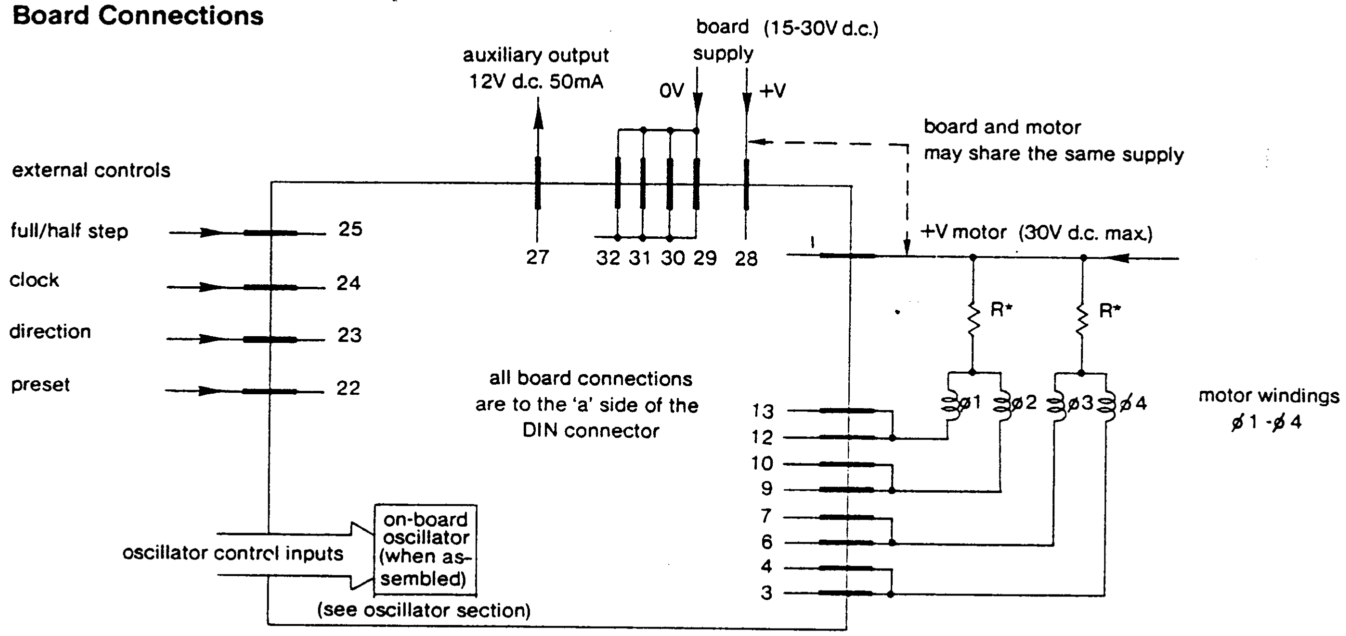
586-468

4-Phase Unipolar Stepper Motor Drive Board PVP134

Technical specification:

Size	standard Euro card 168 x 100 x 1·5
Mating edge connector	standard 32-way DIN 41612 socket
Supply (board and motor)	15-30V d.c. +10% max. unregulated smoothed i.e. PVP102B1
Current consumption:	
a) board only	60mA
b) motor windings	dependent on motor used-up to 2A/phase max.
On-board auxiliary output	12V d.c. 50mA max. regulated
Switching logic control inputs	Level '0' 0V, Level '1' 12V } CMOS and open collector T.T.L. compatible
a) full/half step	Level '1' full step Level '0' half step
b) direction	
c) clock	1Hz-25kHz, 10μs min. pulse width negative edge triggered
d) preset	Active Level '0' sets motor drive states to Q1, & Q3 OFF, Q2 & Q4 ON (full step mode) Q1, Q2 & Q3 OFF, Q4 ON (Half step mode) - see fig. 1. Automatic preset at switch-on

Board Connections



$^*R = \frac{+V\ \text{motor} - \text{rated winding voltage}}{\text{rated winding current}}$

Fig. 1

Max. power dissipated through R = (rated motor current)^2 x R. If the power dissipation is high it is advisable to arrive at the required value of R by using a network of series or parallel resistors. (The use of higher wattage resistors and heat sinks may be required).

Max. current consumption (motor & board) = 2 x (current per phase) +60mA. Thus ensure power supply cables used are sufficiently rated.

External control signals e.g. full/half step, direction etc. as well as the oscillator (if fitted) stop/run signal can be applied to the circuit in any of the methods of fig. 2.

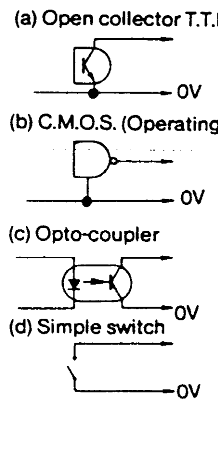
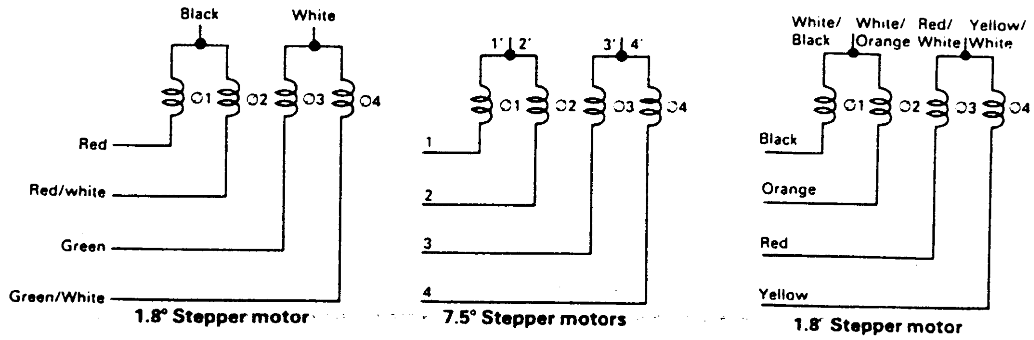


Fig. 2

Connection to stepper motors

When the windings of the Stepper Motors are assigned (Ø1 - Ø4) as shown in Fig. 3, they can be connected to the board according to Fig. 1.



On-board oscillator assembly

If external clock source is not available, an on-board oscillator can be assembled simply by soldering into place the required Components listed below.
Note: the oscillator clock output must be externally wired to the clock, input-pin 24a).

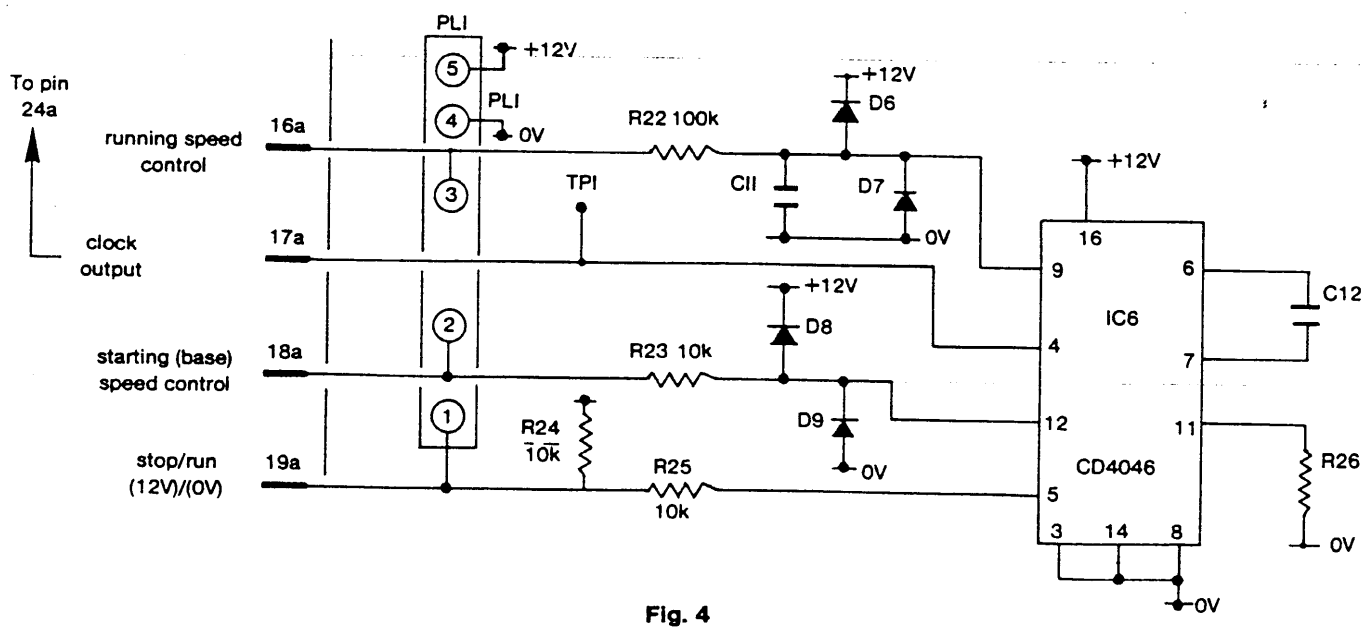


Fig. 4

R22	100K Ω resistor	1 off
R23, 24, 25	10K Ω resistor	3 off
D6, 7, 8, 9	signal diode	4 off
IC6	CMOS I.C.	1 off
R26, C11 & C12	(value depends on application)	1 off each

If oscillator remote controls are required (e.g. front panel controls) then plug PLI (5-way inter-p.c.b.) can be added together with mating cable shell and crimp terminals.

Starting (base) and running speed control

The on-board oscillator can be arranged to start at a fixed frequency (thus a fixed motor speed) and then ramp up to a final value (the running motor speed). This facility is available to start the motor within its pull-in performance region and then accelerate the motor through so that it can operate within the pull-out mode. On switch-off the motor decelerates automatically.
Three parameters need to be determined for any application:

a. The starting speed: this should be below the pull-in speed for the motor (with any additional load).
b. The running (final) speed: this should be within the pull-out capability of the motor (with any additional load).
c. The acceleration and deceleration rate between starting and running speeds: this is limited by the motor capability to accelerate through its own (plus any load) inertia.

Oscillator controls (external)

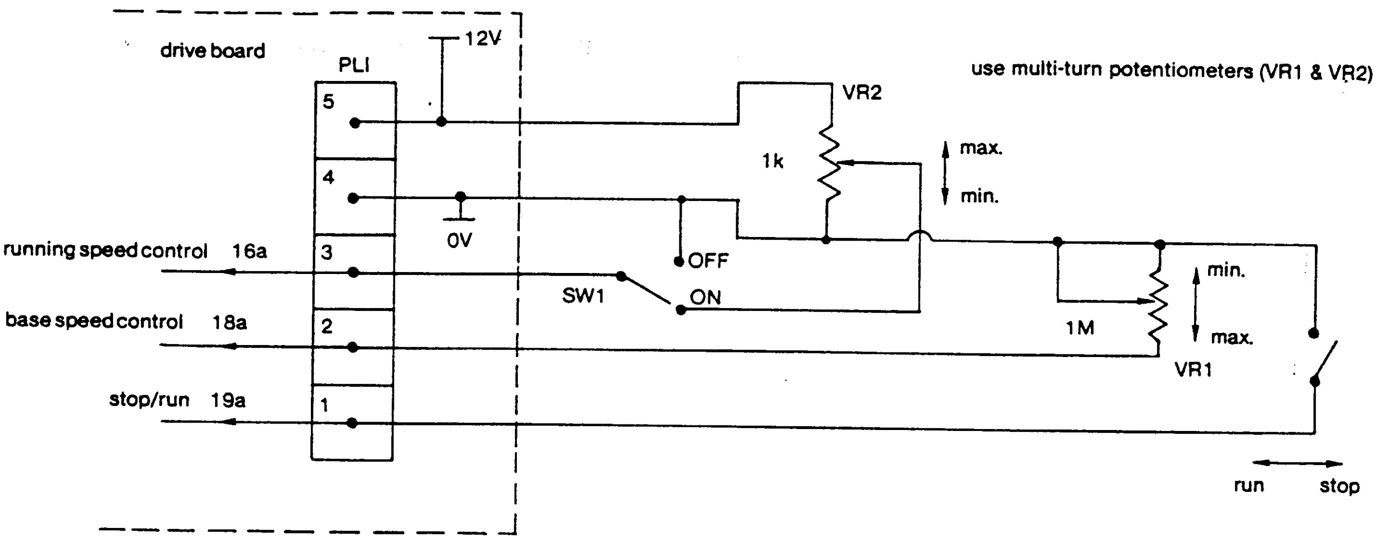


Fig. 5

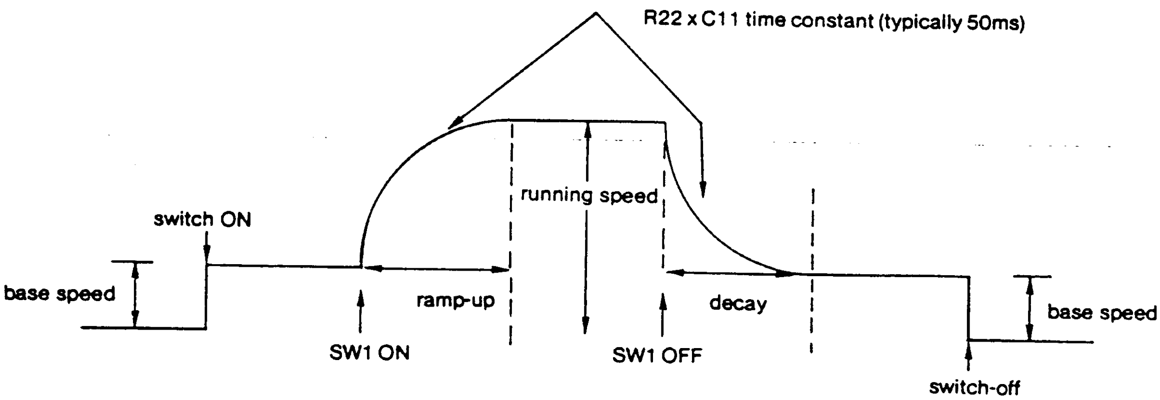


Fig. 6 Motor speed-ramping characteristic

Note: Oscillator frequency corresponds directly to motor speed in steps/s or half steps/s depending on motor drive mode.

For A 1.8° stepper motor
speed in revs/min $= \frac{60}{200}$ x speed in steps/s

or $\frac{60}{400}$ x speed in half steps/s

For A 7.5° stepper motor
speed in revs/min $= \frac{60}{48}$ x speed in steps/s

or $\frac{60}{96}$ x speed in half steps/s

Oscillator frequency setting

Recommended component values

VR1	0 – 1MΩ
VR2	1KΩ
R26	10KΩ – 1MΩ
C12	greater than 100pf

Determine the base frequency and maximum running frequency. Using Fig. 7 and the base frequency value choose a value for C12 and VR1. Calculate the ratio max. running frequency/base frequency to determine the ratio of $\frac{\text{VR1} + \text{R23 (fixed at 10k}\ \Omega)}{\text{R26}}$

and thus using Fig. 8 establish the required value for R26.

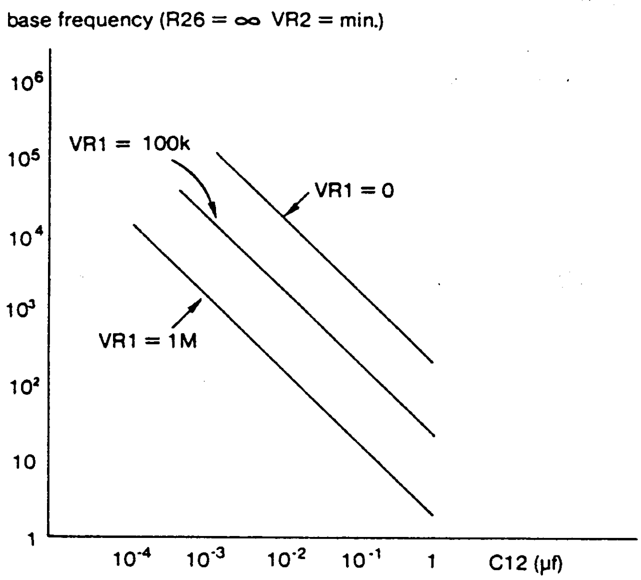


Fig. 7

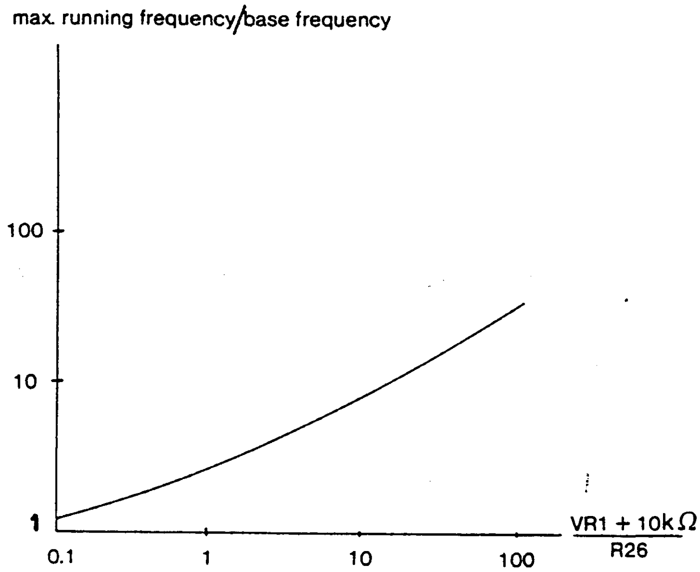


Fig. 8

Once all component values are established and assembled the oscillator frequency range is as shown in Fig. 9. If SW1 is OFF the oscillator runs at base frequency. When SW1 is ON the oscillator builds up (at a rate depending on R22 x C11 time constant) to a frequency determined by VR2 setting.

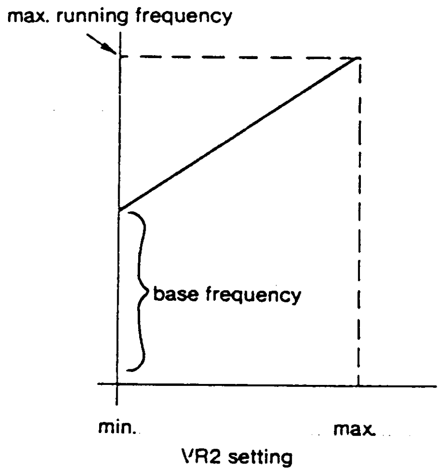


Fig. 9