

■ Connection and Operation

● Names and Functions of Driver Parts

Internal Potentiometer	
Display	Function
SPEED	Internal Speed Potentiometer
S.S.	Acceleration Time Potentiometer*
S.D.	Deceleration Time Potentiometer*

* Acceleration/Deceleration Time Setting:
0.5~15 sec. (3000 r/min)

For Motor Connector

Power Supply Terminal Block



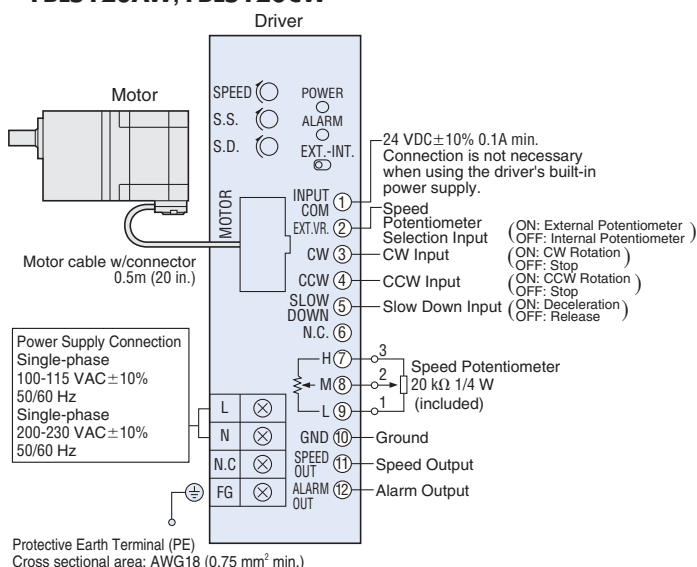
LED Display		
Display	Function	Lighting Condition
POWER	Power Indicator	Lights when the power is ON.
ALARM	Alarm Indicator	<ul style="list-style-type: none"> When the motor load exceeds rated torque for a minimum of 5 seconds. When the temperature of the heat sink inside driver exceeds approximately 90°C (194°F). When a load exceeding the permissible load inertia is driven. When a gravitational operation is performed. When the power supply voltage applied to the driver dropped below the specified voltage (–10%). When the sensor wire inside the motor cable is disconnected.

I/O Power Supply Switch	
Display	Function
EXT.	When controlling from a programmable controller or other external power supply. (Factory setting)
INT.	When controlling with a relay or switch. (Driver built-in power supply)

- When the switch is set to EXT., the input circuit is insulated by the photocoupler. However when the switch is set to INT., the input circuit is not insulated, so the system will not work, even if an input signal is input, unless GND is connected to a controller.

Input/Output Signal Terminal Block		
Display	Signal Name	Function
INPUT COM	Power Supply for Input Signals	External power supply +24 VDC A connection is not necessary when using the driver's built-in power supply.
EXT.VR.	Speed Setting Selection Input	Input signal for selecting internal or external speed potentiometer.
CW	CW Rotation Input	Input signal for selecting CW rotation/stop.
CCW	CCW Rotation Input	Input signal for selecting CCW rotation/stop.
SLOW DOWN	Deceleration Input	Input terminal for decelerating the motor to a stop.
N.C.	—	Not used.
H M L	Speed Setting Input	Used when controlling the speed by an external potentiometer or DC voltage.
GND	Ground	Common ground terminal for input/output signals.
SPEED OUT	Speed Output (Open-Collector Output)	Used when monitoring the motor speed; 12 pulses are output for each motor rotation.
ALARM OUT	Alarm Output (Open-Collector Output)	This signal is output when a protective function is activated. The ALARM LED lights and the motor coasts to a stop. To reset, turn off the power for 30 seconds, then turn the power on again.

● Connection Diagrams

◇ FBL575AW, FBL575CW,
FBL5120AW, FBL5120CW

- Motor cable should be no more than 10.5 m (34.4 ft.) in length. The motor comes with 0.5m (20 in.) long connector-equipped cable which can be extended by using an accessory extension cable (sold separately).

There are six different length extension cables. Also there are flexible extension cables.

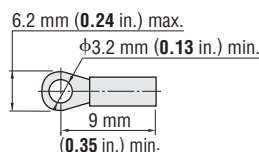
[Length: 1 m (3.3 ft.), 2 m (6.6 ft.), 3 m (9.8 ft.), 5 m (16.8 ft.), 7 m (23.0 ft.), 10 m (32.8 ft.)]

Extension cables, flexible extension cables → Page B-116

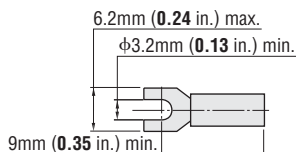
- Signal wires and motor wires should be kept away from equipment, power cables and other sources of magnetic noise.

◇ Applicable Crimp Terminals

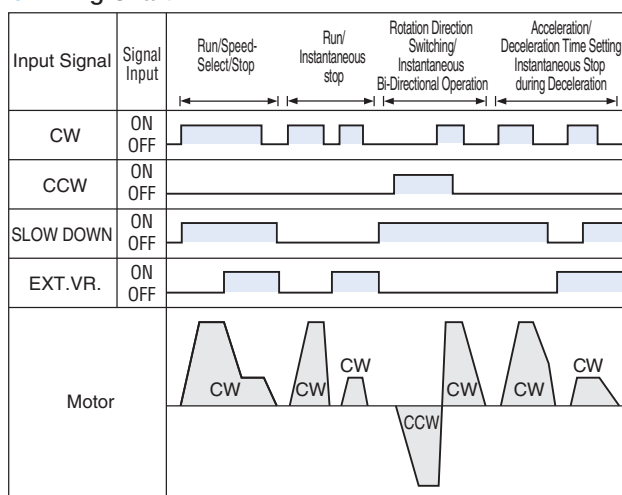
- Round Terminal with Insulation (M3)



- U-Shape Terminal with Insulation (M3)



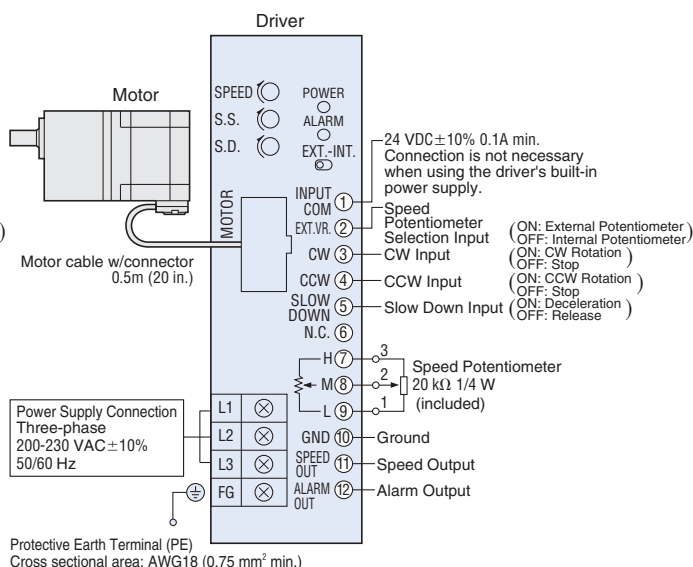
● Timing Chart



Notes:

- Pay attention to the temperature rise of the motor when used in applications requiring short cycles of start/stop (instantaneous stop) operation and bi-directional operation.
- Operate the motor so that the temperature of the motor case remains below 90°C (194°F) and the temperature of the driver remains below 80°C (176°F). If the temperature of the heat sink in the driver exceeds 90°C (194°F), the overheat protection activates and stops the motor.
- Cannot be used while the gravitational operation or other application where the motor shaft is turned by the load. To prevent damage to the driver during gravitational operations, if the primary voltage of the driver's inverter exceeds the permissible value, the protective circuit will be activated.

◇ FBL575SW, FBL5120SW

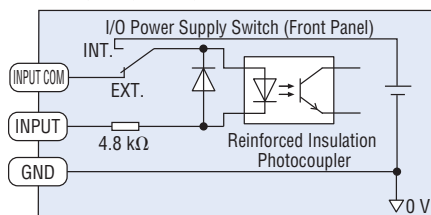


- The CW input signal, CCW input signal and SLOW DOWN input signal can be used to control all motor operations, such as run, stop, direction switching, deceleration stop and instantaneous stop.
- Switching the CW input signal ON will cause the motor to turn clockwise as viewed from the motor shaft, while switching the CCW input signal ON will cause the motor to turn counterclockwise. Switching each input signal OFF will stop the motor. If both the CW and CCW input signal are turned ON at the same time, the motor will turn clockwise. The motor will start at the rise time corresponding to the time set on the acceleration time potentiometer.
- Switching the SLOW DOWN input signal ON will cause the motor decelerates and the motor stops at the time set on the deceleration time potentiometer. Switching the SLOW DOWN input signal OFF will cause the motor to stop instantaneously.
- Switching the EXT.VR. input signal ON, the external speed potentiometer (external DC voltage) can be used to set speed, while internal speed potentiometer can be selected by switching the EXT.VR. input signal OFF.

Input/Output Signal Circuit

Input Circuit

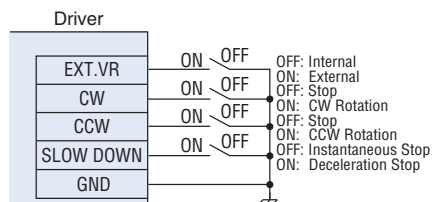
Common to EXT.VR., CW, CCW, SLOW DOWN



Connection Example for Input Circuit

Control by Small Capacity Relays

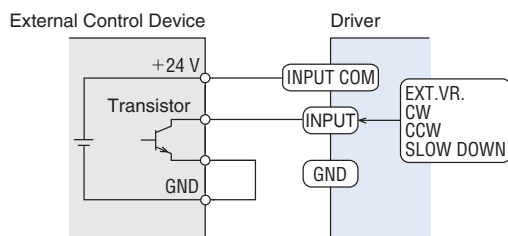
Flip the I/O power supply switch to INT. position.



Use a small capacity contact point type relay capable of switching 24 VDC, 0.5 mA.

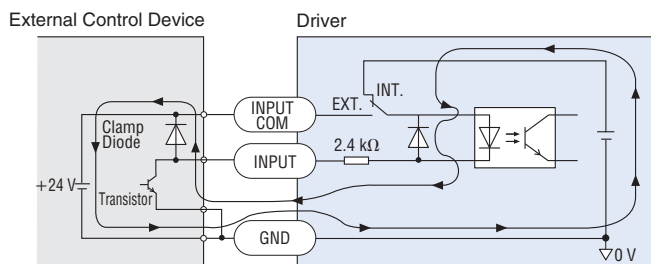
Control by Transistor Output Type Controller

Flip the I/O power supply switch to EXT. position (factory setting).



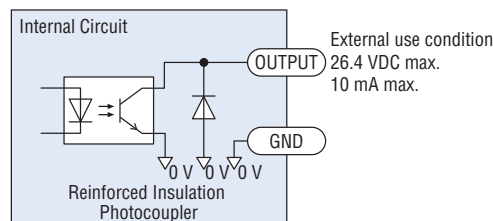
When an External Control Device with a Built-In Clamp Diode is Used

When using a controller with an internal clamp diode, be sure to set the I/O power supply switch on the front panel to the EXT. (external DC power supply) position. If the I/O power supply switch is in the INT. (built-in power supply) position, the current will flow as indicated by the arrows in the diagram, thereby causing the motor to run abnormally.

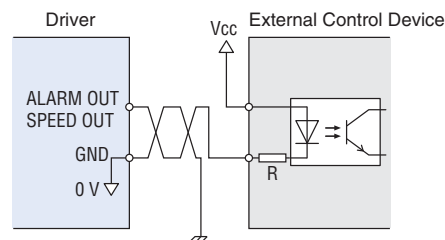


Output Circuit

Common to SPEED OUT and ALARM OUT



Connection Example for Output Circuit



Speed output: Output at a rate of 12 pulses per motor rotation.

$$\text{Motor speed [r/min]} = \frac{\text{Speed output frequency [Hz]}}{12} \times 60$$

Alarm output: Output when the protective function for overload, overheat, overvoltage, under voltage or missing phase has been activated. When output, the current flows between ALARM OUT and GND terminal.

Notes:

- Output signal is open-collector output, so an external power supply (Vcc) is required.
- Use a power supply of no more than 26.4 VDC and connect a limit resistor (R) so that the output current does not exceed 10 mA. When using neither the speed output function nor the alarm output function, this connection is not required.
- To display or monitor the speed of the motor output shaft or the reduced speed of the gearhead output shaft, use an optional **SDM496** motor speed indicator. Motor speed indicator → Page A-298

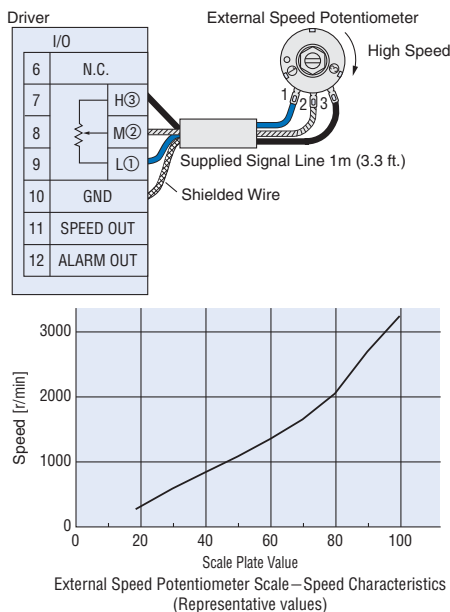
Speed Setting Method

Internal Speed Potentiometer

Motor speed is adjusted by using the internal potentiometer located on the front panel. The internal speed potentiometer is selected when the EXT.VR. input has been set to OFF.

External Speed Potentiometer (Included)

To set speeds at a location away from the driver, connect an external speed potentiometer as shown below. The EXT.VR. input should be set to ON.



Note:

- Use included signal wires [($\phi 3.3$ mm \times 1 m ($\phi 0.13$ in. \times 3.3 ft.)) when speed setting using the external speed potentiometer. The shielded wire of the signal line should be connected to the GND terminal. Also note that the shielded wire does not contact with other terminals on the external speed potentiometer.

Multi-Motor Control

Two or more sets of motor and driver can be operated at the same speed by using a DC power supply or an external speed potentiometer. The figure below is for single-phase power supply specification. For three-phase power supply specification, connect the power supply line to three-phase power supply. Also note that the diagram does not show the motor or operation control part.

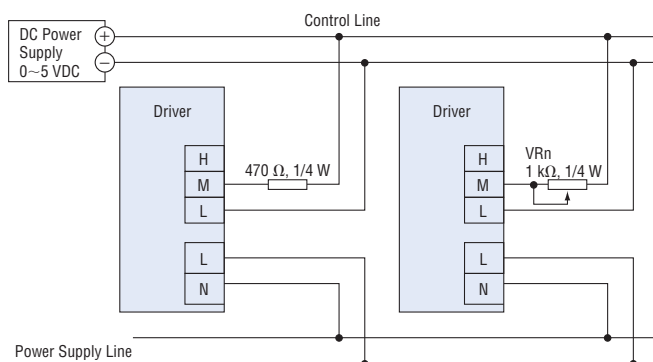
When External DC Power Supply is Used

- Use a DC power supply with current capacity equal to or greater than the value obtained by the following expression.

$$\text{Current capacity (N is the number of drivers)} \quad I = 1 \times N \text{ (mA)}$$

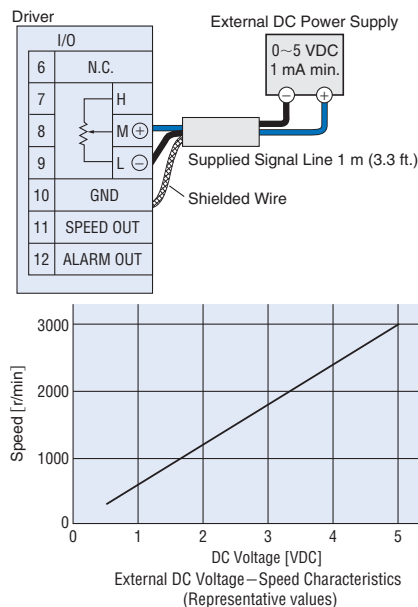
Example: When two drivers are used, current capacity should be at least 2 mA.

- Connect the other input/output lines to each driver individually.
- Motor speed differences can be adjusted by connecting a resistor of 470 Ω , 1/4 W to the M terminal of the first driver, and a 1 k Ω , 1/4 W variable resistor (VRn) to the M terminals of the other drivers.



External DC Voltage

When setting the motor speed with an external DC voltage, do so in the following manner. The EXT.VR. input should be set to ON.



- Do not allow the voltage to exceed 5 VDC, and connect the positive and negative terminals of the power supply correctly.

Note:

- Use included signal wires [($\phi 3.3$ mm \times 1 m ($\phi 0.13$ in. \times 3.3 ft.)) when speed setting using external DC voltage. The shielded wire of the signal line should be connected to the GND terminal. Also note that the shielded wire does not contact with other terminals on the DC voltage source.

When External Speed Potentiometer is Used

As shown below, make the power supply line and the speed control line common to set the speed at VRx.

- The required resistance of the external speed potentiometer is calculated by the following expression.

$$\text{Resistance value (N is the number of drivers)} \quad VRx = 20/N \text{ (k}\Omega\text{)}, N/4 \text{ (W)}$$

Example: When two drivers are used, the resistance is 10 k Ω , 1/2 W.

- Connect the other input/output lines to each driver individually.
- Motor speed differences can be adjusted by connecting a resistor of 470 Ω , 1/4 W to the M terminal of the first driver, and a 1 k Ω , 1/4 W variable resistor (VRn) to the M terminals of the other drivers.
- No more than 20 motors should be operated simultaneously when using the external speed potentiometer.

