Burroughs

B 9484-12
Disk Storage Drive

OPERATOR'S MANUAL

PRICED ITEM

Printed in U.S. America

May 1983

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PREFACE

This manual presents the information required for operation and routine maintenance of the B 9484-12 Disk Storage Drive.

SECTION 1
OPERATOR FUNCTIONS

GENERAL DESCRIPTION

The B 9484-12 Disk Storage Drive shown in figure 1-1 is a large-capacity random access memory device used for input/output in a data processing system. The system, configured with a single drive or multiple drives attached to one or more control units, uses the drives for mass storage of sequential and randomly organized data. The total number of drives in the system is selectable, depending on the system requirement for total storage capacity.

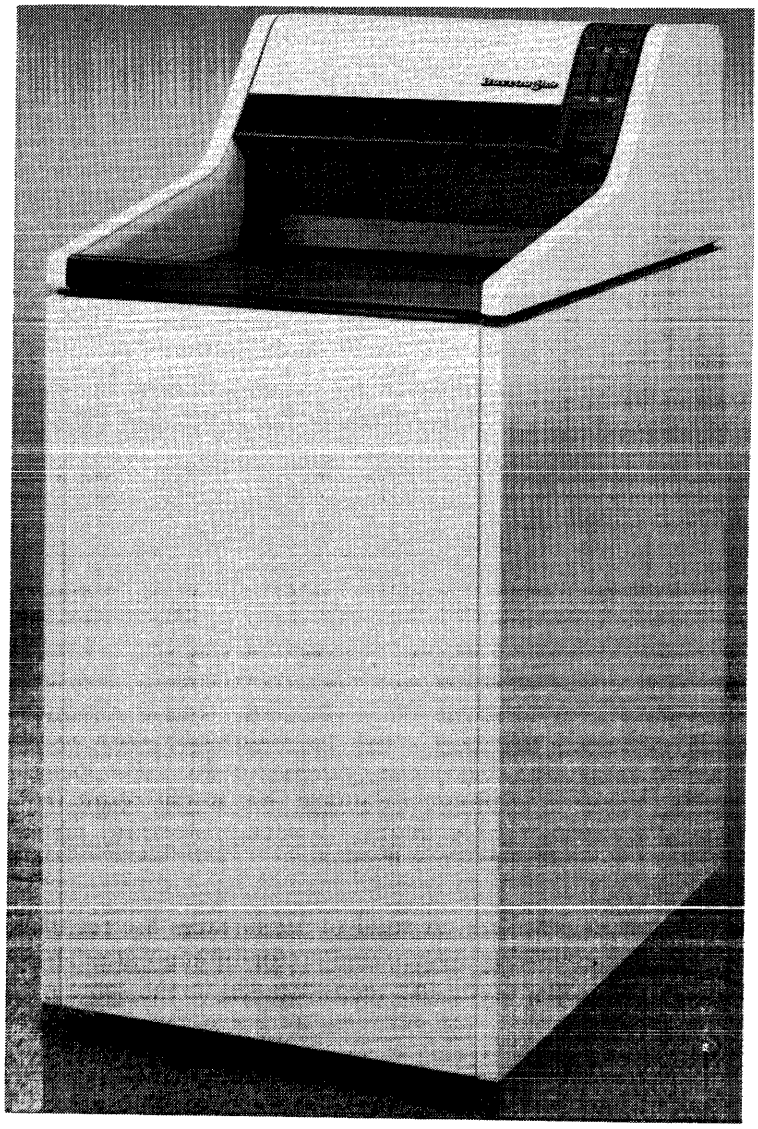

Figure 1-1. B 9484-12 Disk Storage Drive

CONTROL UNIT

The control unit (also referred to as the controller) directs the functions performed by the drive. Address and command information is transferred serially from the controller to the drive by means of the Controller Message (CM) line. The drive communicates with the controller using the Drive Message (DM) line.

DISK STORAGE DRIVE

The B 9484-12 Disk Storage Drive consists of a disk pack spindle with associated drive motor, a voice-coil positioner servo, read/write heads, an air-flow and filtration system and electronics. The drive's disk pack contains 10 recording disks and 19 recording surfaces and serves as a permanent or temporary data storage media. Data is either read from a recorded surface on the disk pack in a drive and sent to the system through its attached control unit, or written on a disk surface for retrieval at a later time.

The B 9484-12 Disk Storage Drive features are as follows:

1. Memorex or equivalent disk packs can be used in the drive.
2. An electrodynamic braking feature stops the pack rotation within 20 seconds (nominal).
3. The drive uses Modified Frequency Modulation (MFM) techniques to record standardized serial streams of data on the disk.
4. The Diagnostic Display provides a quick visual indication of various status and fault conditions within the drive.
5. An optional Dual Port feature allows two control units to be attached to a single drive.
6. A 50 or 60 Hz selective feature allows the drive to operate on 50 Hz or 60 Hz.
7. Read/Write Fault Indication circuits protect data from being destroyed in the event of a component failure.

Other operating features are identified and explained within the operating procedures that follow.

DISK PACK USE, HANDLING AND CARE

The disk pack in a drive can serve as a permanent or temporary data storage media. The disk pack is a compact disk assembly weighing 20 pounds. Protective disks are located at the top and bottom of the disk array to minimize possible physical damage that might result from handling. A two-piece cover has a shock absorbing bumper strip for additional pack protection. Specifications for the Memorex packs equal or exceed those for equivalent capacity packs.

The disk pack contains 10 recording disks. A total of 19 surfaces are recording surfaces; the 20th surface contains prerecorded track-following (servo) and sector-timing data. The disk pack containing data can be removed from the drive and stored, and then installed in the same or another drive for reading or additional writing of data.

The drive rotates the pack at 3600 rpm, selects one of 19 read/write heads, positions the heads to the selected track on the disk surface, and allows the system to synchronize the data transfer. The data transfer between the drive and system occurs under the control of the control unit connected to the drive. The drive either transmits data to, or receives data from, the control unit. Once the drive is installed into the system, routine operation of the drive is fully automated, requiring operator intervention only for an exchange of disk packs or to change the drive's path of communication with the system.

Handling the Disk Pack

The disk pack shown in figure 1-2 is protected during shipping by a special plastic foam container. When the pack is received, the container should be inspected for damage. If the condition appears undamaged, remove the pack and store the container for later use. If the container or pack is found to be damaged, retain the consignment "as received" and notify your operations manager.

A two-piece plastic cover protects the disk pack from dust and moisture when the pack is stored. The top section of the cover contains a handle for carrying the pack. This top cover is removed by the operator when the pack is installed into a drive.

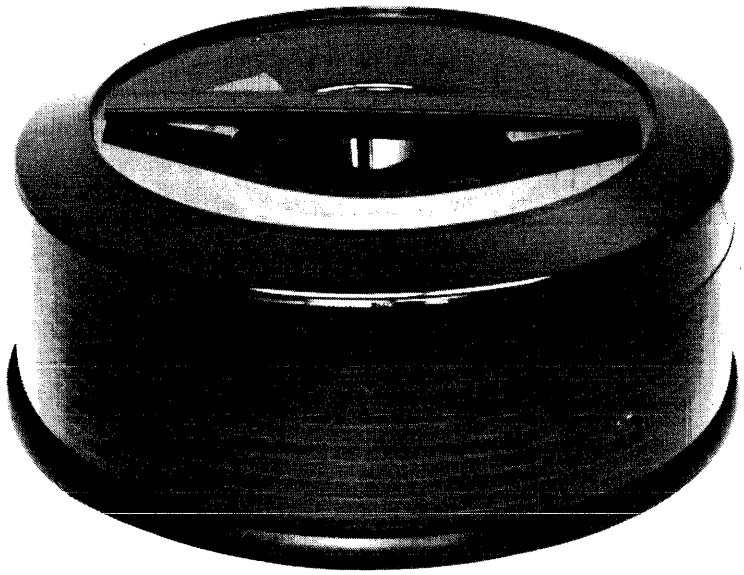

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Figure 1-2. Disk Pack

Transportation

When transporting disk packs, the following precautions should be taken:

1. The pack must be securely fastened in its two-piece cover.
2. The specially designed shipping container must be used.
3. The pack must be handled only with its top cover on. If the pack is accidentally dropped or receives a sharp impact of any kind, it must be inspected by service personnel before further use.

Labeling

Labeling of the disk pack media is not recommended. If adhesive labels are included with the disk pack, it is suggested that they be used only on the outside of the disk pack protective cover.

Stacking/Storing

To ensure maximum disk pack life and reliability, the following precautions should be taken:

1. Each pack should rest flat on a shelf when being stored, not on edge or on top of another pack.
2. Packs should be stored in a computer room environment. If a pack must be stored in a different environment, allow two hours for temperature adjustment within the computer room before using.

OPERATING PROCEDURES

All controls and indicators needed for efficient operation of the drive are located on a single panel designed for use by nontechnical personnel. The names of individual controls are descriptive of their functions and are printed on the panel. Indicators illuminate with English words that identify the condition existing in the drive. The FAULT indicator will illuminate when a malfunction is present. The normal response is to press the START/STOP switch to STOP and request maintenance.

OPERATOR CONTROLS AND INDICATORS

The following control switches and indicators are located on the operator panel of the drive. (See figure 1-3.)

Controls and Indicators

Switch	Function
START Neutral STOP	Starts or stops the unit's spindle drive motor. In the neutral position the spindle may be started and stopped remotely.
READ ONLY READ WRITE	Protects data on a disk pack by not allowing any writing when set to READ ONLY; data can be read only. When set to the READ WRITE position, both writing and reading are permitted.
PORT A ONLY Neutral PORT B ONLY	This switch provides a means of enabling communication to one of the two ports when placed in its respective position. Both ports are enabled when placed in the neutral position.
LAMP TEST	This switch illuminates all panel indicators.

Lights	Function
START	Indicates the state of the START/STOP switch and interlocks.
PORT A PORT B	Indicates the port selected by the interface.
READY	Indicates that the pack is up to speed, heads are loaded, and no malfunctions or unsafe conditions exist.
FAULT	Indicates that an unsafe or malfunction condition exists in the unit.
READ ONLY	Indicates the state of the READ ONLY switch; unit is protected from writing.
DOOR LOCKED	Indicates that the sliding door over the disk pack is locked by a solenoid-actuated mechanism.

Control Switches

The functions of individual control switches on the drive's operator panel are described in the following paragraphs (see figure 1-3).

START/STOP
: This is a three-position rocker switch. When pressed to the START position and released, the switch returns to its center position. When pressed to the STOP position, it remains in the STOP position. With the pack access door closed and all interlocks satisfied, pressing the switch to START locks the pack access door and initiates a drive power-up sequence. When the pack reaches operating speed, the heads are extended and loaded. When the switch is pressed to STOP, the carriage moves in a reverse direction to pull the heads out of the pack area. Electrodynamic braking power is applied to stop pack rotation and, when stopped, the pack access door is unlocked. Starting or stopping time is approximately 20 seconds. If left in the center position and sequence conditions are satisfied, the drive will initiate a power-up sequence when ac power is applied or restored.

READ ONLY/READ WRITE
: With this two-position rocker switch in the READ ONLY position, data stored on a disk pack is protected against accidental over-write. The write function of the drive is inhibited, providing the drive is not writing at the time the switch is engaged. If the switch is engaged while the drive is writing, the inhibit function will operate after the drive stops writing. With the switch in the READ WRITE position, the reading or writing function of the drive is permitted. If both functions are commanded simultaneously, heads are deselected and both reading and writing functions are disabled.

PORT A ONLY/PORT B ONLY
: This is a three-position rocker switch used with the Dual Port feature. When pressed, the PORT A/B ONLY switch enables the desired Port A/B interface. The switch provides a means for enabling one of the two interfaces, thereby dedicating the drive to one controller until the switch is returned to the neutral position. When the switch is in the neutral position, the drive may be selected by either controller.

LAMP TEST
: This momentary switch provides illumination of all panel indicators for checking purposes.

Control Indicators

The individual indicators on the drive's operator panel (see figure 1-3) have the following functions:

START
: This word illuminates when the START/STOP switch is set to START and all start conditions are satisfied, and remains illuminated until the drive is stopped.

PORT A B
: PORT and A (two different lamps) illuminate to indicate the control unit has selected the drive through Port A. PORT and B illuminate to indicate the control unit has selected the drive through Port B.

READY
: This word illuminates when the drive is ready to execute commands.

FAULT
: This word illuminates to indicate a drive malfunction that requires the attention of service personnel. Illumination occurs when either an abnormal-stop or read/write safety error occurs.

READ ONLY
These words illuminate when the READ ONLY/READ WRITE switch is in the READ ONLY position.

DOOR LOCKED
These words illuminate to indicate the pack access door is closed and locked. For personnel safety, pack rotation can begin only when this indicator is illuminated. If the door is forced open during drive operation, pack rotation will commence stopping and the heads will be retracted out of the pack automatically. Normal sequence down will take place under this condition.

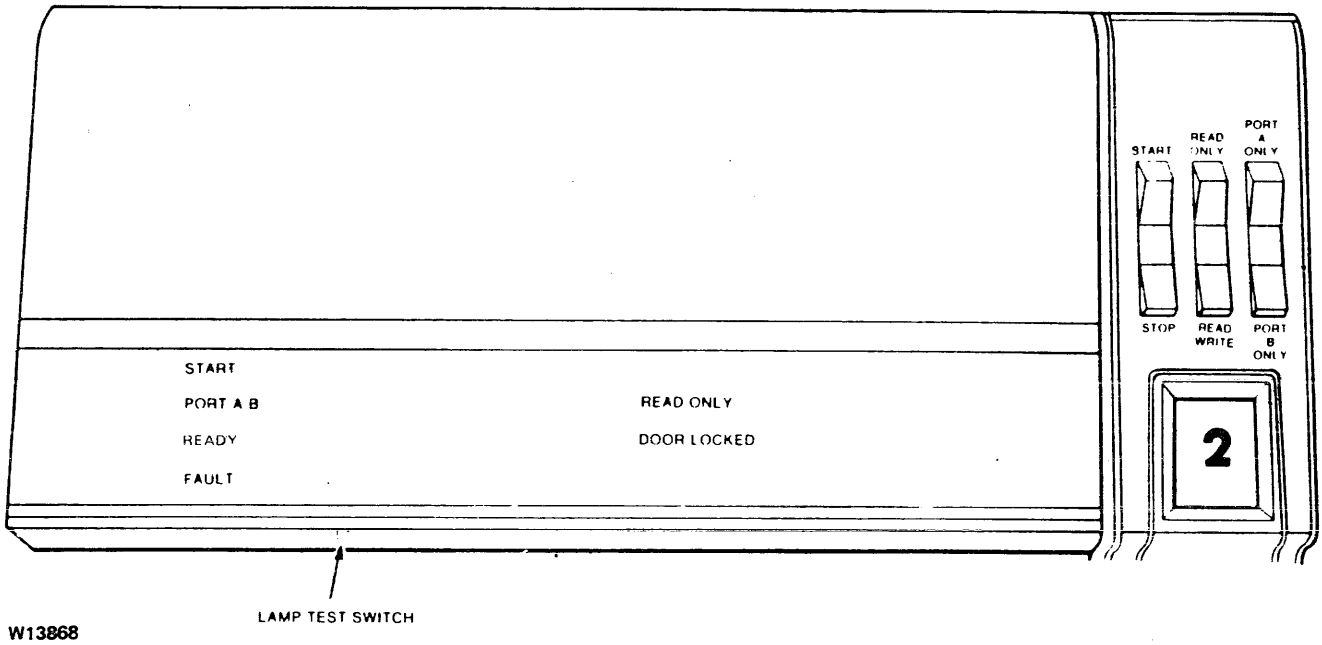

Figure 1-3. Operator Panel

DOOR ASSEMBLY AND LOCKING MECHANISM

The drive uses a sliding glass door assembly for easy access to the disk pack area. Figure 1-4 shows how the four rollers attached to the door ride on two rails along the shroud cover. Pushing against the cover bar causes the door to slide rearward under the logic file. (Door cannot be opened until the DOOR LOCKED light is off.) With the door in its rearward position, the operator can install or remove a disk pack.

The door switch detects the open or closed condition of the door. If open, it is not possible to start the drive motor and the DOOR LOCKED indicator will not be lit on the drive's operator panel. A door lock mechanism locks the door closed while the pack is rotating. Locking the door closed is a safety measure which guards against accidental or inappropriate opening of the door when the drive is being operated. If the door is opened while the drive is operating, the heads are automatically retracted and pack rotation is automatically braked to a complete stop.

Air Seal

The glass door, in addition to offering visual inspection of the pack and heads while closed, provides for an air seal which protects the area from contaminants. The pack access door should never be left open unnecessarily. The longer it is open, the greater the susceptibility to contamination. Tobacco smoke and ashes create serious contamination problems.

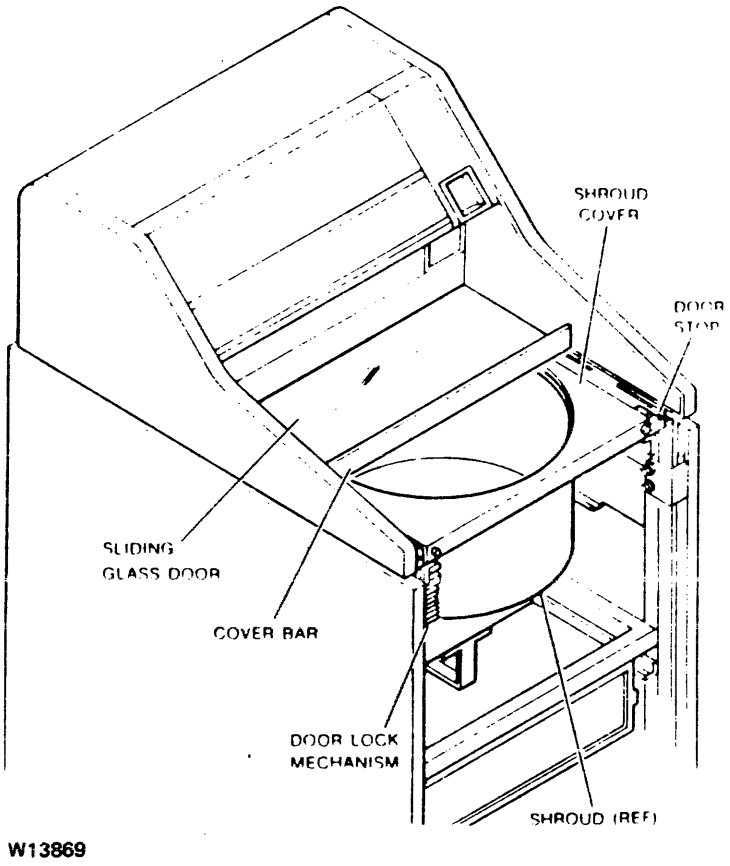

Figure 1-4. Pack Access Door Assembly

DISK PACK INSTALLATION AND REMOVAL

A disk pack can be installed when power to the drive is off and the spindle is stopped.

1. If the spindle in the drive is stopped (both START and READY are not illuminated), go directly to step 4; otherwise perform steps 2 and 3 before step 4.
2. Press the START/STOP switch to the STOP position. This will cause the START illumination to disappear.
3. Wait approximately 20 seconds, until the DOOR LOCKED illumination disappears, indicating the spindle dynamic braking is complete and the pack access door is unlocked.
4. Open the glass access door by sliding it all the way to the rear of the drive.

CAUTION

Do not place a heavy object (such as a disk pack) on top of the glass pack access door.

5. Remove pack (if present) by performing steps 14 through 16.
6. Remove the bottom cover of the disk pack to be installed by pressing the two handles on the bottom cover together.
7. Place the disk pack, together with its top cover, on the spindle carefully and slowly.
8. Turn the handle on the top cover in a clockwise direction until it comes to a full stop.
9. Carefully lift the top cover straight up from the pack, to avoid hitting the edges of the disks.
10. Place the top cover on the bottom cover to create a positive dust seal, and store.
11. Close the glass access door by sliding it all the way to the front of the drive. The access door should always be left closed to prevent contamination.

To remove a disk pack, perform steps 12 through 16.

12. Make sure that the spindle is stopped. Open the glass access door by sliding it all the way to the rear of the drive.
13. Carefully lower the disk pack top cover straight down over the pack and avoid hitting the edges of the disks. Turn the handle on the top cover in a counterclockwise direction two to three full turns.
14. Using the handle, remove the pack from the drive.
15. Immediately attach the bottom cover to the pack, and store.
16. Close the glass access door by sliding it all the way to the front of the drive. The access door should always be left closed to prevent contamination.

SPINDLE MOTOR START/STOP

To start the drive spindle motor, press the START/STOP switch to START. The drive will sequence to the ready state approximately 20 seconds later, at which time the word READY illuminates. After starting the drive motor, wait 20 seconds before powering another drive. The following information covers both the actual starting procedure and the prerequisites to starting.

1. Be sure a disk pack is installed and the glass access door is closed.
2. Verify that all indicators light by pushing the LAMP TEST switch. This also indicates main power is applied to the drive. If a fault condition has been detected (FAULT is illuminated), go to the following paragraph, User Responses to Abnormal Conditions, to clear this condition. If cleared, go to step 3. If the fault condition persists, request maintenance.
3. Press the START/STOP switch to the START position. When pressed, the following events occur: START illuminates, pack begins rotating, and DOOR LOCKED illuminates. If DOOR LOCKED does not illuminate, close the door fully.
4. Wait approximately 20 seconds until the word READY illuminates. It indicates the drive is started and ready to execute commands. START and DOOR LOCKED will remain illuminated.

To stop the drive spindle motor, press the START/STOP switch to STOP. When pressed, the READY and START lamps are extinguished and the drive retracts the heads. The DOOR LOCKED illumination disappears approximately 20 seconds later, when the motor-down sequence is completed.

USER RESPONSES TO ABNORMAL CONDITIONS

There is a possibility that the following abnormal conditions might occur.

Clearing a Fault Condition

If a sequence malfunction occurs during a start operation, a fault condition will occur (FAULT is illuminated) and the drive will automatically perform an abnormal stop sequence. At the end of the stop sequence, the spindle should come to a complete stop. To restart the drive, clear the fault condition by pressing START. FAULT should disappear; if not, service personnel should be advised that the drive cannot be restarted. If FAULT disappears, the drive will then perform its normal starting sequence. If FAULT reappears, the abnormal stop sequence will perform again automatically; in this event press STOP and advise service personnel.

CAUTION

Anytime the stop sequence malfunctions, as indicated when the spindle does not stop at the end of the sequence, advise service personnel and do not attempt other operations.

Detecting Head-to-Disk Interference (HDI)

Head-to-Disk (HDI) results from head contact with a disk surface. Usually a foreign particle in the air stream or a protrusion from the disk surface causes the head to break through the air "bearing" and abrade the disk surface. If the problem is not totally corrected, it will have a propagation effect from pack to pack and, in turn, drive to drive. Try to recognize the following symptoms of HDI:

1. Sudden hard read errors.
2. Black contamination on flying surface of any head.
3. FAULT during a write operation.
4. Uncommon noise from the disk, characterized by audible tinkling, zinging, or scratching sounds. If allowed to continue, the noise will progress to a screech.

If any of the preceding occurs, take the following action:

1. Stop the drive immediately and contact service personnel.
2. Do not remove the suspected pack from the drive unless absolutely necessary.

CAUTION

If the suspected pack is replaced with another pack and the drive is operated, or the suspected pack is used in another drive, damage to either the second drive or the substituted pack will occur.

All packs and drives being used when HDI symptoms are exhibited must be checked for HDI by service personnel.

OPERATOR DUTIES

In addition to performing the proper operating procedures described previously, the operator is required to maintain the cleanliness of the drive.

1. Use a lint-free cleaning pad (Texwipe) to remove fingerprints and smudges from the pack access door and operator panel. Do not use any type of spray container (aerosol or pump) near the equipment.
2. Clean covers and panels with a damp rag.

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