

Systems Reference Library

IBM 2321 Data Cell Drive Original Equipment Manufacturers' Information

This publication contains information for engineers who plan to attach the IBM 2321 Data Cell Drive to their equipment.

The information includes a general description of machine functions, a reference listing of useful publications and engineering documents, and information concerning machine interfaces.



The IBM 2321 Data Cell Drive is a direct access storage device which stores data on individual magnetic strips. These strips are contained in removable, interchangeable data cells. The 2321 economically extends the on-line storage capacity of the using system.

The 2321 Data Cell Drive functions under the direct control of the using system. The 2321 must be instructed by control signals from the storage control unit to perform Seek, Restore, Read, and Write operations.

Related Publications

Detailed theory of operation, physical planning information, mechanical principles of operation, and general engineering information for the 2321 can be obtained from the following IBM publications:

Field Engineering Manual of Instruction

(Form 227-5895)

Field Engineering Maintenance Manual

(Form 227-5894)

IBM 2321 Model 1 System Diagrams

(Part No. 2175100)

IBM System/360 Installation Manual-Physical

Planning (Form C22-6820)

IBM System/360 Component Descriptions

(Form A26-5988)

Data Cell Handling Guide

(Form A26-3633)

Requests for publications, engineering information, or engineering documents should be forwarded to the nearest IBM sales office.

Personal Safety

Personal safety cannot be overemphasized. To ensure your own safety, make it an everyday practice to follow all safety precautions at all times. Become familiar with and use the safety practices outlined in the IBM pocket-size card, Form 124-0002, issued to all Customer Engineers.

Specific safety items to remember when working on the IBM 2321 follow:

- Turn off hydraulic power when working near the cell array.
- Remove service supply voltage when working in high voltage areas. These areas are labeled as hazardous.

- Drum shaft is under heavy spring tension when latched. Tripping the start clutch, even though machine power is off, causes the drum shaft to rotate.

Alterations and Attachments

If lessees are considering the special application of IBM leased machines in conjunction with associated equipment, they should review the Alterations and Attachments clause of the Agreement for IBM Machine Service. Under this clause, IBM must receive written notice prior to any alterations or attachments to the machines or units. If the alteration or attachment interferes with the normal operation or maintenance of any of the IBM machines or units and substantially increases the cost of maintenance, the customer must remove the alteration or attachment and restore the machines and units to their normal condition upon notice from IBM.

The customer is responsible for the design, procurement, installation, repair, and service of the alteration or attachment. In the event that an alteration or attachment causes interference with the installation of an engineering change which is considered necessary to effect an improvement in the operation or maintenance of an IBM machine, the customer will be required to eliminate such interference.

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NOTE: The illustrations in this manual have a code number in the lower corner. This is a publishing control number and is unrelated to the subject matter.

DEVICE DESCRIPTION

The IBM 2321 Data Cell Drive is not a separate operational entity. It operates as a slave unit to a storage control unit which is attached to a CPU (central processing unit).

The IBM 2321 is a direct access storage unit which stores data on and retrieves data from individual magnetic strips.

From a circular array of 10 cells with 20 subcells each (Figure 1), a rotary positioning system positions a selected subcell of ten strips beneath an access station. At this station a selected strip is

first withdrawn from the subcell, then rotated past a read/write head element for data transfer, and finally returned to its original location in the subcell.

Cell Drive

A Seek instruction initiates data cell positioning. The cell drive rotates the circular array of ten data cells to one of 200 discrete subcell positions. The array can rotate in either direction and always moves in the direction that requires least travel.

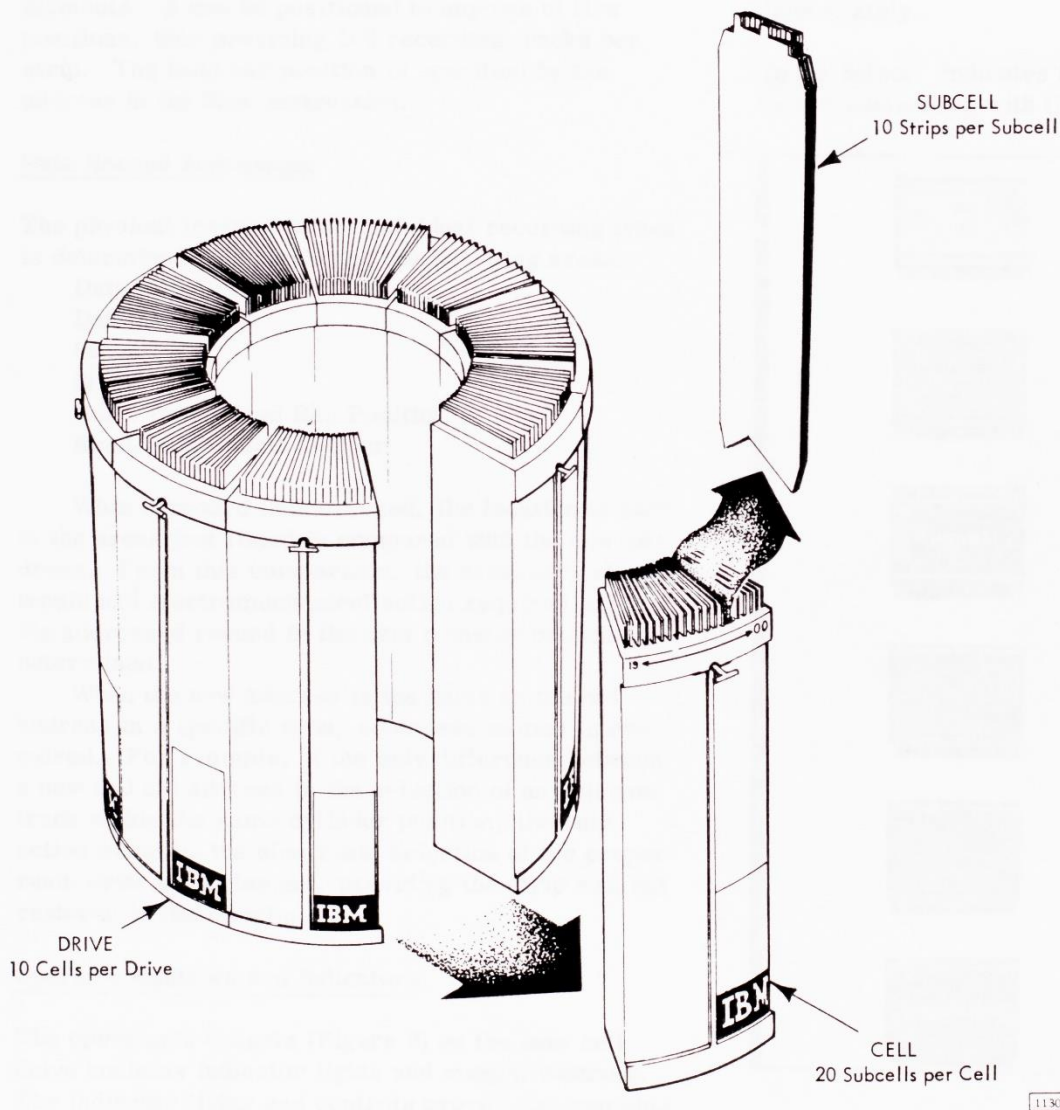


Figure 1. 2321 Drive, Cell, and Subcell

When the array has placed the subcell containing the addressed strip beneath the access station, a subcell position detector makes a position check to ensure that a subcell is within the range of the access station.

Access Station

The addressed strip is exposed by parting the adjacent strips with separation fingers. The strip is selected from a subcell containing ten strips and placed on a revolving drum. It is then rotated past the read/write head bar for data transfer. When reading and/or writing is complete, the strip is returned to its original subcell location by a restore function.

The read/write head bar contains 20 magnetic elements. It can be positioned to any one of five positions, thus providing 100 recording tracks per strip. The head bar position is specified by the address in the Seek instruction.

Data Record Addressing

The physical location of an individual recording track is determined by considering the following areas:

- Data Cell Drive
- Data Cell
- Subcell
- Strip
- Read/Write Head Bar Position
- Read/Write Head Element

When a record is addressed, the location of each of the areas just listed is compared with the new address. From this comparison, the necessary electronic and electromechanical action required to place the addressed record in the data transfer position is determined.

When the new address is the same as the old address in a specific area, no access motion is required. For example, if the only difference between a new and old address is the selection of an adjacent track within the same cylinder position, the only action would be the electronic selection of the proper read/write head element, providing the strip was not restored in the interim.

Operator Controls and Indicators

The operator's console (Figure 2) on the data cell drive contains indicator lights and manual controls. The indicator lights and controls provide the machine operator with the following information:

AC On: Indicates that primary ac power is applied to the IBM 2321.

DC On: Indicates that all dc power within the 2321 is on.

Drive Op: Indicates that the 2321 has all power on and no unsafe conditions exist. Does not turn off if the bin door is open.

Drive Ready: Indicates that the 2321 is ready to perform normal programmed operations under control of the storage control unit.

Thermal: Indicates that a high temperature condition exists within the 2321. The cause of the high-temperature condition should be located and corrected immediately.

Drive Select: Indicates that the storage control unit is communicating with the 2321.

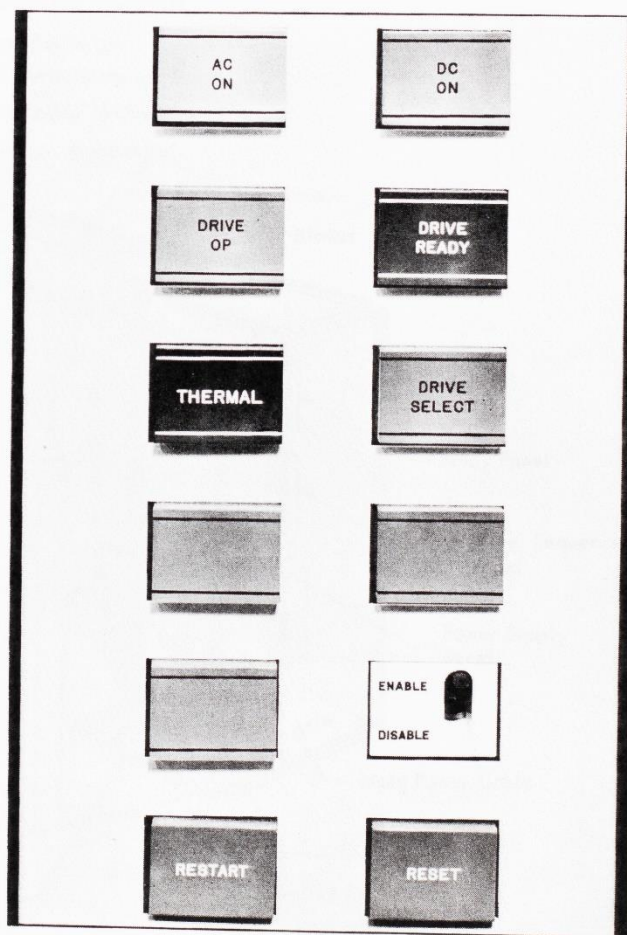


Figure 2. Operator Panel

Enable/Disable: This switch controls the timing meter which is located inside the array chamber. It must be enabled before the 2321 can operate.

Reset: This button allows the 2321 indicators to be reset in the event of an improper status condition. This reset will not establish a Drive Operative or Drive Ready status.

Restart: This button allows the restart of the 2321 when certain inoperative conditions occur, such as a momentary interruption in power.

Physical Component Arrangement

The components of the 2321 are arranged in two separate, self-contained frames, one mechanical and the other electrical. Separating the mechanical section and the electrical section facilitates shipment and installation of the machine (Figure 3).

Mechanical Section Components

The following components comprise the mechanical section of the 2321.

Operator Panel: Indicates the Drive status and facilitates operator intervention.

Cell Array: Contains the magnetic strips in ten removable cells of 200 strips each.

Cell Drive: Rotates the cell array to one of 200 discrete positions.

Separation Mechanism: Selects one of ten strips in a subcell.

Drum Cell: Transports a selected strip to and from a subcell.

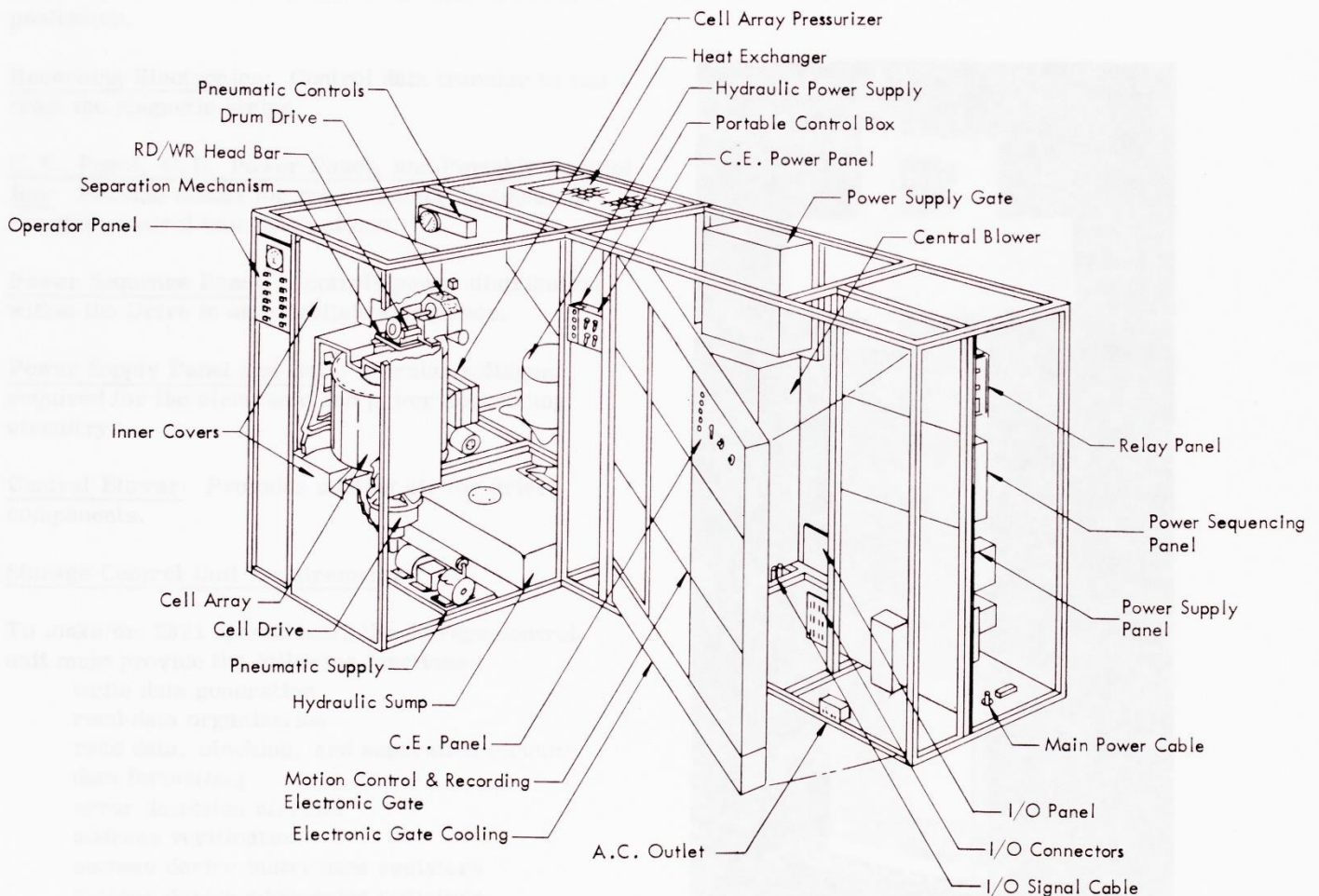


Figure 3. Component Layout

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Read/Write Head Bar and Positioner: Permits magnetic recording on 100 tracks from a 20-element head bar that can be moved to one of five discrete positions.

Cell Array Pressurizer: Provides an environment suitable for reliable strip transport and data transfer.

Hydraulic Power Supply: Supplies hydraulic power to the cell drive.

Pneumatic Supply: Supplies filtered air to the separation mechanism and the drum drive.

Electrical Section Components

The following components comprise the electrical section of the 2321.

Motion Controls: Control the cell drive, separation mechanism, drum drive, and read/write head bar positioner.

Recording Electronics: Control data transfer to and from the magnetic strips.

C.E. Panel, C.E. Power Panel, and Portable Control Box: Provide means for the Customer Engineer to simulate control unit instructions.

Power Sequence Panel: Controls power distribution within the Drive in an established sequence.

Power Supply Panel and Gate: Furnish voltages required for the electronic and power sequencing circuitry.

Central Blower: Provides cooling air for drive components.

Storage Control Unit Requirements

To make the 2321 operational, the storage control unit must provide the following functions:

- write data generation
- read data organization
- read data, clocking, and separation circuits
- data formatting
- error detection circuits
- address verification
- storage device instruction registers
- storage device addressing registers
- storage device operation controls
- power sequence control logic
- recognition of storage device malfunctions.

Data Cell Removal and Storage

A covered data cell (Figure 4), containing a full complement of 200 data strips, weighs about five pounds. It measures five inches wide by five inches deep by sixteen inches high.

A data cell can be quickly and easily removed by a machine operator. When a cell is removed from the data cell array, it must be replaced either with another data cell or a ballast cell. A ballast cell is similar to a data cell but contains no strips; it is required in order to maintain the dynamic balance of the array.

It is recommended that cells containing strips be maintained in an environment similar to that of the machine location. If they are not maintained as recommended, but are within the limits specified,

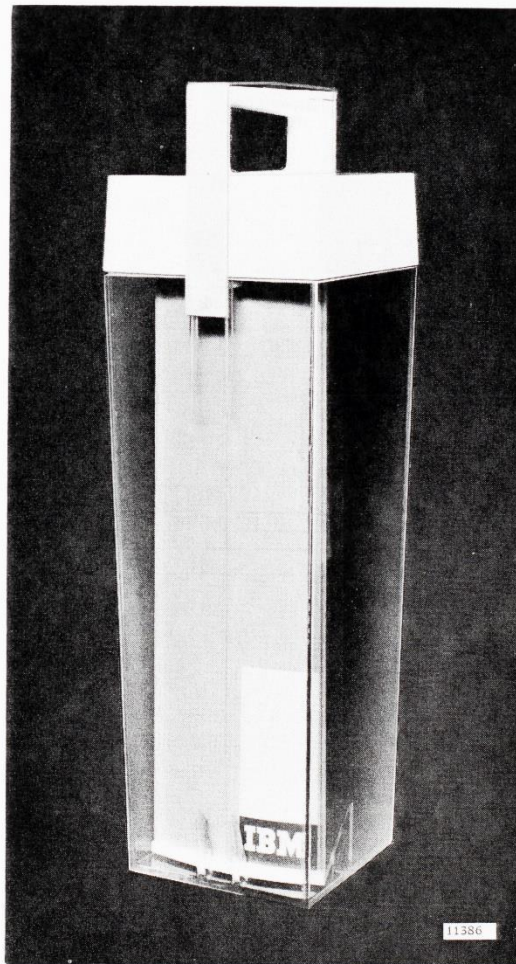


Figure 4. Data Cell with Covers in Place