Interfacing the 8255 with 8051

8255 features

The 8255 is a 40-pin DIP chip. It has three separately accessible ports. The ports are each 8-bit and are named A, B and C. The individual ports of the 8255 can be programmed to be i/p or o/p.

Port A (PA0-PA7): The 8-bit port A can be programmed as all input or as all output or all bits as bidirectional input/output.

Port B (PB0-PB7): The 8-bit port B can be programmed as all input or as all output. port B cannot used as a bidirectional port.

port C (PC0-PC7): The 8-bit port C can be all input or all output. It can also be split into two parts, port C upper and port C lower. Each can be used for input or output.

RD and WR: These two are active low control pins. The RD and WR signals from the 8051 are connected to these inputs.

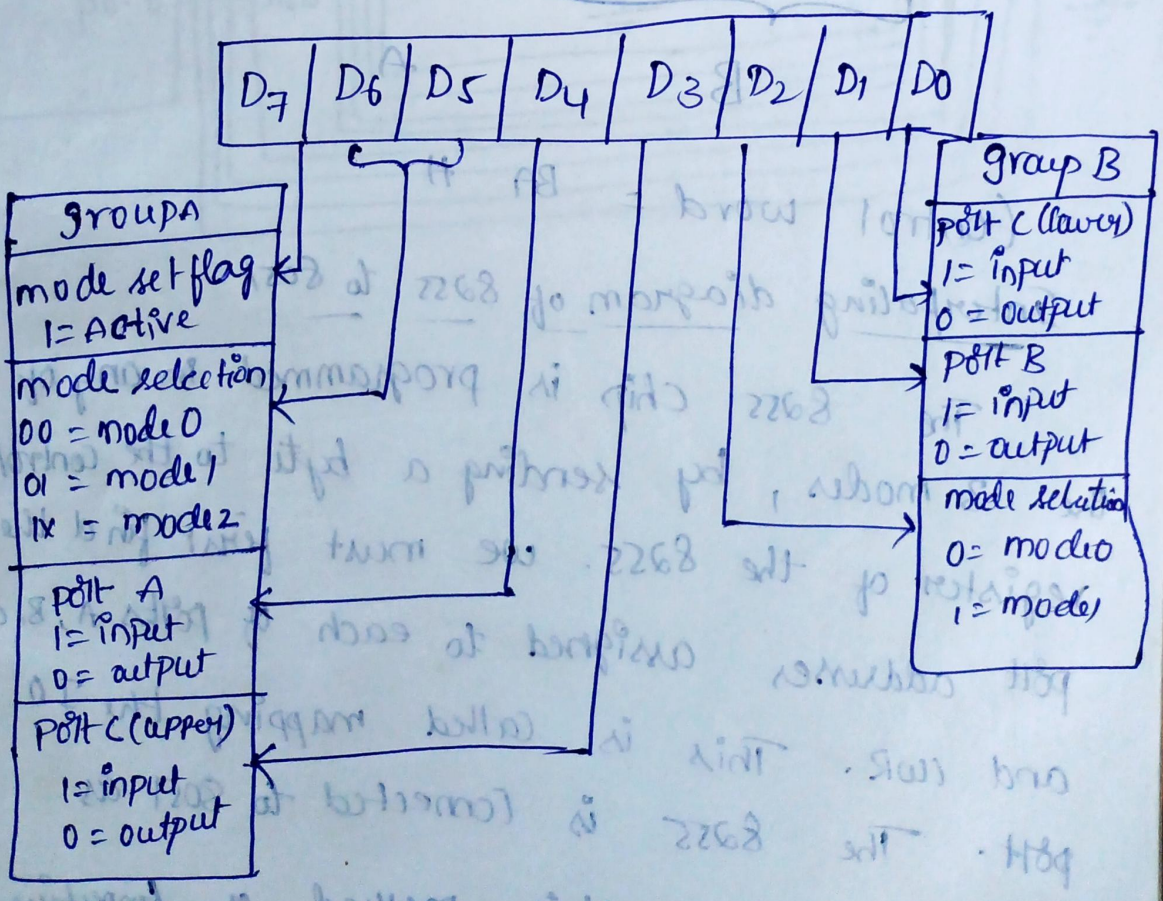
D0-D7 (data bus): These pins are used for data transmission.

Reset: This is an active-high signal input into the 8255 used to clear the control register.

A0 and A1: These two pins are used to access the A, B, C and CR registers as follows:

CS	A1	A0	Port/CWR
0	0	0	A
0	0	1	B
0	1	0	C
0	1	1	CWR
1	X	X	8051 not selected

Control word of PPI 8255A



Eg: obtain the control coord for the following configuration of the ports of 8255A

port A - as input port

mode for port A - mode 1

port B - input port

mode for port B - mode 0

port C lower - output port

The remaining pins PC6 and PC7 of port C are to be used input pins.

Sol: The control word for this case is given as

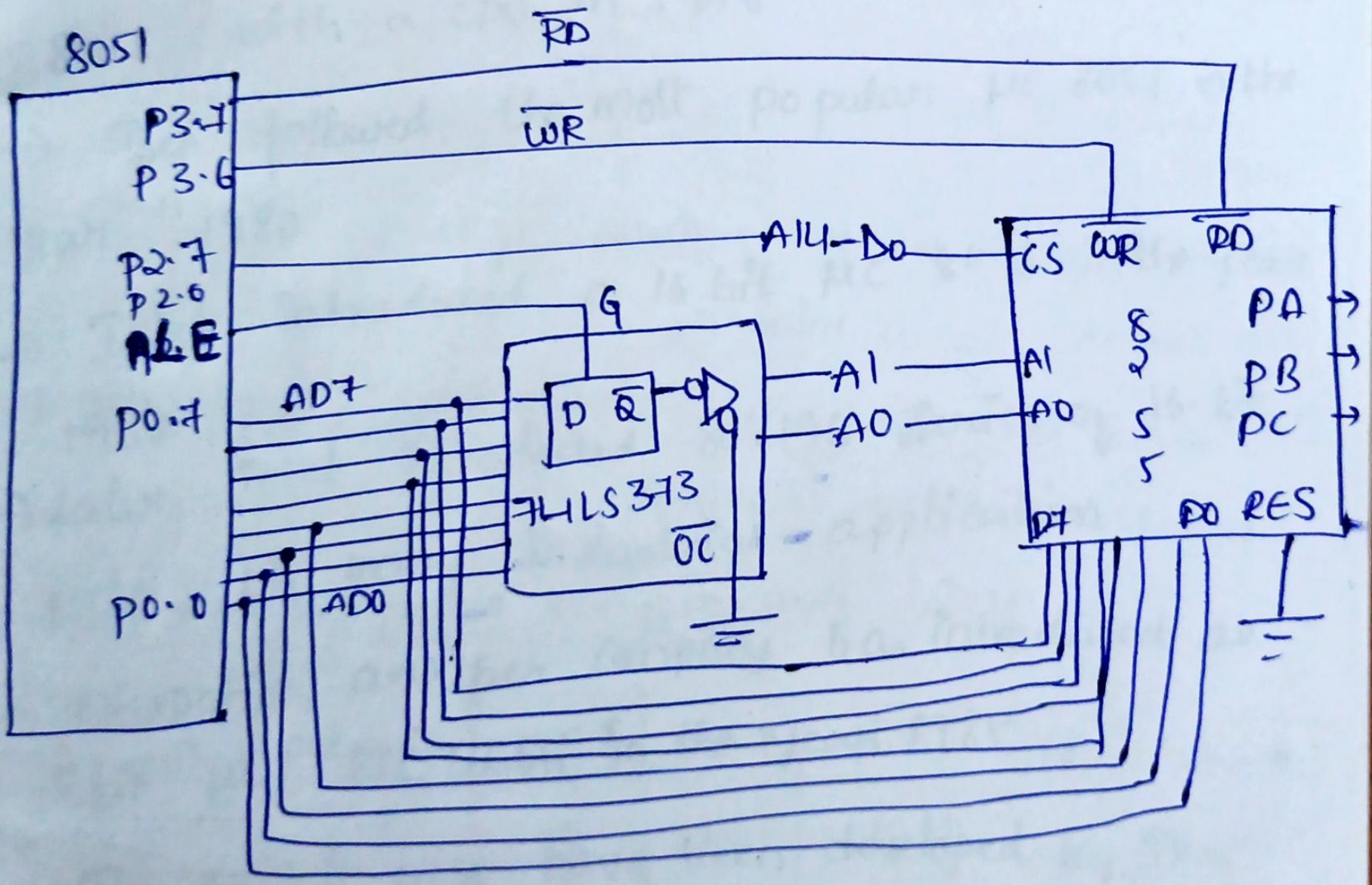
D7	D6	D5	D4	D3	D2	D1	D0
1	0	1	1	1	0	1	0
B				A			

Control word = BA H

Interfacing diagram of 8255 to 8051

The 8255 chip is programmed in any of the 3 modes, by sending a byte to the control register of the 8255. We must first find the port addresses assigned to each of ports A, B, C and CWR. This is called mapping the IO port. The 8255 is connected to 8051 as shown in fig, this method of connecting

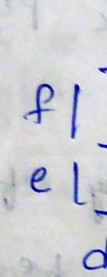
IO chip to CPU is called memory mapped IO since it is mapped into the memory space. For this reason we use instruction such as movx to acces the 8255.



Interfacing 7 Segment display with 8051

→ Seven segment display is used to display BCD digits 0 to 9.

→ A group of 7 LED's physically mounted in the shape of no: eight



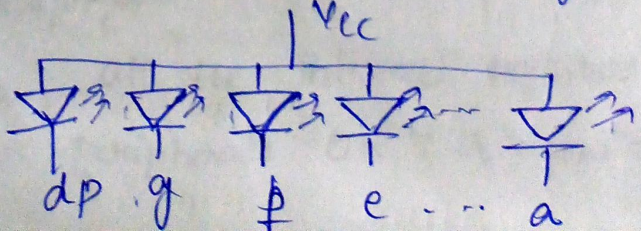
→ 7 segment displays are two types
- Common anode
- Common cathode

Common anode

→ All anodes are connected together to a power supply

→ Cathodes are connected to data lines

→ Logic 0 turns on a segment

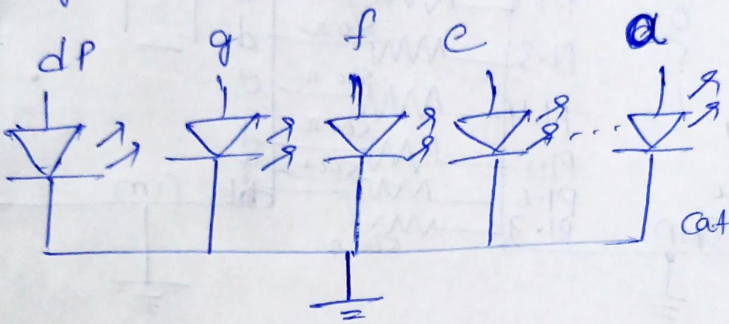


Common cathode

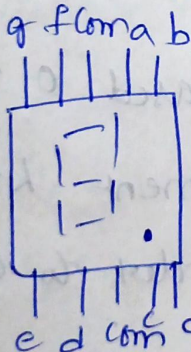
→ All cathodes are connected together to ground

→ Anodes are connected to data lines

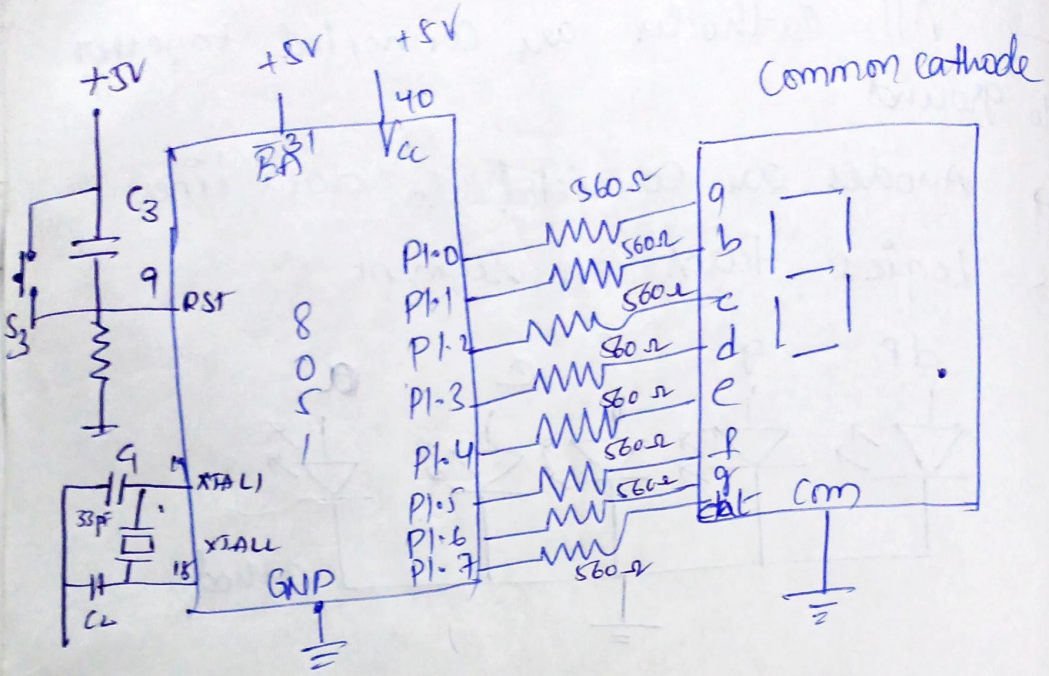
→ Logic 1 turns on segment



7 Segment display pin diagram as shown below



Digit	a	b	c	d	e	f	g
0	1	1	1	1	1	1	0
1	0	1	1	0	0	0	0
2	1	1	0	1	1	0	1
3	1	1	1	1	0	0	1
4	0	1	1	0	0	1	1
5	1	0	1	1	0	1	1
6	1	0	1	1	1	1	1
7	1	1	1	0	0	0	0
8	1	1	1	1	1	1	1
9	1	1	1	1	0	1	1



The circuit diagram shown above is of a microcontroller based 0 to 9 counter which has a 7 segment LED display interfaced to it in order to display the count.

→ The common cathode seven segment display is connected to the port 1 of the micro controller.

→ R3 to R10 are current limiting resistors.

→ S3 is the reset switch and R2, C3 form a debouncing circuitary

C_1, C_2 and X_1 are related to the clock circuit.

LCD Interfacing :

LCD is finding widespread use replacing LED's for the following reasons:

→ The declining prices of LCD

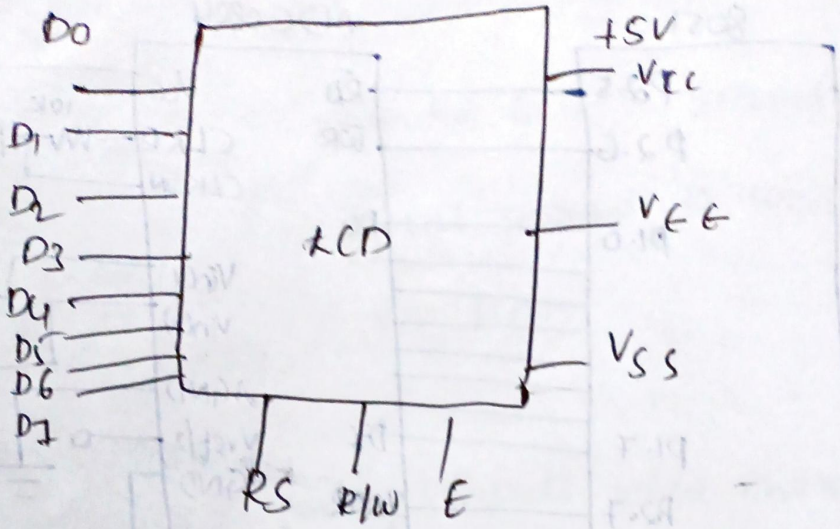
→ The ability to display numbers, characters and graphics.

→ Ease of programming for characters and graphics.

→ LCD itself, it has refreshing controller, in case of LED must be refreshed by the CPU

LCD pin description :

Vcc & Vss : These pins provide +5v and ground.



V_E : It is used for controlling LCD Contrast.

RS (register select) :

There are two very important registers inside the LCD. The RS pin is used for their selection as follows.

If RS=0, the instruction command code register is selected, allowing the user to send a command such as clear display etc. If RS=1 the data register is selected, allowing the user to send data to be displayed on the LCD.

R/W : This allows the user to write information on the LCD or read information

from it

R/W = 1, when reading

R/W = 0 when writing

E - Enable

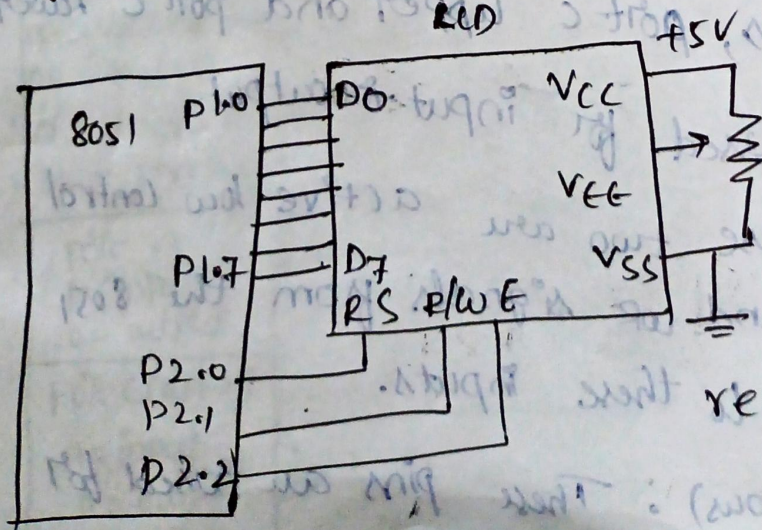
The enable pin is used by the LCD to latch information presented to its data pins. when data is supplied to data pins, a high to low pulse must be applied to pin.

D0 - D7:

The 8-bit data pins, D0 - D7 are used to send information to the LCD or read the contents of the LCD's internal register.

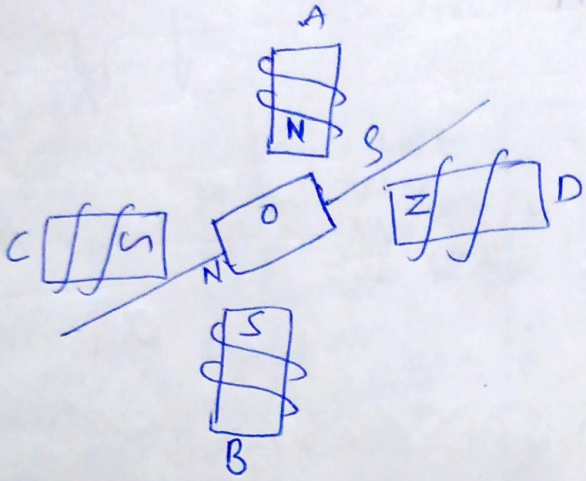
To display letters and numbers, we send ASCII codes for while making RS=1. There are also instruction command to the LCD by making RS=0

We also use RS=0 to check the busy flag bit (D7) to see the LCD is ready to receive information or not.



The busy flag D7 can be read when R/W=1 and RS=0. when D7 = 0 the LCD is ready to receive new information

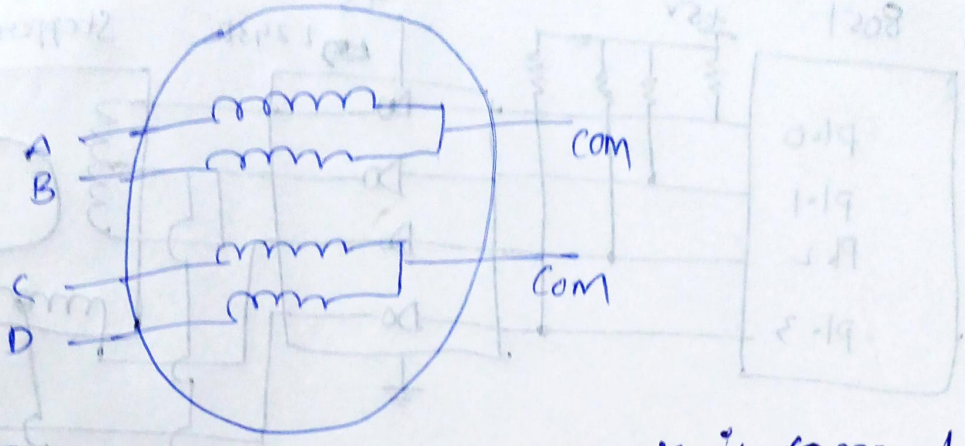
Stepper motor interfacing to 8051



A Stepper motor is widely used device that translates electrical pulses into mechanical movement. Applications disk drives, dot matrix printers and robotics, the stepper motor is used for position control. Stepper motors ~~that do not~~ Commonly have a permanent magnet rotor surrounded by a stator. There are also other steppers called variable reluctance stepper motors that do not have permanent rotor.

The most common stepper motors have four stator windings that are paired with

a center tapped common as shown in fig.

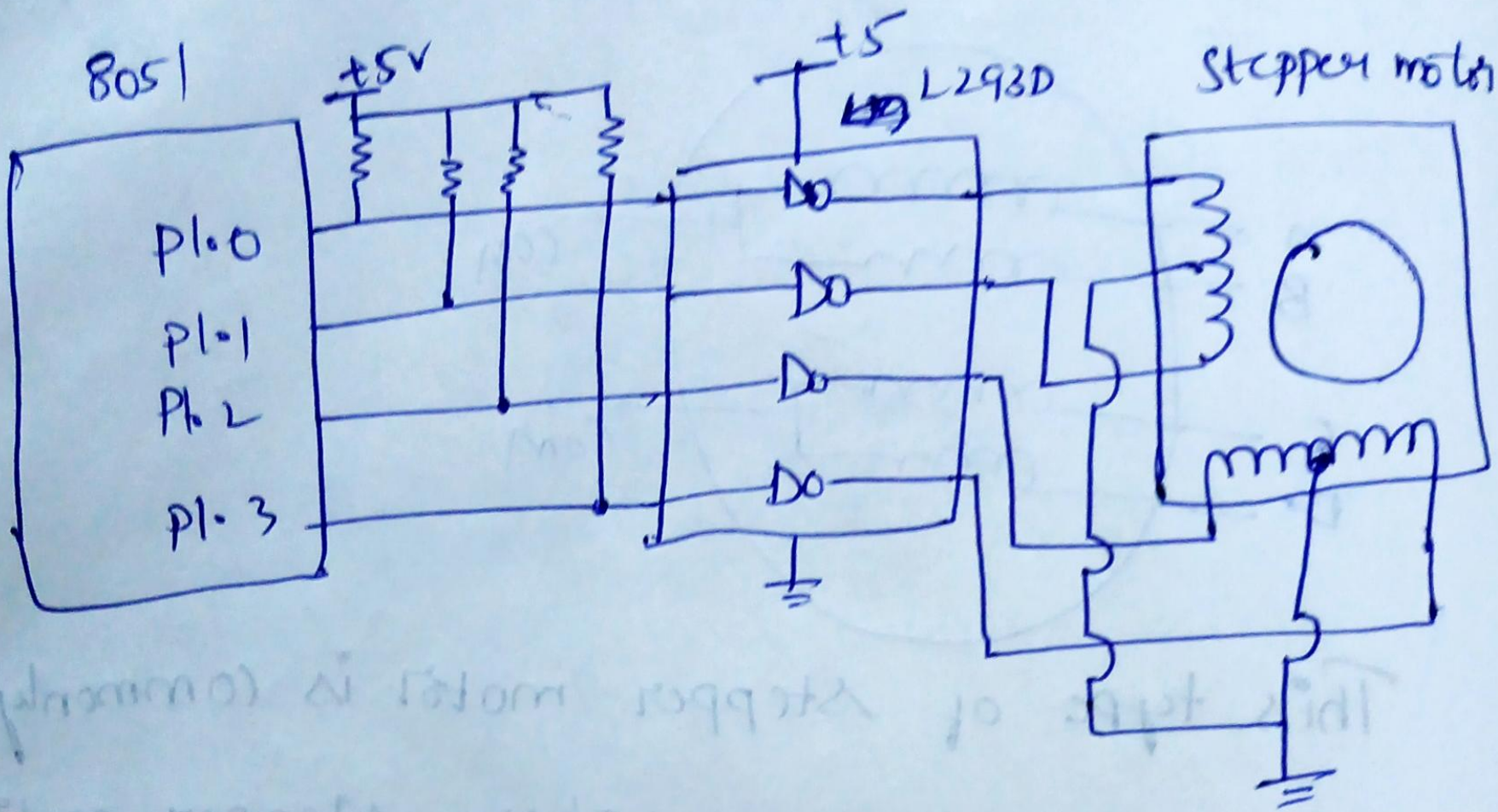


This type of stepper motor is commonly refered to as a four-phase stepper motor. The center tap allows a change of current direction in each of two coils when a winding is grounded, thereby resulting in a polarity change of the stator.

→ The stepper motor rotor moves in a fixed repeatable increment, which allows one to move it to an accurate position.

→ The stator poles are determined by the current sent thragh the wire coils. As the direction of current is changed, the polarity is also changed causing the reverse motion of the rotor.

→ As the sequence of power is applied to each stator winding the rotor will rotate.


8051
+5V
+5
L293D
Stepper motor
P1.0
P1.1
P1.2
P1.3