

**PUBLICATIONS
UPDATE**

General

8419 Disk Subsystem

Operator Reference

UP-8919 Rev. 1-A

This Library Memo announces the release and availability of Updating Package A to "SPERRY UNIVAC 8419 Disk Subsystem Operator Reference", UP-8919 Rev. 1.

This update provides a caution to ensure the integrity of disk files when system power is turned off.

Copies of Updating Package A are now available for requisitioning. Either the updating package only or the complete manual with the updating package may be requisitioned by your local Sperry Univac representative. To receive the updating package, order UP-8919 Rev. 1-A. To receive the complete manual, order UP-8919 Rev. 1.

LIBRARY MEMO ONLY	LIBRARY MEMO AND ATTACHMENTS	THIS SHEET IS
Mailing List BZ, CZ (less DE, GZ, HA) and MZ	Mailing Lists DE, GZ, HA; 28U and 29U (Package A to UP-8919 Rev. 1, 5 pages plus Memo)	Library Memo for UP-8919 Rev. 1-A RELEASE DATE: January, 1982



**PUBLICATIONS
REVISION**

General

8419 Disk Subsystem

Operator Reference

UP-8919 Rev. 1

This Library Memo announces the release and availability of "SPERRY UNIVAC® 8419 Disk Subsystem Operator Reference", UP-8919 Rev. 1.

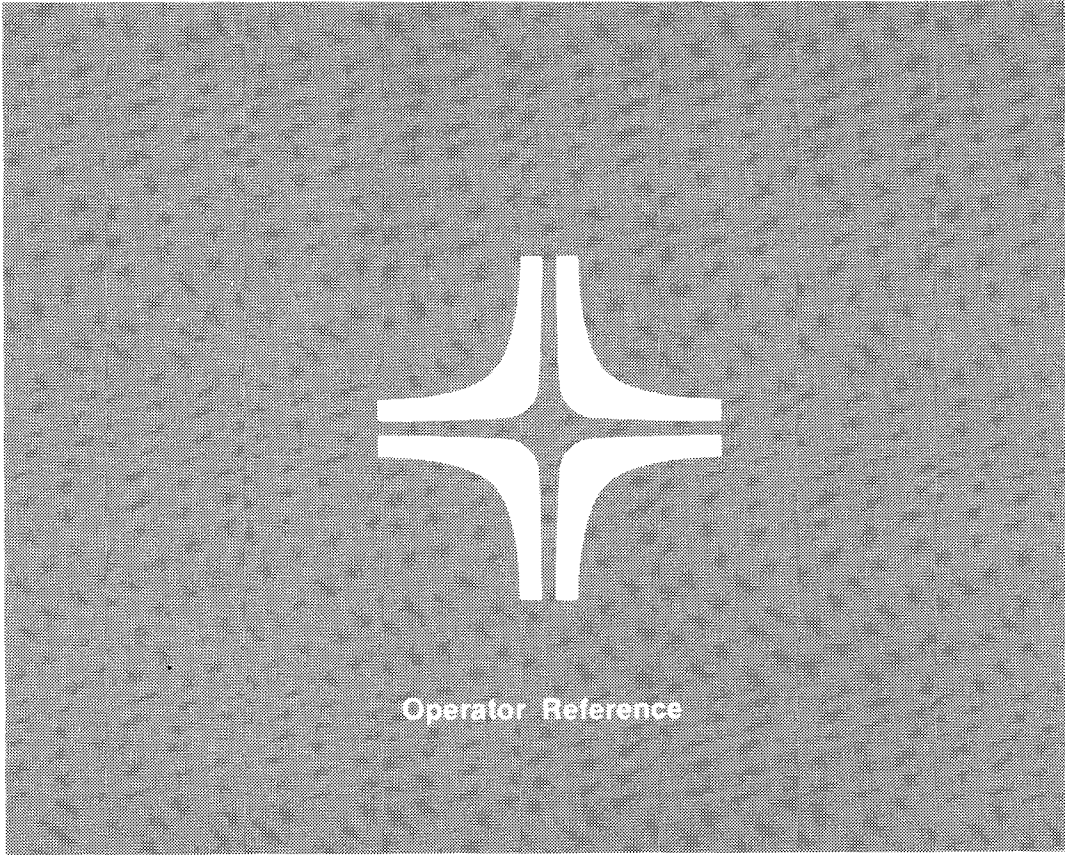
This document revises the power turn-on and turn-off procedures to include both system and individual disk subsystem power control.

Additional copies may be ordered by your local Sperry Univac representative.

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<p>Mailing List BZ, CZ (less DE, GZ, HA) and MZ</p>	<p>Mailing Lists DE, GZ, HA, 28U and 29U (Covers and 24 pages)</p>	<p>Library Memo for UP-8919 Rev. 1</p> <hr/> <p>RELEASE DATE: November 1981</p>



8419 Disk Subsystem



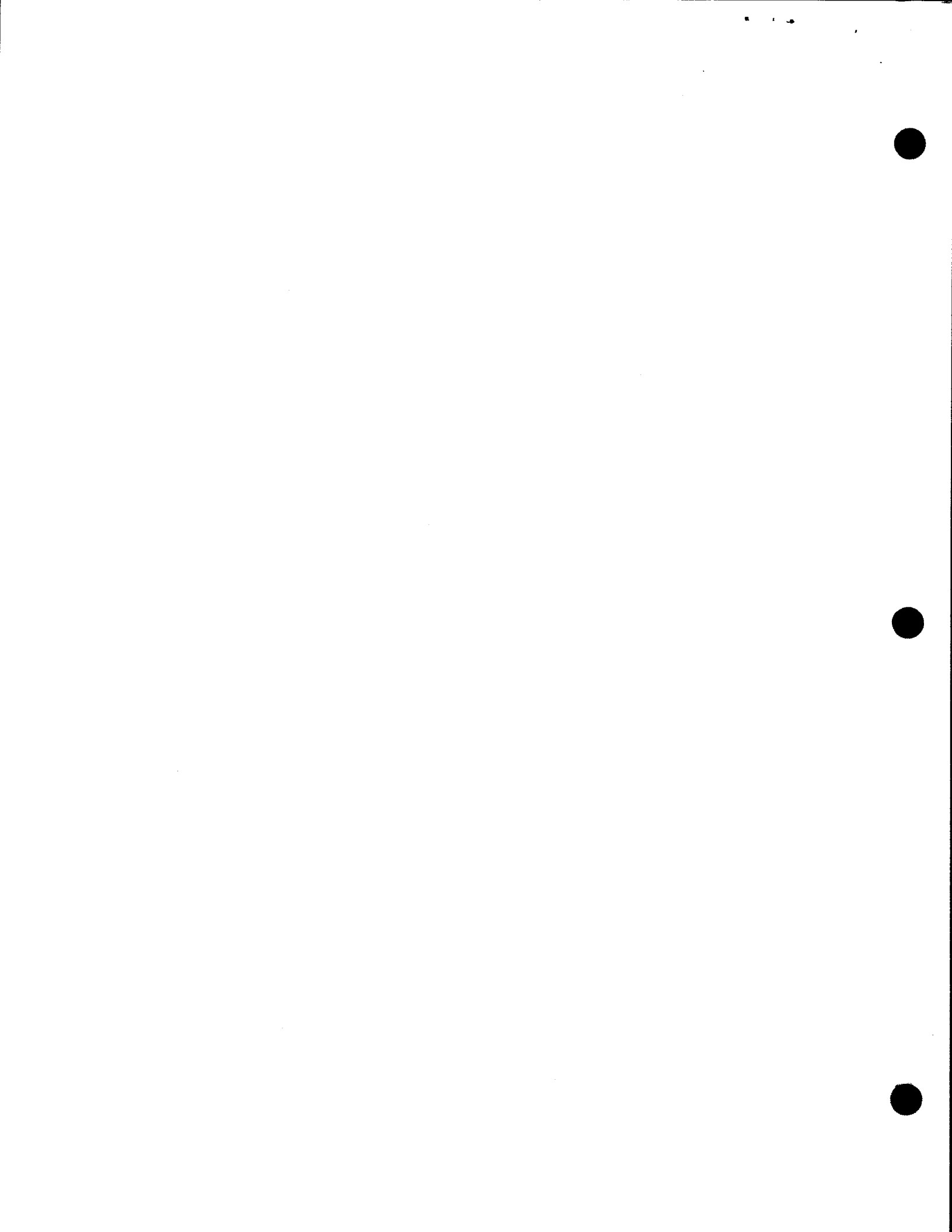
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1. Introduction

1.1. GENERAL

This manual contains information and procedures for operating the SPERRY UNIVAC 8419 Disk Subsystem. The subsystem consists of a disk channel/controller (DC/C) located in the processor cabinet and from one to seven 8419 disk drives (Figure 1-1), each in a separate cabinet. The 8419 disk drive uses removable disk-pack media.

1.2. OPERATOR RESPONSIBILITIES

The operator is responsible for preparing the disk drive for operation and performing routines required for efficient operation. To assume these responsibilities, the operator must be aware of the locations and functions of all operator-oriented controls and indicators involved in daily use of the disk drive. The operator must:

- turn power on and off at the disk drive when required;
- observe and respond to fault indications; and
- protect data written on the disk surface when necessary.

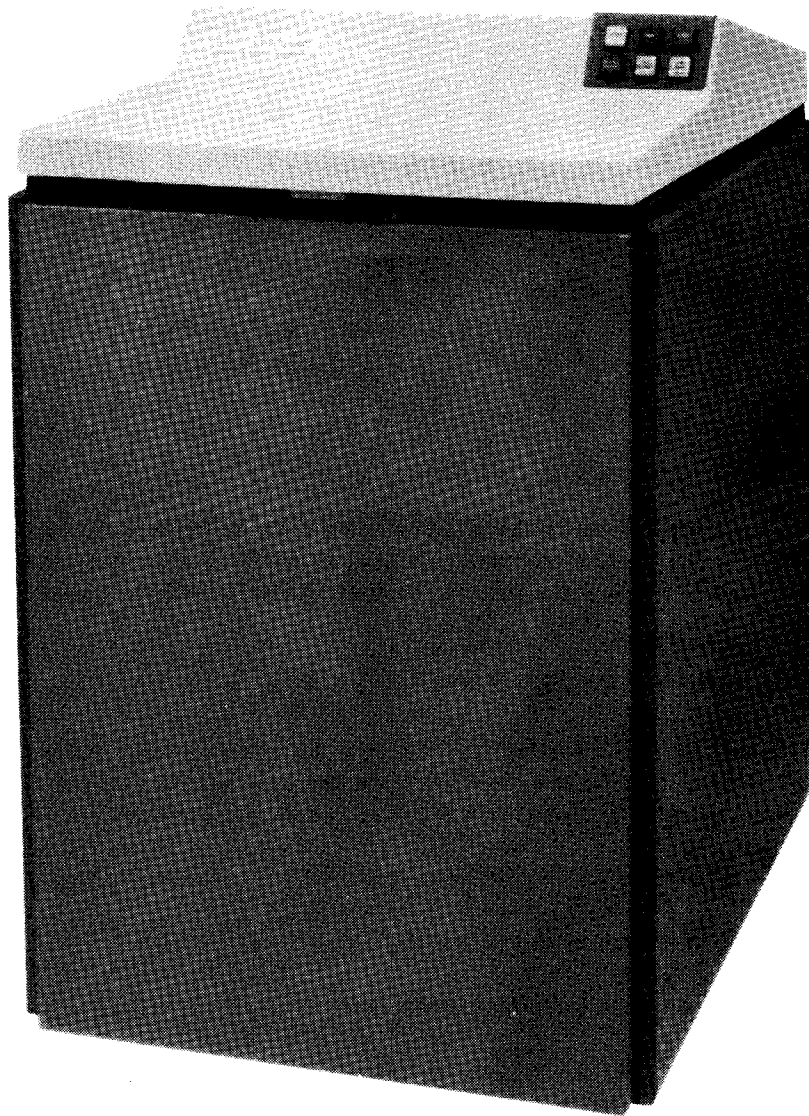


Figure 1—1. 8419 Disk Drive

2. Subsystem Description

2.1. SUBSYSTEM COMPONENTS

The subsystem comprises a disk channel/controller (DC/C) located inside the main frame cabinet, as well as up to seven disk drives, which are located in freestanding cabinets and cabled to the DC/C.

2.1.1. Disk Channel/Controller

The disk drives in a subsystem are controlled by software that is directed to the DC/C. Functions performed by disk drives are initiated by commands supplied to the disk drive via processor channels. The disk drive, in turn, sends status information concerning disk drive operation to the channel.

This communication between disk drive and processor channel is controlled by the DC/C. Functions required by the system operator or system software are accommodated by commands initiated by the DC/C to read, write, or search data. Since the DC/C has no operator controls or indicators, the operator enters the commands from the system console workstation at the processor. Figure 2-1 shows the disk subsystem configuration and illustrates the subsystem control paths between the DC/C and disk drives.

2.1.2. Disk Drive

A single disk drive is located in a freestanding cabinet. The disk drive uses removable media; that is, the disk pack may be replaced by the operator with other disk packs used on the 8419 disk drives.

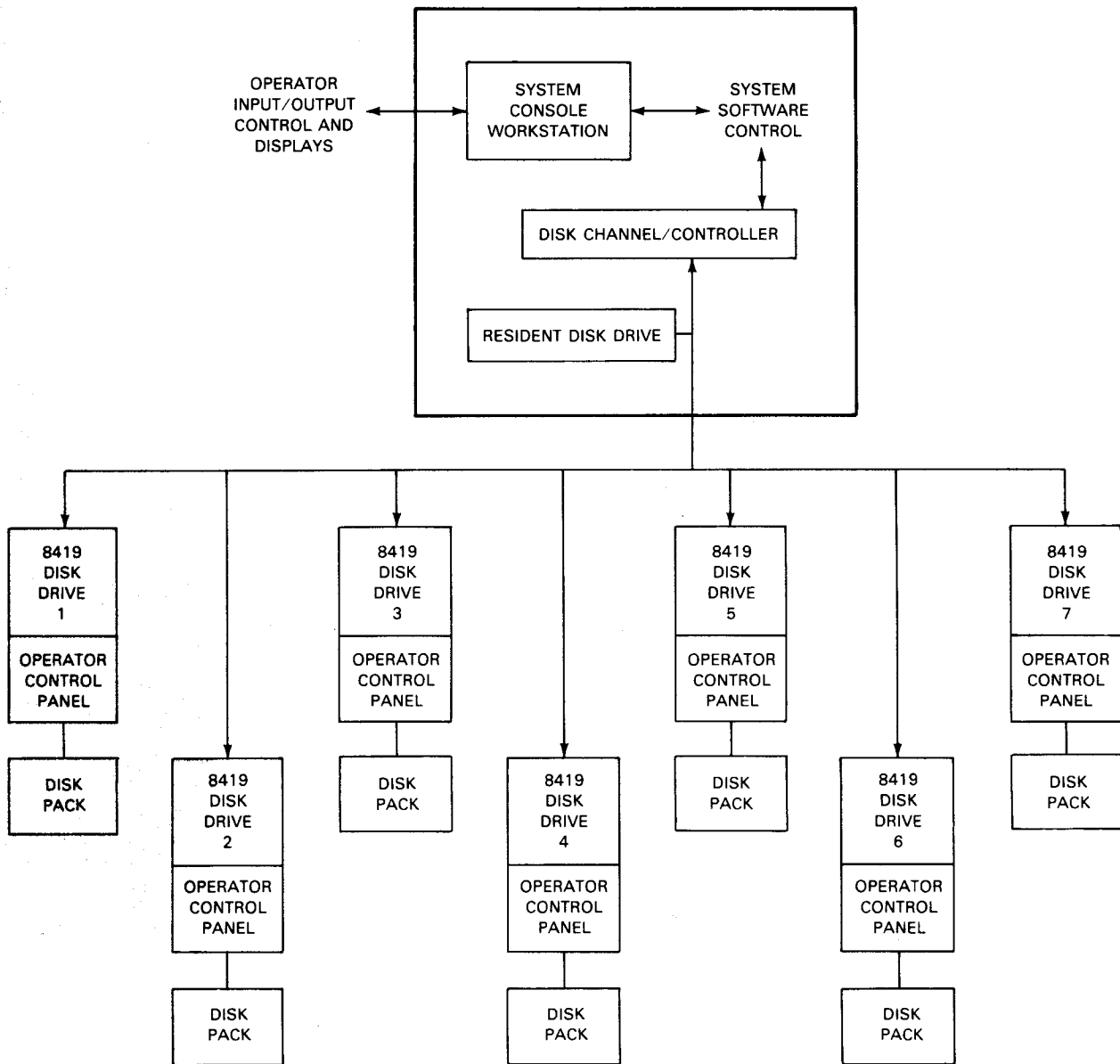


Figure 2-1. Disk Subsystem Configuration

Seven read/write heads, mounted on individual arms of an accessor assembly, service respective disk platter surfaces. An additional read/write head and arm are used for obtaining head positioning information from its related disk surface.

The accessor assembly, along with read/write heads, is mounted on a support tower. Movement of the support tower is controlled by an electromagnetic servo positioning system. When a command requests movement to a specific cylinder position on the disk surface, the heads are moved directly to that position without returning to home position. Up to 815 cylinder locations may be accessed in this manner.

Each disk surface contains 815 tracks, consisting of 808 primary tracks and 7 spares. Errors can be flagged on each track. When necessary, a spare track can be accessed by programming if an addressed track is flagged. Disks rotate at a nominal speed of 2800 revolutions per minute (rpm).

2.1.3. Programmed Servo Offset

Because disk packs are used interchangeably between other 8419 disk drives, slight differences in servo positioning or head alignment between drives can cause data to be recorded slightly off-track. Such data can be recovered by using programmed servo offset, which allows the disk drive to slightly reposition accessor arms from a designated track location. This preprogrammed servo offset may also recover data recorded on a disk surface having slight magnetic defects, which otherwise might not be recovered.

2.1.4. Disk Pack

The removable disk pack used on the 8419 is not interchangeable with disk packs used on other disk drive types. However, disk packs used on the 8419 disk drives may be interchanged among other disk drives in the 8419 subsystem.

The disk pack consists of four disk platters mounted on a vertical hub, which engages with a drive gear on the disk drive. Bottom and top covers protect the disk pack during removal from the drive (Figure 2-2). The operator removes the bottom cover before mounting the disk pack, then the top cover after the pack is mounted. A handle on the top dust cover facilitates handling of the disk pack. The disk pack rotates at the rate of 2800 revolutions per minute (rpm) when operating.

The disk drive top cover is equipped with a special rack to store the top and bottom disk pack covers while the disk pack is in use. The operator should avoid storing the disk pack (with covers) on top of the disk drive. Vibration occurring during operation can cause the disk pack to fall to the floor and a head crash to occur if its use is later attempted.

2.1.5. Safety Checks

A group of checks that relate to conditions indicated on the operator control panel (Section 3) are made to the disk drive during operation. Indications that result from safety checks, presented to the operator, are caused by detected conditions that may temporarily halt operation of the disk drive.

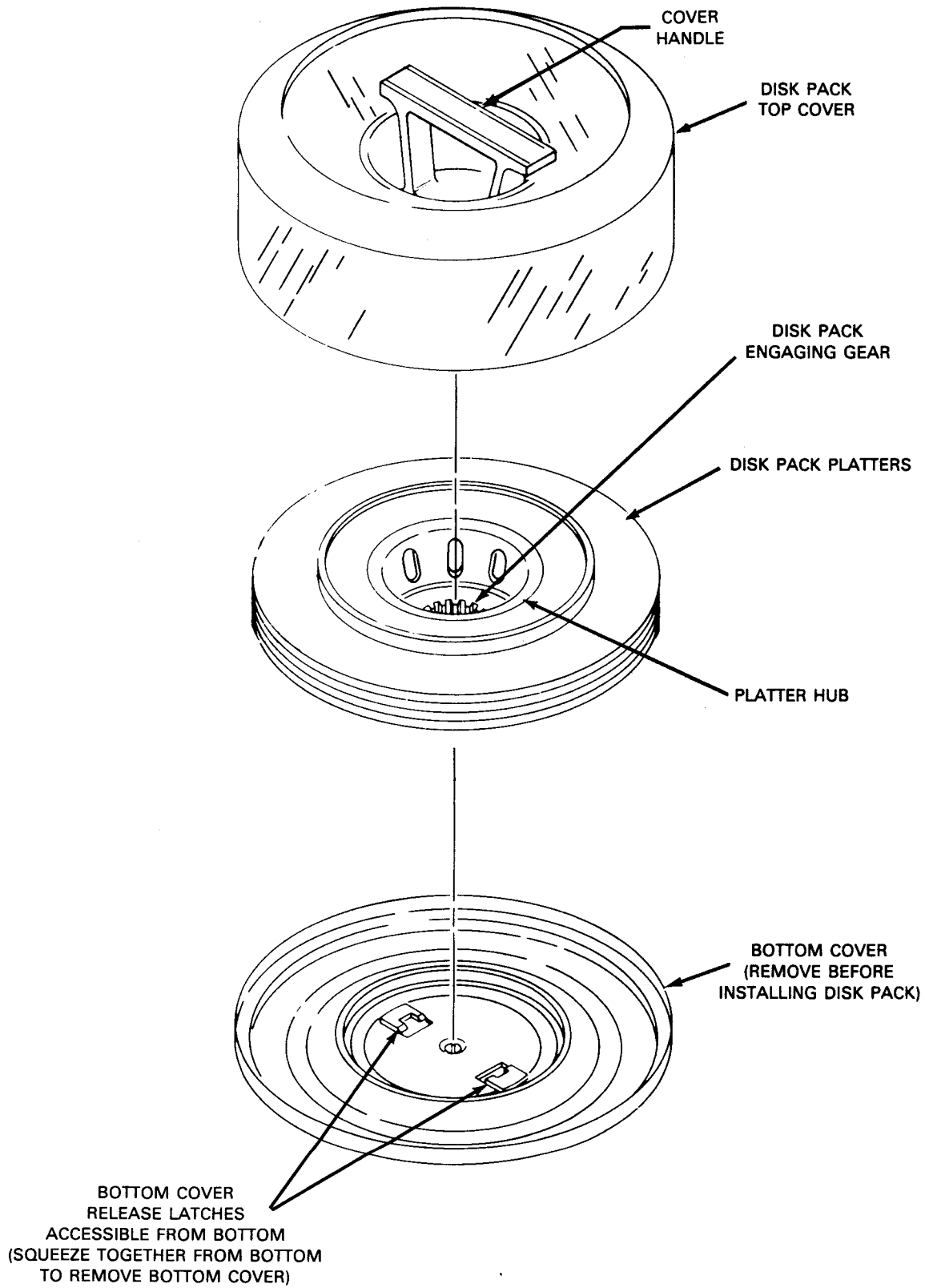


Figure 2-2. 8419 Disk Pack with Dust Cover

3. Controls and Indicators

3.1. GENERAL

Operator controls and indicators for the 8419 disk drive are located on an operator control panel at the front of the disk drive cabinet. The DC/C is located inside the processor cabinet and does not contain any operator controls or indicators.

3.2. MAIN POWER CIRCUIT BREAKER

The MAIN POWER circuit breaker is located on the rear of the disk drive cabinet. The circuit breaker connects primary power to the internal power supplies and power distribution panel. Normally, the circuit breaker is set to the ON (up) position, and power is controlled from the operator control panel and the system console workstation. However, in an emergency at the particular disk drive, the operator should set the circuit breaker to the OFF (down) position until assistance arrives.

3.3. OPERATOR CONTROL PANEL

The operator control panel is illustrated in Figure 3-1. Table 3-1 lists the operator control panel controls and indicators.

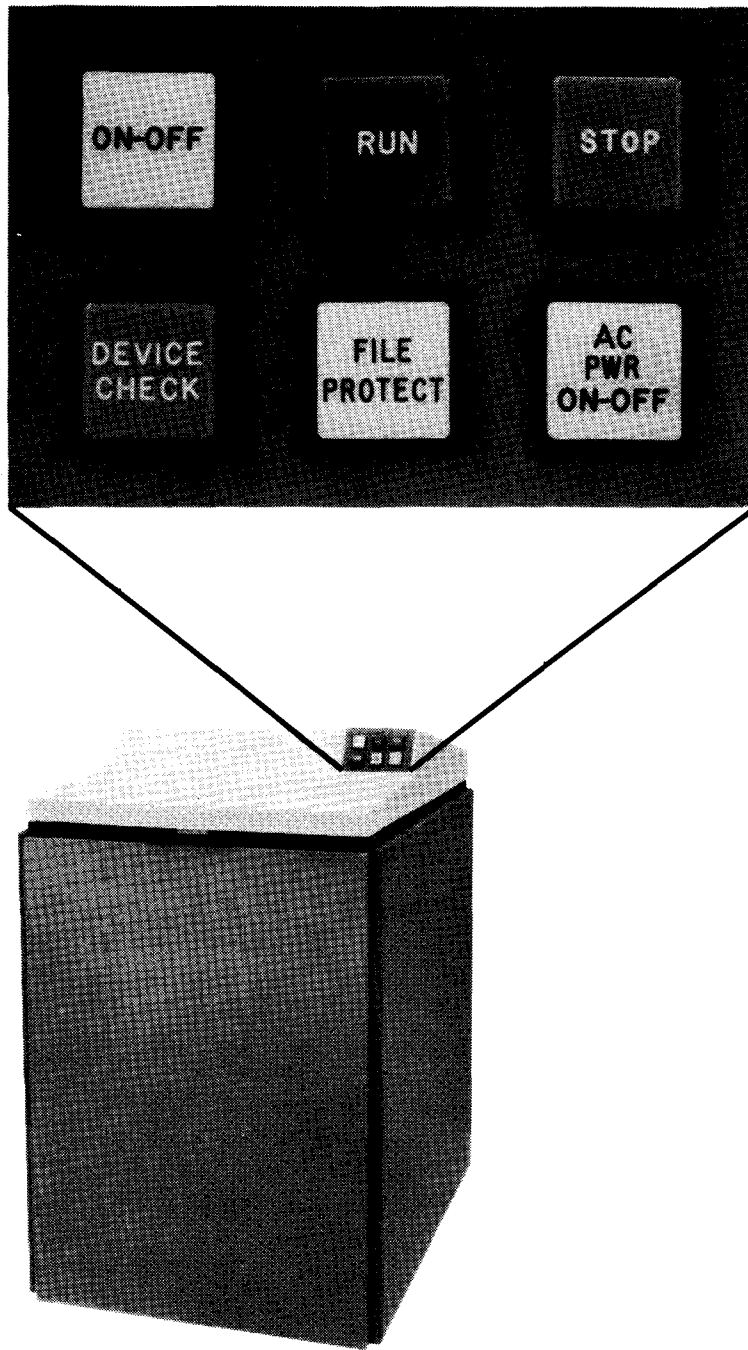


Figure 3—1. Operator Control Panel

Table 3—1. Operator Controls and Indicators (Part 1 of 2)

Control/Indicator	Function
<p>ON-OFF switch/indicator</p>	<p>When pressed for ON condition:</p> <ol style="list-style-type: none"> 1. Indicator lights. 2. Power is enabled to the disk drive motor. 3. When disk pack reaches proper rotation speed for operation, read/write heads are positioned to cylinder 0. The disk drive remains in stop state (STOP indicator lit) until RUN switch/indicator is pressed. <p>NOTE:</p> <p>Pressing the ON/OFF switch/indicator to the ON position will have no effect unless the disk subsystem is in local mode of operation (maintenance), AC PWR ON-OFF switch is set to ON (indicator lit), and a disk pack is installed.</p> <p>When pressed to OFF condition:</p> <ol style="list-style-type: none"> 1. The ON-OFF switch/indicator blinks until the disk pack stops rotating. 2. The disk drive reverts to stop condition without waiting for disk pack to stop rotating. 3. The read/write heads return to the retracted position. 4. The disk drive motor turns off after read/write heads are retracted. <p>NOTE:</p> <p>The OFF conditions occur immediately if module-select condition is inactive or if in stop condition.</p> <p>The ON-OFF switch does not complete all the functions for the ON condition:</p> <ul style="list-style-type: none"> ■ if interlocks for pack-in-place or cover-closed conditions are active; or ■ if any circuit breaker or the AC PWR ON/OFF switch is set to OFF position. <p>If the ON-OFF switch is set for ON condition when the cabinet top cover is raised or if no disk pack is mounted, the functions for the ON condition occur after the disk pack is mounted and cover is closed. Until then, the STOP switch/indicator blinks continuously.</p> <p>NOTE:</p> <p>If the operator cycles the disk drive motor with the ON-OFF switch more than five times from full stop to full speed to full stop, etc., a thermal switch in the motor turns off power until the motor cools to a safe operating temperature. The ON-OFF switch indicator lights and extinguishes as the switch position is changed, but the run state is not entered until the motor cools.</p>
<p>RUN switch/indicator</p>	<p>When pressed with the disk pack mounted, top cover closed, disk pack rotating at required speed, and read/write heads in load position with no device check, upon release of the switch/indicator, the following should take place:</p> <ol style="list-style-type: none"> 1. RUN switch/indicator lights. 2. STOP switch/indicator extinguishes. 3. Generate attention status. 4. The DC/C accesses the disk drive for positioning, reading, or writing by enabling the selected online condition. However, if the file-protect function is active, the disk drive is available only for head positioning and reading.

Table 3-1. Operator Controls and Indicators (Part 2 of 2)

Control/Indicator	Function
STOP switch/indicator	<p>When pressed and released:</p> <ol style="list-style-type: none"> 1. Disk drive enters stop state with an inactive selected online condition upon completion of the current operation. 2. RUN switch/indicator is extinguished if currently in run state. 3. STOP switch/indicator lights. <p>When pressed and held, the switch/indicator provides a test for all indicators on the operator control panel.</p> <p>The switch/indicator blinks continuously if the ON-OFF switch/indicator is pressed while either a disk pack is not yet mounted or the top cover is not closed.</p> <p>Soft unsafe conditions (1 through 4 of Table 4-1) do not cause the STOP switch/indicator to light. Hard unsafe conditions (4.5.2.1) always light the switch/indicator.</p>
DEVICE CHECK indicator	<p>Indicator lights if any unsafe condition (1 through 9 of Table 4-1) occurs. The safety circuit is reset and the indicator extinguished by pressing the ON-OFF switch/indicator to OFF condition, then pressing it again for ON condition. Soft unsafe conditions may be reset as described in 4.5.2.1. If the DEVICE CHECK indicator remains lit after reset is attempted, service is required by the Sperry Univac customer engineer. Pressing the RUN or STOP switch/indicators does not clear a device check condition. The disk drive is prevented from entering a run condition if a device check condition is present.</p>
FILE PROTECT switch/indicator	<p>When pressed, the switch/indicator lights, write operation is inhibited, and the DC/C is notified of a selected-file-protect condition upon completing the current operation. The FILE PROTECT switch/indicator does not change state if a module-select condition is active unless the STOP switch/indicator is lit.</p>
AC PWR ON-OFF switch/indicator	<p>This alternate action switch/indicator controls primary power to the disk drive. When the switch is set to ON position, the switch/indicator lights and the dc power supply and cabinet fans are turned on. Power for the disk drive motor is controlled with the ON-OFF switch/indicator after the AC PWR ON-OFF switch is set to ON (lit) position.</p>

4. Operation

4.1. GENERAL

Operation of the 8419 disk drive includes:

- turning power on and off;
- energizing the drive motor;
- controlling write protection functions;
- loading and unloading disk packs in the disk drive;
- observing and responding to any fault conditions that occur during operation; and
- recovering operation from any unsafe operating condition.

4.2. POWER TURN ON/OFF

Power for the disk drive is normally turned on or off from a main power switch on the system console at the processor. The ac power is always present in the disk drive unit unless a power box is used. In that case, the circuit breaker at the power box is turned on first, following a complete power turn off.

CAUTION

Prior to turning off system power, make certain that the 8419 disk drive subsystem is either in file protect mode (FILE PROTECT switch/indicator set to on position, indicator lit) or power is removed at the subsystem (AC PWR ON-OFF switch/indicator set to off position, indicator off). This procedure prevents the possible loss of data due to partial erasure or noise transients that may be the result of a system power turn off.

However, the disk subsystem MAIN POWER circuit breakers should always be set to the ON position except in case of an emergency. The AC PWR ON-OFF switch on the operator control panel should also be set to and left in the ON position. With these switches set to their ON position, system power then controls the power sequencing of the disk drives and no further operator intervention is required.

For remote or system power control operation, the disk pack must be installed in the unit to permit automatic power sequencing.

4.2.1. Subsystem Power Turn On

To turn on power initially for each disk drive unit independent of the system, proceed as follows:

1. Check whether the system main power on the system console, at the processor, is turned on.
2. Set the MAIN POWER circuit breaker at the lower rear of the disk drive cabinet to the ON (up) position.

3. Press the AC PWR ON-OFF switch/indicator on the operator control panel (Figure 3-1). Note that the switch/indicator lights.
4. Press the STOP switch/indicator and note that the switch/indicator lights.
5. Mount a disk pack in the disk drive as directed in 4.3.
6. Place the disk drive on the system list of available resources by using the appropriate processor command (refer to the appropriate processor operations or user manual).

4.2.2. Subsystem Power Turn Off

Power to each disk drive unit is normally turned off with the system main power switch located on the system console workstation. However, for complete power turn off for each disk drive unit independent of the system, proceed as follows:

1. Remove the disk drive from the system list of available resources by using the appropriate processor command (refer to the appropriate processor operations or user manual).
2. Press the ON-OFF switch/indicator on the operator control panel (Figure 3-1). Note that the switch/indicator extinguishes and the STOP switch/indicator lights.

CAUTION

Failure to allow the STOP switch/indicator to light before proceeding to the next step causes power transients that may disturb processor operation.

3. Press the AC PWR ON-OFF switch/indicator on the operator control panel. Note that this switch/indicator and all other switch/indicators on the operator control panel extinguish.
4. Set the MAIN POWER circuit breaker at the rear of the disk drive cabinet to the OFF (down) position.

NOTE:

In an emergency, the operator should set the MAIN POWER circuit breaker at the rear of the cabinet to OFF (down), then contact the Sperry Univac customer engineer and explain the emergency condition.

4.3. REPLACING DISK PACK

Before operation of the disk drive unit can begin, a disk pack must be mounted in the drive. Upon completion of operation, the disk pack is removed from the drive unit and stored in a safe place.

4.3.1. Loading the Disk Pack

The disk pack must be securely mounted in the disk well before operation can be started.

CAUTION

Follow these precautions when loading a disk pack:

- 1. Do not drop the disk pack onto the disk drive spindle; damage may result to the first threads on the spindle.*
- 2. Be sure that the disk pack top cover (Figure 2—2) is completely released from the disk pack before attempting removal; a sudden upward pull applied to the drive shaft lock can damage the threads.*
- 3. Avoid excessive loading torque; extra twisting of the top cover handle to ensure that the disk pack is tightly locked on the shaft is not necessary and can damage the spindle threads.*

Proceed as follows to load a disk pack:

1. Press the cover latch on top of the disk drive unit to allow the well cover to spring upward (Figure 4-1).

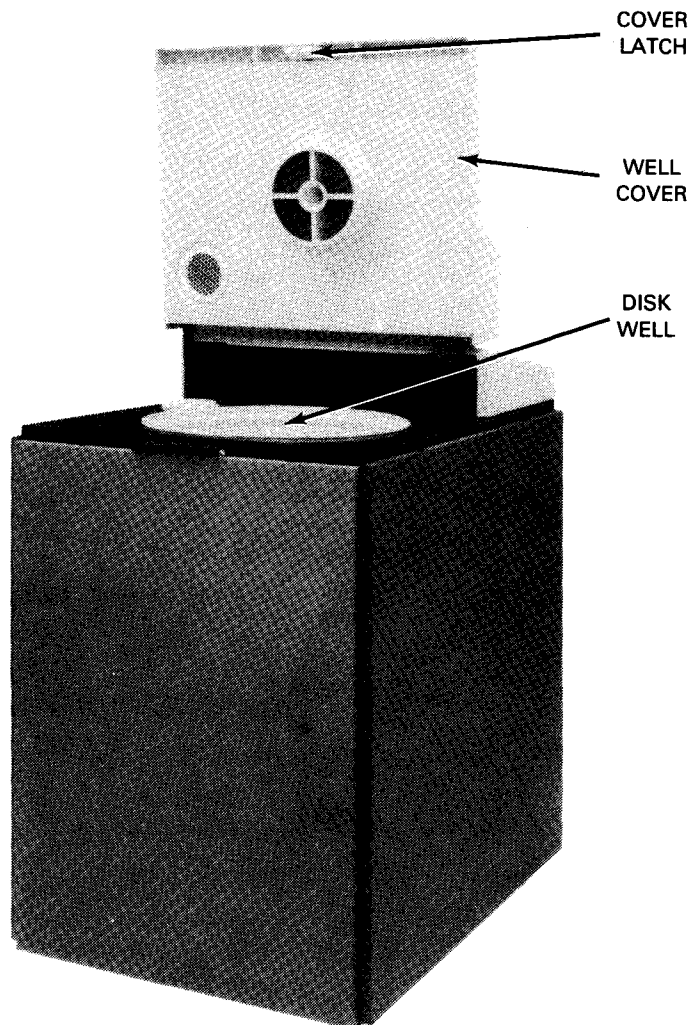


Figure 4—1. Disk Drive Well Cover Opened

CAUTION

To reduce contamination of the well area by airborne particles, close the well cover as soon as possible upon loading the disk pack.

2. Lift the disk pack to be mounted by its top cover handle. Squeeze the two bottom cover latches to remove the bottom cover (Figure 2-2).
3. While still holding the disk pack by its top cover handle, carefully lower the disk pack straight down into the well to engage the drive gear (Figure 4-2).
4. Set the disk pack carefully in the well so that the drive gear in the well engages the disk pack engaging gear (Figure 2-2). When the disk pack is firmly seated, carefully rotate the disk pack (by the cover handle) in a clockwise direction until rotation stops. *Do not overtighten.*
5. Lift out the disk pack top cover.
6. Close and latch the disk drive cover. Store the disk pack top and bottom covers in the disk pack storage basket on top of the disk drive, or in any designated storage location.
7. Set the mode of operation for the disk drive by pressing the FILE PROTECT switch/indicator on the operator control panel. When the FILE PROTECT switch/indicator is lit, the disk drive will operate in read-only mode and recorded data cannot be erased. If the FILE PROTECT switch/indicator is extinguished, the disk drive is in write mode and recorded data will be erased, depending on the location of the read/write heads.

NOTE:

The operating mode can be changed any time, but the change is not effective until the current operation is complete.

8. Press the ON-OFF switch/indicator, then the RUN switch/indicator on the operator control panel. Note that the ON-OFF switch/indicator lights and the STOP switch/indicator extinguishes. The RUN switch/indicator lights when the disk pack rotation reaches operating speed and the read/write heads have been positioned to cylinder 0.

NOTE:

It is not necessary to wait for the disk pack to reach full operating speed before pressing the RUN switch/indicator. By pressing the ON-OFF then the RUN switch/indicators in sequence, the disk drive immediately switches from stop state (STOP switch/indicator extinguished) and automatically enters run state (RUN switch/indicator lit) when the proper speed is reached.

9. Place the disk drive unit on the system list of available resources by entering the proper command at the processor.

NOTE:

The disk drive unit may be placed offline to prevent communications with the disk channel/controller by pressing the STOP switch/indicator. In that event, note that the STOP switch/indicator lights and the RUN switch/indicator extinguishes.

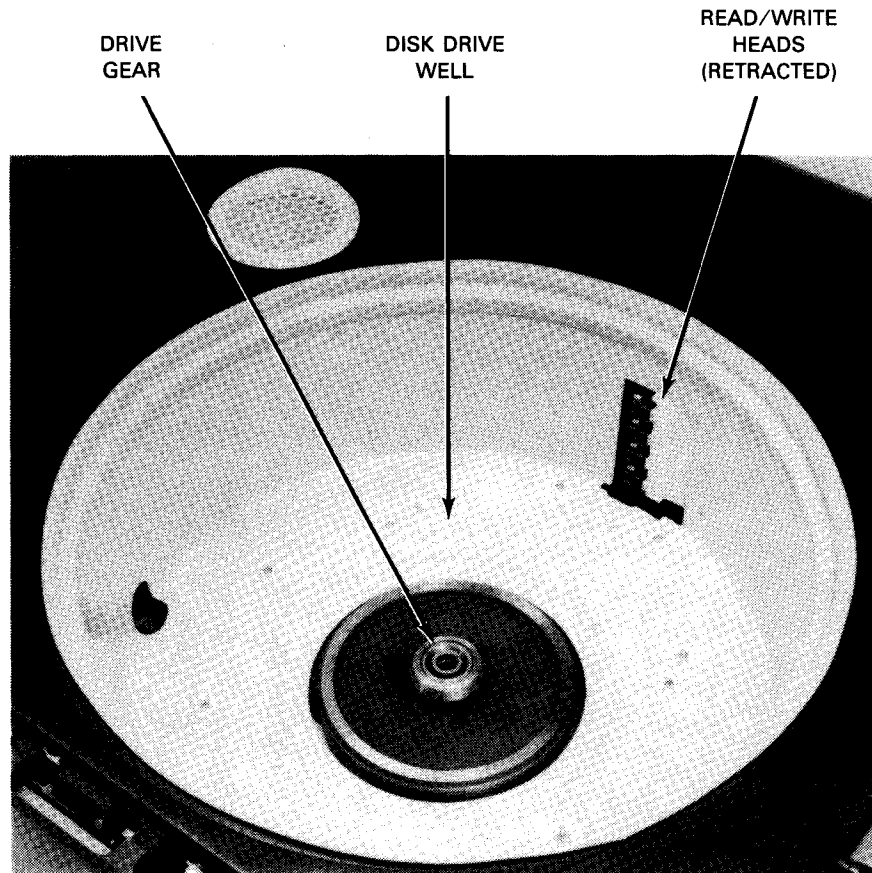


Figure 4—2. Disk Drive Well with Disk Pack Removed

4.3.2. Unloading the Disk Pack

CAUTION

Follow these precautions when unloading a disk pack:

1. *When releasing the disk pack from the drive spindle, stop rotating the disk pack cover handle (counterclockwise for removal) when one or two clicks are heard. Continuous clicking is unnecessary and may damage the spindle threads.*
2. *Do not attempt to lift the disk pack from the spindle until the disk pack is completely disengaged from the drive or damage may result to the spindle threads.*
3. *Store the removed disk pack in an environment the same as that of the disk drive.*

To remove a disk pack from the drive, proceed as follows:

1. Remove the disk drive unit from the system list of available resources by entering the proper command at the processor.
2. Press the STOP then the ON-OFF switch/indicators on the operator control panel. Note that the STOP switch/indicator lights and the ON-OFF switch/indicator flashes until the disk pack stops rotating.

NOTE:

A solenoid-operated latch prevents the disk drive unit top cover from opening until the disk pack stops rotating.

3. When the disk pack stops rotating, press the latch on the disk drive top cover and allow the cover to swing fully open.
4. Obtain the disk pack top cover identified with the disk pack in the drive well.
5. Carefully lower the top cover over the disk pack in the well until it is resting on the pack.
6. Rotate the top cover (by its handle) in a counterclockwise direction, until one or two clicks are heard.
7. Carefully lift out the disk pack (by the cover handle) from the drive well.

CAUTION

The bottom cover for the disk pack should be fit securely (step 8) to create a positive dust seal. Also, the disk drive unit top cover must be closed securely as soon as possible after removing the disk pack to reduce contamination of the well area by airborne dust particles.

8. While holding the disk pack raised, attach the bottom cover by squeezing the release latches to fit the cover; then release the latches to secure the bottom cover onto the top cover with the disk pack.
9. Close the disk drive top cover and store the disk pack with covers in a designated location.

4.4. DISK DRIVE OPERATION

Operation of the 8419 disk drive is limited to replacing the disk pack (4.3), along with observation and use of the switch/indicators on the operator control panel.

CAUTION

Do not attempt to open any of the cabinet doors, even with power off. Air within the cabinet has been purged, and the cabinet should be opened only by a Sperry Univac customer engineer.

The FILE PROTECT switch/indicator must be left in the on (lit) condition when read-only operations are made. If programming requires new data to be recorded, press the FILE PROTECT switch/indicator and note that it becomes extinguished. Return the switch/indicator to the on (lit) position upon completion of the new recording.

CAUTION

Do not allow the FILE PROTECT switch/indicator to remain off (extinguished) when not recording or portions of recorded data may be lost.

4.5. OPERATOR MAINTENANCE

The operator may use safety resets designed in the disk drive unit to restore proper operation, as well as the operator recovery procedures.

4.5.1. Unsafe Conditions

Unsafe conditions affecting operation of the disk drive unit cause the DEVICE CHECK indicator to light on the operator control panel. The unsafe condition must be cleared by the operator before operation can continue. The DEVICE CHECK indicator is then extinguished by pressing the ON-OFF switch/indicator to the off (extinguished) position, then pressing it again to the on (lit) position.

NOTE:

If the DEVICE CHECK indicator remains lit after an attempt is made to correct an unsafe condition and reset the device check indication, contact the Sperry Univac customer engineer.

An unsafe condition that can trigger a device-check condition is any of those listed in Table 4-1. If internal temperature reaches an overheat condition, power to the disk drive unit is completely turned off by heat-sensing circuits.

Table 4—1. Disk Drive Unsafe Conditions

Unsafe Condition		Reason
Number	Name	
1	Phase Locked Oscillator (PLO)	Write oscillator is not synchronized with disk pack rotation speed.
2	Write Ready	Write gate is enabled but read/write heads are not positioned on the correct cylinder.
3	AC Write	May be caused by either: <ul style="list-style-type: none"> ▪ multiple read/write heads being selected while the write gate is enabled; or ▪ no write transition being detected while the write gate is enabled, except during address mark writing.
4	Offset/Write	Write gate enabled while the programmed servo offset function is active
5	DC Write	Write current is sensed when the write gate is not enabled.
6	Disk Pack Speed	Disk pack rotation speed slows to less than approximately 90 percent of normal when read/write heads are extended.
7	Head Velocity	Read/write heads were detected as moving too fast.
8	Power	Any dc voltage supply has fallen below allowed limits.
9	Inner Guard Band Detection	The inner guard band area of the disk pack was not detected during an initial head-load or restore operation. This unsafe condition can occur only during a head-load or restore operation.

Another condition that may cause a device-check indication is damage to the disk pack. Extra care should be taken to avoid dropping or otherwise sharply jarring the disk pack because a head crash may result when the disk pack is loaded into the disk drive unit.

CAUTION

If a suspected disk pack or disk drive unit malfunction requires substitution of the disk pack or disk drive unit due to a recurring device-check condition, do not substitute disk packs or disk drive units after the first replacement. A read/write head or disk pack crash during a previous operation might have damaged the replacement disk pack, which (in turn) damaged the read/write heads in the replacement disk drive unit. Further replacements will cause further damage and eventually disable the entire subsystem, if continued. Contact the Sperry Univac customer engineer at once when the second disk pack or disk drive unit, known to be previously operative, presents a malfunction indication.

4.5.2. Safety Resets

4.5.2.1. Automatic Resets

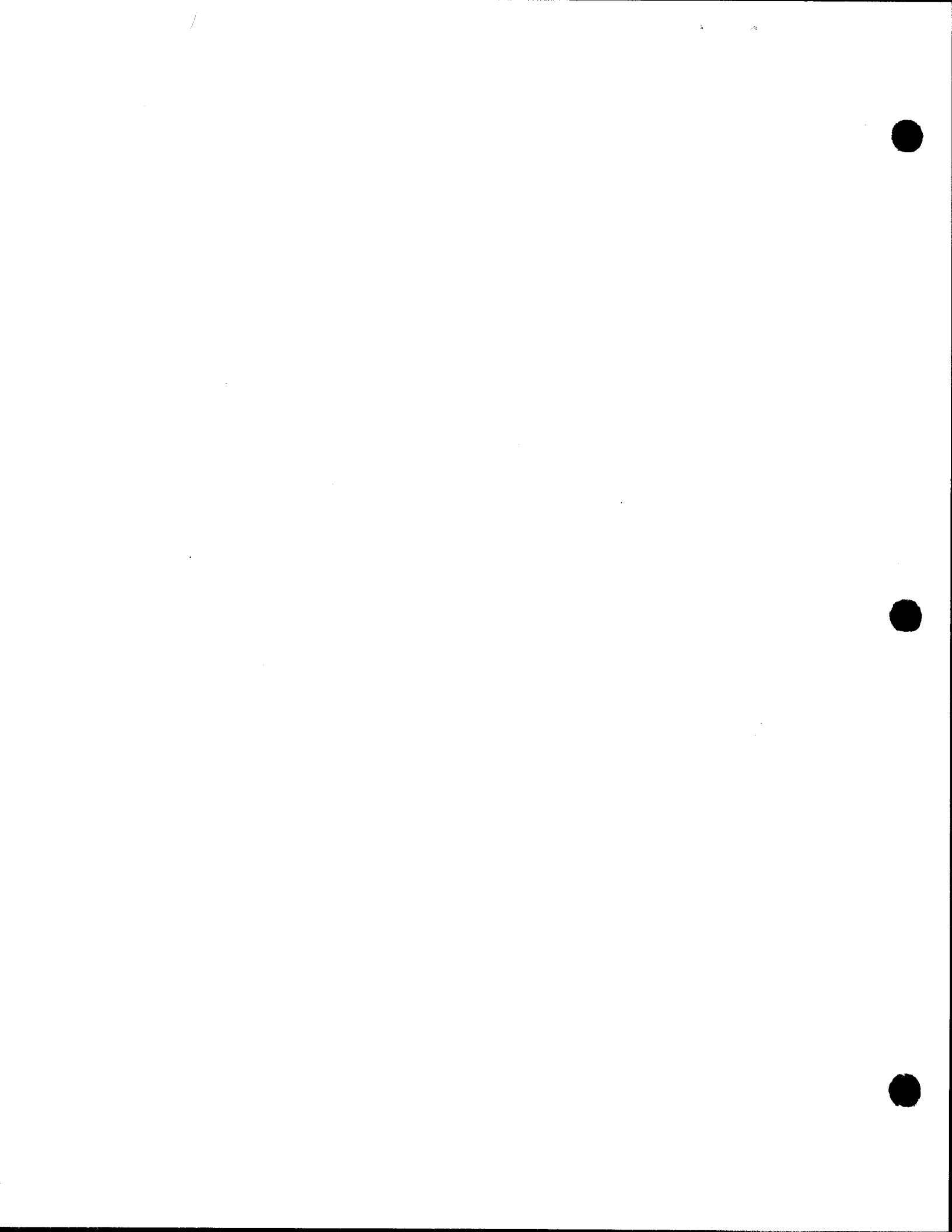
Automatic reset of the disk drive unit is attempted for unsafe conditions 1 through 4 (Table 4-1), which are considered as "soft unsafes". In any of these conditions, the DC/C informs the system of the device check conditions, and recovery procedures by system software are initiated. This operation results in deselecting and reselecting the disk drive unit by the DC/C in an attempt to reset the unsafe condition. If the reset attempt is unsuccessful, no further resetting is attempted by software and the unsafe condition resorts to a "hard unsafe", which requires operator intervention (4.5.2.2).

4.5.2.2. Operator Resets

Unsafe conditions 5 through 9 (Table 4-1) are considered hard unsafes and require the operator to attempt to reset the unsafe condition. All of these conditions cause the RUN switch/indicator to extinguish and the STOP switch/indicator to light because the module-select function for the disk drive is deselected by the DC/C. In addition, the current operation in the disk drive is terminated.

The operator may attempt to correct a hard-unsafe condition by pressing the ON-OFF switch/indicator to the off (extinguished) position, then pressing it again to the on position. If this resetting clears the problem, the DEVICE CHECK indicator extinguishes and operation may resume by pressing the RUN switch/indicator.

If the DEVICE CHECK indicator does not extinguish or if an unsafe condition recurs immediately following or during a head load, service is required by a Sperry Univac customer engineer.



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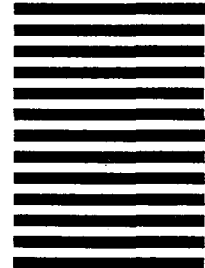
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