Magnetic core rope memory (ROM)

The same type of ferried torus rings used in the magnetic core RAM are used for this except they are just used as transformers. The ferrite cores have two separate coils/wires (a word line wire and a bit line wire).

The signal passing from a word line wire causes a 1 in the output (bit line wire) provided it is fed through the core. If the word line wire is wrapped around the core then the core will represent a 0, outputting a 0 in the bit line wire.

Wires are fed through multiple ferrite toruses to create a memory device.

Programs had to be weaved using the wires and ferrite cores. Roughly 20Mbit per m^3

History: First used in 1960s in early Mars space probes by NASA. It was also used in the Apollo Guidance Computer (AGC) programmed by the MIT instrumentation LAB. Software written by MIT programmers had to be weaved into the rope memory. Some workers nicknamed it the little old lady memory.

Magnetic core memory (RAM)

This was the main form of random-access-memory (1955 to 1975)

This is made up of many magnetic toroids. Each ferrite core has two separate coils wrapped at each end of the torus (3D ring-like shape). When an alternating current is passed through one of the coils it induces a changing magnetic field which also induces an alternating current through the opposite coil (it is used as a transformer).

The state in which a ferrite core is dependent on the direction of flow of current. Each end of a wire from the coil is marked, the current flowing through the dot side (dot-current) will induce a negative magnetic field to set the core state to binary 0.

Current flowing in from the non-dot side (non-dot current) will set the core state to binary 1 as a positive magnetic field is induced.

The wires are arranged to allow for an individual core to be set to 1 or 0 by sending appropriate electronic pulses through selected wires.

When reading the cores, the cores are reset to a zero, so are erased (destructive readout). When not being read or written, the cores retain the last value they store even with no power flowing through them so this memory is non-volatile (despite today's RAM being volatile)

History: Using smaller cores and wires, the memory density of the core slowly increased (1960s typically 1Mbit per m^3). However, increasing density was costly and time-consuming (manufacture by hand). Cost declined from ~$1 per bit to ~1 cent per bit. However, the introduction of the first semiconductor memory (SRAM chips) in the late 1960s drove the core memory out the market. By 1974, Intel 1103s DRAM provided 1cent per bit memory, the rapid increase in storage and decrease in price removed the need for core memory.

Core dumping

Core memory is now obsolete as it is not very dense of the data it holds (ROM - 20 Mbit per metre cubed, RAM – 1Mbit per metre cubed). However, computer memory is sometimes still called “core” - in particular, a memory register containing the contents of memory after a system error is usually called a core dump.

Core dump = the dumping of the contents of the main memory into a file record (on a volatile storage such as a hard disk) proceeding a system error. This occurs so that debugging is made easier with the data stored.

Dump report = a core dump represented in a readable way that humans can understand when debugging.