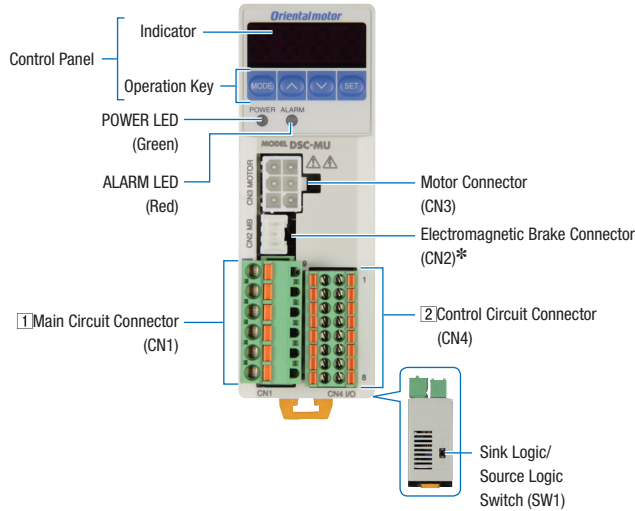


Connection and Operation

Names and Functions of Speed Controller Parts



Name		Overview
Control Panel	Indicator (4 digit LED)	Displays speed, parameters, alarms, etc.
	Operation Key	Switches operating mode, sets operating data and changes parameters.
POWER LED (Green)		Lights when the AC power supply is provided to the speed controller.
ALARM LED (Red)		Lights when an alarm is activated.
Motor Connector (CN3)		Connects to the motor connector.
Electromagnetic Brake Connector (CN2)*		Connects to the electromagnetic brake connector.
Main Circuit Connector (CN1)		Connects to the AC power supply, capacitor and FG.
Control Circuit Connector (CN4)		Connects the DC power supply for control and I/O signals.
Sink Logic/Source Logic Switch		Switches between the sink logic and source logic for the input signal.

*Only the electromagnetic brake type is connected.

1 Main Circuit Connector (CN1)

Pin No.	Contents	Description
1	Capacitor	Connects the capacitor.
2		
3	N.C.	No connection.
4	AC Power Supply	Connects to the live side.
5		Connects to the neutral side.
6	FG	Connects to the ground wire.

2 Control Circuit Connector (CN4)

Pin No.	Signal Name	Function*1	Description
1	+24 V	DC Power Supply for Control	Connects the 24 VDC power supply for control circuit.
2	0 V (GND)		
3	IN0	[FWD]	The motor rotates in the forward direction when "ON." *2
4	IN1	[REV]	The motor rotates in the reverse direction when "ON." *2
5	IN2	[MO]	Selects the operating data.
6	IN3	[M1]	
7	IN4	[ALARM-RESET]	Alarms are canceled.
8	IN5	[FREE]	When the FREE input is set to "ON" during motor operation, the motor will perform a coasting stop. When the FREE input is "ON", the motor will not rotate, even if the FWD input or REV input are set to "ON". For electromagnetic brake type, when the FREE input is "ON", the electromagnetic brake is released.
9	VH	External Speed Setting Input	It is connected when speed is set externally using external speed potentiometer or external DC voltage.
10	VM		
11	VL		
12	N.C.	—	No connection.
13	OUT0 +	[SPEED-OUT]	12 pulses are output when the motor output shaft makes one rotation.
14	OUT0 —		
15	OUT1 +	[ALARM-OUT]	Output when an alarm activates. (Normally closed)
16	OUT1 —		

*1 Text inside the [] represents the factory default function assignment. The following signals can be assigned as necessary to 6 input signal terminals (IN0~IN5) and 2 output signal terminals (OUT0, OUT1).

6 of the 7 input signals (FWD, REV, MO, M1, ALARM-RESET, FREE, EXT-ERROR)

2 of the 4 output signals (SPEED-OUT, ALARM-OUT, TH-OUT, WNG)

*2 Rotation direction varies according to the gearhead's gear ratio and the parameter settings.

Overview,
Product
Series

Brushless
Motors

AC Input
BMU

AC Input
BLE

AC Input
BLF

AC Input
BXII

DC Input
BLH

AC Speed
Control
Motors

DSC

BHF

Accessories

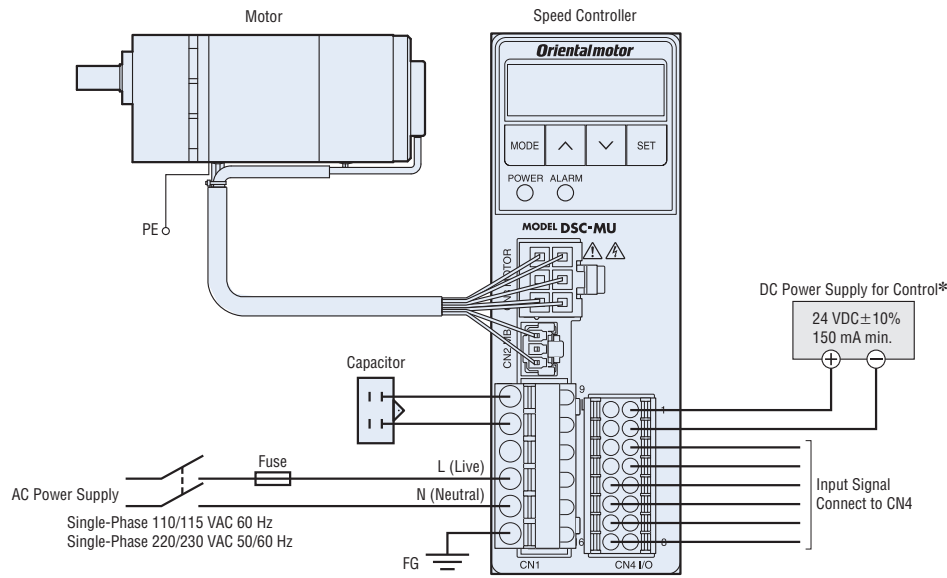
Installation

Standard Type
Parallel Shaft/
Round Shaft

Electromagnetic
Brake Type
Parallel Shaft

●Connection Diagram

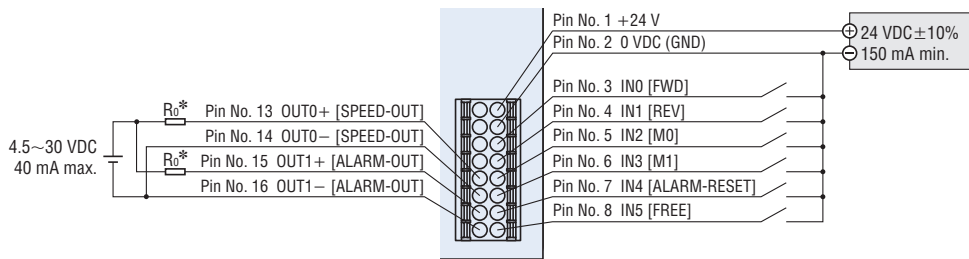
The figure shows a connection example for the electromagnetic brake type. Always connect the DC power supply for control when operating the motor in addition to the AC power supply.



*Use a power supply with reinforced insulation on the primary and secondary sides for the DC power supply for control.

◇Example of I/O Signal (CN4) Connection

The figure shows a connection example when operating with a contact switch, such as switches and relays with sink logic setting.



*Recommend Resistance Value
24 VDC: 680 Ω~4.7 kΩ (2 W) 5 VDC: 150 Ω~1 kΩ (0.5 W)

Note

● Connect a limiting resistor R_0 that corresponds to the power supply used, so that the current that flows with the output signals does not exceed 40 mA.

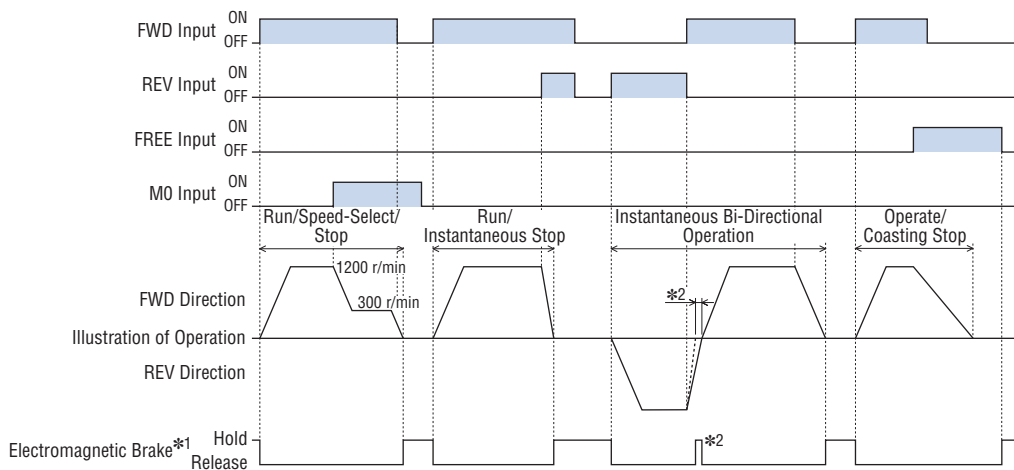
◇Rating of Fuse

For overcurrent protection, be sure to insert a fuse into the power supply line.

Rating of Fuse	Single-Phase 110/115 VAC	216 Series (Littelfuse, Inc.) 10 A or equivalent
	Single-Phase 220/230 VAC	216 Series (Littelfuse, Inc.) 6.3 A or equivalent

●Timing Chart

Operating data No.0 has been set to 1200 r/min and operating data No.1 has been set to 300 r/min.



*1 Only for electromagnetic brake type.

*2 Only for electromagnetic brake type. Holds while "deceleration control" parameter is ON, and time lag occurs during motor standstill (approx. 0.1 seconds). Does not hold when "deceleration control" parameter is OFF. There is no time lag, either.

Note

● The duration of ON for each signal must be 10 ms or more.

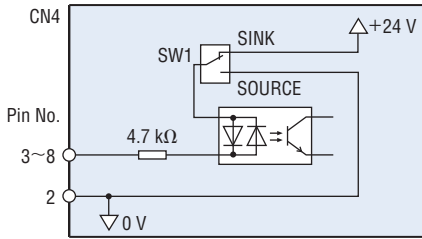
- After setting the speed, when the FWD or REV input is set to ON, the motor is rotated at the set speed.
- During motor operation, when the signal that is ON (either FWD or REV input) is turned OFF, the motor will perform a deceleration stop within the set deceleration time .
- If the FWD input and REV input are turned ON simultaneously, the motor will stop instantaneously.
- For electromagnetic brake types, the motor stops and the brake is simultaneously activated.

I/O Signal Circuits

Sink logic or source logic can be selected according to the external control device the customer is using.

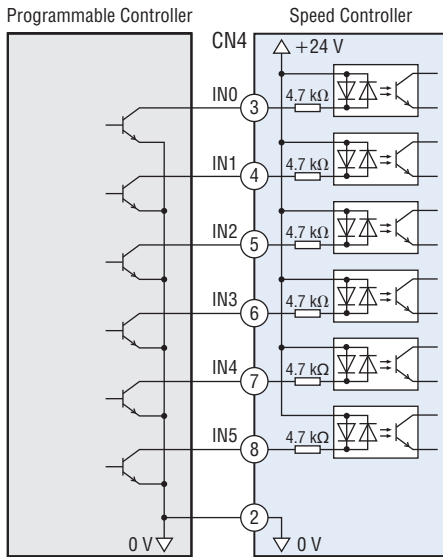
Input Circuit

IN0~IN5

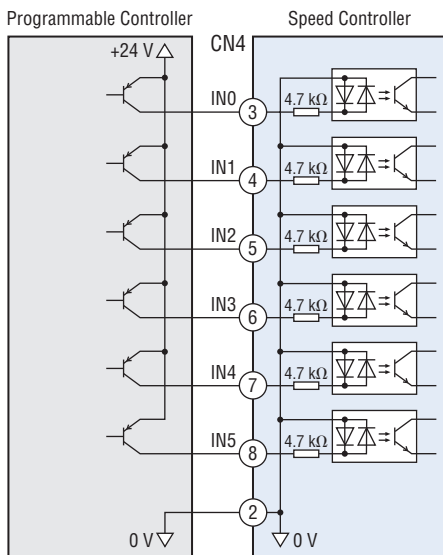


Connection to Programmable Controller

Sink Logic

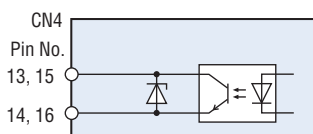


Source Logic



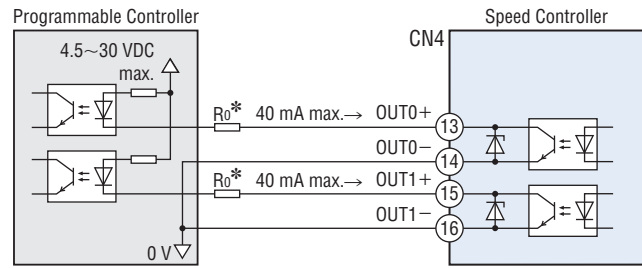
Output Circuit

OUT0, OUT1

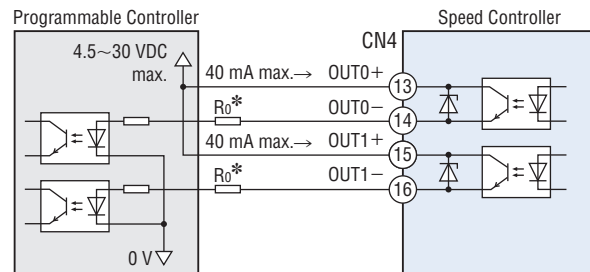


Connection to Programmable Controller

Sink Logic



Source Logic



*Recommended Resistance Value

24 VDC: 680 Ω~4.7 kΩ (2 W) 5 VDC: 150 Ω~1 kΩ (0.5 W)

Note

● Maintain the current value of OUT0 and OUT1 at 40 mA or less. If this current value is exceeded, connect the limiting resistor R₀.

When an External Control Device with a Built-in Clamp Diode is Used

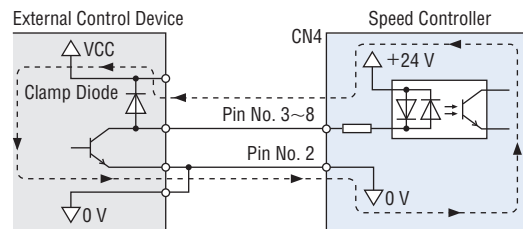
If an external control device with a built-in clamp diode is connected and the external control device is turned off when the speed controller power is on, current may flow in and rotate the motor. Also, depending on the external control device used with the speed controller, the motor may rotate even when the power supply is set to ON and OFF simultaneously. Use the following procedure to turn the power ON or OFF.

When turning the power off:

Speed controller → External control device

When turning the power on:

External control device → Speed controller



Speed Output (SPEED-OUT)

Pulse signals of 12 pulses are output at every rotation of the motor output shaft in synchronization with the motor operation. If the speed output frequency is measured, the motor speed can be calculated.

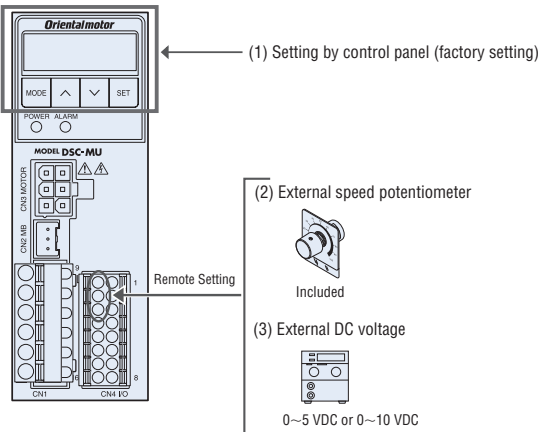
$$\text{Motor Shaft Speed [r/min]} = \frac{\text{Speed Output Frequency [Hz]}}{12} \times 60$$

$$\text{Speed Output Frequency [Hz]} = \frac{1}{T [\text{s}]}$$



●Speed Setting Method

The following 3 methods for setting speed can be used.



◇Setting by Control Panel

Up to 4 operating data can be set.

By switching the M0 and M1 inputs between ON and OFF, the pattern can be selected and the motor will operate.

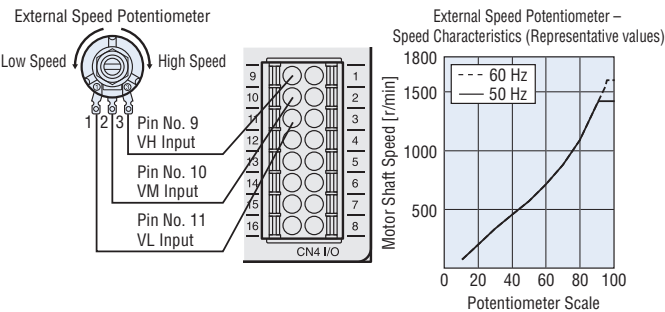
Operating Data No.	M1	M0	Contents
0	OFF	OFF	Setting by control panel/remote setting*
1	OFF	ON	Setting by control panel
2	ON	OFF	
3	ON	ON	

*When the "External speed command input" parameter is set to "ON (enabled)" (Initial value: OFF), the speed can be set using the external speed potentiometer and external DC voltage.

◇Setting by External Speed Potentiometer (Included)

Connect the external speed potentiometer to CN4.

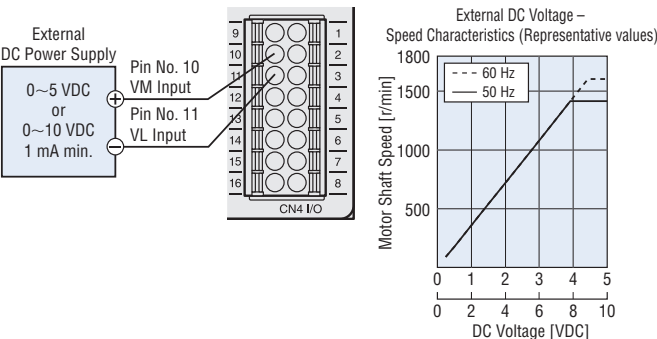
"External speed command voltage selection" parameter setting:
"0-5" (Initial value)



◇Setting by External DC Voltage

Connect the external DC power supply (0~5 VDC or 0~10 VDC) to CN4.

"External speed command voltage selection" parameter setting:
0~5 VDC "0-5" (Initial value)
0~10 VDC "0-10"



Note

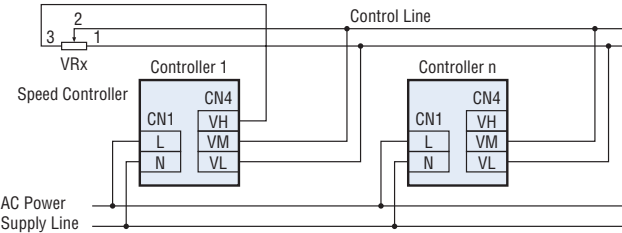
● Ensure that the external DC voltage is 10 VDC or less. When connecting the external DC voltage, ensure that the polarity is correct. Otherwise, it may damage the speed controller.

●Parallel-Motor Control

Multiple motors can be operated at the same speed using 1 external speed potentiometer or external DC voltage.

◇Using an External Speed Potentiometer

Parallel-motor operation using the external speed potentiometer (VRx) should be performed with a maximum of 20 speed controllers.



● The Calculation Method of the Resistance Value (VRx) when the Number of Speed Controllers Connected is n

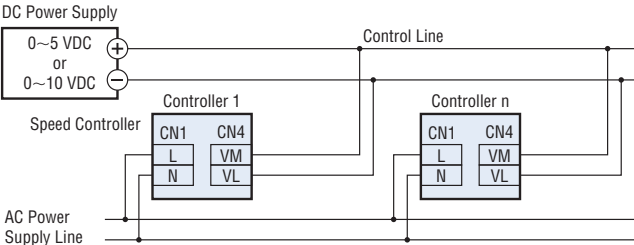
Resistance value (VRx) = 20/n (kΩ), permissible loss=n/4 (W)

Example: When connecting 2 speed controllers

Resistance value = 20/2 = 10 (kΩ), permissible loss = 2/4 = 1/2 (W)

◇Using External DC Voltage

The number of connected units will be limited depending on the current capacity of the external DC power supply.



● The Calculation Method of the Current Capacity of the External DC Power Supply (I) when the Number of Speed Controllers Connected is n

Current capacity (I)=1×n (mA)

Example: When connecting 2 speed controllers

Current capacity (I)=1×2=2 (mA)

● Repetitive Operation Cycle

When the motor is operated repeatedly in short cycles, use the cycles below as a reference, and ensure that the motor's external temperature is at 90°C (194°F) or less.

Instantaneous Stop	6~40 W (1/125~1/19 HP)	When operation and instantaneous stops are repeated 2 seconds min., operating duty 50% max. (Example: 1 second operating, 1 second stopped)
	60 W, 90 W (1/12 HP, 1/8 HP)	When operation and instantaneous stops are repeated 4 seconds min., operating duty 50% max. (Example: 2 seconds operating, 2 seconds stopped)
Instantaneous Bi-Directional Operation	6~40 W (1/125~1/19 HP)	When rotation direction is repeatedly switched during operation Switch once every 2 seconds min.
	60 W, 90 W (1/12 HP, 1/8 HP)	When rotation direction is repeatedly switched during operation Switch once every 4 seconds min.

● On the electromagnetic brake type, continuous operation conditions occur when the "deceleration control" parameter is set to ON. Check the electromagnetic brake type "Common Specifications - Permissible Continuous Operation Time While Deceleration Control is ON" (→ Page D-159)

● Brake Current

When performing an instantaneous stop, bi-directional operation or vertical operation*, the large brake current flows for approximately 0.4 seconds on a half-wave rectified AC power supply line.

When performing these kinds of operations, select the equipment breaker and AC power supply capacitance by referring to the table's braking current (peak value).

Motor Output Power	Braking Current (Peak value)	
	Single-Phase 110/115 VAC	Single-Phase 220/230 VAC
6 W (1/125 HP)	2 A	1 A
15 W (1/50 HP)	4 A	3 A
25 W (1/30 HP)	8 A	4 A
40 W (1/19 HP)	12 A	7 A
60 W (1/12 HP)	21 A	10 A
90 W (1/8 HP)	29 A	13 A

*Only for electromagnetic brake type.

Overview,
Product
Series

Brushless
Motors

AC Input
BMU

AC Input
BLE

AC Input
BLF

AC Input
BXII

DC Input
BLH

AC Speed
Control
Motors

DSC

BHF

Accessories

Installation