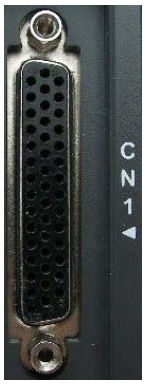
3.3 I / O Signal (CN1) Connection

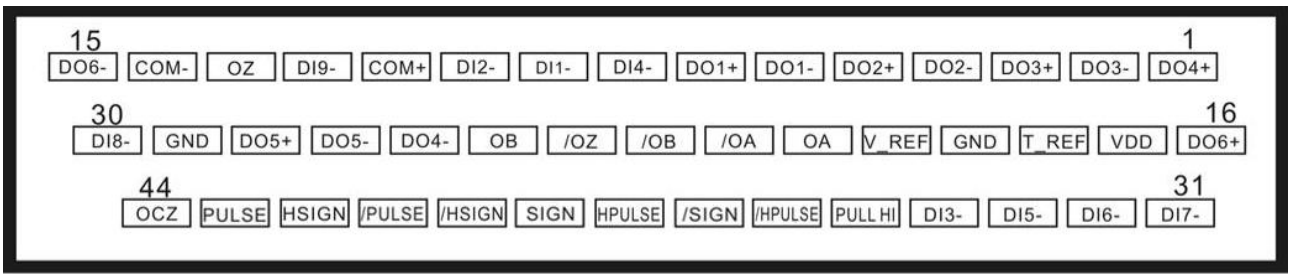
3.3.1 I/O Signal (CN1) Connector Terminal Layout

In order to have a more flexible communication with the master, 6 programmable Digital Outputs (DO) and 9 programmable Digital Inputs (DI) are provided. The setting of 9 digital inputs and 6 digital outputs of each axis provided by ASDA-B2, which are parameter P2-10~P2-17, P2-36 and parameter P2-18~P2-22, P2-37 respectively. In addition, the differential output encoder signal, A+, A-, B+, B-, Z+ and Z-, input of analog torque command, analog speed/position command and pulse position command are also provided. The followings are the pin diagrams.



Side View

Rear View



1	DO4+	Digital output
2	DO3-	Digital output
3	DO3+	Digital output
4	DO2-	Digital output
5	DO2+	Digital output
6	DO1-	Digital output
7	DO1+	Digital output
8	DI4-	Digital input
9	DI1-	Digital input
10	DI2-	Digital input
11	COM+	Power input (12~24V)
12	DI9-	Digital input
13	OZ	Encoder Z pulse Line-driver output
14	COM-	VDD(24V) power ground
15	DO6-	Digital output
16	DO6+	Digital output
17	VDD	+24V power output (for external I/O)
18	T_REF	Analog torque Input
19	GND	Analog input signal ground
20	V_REF	Analog speed input (+)
21	OA	Encoder A pulse output
22	/OA	Encoder /A pulse output
23	/OB	Encoder /B pulse output
24	/OZ	Encoder /Z pulse output
25	OB	Encoder B pulse output
26	DO4-	Digital output
27	DO5-	Digital output
28	DO5+	Digital output
29	GND	Analog input signal ground
30	DI8-	Digital input
31	DI7-	Digital input
32	DI6-	Digital input
33	DI5-	Digital input
34	DI3-	Digital input
35	PULL HI	Pulse applied power
36	/HPULSE	High-speed position pulse (-)
37	/SIGN	Position sign (-)
38	HPULSE	High-speed position pulse (+)
39	SIGN	Position sign (+)
40	/HSIGN	High-speed position sign (-)
41	/PULSE	Pulse input (-)
42	HSIGN	High-speed position sign (+)
43	PULSE	Pulse input (+)
44	OCZ	Encoder Z pulse Line-driver output

3.3.2 Signals Explanation of Connector CN1

The following details the signals listed in previous section:

General Signals

Signal		Pin No	Function	Wiring Diagram (Refer to 3.3.3)
Analog Command (input)	V_REF	20	(1) The speed command of the motor is -10 V ~ +10 V which means the speed command is -3000 ~ +3000 r/min (default). It can change the corresponding range via parameters. (2) The position command of the motor is -10 V ~ +10 V which means the position command is -3 cycles ~ +3 cycles (default).	C1
	T_REF	18	The torque command of the motor is -10 V ~ +10 V which means the rated torque command of -100 % ~ +100 %.	C1
Position Pulse (Input)	PULSE /PULSE SIGN /SIGN PULL HI	43 41 39 37 35	Position pulse can be inputted by Line Driver (single phase max. frequency 500KHz) or open-collector (single phase max. frequency 200 KHz). Three kinds of command type can be selected via P1-00, CW pulse + CCW pulse, pulse + direction, A pulse + B pulse. When position pulse uses open-collector, the terminal should be connected to an external applied power in order to pull high.	C3/C4
High-speed Position Pulse Input	HPULSE /HPULSE HSIGN /HSIGN	38 36 42 40	High position pulse command only accepts differential input (+5V, Line-Drive). The max. input frequency is 4MHz. Three kinds of command type can be selected via P1-00, CW pulse + CCW pulse, pulse + direction, A pulse + B pulse.	C4-2
Position Pulse (Output)	OA /OA	21 22	Encoder signal output A, B, Z (Line Drive output)	C13/C14
	OB /OB	25 23		
	OZ /OZ	13 24		
	OCZ	44	Encoder signal output Z (Open-collector output).	-

Signal		Pin No	Function	Wiring Diagram (Refer to 3.3.3)
Power	VDD	17	VDD is the +24 V power provided by the drive and is for Digital Input (DI) and Digital Output (DO) signal. The maximum current is 500 mA.	-
	COM+ COM-	11 14	COM+ is the common input of Digital Input (DI) and Digital Output (DO) voltage. When using VDD, VDD should be connected to COM+. If not using, it needs to apply the external power (+12 V ~ + 24 V). Its positive end should connect to COM+ and the negative end should connect to COM-.	
	GND	19	VCC voltage is based on GND.	

There are numerous operation mode of this servo drive (please refer to Chapter 6.1). Each operation mode needs different I/O signal. In order to use the terminal in a more efficient way, the selection of I/O signal has to be programmable. That is to say, users can choose the desired DI/DO signal to meet the demand. Basically, the default setting of DI/DO signal has already have the appropriate function which can satisfy the demand of normal application.

Users have to select the operation mode based on the needs first (please refer to Chapter 6.1 for the introduction of each mode) and refer to the following DI/DO table to know the corresponding default setting of DI/DO signal and Pin No of the selected mode in order to conduct the wiring.

The table below lists the default setting of DI/DO signal function and pin No:

The explanation of DO signal default setting is as the followings.

DO Signal	Operation Mode	Pin No.		Details	Wiring Method (Refer to 3.3.3)
		+	-		
SRDY	ALL	7	6	When the servo drive applies to the power and no alarm (ALRM) occurs in control circuit and motor power circuit, this DO is ON.	C5 / C6 / C7 / C8
SON	N/A	-	-	When the DI.SON is ON and the motor servo circuit can operate smoothly, this DO is ON.	
ZSPD	ALL	5	4	When the motor speed is slower than the setting value of parameter P1-38, this DO is ON.	
TSPD	ALL	-	-	When the motor actual speed (r/min) is faster than the setting value of parameter P1-39, this DO is ON.	
TPOS	PT, PT-S, PT-T	1	26	When the deviation between the motor command and actual position (PULSE) is smaller than the setting value of parameter P1-54, this DO is ON.	
TQL	ALL (except for T and Tz)	-	-	When torque is limiting, this DO is ON.	
ALRM	ALL	28	27	When the alarm occurs (except forward/reverse limit, emergency stop, communication error, under voltage), this DO is ON.	
BRKR	ALL	-	-	Control contact of brake.	
OLW	ALL	-	-	When the overload level is reached, this DO is ON.	
WARN	ALL	-	-	A warning occurs. When it is in the status of forward / reverse limit, emergency stop, communication error, under voltage, this DO is ON.	
S_CMP	S, Sz	-	-	When the deviation between the speed command and the feedback speed of the motor is smaller than the setting value of parameter P1-47, this DO is ON.	

NOTE
1. For example, if the user selects S mode, pin 3 and 2 are TSPD.
2. The unlisted Pin No means the signal is not the preset one. If users want to use it, parameters need to be changed and set as the desired ones. Please refer to Section 3.3.4 for further details.

The explanation of DI signal default setting is as the followings

<table>
<tr><th>DI Signal</th><th>Operation Mode</th><th>Pin No.</th><th>Function</th><th>Wiring Method (Refer to 3.3.3)</th></tr>
<tr><td>SON</td><td>ALL</td><td>9</td><td>When DI is ON, the servo circuit will be activated and the motor coil will generate current.</td><td rowspan="6">C9 / C10 / C11 / C12</td></tr>
<tr><td>ARST</td><td>ALL</td><td>33</td><td>When the alarm (ALRM) occurs, this signal is used to reset the servo drive and output the signal, Ready (SRDY) again.</td></tr>
<tr><td>GAINUP</td><td>ALL</td><td>-</td><td>It is for switching the controller gain.</td></tr>
<tr><td>CCLR</td><td>PT</td><td>10</td><td>It is for clearing the deviation counter.</td></tr>
<tr><td>ZCLAMP</td><td>ALL</td><td>-</td><td>When this DI is ON and the motor speed is slower than the setting of P1-38, the motor position will be locked when the signal is triggered.</td></tr>
<tr><td>CMDINV</td><td>T, S</td><td>-</td><td>When this DI is ON, the motor will operate in the opposite direction.</td><td rowspan="8">C9 / C10 / C11 / C12</td></tr>
<tr><td>TRQLM</td><td>S, Sz</td><td>10</td><td>ON means the torque limit command is effective.</td></tr>
<tr><td>SPDLM</td><td>T, Tz</td><td>10</td><td>ON means the speed limit command is effective.</td></tr>
<tr><td>STP</td><td>-</td><td>-</td><td>Motor stops.</td></tr>
<tr><td>SPD0</td><td rowspan="2">S, Sz, PT-S, S-T</td><td>34</td><td rowspan="2">Select the source of speed command:
<table>
<tr><th>SPD1</th><th>SPD0</th><th>Command source</th></tr>
<tr><td>OFF</td><td>OFF</td><td>S mode: analog input
Sz mode: 0</td></tr>
<tr><td>OFF</td><td>ON</td><td>P1-09</td></tr>
<tr><td>ON</td><td>OFF</td><td>P1-10</td></tr>
<tr><td>ON</td><td>ON</td><td>P1-11</td></tr>
</table></td></tr>
<tr><td>SPD1</td><td>8</td></tr>
<tr><td>TCM0</td><td>PT, T, Tz, PT-T</td><td>34</td><td>Select the source of torque command:</td></tr>
</table>

<table>
<tr><th>DI Signal</th><th>Operation Mode</th><th>Pin No.</th><th>Function</th><th>Wiring Method (Refer to 3.3.3)</th></tr>
<tr><td>TCM1</td><td>S-T</td><td>8</td><td>
<table>
<tr><th>TCM1</th><th>TCM0</th><th>Command source</th></tr>
<tr><td>OFF</td><td>OFF</td><td>T mode: analog input
Tz mode: 0</td></tr>
<tr><td>OFF</td><td>ON</td><td>P1-12</td></tr>
<tr><td>ON</td><td>OFF</td><td>P1-13</td></tr>
<tr><td>ON</td><td>ON</td><td>P1-14</td></tr>
</table>
</td><td></td></tr>
<tr><td>S-P</td><td>PT-S</td><td>31</td><td>Mode switching. OFF: Speed; ON: Position</td><td></td></tr>
<tr><td>S-T</td><td>S-T</td><td>31</td><td>Mode switching. OFF: Speed; ON: Torque</td><td></td></tr>
<tr><td>T-P</td><td>PT-T</td><td>31</td><td>Mode switching. OFF: Torque; ON: Position</td><td></td></tr>
<tr><td>EMGS</td><td>ALL</td><td>30</td><td>It is contact B and has to be ON frequently; otherwise the alarm (ALRM) will occur.</td><td></td></tr>
<tr><td>NL (CWL)</td><td>PT, S, T, Sz, Tz</td><td>32</td><td>Reverse inhibit limit (contact B) and has to be ON frequently; or the alarm (ALRM) will occur.</td><td></td></tr>
<tr><td>PL (CCWL)</td><td>PT, S, T, Sz, Tz</td><td>31</td><td>Forward inhibit limit (contact B) and has to be ON frequently; or the alarm (ALRM) will occur.</td><td></td></tr>
<tr><td>TLLM</td><td>N/A</td><td>-</td><td>Reverse operation torque limit</td><td></td></tr>
<tr><td>TRLM</td><td>N/A</td><td>-</td><td>Forward operation torque limit</td><td></td></tr>
<tr><td>JOGU</td><td>ALL</td><td>-</td><td>When this DI is ON, the motor JOG operates in forward direction.</td><td></td></tr>
<tr><td>JOGD</td><td>ALL</td><td>-</td><td>When this DI is ON, the motor JOG operates in reverse direction.</td><td></td></tr>
<tr><td>GNUM0</td><td>PT, PT-S</td><td>-</td><td>Electronic gear ratio (numerator) selection 0 (Please refer to P2-60~P2-62 for gear ratio selection (numerator).)</td><td></td></tr>
<tr><td>GNUM1</td><td>PT, PT-S</td><td>-</td><td>Electronic gear ratio (numerator) selection 1 (Please refer to P2-60~P2-62 for gear ratio selection (numerator).)</td><td></td></tr>
<tr><td>INHP</td><td>PT, PT-S</td><td>-</td><td>In position mode, when this DI is ON, the external pulse input command is not working.</td><td>C9 / C10 / C11 / C12</td></tr>
</table>

The default setting of DI and DO in each operation mode is shown as the followings. Please note that the following table neither detail the information as the previous one nor show the Pin number of each signal. However, each operation mode is separated in different columns in order to avoid the confusion.

Table 3.1 Default Value of DI Function

Symbol	DI Code	Function	PT	S	T	Sz	Tz	PT-S	PT-T	S-T
SON	0x01	Servo On	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1
ARST	0x02	Alarm Reset	DI5	DI5	DI5	DI5	DI5			
GAINUP	0x03	Gain switching								
CCLR	0x04	Pulse clear	DI2					DI2	DI2	
ZCLAMP	0x05	Zero speed CLAMP								
CMDINV	0x06	The input command will be in reverse direction								
Reserved	0x07	Reserved								
Reserved	0x08	Reserved								
TRQLM	0x09	Torque limit		DI2		DI2				
SPDLM	0x10	Speed limit			DI2		DI2			
STP	0x46	Motor stop								
SPD0	0x14	Speed command selection 0		DI3		DI3		DI3		DI3
SPD1	0x15	Speed command selection 1		DI4		DI4		DI4		DI4
TCM0	0x16	Torque command selection 0	DI3		DI3		DI3		DI3	DI5
TCM1	0x17	Torque command selection 1	DI4		DI4		DI4		DI4	DI6
S-P	0x18	Mode switch between speed and position command						DI7		
S-T	0x19	Mode switch between speed and torque command								DI7
T-P	0x20	Mode switch between torque and position command							DI7	
Reserved	0x2C	Reserved								
Reserved	0x2D	Reserved								
EMGS	0x21	Emergency stop	DI8	DI8	DI8	DI8	DI8	DI8	DI8	DI8
NL(CWL)	0x22	Reverse inhibit limit	DI6	DI6	DI6	DI6	DI6			
PL(CCWL)	0x23	Forward inhibit limit	DI7	DI7	DI7	DI7	DI7			
Reserved	0x24	Reserved								

Symbol	DI Code	Function	PT	S	T	Sz	Tz	PT-S	PT-T	S-T
TLLM	0x25	Reverse operation torque limit								
TRLM	0x26	Forward operation torque limit								
Reserved	0x27	Reserved								
Reserved	0x36	Reserved								
JOGU	0x37	Forward JOG input								
JOGD	0x38	Reverse JOG input								
GNUM0	0x43	Electronic gear ratio (Numerator) selection 0								
GNUM1	0x44	Electronic gear ratio (Numerator) selection 1								
INHP	0x45	Pulse inhibit input								

For corresponding pin of DI1 ~ DI8, please refer to section 3.3.1.

Table 3.2 Default Value of DO Function

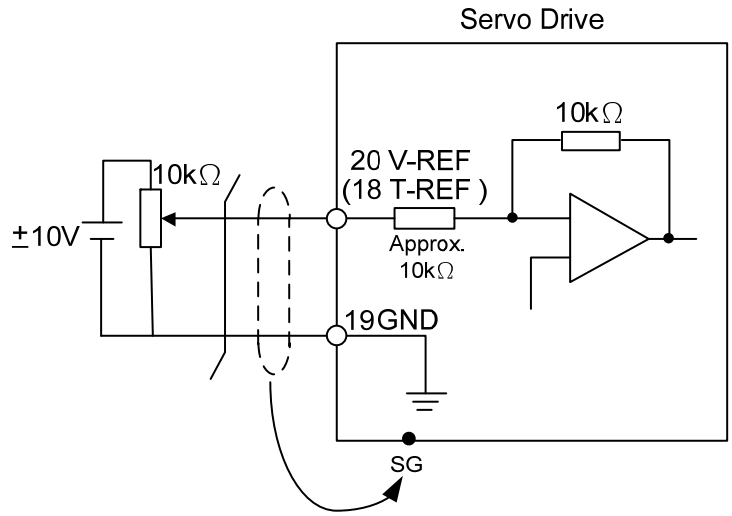
Signal	DO Code	Function	PT	S	T	Sz	Tz	PT-S	PT-T	S-T
SRDY	0x01	Servo ready	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1
SON	0x02	Servo On								
ZSPD	0x03	Zero-speed reached	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2
TSPD	0x04	Reach the target speed		DO3	DO3	DO3	DO3	DO3	DO3	DO3
TPOS	0x05	Reach the target position	DO4					DO4	DO4	
TQL	0x06	Torque limit								
ALRM	0x07	Servo alarm	DO5	DO5	DO5	DO5	DO5	DO5	DO5	DO5
BRKR	0x08	Brake		DO4	DO4	DO4	DO4			
OLW	0x10	Early warning for overload								
WARN	0x11	Servo warning								
SNL(SCWL)	0x13	Reverse software limit								
SPL(SCCWL)	0x14	Forward software limit								
SP_OK	0x19	Target speed reached								

For corresponding pin DO1 ~ DO6, please refer to section 3.3.1.

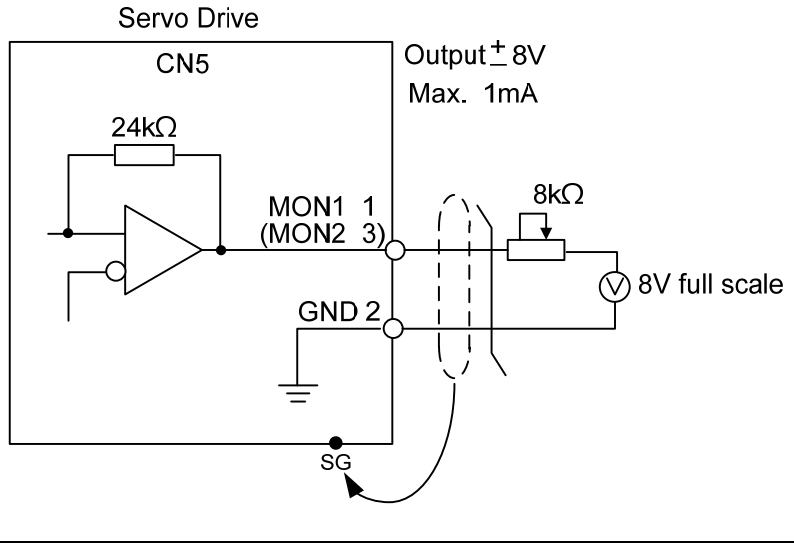
3.3.3 Wiring Diagrams (CN1)

The valid voltage range of analog input command in speed and torque mode is -10V ~+10V. The command value can be set via relevant parameters.

C1: Speed / Torque analog signal input

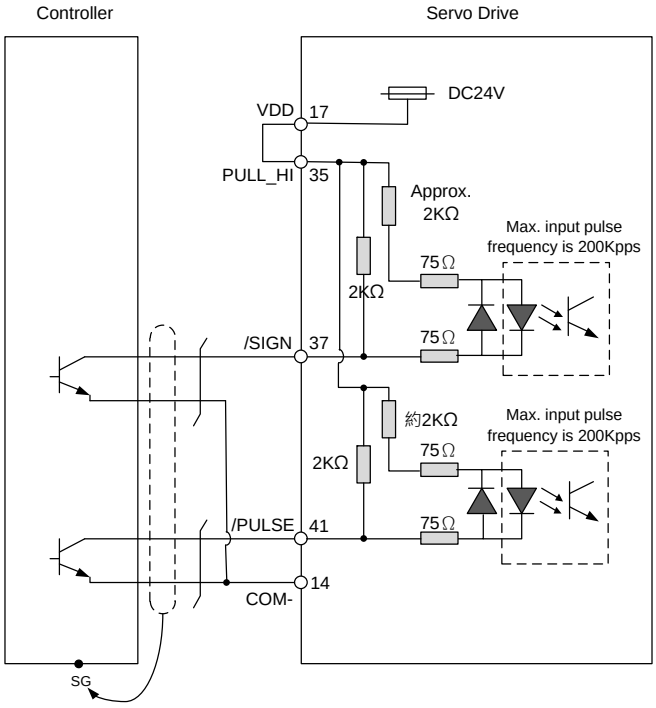


C2: Analog monitor output (MON1, MON2)

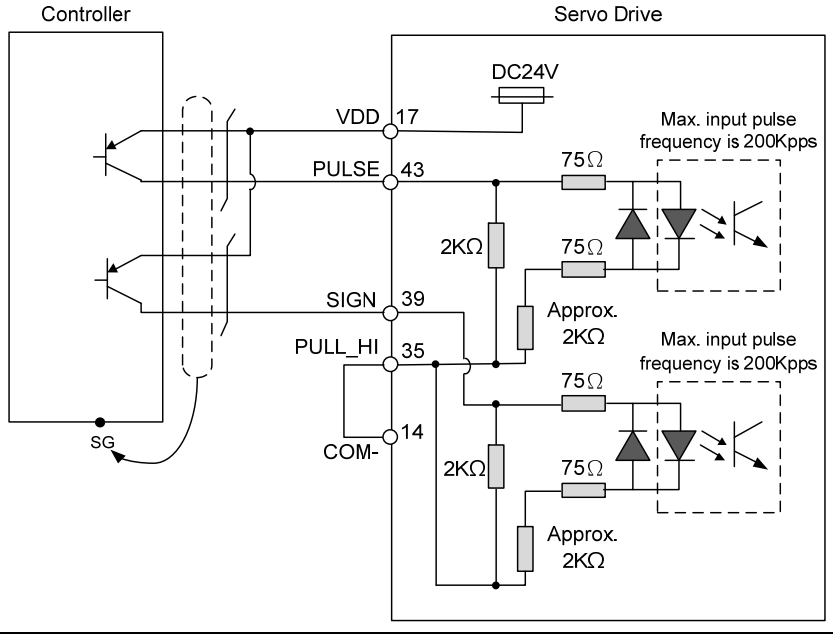


Pulse command can be input by the way of open-collector or Line driver. The maximum input pulse of Line driver is 500 kpps and 200 kpps for open-collector.

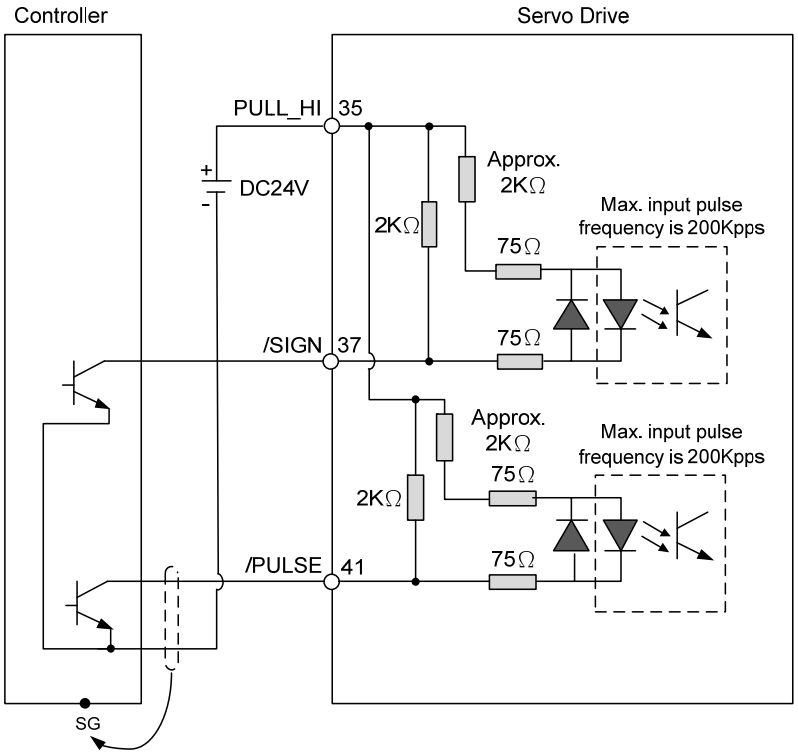
C3-1: The source of pulse input is open-collector NPN equipment which applies the internal power of the servo drive.



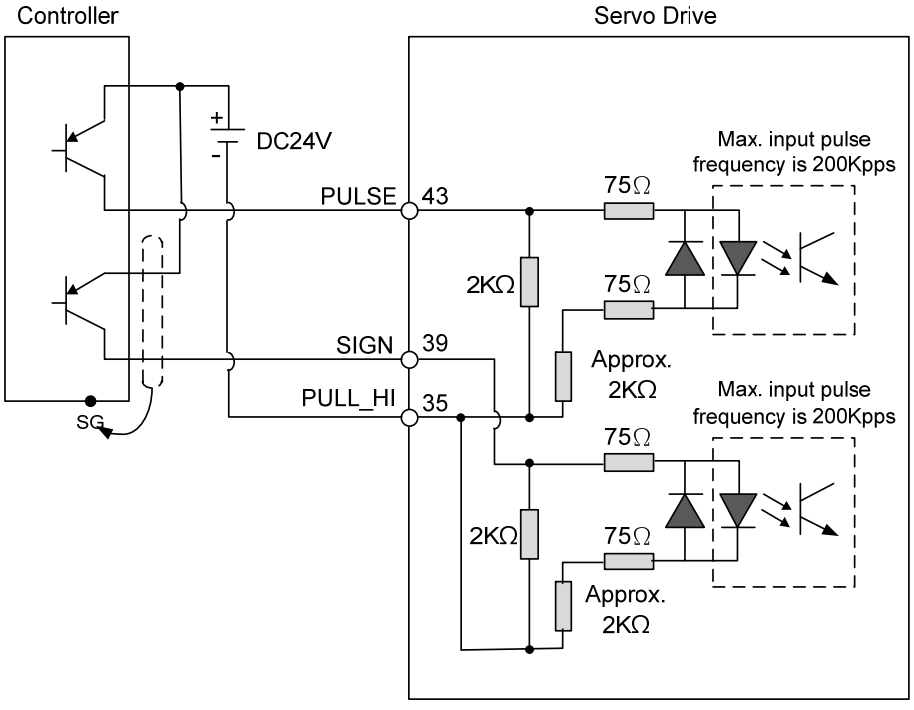
C3-2: The source of pulse input is open-collector PNP equipment which applies the internal power of the servo drive.



C3-3: The source of pulse input is open-collector NPN equipment which applies the external power of the servo drive.



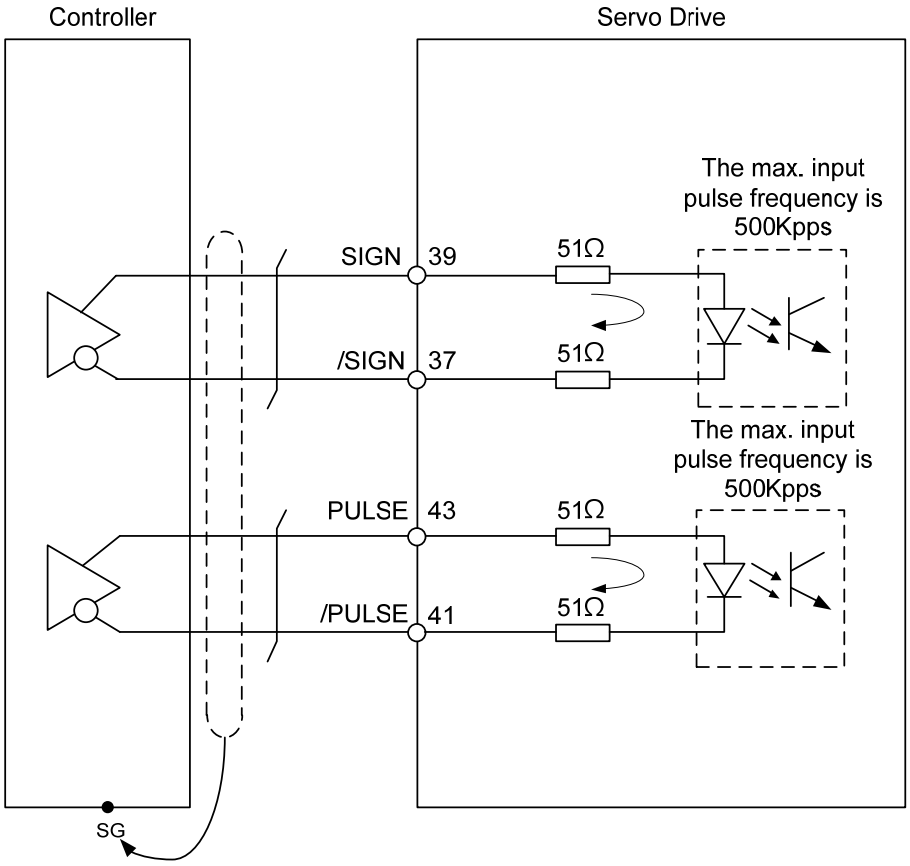
C3-4: The source of pulse input is open-collector PNP equipment which applies the external power of the servo drive.



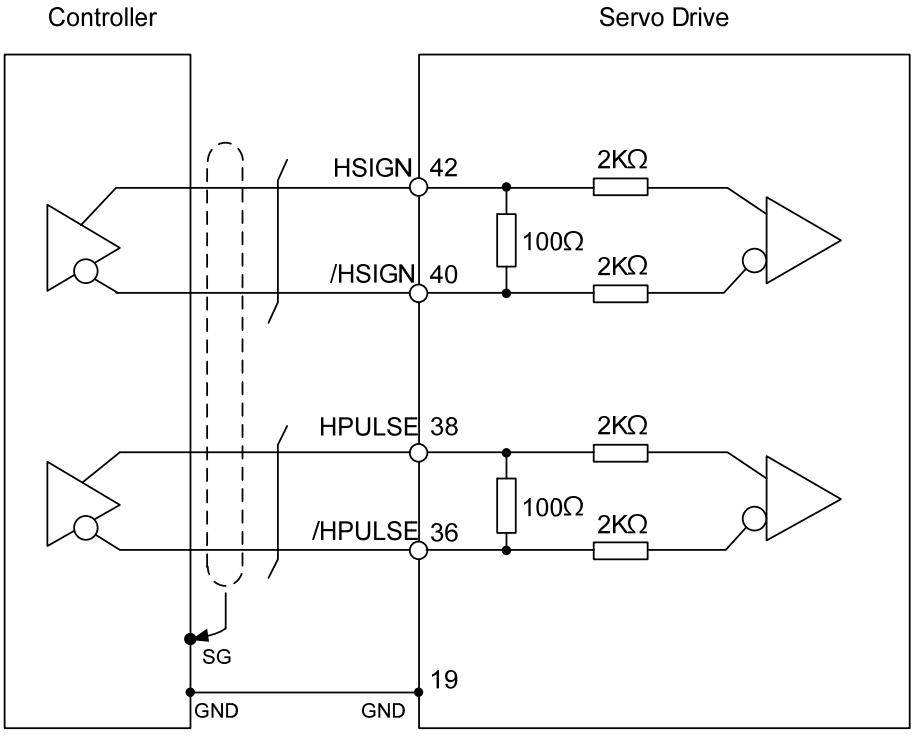
WARNING

➢ ***Caution: Do not apply to dual power or it may damage the servo drive.***

C4-1: Pulse input (Line driver) can only apply to 5V power. Never apply to 24V power.



C4-2: High-speed pulse input (Line driver) can only apply to 5V power. Never apply to 24V power.

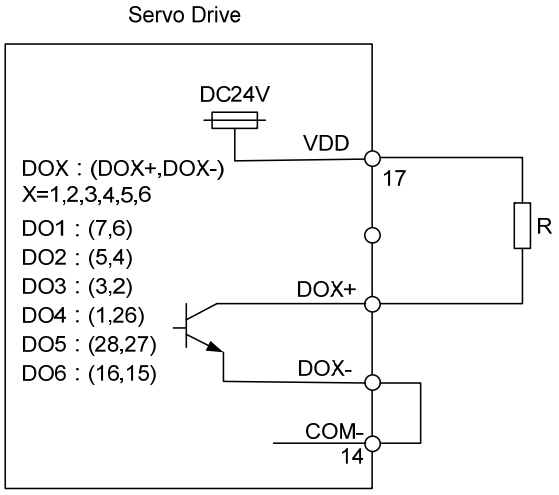


WARNING

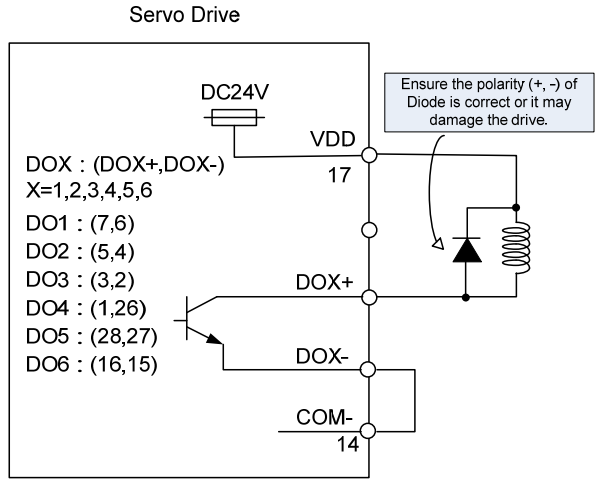
- ***The high-speed pulse input interface of the servo drive is not the isolated interface. In order to reduce the interference of the noise, it is suggested that the terminal ground of the controller and the servo drive should be connected to each other.***

When the drive connects to inductive load, the diode has to be installed. (The permissible current is under 40 mA; the surge current is under 100 mA; the maximum voltage is 30V.)

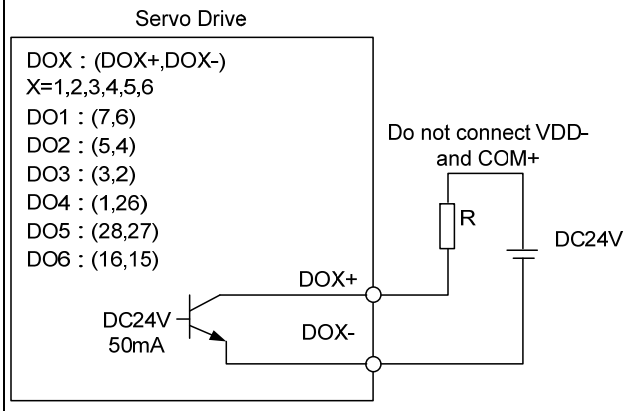
C5: Wiring of DO signal. The servo drive applies to the internal power and the resistor is general load.



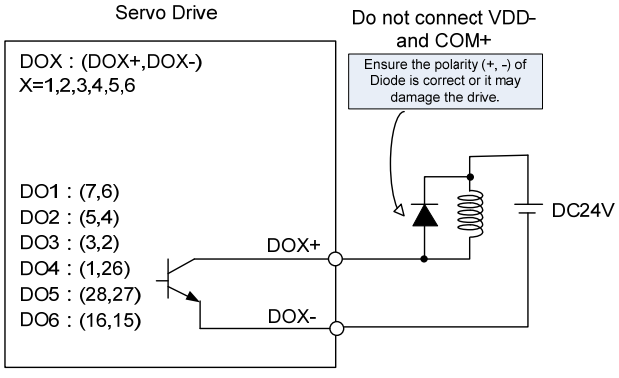
C6: Wiring of DO signal. The servo drive applies to the internal power and the resistor is inductive load.



C7: Wiring of DO signal. The servo drive applies to the external power and the resistor is general load.



C8: Wiring of DO signal. The servo drive applies to the external power and the resistor is inductive load.



The DI wiring inputs signal via the relay or open-collector transistor.

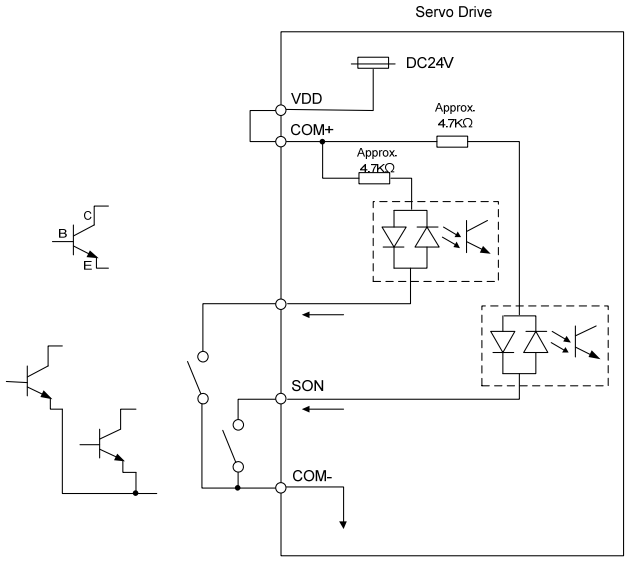
Conditions of DI On / Off:

ON: 15V - 24V; the input current is higher than 3 mA.

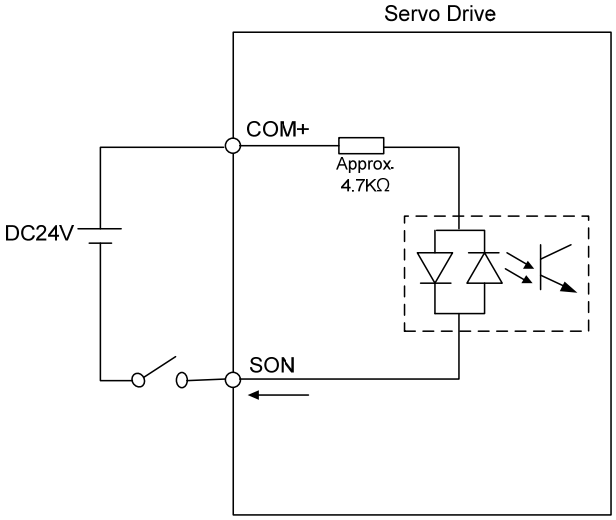
OFF: below 5V; the input current must not be higher than 0.5 mA.

NPN transistor, common emitter (E) mode (**SINK** mode)

C9: Wiring of DI signal. The servo drive applies to the internal power.

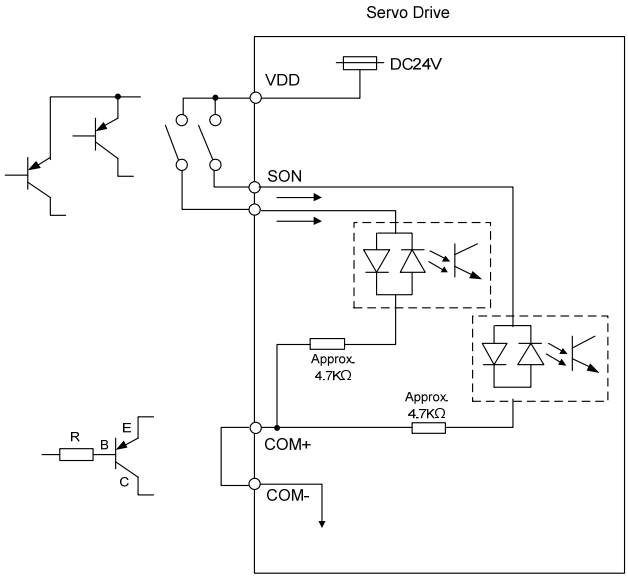


C10: Wiring of DI signal. The servo drive applies to the external power.

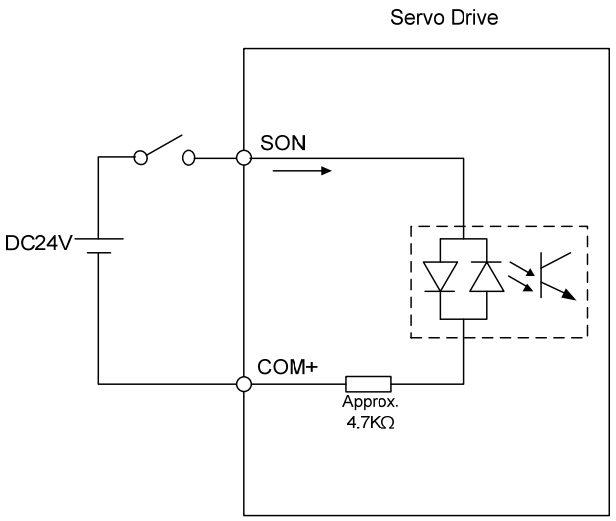


PNP transistor, common emitter (E) mode (**SOURCE** mode)

C11: Wiring of DI signal. The servo drive applies to the internal power.



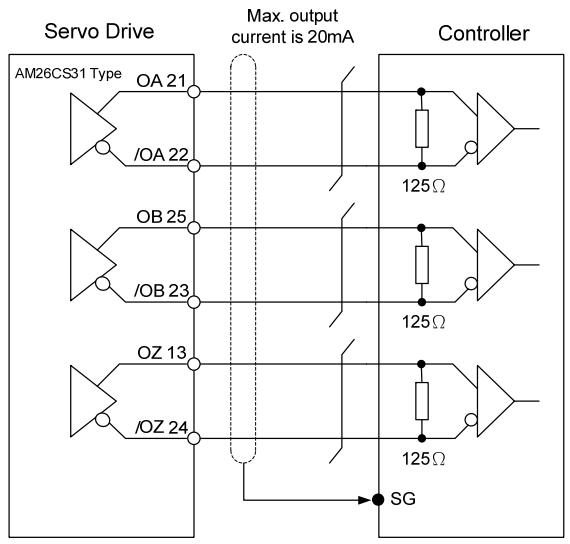
C12: Wiring of DI signal. The servo drive applies to the external power.



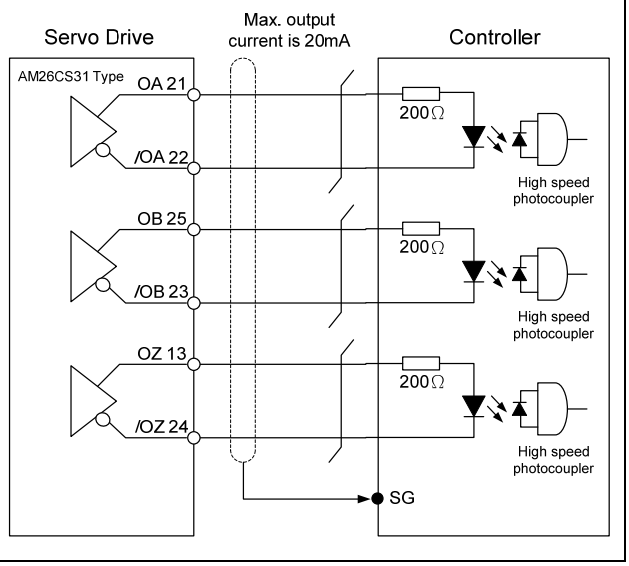
WARNING

➢ ***Caution: Do not apply to dual power or it may damage the servo drive.***

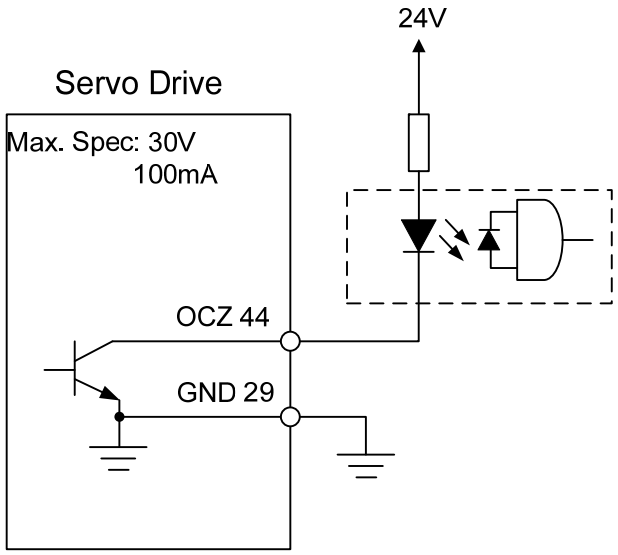
C13: Encoder signal output (Line driver)



C14: Encoder signal output (Opto-isolator)



C15: Encoder OCZ output (Open-collector Z-pulse output)



3.3.4 DI and DO Signal Specified by Users

If the default setting of DI/DO signal cannot satisfy the need, self-set the DI/DO signal will do and easy. The signal function of DI1 ~ 9 and DO1 ~ 6 is determined by parameter P2-10 ~ P2-17, P2-36 and parameter P2-18 ~ P2-22, P2-37 respectively. Please refer to Chapter 7.2, which shown as the following table. Enter DI or DO code in the corresponding parameter to setup DI/DO.

Signal Name		Pin No.	Parameter
DI	DI1-	CN1-9	P2-10
	DI2-	CN1-10	P2-11
	DI3-	CN1-34	P2-12
	DI4-	CN1-8	P2-13
	DI5-	CN1-33	P2-14
	DI6-	CN1-32	P2-15
	DI7-	CN1-31	P2-16
	DI8-	CN1-30	P2-17
	DI9	CN1-12	P2-36

Signal Name		Pin No.	Parameter
DO	DO1+	CN1-7	P2-18
	DO1-	CN1-6	
	DO2+	CN1-5	P2-19
	DO2-	CN1-4	
	DO3+	CN1-3	P2-20
	DO3-	CN1-2	
	DO4+	CN1-1	P2-21
	DO4-	CN1-26	
	DO5+	CN1-28	P2-22
	DO5-	CN1-27	
	DO6+	CN1-16	P2-37
	DO6-	CN1-15	