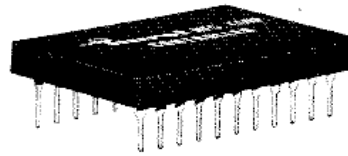# HURST ELECTRONIC STEPPING MOTOR CONTROLS

MODEL 220001

- SMALL SIZE
- LOW POWER CONSUMPTION
- 6-24 VDC SINGLE SUPPLY OPERATION
- CONTINUOUS OR SINGLE STEP OPERATION
- BIDIRECTIONAL SEQUENCER

- PHASE DRIVER DISABLE CONTROL
- 500 MA PER PHASE DRIVE CURRENT
- DIRECT INTERFACING WITH CMOS OR TTL

GENERAL DESCRIPTION

The Hurst Stepping Motor Controller is a general purpose control and driver for 4-phase stepping motors rated at up to 500 ma per phase. It is fabricated using thick film hybrid technology and CMOS components, thus providing small size and low power consumption. The hybrid may be operated with external supply voltages from 6-24 VDC. It contains a regulator which provides an internal 5V logic supply.

The circuit includes a multivibrator which permits two modes of operation, continuous stepping at an adjustable frequency (RUN mode) or single steps (JOG mode). The period of the multivibrator output is determined by an external user-supplied resistor and capacitor. The pulse output and its complement are available at the output terminals.

Pulses from the multivibrator or external pulses are connected to the PULSE IN terminal of the logic sequencer. This circuitry generates 4 phase-control signals in the conventional 2-on, 2-off sequence. Direction of rotation is reversible and is determined by the state of the CW/CCW terminal. In addition all 4 phases may be deenergized without interrupting the power supply by means of the DISABLE terminal.

The phase drivers are open collector transistors with maximum I_C and V_{CEO} ratings of 500 ma and 80V respectively. In applications which require larger phase currents the phase drivers may be used to control power switching transistors.

APPLICATION INFORMATION

MOTOR CONNECTIONS

The 4 motor phases are connected to terminals 7-10 as shown in the figure. The phase commons are connected to the positive terminal of the supply voltage.

LOGIC SEQUENCER

When power is applied to the hybrid the sequencer outputs will assume a 2-on, 2-off configuration corresponding to one of the 4 steps shown in the switching sequence diagram. Each input pulse at Terminal 16 results in one step in the sequence. The direction of the step, CW or CCW, is determined by the state of Terminal 6. If Terminal 6 is unconnected, the sequence is CW. If Terminal 6 is connected to COMMON, the sequence is CCW. When the DISABLE control, Terminal 14, is pulled to COMMON, all 4 phases drivers are deenergized. This action is independent of the sequence step and may be used to deenergize the motor between steps.

INTERNAL MULTIVIBRATOR

The output of the multivibrator (Terminal 19) should be connected externally to the input of the logic sequencer (Terminal 16). The complement of the multivibrator output is also available for external use at Terminal 20.

The pulse period is determined by the choice of the external R and C. In the RUN mode the period is approximately 4.40 RC, while in the JOG mode it is approximately 2.48 RC. The hybrid contains an internal 10K Ω resistor to limit the minimum value of R. The maximum recommended value is 1 M Ω. If a potentiometer is used, a logarithmic taper will provide a somewhat linear frequency adjustment.

RUN mode: When Terminal 4 is pulled low by either a manual switch to COMMON or an active device, e.g., CMOS, TTL or a discrete transistor, the multivibrator operates as an oscillator. When Terminal 4 is unconnected, the phase drivers will remain in a "holding" mode with 2 phases on.

JOG mode: When Terminal 5 is pulled low, the multivibrator will produce a single pulse at its output. Note that if a manual switch is used, the contacts must be "debounced". The JOG control has no effect if the RUN control is low.

HURST ELECTRONIC STEPPING MOTOR CONTROLS

SPECIFICATIONS

|	
Supply voltage. $+V_{in}$ (Terminal 18) to COMMON (Terminal 17) .	6–24VDC
Supply current	35 ma
Logic supply, V_L (internal regulator)	+5VDC
Operating temperature range	0 to 70°C
Phase drivers, open collector transistors	
(Terminals 7, 8, 9 and 10)	
I_c max.	500 ma
V_{CEO} max.	80V
RUN, JOG, CW/CCW, DISABLE and PULSE IN inputs	
(Terminals 4, 5, 6, 14 and 16)	
Input voltage range	–0.5 to +5.5V
Max. current sinking required for logic 0	0.5 ma
Min. input pulse width	1.0 µsec
PULSE OUT and PULSE OUT (Terminals 19 and 20)	
Min. sink or source current	0.36 ma
Typical sink or source current @ 25° C	1.0 ma
Timing components:	
Internal timing resistor (Terminal 2)	10 KΩ
External timing resistor R (Terminal 2 to 3)	
Min. value	0Ω
Max. value	1 MΩ
External timing capacitor (non-polarized,	
low leakage type recommended)	
Min. value	1000 pf
Typical pulse period with external R and C	
Run mode	4.40 (R + 10K) C sec
Jog mode	2.48 (R + 10K) C sec

TYPICAL APPLICATION FOR HURST STEPPING MOTORS
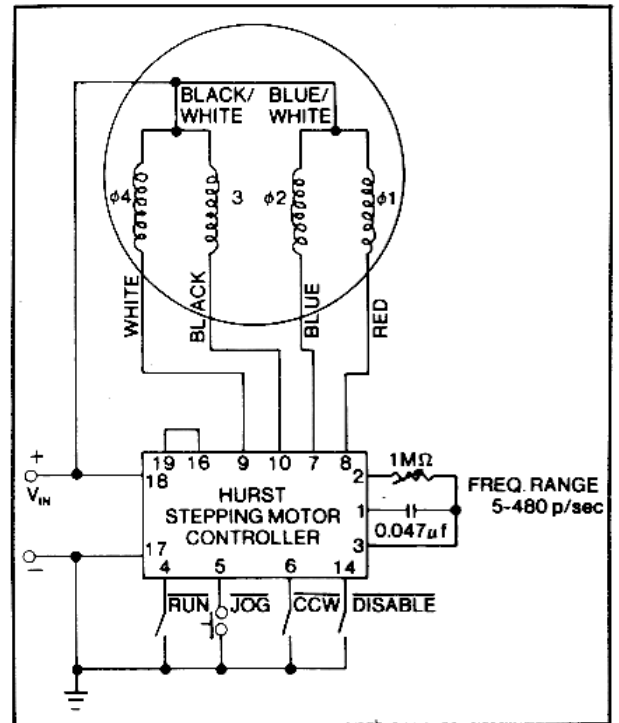
BLOCK DIAGRAM
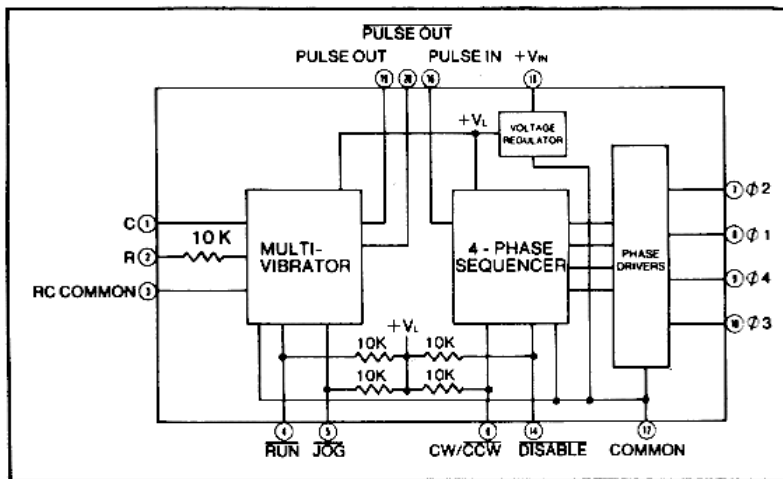
DIMENSIONS
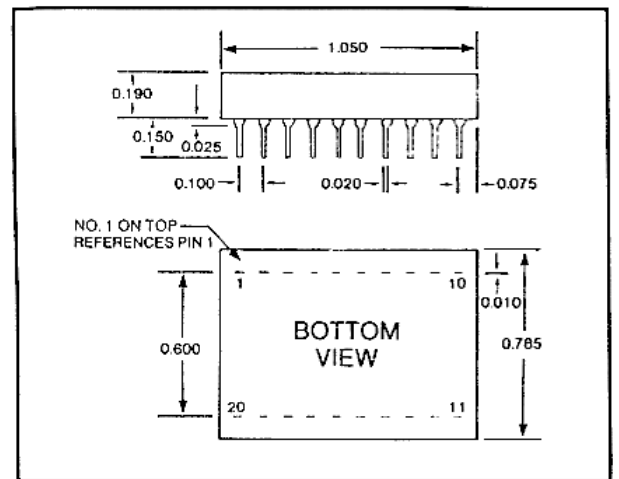
TERMINAL CONNECTIONS

PIN	FUNCTION	PIN	FUNCTION
1	EXTERNAL C	20	PULSE OUT
2	EXTERNAL R	19	PULSE OUT
3	RC COMMON	18	+ V IN
4	RUN	17	COMMON
5	JOG	16	PULSE IN
6	CW/CCW	15	NC
7	PHASE 2 OUT	14	DISABLE
8	PHASE 1 OUT	13	NC
9	PHASE 4 OUT	12	NC
10	PHASE 3 OUT	11	NC

SWITCHING SEQUENCE

	φ4 WHITE	φ3 BLACK	φ2 BLUE	φ1 RED	
CW ROTATION	1	0	1	0	CCW ROTATION
	1	0	0	1	
	0	1	0	1	
	0	1	1	0	

1 = ON, 0 = OFF