DR3535
DR3535-O
Hardware Reference Manual

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MICROKINETICS   CORPORATION

Table of Contents

Operating voltage range .... 12 ~ 35 VDC
Output Current .... 0.4 - 3.5 Amps models standard
Stepping Mode .... Half step / Full step selectable
Current cutback .... Automatic after 0.7 seconds of idle
Step signals .... 1 TTL compatible positive edge trigger
Direction signals .... 1 TTL compatible
Motor control outputs .... 4 current mode chopper lines per axis
Current capability .... 3.5 amps per phase continuous
Physical dimensions .... 4.00" w   X   3.00" d   X   1.50" h
Working temperature range .... (32°F ~ 122° F (0° C ~ 50° C)

1.3 Configuration

The DR3535 dip switch block is used to configure various functions on the board.

Dip switch 1 selects the Stepping mode operation of the DR3535. As shipped, the DR3535 is set for half step operation (This results in 400 logical steps per revolution on a standard 1.8° motor).

Dip switches 2 - 6 select the Stepping power level. These switches settings should be verified and changed before connecting a motor to ensure proper current. Each switch controls the amount of current, in amperes (A), that it's label indicates. There is always a base of current of 0.4 A. To add to that base current, slide the appropriate switches toward their labels.

Example

To set the driver for 2.4 amps per phase, you need the 0.4 A base current plus another 1.6 and 0.4 A.   2.4 A= 0.4 + 0.4 + 1.6

Slide the 0.4 A and 1.6 A switches toward the labels.

Optoisolation
The DR3535 drive contains optoisolators to prevent the electrical noise in the switching amplifier from interfering with your circuits. Optical isolation is accomplished by powering the motor driver from a different supply than the controller (see Figure 1).
The user must supply 5 volts DC to activate the LED's on the input side of the optoisolators. The maximum current draw is 15 ma. Your controlling logic must be capable of sinking at least 5 ma to control each drive input. Most CMOS and open collector TTL devices are directly compatible with this drive.

Step
This input tells the driver to move the motor one step. The drive steps on the falling edge of the pulse. If the pulse is negative (low) the minimum pulse width is 10 microseconds.

Direction
This input signals which direction the motor should turn. The direction signal should be changed at least 50 microseconds before a step pulse is sent.

Enable
This input allows the user to turn off the current to the motor by setting this signal to logic 0. The logic circuitry continues to operate, so the drive remembers the step position even when the amplifiers are disabled. However, caution should be used as the motor may move when the current is removed depending on the exact motor and load characteristics. If you have no need to disable the amplifiers, this input should be left disconnected.

Heat sinks may be needed for drivers running at 1 Amp or above. To operate the drive continuously at maximum power you must properly mount it on a heat sink with a thermal constant of no more than 4°C/watt.

Warning: *Insure proper air circulation in the enclosure. Never allow liquids or machining debris to contact the electronics.*
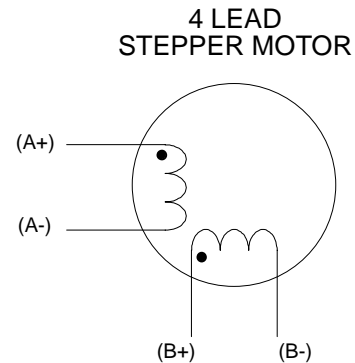
1.4 DR3535 Wiring Diagram

Figure 1 - DR3535 Typical Wiring Diagram

LIMIT SWITCHES
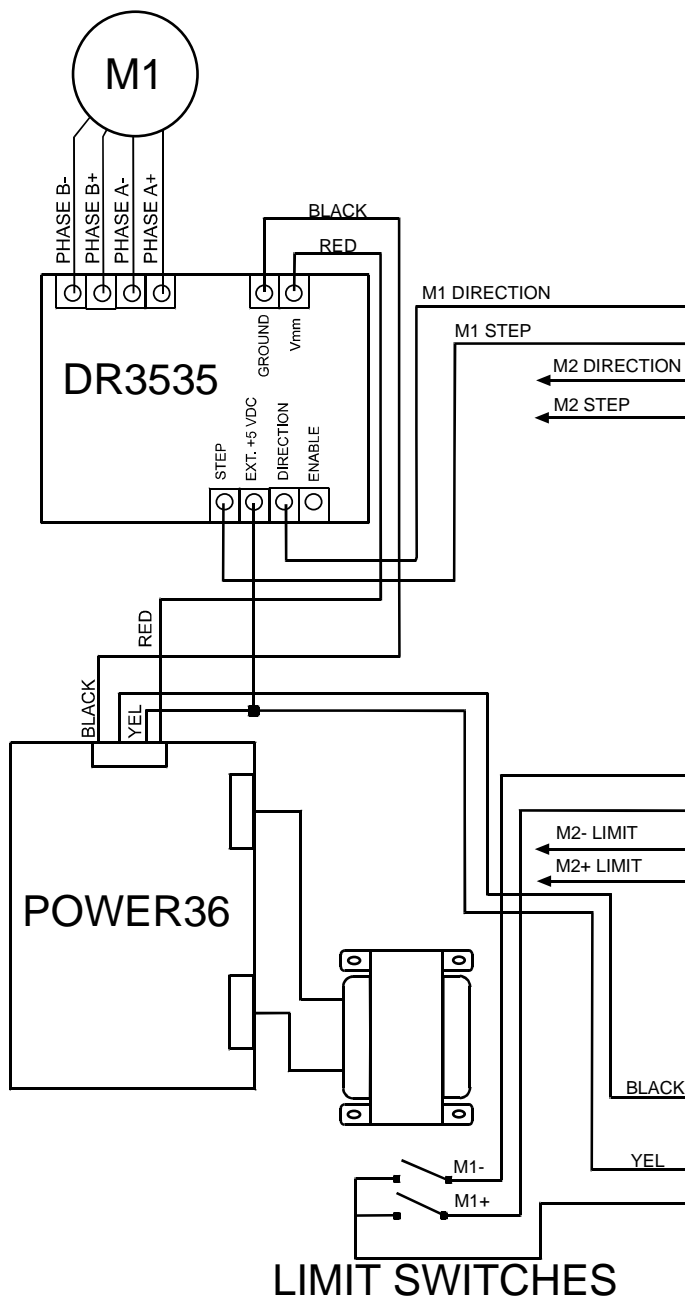
# 1.5 Stepper Motor Wiring Diagrams

1.5.1 4 Lead motor connection

Four lead motors must be connected as shown in figure 2.

Figure 2 - 4 Lead Motor Connection

1.5.2 6 Lead motor connection

Six lead motors can be connected in two configurations, center tap and series. In center tap mode (Figure 3), the motors will run at their normal current and torque ratings. In series mode (Figure 4), the motors will have greater low end torque ratings but will not run as fast as center tapped motors. In series mode, the motors should also be run at only 70% of their rated current to prevent over heating.
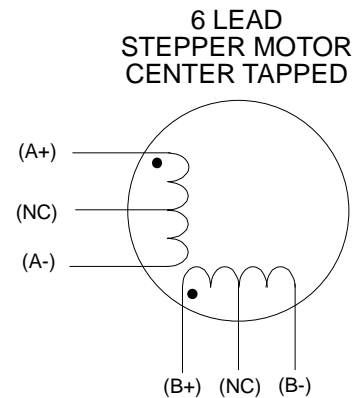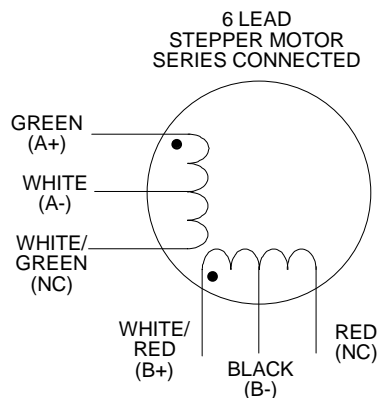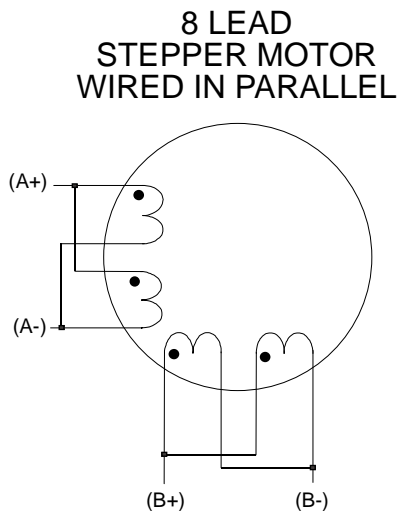

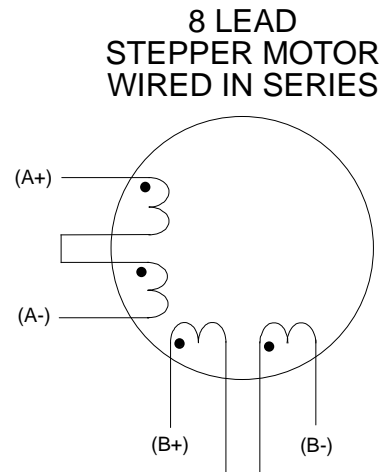**Figure 3 - 6 Lead Series Connected**

Figure 4 - 6 Lead Center Tapped

1.5.3 8 Lead motor connection

Eight lead motors can be connected in three configurations, parallel, series, and two of four windings. In parallel mode (Figure 5), the motor will run at 140% of its normal current rating, and will provide higher torque at higher speeds.


Figure 5 - 8 Lead Parallel Connected

Figure 6 - 8 Lead Series Connected

 In series mode (Figure 6.), the motor will have greater torque capability at low speeds but the torque will drop off sharply as speed increases. In series mode, the motors should be run at only 70% of their rated current to prevent over heating. The two of four method (Figure 7) uses only half of the windings available on the motor. The current requirements are those stated for the motor.
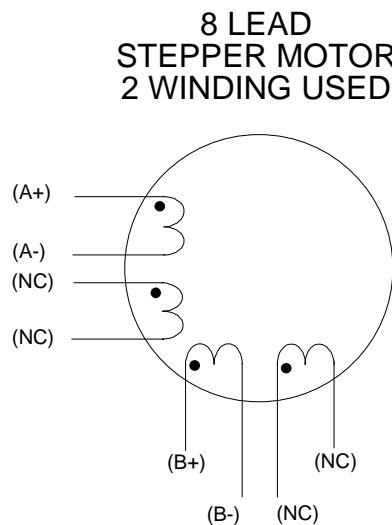
Figure 7 - 8 Lead Two Windings Used

1.6 Using the Oscillator

Drives with an O suffix are equipped with internal pulse generators that you can use to drive the motor. To set the drive to oscillator mode, simply find the jumper located near the center of the printed circuit board and move it to the SLEW setting. The figure at the right shows the proper setting of the jumper.

STEP   *SLEW*
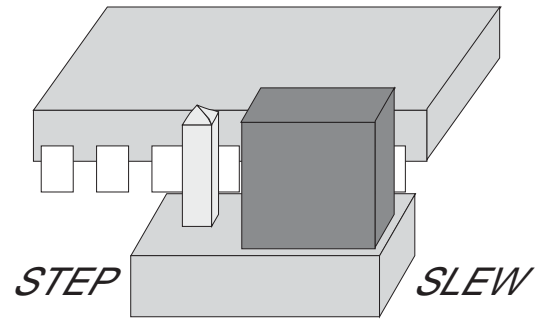
The oscillator is activated by driving the STEP input low. The frequency of step pulses will increase linearly, accelerating the motor until it reaches a preset slew speed. The motor will remain at this speed until the STEP input is driven high. The step pulse frequency then decreases linearly, decelerating the motor and load to rest.

To change the slew speed, locate the trimpot labeled SPEED. By turning the brass screw you can raise or lower the speed within a range of 400 to 5000 steps per second. Turning clockwise makes the motor run faster.

The acceleration and deceleration rates can also be adjusted using the trimpots labeled ACCEL and DECEL. The range of acceleration and deceleration time is 5 to 900 milliseconds. Turning the screw clockwise makes the motor accelerate and decelerate faster.

1.6.1 Using Remote Speed Control Potentiometer

The 3535 0 step motor driver includes an analog signal input connector that can be used to control the oscillator speed externally. Normally, an on board potentiometer controls the speed.

You will need:
- A 100k ohm or 200k ohm linear potentiometer. A multiturn type is recommended
- A two pin female connector compatible with .025 inch square pins on .1000 centers. AMP type MTA-100 is one type that works well
- A shielded, two wire cable

To install the external pot:

- Locate the connector on the 3535 0 labeled 0XSPD.0 It can be found between the signal connector and the three blue potentiometers.
- Turn the screw on the blue SPEED potentiometer 15 turns counterclockwise. **If you don't do this, the external potentiometer will not provide the correct speed range.**
- Prepare a cable with your pot on one end and the connector on the other end:
    - the potentiometer wiper connects to pin 2
    - the potentiometer CW terminal connects to pin 1
    - the third pot terminal connects to the wiper
    - the cable shield connects to the CW pot terminal

With this arrangement, speed will increase as you turn the external pot clockwise. The frequency range for the 200k ohm pot will be 600 to 5000 steps per second. The frequency range for the 100k ohm pot will be 900 to 5000 steps per second. The on board trimpots will still control acceleration and deceleration times. Turning the pots clockwise makes the acceleration and deceleration faster (i.e. reduces the time to or from speed).
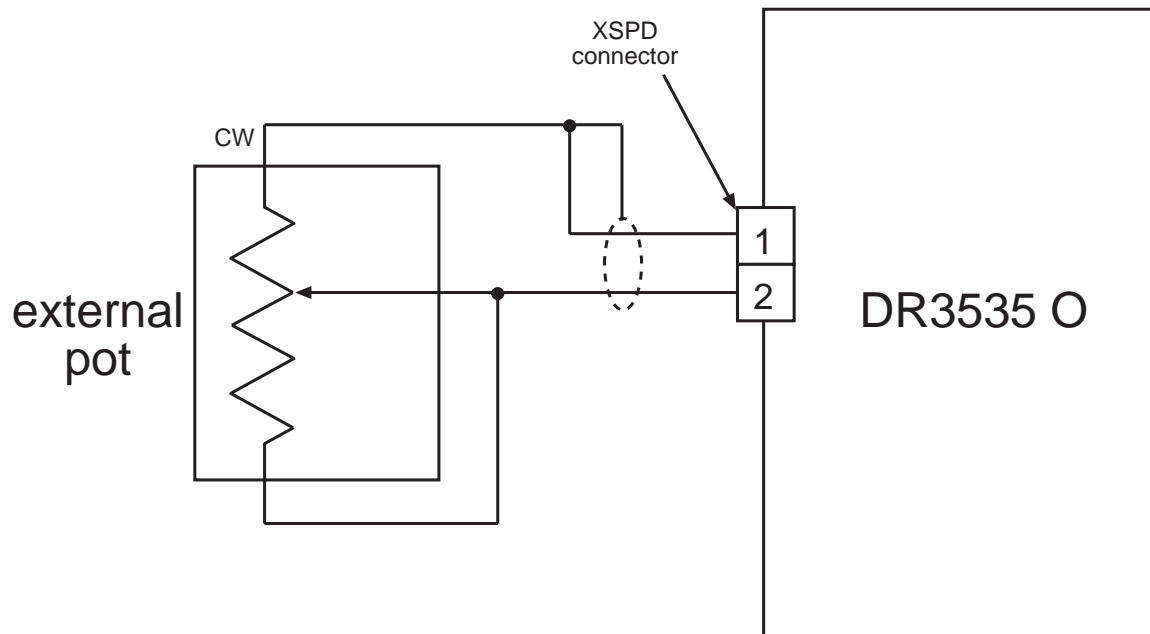
2   Technical Support

Should you need help in identifying and correcting a problem, the MicroKinetics engineering staff is ready to assist you during business hours. You should refer to the documentation and verify any described adjustments before calling. Be prepared to supply the model number of all components and any software and/or dip switch or jumper settings.

2.1 How to Obtain Technical Support

Technical support is available as follows:

Via Email
Email MicroKinetics with a description of problem symptoms to *helpdesk@microkinetics.com* where it is reviewed and answered daily.

Via Fax
Fax a detailed description of the problem to 770-422-7854 including your fax and voice number. An engineer will call to help you.

Via Telephone
Call our main line directly and request Hardware Tech Support. The number is 770-422-7845.

2.2 Product Service

The technical support staff can determine if the problem requires returning the product for testing and can give you an RMA (Return Merchandise Authorization) number to write on the outside of the package for proper routing. This improves repair turnaround time.

When returning an electronic product, always pack in the original antistatic bag. If original packaging is not available, wrap in aluminum foil and place in container to withstand shipping and handling. Always insure product with shipping company for full value.

If a product is returned to us for repair, is tested and found to operate within the rated specifications, a nominal testing fee will apply. Please inquire as to the testing charge at the time you obtain the RMA number.

APPENDIX A

Using the Oscillator with Mechanical Switches

The Optoisolation on the DR 3535 drive requires a separate +5 volts DC to oper-ate. This is generally available in most systems, however,   in order to use the inter-nal oscillator function with mechanical switches only or if you have no readily avail-able source of +5 volts, the 12-40 VDC motor power supply can be used with addi-tional dropping resistors to power the optoisolator LED's. The recommended wiring diagram is shown below. Table 1 lists the appropriate resistor value to use for given power supply voltage. 1/4 watt or larger resistors should be used.

Please take care not to reverse the wiring, as damage to the LEDs would result rendering the drives inoperable. Check your wiring carefully before turning on the power supply!
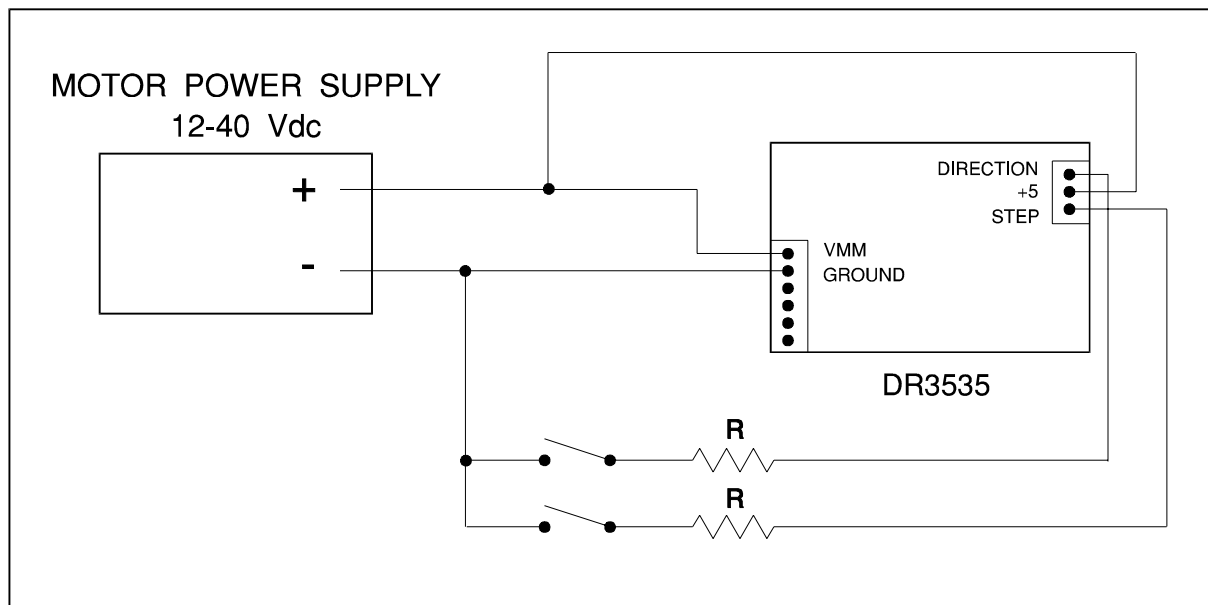
Table 1 Resistor Selection Table	
Supply Voltage	**R (ohms)**
12	1200
15	1800
18	2400
21	3000
24	3600
27	4200
30	4700
33	5100
35	5600