



Introduction

This Step motor controller uses the L297 and L298N driver combination; it can be used as stand alone or controlled by microcontroller. It is designed to accept step pulses at up to 25,000 per second. An on-board step pulse generator can be used if desired (40-650 pps range). Single supply operation is standard

All eight inputs are pulled up to +5V by RP1 (4.7K) and are buffered by 74HC244. The output driver is capable of driving up to 2Amp into each phase of a two-phase bipolar step motor. The motor winding current is limited by means of a 35KHZ-chopper scheme. The potentiometer (R6) is for varying the winding currents. The nature of the chopping scheme eliminates the need for external current limiting resistors on the motor windings; this simplifies connections and increases efficiency.

A useful of this design is the "idle" current reduction mode. The amount of reduction is fixed at approximately 50% from whatever the running current is set at. Similarly, the motor current can be commanded to shut entirely off.

The internal +5V voltages required for operation are derived from the stepper motor supply. The motor supply voltages should be at least 9V, but must never exceed 32V.

J3 Pin Functions

Step pulse (J3-2)	Increments the motor step counts in the selected direction by one step or half step. The increment is triggered on the negative edge of the input pulse.
CW/CCW (J3-3)	A logic high on the input selects step advances to be made in the clockwise direction, If it is logic low, step advances will be made in counter clockwise direction
Half/Full (J3-4)	The input can select between 3 operation modes. When left disconnected or driven high, the half step mode is selected. When brought low, this line selects the full step or waveldrive modes. The selection between these modes is determined by the time of the transition (more detail later)
Home (J3-5)	When this line is low, the controller is reset to a known "Home" state
Run/Idle (J3-6)	A logic high on this input allows full current operation (As set by R6 control), A logic low reduces the winding current to approximately 50% of the normal "Run" setpoint current. This ratio is fixed by R4 & R5
On/Off (J3-7)	A logic high on this input allows current to be applied to the motor windings, A logic low disables the output driver
Clock out (J3-8)	The output clock pulse, It is variable from 40-650pps.
Home output (J3-9)	A high on this pin indicates the controller is in the "Home" state

Step Pulse Specification

The minimum Step pulse width is 1usec, and can remain low indefinitely if needed. It must be high for at least 1usec between pulses, and may not repeat more than 25,000 times per second.

Current Reduction

This design has the ability to reduce the current supplied to the motor windings by about 50% upon command. When the J3-6 line is brought low, the current regulating chopper logic is set to 50% of the normally set current level. It is not recommended to run the stepping motions at this low current. Further it is advisable to allow the motor to remain at full current for at least 0.2 sec past the completion of a motion. The reason for this is that the mechanical system attached to the motor will have some amount of inertia, If the current is reduced too soon, the motor may overrun the position it was commanded to go.

Motor Drive Mode

To select the three available motor drive modes, the following sequences are used:

Half Step Drive J3-4 to a TTL high, no further action is required.

Full Step Pulse the J3-5 low for at least 5usec and then bring J3-4 low

Wavedrive Pulse the J3-5 low for at least 5usec, then with J3-4 High, pulse J3-2 low for at least 5usec then bring J3-4 low.

FullStep Mode

The fullstep mode sequences the motor phase in the following manner:

A	B
-	+
+	+
+	-
-	-

The full step mode provides the maximum low speed torque because two windings are always energized. It also provides the largest amount of rotation per step pulse. It will always be the noisiest acoustically, and

has the highest mechanical torque ripple.

HalfStep Mode

The halfstep mode sequences the motor phases in the following manner:

A	B
-	+
Off	+
+	+
+	Off
+	-
Off	-
-	-
-	Off

The half step mode normally provides the smoothest mode of operation. It also provides the smallest amount of rotation per step pulse. Its principle advantage is a much higher resistance to

mechanical motor and system resonance. Mostly for this reason, higher motor angular rotation speeds are usually possible with the halfstep mode.

Wavedrive Mode

The wavedrive mode is a variation on the full step mode which exhibits the following phase pattern:

A	B
-	Off
+	Off
Off	-
Off	-

The wavedrive provides the lowest power consumption of any of the three modes. One phase is always on, but never more than one. The step angle per step pulse is the same as the full step mode, but less low-speed torque available. There is an important advantage to this mode concerning step angle accuracy.