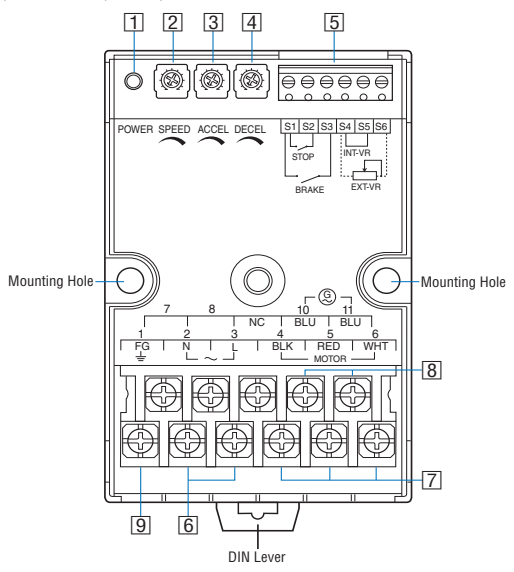


Connection and Operation

Names and Functions of Speed Controller Parts

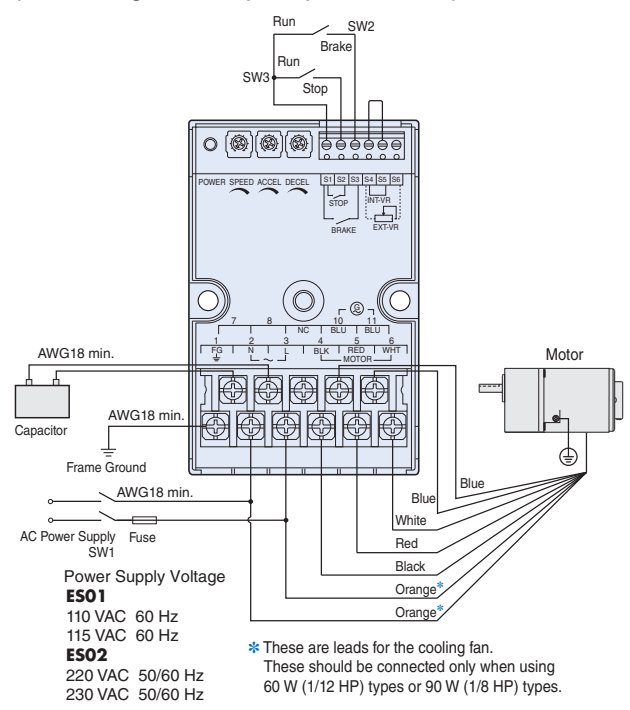
The illustration shows the controller with the cover removed. Install the cover after connection. Figures in parentheses represent pin numbers.



- 1 **POWER LED (POWER)**
Lights (green) while power is being supplied.
- 2 **Internal speed potentiometer (SPEED)**
Sets the motor's operating speed.
- 3 **Acceleration time potentiometer (ACCEL)**
Sets the acceleration time at starting of motor.
- 4 **Deceleration time potentiometer (DECCEL)**
Sets the deceleration time at stopping of motor.
- 5 **Control input terminals**
S1: Common terminal for running and braking
S2: Run/Stop input
Runs (OFF) or stops (ON) the motor.
S3: Run/Brake input
Runs (OFF) or brakes (ON) the motor.
S4, S5, S6: Speed potentiometer inputs
When S4 and S5 are shorted, the speed can be set using the internal speed potentiometer (INT-VR).
When S4 and S5 are open, the speed can be set using an external speed potentiometer (EXT-VR).
When using an external speed potentiometer, connect it to S4 and S6.
- 6 **Power connection terminals (terminals 2 and 3)**
- 7 **Motor connection terminals (terminals 4, 5 and 6)**
- 8 **Generator connection terminals (terminals 10 and 11)**
- 9 **FG terminal (terminal 1)**

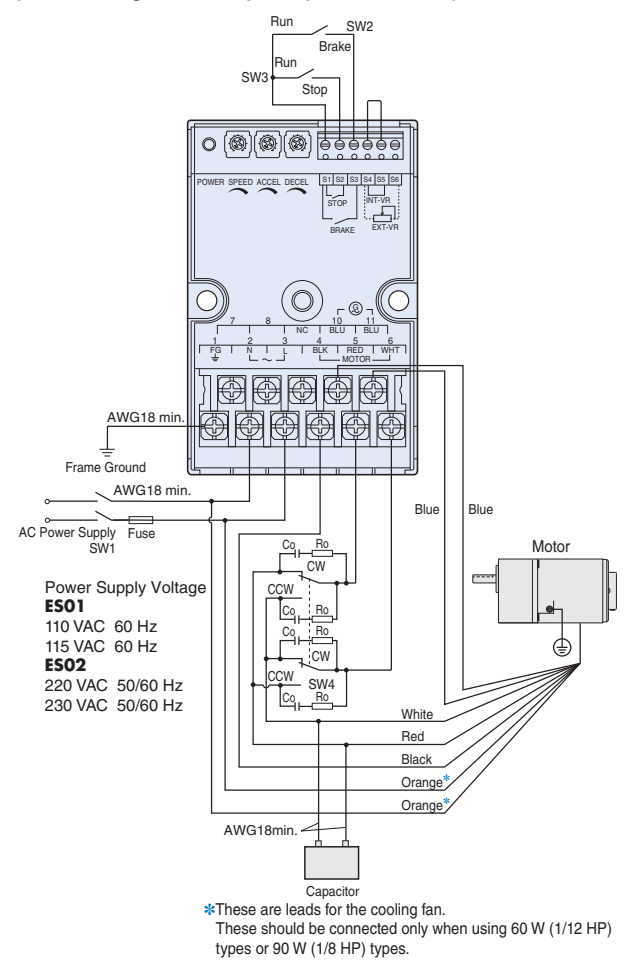
Connection Diagrams

Uni-Directional Operation (When using internal speed potentiometer)



- For uni-directional operation, connect the red lead to motor connection terminal 5, and the white lead to terminal 6. In this case, the motor rotates in the clockwise direction, as viewed from the motor output shaft.
- If you connect the white lead to terminal 5 and the red lead to terminal 6, the motor rotates in the counterclockwise direction, as viewed from the motor output shaft.
- When using an external speed potentiometer, refer to page B-199
- How to connect a capacitor → Page A-313
- Specifications of the switches and fuse → Page B-198

Bi-Directional Operation (When using internal speed potentiometer)



● Specifications of the Switches and Fuse

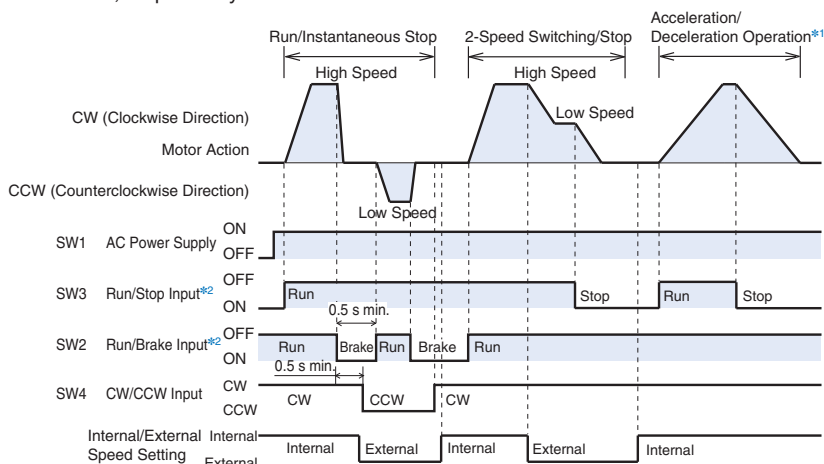
Power Supply Voltage	110/115 VAC (E501)	220/230 VAC (E502)
SW1	125 VAC 10 A	250 VAC 5 A
SW2, SW3	18 VDC 1 mA	
SW4	125 VAC 10 A	250 VAC 5 A
Ro, Co (CR circuit for surge suppression)	Ro=5~200 Ω, Co=0.1~0.2 μF, 200 WV	Ro=5~200 Ω, Co=0.1~0.2 μF, 400 WV
Fuse	Product recognized by UL/CSA in accordance with UL/CSA 248-14 or equivalent, 250 VAC 10 A	Product recognized by UL/CSA in accordance with UL/CSA 248-14 or equivalent, 250 VAC 5 A

Notes:

- The control input terminals are not insulated from the AC power supply. Any equipment (programmable controller, relay and switch) that will be connected to the control input terminals must have contact ratings of 18 VDC and 1 mA minimum. Do not use a transistor output type controller.
- The length of the cable connecting the motor and speed controller should be 10 m (32.8 ft.) or less. The length of the control cable should be 2 m (6.6 ft.) or less and as short as possible.
- Be sure to connect a surge suppressor to SW4. **EPCR1201-2** CR circuit for surge suppression is available as an accessory. → Page A-302

● Timing Chart

The timing chart below shows an example of two-level speed control operation when the high speed and low speed are selected via the internal and external speed potentiometers, respectively.



*1 Case where the acceleration and deceleration times are set longer by turning each potentiometer clockwise.
 *2 In case SW2 and SW3 are turned on at the same time, brake input (SW2) is given priority.

◇ Run/Brake, Stop

Setting SW2/SW3 to "Run" (OFF) causes the motor to rotate at the speed set via the speed potentiometers.

Setting SW2 to "Brake" (ON) during operation causes the motor to stop instantaneously.

Setting SW3 to "Stop" (ON) during operation causes the motor to coast to a stop.

Run/Stop Input	Run/Brake Input	Motor Operation
OFF	OFF	Run
OFF	ON	Instantaneous stop
ON	OFF	Coast to a stop*

*When the deceleration time set with a potentiometer is longer than the time which motor coasts to a stop, motor will stop with deceleration time.

The braking function (current through the motor) is only active for approximately 0.4 second after the Run/Brake input is turned ON. Do not switch SW2, SW3, SW4 within 0.5 second after Run/Brake input is turned ON.

◇ Switching the Rotation Direction

SW4 is used to switch the rotation direction of motor. When SW4 is set to CW, the motor rotates in the clockwise direction, as viewed from the motor output shaft. When SW4 is set to CCW, the motor rotates in the counterclockwise direction, as viewed from the motor output shaft.

- Be sure to connect a surge suppressor to SW4. **EPCR1201-2** CR circuit for surge suppression is available as an accessory. → Page A-302
- Instantaneous bi-directional operation is possible with a reversible motor.
- For bi-directional operation of an induction motor, switch the rotation direction after the motor has come to a complete stop.

● Speed Setting Methods

The following two methods of setting speed can be used. Multi-motor control or DC voltage control cannot be used.

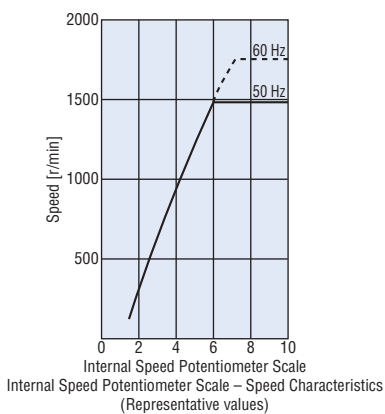
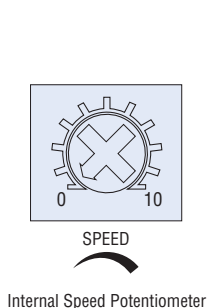
◇ Internal Speed Potentiometer

The setting speed range is 90 to 1400 r/min at 50 Hz, or 90 to 1600 r/min at 60 Hz.

Short the speed potentiometer input terminals S4 and S5.

When the dial on the internal speed potentiometer is turned in the clockwise direction, the set speed will be faster.

The factory setting is 0 r/min.



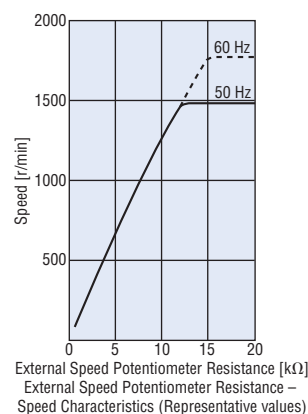
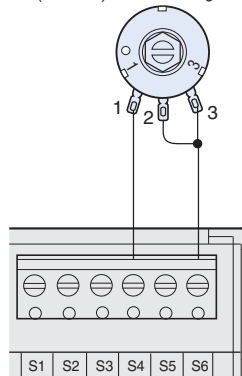
◇ External Speed Potentiometer (Included)

Open the speed potentiometer input terminals S4 and S5.

Before connecting, turn the dial on the external speed potentiometer in the counterclockwise direction to set the speed to 0 r/min.

When the dial on the external speed potentiometer is turned in the clockwise direction, the set speed will be faster.

External Speed Potentiometer (Included) 20 kΩ 1/4 W, with a linear resistance vs. angle curve



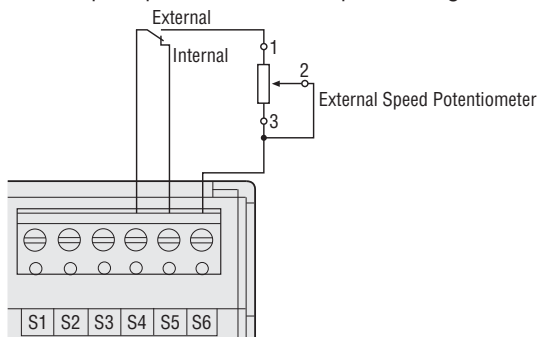
Note:

- Do not operate multiple speed controllers with a single external speed potentiometer. This may damage the speed controllers.

● Two-Level Speed Control

The motor can be controlled over two-level speed by switching between the internal and external speed potentiometers.

Select the internal speed potentiometer or external speed potentiometer with speed setting switch.



Note:

- The control input terminals are not insulated from the AC power supply. Any equipment (programmable controller, relay and switch) that will be connected to the control input terminals must have contact ratings of 18 VDC and 1 mA or more. Do not use a transistor output type programmable controller.

● Acceleration (ACCEL) and Deceleration (DECEL) Operation

Equipment and loads are subject to large acceleration/deceleration force when starting, stopping, and changing speed. When you want to accelerate/decelerate without any accompanying shock, the acceleration/deceleration time can be extended using the acceleration/deceleration function. The acceleration/deceleration time can be set using acceleration/deceleration time potentiometers built in the controller. The setting range is approximately 0.5 to 10 seconds (at 1000 r/min, with no inertial load).

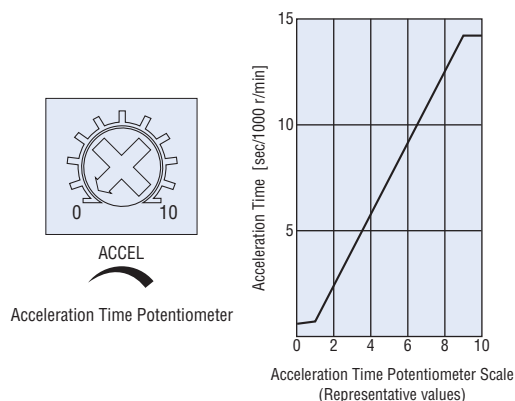
However, when the load inertia is large, the deceleration time cannot be set at a shorter time than when the motor is coasted to a stop.

◇ Acceleration (ACCEL)

The acceleration function is activated at starting or when the speed is switched to the higher setting in a two-level speed control.

When the dial on the acceleration time potentiometer is turned in the clockwise direction, the set time will be longer.

The factory setting is 0 (no acceleration).

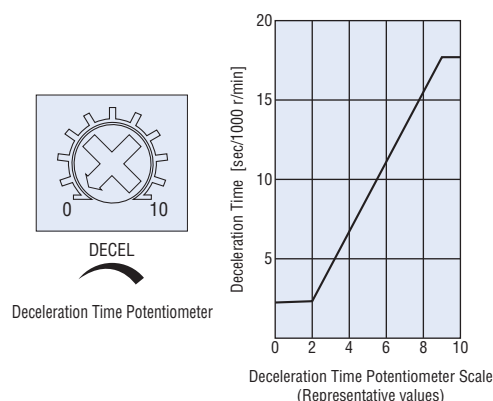


◇ Deceleration (DECEL)

The deceleration function is activated at coast to a stop or when the speed is switched to the lower setting in a two-level speed control.

When the dial on the deceleration time potentiometer is turned in the clockwise direction, the set time will be longer.

The factory setting is 0 (no deceleration).



● Repeated Running/Braking Cycle

When running/braking of the motor is repeated in short cycles, the motor temperature rise will increase and the continuous operation time will be limited. Use the following values shown below.

The motor may generate heat depending on drive conditions. Ensure that the temperature of the motor case does not exceed 90°C (194°F).

Motor Output Power	Repetition Cycle
6 W (1/125 HP) to 40 W (1/19 HP)	2 seconds min. (Running 1 second, stopping 1 second)
60 W (1/12 HP), 90 W (1/8 HP)	4 seconds min. (Running 2 seconds, stopping 2 seconds)

● Braking Current

● When the motor is stopped instantaneously, a large braking current flows through the motor. When connecting a circuit breaker (or fuse), refer to the table below for the braking current (peak value) and select its current capacity.

● Be careful that repeated motor running and braking may cause the motor's temperature to rise.

Motor Output Power	Braking Current (Peak value) [A]	
	Single-Phase 110/115 VAC	Single-Phase 220/230 VAC
6 W (1/125 HP)	1.5	1.0
15 W (1/50 HP)	3.5	2.0
25 W (1/30 HP)	5.5	4.0
40 W (1/19 HP)	8.5	6.0
60 W (1/12 HP)	15.5	8.0
90 W (1/8 HP)	20.5	12.0

■ List of Motor and Gearhead Combinations

● Model names for motor and gearhead combinations are shown below.

● Induction Motors

Model	Motor Model	Gearhead Model
VSI206A2-□U	VSI206A2-GV	GV2G□
VSI206C2-□E	VSI206C2-GV	
VSI315A2-□U	VSI315A2-GV	GV3G□
VSI315C2-□E	VSI315C2-GV	
VSI425A2-□U	VSI425A2-GV	GV4G□
VSI425C2-□E	VSI425C2-GV	
VSI540A2-□U	VSI540A2-GVH	GVH5G□
VSI540C2-□E	VSI540C2-GVH	
VSI560A-□U	VSI560A-GVH	GVH5G□
VSI560C-□E	VSI560C-GVH	
VSI590A-□U	VSI590A-GVR	GVR5G□
VSI590C-□E	VSI590C-GVR	

● Enter the gear ratio in the box (□) within the model name.

● Reversible Motors

Model	Motor Model	Gearhead Model
VSR206A2-□U	VSR206A2-GV	GV2G□
VSR206C2-□E	VSR206C2-GV	
VSR315A2-□U	VSR315A2-GV	GV3G□
VSR315C2-□E	VSR315C2-GV	
VSR425A2-□U	VSR425A2-GV	GV4G□
VSR425C2-□E	VSR425C2-GV	
VSR540A2-□U	VSR540A2-GVH	GVH5G□
VSR540C2-□E	VSR540C2-GVH	
VSR560A-□U	VSR560A-GVH	GVH5G□
VSR560C-□E	VSR560C-GVH	
VSR590A-□U	VSR590A-GVR	GVR5G□
VSR590C-□E	VSR590C-GVR	

● Enter the gear ratio in the box (□) within the model name.