

CAO: Lecture 30

8086 Timing & Control

Topics Covered

- Microprocessors-8086
- Microcomputer
- 8086 buses
- Machine cycle
- Timing sequence
- Read cycle
- Write cycle

MICROPROCESSORS-8086

- Architecture
- Programming
- Interfacing

FOR STUDY OF MICROPROCESSORS TWO TYPES OF MODELS ARE USED :

➤PROGRAMMER'S MODEL :- THIS MODEL SHOWS FEATURES , SUCH AS INTERNAL REGISTERS, ADDRESS ,DATA & CONTROL BUSES ; THAT WE NEED TO PROGRAM THE DEVICE.

➤THE HARDWARE MODEL:- THIS MODEL SHOWS THE PIN DIAGRAM AND THE SIGNALS TO/FROM THIS PINS TO UNDERSTAND HOW A MOCROCOMPUTER SYSTEM IS BUILT AROUND.

MICROCOMPUTER

➤ **A MICROCOMPUTER SYSTEM IS ONE WHICH USES A MICROPROCESSOR AS ITS CPU**

➤ **IN ADDITION THE MICROCOMPUTER ALSO HAS A MEMORY UNIT, INPUT/OUTPUT DEVICES AND SYSTEM BUSES.**

➤ **THE SYSTEM BUSES ARE OF THREE TYPES:**

1. ADDRESS BUS

2. DATA BUS

3. CONTROL BUS

➤ **PHYSICALLY BUSES ARE GROUP OF WIRES**

8086 BUSES

THE 8086 HAS

- 20 ADDRESS LINES**
- 16 DATA LINES**
- 4-10 CONTROL LINES.**

WITH THIS THE 8086 IS ABLE

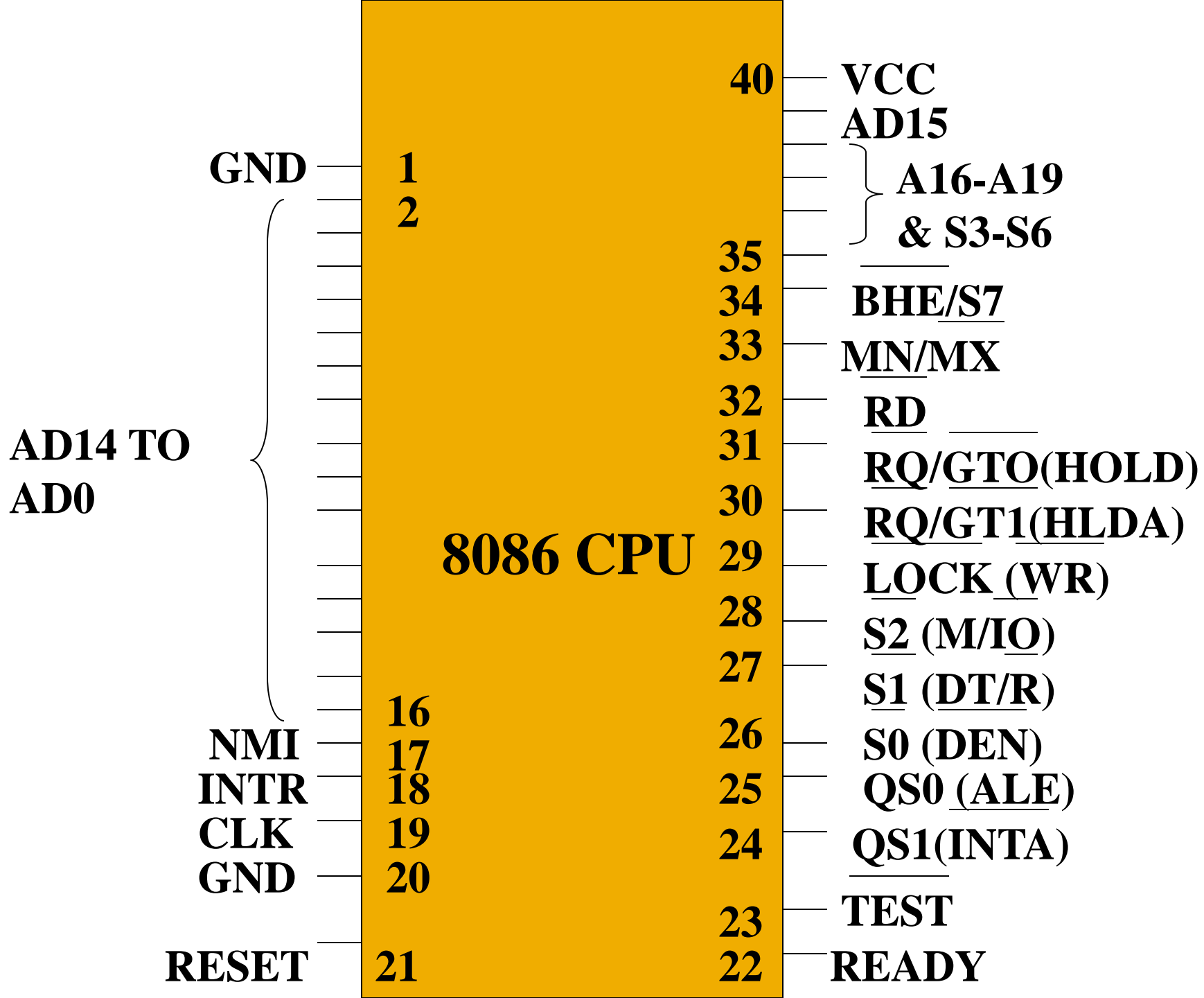
- TO ADDRESS 1,048,576 (2^{20}) MEMORY LOCATIONS/PORTS.**
- TO MANIPULATE AND/OR OPERATE ON 16-BITS (2-BYTES) OF DATA AT A TIME.**
- TO GENERATE NECESSARY CONTROL SIGNALS.**

8086 SYSTEM CONNECTIONS, TIMING & TROUBLESHOOTING

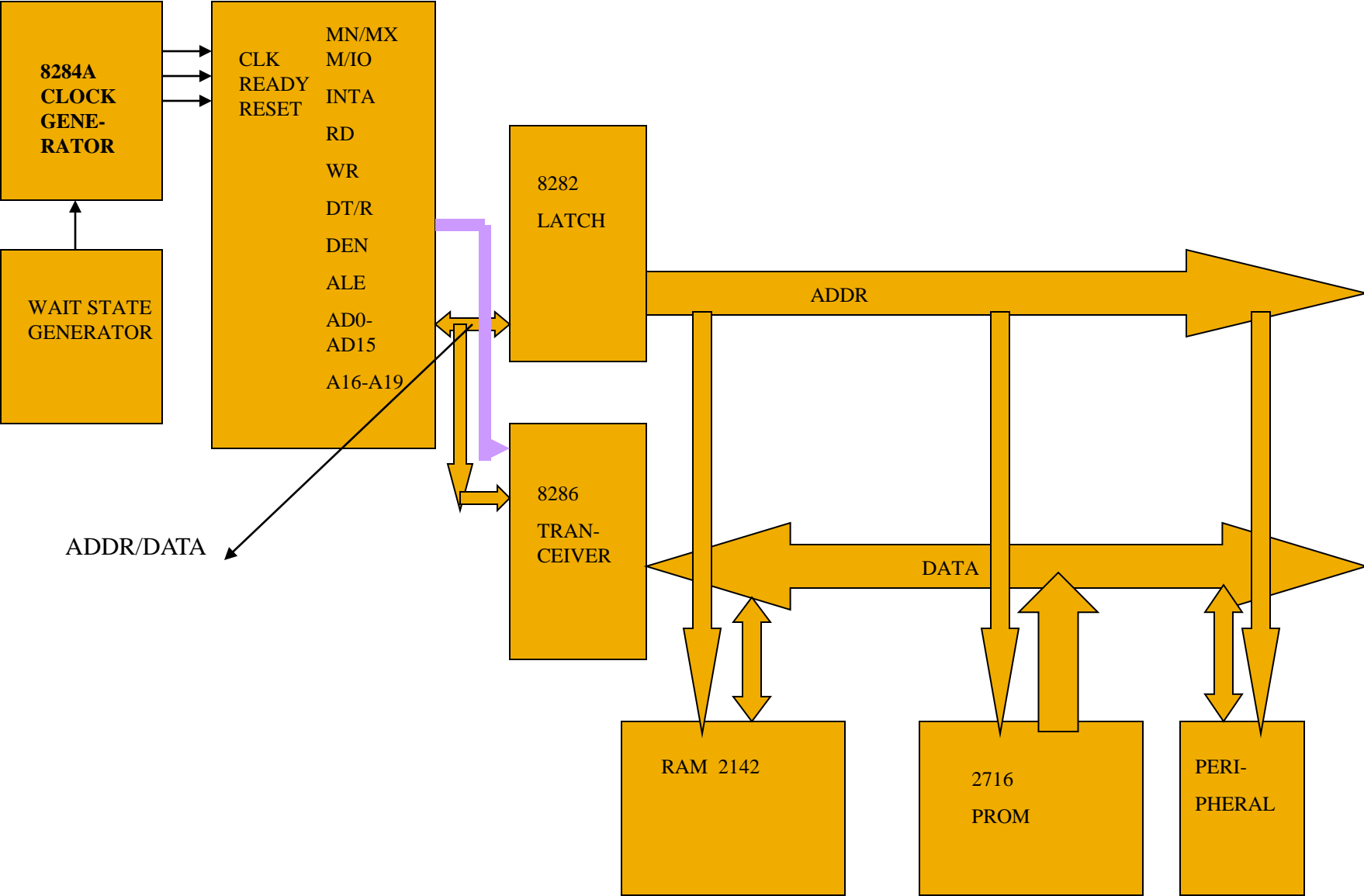
Machine Cycle: A Basic microoperation such as reading a Byte from memory or Writing a byte to a port is called *Machine Cycle*.

A machine cycle consist of state.

Instruction Cycle: The time a microprocessor requires to fetch and Execute an entire Instruction is called an *Instruction Cycle*. *An instruction cycle consist of one or more machine cycle.*



BASIC 8086 MINIMUM MODE SYSTEM



TIMING SEQUENCE

- AN EXTERNAL CLOCK GENERATOR DEVICE IS CONNECTED TO 8086 TO PROVIDE CLOCK SIGNALS THROUGHOUT THE SYSTEM.
- ONE CYCLE OF CLOCK IS CALLED A STATE OR T-STATE.
- EACH BASIC OPERATION SUCH AS READING A MEMORY LOCATION OR WRITING TO A PORT REQUIRES SEVERAL STATES. THIS GROUP OF STATES IS CALLED A MACHINE CYCLE.
- THE TOTAL TIME REQUIRED TO FETCH AND EXECUTE AN INSTRUCTION IS CALLED AN INSTRUCTION CYCLE. AN INSTRUCTION CYCLE CONSISTS OF ONE OR MORE MACHINE CYCLE.

BASIC SIGNAL FLOW ON 8086 BUSES

BASICALLY THERE ARE TWO OPERATIONS TO SEE:

1. READ OPERATION

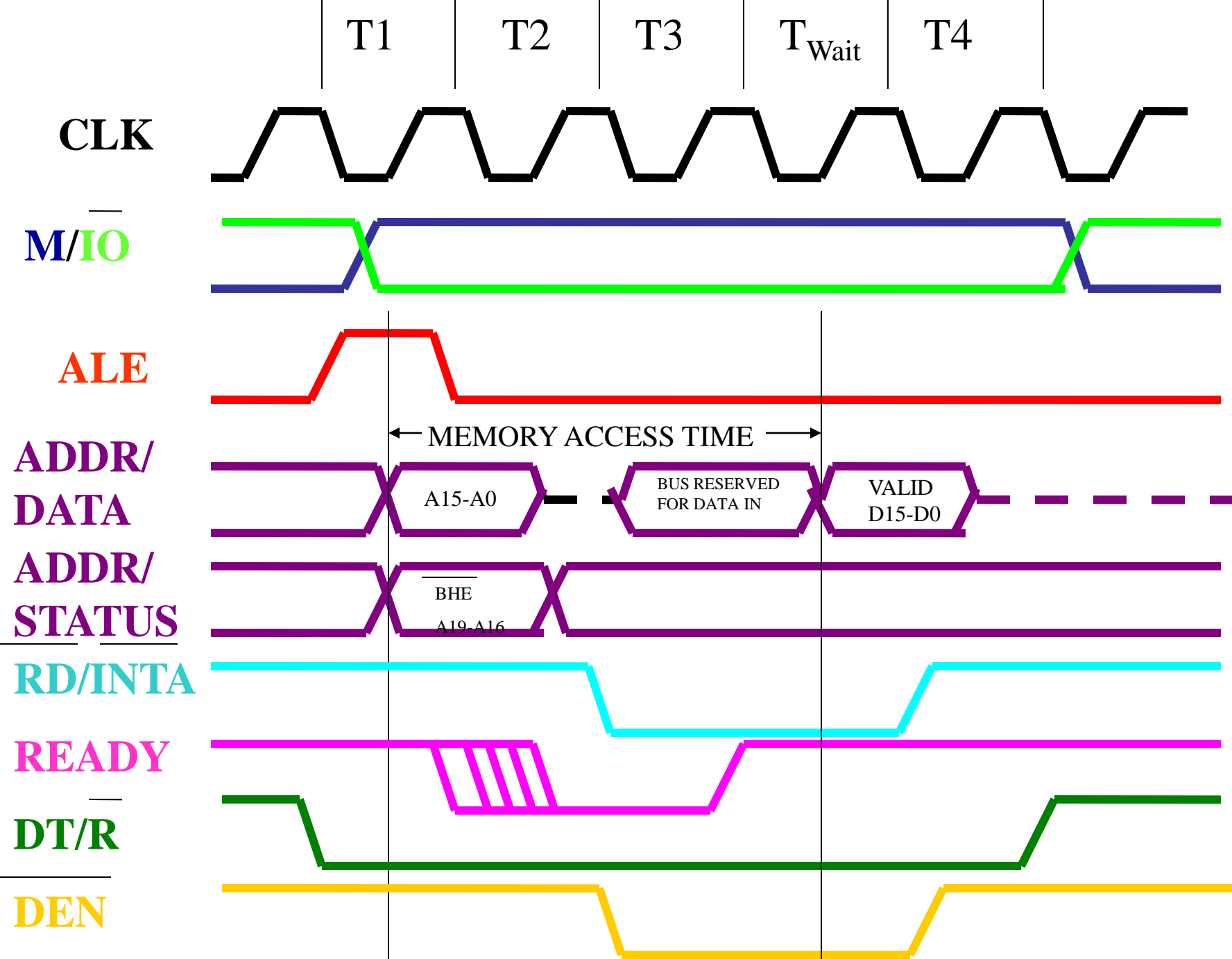
2. WRITE OPERATION

WILL SEE WHAT IS GOING ON DURING THIS TWO CYCLES OF OPERATION.

READ CYCLE

➤ HERE WE WILL SEE THE ACTIVITIES CARRIED OUT ON 8086 BUSES AT VARIOUS TIME INSTANTS WHEN IT READS FROM A MEMORY LOCATION OR FROM A PORT.

➤ HERE WE WILL ASSUME THAT THE 8086 IS OPERATED IN IS MINIMUM MODE.



WRITE CYCLE

➤ HERE WE WILL SEE THE ACTIVITIES CARRIED OUT ON 8086 BUS AT VARIOUS TIME INSTANTS WHEN IT WRITES TO A PORT OR A MEMORY LOCATION.

➤ HERE WE WILL ASSUME THAT THE 8086 IS OPERATED IN IS MINIMUM MODE.

