Group 6

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**PRACTICAL LAB I: 8086 Microprocessor Kit and 8086 Pin Diagram**

* Identify the components, one by one; in terms of their location in the kit and what purpose they serve. In the photo, label the parts identified, serially e. g part 1, Part 2, etc.



**Part 1 - CPU** This performs arithmetic and logical operations on the data and serves as the “brain” of the computer

**part 2 - EEPROM** (Electrically Eraseble Programmable Read-Only Memory)

It is a non volatile part of memory that uses microcontrollers for storing small amount of data like smart cards but allowing individual bytes to be erased and reprogrammed

**part 3 8255 PPI -** Its a general purpose programmable I/O device designed to transfer data from input and output to interrupt I/O

**part 4 ps2 keyboard connector** - Used to connect input device keyboard to the the computer

**part 5 Timer port -** The timing gets commands from the instruction decoder and issues signals on the data bus, address bus, and control bus.

**part 6 RAM** - Stores and accesses data on short term basis for your computer to use actively

**part 7 RS 232** - Used to connect the computer to its peripheral devices to allow serial data exchange between them

**part 8 50 pin bus header -** Used to connect the computer to other peripheral devices

**part 9 power jack** - connect the conputer to the AC power supply

**part 10 power on switch** - Used to turn on the computer

**part 11 power supply -** has resistors and capacitors to regulate amount of power the computer receives for use

**part 12 capacitors -** to store current temporarily to mantain constant DC voltage

**part 13 20 pin I/O header -** Used to connect peripheral devices to the computer

**part 14 LCD -** Its an output device used to view data coming into and out of the processor

**part 15 Reset -** Has two functions for input and output : Reset in ( input ) When the signal on this pin goes the program counter is set to zero and the processor is reset. It is an active low signal.

Reset out (output) this signal can be used to reset other devices that are connected to the processor. It is an active high signal.

**part 16 USART (**Universal Synchronous/Asynchronous Receiver/Transmitter**) -**  is a microchip that facilitates communication through the computer's serial pirt using the rs 232 protocol... its different from UART because it offer synchronous connection

**Part 17 8253 timer** - It's designed for microprocessors to perform timing and counting functions using 3 16-bit registers

Identify the 8086 microprocessor chip pins shown in Fig. 2 and give their functions



pin Function

1,20,40 Power supply and frequency signals ... It uses 5V DC supply at VCC pin 40, and uses ground at VSS pin 1 and 20 for its operation.

19 Clock signal is provided through Pin-19. It provides timing to the processor for operations. Its frequency is different for different versions, i.e. 5MHz, 8MHz and 10MHz.

address buses(AD 0 - AD 15)

16,15,14,13, AD0-AD7 (named in order 0-7 *but 16-9* respectively)carries low order byte 12,11,10,9 data and AD8AD15 carries higher order byte data. During the first clock cycle, it carries 16-bit address and after that it carries 16-bit data.

8,7,6,5,4,3,2,39 AD8AD15 (named in order 8-15 *but 8-2 then 39*)carries higher order byte data. During the first clock cycle, it carries 16-bit address and after that it carries 16-bit data.

Address/status buses(A16-A19)/(S3-S6)

38,37,36,35 A16-A19/S3-S6. These are the 4 address/status buses. During the first clock cycle, it carries 4-bit address and later it carries status signals.

S7/BHE

34 BHE stands for Bus High Enable. It is available at pin 34 and used to indicate the transfer of data using data bus D8-D15. This signal is low during the first clock cycle, thereafter it is active.

MN/$\overline{MX}$

33 It stands for Minimum/Maximum. It indicates what mode the processor is to operate in; when it is high, it works in the minimum mode and vice-aversa.

Read($\overline{RD}$)

32 used to read signal for Read operation.

RQ/GT1 and RQ/GT0

These are the Request/Grant signals used by the other processors requesting the CPU to release the system bus. When the signal is received by CPU, then it sends acknowledgment. RQ/GT0 has a higher priority than RQ/GT1 ...

HOLD(RQ/GT0)

31 This signal indicates to the processor that external devices are requesting to access the address/data buses.

HLDA(RQGT1)

30 It stands for Hold Acknowledgement signal. This signal acknowledges the HOLD signal.

WR

29 It stands for write signal. It is used to write the data into the memory or the output device depending on the status of M/IO signal.

S0, S1, S2

These are the status signals that provide the status of operation, which is used by the Bus Controller 8288 to generate memory & I/O control signals. These are available at pin 26, 27, and 28 ...

M/IO(S2)

28 This signal is used to distinguish between memory and I/O operations. When it is high, it indicates I/O operation and when it is low indicates the memory operation.

DT/R(S1)

27 It stands for Data Transmit/Receive signal. It decides the direction of data flow through the transreceiver. When it is high, data is transmitted out and vice-a-versa.

DEN(S0)

26 It stands for Data Enable. It is used to enable Transreceiver 8286. The transreceiver is a device used to separate data from the address/data bus.

QS1 and QS0

These are queue status signals and are available at pin 24 and 25. These signals provide the status of instruction queue ...

ALE

25 It stands for address enable latch. A positive pulse is generated each time the processor begins any operation. This signal indicates the availability of a valid address on the address/data lines.

INTA

24 It is an interrupt acknowledgement signal. When the microprocessor receives this signal, it acknowledges the interrupt.

$\overline{TEST}$

23 This signal is like wait state and is available at pin 23. When this signal is high, then the processor has to wait for IDLE state, else the execution continues.

Ready

22 It is an acknowledgement signal from I/O devices that data is transferred. It is an active high signal. When it is high, it indicates that the device is ready to transfer data. When it is low, it indicates wait state.

Reset

21 It is available at pin 21 and is used to restart the execution. It causes the processor to immediately terminate its present activity. This signal is active high for the first 4 clock cycles to RESET the microprocessor.

INTR

18 It is available at pin 18. It is an interrupt request signal, which is sampled during the last clock cycle of each instruction to determine if the processor considered this as an interrupt or not

NMI

17 It stands for non-maskable interrupt and is available at pin 17. It is an edge triggered input, which causes an interrupt request to the microprocessor.

Clock signal

19 Clock signal is provided through Pin-19. It provides timing to the processor for operations. Its frequency is different for different versions, i.e. 5MHz, 8MHz and 10MHz.

**QUESTIONS**

1. Distinguish between the minimum mode and maximum mode of 8086 Microprocessor.

In minimum mode there can be only one processor i.e. 8086. In maximum mode there can be multiple processors with 8086, like 8087 and 8089. they are in pin/port 32

2. Comment on the use of 8086 microprocessor kit and 8086 Emulator.

The 8086 emulator is a doftware emulation of the microprocessor used to contol the hardware via assembly programming