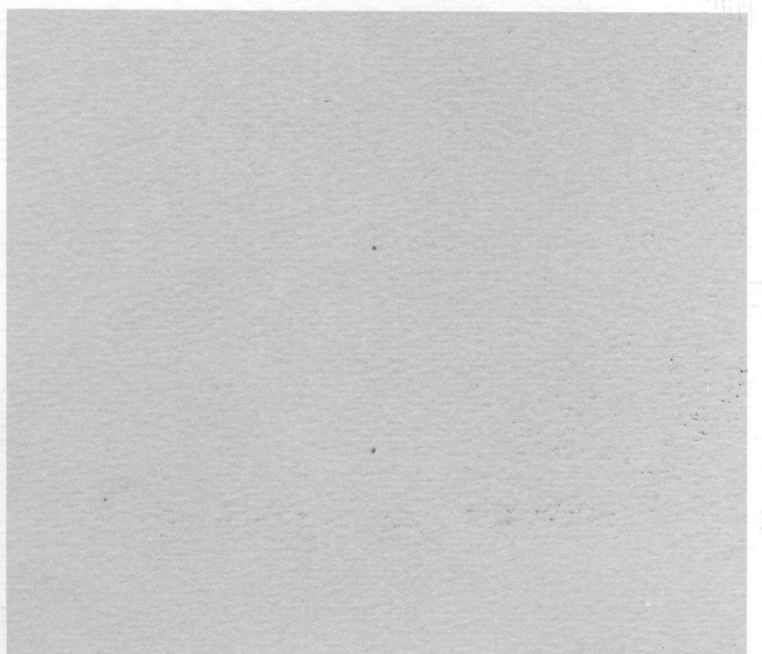
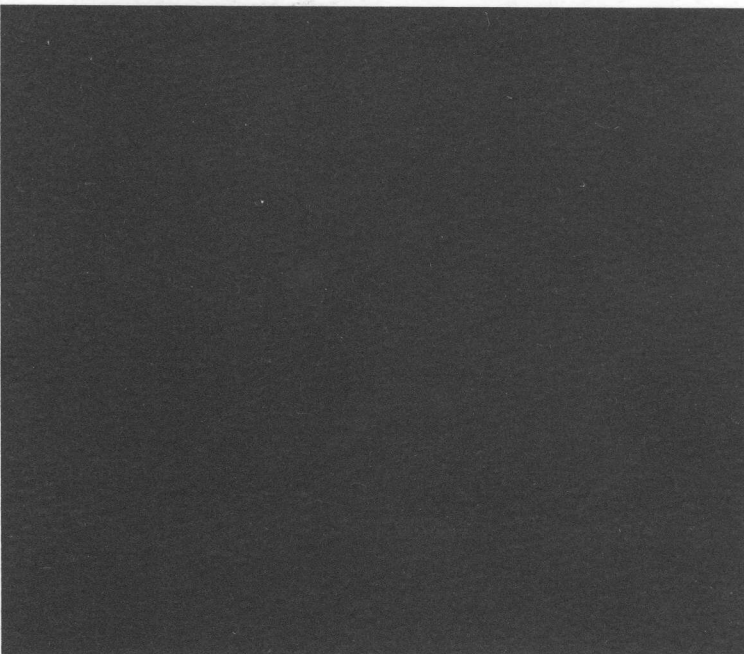
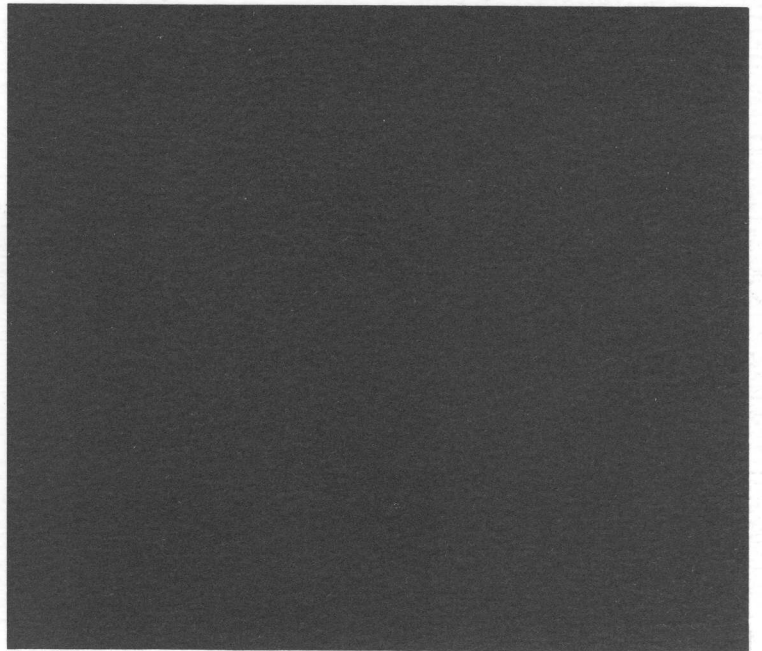
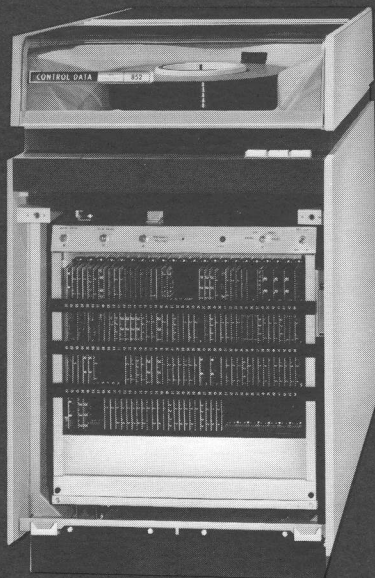


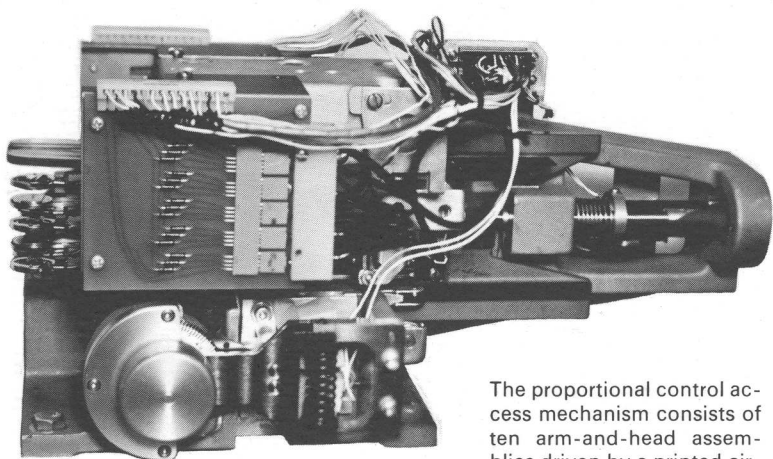
**CONTROL DATA® 852  
853  
854**

**DISK STORAGE DRIVES**

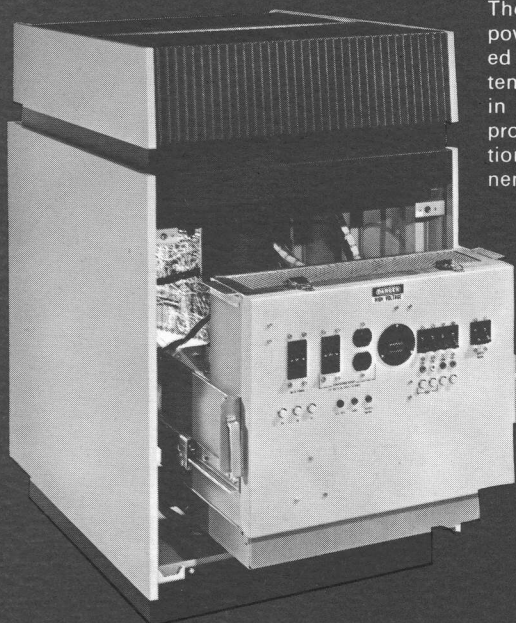




The logic chassis is hinged-mounted in the front of the Disk Storage Drive for easy access. Circuits are composed of solid-state plug-gable modules with test points on the leading edge of each card.



The proportional control access mechanism consists of ten arm-and-head assemblies driven by a printed circuit motor. Photoelectric track sensing and mechanical (detent gear) positioning provide accurate head positioning.



The built-in transistorized power supply is rack-mounted and slides out for maintenance. Two fans located in the back of the supply provide constant air circulation for increased component life.

## OPERATING PARTICULARS

**DATA ACCESS TIME**—An electronic, proportional control head actuator provides maximum access times of 145 milliseconds for each of the disk storage drives. Head movement speed is proportional to the distance the head must travel. Track-to-track access time, which is important in sequential processing operations, is 30 milliseconds. The disk rotation time (maximum latency time) for the 852 is 40 milliseconds. Maximum latency time for the 853 and 854 is 25 milliseconds.

**STORAGE CAPACITY**—Total capacity for the 852 Disk Storage Drive is 2,000,000 7-bit characters when used in the sector mode and 2,980,000 characters in the full-track mode. The 853 capacity is 4,096,000 6-bit characters, and the 854 capacity is 8,192,000 6-bit characters (sector mode only). This large on-line storage capacity is complemented by quickly replaceable disk packs which provide for unlimited shelf storage.

**DATA TRANSFER RATE**—The 852 has a transfer rate of 77,730 characters per second. The 853 and 854 Disk Storage Drives have a transfer rate of 208,333 characters per second.

**RECORDING DENSITY** — Accurately machined disk surfaces, precisely applied magnetic oxide coating, extremely close repositioning tolerances, and minimum spindle bearing run-out, combined with external and internal vibration isolation, allow high bit packing densities without compromising the interchangeability of disk packs. Recording density for the 852 is 684 bpi (outer track) and 988 bpi (inner track). The density for the 853 and 854 is 765 bpi (outer track) and 1105 bpi (inner track).

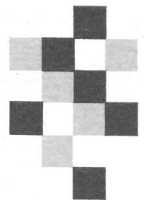
**RECORDING METHOD** — The 852 Disk Storage Drive employs a non-return-to-zero (NRZI) recording format and is compatible with the IBM Model 1311 Disk Storage Drive. The recording method for the 853 and 854 is double frequency recording.

CONTROL DATA **852**  
**853**  
**854** DISK STORAGE DRIVES



The **Control Data 852, 853, and 854** Disk Storage Drives combine the desirable features of magnetic tape and magnetic disk recording—fast random access and unlimited shelf storage. This is made possible by removable disk packs which may be recorded on, stored indefinitely (like magnetic tape reels), and rapidly reinserted on-line. All disk packs are completely interchangeable among Disk Storage Drives of the same model number; disks recorded on one unit may be read on other units. The 852 is also compatible with the IBM Model 1311 Disk Storage Drive.

The 852, 853, and 854 all have direct seek capabilities—the last address used is retained by the Disk Storage Drive and is available to the computer to determine the distance and direction of the next head movement. This provides considerably faster access times than the return-to-home method. The speed with which the heads are moved is proportional to the number of tracks that must be traversed to reach the new location. Seek overlap, an additional standard feature on all models, allows simultaneous seek operations to be performed by more than one unit.



## DESIGN FEATURES

**DISK PACK**—The disk packs used with the 852, 853, and 854 are removable, light, compact units which can be easily and quickly interchanged by the operator. The disk pack contains six aluminum disks mounted on a common spindle. The six disks provide ten storage surfaces—the upper surface of the top disk and the lower surface of the bottom disk are not available for data storage. Capacity of each disk surface is 200,000 7-bit characters for the 852; 409,600 6-bit characters for the 853; and 819,200 6-bit characters for the 854. The 852 and 853 have 100 tracks per disk surface and the 854 has 200 tracks plus 3 spares.

The 852 disk pack is mechanically interchangeable with disk packs used on IBM Model 1311 and 2311 Disk Storage Drives, and is magnetically compatible with the 1311 pack. The 852, 853, and 854 packs are completely interchangeable between disk storage drives of the same model number—disk packs recorded on one unit may be read on other units. Packs used on the 852 may not be used with the 853 or 854. A container protects the disks from dust and damage during storage.

**READ/WRITE HEADS**—The **Control Data** 852, 853, and 854 Disk Storage Drives employ 10 single-channel flying heads, one on the end of each actuator arm. The heads are mounted in pairs, one facing up and the other facing down—adjacent heads read or record on corresponding upper and lower disk surfaces.

The spring-loaded heads are gimbal mounted, with the bearing riding in a vee slot. This arrangement precludes the necessity for periodic adjustment and allows the heads to fly at a constant distance from the disk. The gimbal mounting also compensates for any variances in the disk surface or any run-out in the spindle bearing. The heads on the 852 fly at 100 microinches (inner track) and 125

microinches (outer track). The heads on the 853 and 854 fly at 125 microinches (inner track) and 150 microinches (outer track). All heads retract on loss of power so that the surface of the disks are not damaged.

**DISK DRIVE**—The disk pack is driven by a precision spindle with a total shaft runout of less than 0.00015 inch. The shaft runout is kept extremely small to eliminate repositioning errors when interchanging disk packs. A flat belt drive is used between the pack drive motor and the spindle to provide for a smooth transfer of power with a minimum of velocity fluctuations. This smooth transfer is essential for a constant data rate—also a requirement for interchangeability of packs.

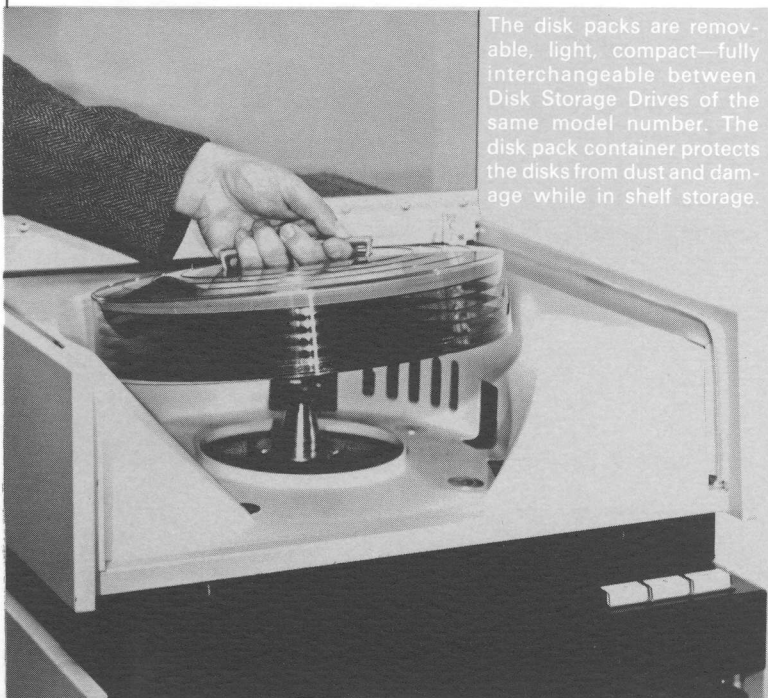
An electromagnetic brake is attached to the lower end of the spindle shaft. This brake is used to provide a back torque when the operator locks a new pack on the spindle and is disengaged when the pack is rotating. When power is removed from the pack drive motor, the brake is engaged and the disk pack is brought to a stop.

A sector disk, mounted in the bottom of the disk pack, is used to monitor disk rotational speed. Notches cut into the periphery of the disk (one for each sector) interrupt a photocell circuit at a rate proportional to the rotational speed of the disk pack. When disk speed falls below a predetermined level, the heads are retracted and the spindle is braked to a stop.

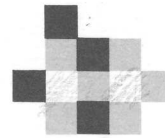
**ACCESS MECHANISM**—The access mechanism consists of ten arms with a read/write head mounted on the end of each arm. The heads are mounted in pairs so that one head reads or writes on the bottom of one disk and the other head reads or writes on the top of the adjacent disk. All arms move simultaneously in a horizontal linear direction.

The small mass of the access mechanism allows rapid movement of the arms and heads. Maximum access time with the standard direct seek capability is 145 milliseconds. The actuator is driven by a printed circuit motor which has a printed rotor for minimum inertia, and a fixed-magnet stator. An electronic access mechanism was chosen in favor of an hydraulic actuator to reduce maintenance requirements and provide lower cost.

The actuator is a proportional type—the motor is driven at a speed proportionate to the number of tracks that must be traversed to reach the new disk location. Positioning is accomplished by an open-loop servo system. The track positions are counted photoelectrically and the final positioning of the head over the desired track is accomplished mechanically by a detent gear. This allows extremely accurate repositioning to within .002 inch—a necessary requirement for interchangeability of disk packs between storage drive units.



The disk packs are removable, light, compact—fully interchangeable between Disk Storage Drives of the same model number. The disk pack container protects the disks from dust and damage while in shelf storage.



# SPECIFICATIONS

9430  
852

9432  
853

9433  
854

9434

## CAPACITY/DATA FORMAT

Total Capacity.....	2,000,000 characters (Sector Mode) 2,980,000 characters Full-Track Mode)	4,096,000 characters (Sector Mode)	8,192,000 characters (Sector Mode)
Bits per Character.....	7 bits (BCD)	6 bits	6 bits
Characters per Disk Surface....	200,000 (Sector Mode)	409,600	819,200
Characters per Track.....	2,000 (Sector Mode)	4,096	4,096
Characters per Sector.....	100	256	256

SBMB  
84.7

## PROCESSING SPEED

Access Time (maximum— with Direct Seek).....	145 milliseconds	145 milliseconds	145 milliseconds
Track-to-Track Access Time....	30 milliseconds	30 milliseconds	30 milliseconds
Latency Time (maximum).....	40 milliseconds	25 milliseconds	25 milliseconds

## RECORDING

Mode.....	NRZ1	Double frequency	Double frequency
Density.....	684 bpi (outer track) 988 bpi (inner track)	765 bpi (outer track) 1105 bpi (inner track)	765 bpi (outer track) 1105 bpi (inner track)
Bit Rate.....	699.53 KC	1.25 MC	1.25 MC
Data Transfer Rate.....	77,730 characters/sec	208,333 characters/sec	208,333 characters/sec

## DISKS

Number of Disks.....	6	6	6
Usable Disk Surfaces.....	10	10	10
Number of Sectors per Track....	20	16	16
Tracks per Disk Surface.....	100	100	200 (plus 3 spares)
Speed (rpm).....	1500	2400	2400
Diameter.....	14 inches	14 inches	14 inches
Coating.....	Magnetic Oxide	Magnetic Oxide	Magnetic Oxide

## HEADS

Total.....	10	10	10
Read/Write Width.....	.010 inch	.010 inch	.005/.008 inch
Erase Width.....	.018 inch	.018 inch	.011 inch
Track Spacing.....	.020 inch	.020 inch	.010 inch

IBM COMPATIBLE..... Yes (1311)

No

No

PANEL CONTROLS..... Unit number indicator  
Power on-off  
Fault indicator

Unit number indicator  
Power on-off  
Fault indicator

Unit number indicator  
Power on-off  
Fault indicator

## PHYSICAL

Height.....	40 3/4 inches	40 3/4 inches	40 3/4 inches
Depth.....	36 inches	36 inches	36 inches
Width.....	24 inches	24 inches	24 inches
Weight.....	480 pounds	480 pounds	480 pounds
Environment (operating).....	60°-90°F (20°F/hr.— max. gradient) 10%-80% relative humidity 3000 BTU/hr	60°-90°F (20°F/hr.— max. gradient) 10%-80% relative humidity 3000 BTU/hr	60°-90°F (20°F/hr.— max. gradient) 10%-80% relative humidity 3000 BTU/hr
(non-operating).....	-30° to +150°F 5%-98% relative humidity	-30° to +150°F 5%-98% relative humidity	-30° to +150°F 5%-98% relative humidity

## ELECTRICAL

Power Source.....	208 v, 50/60 cycle, 3 phase	208 v, 50/60 cycle, 3 phase	208 v, 50/60 cycle, 3 phase
Maximum Current.....	3 amperes/phase	3 amperes/phase	3 amperes/phase

ADDITIONAL FEATURE..... Seek overlap

Seek overlap

Seek overlap

**CONTROL DATA SALES OFFICES**

ALAMAGORDO • ALBUQUERQUE • ATLANTA • AUSTIN, TEXAS • BILLINGS  
BOSTON • BOULDER, COLORADO • CAPE CANAVERAL • CHICAGO • CIN-  
CINNATI • CLEVELAND • COLORADO SPRINGS • DALLAS • DAYTON • DENVER  
DETROIT • DOWNEY, CALIFORNIA • GREENSBORO, NORTH CAROLINA  
HONOLULU • HOUSTON • HUNTSVILLE • MIAMI • MONTEREY, CALIFORNIA  
INDIANAPOLIS • KANSAS CITY, KANSAS • LOS ANGELES • MADISON,  
WISCONSIN • MINNEAPOLIS • NEWARK • NEW ORLEANS • NEW YORK  
CITY • OAKLAND • OMAHA • PALO ALTO • PHILADELPHIA • PHOENIX  
PITTSBURGH • ROCHESTER, NEW YORK • SACRAMENTO • SALT LAKE  
CITY • SAN BERNARDINO • SAN DIEGO • SAN TURCE, PUERTO RICO  
SANTA BARBARA • SAN FRANCISCO • SEATTLE • ST. LOUIS • TULSA  
WASHINGTON, D. C.

AMSTERDAM • ATHENS • BOMBAY • CANBERRA • DUSSELDORF • FRANK-  
FURT • HAMBURG • JOHANNESBURG • LONDON • LUCERNE • MELBOURNE  
MEXICO CITY • MILAN • MONTREAL • MUNICH • OSLO • OTTAWA • PARIS  
TEL AVIV • STOCKHOLM • STUTTGART • SYDNEY • TOKYO (C. ITOH ELEC-  
TRONIC COMPUTING SERVICE CO., LTD.) • TORONTO • ZURICH

**CONTROL DATA**  
CORPORATION

8100 34th AVE. SO., MINNEAPOLIS, MINN. 55440