connected directly to the chip without the need for external power transistors.

The complexity of the stepper motor driver chip means that the rest of the circuit needed for the robot control is very simple indeed. Each motor requires one of these chips, to which the motor is connected. Unfortunately, the driver chips operate at a voltage of about 12 volts, while your computer user port operates at five volts. That is, a logic zero is zero volts (or thereabouts) and a one is five volts. The driver chip inputs require zero volts for a zero input and between 7.5 and 12 volts for a one. To interface the user port to the driver chips we therefore also need a special two-voltage buffer chip with the inputs operating on one voltage and the outputs on another. This is the 40109 chip that is also needed in the circuit.

Parts List

MAPLIN

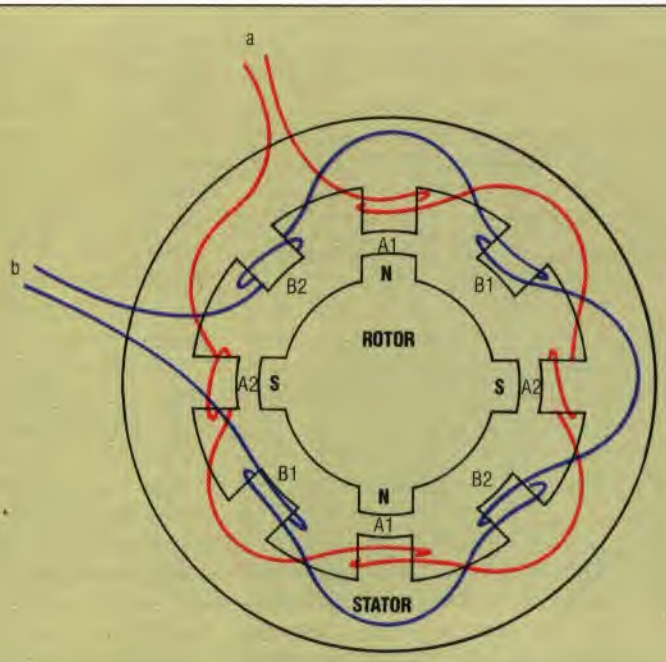
No	Item	Source
1	40109 buffer chip	QW67X
3	16-pin DIL sockets	BL19V
2	100 ohm resistors	M100R
2	270 ohm 0.5 watt resistors	S270R
2	0.1µF capacitors	YR75S
1	1000µF 25v capacitor	FB83E
1	24 strip x 50 hole veroboard	FL07H
1	reel tinned 20 swg wire	BL13P

RADIO SPARES

2	SAA 1027 stepper motor drivers	300-237

One Step At A Time

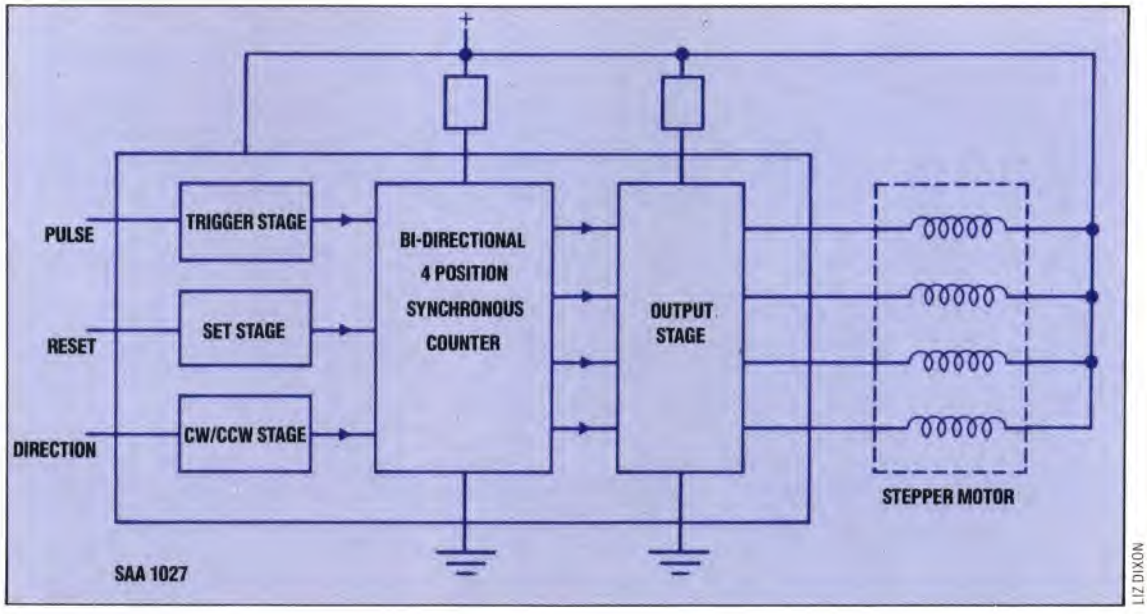
This simplified diagram of a stepper motor shows two stator winding circuits 'a' and 'b' and a rotor. The rotor is forced to rotate in a clockwise direction by alternate energising of the two winding circuits. Notice that the coil pairs A1 and A2 are wound in opposite directions. When winding 'a' is energised inducing south poles in pair A1, north poles are therefore induced in pair A2. Coil pairs B1 and B2 are similarly wound in opposing directions. The minimum step angle that this simple motor can turn through is 45°. The motors used in the Workshop robot have more windings on the stator and an increased number of poles on the rotor, allowing these motors to turn through 7.5° steps



KEVIN JONES

The Driving Force

Although the logic of the stepper motor driving chips is complex, the principles of operation are easily understood. In order to turn the rotor the stator coils must be energised in a certain sequence. A bi-directional counter moves through this sequence a stage at a time in response to a pulse signal. The sequence can also be stepped through in the opposite direction if the direction line input is changed, causing the rotor to turn in the opposite direction. A third input allows the rotor to be reset to its position at the beginning of the sequence, if required



LIZ DIXON