



Microdata Peripheral

March 1, 1972

Disc Storage System Models 2851, 2852, 8955, 8956

GENERAL DESCRIPTION

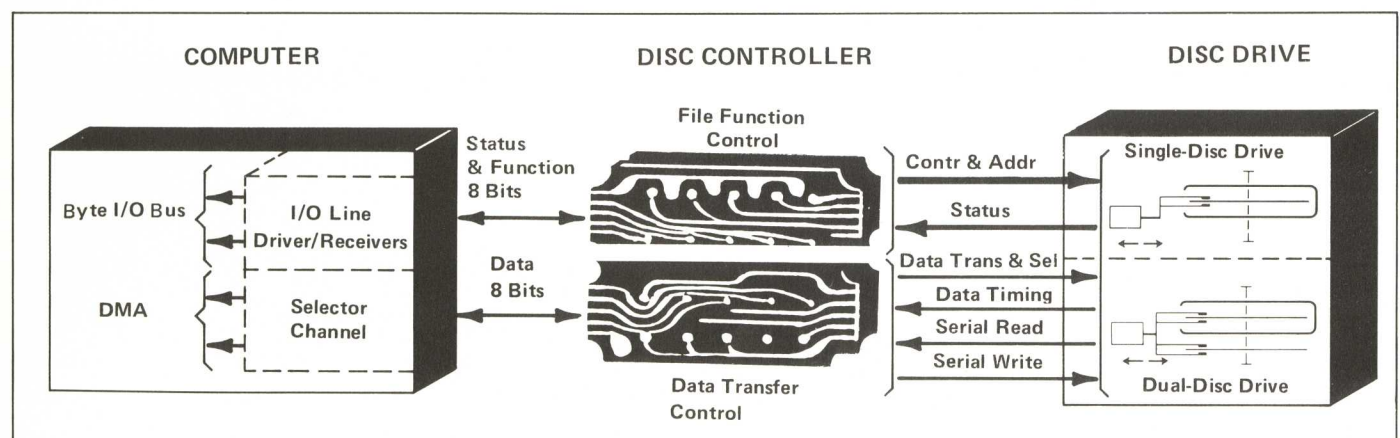
Microdata Disc Storage Systems offer low-cost, random-access mass storage for the Micro 800 and the Micro 1600 Series Computers. A Disc Storage System consists of a controller, interface and a disc drive. The disc drive incorporates either one removable disc cartridge (2.4 million bytes) or a removable disc cartridge and a resident disc (4.9 million bytes).

The controller is connected to either the Micro 800 or the Micro 1600 Computer through a direct memory access (DMA) selector channel and the byte I/O bus. Controller logic is designed to operate from an interrupt-driven program. Command, control, address, status and interrupt information is exchanged over the byte I/O bus. Data is transferred over a DMA selector channel in 8-bit bytes.

The Disc System is housed in a standard Microdata computer cabinet that provides adequate space for either a Micro 800 or a Micro 1600 computer chassis.

STANDARD FEATURES

- Direct memory access transfers 195,000 bytes per second
- Interrupt-driven control for completed transfers or error indications
- Error checking including data overrun, sector overrun, sync error or address error
- Access overlap to the sector level
- Can queue and execute composite storage/retrieval operations (seek-read, seek-write)
- Standard utility programs and diagnostics
- Available in either removable disc cartridge and resident disc, (Models 2852 and 8956) or removable disc cartridge only (Models 2851 and 8955)
- Drive incorporates safety sensing, optional data protect, advanced servo design, mechanical simplicity, voice coil actuator and optical positioner
- Computer cabinet includes 300 CFM blower with air filters, power distribution for disc system and computer chassis, desk height work surface and provision for system expansion



CONTROLLER

The Disc System controller provides access control, read-write formatting and data conversion, plus data and status checking. The controller consists of two logically independent sections: file function control and data transfer control. The controller with a DMA and a disc drive comprise a storage system which executes commands to store and retrieve data.

The controller interfaces with Micro 800 and Micro 1600 computers via the DMA and the byte I/O channels. Unique commands, or chains of commands, are initiated by the CPU and once initiated are executed by the Disc System without further control from the CPU. When an operation is completed, a flag from the Disc System signals the CPU for interruption of the program. Provision is made for overlap to either the cylinder or sector level. Data transfer operations may be queued for execution upon access completion. This feature allows the Disc System to accept and execute complete storage or retrieval instructions (e.g., seek-read, seek-write) without intervening program interruptions for operation updating.

File Function Control

This section of the controller provides lines for interfacing with the drive control logic and for recognizing and servicing commands from the computer. It also recognizes and transmits status information from the disc drive to the computer.

Data Transfer Control

This section of the controller performs those operations necessary for the transmission and control of data between the computer and the disc drive, including error checking. The prime purpose of the data transfer control is to serialize and deserialize data, provide format control, and control the movement of data to and from the computer. It provides a cyclic redundancy check on data stored within each sector.

DRIVE

The 8955 or 2851 System drive stores up to 2.4 million bytes on a single removable disc. The 8956 or 2852 System drive stores up to 4.9 million bytes on a combination removable disc and a resident disc. Both discs of the dual-disc drive are served by the same head carriage. This feature allows the use of the removable disc for data input/output. The fixed disc can be used for copying data and also for on-line storage of programs and data. The removable disc in both systems is housed in a cartridge for protection against contamination or damage.

SOFTWARE

Software programs for the Disc System include diagnostic programs and a Disc Utility Program. The diagnostic programs exercise the disc and the disc commands. The Disc Utility program is an on-line executive system that incorporates teletype control of console and executive functions.

Diagnostics

The Disc System includes three diagnostic programs that functionally test all disc commands, initialize the disc, and exercise the disc. A minimum configuration required to execute the diagnostics is:

- Disc System
- Microdata 800 Series or 1600 Series CPU and 8K bytes of Memory
- ASR 33 or ASR 35 Teleprinter and interface

Disc Utility Program (DUP)

DUP is a single-user system that employs teletype instead of console operations, except for the console interrupt which causes the computer to return to DUP while executing another program. DUP furnishes the user with:

- Disc Read
- Disc Write
- Disc Verify
- Memory cell display capability
- Memory cell modification capability
- Memory area display capability
- Output of specified memory area to paper tape
- Operational registers display capability
- Two break points for program debugging
- User program execution
- Formatted program tape loading capability
- Hexadecimal arithmetic

DATA ACCESS AND TRANSFERS

Data is transferred between the computer and the controller in 8-bit bytes. Data is accessed by addressing a cylinder (0-202) and specifying a sector number (0-23) within the cylinder and a head (0-1 for single disc or 0-3 for dual disc). Each sector contains a 16-bit address field and up to 256 eight-bit bytes of system data. The address field contains the cylinder number, head-sector number, and a defective cylinder bit. The controller checks the address field for correct access, and performs a cyclic redundancy check on the address and data fields.

BYTE I/O INSTRUCTION

Byte I/O Instructions are executed in two phases. First, an address and command byte is placed on the byte I/O bus. Second, a status byte from the drive to the CPU is placed on the bus if an IB instruction is being executed, or a byte containing additional control information from the CPU to the drive is placed on the bus if an OB instruction is being executed.

Code	Mnemonic	Operand	Operation
31	IBA	f,d	Transfer status from controller to A register
32	IBB	f,d	Transfer status from controller to B register
33	IBM	f,d,a,x	Transfer status from controller to memory
39	OBA	f,d	Transfer address and control byte from A register to controller
3A	OBB	f,d	Transfer address and control byte from B register to controller
3B	OBM	f,d,a,x	Transfer address and control byte from memory to controller

Operand Key:	f	Device Order
	d	Device Number
	a	Address Expression
	x	Address Expression with Index Flag

DMA CHANNEL INSTRUCTIONS

The DMA channel instructions connect the controller to the CPU through DMA channel 1 or DMA channel 2. DMA channel 1 is assigned address 16₁₆ and DMA channel 2 is assigned address 17₁₆. An OBA instruction is normally used to control the DMA, since the data transfer is ignored by the channel.

Code	Mnemonic	Operand	Operation
3B	OBA	7,d	Start channel and stop at end of block
3B	OBA	9,d	Disconnect channel immediately
3B	OBA	1, X' 16'	Transfer busy and interrupt status from controller to memory location 0058
3B	OBA	1, X' 17'	Transfer busy and interrupt status from controller to memory location 0059

FUNCTION CODES

The function codes consist of the three most-significant bits of the instruction control bytes.

Code	Command	Description								
000	Input Status 1	Transfers drive status to CPU for error recovery analysis. This operation also resets the interrupt request. Byte 1 assignments are: <div style="text-align: center; margin-top: 10px;"> <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">1</td><td style="padding: 2px 5px;">0</td> </tr> </table> <div style="display: flex; justify-content: center; gap: 10px; margin-top: 5px;"> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> </div> <ul style="list-style-type: none"> Not Ready Unsafe Access Error Data Error Overrun End of Cylinder Flagged Cylinder Busy </div>	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0			
001	Write Data	Normal write command after disc is initialized. Up to 48 sectors may be transferred. Writing continues sector-by-sector until terminated by DMAC or controller-detected error. Termination generates an interrupt.								
010	Read Data	Normal read command transfers data from disc to CPU. Up to 48 sectors may be transferred. Reading continues sector-by-sector until terminated by DMAC. Termination generates an interrupt.								
011	Load RAR	Transfers cylinder address from CPU to controller to specify cylinder to be accessed. No interrupt generated.								

Code	Command	Description								
100	Input Status 2	Transfers additional drive status information to CPU for error condition analysis. This operation also resets the interrupt request. Byte 2 assignments are: <div style="text-align: center; margin-top: 10px;"> <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">1</td><td style="padding: 2px 5px;">0</td> </tr> </table> <div style="display: flex; justify-content: center; gap: 10px; margin-top: 5px;"> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> <div style="text-align: center;">↑</div> </div> <ul style="list-style-type: none"> Read/Write Unsafe Seek Check Seek Incomplete Address Error Sync Error Data Overrun Read Only Violation Drive or Adaptor Busy </div>	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0			
101	Initialize Data	Initializes unwritten cylinders and generates defective cylinder indicator bits. Execution similar to Write Data command. Generates interrupt on termination.								
110	Check Data	Performs cyclic check on disc data to ensure data is recoverable. No transfers occur. Generates interrupt on termination.								
111	Seek Record	Initiates read/write head positioning operation and transfers head-sector number to Record Address Register. Interrupt generated 1.5 msec. ahead of addressed sector.								

SYSTEM COMPLEMENT SUMMARY

Model Number		Description
Micro 800	Micro 1600	
8955	2851	Disc System including: disc drive with moving head removable cartridge, 2.4 million bytes, 75ms average random access, 200 KC byte transfer rate, 63" computer cabinet, cables, DMA selector channel and I/O controller. Requires 2 assembly slots in the computer.
8956	2852	Disc System including: disc drive with moving head, one fixed plus one removable cartridge, 4.9 million bytes, 95ms average random access, 200 KC byte transfer rate, 63" computer cabinet, cables, DMA selector channel and I/O controller. Requires two assembly slots in the computer.

SPECIFICATIONS

GENERAL SYSTEM

Electrical/Mechanical

Standard AC Power100/115/208/230 V, 60 Hz, 540 W
 Optional AC Power100/115/220/240 V, 50 Hz, 540 W

Environmental

Temperature60° – 90°F operating
 5° – 160°F non-operating/power off

Humidity8% – 80% operating
 (no condensation) 0% – 95% non-operating/power off

Shock and Vibration:

Frequency < 14 Hz0.03 in. p - p sustained
 0.3 in. p - p intermittent
 Frequency ≥ 14 Hz1.3G peak sustained > 5 sec
 0.75G peak intermittent ≤ 5 sec

CoolingForced ambient room air at site

Air Circulation75 to 90 CFM ducted

CONTROLLER

DC for Logic Circuitry
 (Derived from CPU power supply)+5 V ± 1%, 6.0A

DISC DRIVE

DC for R/W Electronics
 (Derived from disc power supply)+5 V ± 1%, 3.0A
+36 V ± 1%, 2.0A
-36 V ± 5%, 2.0A

Access Mechanism:

ActuatorElectromagnetic voice coil motor
 PositionerOptical

Access Times (including head settling):

Track – Track35 msec
 Average Random Move75 msec
 Avg. Rotation Delay20 msec

Recording Techniques:

Bit Density2,200 bpi
 Track Density100 tpi
 Recording FormatDouble frequency
 Data Transfer Rate195 K Bytes/sec
 Clock Frequency3.12 MHz (2X bit rate)
 Bit Cell Time640 nsec nominal
 Disc Rotational Speed1,500 rpm
 Cartridge Diameter15 in
 Disc Diameter14 in

No. of Heads:

Models 8955, 28512
 Models 8956, 28524

DISC DRIVE CAPACITIES (USABLE DATA)

Cylinders:

Models 8955, 2851203
 Models 8956, 2852406

Tracks:

Models 8955, 2851406
 Models 8956, 2852812

Sectors:

Models 8955, 28519,600
 Models 8956, 285219,200

Capacity:

Models 8955, 28512,457,600 bytes
 Models 8956, 28524,915,200 bytes

Bytes/Cylinder12,288

Bits/Cylinder90,304

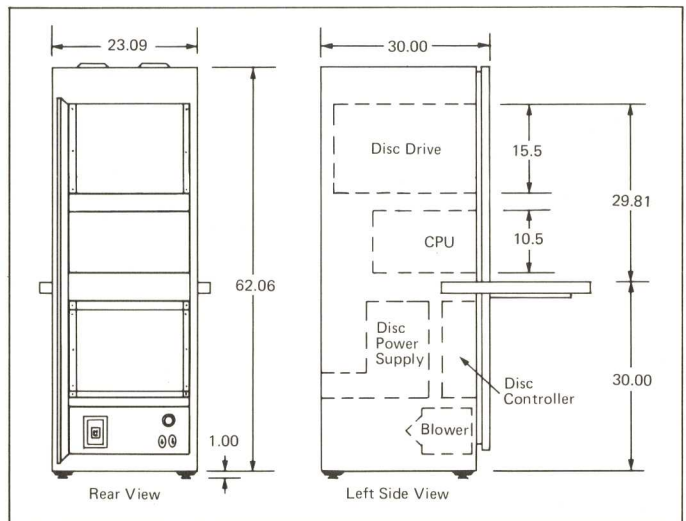
Bytes/Track6,144

Bits/Track49,152

Bytes/Sector256

Bits/Sector2,048

INSTALLATION



Microdata

Microdata Corporation
 644 East Young Street
 Santa Ana, California 92705
 (714) 540-6730 TWX: 910-595-1764