**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 decreasing as voltage decreases. The SPD (speed) input selects speed range. LO SPEED and HI SPEED pots adjust the 2 speed ranges.

- **Oscillator mode**
  - Oscillator mode is selected by moving switch #1 away from the word Joystick. The speed 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.

<table>
<thead>
<tr>
<th>SPD Input</th>
<th>Switch #2</th>
<th>Speed Set When RUN Goes ON</th>
<th>Speed Set When RUN Goes OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>Accel to Speed</td>
<td>Instant Stop</td>
</tr>
<tr>
<td>ON</td>
<td>OFF/open</td>
<td>Accel to Speed</td>
<td>Instant Stop</td>
</tr>
<tr>
<td>OFF/open</td>
<td>ON</td>
<td>Accel to Speed</td>
<td>Decel to Stop</td>
</tr>
<tr>
<td>OFF/open</td>
<td>OFF/open</td>
<td>WPR Input Trimmed by HI SPEED</td>
<td>Accel to Speed</td>
</tr>
</tbody>
</table>

**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.

**Oscillator mode**

Oscillator 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 decreasing as voltage decreases. The SPD (speed) input selects speed range. LO SPEED and HI SPEED pots adjust the 2 speed ranges.

**Ext Speed Pin (wiper) Terminal**

The WPR input is a voltage-controlled wiper. 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.
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 OFF when current is flowing through the input. A signal is OFF when no current is flowing. An input is ON when current is flowing 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.

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.

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

Mounting the Drive
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.

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 to the way it is connected, to find out more about the different way of connecting your motor, see the technotes or FAQs on our website.

Warning: When connecting the motor to the drive, 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. Never connect motor leads to ground or to a power supply!