

RSD110-6 STEPPING MOTOR DRIVE Operation Manual

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Overview

Thank you purchasing the Model RSD110-6, stepping motor driver. This advanced stepper drive utilizes a PWM current control mode.

This control mode has the following advantages over traditional stepper technologies.

- a. Smoother operation
- b. Lower audible noise
- c. Lower mechanical vibration
- d. Lower operating temperature

Wiring Instructions

The RSD110-6 stepper motor drivers utilize a simple screw terminal type connector to connect the AC, motor and control wires.

The following instructions explain how to connect typical stepper motors, control systems and AC sources. Fig. 1 shows a typical wiring diagram.

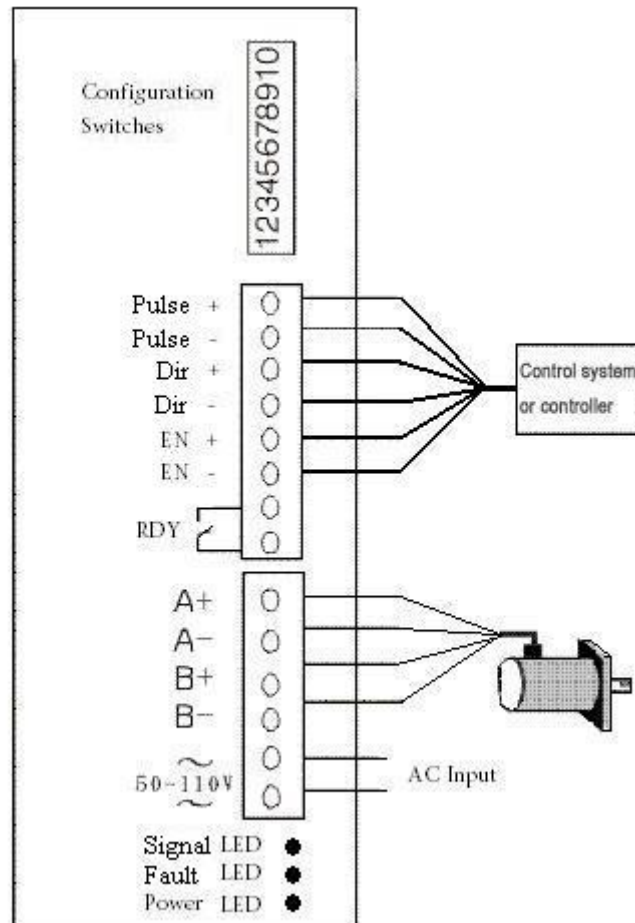


Fig. 1 – Typical wiring diagram

Tools

There are only two tools necessary to connect the wires to the drive.

1. Wire strippers
2. Small flat head screwdriver

Wiring procedures

1. Carefully strip $\frac{1}{4}$ " of the protective coating off of the wire
2. Unscrew the desired screw terminal with the small flat head screwdriver
3. Push in the wire until the protective coating reaches the edge of the screw terminal. Ensure you are not crimping any of the protective coating
4. Tighten the screw terminal with screw driver
5. Test the connection with an appropriate tug on the wire

Connector Information

AC Input Connector

Use this connector to attach the wires from the AC Voltage source.

Specification:

AC Voltage Range: 50-110V

Maximum Voltage: 120V

Max Current: RSD110-6, (6 Amps),

Caution: AC Voltages beyond this range WILL damage the drive and void the warranty.

Motor Connector

Use this connector to attach the wires coming from the stepper motor. This drive will work with 2-phase stepper motors with 4, 6 and 8 wiring options.

Wiring Options:

There are 5 ways to connect a stepper motor to the drive.

1. 4-wire motor: Connect one motor phase to A + and A – on the drive, and the other motor phase to B+ and B- on the drive. (Fig. 2)
2. 6-wire motor (Serial Connected): In a 6-wire serially connected stepper motor the center tap is not used. Connect one motor phase to A + and A – on the drive, and the other motor phase to B+ and B- on the drive. (Fig. 4)

Note: If the motor is connected properly the resistance will be double the phase resistance.

3. 6-wire motor (Parallel Connected): In a 6-wire Parallel connected stepper motor the center tap is used. The user must connect the A+ and A – and B+ and B – wires together. Then, connect one motor phase to A + and A – on the drive, and the other motor phase to B+ and B- on the drive. (Fig. 5)

Note: If the motor is connected properly the resistance will be half of the phase resistance.

4. 8-wire motor (Serial Connected): In an 8-wire serially connected stepper motor the center tap wires need to be connected together. Then, connect one motor phase to A + and A – on the drive, and the other motor phase to B+ and B- on the drive. (Fig. 7)

Note: If the motor is connected properly the resistance will be double the phase resistance.

5. 8-wire motor (Parallel Connected): In an 8-wire Parallel connected stepper motor the center tap wire need to be connected together. The user must also connect the A+ and A – and B+ and B – wires together. Then, connect one motor phase to A + and A – on the drive, and the other motor phase to B+ and B- on the drive. (Fig. 8)

Note: If the motor is connected properly the resistance will be half of the phase resistance.

Caution: Stepper motors with 6 and 8 wiring options must have their center tap connections wired correctly or the drive and/or motor may be come damaged.

Tip: If the stepper motor wires are not labeled, use a multi-meter on the resistance setting to find the phase resistances.

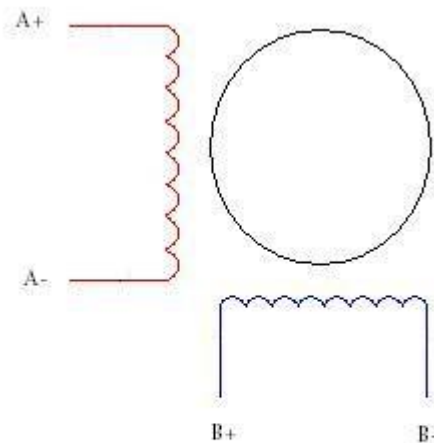


Fig 2 - Typical 4 wire Stepper motor

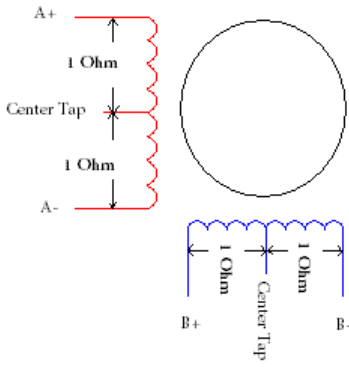


Fig 3 - Typical 6 wire Stepper motor

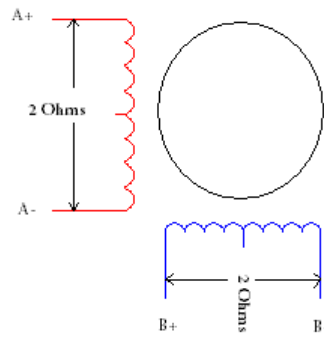


Fig 4 - 6 wire, Serial connected

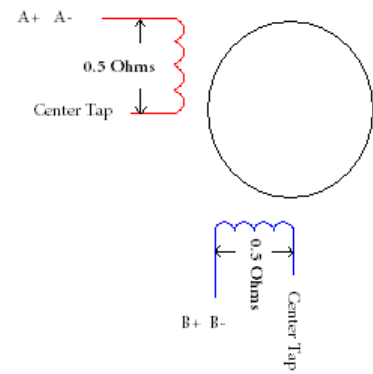


Fig 5 - 6 wire, Parallel Connected

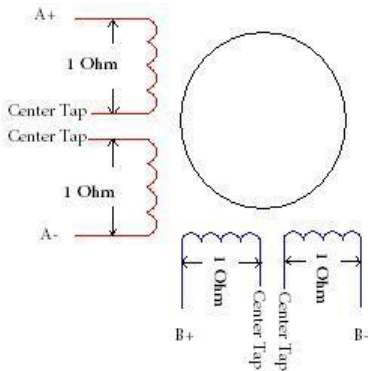


Fig 6 - Typical 8 wire Stepper motor

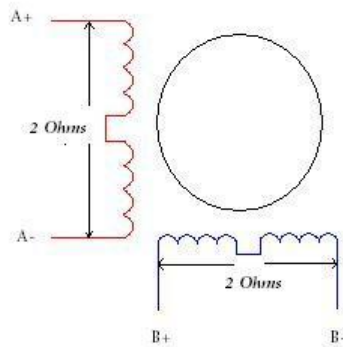


Fig 7 - Typical 8 wire Stepper motor

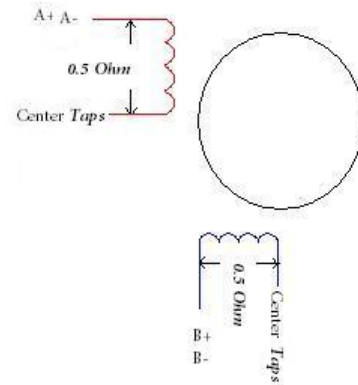


Fig 8 - Typical 8 wire Stepper motor

Control System Connector

Use this connector to connect control systems that support the standard pulse and direction mode of operation.

Specification:

Input current range: 8-15mA

Maximum input Voltage: 30V

Maximum input frequency: 2000Hz

Control Connector definition

Dir +, - : Input connection that controls the direction of the motor. The state of the control signal (high & low) will determine if the motor is running clockwise or counter clockwise. The signal level should stagger the CP pulses falling edge, and the signal duration has to be greater than 2.5 us.

EN +, - : Input connection that controls the power to the motor. The state of the control (high & low) will determine if the motor is engaged or off-line.

Pulse +, - : Input connection that controls the position of the motor shaft. The state of the control signal (high & low) will determine if the motor shaft turns. The maximum frequency that can be used to control the drive is 2000Hz, and the signal duration has to be greater than 2.5 us.

Caution: Control system signal must have enough current capability to drive the stepper motor drivers internal interface circuit directly.

The internal interface circuit for the stepper motor drives uses opto-couplers technology to isolate and protect the control system from the drive. (Fig. 9)

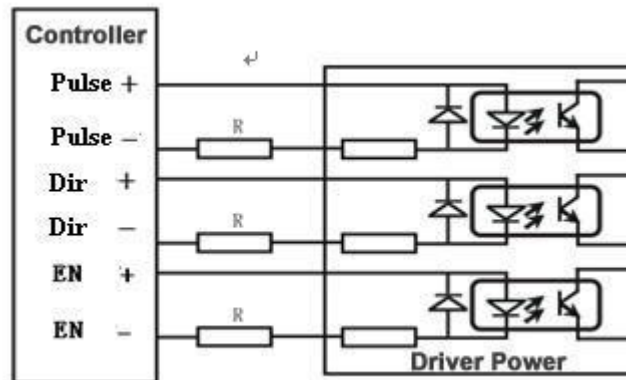


Fig 9 - internal interface circuit

The stepper drive supports a standard 5V input, however, if the users control system support 12V or 24V, please refer to table 1 to add the correct current limiting resistor.

Signal Amplitude	Resistor
5V	None needed
12V	680Ω
24V	1.8KΩ

Table 1- Resistor values

There are three ways to connect an input to the drive.

1. **Single Ended Input (sourcing current):** Connect Pulse+, Dir+, EN+ together and then connect to the control systems voltage source. Note: depending on the control system a 1K pull up resistor may be necessary. Then connect the control systems Pulse+, Dir+ and EN+ to the drives Pulse-, Dir- and EN- connections.

2. **Single Ended Input (sinking current):** Connect the drives Pulse -, Dir -, EN-, together, and then connect to the control systems ground. Note: depending on the control system a 1K pull down resistor may be necessary. Then connect the control systems Pulse +, Dir + and EN+ to the drives Pulse +, Dir + and EN+ connections.
3. **Differential Input:** Connect the control systems Pulse +, Dir + and EN+ to the drives Pulse +, Dir + and EN+ connections. Then connect the control systems Pulse -, Dir - and EN- to the drives Pulse -, Dir - and EN- connections.

Note: If the voltages for the control signals are greater than 5V, the user must add current limiting resistors to ensure that the current for opto-coupler stay below 15mA. (See Table 1)

Configuring the Drive

The drive is configured by changing the state of the micro switches on the front panel.

There are four user configurable settings.

1. **Phase Current Setting:** Sets the maximum phase current the drive can use to drive the stepper motor. Please refer to the stepper motors datasheet.
2. **Micro-step Setting:** Set the amount of micro step per full step. Example: If the stepper motor has 50 poles (steps), and the user sets switches 7, 8, 9, 10 to (0 1 1 0) or 10 micro steps, then the motor will have 500 micro steps per revolution.
3. **Current fold back:** Switch 5 is used to cut back the current by 50% when the motor is standing still.(On = disable, Off = enable)
4. **Pulse Definition:** Switch 6 is used to define the move value (in steps) of one pulse. (On = Single step for every pulse, OFF = two step for every pulse),

Note: All the possible settings are in tables 2 and 3.

Note: After selecting a micro-step, the stepping angle of the motor can be calculated with full-step angle divided by selected micro-step value. Example: Micro-step value of 2 with a 1.8° two-phase motor will give a new angle of 0.9°. ($1.8^\circ / 2 = 0.9$)

Note: For all Switch, ON=0, OFF=1

Phase current setting (Switches – 1 2 3 4)			
1 2 3 4	Phase current	1 2 3 4	Phase current
0 0 0 0	0.38A	1 0 0 0	3.38A
0 0 0 1	0.75A	1 0 0 1	3.75A
0 0 1 0	1.13A	1 0 1 0	4.13A
0 0 1 1	1.50A	1 0 1 1	4.50A
0 1 0 0	1.88A	1 1 0 0	4.88A
0 1 0 1	2.25A	1 1 0 1	5.25A
0 1 1 0	2.63A	1 1 1 0	5.63A
0 1 1 1	3.00A	1 1 1 1	6.00A

Table 2 – Current Settings

Micro-step setting (Switches - 7 8 9 10)	
Switch Value	Micro-steps
0 0 0 0	1
0 0 0 1	2
0 0 1 0	4
0 0 1 1	5
0 1 0 0	6
0 1 0 1	8
0 1 1 0	10
0 1 1 1	16
1 0 0 0	18
1 0 0 1	20
1 0 1 0	32
1 0 1 1	40
1 1 0 0	50
1 1 0 1	64
1 1 1 0	128
1 1 1 1	256

Table 3- Micro Step Values

Dimensions and Mounting Instructions

Refer to Fig. 10 for the dimensions of the drive.

Note: The drive can generate heat; therefore, ensure that the drive is mounted to an appropriate heat sink. The drive is thermally protected, therefore, increase heat sink size if drive receives thermal error.

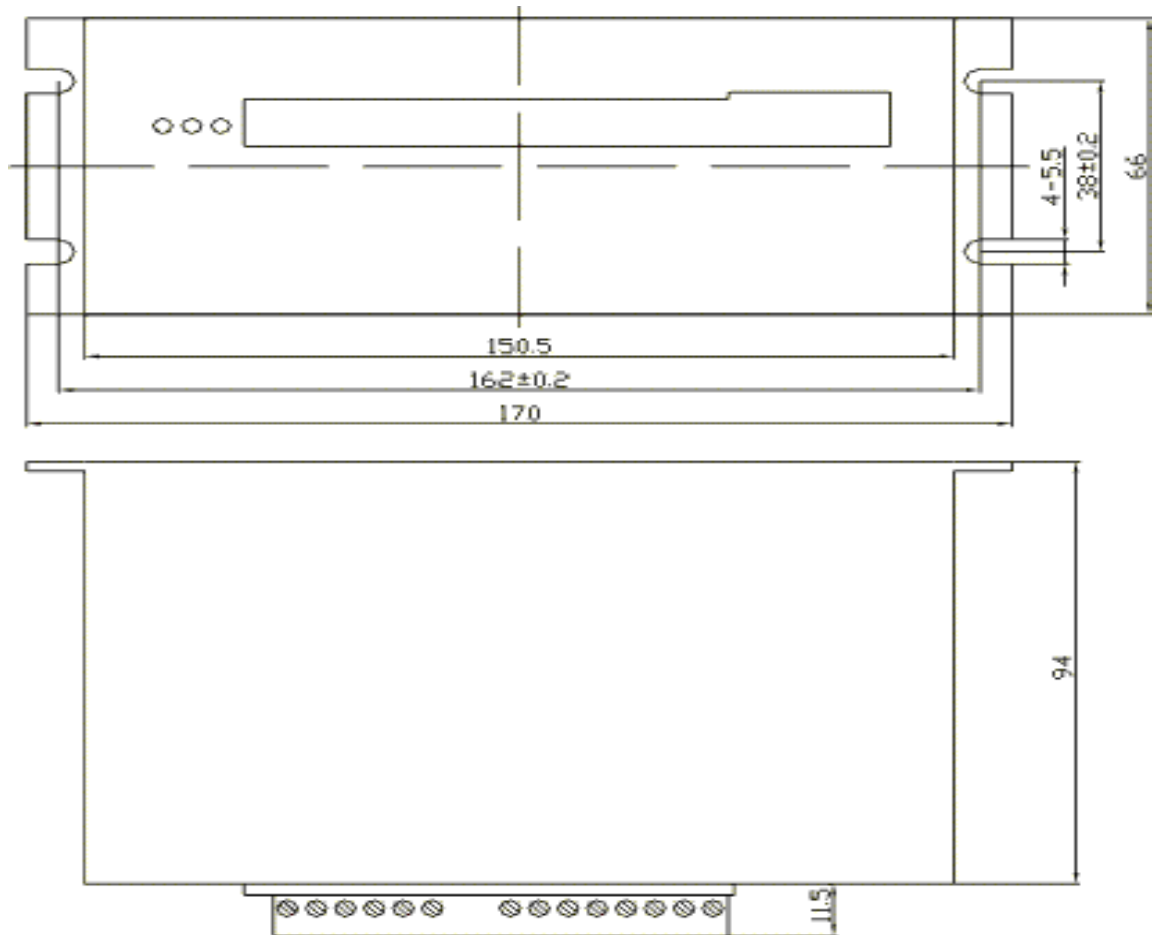


Fig 10 – RSD110-6 Drive Dimensions

Trouble Shooting and Errors Codes

State	Reason	Solution
Error LED - Flashing Red (Over Current)	Motor wiring has short circuit Motor has internal short Drive has internal short	1. Check the wiring 2. Measure motors phase resistance, change the motor 3. Return to factory
Error LED - Flashing Orange (Over voltage)	External AC voltage exceeded 120V	Decrease voltage
Error LED – Solid Red (Under voltage)	External AC voltage below 50V	Increase voltage
Error LED Flashing red and blue alternately (Over temperature)	The temperature of driver exceeded normal working conditions.	Add heat sink Add a fan
Power LED – Solid Red	Fuse was damaged	Replace fuse with the same current value.