![Applied Motion Products - A MOONS' COMPANY]

Quick Setup Guide 3540MO

power connector
• DC power supply
• motor

mounting hole (1 of 6)

trim pots
• accel/decel rate
• low speed
• high speed

DIP switches
• motor current
• idle current reduction
• joystick mode
• ext speed mode

Always use the blue & white Applied Motion screwdriver with this connector. Larger screwdrivers may remove the plastic dimples that prevent the screws from falling out.

input connector
• run/stop (cw limit)
• dir (ccw limit)
• high/low speed select
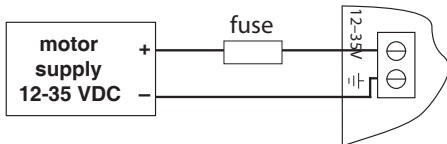• amp enable
• ext speed pot/joystick
• tach out

Connecting the Power Supply

Modes of Operation

Note: We refer to an input as being ON when current is flowing through the input. A signal is OFF when no current is flowing. An input is OFF when COM and the input terminal are at the same voltage, or when the input is left unconnected (open).
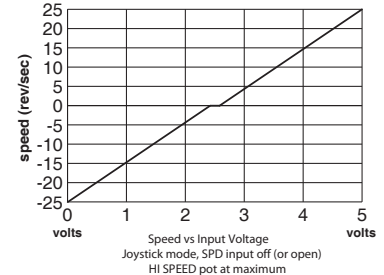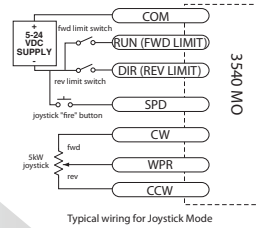The 3540 MO features two modes of operation.

Joystick mode

Joystick mode is set by moving switch #1 toward the word "Joystick". Switch #2 (EXT SPEED) has no effect in Joystick mode.

Joystick mode - speed and direction are determined by the voltage applied to the WPR (wiper) terminal. 2.5 volts is "stopped" (no speed). Increasing the WPR voltage toward 5 volts results in forward motion: speed increases with voltage. Decreasing the WPR voltage from 2.5 toward 0 results in reverse motion, with speed increasing as voltage decreases. The SPD (speed) input selects speed range. LO SPEED and HI SPEED pots adjust the 2 speed ranges.
EXT SPD=ON speed adjusted by LO SPEED trimpot - range up to 5 rev/sec
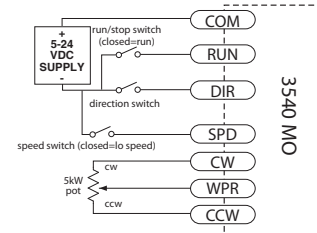EXT SPD=OFF speed adjusted by HI SPEED trimpot - range up to 25 rev/sec

In joystick mode, limit switches can be connected to the 3540 MO.
Refer to the full manual - available from the website for connection details.

Typical wiring for Joystick Mode

Speed vs Input Voltage
Joystick mode, SPD input off (or open)
HI SPEED pot at maximum

Oscillator mode

Oscillator mode is selected by moving switch #1 away from the word Joystick. Thespeed can be controlled by on-board potentiometers and/or by an external analog voltage. RUN input starts and stops the motor. DIR input controls direction of rotation. SPD input selects the speed range.
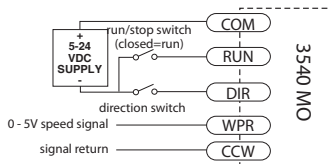
If the motor is wired according to the motor wiring section,
Motor speed and the function of the RUN input can be determined from the following table.

SPD input	switch #2	speed set by	when RUN goes ON	when RUN goes OFF
ON	joystick ext speed	LO SPEED	accel to speed	instant stop
ON	joystick ext speed	LO SPEED	accel to speed	instant stop
OFF/open	joystick ext speed	HI SPEED	accel to speed	decel to stop
OFF/open	joystick ext speed	WPR input trimmed by HI SPEED	accel to speed	decel to stop

SPD (speed) input selects speed range. LO SPEED and HI SPEED pots adjust the 2 speed ranges.
EXT SPD=ON speed adjusted by LO SPEED trimpot - range up to 5 rev/sec
EXT SPD=OFF speed adjusted by HI SPEED trimpot - range up to 25 rev/sec

If switch #2 is toward the words EXT SPEED, then the high speed is proportional to the voltage applied to the WPR terminal, and is trimmed by the HI SPEED pot. You can connect an external 1K - 5K pot to the WPR, CW and CCW terminals, or you can apply a 0 to 5 volt analog signal to the WPR terminal (ground your analog signal to the CCW pin.) The high speed range is 0 - 25 rev/sec (0 - 1500 rpm.) You can reduce the range by turning down the HI SPEED pot.

When switch #2 is away from the EXT SPEED label, the high speed is set by the HI SPEED pot and the WPR input does nothing.

Never apply more than 5 volts DC or less than 0 volts to the WPR pin.

In both operating modes, the accel/decel rate is set by the ACCEL pot. The range is 1 to 250 rev/sec/sec.

Speed Control from a 0 to 5 Volt Analog Signal

In oscillator mode, the 3540MO can rotate the motor a speed proportional to an analog voltage. The voltage must be applied to the WPR terminal. The direction of rotation will be controlled by the digital DIR input and the motor can be stopped either by setting the analog input voltage to 0 or by turning the digital RUN signal off.
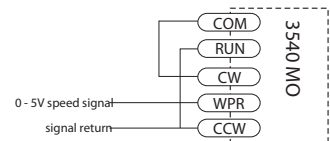To use the 3540 MO in this mode, set switch #1 away from the JOYSTICK label, and set switch #2 toward the EXT SPEED label.

The HI SPEED pot sets the maximum speed (the motor speed when the analog signal is at 5 volt DC). The range is 0 - 25 rev/sec.
Wiring diagrams and a plot of speed vs voltage are shown below.

Wiring for Speed Control by 0 - 5 Volt Analog Signal
(Direction Control by Digital Signal or Switch)

Wiring for Speed Control by 0 - 5 Volt Analog Signal
(Unidirectional Rotation)

Typical wiring for Oscillator Mode using external speed Control pot

Flip Over

Tach Output

The Tach Out signal is provided for measuring the motor speed. It generates 100 pulses per revolution, so if you connect a frequency counter, the speed reads out in revs/second with two decimal places. The schematic diagram of the Tach Out optoisolation circuit is shown below.

Do not connect the Tach output to more than 24VDC.
The current into the Tach+ terminal must not exceed 20 mA.

Internal Tach Circuit

Connecting Tach Output to a Frequency Counter
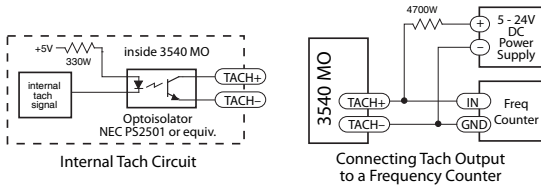
Connecting Digital Inputs and Limit Switches

You must supply 5-24 volts DC to supply current to the LEDs on the input side of the opto-isolators. Your controlling logic must be capable of sinking or sourcing at least 3 mA at 5 volts and 10 mA at 24 volts to control each drive input.

Sinking Circuits (NPN) - If your output devices prefer to sink current, then connect the COM terminal to your positive power supply. If you are using a TTL circuit to drive the 3540 MO, connect the COM terminal to your 5 volt bus. No ground connection is needed. If you are using a PLC or proximity sensor, you'll need a power supply.
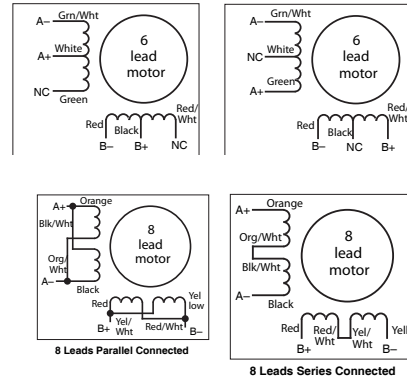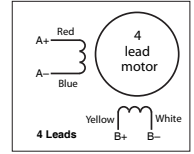
Sourcing circuits (PNP) - If your output devices can only source current (some PLC outputs are this way), connect the COM terminal to the ground of the DC power supply that powers your output circuits Note: We refer to an input as being ON when current is flowing through the input. A signal is OFF when no current is flowing. An input is OFF when COM and the input terminal are at the same voltage, or when the input is left unconnected (open).

The ENABLE input allows the user to turn off the current to the motor by setting this signal on. The logic circuitry continues to operate, so the drive "remembers" the step position even when the amplifiers are disabled. If you have no need to disable the amplifiers, you don't need to connect anything to the ENABLE input.

Connecting the Motor

STEP motors have 4, 6 or 8 leads , these are wired to 4 connections on the drive in various combinations.

Motors will perform differently according the way it is connected, to find out more about the differnet way of connecting your motor, see the technotes or FAQs on our website.

4 lead motor

4 Leads

6 lead motor

6 lead motor

8 lead motor

8 Leads Parallel Connected

8 lead motor

8 Leads Series Connected

Warning: When connecting the motor to the driver, be sure that the motor power supply is off. Secure any unused motor leads so that they can't short to anything. Never disconnect the motor while the drive. <u>Never connect motor leads to ground or to a power supply!</u>

Microstepping

The 3540 MO divides each full step into 64 microsteps, providing 12,800 steps per revolution for precise positioning and smooth motion.

Idle Current Reduction

Your drive is equipped with a feature that automatically reduces the motor current by 50% anytime the motor is not moving. . Idle current reduction is enabled by sliding switch #4 toward the 50% IDLE label, as shown in the sketch below. Sliding the switch away from the 50% IDLE label disables the reduction feature

50% IDLE

Idle Current Reduction Selected

50% IDLE

No Current Reduction
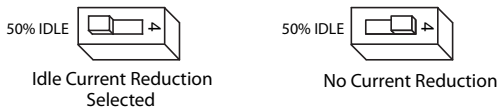
Choosing a Power Supply

To find out how to choose a power supply refer to the tech notes on our website.

Mounting the Drive

smooth flat surface

#4 screws

wide side mount

narrow side mount
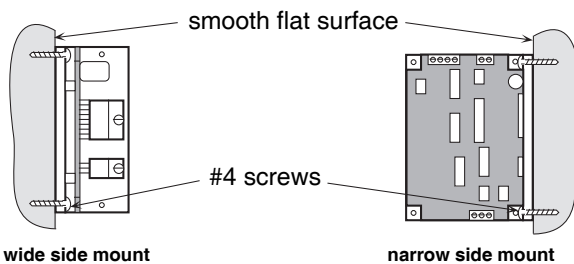
To operate the drive continuously at maximum power you must properly mount it on a heat sinking surface with a thermal constant of no more than 4°C/watt. Often, the metal enclosure of your system will make an effective heat sink.

Technical Specifications

Amplifiers	Dual, bipolar MOSFET H-bridge, pulse width modulated three state switching at 20kHz. 12-42 VDC input. 0.4 - 3.5 amps/phase output current, switch selectable in 0.1 A increments. 122 watts maximum output power. Automatic idle current reduction (switch selectable), reduces current to 50% of setting after one second. Minimum motor inductance is 1 mH.
Inputs	Run/stop (cw limit), direction (ccw limit), hi/lo speed and enable inputs are optically isolated, 5-24V logic. 3 - 15 mA input current. 2200 ohms input impedance. Can be configured for sinking or sourcing signals. Recommended external pot/joystick resistance: 1K - 5K Joystick dead zone: ± 80 mV. Potentiometer/analog signal dead zone: 40 mV.
Recommended Joystick	Maurey Instrument Corp., Chicago, IL (773)581-4555 JS31462S5T3 (2 axis) or SAJ2515-F-502 (1 axis)
Speed Ranges	LO speed range: 0 - 5 rev/sec HI speed range: 0 - 25 rev/sec Accel/decel range: 1 to 250 rev/sec/sec
Tach Output	Phototransistor, open collector, open emmiter. 24 volts max, 20 mA max. 100 pulses per motor revolution, 50% duty cycle (square wave).
Physical	Mounted on 1/4 inch thick black anodized aluminum heat transfer chassis. 1.5 x 3.0 x 4.0 inches overall. Power on red LED. Ambient temperature range: 0 - 70 C.
Connectors	European style screw terminal blocks. Power Supply & Motor: 6 position. Wire size: AWG 12 - 28. Signal Input: 10 position. Wire size: AWG 16 - 28.
Microstepping	CE Mark 1/64 step (12,800 s/r) with 1.8 motor. Pure sine waveform.
CE Mark	Complies with EN55011A and EN50082-1(1992).

CE