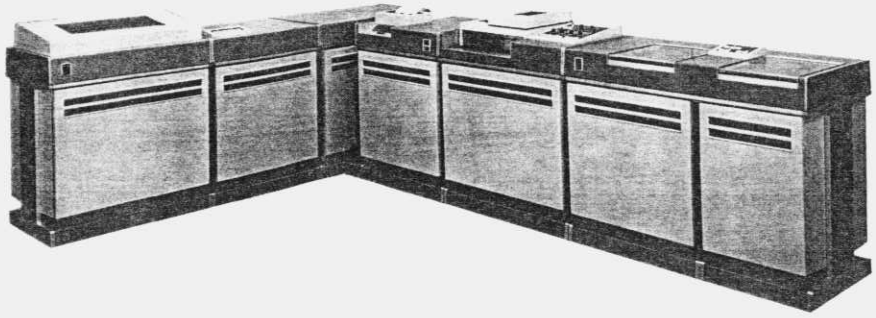
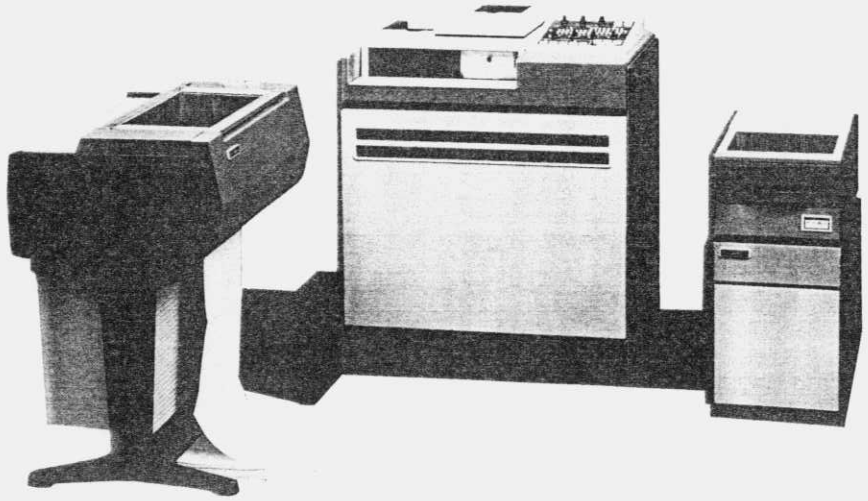
NCR CENTURY 100



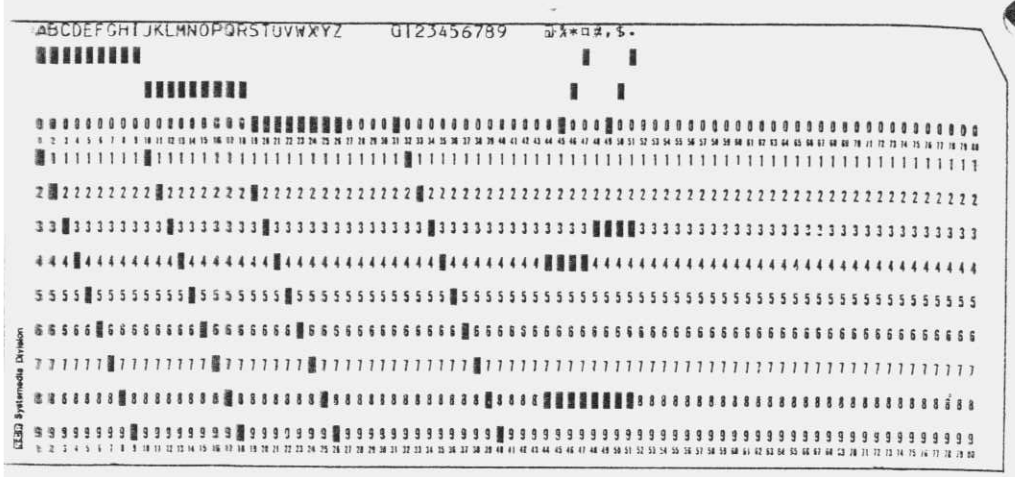
THE NCR CENTURY 101



NCR CENTURY 151 BASE SYSTEM

NCR CENTURY 200 SYSTEM

Figure 2 - Input Media, Punched Cards



Preparation of a Punched Card

- As a card feeds through the device known as a keypunch, the operator types data on a keyboard similar to a typewriter.
- The keypunch punches holes into the cards in a code that represents letters, digits and special characters.
- Generally, a single card contains one record or transaction.
- A single card containing one record may not use the entire 80 columns for data.

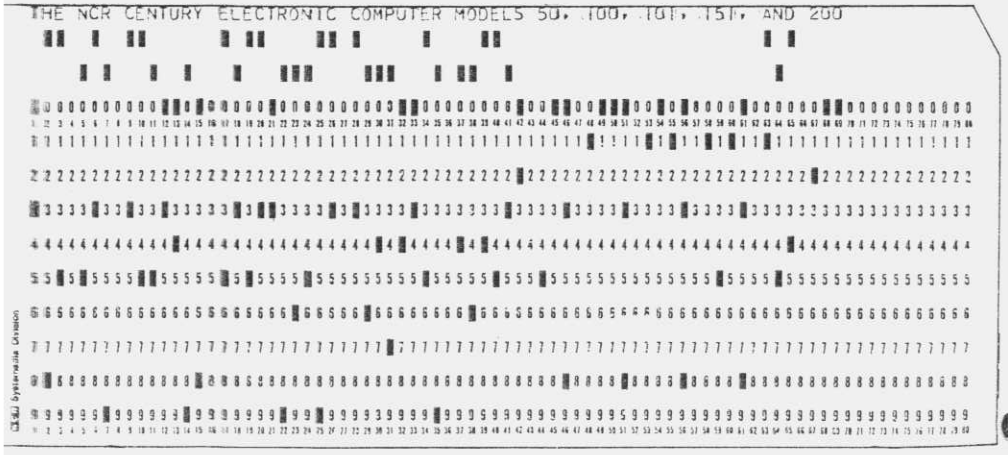
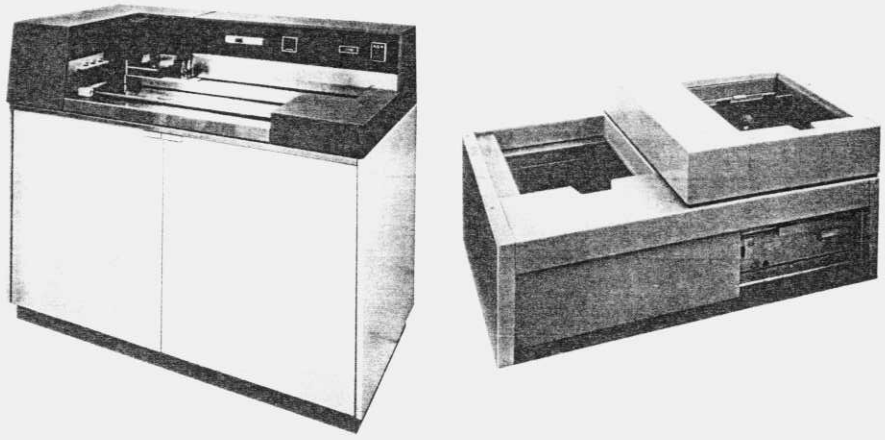
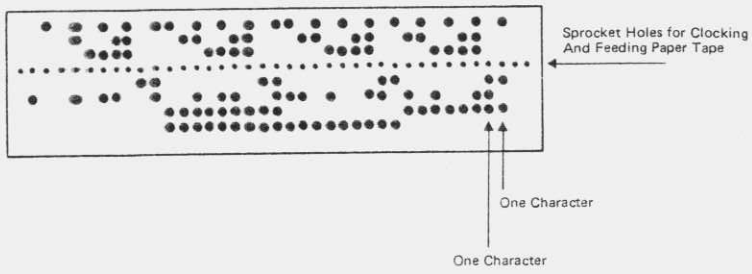


Figure 3 - Punched Cards as Input to the Computer System



- Punched cards are loaded into a computer system card reader in batches.
- The punched card moves through the card reader which senses and reads the holes which represent the data.
- The data, represented by the punched holes, is read photoelectrically and is transmitted by cable to the internal memory area of the computer.
- Two card readers are shown: at the left, the high speed card reader, and at the right, the card reader that is part of the console of the computer system.

Figure 4 - Input Media, Punched Paper Tape



Preparation of Punched Paper Tape

- Patterns of punched holes in specified codes are punched into a continuous roll of one inch wide paper tape moving through a paper tape punch.
- The paper tape punch works in combination with a parent machine, such as an adding machine, bookkeeping machine, accounting machine, or retail sales register.
- The operator of the parent machine, in the normal course of keeping daily records, or recording transactions, prepares input for the computer from the keyboard of the parent machine.

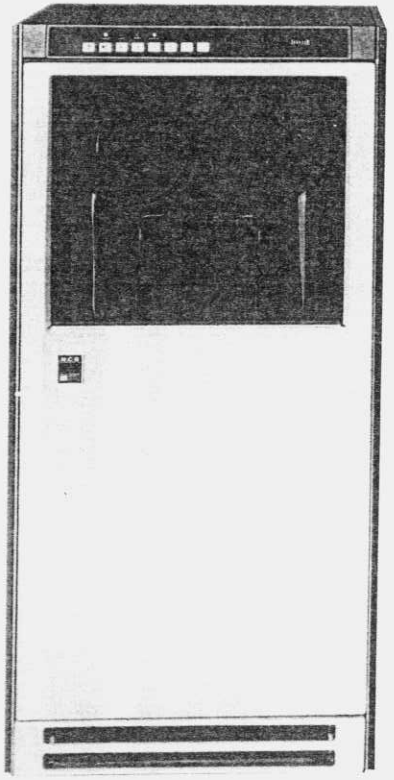
Parity Checking

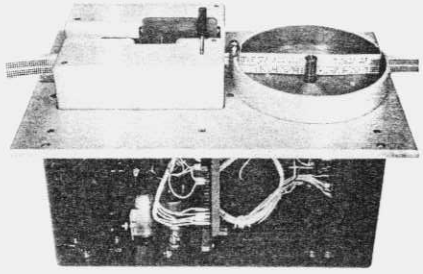
- Parity checking is an accuracy check made by counting the punches in a frame of paper tape to determine whether the sum is an odd or an even number of holes. If necessary, extra punches are added automatically in the parity channel.

Clocking

- Smaller holes punched in a single line assure the proper spacing of the frames of tape or characters.
- The single line of smaller holes are called sprocket holes. They provide a means of feeding the tape through the punched paper tape recorder.

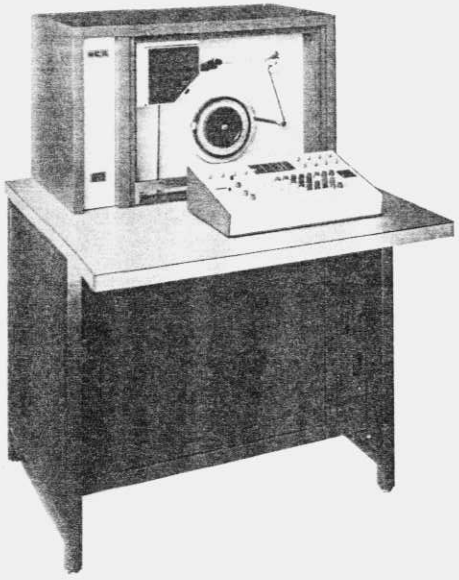
Figure 5 - Punched Paper Tape as Input to the Computer System

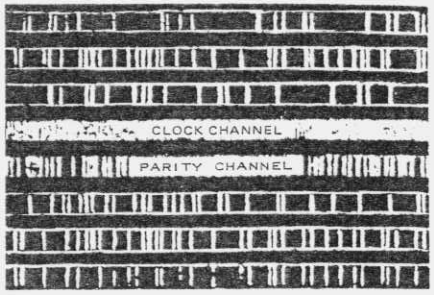




- A roll of paper tape punched as a result of operating a parent machine, is mounted at the left of the cabinet unit, and after it is read, is rolled up on the take-up reel at the right.
- A punched paper tape strip reader is used for reading shorter lengths of tape, and no take-up reel is provided.
- The data, represented by the punched holes, is read photoelectrically and is transmitted by cable to the internal memory area of the computer.
- Parity is again checked as the paper tape is read. The consistency of the number of holes in each frame is checked automatically. (odd or even number)
- As the tape is fed through the reader, clocking is accomplished by the hardware. Sprocket holes, punched by the recorder, ensure the proper spacing of the frames or characters as they are read.

Figure 6 - Input Media, Magnetic Tape





(1-INCH SECTION ENLARGED)

Preparation of Magnetic Tape

- Data is encoded from a source document directly onto magnetic tape by an NCR magnetic tape encoder.
- As the operator key enters the data through the encoder keyboard, a mechanism called a write-head magnetizes the tape in a magnetic pattern similar to the patterns of holes in paper tape.

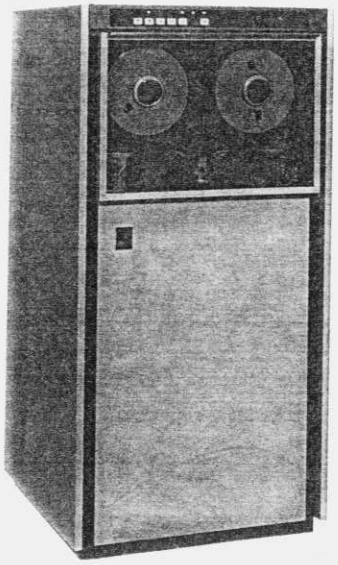
Parity Checking

- Parity Checking is an accuracy check made by counting the magnetized spots, or bits, for each character of data encoded to determine whether the sum is an odd or an even number of bits. If necessary, extra bits are added in the parity channel automatically to maintain consistency of odd or even.

Clocking

- Bits, encoded in the clock channel of magnetic tape assure the proper spacing of the magnetically encoded characters.

Figure 7 - Magnetic Tape as Input to the Computer System

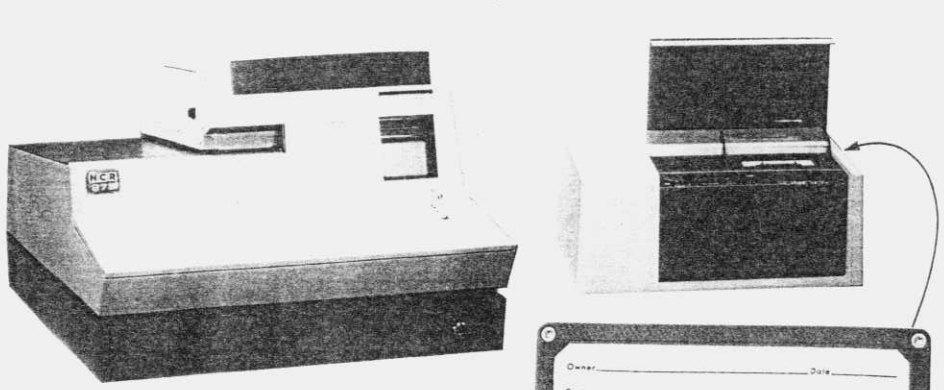


- A reel of magnetic tape encoded as a result of operating an encoder is mounted at the left of the magnetic tape handler, and after reading, the tape is stored on the take-up reel at the right. The tape is then rewound to the left.
- The data, represented by magnetized bits on the tape, is read electronically, and is transmitted by cable to the internal memory of the computer.
- The magnetic tape handler also serves as an output device for recording data on magnetic tape as a result of processing.
- A magnetic file of data on magnetic tape, recorded as a result of processing, can be used as input during some future computer run.
- As the magnetic tape is read, consistency of the number of bits in each character is checked automatically. (odd or even number)
- Bits, encoded in the clock channel, are read by the handler to ensure the proper reading of the magnetically encoded characters.

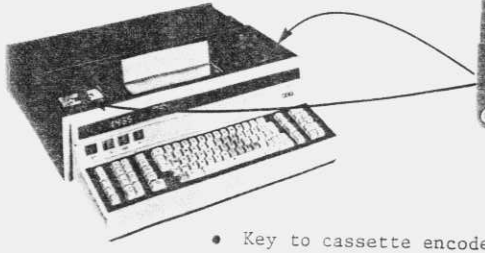
Magnetic Tape Recording Modes

- Phase Mode - Set dial on handler to Phase position.
- NRZ Mode - Set dial on handler to NRZ position.

Figure 8 - Input Media, the Magnetic Tape Cassette



- Retail Terminal with cassette data capture



- Key to cassette encoder

Preparation of Magnetic Tape Cassettes

- The magnetic tape cassette recorder works in combination with a parent machine such as a retail terminal, a financial terminal, an electronic accounting machine, and many others.
- The operator of the parent machine, in the normal course of keeping daily records, or recording transactions, prepares input for the computer from the keyboard of the parent machine.
- The magnetic tape cassette can also be encoded through a key to cassette encoder.

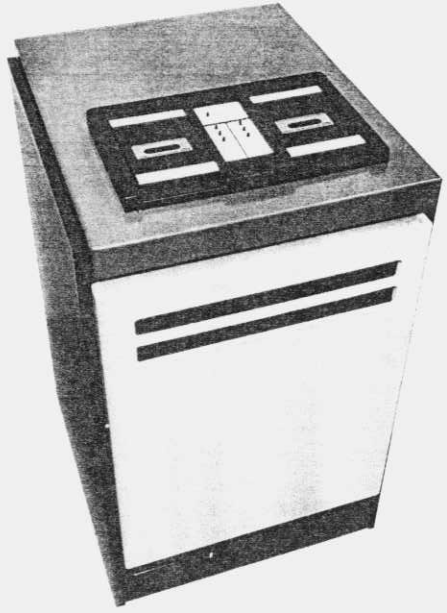
Parity Checking

- Since data is recorded serially, that is one bit after the other, and because there is only one forward and one reverse channel, an extra character is written following a data record as the parity character.

Clocking

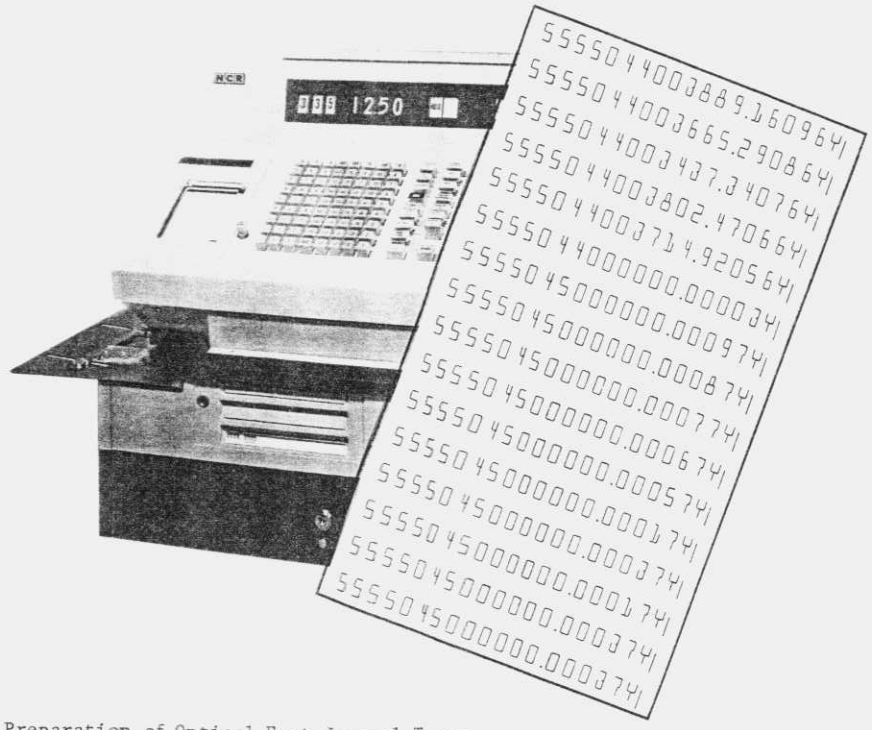
- Clocking for accuracy of reading and writing is handled by the hardware.

Figure 9 - Cassette Magnetic Tape as Input to the Computer System



- The digital data cassette encoded as a result of operating a parent machine, or a key to cassette encoder, is mounted on the cassette handler.
- The data, represented by magnetized bits on the tape, is read electronically, and is transmitted by cable to the internal memory of the computer for processing.
- The magnetic cassette handler also serves as an output device for recording data on magnetic tape cassettes as a result of processing.
- A magnetic file of data on magnetic tape cassette, recorded as a result of processing, can be used as input during some future computer run.
- Both parity and clocking are checked by the hardware to ensure the accurate reading of the encoded data.

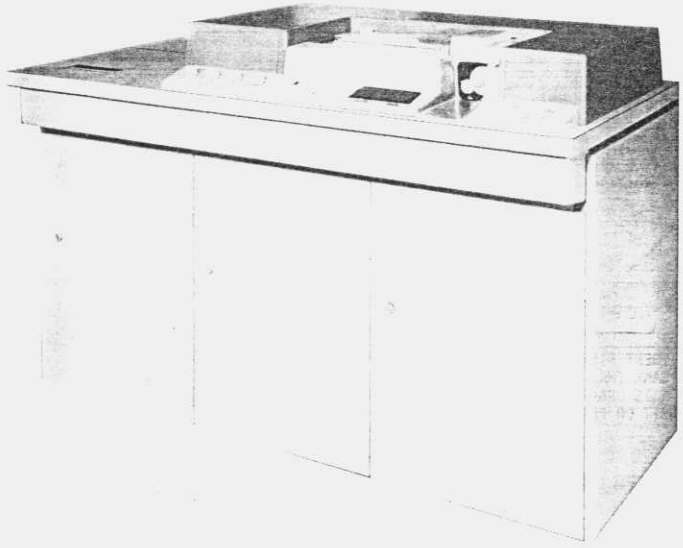
Figure 10 – Input media, Optical Font



Preparation of Optical Font Journal Tapes

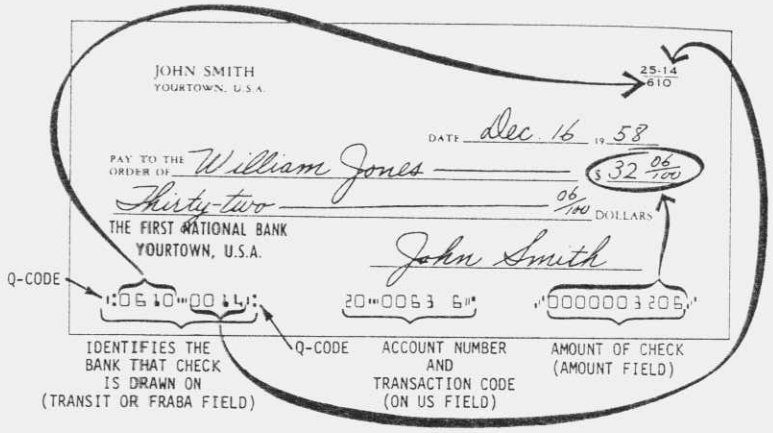
- A roll of journal paper is printed in optical font stylized characters by a parent machine, such as a retail sales register, an adding machine, or accounting machine.
- Optical journal tapes representing the data that is required, can be read by the parent machine operator.
- Optical journal tapes can also be read by an NCR Optical Scanner as input to the computer system.
- The reading of the stylized characters by the scanner is called direct character recognition.

Figure 11 – Optical Font as Input to the Computer System



- The journal tape, printed in optical font by a parent machine, is mounted in the optical journal reader.
- The data, represented by the stylized characters is read photoelectrically and is transmitted by cable to the internal memory of the computer.

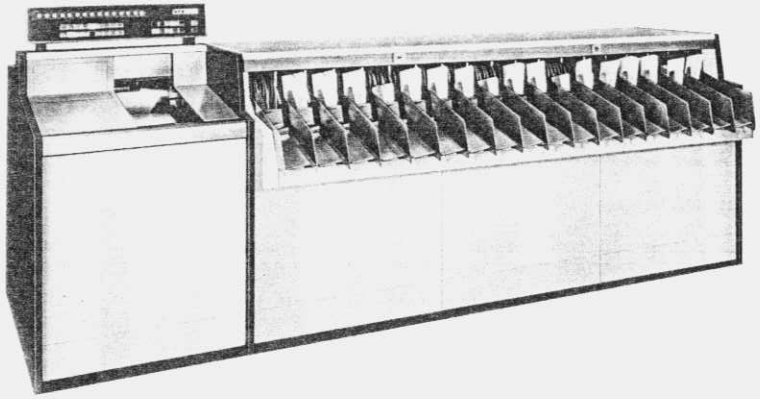
Figure 12 - Input Media, Magnetic Ink Character Recognition (MICR)



Preparation of an MICR Encoded Document

- As a document is processed by the operator of an NCR 775 Proof and Encoding machine, data is key entered through the numeric keyboard.
- The NCR 775 Proof and Encoding machine prints special MICR characters along the bottom of the document, using magnetic ink.
- All pertinent data needed for processing is printed with magnetic ink.

Figure 13 - MICR as Input to the Computer System

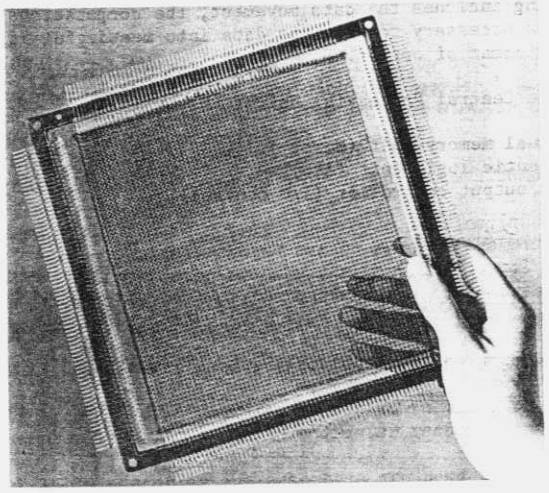


- The encoded documents prepared through the proof and encoding machine are loaded into the MICR reader-sorter.
- The data, represented by the magnetic ink characters printed along the bottom of the document, is transmitted by cable to the internal memory of the computer for processing.

Internal Memory Unit

- An erasable storage area within a computer that serves as a temporary storage place for data and instructions used by the arithmetic logic unit and the input/output control.
- Memory size varies from computer to computer, and the memory size generally depends on the nature of the applications to be processed.
- Memory is segmented into basic units called memory locations, each with a unique address.
- Memory locations are numbered in ascending sequential order.
- A single memory location can hold only one piece of information at a time.
- Placing another piece of information into a memory location automatically erases the previous contents of that location.

Construction of Core Memory



- Magnetic core memory is made up of thousands of pin head size ferrite cores strung on fine wire grids.
- The ferrite cores can be magnetized, or demagnetized. When magnetized, the core is said to be ON. When demagnetized, the core is said to be OFF.

Arithmetic Logic Unit (ALU)

- The arithmetic logic unit, or the ALU is the part of the central processor containing the electronic circuitry which makes the necessary arithmetic computations and logical decisions called for by program instruction.
- Arithmetic computations include addition, subtraction, multiplication, and division.
- The arithmetic logic unit makes decisions based on the relationship of two quantities.
- The logic unit can determine whether one quantity is equal to (=), greater than (>), or less than (<) another quantity.

  Example: A < B ⟶ C

  A = B ⟶ D

  A > B ⟶ E

Input/Output Controller (I/O control)

- The I/O control contains switches and circuits for supervising data flow from input devices into memory, the processing of the data within memory, and the output of meaningful results.
- The I/O control directs the flow of data through the system.

QUIZ 3 - ANSWERS

1. The computer processes data. What does processing include?

   Processing includes the data movement, the computations, and the logic decisions necessary to edit the data into meaningful information in the desired format of output.

2. List the elements of a central processing unit.

   a. *An internal memory (memory)*

   b. *An arithmetic logic unit (ALU)*

   c. *An input/output controller (I/O control)*

3. What is the function or purpose of a computer's memory?

   The internal memory unit, an erasable storage area within a computer, serves as a temporary storage place for data and instructions used by the ALU and the I/O control.

4. What is the function of a computer's I/O control?

   The I/O control contains switches and circuits for supervising data flow from input devices into memory, the processing of the data within memory, and the output of meaningful results.

5. What is the function of a computer's Arithmetic Logic Unit?

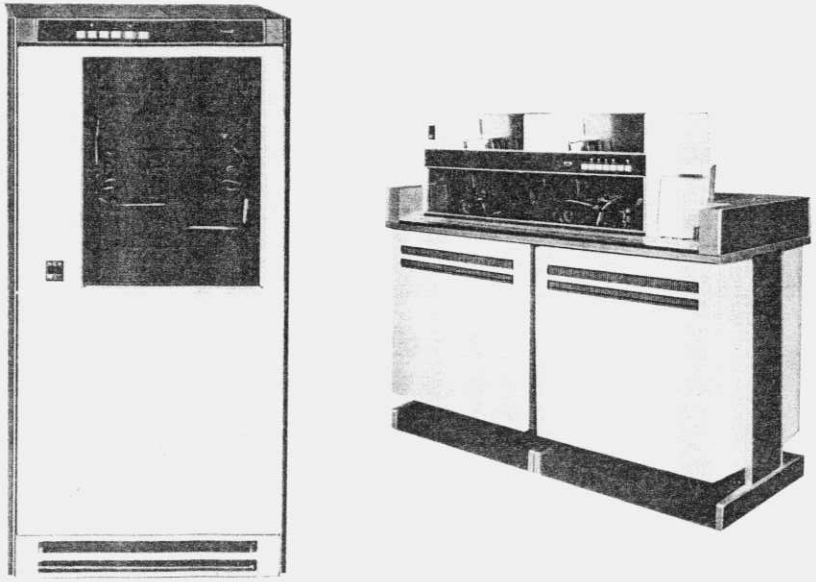
   The arithmetic logic unit, or the ALU is the part of the central processor containing the electronic circuitry which makes the necessary arithmetic computations and logical decisions called for by program instruction.

Switch on to continue with the lesson.

Figure 15 - Output Devices, Printers

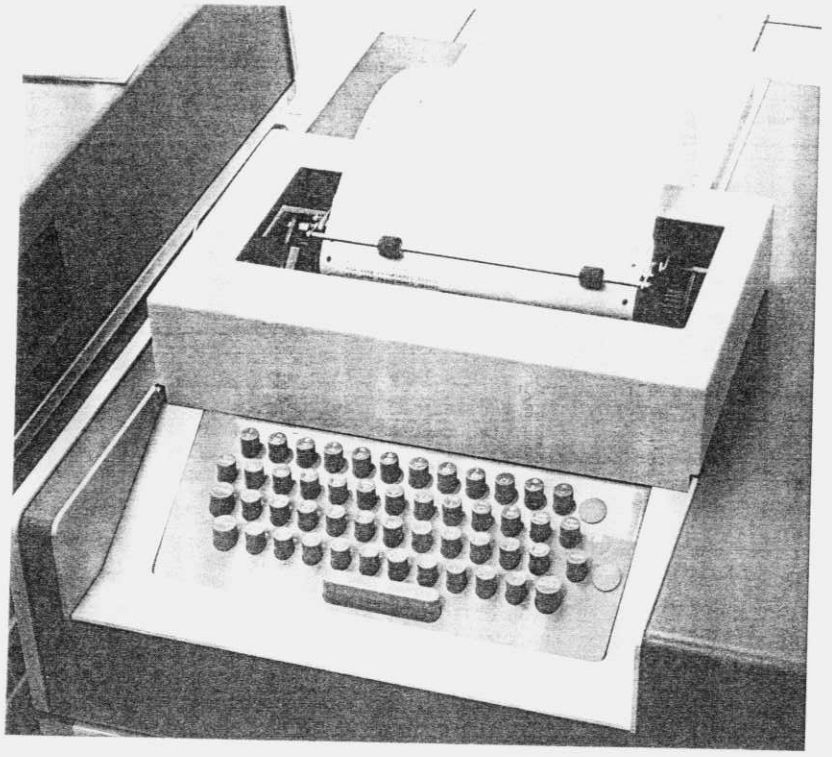
- A computer line printer produces printed reports as the result of processing data.
- A computer line printer prints an entire line of data on a report at the same time.
- A computer line printer will detect end-of-page and out-of-paper conditions.
- There are different models of line printer that can be included with a Century system depending on the printing requirements of the user.

Figure 16 - Output Devices, Card Punch and Paper Tape Punch



- Output from the computer may be in the form of punched cards or paper tape. Card punches and paper tape punches can be connected to the processor by cables.
- Punched media, as output, is normally used as input to some subsequent computer run.

Figure 17 - Output Devices, Input/Output Writer



- Limited output can be obtained from a console I/O writer, usually in the form of messages to the operator allowing the operator to monitor the progress of the program that is running.
- The output writer is extremely slow and should not be depended on to produce high volume printing of reports that should be done on the line printer.
- The I/O writer also permits the operator to input messages to the computer.

Review Points

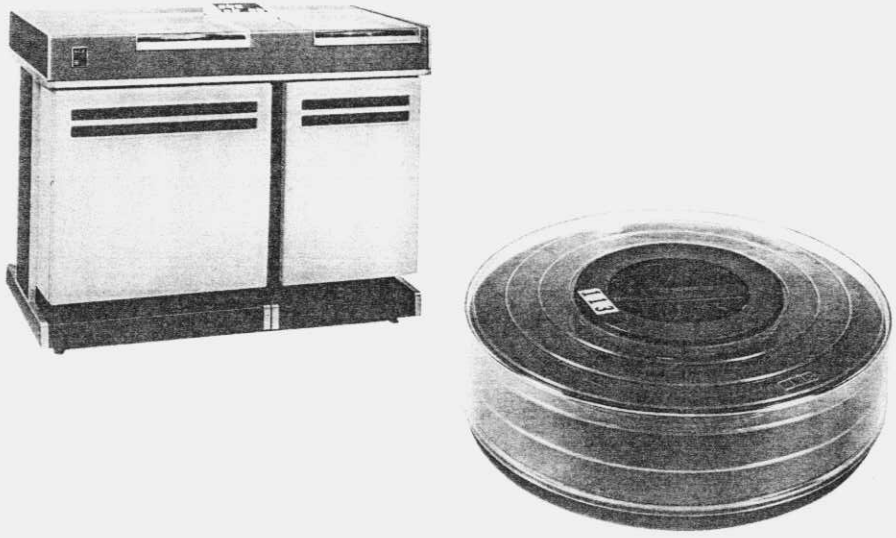
- Magnetic tape, in the form of a reel of one-half inch wide tape, can be used as an input medium, an output medium and a storage location for files of information.
- Key to magnetic tape encoders can be used to encode source data from a source document directly onto magnetic tape.
- Magnetic tape, in the form of cassettes can be used just as the reels of tape are used, but with far less storage capacity.
- Key to cassette recorders can be used to encode source data from a source document directly onto cassette magnetic tape.
- Digital data cassettes can be recorded as a result of operating a parent machine.

New Point

- Magnetic discs can be used as an input medium, an output medium and a storage location for files of information.

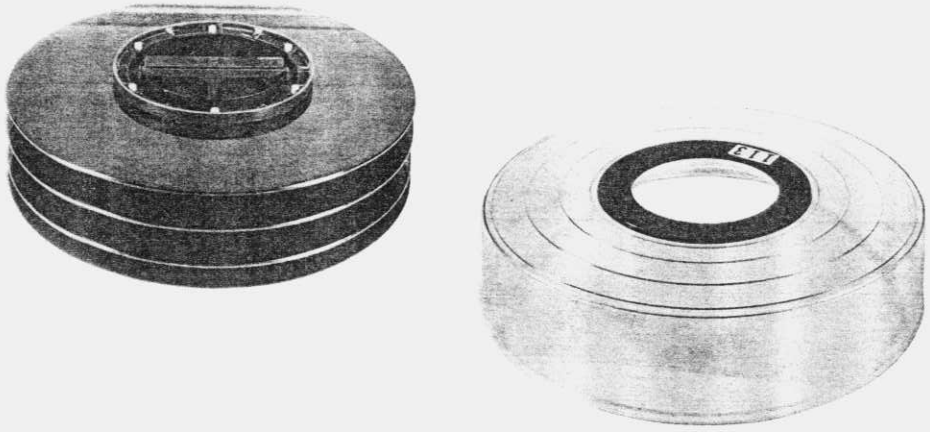
Figure 18 - Input and Output Device, the Magnetic Disc

MAGNETIC DISC – Model 655



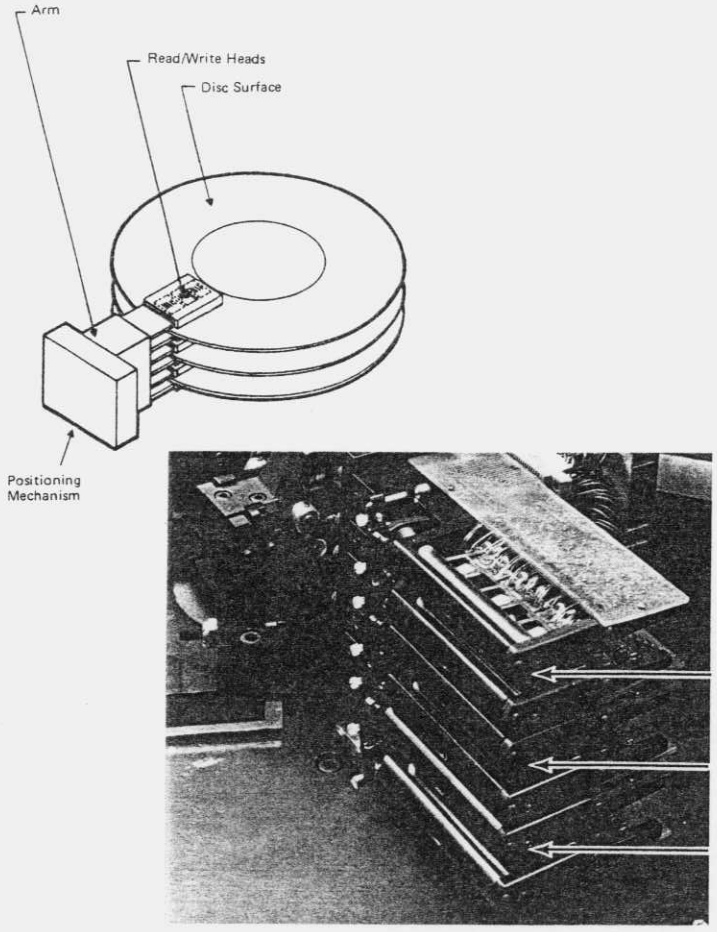
- The first use of a disc pack in a Century system would be as an output medium.
- Whenever a disc pack is used on the system, it could be used as an input medium. Data, or other files encoded on the disc packs could be read from the disc into memory.
- The principle use of a disc pack is as a magnetic file storage device.
- The disc pack is capable of containing a great deal of magnetically encoded data.
- The standard disc unit, or handler, has two compartments for two disc packs.
- The standard disc unit, or handler, is referred to as a dual disc unit.

Figure 19 - Construction of a 655 Disc Pack



- There are three platters within the 655 disc pack.
- Data is recorded magnetically on the surfaces of the platters within the pack. There are six recording surfaces in a 655 disc pack.
- The dust cover is attached to the disc pack to prevent contamination of the disc surfaces.
- When the lid of the handler is closed, the dust cover latches on the pack are released, and the dust cover is raised clear of the pack.

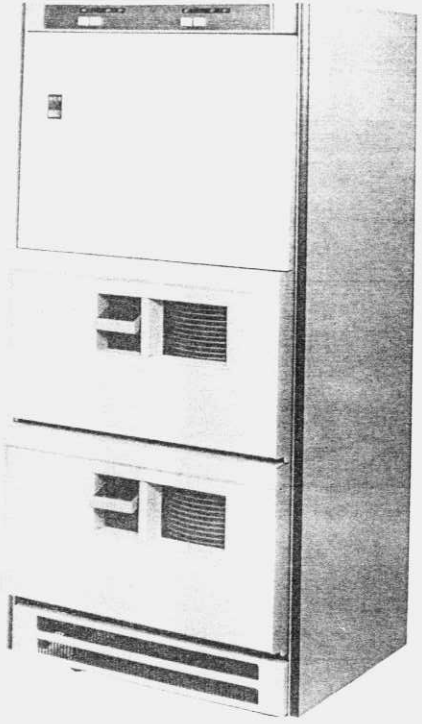
Figure 20 - Reading and Writing on the 655 Disc Pack



- The arm assembly positions the read/write heads over the recording surfaces (tracks) on the disc.
- The read/write heads always move together as a unit, and because the spacing of the individual heads minimizes their required movement, no single head ever crosses the recording area serviced by another head.

Figure 21 - Dual Disc Units for the NCR Century Computers

656



657

655

Disc Units

Figure 22 - Input and Output Device, the Visua. ...printer.

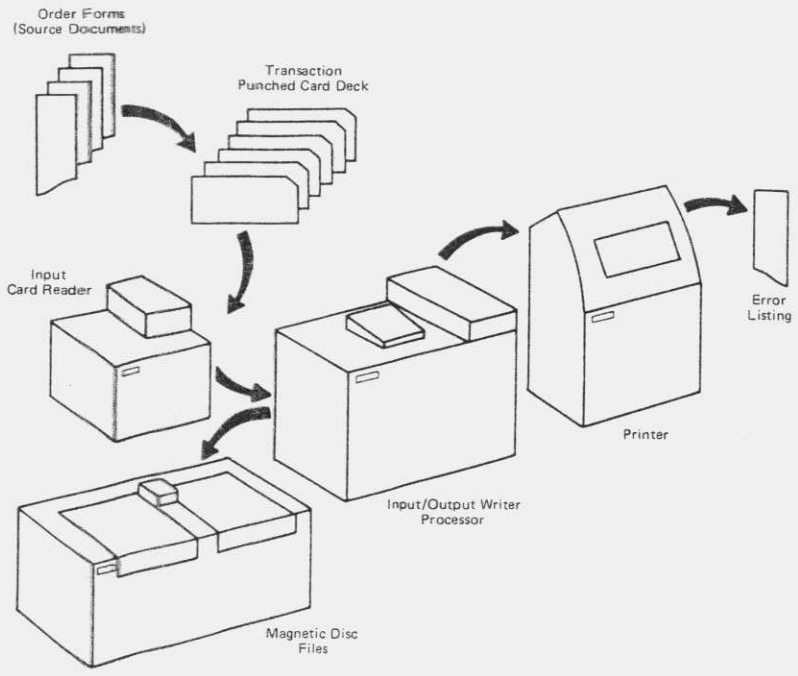
- Different names are given to this type of I/O device.

  CRT - Cathode Ray Tube
  REMOTE Inquiry Station
  Terminal
  Visual Display Unit

- Uses of the visual display unit

  I/O writer for the computer
  Checks airline reservations
  Checks credit status in department stores
  Checks bank balances
  Provides instant reference to data files stored in a computer, (this is sometimes called On-Line).

Figure 2 - FLow of Data Through our Computer System



Input - The transaction punched cards are read into the processor through the card reader input device.

Sorting - Sorting into the proper order takes place in the processor and a sorted transaction file is output to the magnetic disc file.

Processing - Any arithmetic function, and validation, sorting, and control will be handled by the processor.

Filing - The sorted transaction file is output to the magnetic disc file.

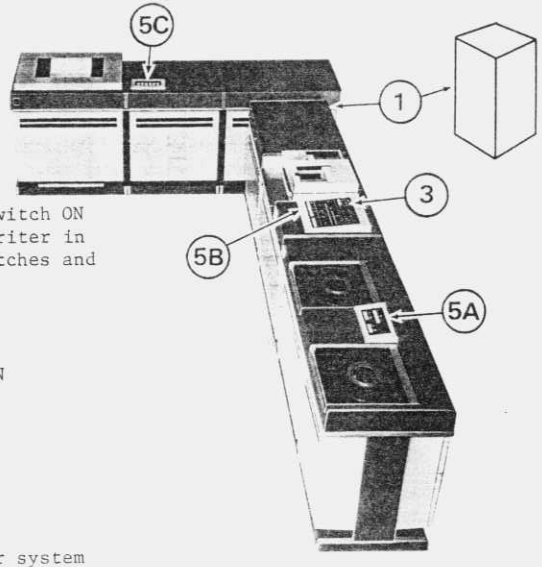
Output - The output from the sorting is written on magnetic disc. The output from the printer is an error listing of non-valid transaction punched cards.

Output may occur through the input/output writer notifying the operator of any internal malfunction.

Control - At the same time all the reading of punched cards, sorting of transactions, writing and reading to and from the magnetic discs, arithmetic functions, and exactly when each thing happens is controlled internally by the computer.

Figure 3 - Power Up Procedure

The following steps should be followed by the operator to power up a Century Computer.



1. Main Power Switch ON
2. Hesitate 15 seconds
3. Console Power Switch ON

   Turning the Console Power Switch ON provides power to the I/O Writer in addition to the Console Switches and lights.
4. Hesitate 15 seconds
5. Peripheral Power Switches ON

   A. Disc Units

   B. Card Reader (COT)

   C. Printer

   D. Other Peripherals on your system

Categories of Peripherals

1. Integrated Peripherals - Those that share cabinetry, or circuitry with the Central Processing Unit.
2. Free Standing Peripherals - Those that are completely self contained.
3. Level 1 Peripherals - Mostly the integrated peripherals.
4. Level 2 Peripherals - Mostly the free standing peripherals

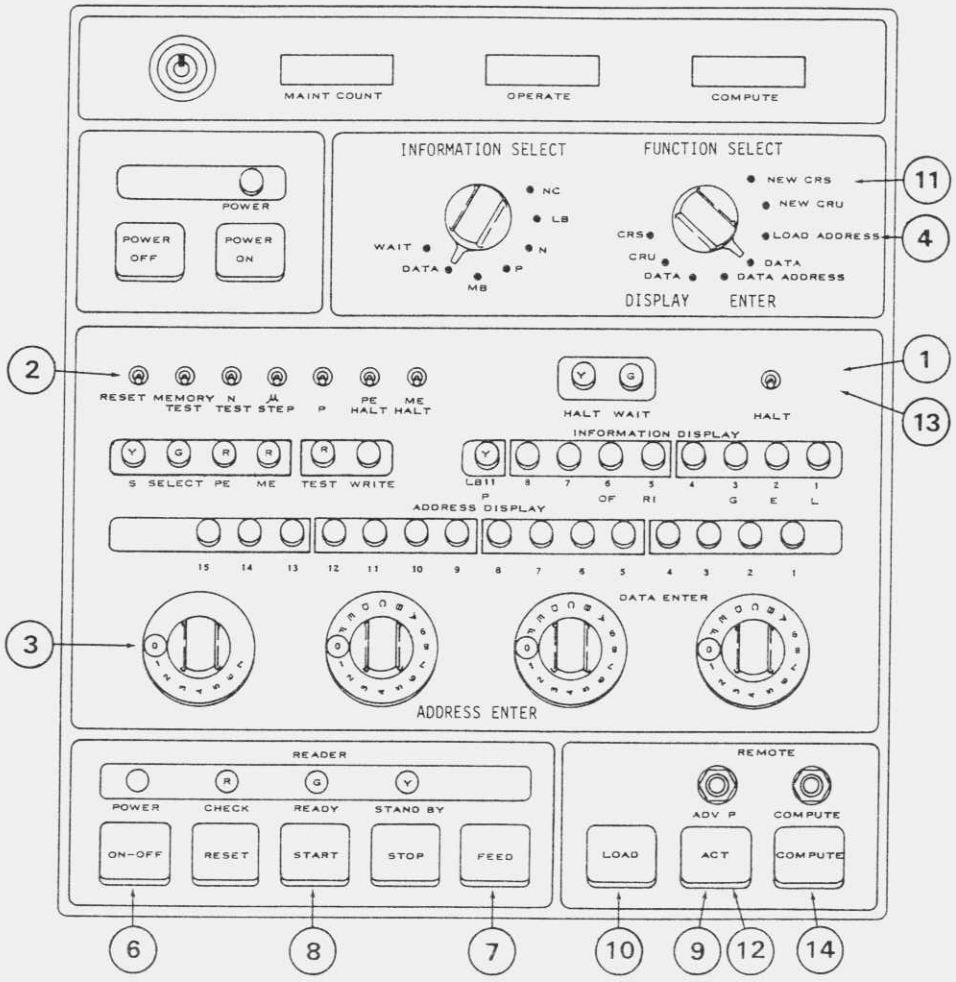
Power up Level 1 peripherals first, then power up level two peripherals.

Figure 9 - Operating Instructions for the Daily Start Routine (Century 50/100)

The following is the sequence of steps required to complete the daily start routine assuming that the power up procedure has been completed, and the console power switch is ON.

1. HALT ON.
2. "Flick" the RESET switch.
3. Set ADDRESS ENTER dials to 00A0.
4. Set FUNCTION SELECT dial to LOAD ADDRESS.
5. Load the BOOT, DATE, PALENT(s) and STOPRD cards in the COT.
6. Turn ON the COT reader.
7. Depress FEED button.
8. Depress START button.
9. Depress ACT button.
10. Depress LOAD button.
11. Move FUNCTION SELECT dial to NEW CRS.
12. Depress ACT button.
13. HALT OFF.
14. Depress COMPUTE button.

Figure 10 - Operators Console (Century 50/100)



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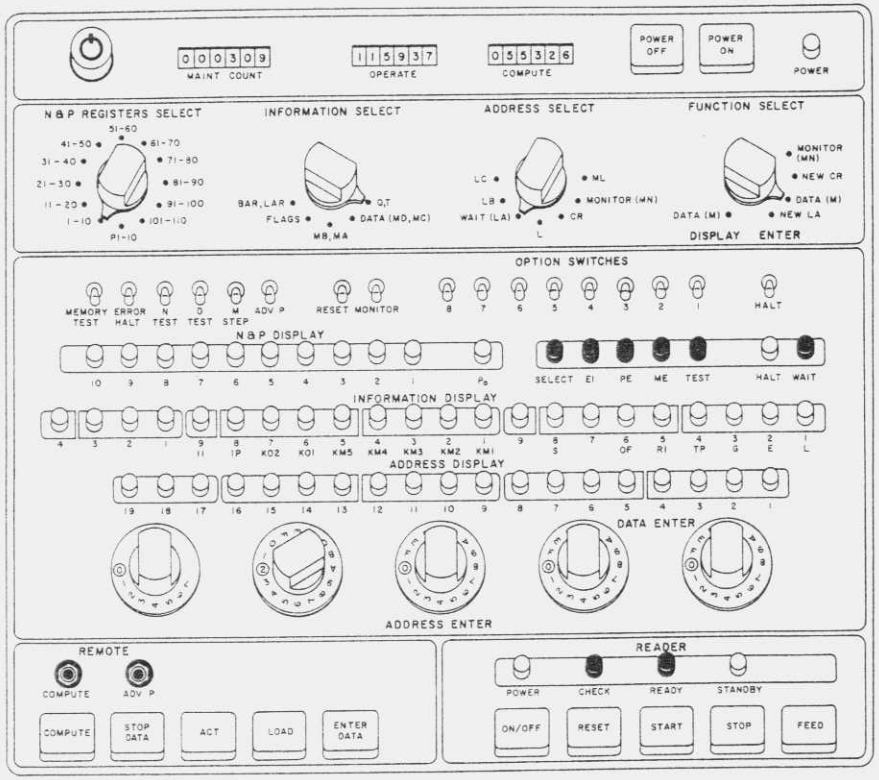
- Receiving and Responding to a Wait Message 19

NCR CENTURY 200 CONSOLE



NCR CENTURY 151 BASE SYSTEM

NCR CENTURY 200 SYSTEM