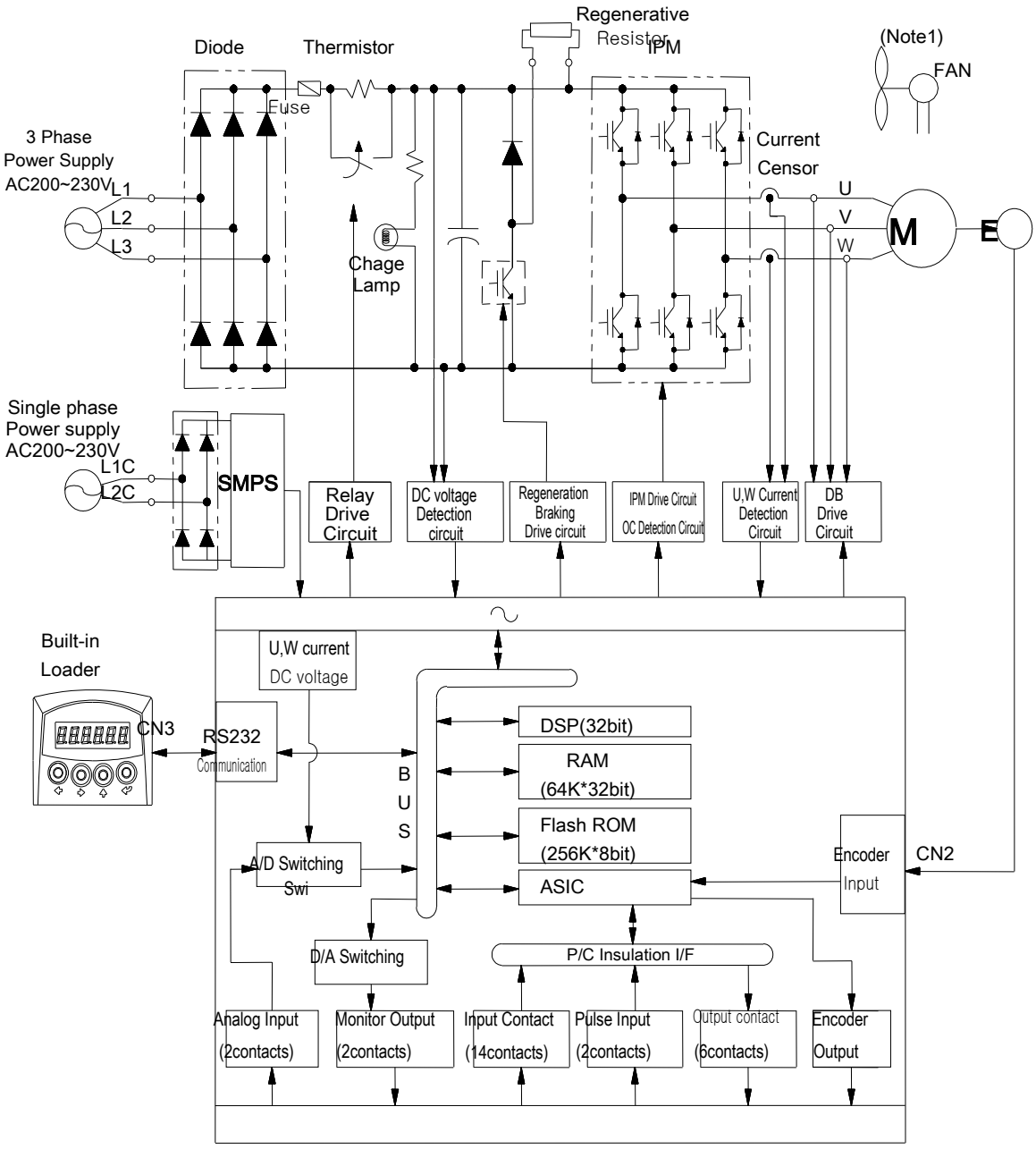
3.1 Internal Block Diagram

3.1.1 Block Diagram(Rated Output is less than 400[W])
[APD-VSR5 ~ APD-VS04]



(Note1) B2-B3 short pin and Regenerative resistor is installed in ONLY APD-VS02, VS04 Type

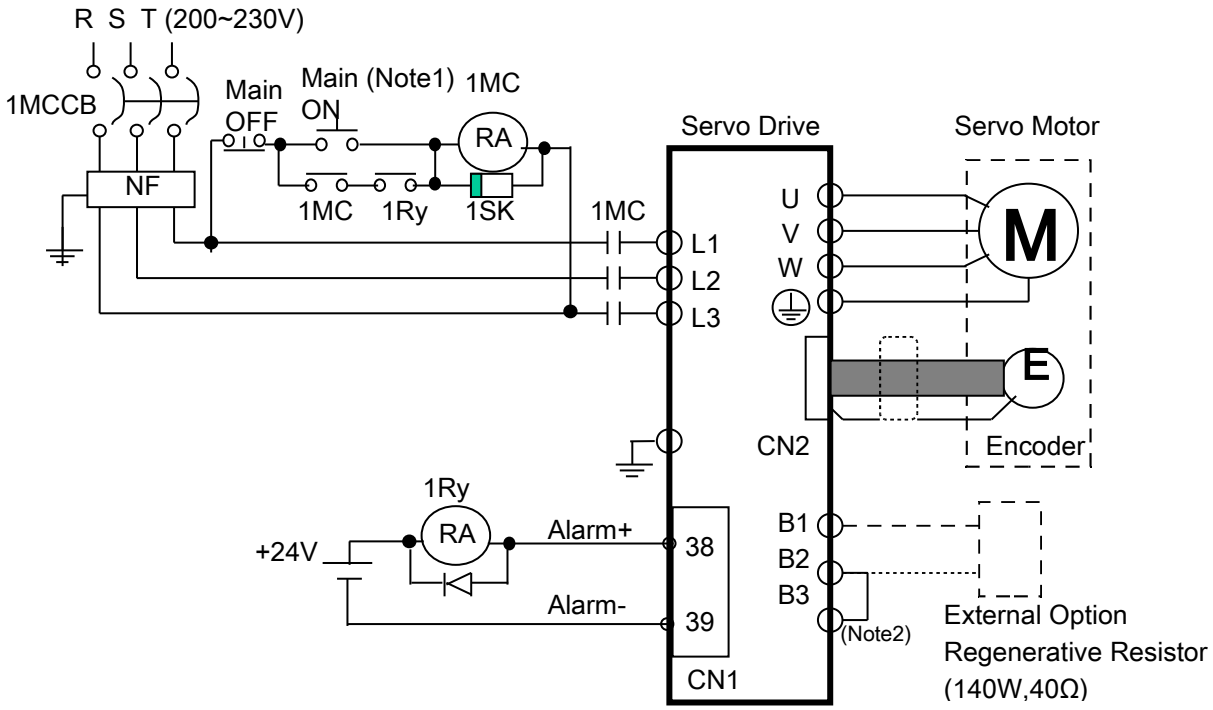
3.1.2 Block Diagram (Rated Output is from 0.5 to 37.0[kW])
[APD-VS05~APD-VS370]



(Note1) APD-VS35, VS50, VS75 Type is cooled forcibly by DC24[V] cooling fan.
APD-VS110 Type is cooled forcibly by AC220[V] cooling fan.

3.2 Power Board Wiring

3.2.1 Wiring (Rated output is less than 400[W]) [APD-VSR5 ~ APD-VS04]



(note1) : It takes approximately 1~2 seconds before alarm signal is activated after power is connected. Press main power on switch for at least 2 seconds of longer.

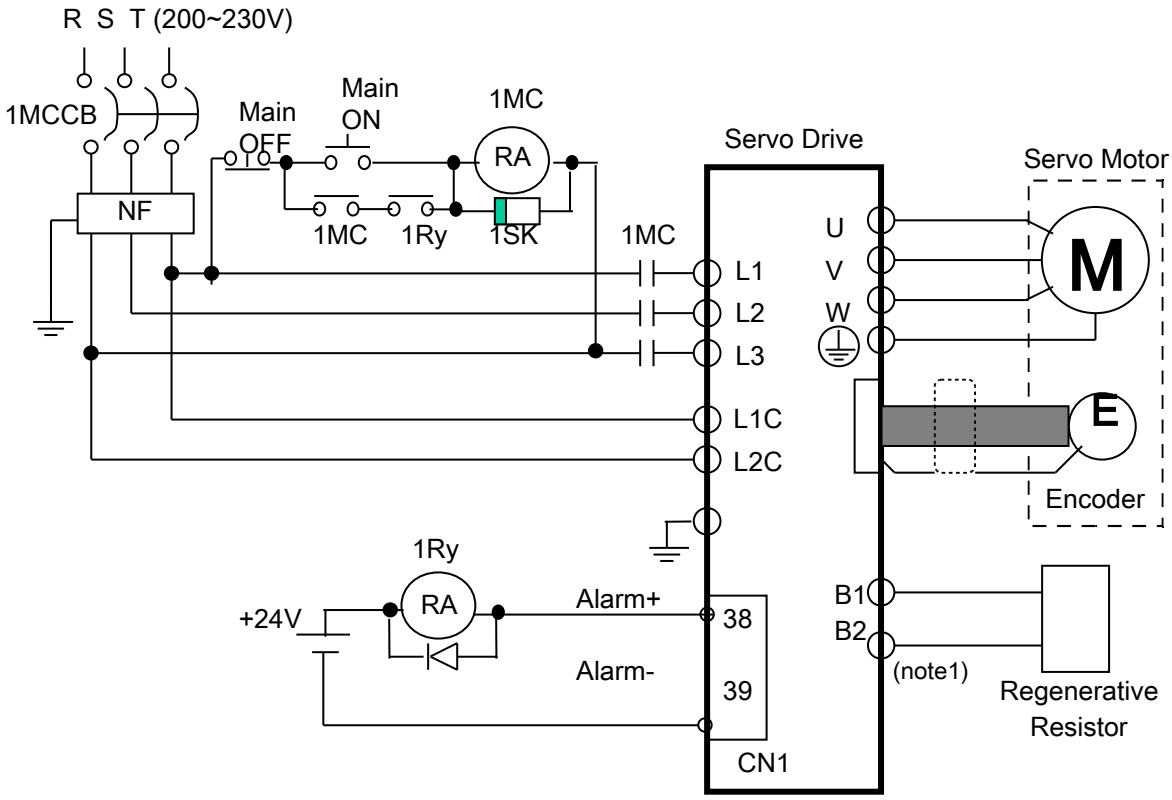
(Note2) : B2-B3 short pin and regenerative resistor is installed in APD-VS02, VS04 Type (but, there are no regenerative circuit, and regenerative resistor in APD-VSR5~01 type)

Open short pin(B2-B3), and connect external regenerative resistor to (B1-B2) in case of regenerative capacity is large due to frequent acceleration / deceleration. At this time, Make sure that the optional Brake resistor should be 140[W], 40[Ω].

(Note3) : For the electric wire that is to be used at Main circuit power board, strip the coating of wire about 10~12[㎜] as below and use the exclusive terminal which is Ferule UA-F1512 (Made by Suh-il Electronics).

(Note4) : Connect or remove the wiring of main circuit power board after press the button (▭) of terminal.

3.2.2 Wiring (Rated output is from 0.5 to 37.0[kW]
[APD-VS05~APD-VS370]



(Note1) : If regenerative capacity is large due to frequent acceleration/deceleration, the same value of resistor and larger capacity of regenerative resistor than that of normal resistor provided should be used.

The resistor value of standard regenerative resistor for each capacity of drive is as below.

APD-VS[Standard Type] Manual

3.2.3 Power circuit parts specification

Type	R5	01	02	04	05	10	15	20	35	50	75	110	150
NFB	ABS33bM(8A)					12A	16A	24A		53Bm(45A)		63bM(60A)	103bM(90A)
NF (Noise Filter)	NFZ-410SM						415SM	420SM	430SM	4040SM		4050SM	4080SM
MC	GMC-9(11A) or equivalent				GMC-18(18A)			GMC-40(35A)		GMC-50(50A)		75A	100A
Power Wire	AWG16 (1.25 SQ)				AWG14 (2 SQ)		AWG12 (3.5 SQ)		AWG10 (5.5 SQ)			AWG8 (8 SQ)	AWG6 (14SQ)
Compressed terminal	UA-F1512,SEOIL (10mm Strip&Twist)				GP110012 KET		GP110721 KET		GP110028 KET			GP140841 KET	14*8
Regenerative resistor (Provided)	-		Internal 50[Ω] (50[W])		40 [Ω] (140[W])		23 [Ω] (300[W])		23 [Ω] (300[W] x2P)			Option	

Type	220	300	370	
MCCB	150P	200P	250P	
NF (Noise Filter)	RFY4150	RFY4200	RFY4250	
MC	150A	200A	250A	
Power Wire	AWG2 (38SQ)	AWG2/0 (60SQ)	AWG3/0 (80SQ)	
Compressed terminal	38-10	60-10	80-10	
Output rated current	125A	185A	210A	
Output Wire	AWG2/0 (60SQ)	AWG3/0 (80SQ)	AWG4/0 (100SQ)	
Compressed terminal	60-10	80-10	100-10	
Regenerative resistor (Provided)	Option			

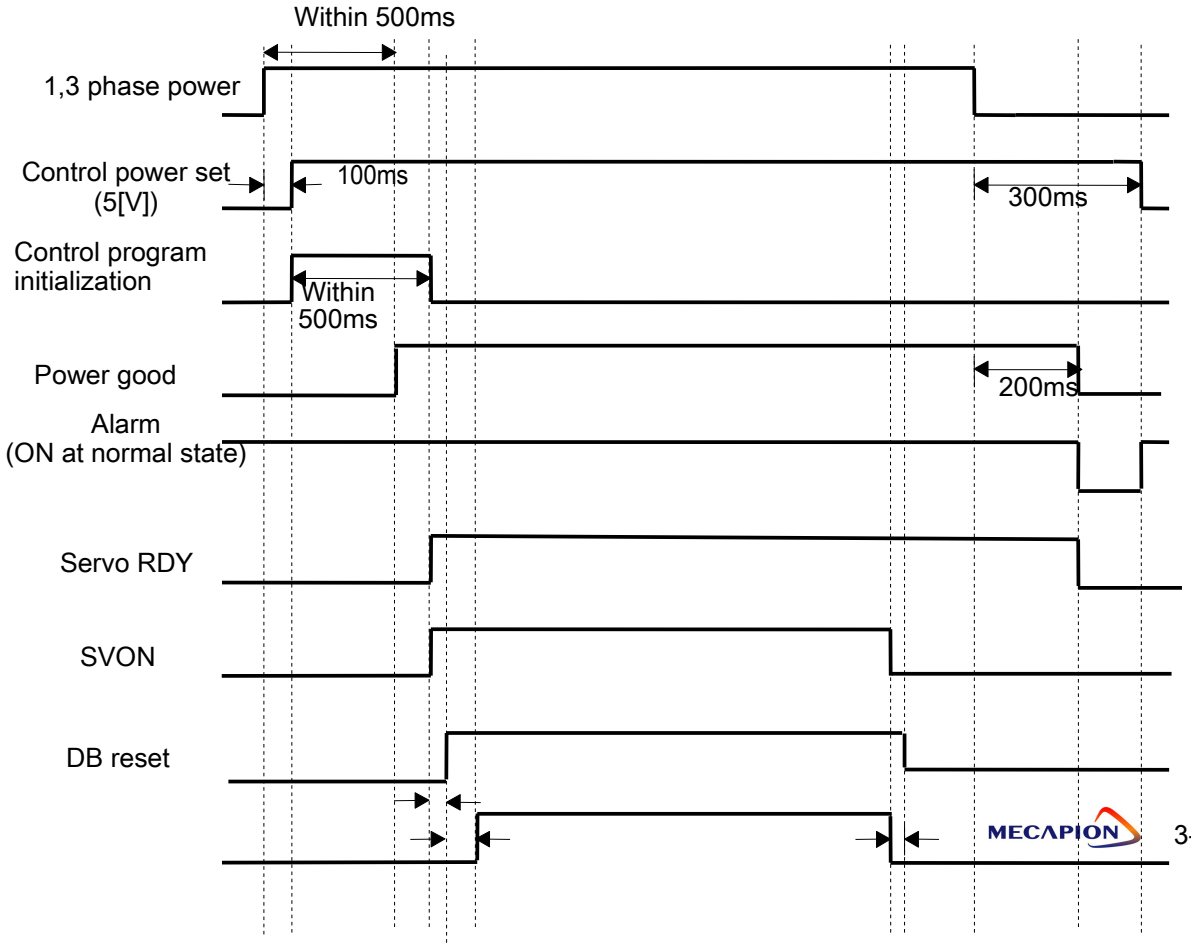
3.3 Timing Diagram

3.3.1 Timing diagram at power supplied

In the case of APD-VSR5~VS04, Power is supplied to the control circuit if 3-phase power is connected to the L1, L2, L3 terminals.

In the case of APD-VS05~VS370, Power is supplied to the control circuit if single-phase power is connected to the L1C, L2C terminals and 3-phase power is connected to the L1, L2, L3 terminals.

Servo becomes RDY after maximum 500[msec] that are required to initialize the drive system inside, and when the servo drive signal is turned ON, operation starts 30[msec] later.

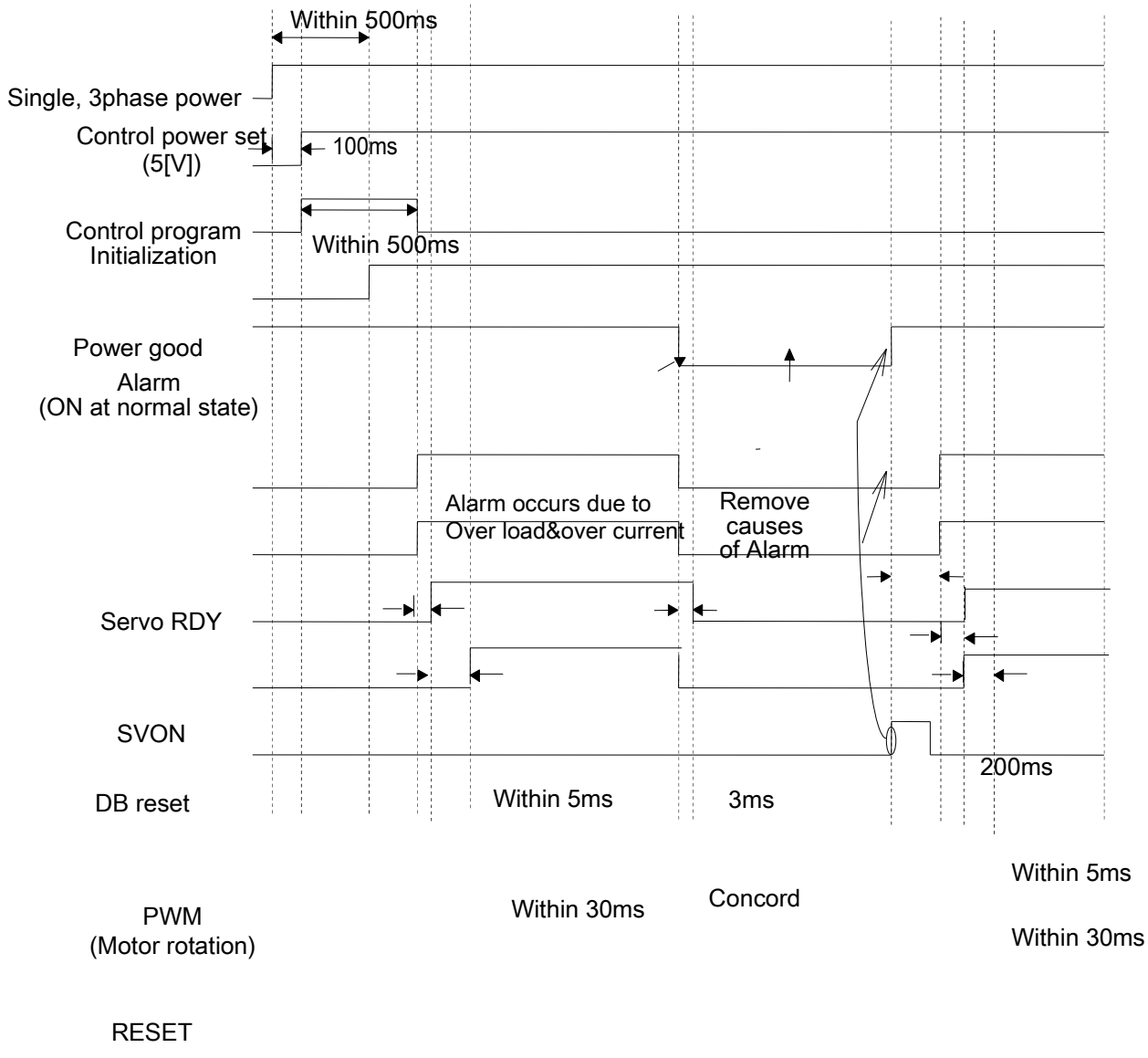


PWM (Motor rotation	Within 5ms Within 30ms	3ms

3.3.2 Timing diagram at Alarm occurred

If Alarm occurred in the drive system, PWM is shut off and the motor stops.

> CAUTION Check and remove causes of Alarm and turn OFF the servo motor operating command(SVON) before resetting Alarm.

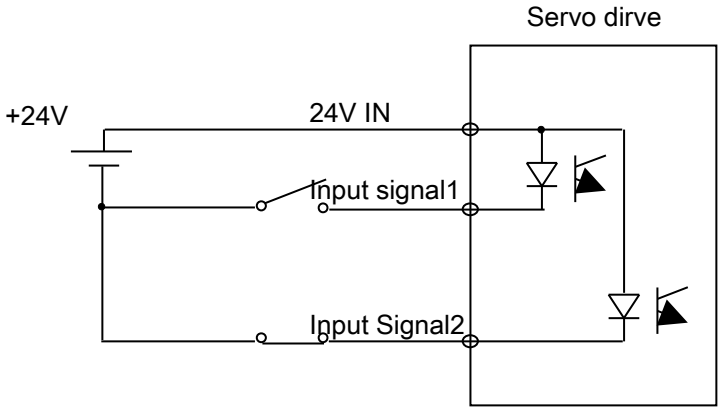


3.4 Wiring of Control Signal

3.4.1 Input Contact Signal

CAUTION

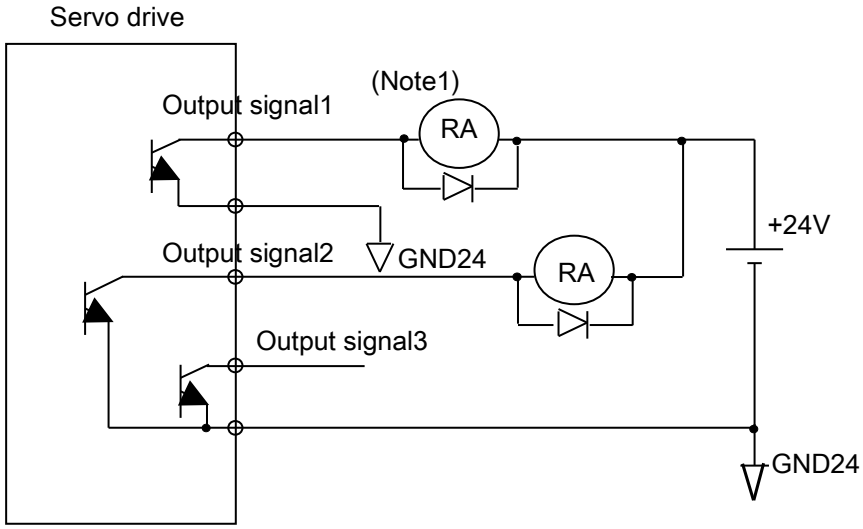
The input contacts are classified into A contact and B contact depending on the contact characteristics and can be reset by the menu [PC-807], And special caution is required because each contacts can forcibly be ON/OFF.



3.4.2 Output Contact Signal

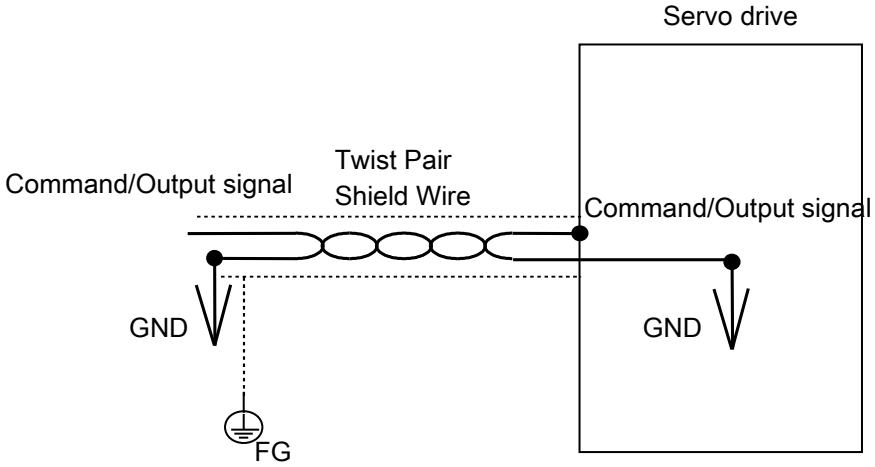
CAUTION

The output contact internally uses transistor switch. Take precaution because over voltage or over current may cause damage to the system.
- Power supply : DC24[V]±10%, 150[mA]



(Note1) For the output signal of Alarm and Ready, the GND24 terminal is separated.

3.4.3 Analog I/O Signal



① GND terminal must be 0[V] of the control power supply.

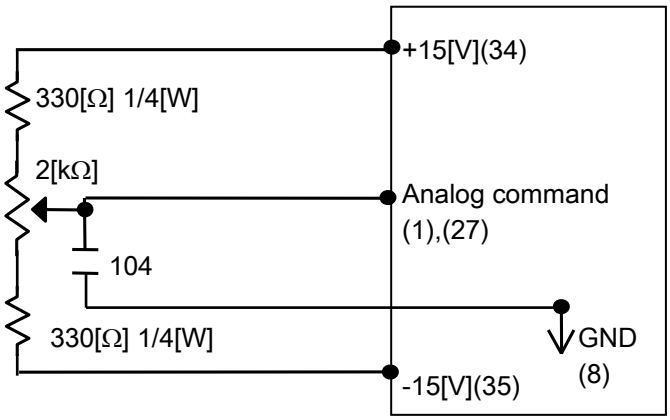
② Input signal command voltage is within ±10[V], and input impedance is 10[kΩ].

③ Output signal voltage of Monitor1(No.28), Monitor2(No.29) is ±5[V].

Addition to this, when controlling analog input by variable resistance using offered power by drive, wiring is as under.

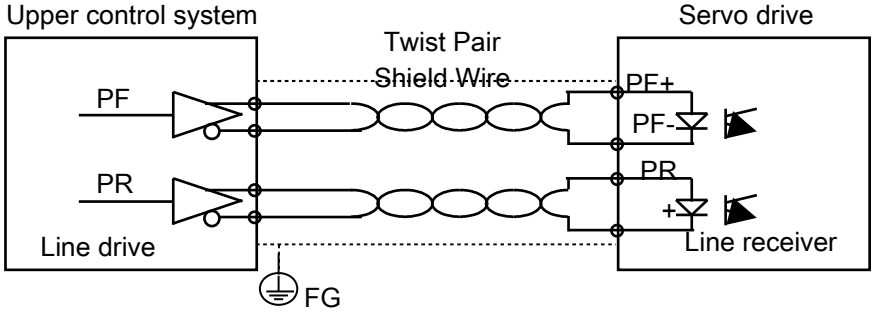
The output capacity of this power is 30[mA] at maximum.

Do not exceed this capacity.

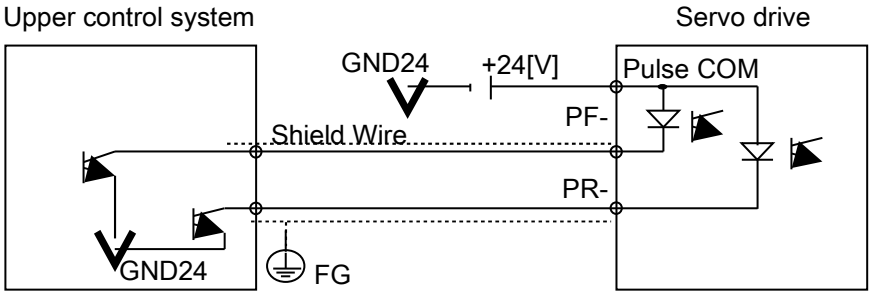


3.4.4 Pulse Input Signal

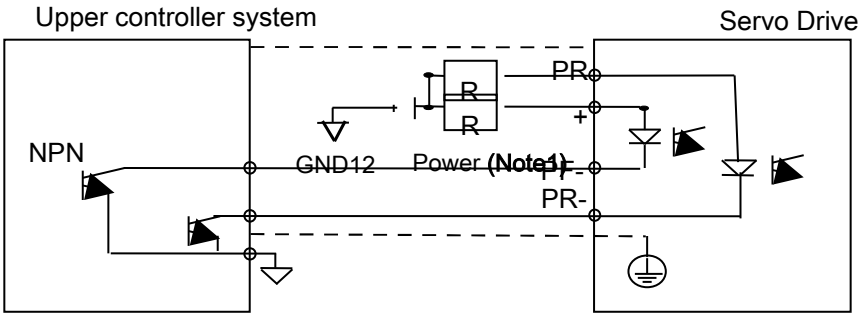
(1) Line driver(5[V]) Pulse input



(2) Open collector(24[V]) Pulse input



(3) 12[V] or 5[V] NPN Open Collector Pulse Command



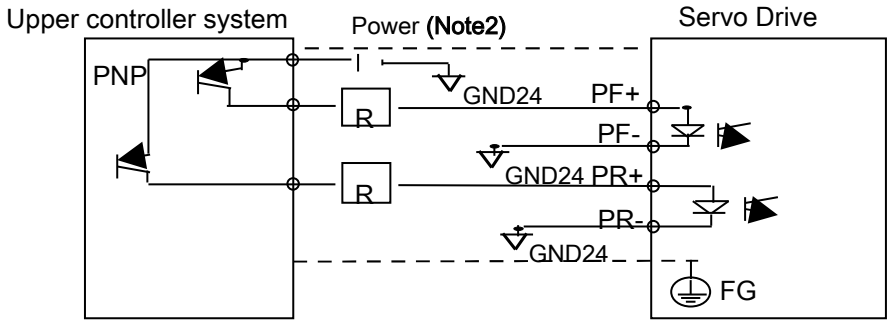
PF+

(Note1) When the power supply 12[V] is used : Resistance R=560~680[ohm], 1/2W

When the power supply 5[V] is used : Resistance R=100~150[ohm], 1/2W

When the power supply 24[V] is used : Resistance R=1.5[ohm], 1/2W

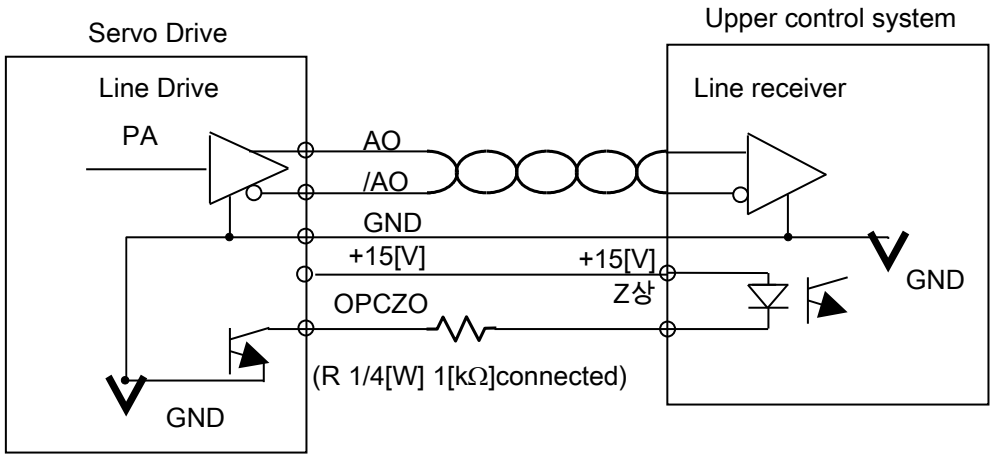
(4) PNP Open Collector type pulse command



(Note 2) When the power supply 24[V] is used: Resistance R=1.5[kohm], 1/2W
When the power supply 12[V] is used: Resistance R=560~680 [ohm], 1/2W
When the power supply 5 [V] is used: Resistance R=100~150[ohm], 1/2W

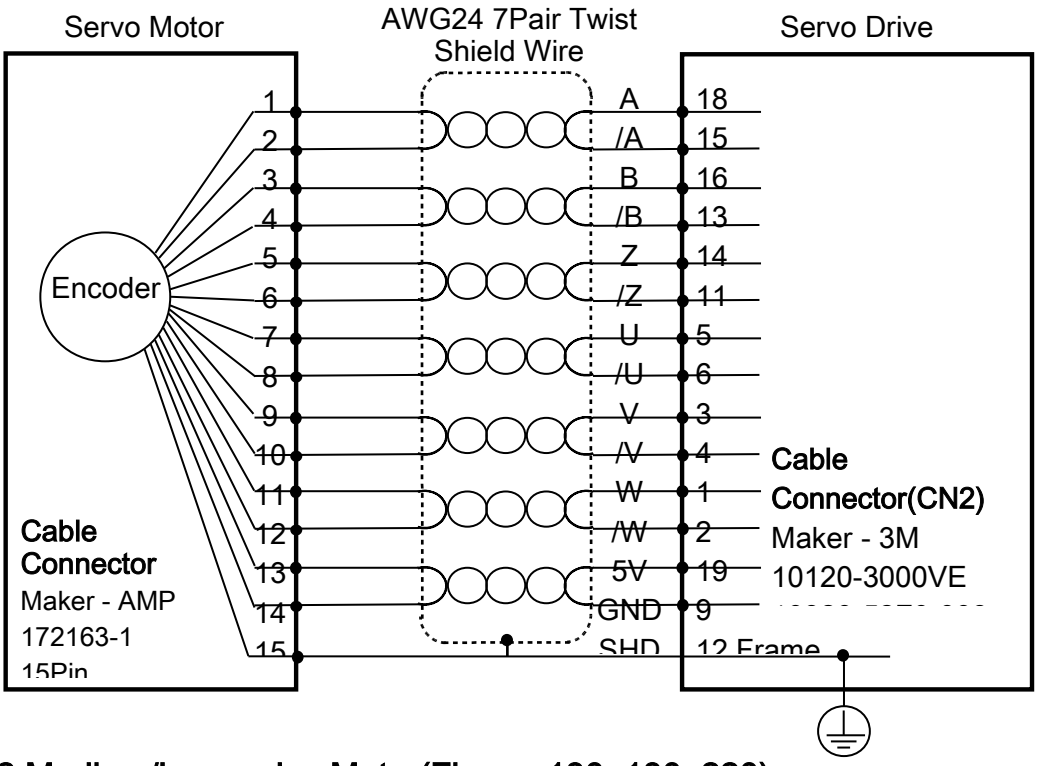
3.4.5 Encoder Output Signal

The encoder signal is produced based on 0[V](GND) of control power supply. Connect 0[V] terminal of the circuit which receives this signal from the upper control system to the 'GND' terminal of CN1. Encoder signal is produced in line drive system after the AC servo motor encoder signal received from CN2 is divided according to the frequency dividing ratio set by the menu [PE-510](Pulse Out Rate). Or in case of Z phase, there is also open collector output.

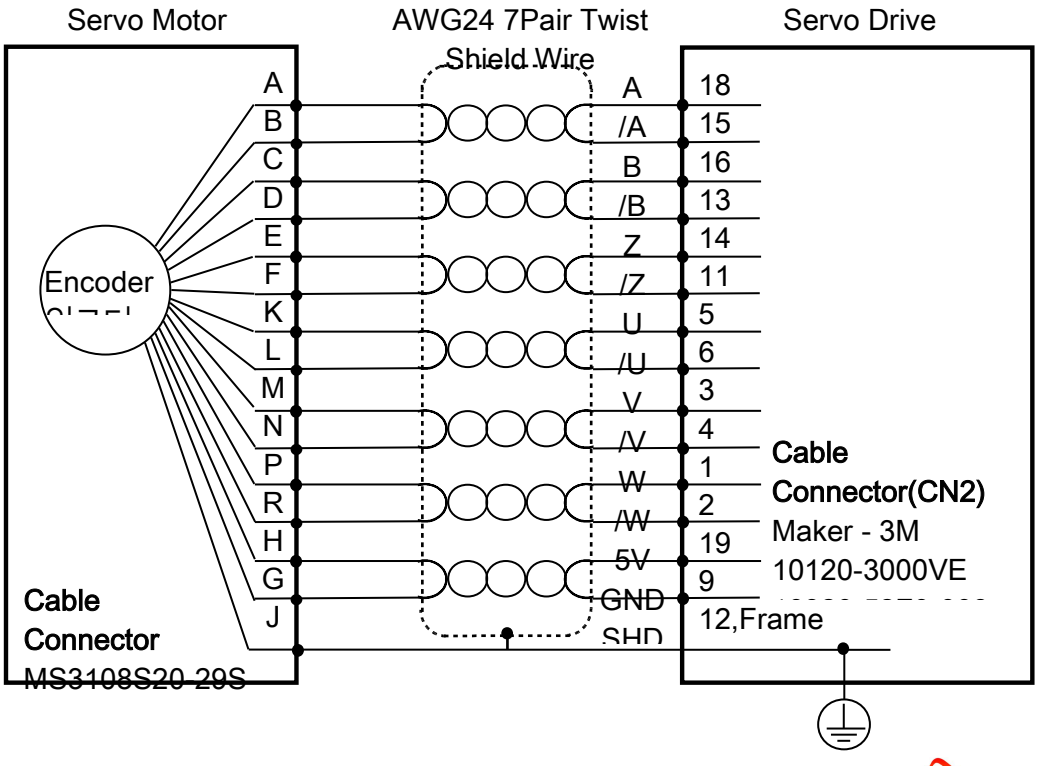


3.5 Wiring of Incremental Encoder Signal(CN2)

3.5.1 Small-size Motor(Flange 40, 60, 80)

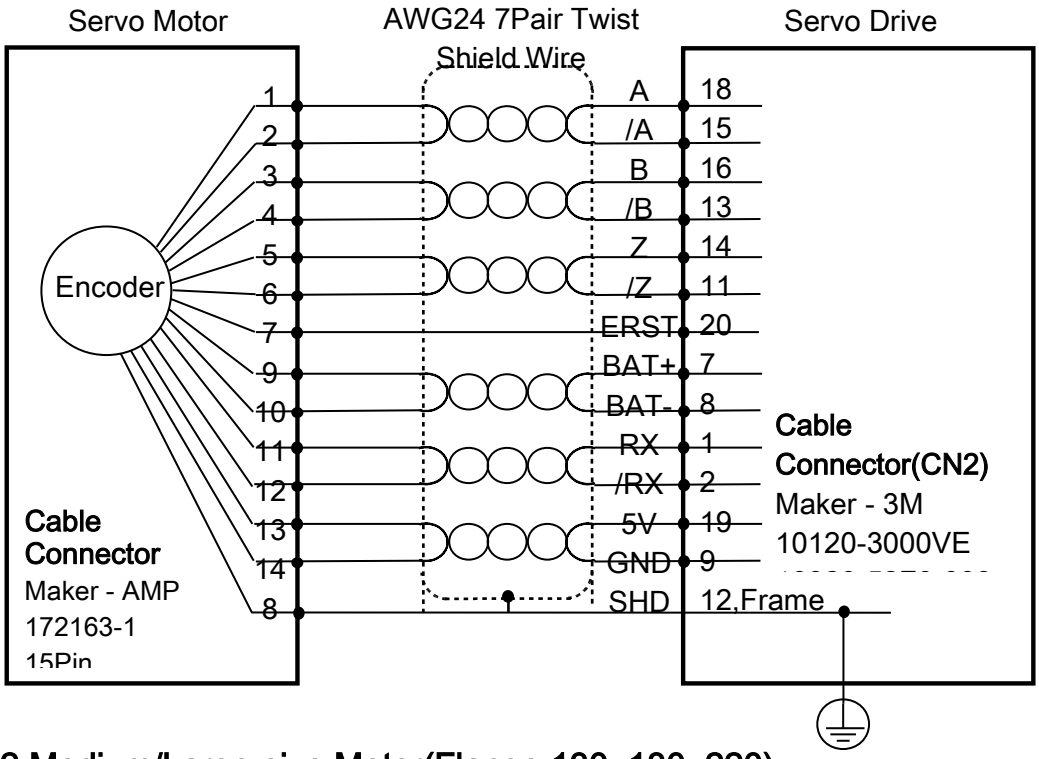


3.5.2 Medium/Large-size Motor(Flange 130, 180, 220)
Special/Large-size Motor(Flange 250, 280)

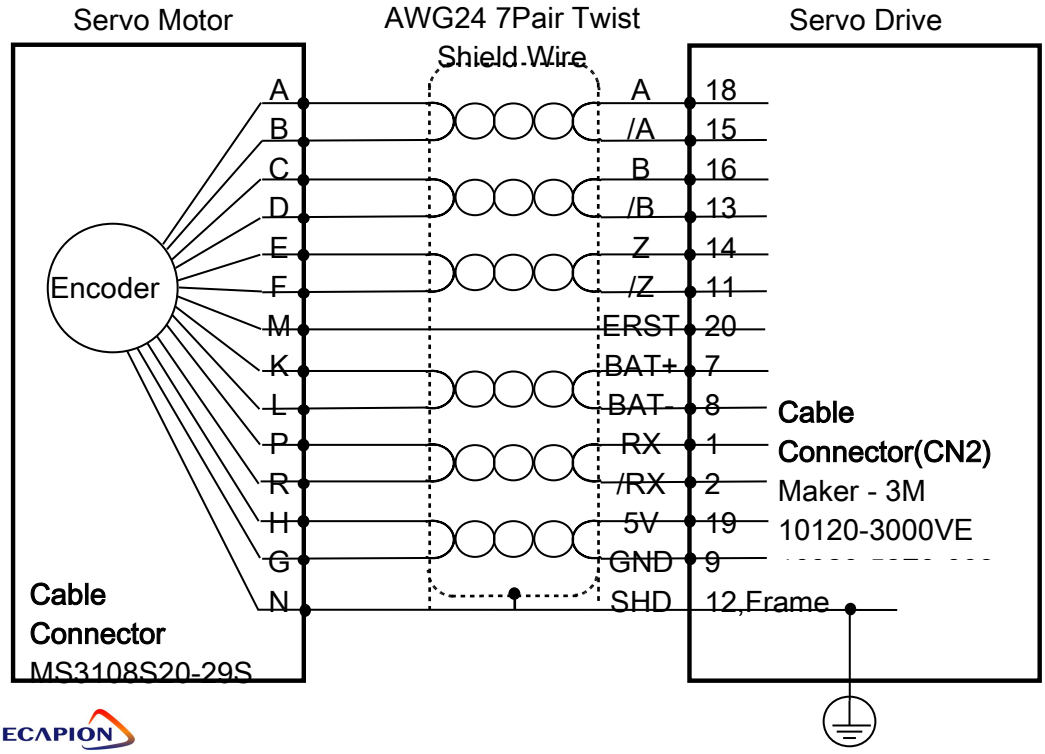


3.6 Wiring of Absolute Encoder signal(CN2)

3.6.1 Small-size Motor(Flange 40, 60, 80)



3.6.2 Medium/Large-size Motor(Flange 130, 180, 220)
Special/Large-size Motor(Flange 250, 280)



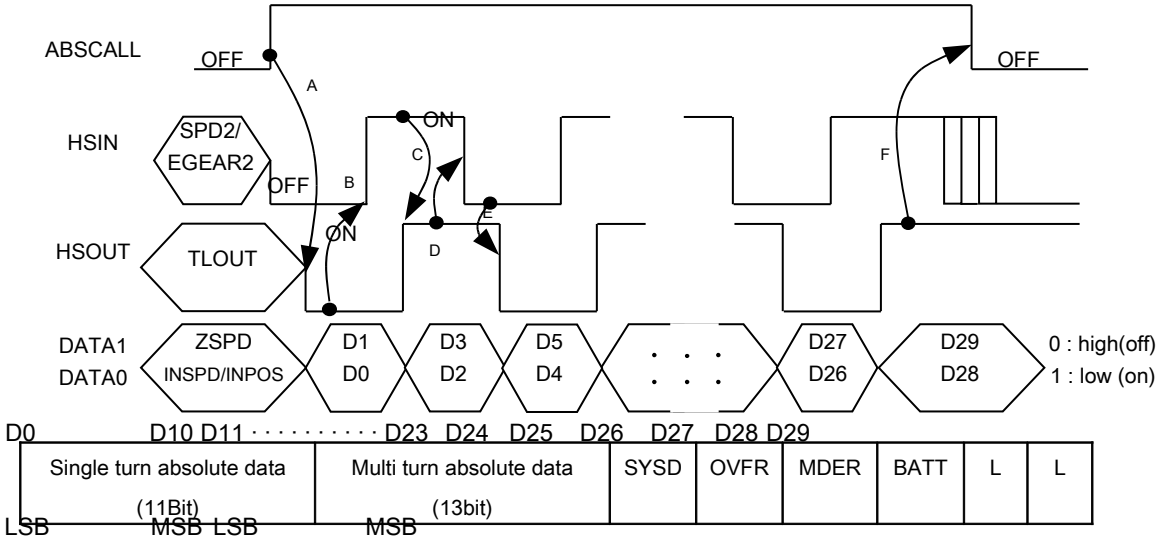
3.6.3 How to use Absolute Encoder

Set Encoder type[PE-203] to “6” when the absolute value Encoder is used. When Encoder type [PE-203] is set to “6”, the input contact ‘SPD3/MODE’ is automatically reset to the absolute position call(ABSCALL). Therefore, Switch operation mode “3, 4, 5” of Operation Mode [PE-601] and internal speed command “4, 5, 6, 7” used ‘SPD3’ at speed control servo are not possible to use.

(1) Absolute position data transmission by upper controller

The absolute position call (ABSCALL) must remain “ON” from the time absolute position transmission is requested to the time transmission is completed, and if the absolute position call(ABSCALL) is turned OFF during transmission, transmission stops and the mode return to initial state. To request absolute position transmission, change the absolute position call(ABSCALL) signal from OFF to ON when the servo is turned OFF. When the absolute position transmission starts based on the absolute position call(ABSCALL), the following I/O signals are reset to function pin for transmission.

If ABSCALL signal is turned OFF	If ABSCALL signal is turned ON
Rotation speed selection2 /Electric gear ratio selection2 (SPD2/EGEAR2)	Handshake Input (HSIN)
INSPD/INPOS ZSPD	Transmission data0 (DATA0) Transmission data1(DATA1)
TLOUT	Handshake Output (HSOUT)



Transmission data is “0” at electrically HIGH(contact OFF), and “1” at electrically

LOW(contact ON)

(2) Sequence of Absolute position Data transmission with upper controller

① If ABSCALL is turned ON from Upper control like PLC, the servo drive reads the absolute value at this time, turns “ON” HSOUT, and displays 2 LSB Data (D0, D1) on DATA0 and DATA1, Servo “ON” is ignored until transmission is completed thereafter. (A)

② Upper controller(PLC) verifies HSOUT is turned “ON”, reads D0, D1, and turns “ON” HSIN. (B)

③ The servo drive verifies that HSIN has been turned “ON”, turns “OFF” HSOUT, and displays D2 and D3 on DATA0 and DATA1. (C)

④ Upper Controller(PLC) verifies HSOUT is turned “OFF”, reads D2 and D3, and turns “OFF” HSIN. (D)

⑤ The servo drive verifies that HSIN has been turned “OFF”, turns “ON” HSOUT, and displays D22 and D23 on DATA0 and DATA1. (E)

⑥ The upper controller(PLC) reads absolute value by repeating the process of item ① through ⑤ above, turns “OFF” ABSCALL, and completes absolute position Data transmission (F)

⑦ The functions of HSIN, HSOUT, DATA0 and DATA1 pins are automatically reset to the pins of original ‘SPD2/EGEAR2’, ‘TLOUT’, ‘INSPD/INPOS’ & ‘ZSPD’ respectively, and the servo can be turned ON.

Note1) In case alarm occurs when attempting to transmit absolute position, reset alarm first and turn “ON” ABSCALL.

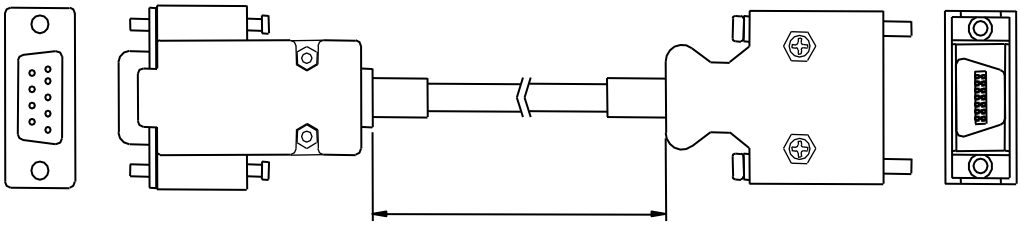
Note2) If ABSCALL is turned ON, the functions of ‘SPD2/EGEAR2’ are automatically reset to HSIN. If ‘SPD2/GEAR2’ pins are turned “ON” at this time, HSIN is recognized as being turned “ON”, and transmission error might occur.

Therefore, when ABSCALL is turned “ON”, turn “OFF” the ‘SPD2/EGEAR2’ (HSIN) pins.

3.7 Wiring of Communication (Option) Signal

3.7.1 PC-Communication (for RS232C)

This cable is for only PC-communication option cable to set servo drive menu by serial communicating of servo drive and PC.



[PC- Serial Port] [Servo Drive- CN3]

Content	PC-Serial Port	Servo Drive-CN3
Connector name	HDEB-9S	10114-3000VE
Case name	3600-09-G-L	10314-52A0-008
Wiring	NO.2(RXD)	NO.6(TXD)
	NO.3(TXD)	NO.5(RXD)
	NO.5(GND)	NO.11,NO.12(GND)
	×	Case(Shield)
Cable length	1,2,3,5[m]	

In Windows98, Serial Port(COM1) setting is as below.

(Setting > Control panel > System > Device manager > Port >

Communication port(COM1) > Port setting)

Bps : 9600[bps] or 19200[bps] (Set it as the same speed in the menu [PE-202])

Data bit : 8

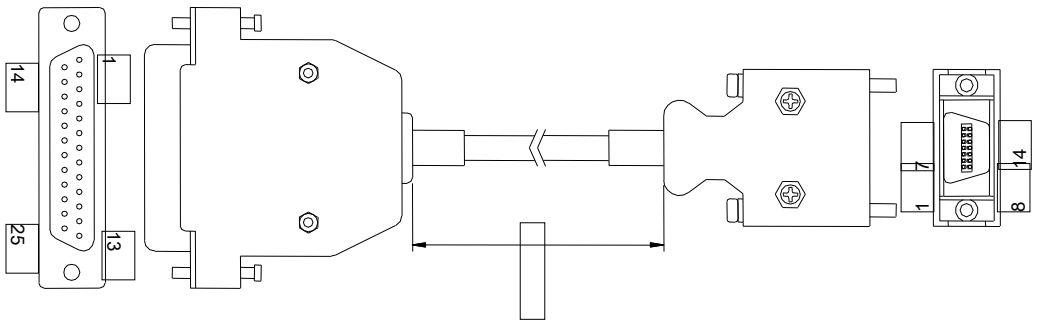
Parity : none

Stop bit : 1

Flow control : Xon/Xoff

3.7.2 Communication for only Servo (for O/S Download)

This cable is for only servo communication cable to upgrade O/S(Operating Software) by parallel communication of servo drive and PC.



[PC-Parallel Port]

[Servo Drive- CN3]

Contents	PC-Parallel Port	Servo Drive-CN3
Connector name	HDBB-25P	10114-3000VE
Case name	3600-25-G-L	10314-52A0-008
Wiring	NO.15(ERROR)	NO.1(DXO)
	NO.8(DATA6)	NO.2(FSRX)
	NO.7(DATA5)	NO.3(CLKRX)
	NO.9(DATA7)	NO.4(CLK)
	NO.16(INIT)	NO.8(RESET)
	NO.18(GND)	NO.9(INT2/3)
	NO.6(DATA4)	NO.10(DRO)
	NO.20(GND)	NO.11(GND)
	×	Case(Shield)
Cable length	1, 2, 3, 5[m]	

In Windows98, Parallel Port(LPT1) setting is as below.

(Setting > Control panel > System > Device manager > Port > Print port(LPT1) > resource)

Range of I/O : 0378 ~ 037B

Request of interrupt : 07

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