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Interfacing of Stepper Motor to Intel 8086 Microprocessor through 8255 PPI

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ABSTRACT

In this paper interfacing of stepper motor to 8086 is presented. A stepper motor is a device which rotates in step wise according to the activation of the windings. The activation of windings can be given from the 8086 microprocessor. This stepper motor and Intel 8086 microprocessor can be interfaced by 8255PPI. This device acts as an interfacing device. In this paper we develop an Assembly language program to rotate stepper motor clock wise and anti-clock wise.

Key words: Microprocessor, Stepper motor, Assembly language program.

I.INTRODUCTION

Stepper motor has Four windings, named as A, B, C,and D. These windings are activated either clock wise or anti clock wise. For this stepper motor there will be a rotating part, which will be called as Rotor. So, we can say that Stator is a Stationary part and Rotor is Rotating part. Stepper motor windings are connected to the 8255PPI port. The port either A or B or C. The 8255PPI data bus is connected to the 8086 microprocessor data lines.

II. 8255 PROGRAMMABLE PERIPHERAL INTERFACE

The one of the most important interfacing device is 8255 PPI. Without this interfacing device, we cannot interface any input or output device to 8086 microprocessor. So, there is much importance to this interfacing device. The block diagram of 8255 Programmable peripheral Device is shown in Figure 1.

The 8255 PPI has three ports are there, these ports named as Port A, PORT B, and PORT C. Again the PORT C is divided into two parts PORT C upper and PORT C Lower. Each port of 825 5PPI contains 8 Input an Output Lines. So, there are total 24 Input and output lines are there for 8255 PPI. The PORT C upper and lower has 4 Lines each respectively. These three ports of 8255 PPI is grouped into two groups named as Group A and Group B. PORTR A and PORT C upper under the control of Group A , PORT B and PORT C lower under the control of Group B. The Internal data bus is of 8 bit Width for 8255PPI.The data bus of this interfacing device is connected to 8086 microprocessor 8 bit data lines. The data lines may either lower data lines or upper data lines.

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This 8255 PPI has different modes of operations like BSR (Bit Set Reset) mode and Input /output mode. In BSR mode, we can use only PORT ,this is shown in Figure 3. So, the PORT C pins can be either set or reset by using this mode. For this we have to program the Control word register of the 8255 PPI. In Input and Output mode we have three mode of operations are there. Those are mode 0, mode 1, and mode 2. For this also we have to program the CWR (Control word register).The format of CWR is shown in figure 2.

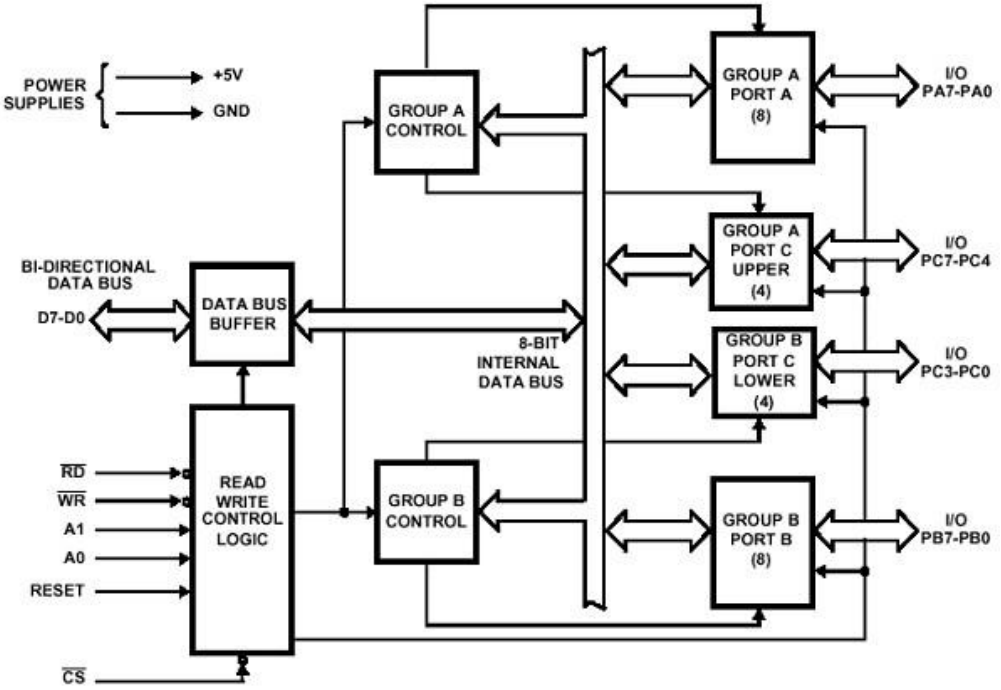


Figure 1: Simplified Architecture of Programmable Peripheral Interface

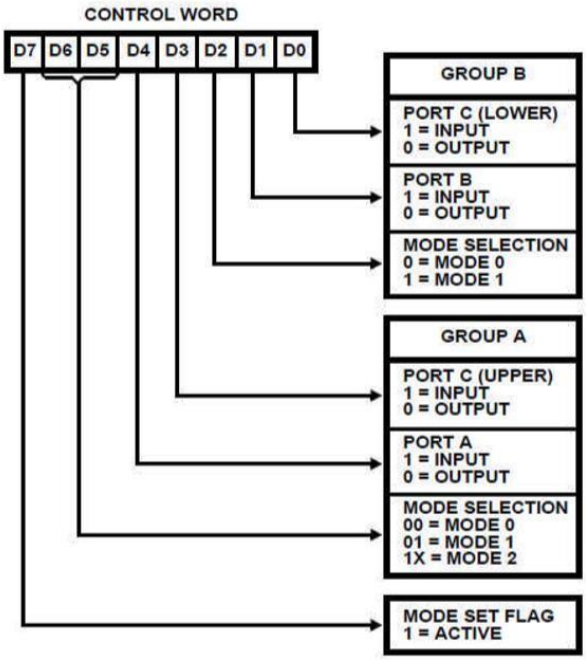


Figure 2: The control word register format of 8255 PPI

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In Mode 0 of PPI all ports are simple input output ports, that is you can connect input and output devices in this mode without any conditioning signals from the processor.in Mode 1, the 8255 PPI uses the hand shaking signals, when the port acts like input port, then the handshaking signals will be Strobe(STB),input Buffer full (IBF) and Interrupt request(INTR) is used. For these signals PORT C is used. The PORT A and PORT B acts like input ports for transferring the data from input device to 8086 microprocessor. When PORTS A and B are acting like output ports , then the hand shaking signals are Output Buffer Full (OBF), Acknowledgement(ACK) and Interrupt request(INTR) is used. For these signals also PORT C will be used. In Mode 2 operation PORT A acts like either Input or Output port, then the handshaking signals are used according to that. The PORT B may acts like input or output port. In this mode also PORT C is used for hand shaking signals. This is the how 8255 PPI is operated in different modes. The programmer according to his requirements, the CWR can be programmed.

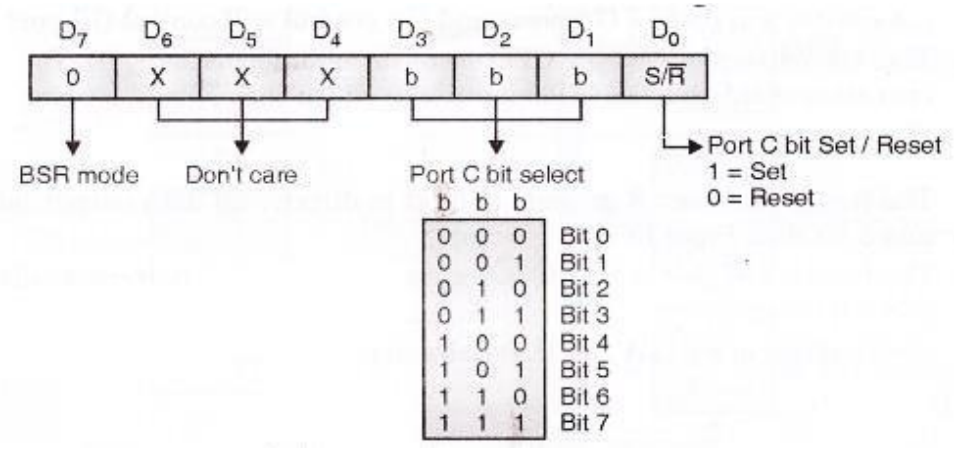


Figure 3: BSR mode of PORT C of 8255 PPI

III. STEPPER MOTOR

The stepper motor is an device, which rotates step wise. In industry, the automation is going on increasing. So, automatically the need of motors is also increasing. Here, the stepper motor is used in many applications according to the industry needs. The main application of stepper motor is which is used in Robotics. The Stepper motor will be rotated as step wise, it may be full step, half step or it may be wave step.

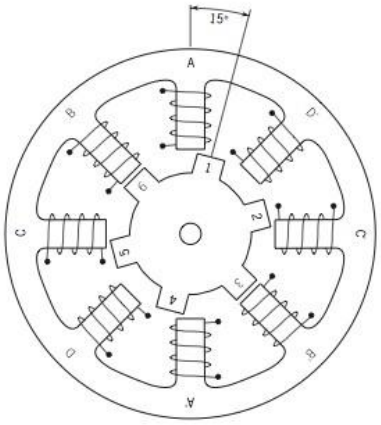


Figure 4: Stepper motor internal view

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The programmer activates the windings of stepper motor according to the application for these kinds of steps. The stepper motor has four windings and rotor will be there. The rotor is rotating part, which is permanent magnet.so; the windings can be connected to the 8255 PPI port either PORT A or PORT B. The below figure 5 shows the industrial applications stepper motors.

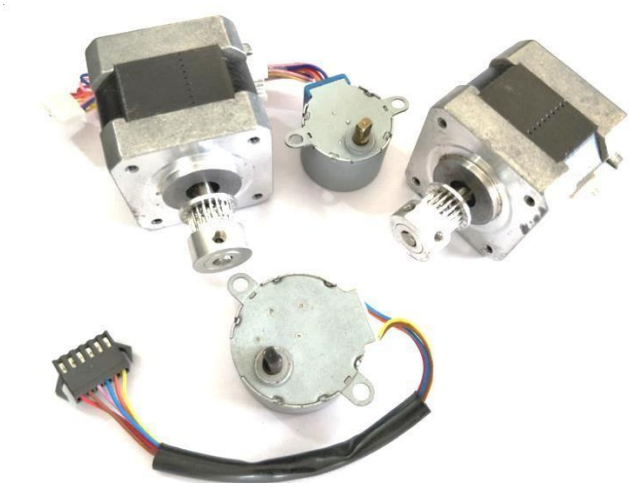


Figure 5: Different types of Stepper motors used in Industries

Here, the stepper motor step rotation will be depends on the number of teeth presented on the rotor. Generally the step angle will be 1.8 degrees if the number of teeth is 200 on the rotor. These teeth will decide the step angle of the stepper motor.

IV. INTERFACING 0F STEPPER MOTOR TO 8086 MP THROUGH 8255 PPI

Here , the stepper motor is a output device ,which is connected to 808 microprocessor through 8255 PPI. The below figure.6 clearly describes the interfacing process.

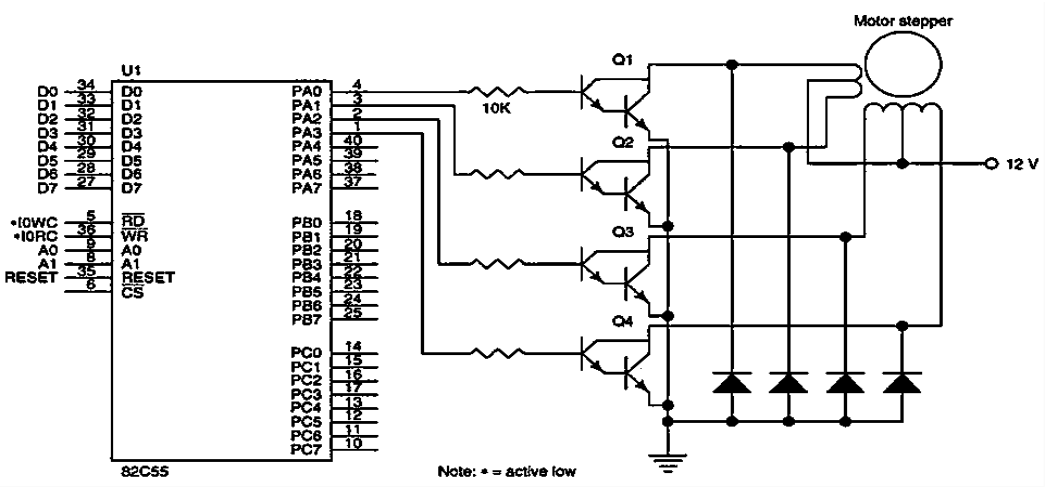


Figure 6: Interfacing Diagram of Stepper motor to 8086 Microprocessor.

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ASSEMBLY LANGUAGE PROGRAM:

For this ALP, the stepper motor rotates in clockwise direction

Address	Opcode	Mnemonics	Operands
4000	B080	MOVB	AL, 80
4002	BAC6FF	MOVW	DX, OFFC6
4005	EE	OUTW	DX,AL
4006	B080	MOVB	AL, 80
4008	BAC4FF	MOVW	DX, OFFC4
400B	EE	OUTB	DX, AL
400C	E8F1DF	CALL	2000
400F	DOC8	ROLB	AL, 1
4011	EBF8	JMP	400B

Delay ALP, This will gives the delay between each step when stepper motor rotates.

Address	Opcode	Mnemonics	Operands
2000	B90010	MOVW	CX, 2000
2003	E2FE	LOOP	2003
2005	C3	RET	

V. RESULTS



Figure 7: Interfacing of stepper motor with 8086 microprocessor kit

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Figure 8 : Based on the activation of windings stepper motor rotating

V. CONCLUSION

In this paper, practically a stepper motor is interfaced to 8086 microprocessor through 8255 PPI programmable peripheral interface. By the ALP, the motor rotated clock wise direction. If we change the rotating command, then the stepper motor rotates in anti-clock wise also. In future , we interface DC motor to 8086 microprocessor.

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