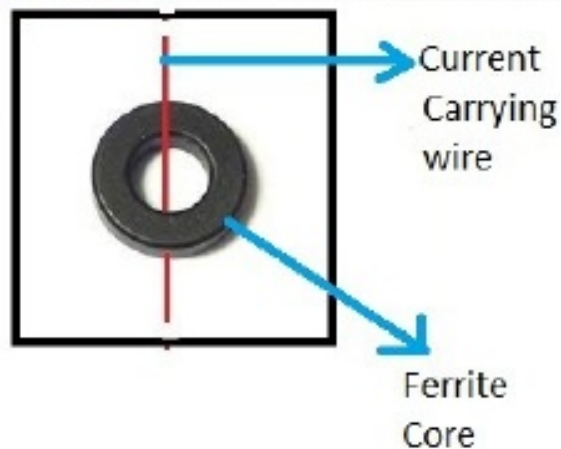
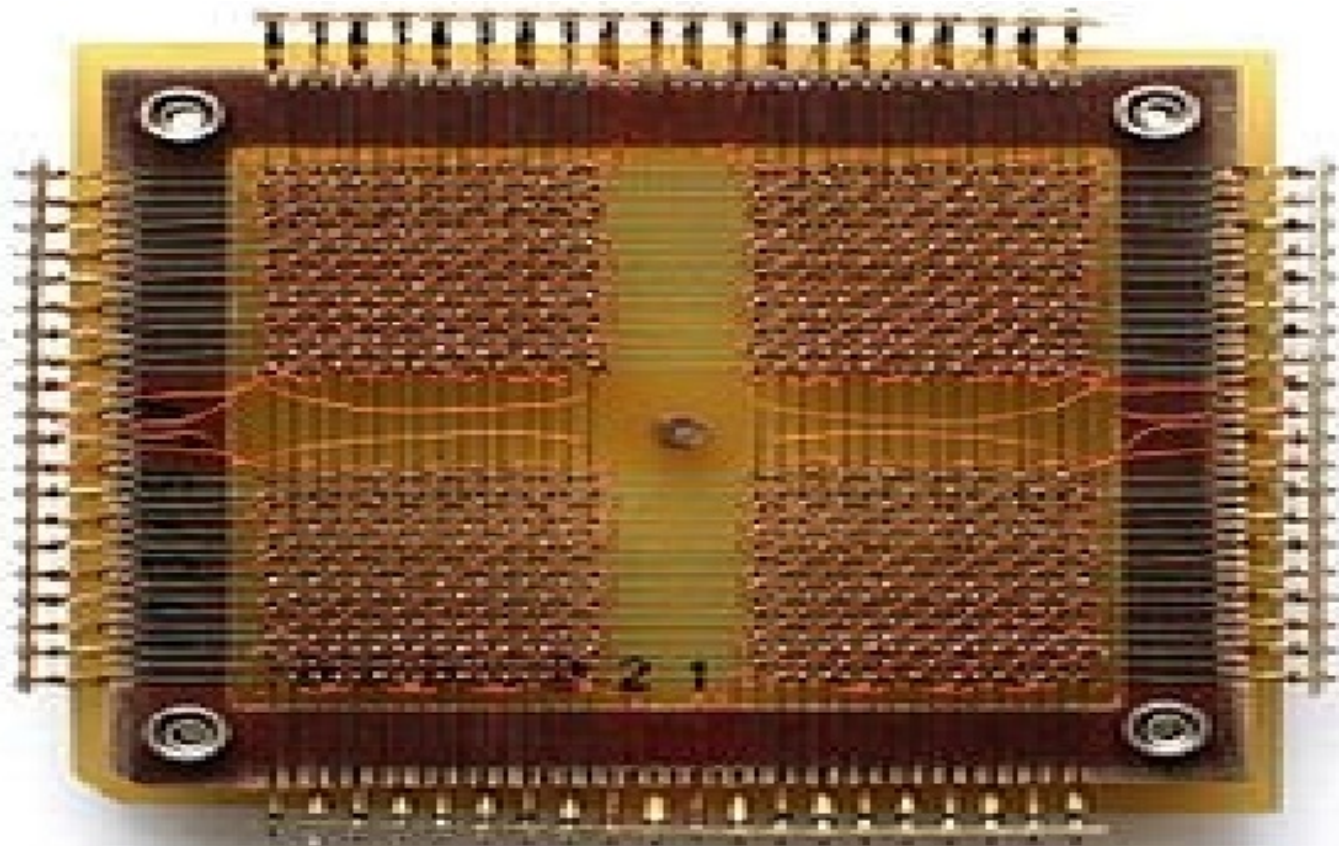


# Ferrites in Computer Memories

Dr. A. Balamurugan

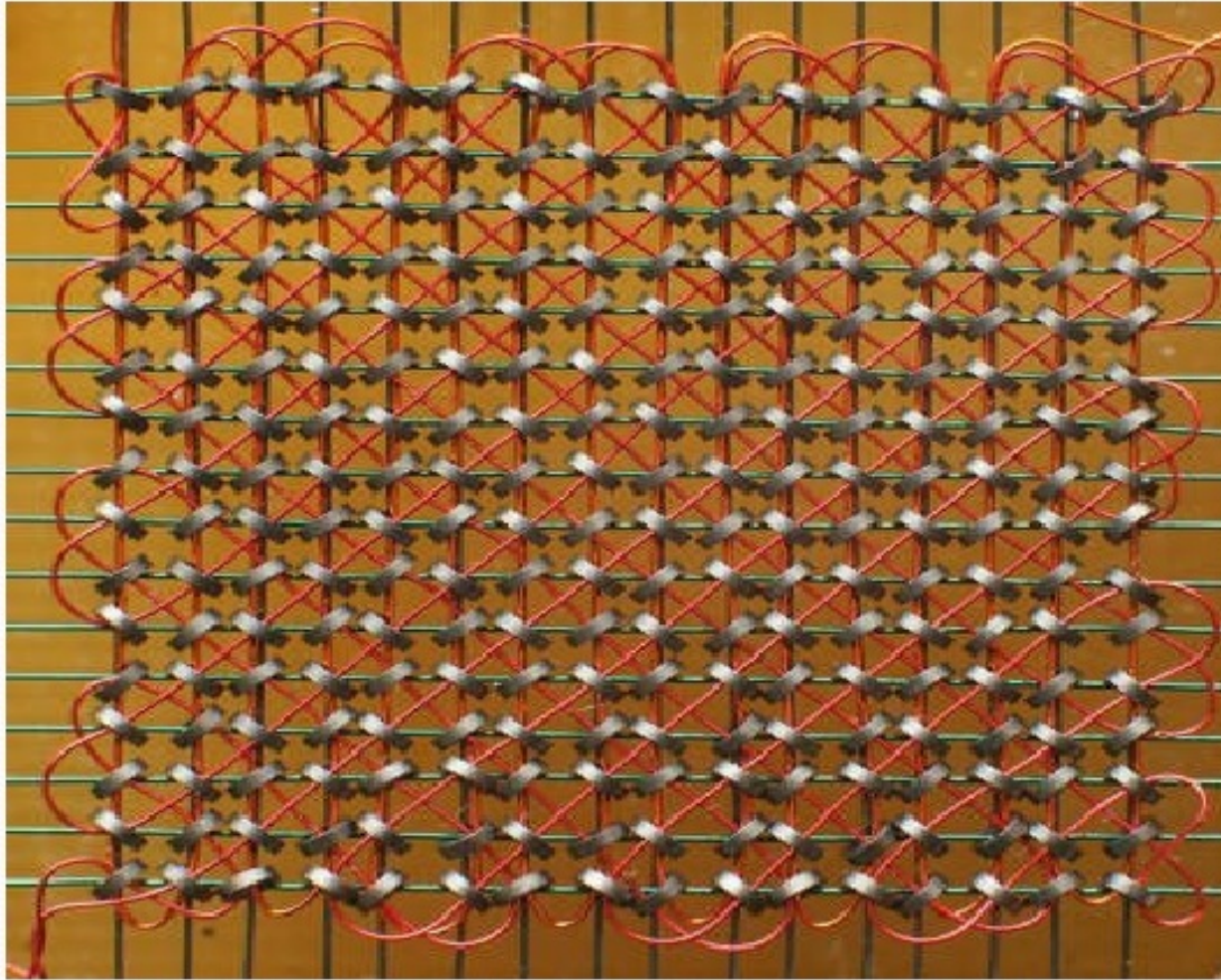
- Magnetic core memory, or ferrite-core memory, is an early form of **random access computer** memory. It uses small magnetic **ceramic** rings, the cores, through which wires are threaded to store information via the **polarity** of the **magnetic field** they contain. Such memory is often just called core memory, or, informally, core.





A 32 x 32 core memory plane storing 1024 bits of data

# INTERNAL STRUCTURE



# What is Ferrite??


- Ferrite is a ceramic material formed by reacting metal oxides into a magnetic material. (It is a compound of ferromagnetic metal, e.g., Iron)

# Why Ferrite?

- Because ferrite can be easily magnetised and demagnetised by the passage electric current.
- And it retain its magnetism even when the external magnetising field has been removed.

# Some key concepts

- Magnetic Field
  - A region around a magnetic material(Here Ferrite) or a moving electric charge within which the force magnetism acts.
  
- Magnetisation
  - The process of making a substance temporarily or permanently magnetic , as by insertion in a magnetic field.



- **Magnetic Flux**

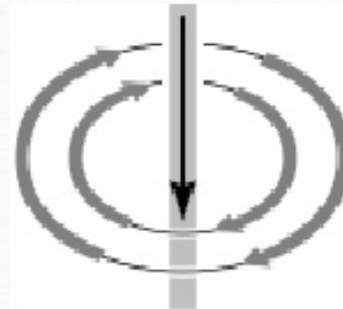
- The number of lines of force passing through a given area is defined as Magnetic Flux.

- **The magnetic field of a current-carrying wire**

- current in a wire creates a magnetic field circulating about the wire, whose strength is proportional to the size of the current. If we reverse the direction of the current, the magnetic field circulates in the opposite direction:

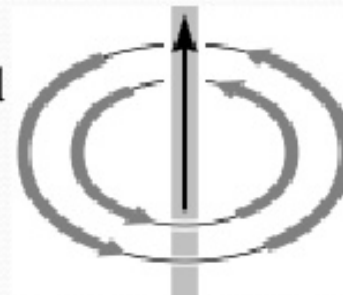


- Large current downward
  - Strong clockwise field

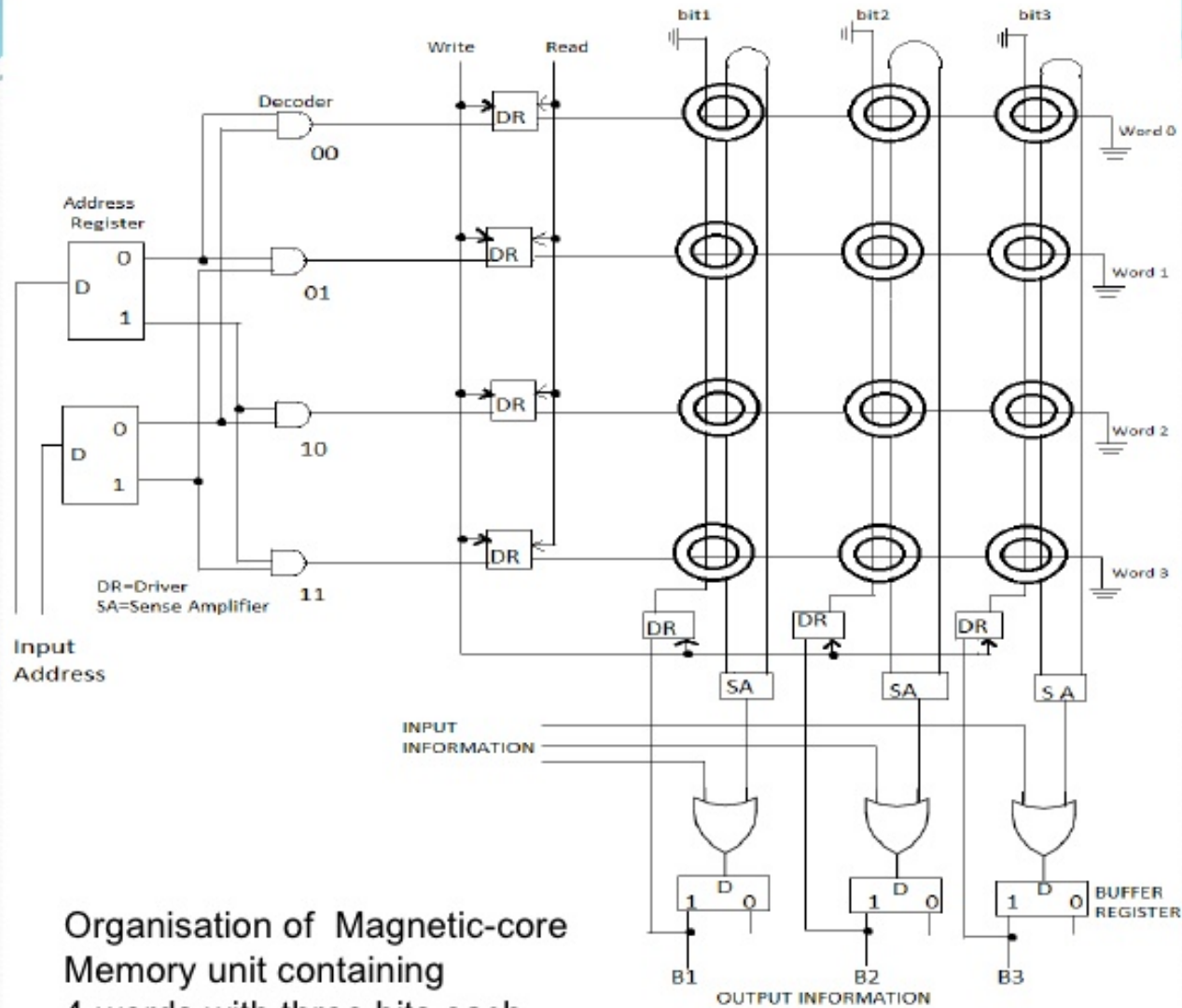


Produces Negative flux ,,  
Which results in the storage of  
ZERO in the Ferrite Core


- Large current upward
  - Strong anti-clock wise field



Produces Positive flux ,,  
Which results in the storage of  
ONE in the Ferrite Core



- DR(Driver)
  - Generates current pulses to magnetise the cores in the two magnetising states as mentioned earlier.
- SA(Sense Amplifier)
  - It amplifies detects the pulses induced in the sense wire winding when the magnetic memory core switches its states .



- Write operation

- During a write operation , the buffer register holds the information to be stored in the word specified by the address register.
- A current pulse is generated simultaneously in the word driver selected by the decoder and in the bit driver, whose corresponding buffer register flip-flop contains a 1(one).
- Both currents are in the positive direction , but their magnitude is only half that is needed to switch the flux to the 1 state.

## RESTORE OPERATION:

- The restore operation during a read cycle is equivalent to a write operation which ,in effect , writes the previously read information from the buffer register back into the word selected .
- The access time plus the time to rewrite is the **memory cycle time**
- The clear operation during a write cycle is equivalent to a read operation which destroys the stored information but prevents the read information from reaching the buffer register by inhibiting the sense amplifier.

Restore and clear cycles are normally initiated by the memory internal control .

# ADVANTAGES OF MAGNETIC /FERRITE CORE MEMORY

- It was more cost effective than high performance vacuum tube or transistor memory and provided better performance than low cost drum memory.
- It is volatile in nature.
- The components had a higher life time expectancy and their operating characteristics do not alter over time
- The Magnetic core needs no power to retain its data.
- Magnetic core memory is permanently magnetised either in clockwise or anti-clockwise direction.

# DISADVANTAGES

- (1) Magnetic core memory has been replaced by semiconductor memory because each integrated circuit in semiconductor memory contains thousands of semiconductor devices which represents million of bit.
- (2) Magnetic core memory don't get smaller than that required by simple calculator.
- (3) Reading a bit from a core sets its state to zero which is a term of destructive reading which needs a write cycle to restore the previous bit.

# USES OF MAGNETIC /FERRITE CORE MEMORY

- It is used as a secondary storage device due to its non volatility.
- Magnetic core memory is used as a computer memory as their behaviour when external magnetic field is applied.
- It can be used as storage device.
- Magnetic core memory is used to capture the imaginations of modern enthusiasts.



Thank  
you