EK-00R80-UG-001

R80 Disk Drive User's Guide

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R80 Disk Drive User's Guide

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CHAPTER 1
INTRODUCTION

1.1 PURPOSE AND SCOPE

This manual describes the R80 Disk Drive and tells how to install, check out, and operate the equipment.

Although this manual was written primarily for the R80 user, information concerning such things as equipment installation and checkout is intended only for qualified Field Service personnel.

1.2 GENERAL INFORMATION

The R80 is a high-performance, non-removable media, free-standing disk drive that incorporates advanced technology. A data storage capacity of 124 million bytes are available in the R80 for customer information.

A key feature of the R80 is the sealed head disk assembly (HDA) which protects data and improves hardware reliability.

Performance

- 1.2 megabyte per second peak transfer rate
- 25 ms average positioning time
- 8.3 ms average rotational delay

Data Integrity

- Protected media
- Microprocessor-controlled servo
- Automatic error correction

Hardware Availability

- Proven rugged design
- Simple modular construction
- Extensive microcoded diagnostics

Since the R80 is a fixed-media device, it is important that careful planning and prudent data backup procedures be used to minimize the effect of a failure. For maximum system availability, the following provisions are recommended.

1. File Backup – Critical files should be backed up frequently. In most cases, this will involve either incremental or volume backup to a removable media device such as a magnetic tape drive.

2. Journaling – The use of journaling is recommended in transaction processing applications. This technique will allow reconstruction of files up to the last checkpoint or backup.

1.3 DRIVE DESCRIPTION

The R80 Disk Drive is a self-contained drive storage assembly which includes the HDA and associated logic. The drive logic consists of three major circuit modules:

- Servo module
- Personality module
- Microprocessor module

These modules are located directly beneath the logic access cover and are hinge-mounted to facilitate servicing (see Figure 1-1). Cooling is provided by a fan located inside the rear of the disk drive.

1.3.1 Head Disk Assembly

The sealed HDA contains the recording media (four platters), internal rotary positioner, read/write heads, and preamplifiers. Seven of the platter surfaces are used for recording data, and the eighth is preformatted with servo data. The encoded pattern on the servo surface is read continuously by a read-only servo head and is decoded by the disk drive control logic to provide head-positioning information and a write clock. Service cylinders (FE cylinders) with preformatted read/write data for diagnostic use are also provided on the recording media. All HDA servo formatting is done at the factory and should not be attempted in the field.

1.3.2 Internal Drive Diagnostics

Two groups of internal diagnostics are incorporated into the disk drive to permit error detection and fault isolation. The first group of diagnostics is run during the power-up cycle and consists of tests for hardcore faults related to the microprocessor, internal bus, read-only memories (ROMs), and random access memories (RAMs).

A second set of diagnostics has switch-selectable routines which are used for maintenance functions in the off-line mode. These switches (located on the microprocessor module inside the drive) are for Field Service use only and are not part of the regular operating controls.

All maintenance switches and front-panel switches and indicators are controlled by the microprocessor. Except for the read and write operations, the microprocessor controls and/or monitors all major functions of the disk drive. This includes drive safety monitors, error and status storage, drive control loops, and retry conditions. Read/write operations can be initiated via the microprocessor in a special diagnostic mode.

1.3.3 Recording Features

The HDA has fourteen read/write data heads and one read-only servo head arranged as shown in Figure 1-2. Two read/write heads are provided for each of the seven disk surfaces allocated for data storage, and a single read-only head reads the eighth disk surface containing encoded servo information. The heads are positioned over the desired data location by a servo-controlled rotary positioner which moves the head arms in an arc over the recording surface.

1.3.3.1 Media Format – Four disks in the HDA comprise the recording media. Each of the read/write heads can address 561 tracks which are numbered 0 through 560. Each track, in turn, is divided into fixed-length sectors. There are 30 physical sectors (numbered 0 through 29) per track when the recording media is formatted for 18-bit words, and 31 sectors (0 through 30) per track in the 16-bit format. The vertical alignment of corresponding tracks on each disk surface comprises cylinders. Each sector on a track contains specific cylinder, sector, and track information which is encoded in a header. This header also has a provision for accepting manufacturer- or user-specified codes to indicate when a sector is unacceptable for data storage.

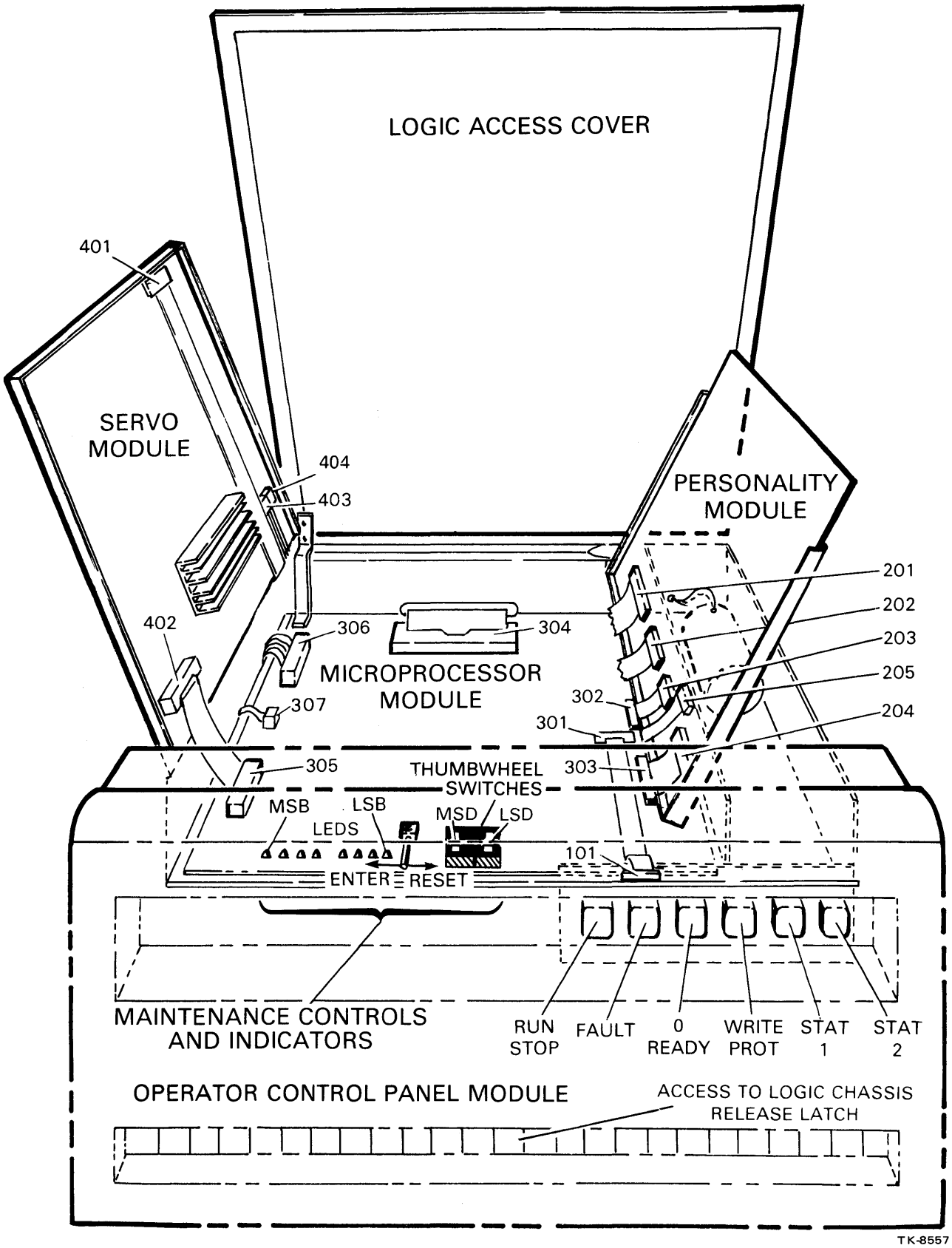


Figure 1-1 Hinged Circuit Module Arrangement

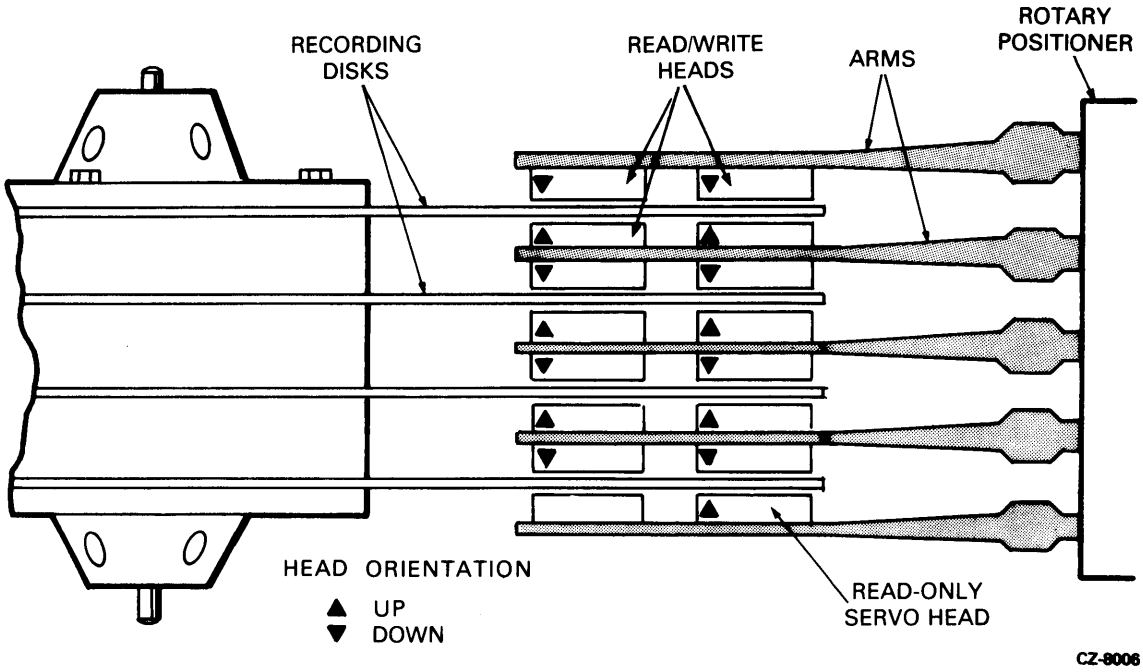


Figure 1-2 HDA Head Arrangement

1.3.3.2 Sector Format – Figure 1-3 shows the sector arrangement on the disk and a breakdown of the sector format.

Each sector is divided into two information fields separated by gaps. The header field contains address information and the data field stores the 256 words of data. The gaps between these fields provide the time necessary for the actions listed below.

- Compensation for drive mechanical tolerances
- Compensation for head switching between the read and write modes
- Phase-locked oscillator (PLO) synchronization

The gaps are generated by a disk controller, and the header and data information is provided via program control during the formatting operation.

Error detection is performed on all data and header information read from the disk. Error detection and correction operations are performed only on the data read from the disk.

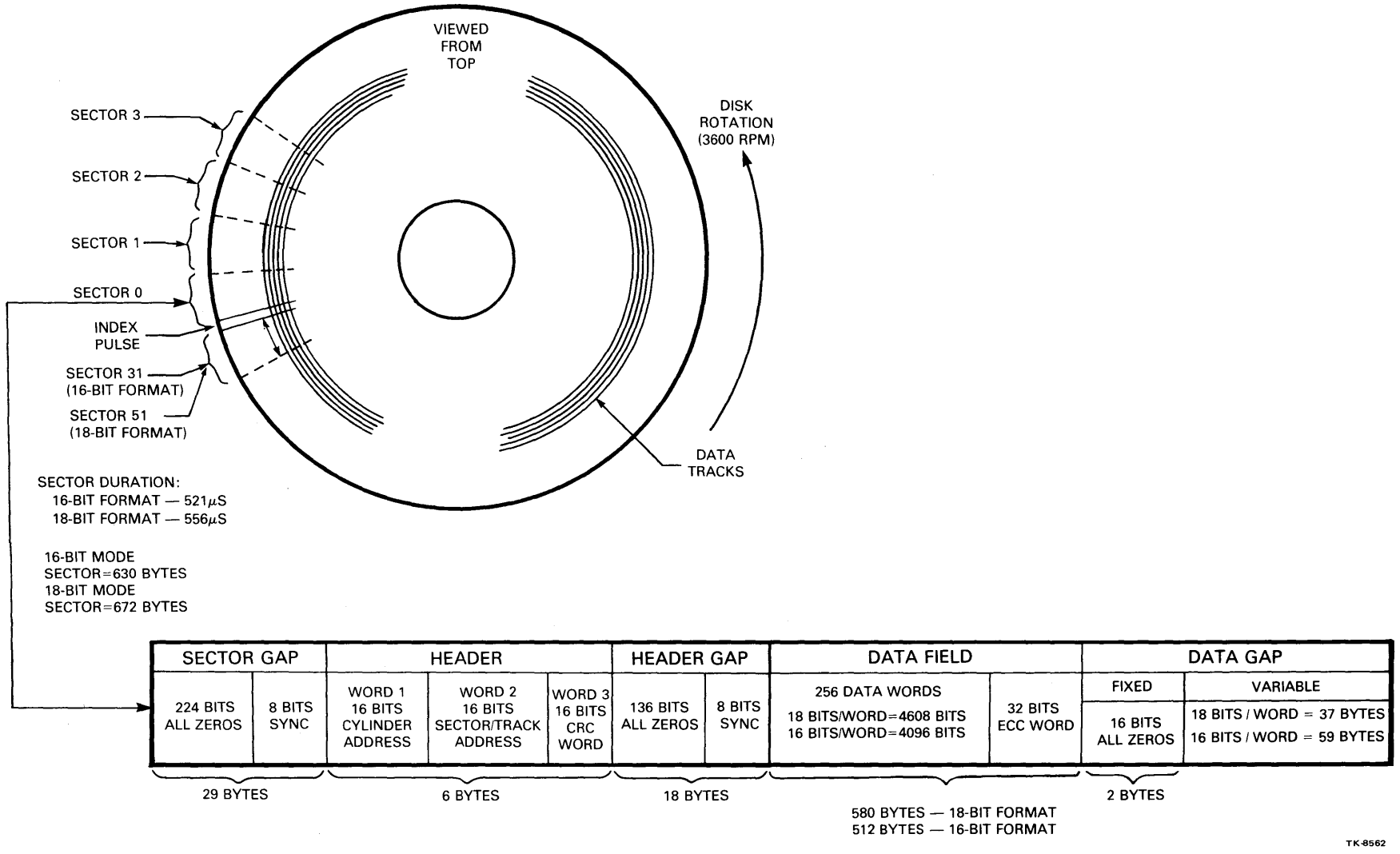


Figure 1-3 Sector Format

The five major divisions of a sector are shown in Figure 1-3 and Table 1-1 lists the overall bit/byte assignments for sectors in each of the two data word formats.

1. Sector Gap – This gap contains 28 bytes of zeros and one sync byte. The sync byte (shown in Figure 1-4) marks the beginning of valid header information.

2. Header Field – The header consists of six bytes, four of which are written by the formatter program during the format operation and two of which (CRC) are generated by a disk controller. The header field is divided into three words as listed below.

   a. First Header Word – This 16-bit, software-generated word is shown in Figure 1-4 and is described in Table 1-2.

   b. Second Header Word – This 16-bit word is shown in Figure 1-4 and is described in Table 1-3.

   c. CRC Word – This word provides a method of error detection in the reading or writing of the header data. This 16-bit word is generated by the cyclic redundancy check (CRC) circuits in a disk controller. These circuits utilize the data in the first two header words to establish the CRC word.

3. Header Gap – This gap contains 17 bytes of zeros and 1 sync byte. The sync byte (shown in Figure 1-4) signifies the beginning of valid data information.

4. Data Field – The data field is composed of 256 words of data and a 4-byte error correction code (ECC) word. There are 580 bytes of data in the 18-bit format and 512 bytes in the 16-bit format. The data bytes are provided by the software (through the controller), and the 4 ECC bytes are generated by the ECC circuits in a disk controller. The 32-bit ECC word, which is derived from the data, is considered part of the data field and is used to detect and correct errors in the reading of the data words.

5. Data Gap – This gap consists of two bytes of zeros, followed by a gap area of zeros whose length depends upon the word format used. Refer to the sector format in Figure 1-3 for more details.

Table 1-1 Assignment of Bits/Bytes in Sectors

	18-Bit Word Format		16-Bit Word Format	
Sector Location	**Bytes**	**Bits**	**Bytes**	**Bits**
Sector Gap	29	232	29	232
Header Field	6	48	6	48
Header Gap	18	144	18	144
Data Field	580	4640	512	4128
Data Gap				
Fixed	2	16	2	16
Variable	37	296	59	472
Total Per Sector	672	5376	630	5040

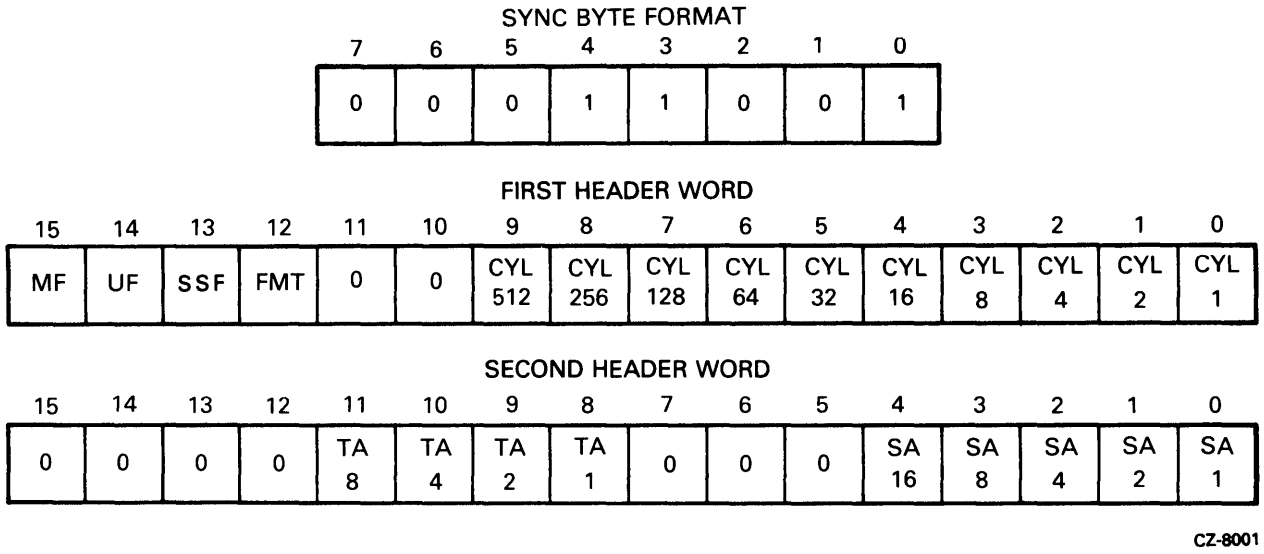


Figure 1-4 Header Bits and SYNC Byte Format

Table 1-2 First Header Word Address Bit Assignments

Bit	Name	Description
0–9	CYL	These ten bit locations comprise the cylinder address. Any number from 0–560 is valid. Bit 0 is the least significant bit.
10, 11	Unused	Always zeros.
12	FMT	This bit signifies whether the data field is formatted using 18-bit words or 16-bit words. A 0 indicates the 18-bit format; a 1 indicates the 16-bit format.
13	SSF	This bit indicates whether or not the sector is to be skipped due to a defect. A 1 indicates a skip condition; a 0 indicates normal use of the sector.
14	UF	This is the location where the user can identify that this sector is bad. A 0 indicates a bad sector; a 1 indicates a good sector.
15	MF	This location is used by the disk manufacturer to indicate a bad sector. A 0 indicates a bad sector; a 1 indicates a good sector.

Table 1-3 Second Header Word Address Bit Assignments

Bit	Name	Description
0–4	SA	These five bits contain the address of the desired sector. Valid decimal numbers are 0–29 for 18-bit formats and 0–30 (31 if the skip sector function is enabled) for 16-bit formats.
5–7	Unused	Always zeros.
8–11	TA	These four bits contain the track address.
12	Unused	Reserved for future use.
13–15	Unused	Always zeros.

1.3.3.3 Skip-Sector Feature – The R80 also incorporates a skip-sector feature which is implemented in the 16-bit word format. The skip-sector scheme increases the ability of the drive to compensate for bad spots encountered on the recording surfaces and operates independently of the user's and manufacturer's bad spot provisions described in Table 1-2.

In the 16-bit word format, the last sector on each data track is reserved for use as a replacement in the event that a bad spot in a previous sector is encountered. If a sector has a defect, that sector is skipped (as a combined function of software and hardware) and the next one is used instead. Thus, the contents of each sector is shifted by one from the point of the defect until the end of the track where the reserved sector is used as the replacement. Therefore, although there are 32 physical sectors on each track in the 16-bit format, only 31 can be utilized for data storage.

NOTE

In no instance should the user attempt to write into a reserved sector or into any of the service (FE) cylinders (559 and 560).

1.4 RELATED DOCUMENTATION

Table 1-4 lists documents that will supplement the information in this *User's Guide.*

Table 1-4 Related Documentation

Manual Title	Part Number
R80 Disk Drive Technical Description	EK-00R80-TD-001 (hard copy)
R80 Disk Drive Pocket Service Guide	EK-00R80-PS-001 (hard copy)
R80 Disk Drive Illustrated Parts Breakdown	EK-00R80-IP (microfiche)
R80 Disk Drive Service Manual	EK-00R80-SV-001 (hard copy)
RM80 Field Maintenance Print Set	MP-00875 (hard copy)

1.5 R80 SPECIFICATIONS

Table 1-5 contains the primary performance, power, environmental, and physical characteristics of the R80 Disk Drive.

1.6 R80 DISK DRIVE OPTIONS

The R80 options are specified according to their power requirements as follows:

R80–AA	120 Vac @ 60 Hz
R80–AD	220–240 Vac @ 50 Hz

Table 1-5 R80 Specifications

Characteristic	Specification
Data Storage Capacity (Single Drive)	
16-bit word format	124 MB
Bits per inch (inner track)	6339
Tracks per inch	478
Head Disk Assembly (HDA)	
Disk recording method	Modified Frequency Modulation (MFM)
Number of disks	4
Disk surfaces	7 data, 1 servo
Number of heads	14 data, 1 servo
Heads per disk surface	2
Number of tracks	561 per head
Logical cylinders	561 per head
Number of sectors	
16-bit word format	30 sectors
Seek Time	
Maximum seek	
All cylinders	50 ms
One cylinder	6 ms
Average seek	25 ms
Latency	
Speed	3600 r/min + 4.2%, − 3.5%
Maximum latency	16.6 ms ± 2.5%
Average latency	8.33 ms
Start/Stop Time	
Start	
Maximum	40 seconds
Typical	20 seconds
Stop	
Maximum	13 seconds
Typical	9 seconds
Inhibit between stop and restart	3 minutes
Data Rates	
Bit cell time	103.3 ns
Bit rate	9.677 MHz
Word rate (16-bit)	1.65 microseconds
Word rate (18-bit)	1.86 microseconds
Error Detection/Correction Method	32-bit burst error correcting code (ECC)
Correction time	4.47 ms (maximum)

Table 1-5 R80 Specifications (Cont)

Characteristic	Specification
R80 Environmental Limits	
Temperature	
Operating	10°C (50°F) to 40°C (104°F) with a temperature gradient of 20°C/hour (36°F/hour)
Non-operating	−40°C (−40°F) to +60°C (+140°F)
Relative humidity	
Operating	10% to 85% (non-condensing) with a maximum wet bulb temperature of 28°C (82°F) and a minimum dewpoint of 2°C (36°F)
Shipping and storage	10% to 85% with no condensation
Heat dissipation	1962 BTU/hr (approximately)
Altitude	
Operating	Sea level to 2400 meters (8000 feet) Note: Maximum allowable operating temperatures are reduced by a factor of 1.8°C/1000 meters (1°F/1000 feet) for operation above sea level.
Non-operating and shipping	300 meters (1000 feet) below sea level to 3600 meters (12,000 feet) above sea level (actual or effective by means of cabin pressurization)
Physical Characteristics	
Overall dimensions	
Height	26 cm (10.38 in.)
Width	44 cm (17.50 in.) 48 cm (18.88 in.) including bezel
Depth	67 cm (26.50 in.) 71 cm (28.12 in.) including bezel
Weight	61.2 kg (135 lbs) approximately
Electrical	
Voltages available (single phase)	120 Vac + 8, − 18; 60 Hz ± 1 Hz 220–240 Vac + 17, − 27; 50 Hz ± 1 Hz

Table 1-5 R80 Specifications (Cont)

Characteristic	Specification
Input Power (Maximum)	
R80–AA	
120 Vac, 60 Hz	575 watts
R80–AD	
220–240 Vac, 50 Hz	575 watts
Starting current for:	
120 Vac, 60 Hz	35 A for 4 seconds
220–240 Vac, 50 Hz	18 A for 4 seconds
Running current for:	
120 Vac, 60 Hz	5.2 A rms
220–240 Vac, 50 Hz	2.75 A rms
Plug type	
120 Vac, 60 Hz	NEMA 5-15P (see Figure 2-1)
220–240 Vac, 50 Hz	NEMA 6-15P (see Figure 2-1)

CHAPTER 2
INSTALLATION

2.1 SITE PREPARATION AND PLANNING

A certain amount of preparation and planning is necessary before installing the R80 Disk Drive. The paragraphs that follow outline some of the things that should be considered.

WARNING

Hazardous voltages are present inside this equipment. Installation and servicing should be performed by a qualified and trained service representative. Bodily injury or equipment damage may result from improper servicing. Refer to the *R80 Disk Drive Service Manual* for proper instructions.

2.1.1 Environmental Considerations

The R80 is designed to operate in a business or light industry environment. Although cleanliness is important in the installation of any computer system, it is even more significant when disk drives are involved.

2.1.1.1 Cleanliness – Since the R80 has a sealed HDA, dust and dirt particles are not likely to enter the area containing the recording media. However, it is still desirable that the equipment be operated in an environment having less than five million particles (0.5 micron or larger in diameter) per cubic foot of air. Under these conditions, the air filtering system of the disk drive can maintain the particle count within acceptable limits.

2.1.1.2 Space Requirements – Provision should be made for service clearances of 1 meter (approximately 39 inches) at the front and rear of the rack or cabinet in which the disk drive is mounted.

2.1.1.3 Floor Loading – The weight of one R80 cabinet (approximately 61.2 kg/135 lbs) will not place stress on most office building, industrial plant, or raised computer room floors. However, the added weight of multiple cabinets and drives should be considered in relation to the weight of existing computer systems, plus the need for possible expansion.

2.1.1.4 Heat Dissipation – The heat dissipation of each R80 Disk Drive may reach approximately 1962 BTU/hour. The approximate cooling requirements for the overall system can be calculated by multiplying this figure by the number of drives, adding the result to the total heat dissipation of the other system commponents, and then adjusting the total figure to compensate for personnel, cooling system efficiency, etc.

2.1.1.5 Acoustics – Most computer sites require some degree of acoustical treatment. However, the R80 will not contribute unduly to the overall system noise level. If any acoustical materials are used, ensure that they do not produce or harbor dust.

2.1.1.6 Other Considerations – Temperature, humidity, and altitude limits must also be considered prior to installing the R80 Disk Drive. For the figures on environmental characteristics, refer to Table 1-5.

2.1.2 Power and Safety Precautions

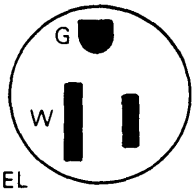
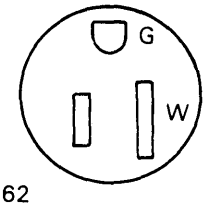
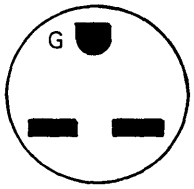
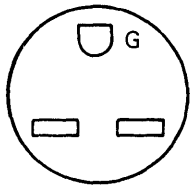
The R80 presents no unusual or additional fire or safety hazards to an existing computer system. The ac power wiring should be carefully checked, however, to ensure that its capacity is adequate for any future system expansion.

2.1.3 AC Power Wiring

The wiring used by Digital Equipment Corporation conforms to UL, CSA, and VDE standards. This means that the wire used as equipment ground is green and yellow. The ground lead carries no load current (except in an emergency), but does carry leakage current. All equipment is shipped with a grounding connection on its frame.

The ac return line (also called the "identified" conductor, neutral, common, cold lead, etc.) is blue. The ac return line must not be used to ground equipment; its purpose is to conduct current.

The ac input line (hot wire) is brown. Its purpose is to supply current to the system. The ac plugs and receptacles used on the R80 are shown in Figure 2-1.

SOURCE	PLUG	RECEPTACLE
120 V 15 A 1-PHASE	 HUBBEL #5266-C NEMA #5-15P DEC #90-08938	 #5262 5-15R 12-05351
240 V 15 A 1-PHASE	 NEMA #6-15P DEC #90-08853	 6-15R 12-11204

MA-0913

Figure 2-1 Approved Electrical Plugs and Receptacles

2.2 EQUIPMENT UNPACKING AND EXTERNAL INSPECTION

All unpacking, inspection, and installation is to be performed only by qualified Digital Equipment Corporation Field Service personnel. When delivered, the R80 is enclosed in a cardboard carton attached to a shipping skid. To unpack the equipment, proceed as follows:

1. Check the outside of the container for damage.
2. Remove the plastic straps that secure the shipping carton to the skid.
3. Remove the lid from the top of the carton.
4. Remove the staples that fasten the carton flanges to the skid.
5. Remove the entire shipping carton.
6. Check every item (hardware, cables, manuals, etc.) against the packing slip.
7. Check the disk drive for shipping damage. All damage claims should be filed promptly with the carrier responsible for handling the equipment. Keep all packing material and receipts whenever a damage claim is filed.

2.3 INSTALLATION PROCEDURE

All equipment installation, checkout, and servicing should be performed only by qualified Field Service personnel. When installing and servicing this equipment, care should be exercised to prevent contact with hazardous voltages which are present inside the cabinet.

The R80 Disk Drive may be shipped in a rack or cabinet as an integral part of a system, or it may be shipped in a separate container for addition to an existing system. If the disk drive is to be installed in an existing rack or cabinet, refer to the specific installation procedures provided in the applicable system *Installation Guide*. The procedure for preparing the disk itself is as follows:

1. Extend (withdraw) the disk drive to the lock position. Ensure that the back hinge is completely exposed.
2. Unlock the logic access cover on the top of the drive and raise the cover. Figure 2-2 shows where to unlock the logic access cover for early-model drives, using an Allen wrench, whereas Figure 2-3 shows where to unlock the logic access cover for late-model drives, using a flat-tip screwdriver. To unlock the logic access cover for late-model drives, perform the following steps:
    a. Insert the screwdriver blade between the metal tab and the outer edge of the slot.
    b. Tilt the screwdriver toward the side of the drive until the cover pops up.
    c. Repeat Steps 2a and 2b above for the opposite side.

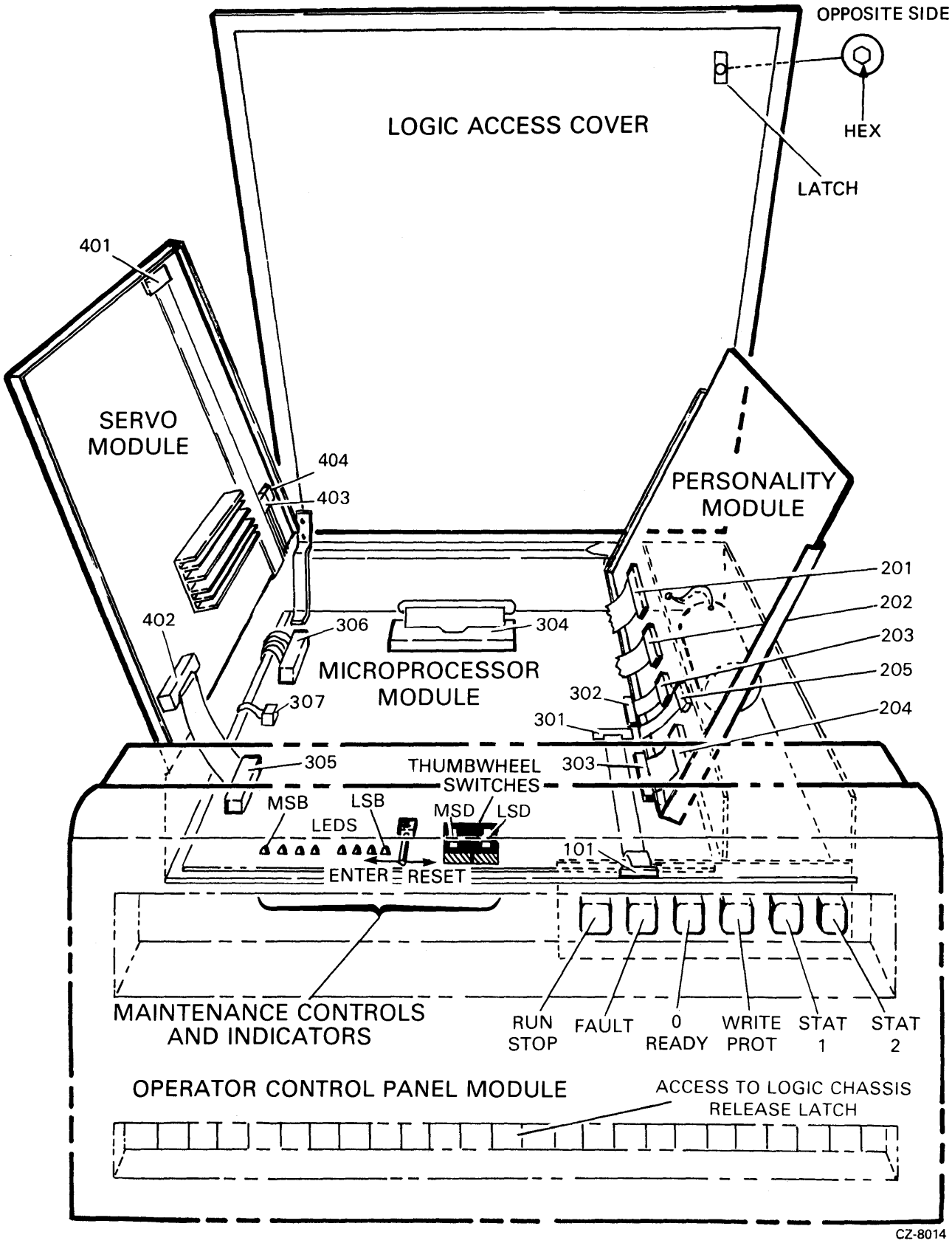


Figure 2-2 R80 Logic Chassis (Early Model)

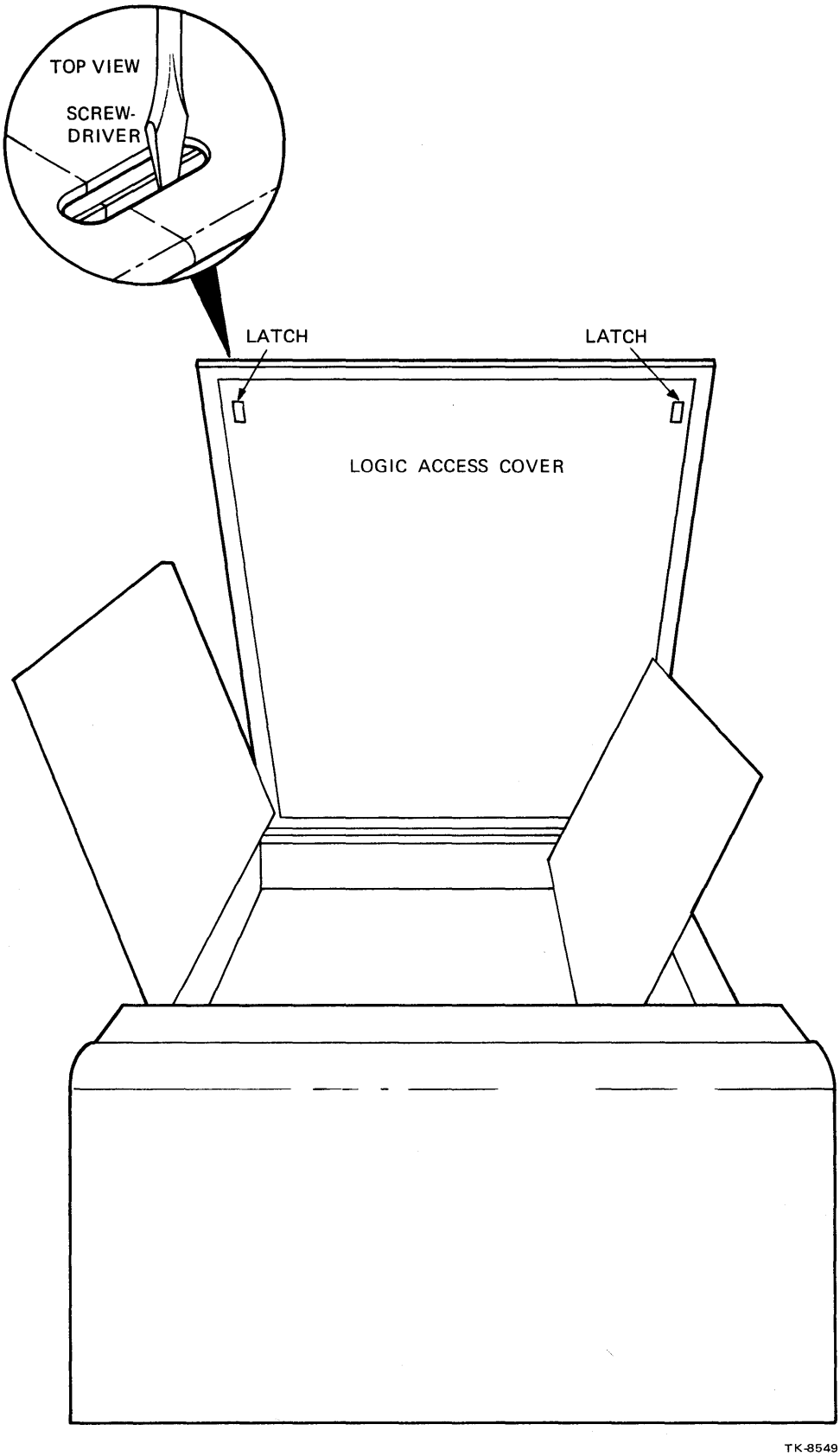


Figure 2-3 R80 Logic Chassis (Late Model)

3. Remove the packing material from between the logic access cover and the circuit modules and from between the modules themselves. Save this packing material for future use.

4. Fold out the hinged circuit board modules and check to ensure that all cable connectors (see Figure 1-1) are firmly seated.

5. Return the circuit board modules to their original horizontal position. Close the logic access cover and secure the latch on the cover with the Allen wrench (early models).

6. Release the logic chassis assembly (using a small screwdriver) by depressing the latch located behind the bezel (refer to Figure 2-4). With the latch released, raise the assembly as high as it will go.

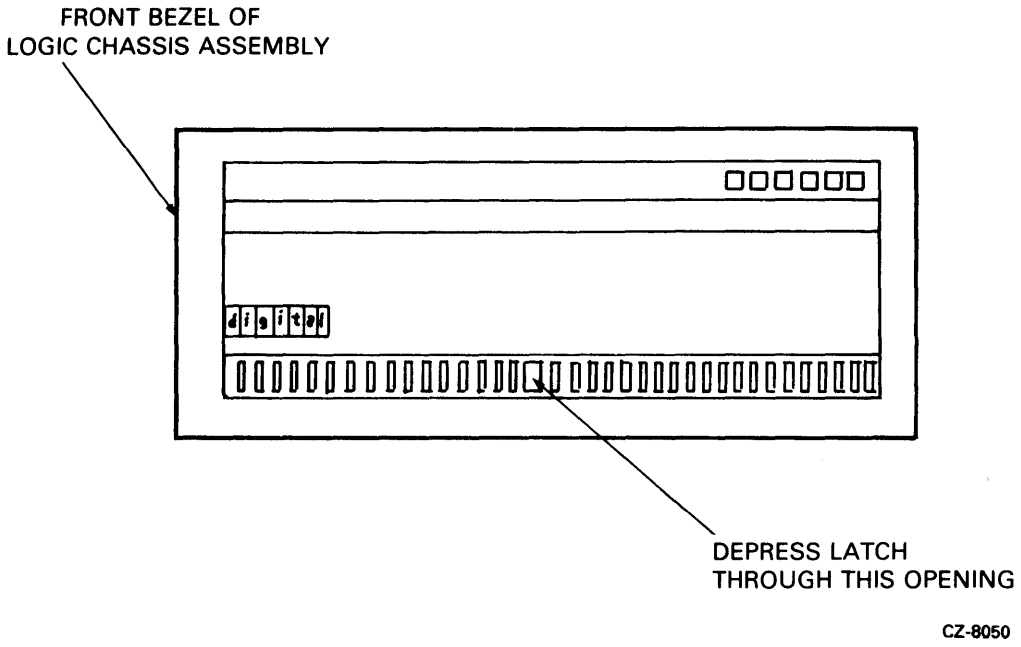


Figure 2-4 Method of Releasing the Logic Chassis Assembly

7. Remove the four red shipping brackets which secure the HDA to its mountings (refer to Figure 2-5A). To do this, loosen each of the four HDA mounting nuts and completely remove the 5/16-inch hex-head bolts on three of the HDA mountings (Figure 2-5C). Slide the three shipping brackets out from under the HDA mounting nuts.

8. Remove the shipping bracket nearest the spindle motor by completely removing the shipping bolt and jam nuts which secure the bracket to the spindle motor assembly (refer to Figure 2-5A). Slide the shipping bracket out from under the HDA mounting nut.

NOTE

Save all shipping brackets and hardware for future use when moving equipment.

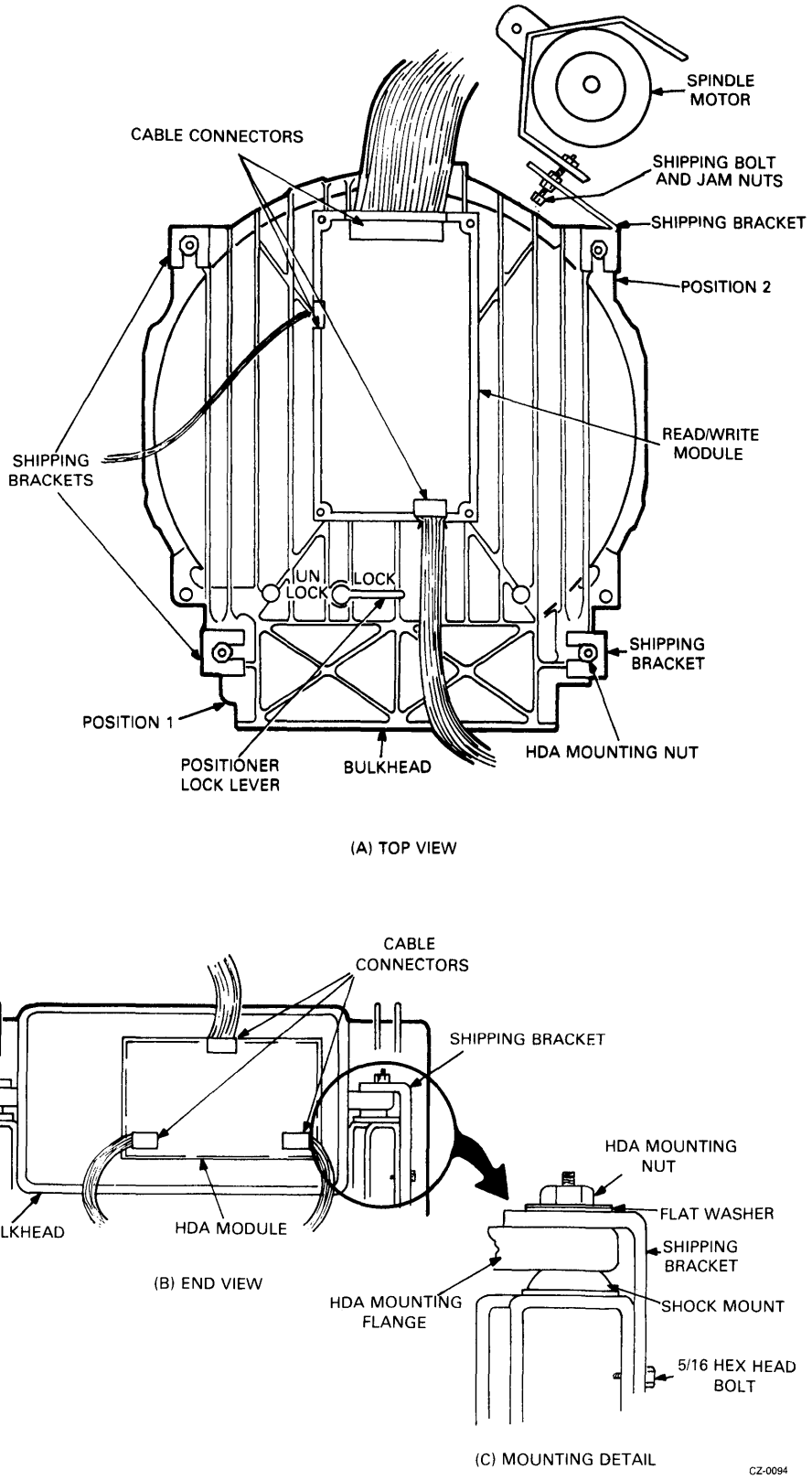


Figure 2-5 HDA Details

9. Retighten all four HDA mounting nuts.

10. Ensure that all three cable connections to the read/write module (Figure 2-5A) and HDA module on the HDA bulkhead (Figure 2-5B) are secure.

11. Place the positioner lock lever (Figure 2-5A) in the UNLOCK position.

12. Ensure that the belt tension lever is in the locked (forward) position, as shown in Figure 2-6, so that belt tension is applied.

NOTE

An interlock switch (shown in Figure 2-6) prevents the spindle motor from operating while the belt tension is released. A spin-up cannot be accomplished unless the belt-tension lever is in the full forward position.

13. Lower the logic chassis assembly into place. The latch will automatically secure the assembly when it is lowered.

14. Reseat the disk drive back in the cabinet or rack.

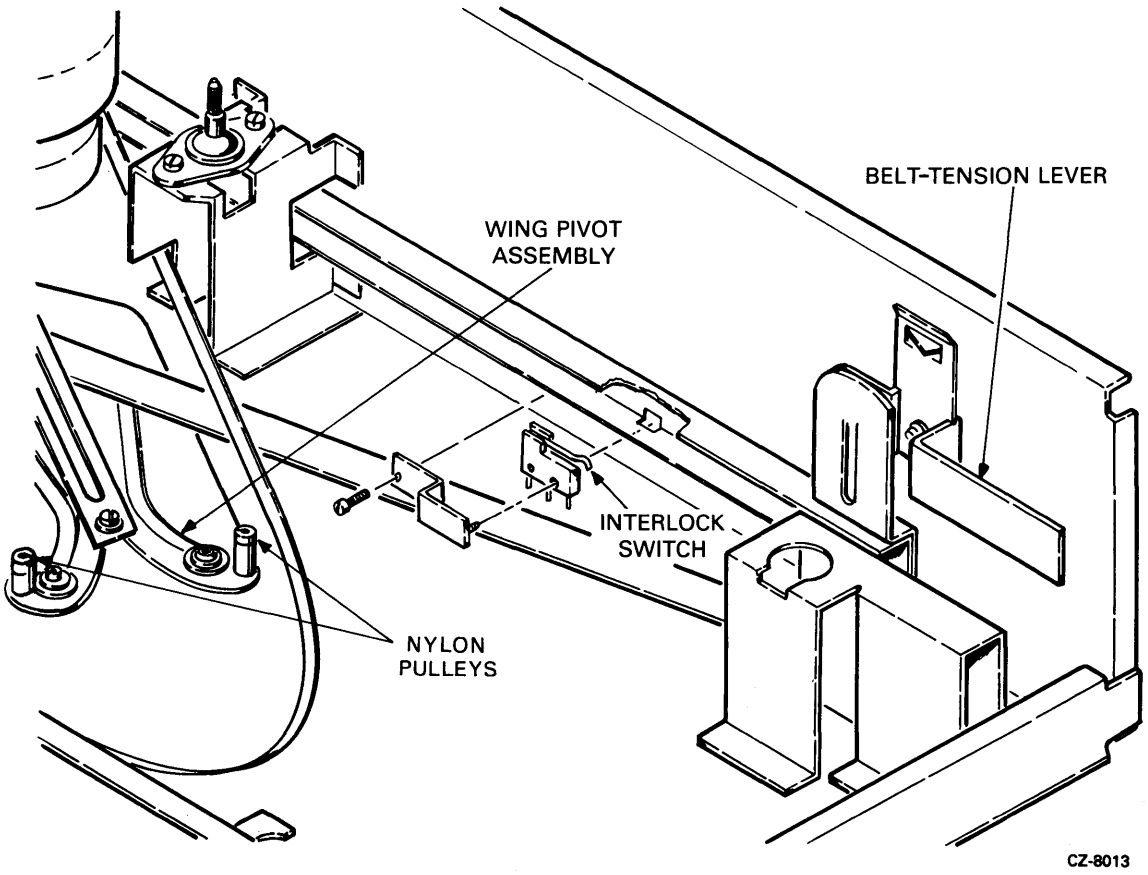


Figure 2-6 Belt Tension Lever and Interlock Switch

2.4 R80 CHECKOUT PROCEDURE

2.4.1 Applying Power

1. Plug the R80 Disk Drive power cord into one of the switched ac power outlets on the system cabinet.

2. Ensure that the WRITE PROTect switch is NOT actuated and the indicator light is out. Otherwise the disk drive will fail internal diagnostics upon powerup.

3. Place the ac power circuit breaker (CB1) at the rear of the R80 Disk Drive in the ON position.

2.4.2 Microcode Diagnostic Checkout Procedure

To check out the operation of the R80 Disk Drive using the microcode diagnostics, follow the flow diagram in Figure 2-7 and the descriptions for each step contained in the following paragraphs.

1. Apply power to the drive by placing the circuit breaker on the rear panel of the drive (Figure 3-3) in the ON position. (The circuit breaker is accessible through the access cutout in the rear cover assembly.) The drive blowers will start to operate.

NOTE

The hardcore diagnostics are run automatically as soon as the drive circuit breaker is turned on. All front panel lights will come on momentarily during the hardcore tests.

2. The hardcore diagnostics check for faults related to the internal drive microprocessor, microprocessor bus, read-only memories, and random access memories. If the hardcore diagnostics complete successfully during powerup, all the front panel lights will go off. If all the lights do not go off, refer to the *R80 Disk Drive Service Manual* for corrective action.

3. Go off-line to perform the static logic tests. To place the drive off-line, perform the steps listed below.

   a. Open the logic access cover and fold out the circuit modules to gain access to the maintenance controls and indicators on the microprocessor module (refer to Figure 1-1).

   b. Set the thumbwheel switches on the maintenance panel to "FF."

   c. Push the ENTER/RESET switch to the ENTER (E) position momentarily and then release. The LEDs will blink "FF" (1111 1111 binary).

   d. Push the ENTER switch again and release. The LEDs should now display a steady-state "FF" (1111 1111 binary).

   e. Turn thumbwheel switches to "00."

   f. Push the ENTER/RESET switch and release. The LEDs will display a steady-state "00" (0000 0000 binary).

   g. Push the ENTER switch again and release. The LEDs will display the "EC" (1110 1100 binary) prompt to indicate that the firmware is waiting for a test select code.

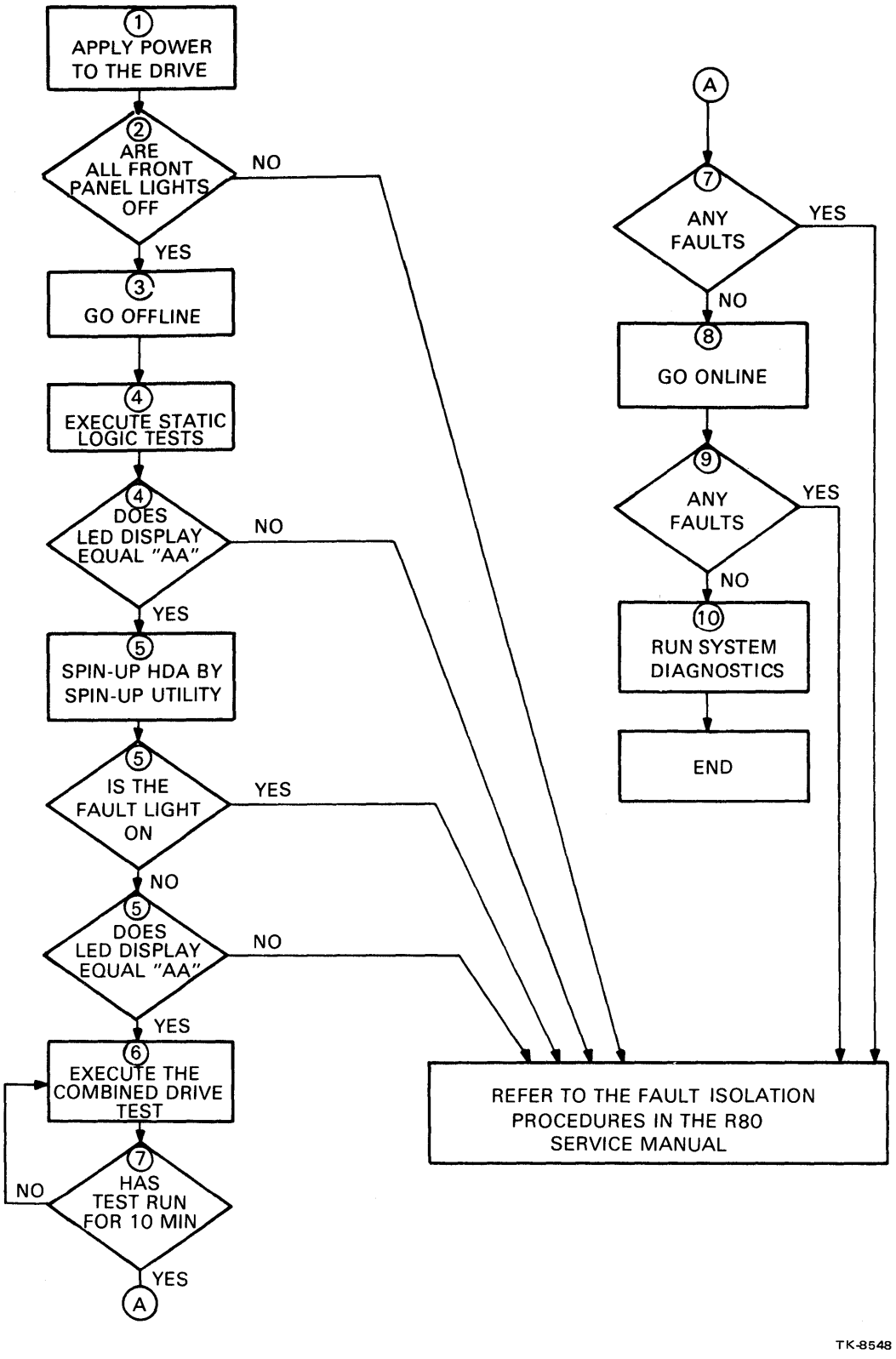


Figure 2-7 Microcode Diagnostic Checkout Procedure

If the above sequence is not followed exactly, the test will fail and the LEDs will display a blinking "FF." If this is the case, return to Step 3b and begin again.

4. Execute the static logic tests as described below.

   a. Set the thumbwheel switches to "22."

   b. Push the ENTER switch and release. The LEDs will momentarily display "22" (0010 0010 binary).

   c. If no errors are encountered, the LEDs will then display "AA" (1010 1010 binary). If any display other than "AA" is observed, refer to the *R80 Disk Drive Service Manual* for corrective action.

   d. Push the ENTER switch and release. The LEDs should blink "EC" (1110 1100 binary).

5. Spin up the HDA while the drive is off-line. To do this, proceed as described below.

   a. Depress the RUN/STOP switch on the operator control panel (refer to Figure 3-1).

   b. Set the thumbwheel switches to "1E."

   c. Push the ENTER switch and release. The LEDs will momentarily display "1E" (0001 1110 binary), then "E7" (1110 0111 binary), and the spin-up sequence will begin.

      The RUN indicator on the operator control panel will come on and the LEDs will display "AA." If the LED display is not "AA," refer to the *R80 Disk Drive Service Manual* for corrective action.

   d. Push the ENTER switch and release. The LEDs should blink "EC."

6. Run the combined drive test for 10 minutes. To perform this test, set the loop mode to loop but to halt on errors. To set the loop mode, proceed as described below.

   a. Set the thumbwheel switches to "CF."

   b. Push the ENTER switch and release. The LEDs will momentarily blink "CF" (1100 1111 binary), then the display will blink "01" (0000 0001 binary).

   c. Set the thumbwheel switches to "4F."

   d. Push the ENTER switch and release. The LEDs will momentarily display "4F" (0100 1111 binary) and then a steady-state display of "AA."

   e. Push the ENTER switch and release. The LEDs should now display "EC," indicating that the drive has successfully been placed in the desired mode.

   To perform the combined drive test, proceed as described below.

   a. Set the thumbwheel switches to "25."

   b. Push the ENTER switch and then release. The LEDs will momentarily display "25" (0010 0101 binary) and then "E7" (1110 0111 binary).

7. Run this test for 10 minutes. If a fault/error occurs during this time, the test will halt and an error code will be displayed by the LEDs. In the event of an error, refer to the *R80 Disk Drive Service Manual* for corrective action. If no errors occur, terminate the combined drive test as described below.

   a. Set the thumbwheel switches to "DD."

   b. Hold the ENTER/RESET switch in the ENTER (E) position until the LED displays "AA" (1010 1010 binary). Then release the ENTER switch. The LEDs should now blink "EC," indicating that the test has been terminated and that the firmware is ready to receive another ENTER command.

CAUTION

Do not push the RESET switch while these diagnostics are being executed. Doing so could damage the HDA.

8. Put the drive back on-line by using the procedure described below.

   a. Set the thumbwheel switches to "1D."

   b. Push the ENTER switch and release. The LEDs will momentarily display "1D" (0001 1101 binary) and then "E7" (1110 0111 binary).

   c. Set the thumbwheel switches to "00."

   d. Push the ENTER switch and release. The READY indicator on the operator control panel will light as soon as the drive is back on-line.

NOTE

If Sequence Pick or Sequence Hold is missing during Step 8d, the drive will sequence down, the RUN light will go off, and "05" will be displayed by the LEDs.

9. If any faults occur in going back on-line, refer to the *R80 Disk Drive Service Manual* for corrective action.

10. Run the system diagnostics, if applicable.

CHAPTER 3
OPERATING INSTRUCTIONS

3.1 OPERATOR CONTROLS AND INDICATORS

Operating controls for the R80 are located on the front and rear panels of the disk unit.

3.1.1 Front Panel Controls and Indicators

The paragraphs that follow describe the function of each control and indicator located on the front panel of the disk unit (Figure 3-1).

3.1.1.1 RUN/STOP Switch and Indicator – This is a two-position pushbutton with a built-in indicator lamp. In the RUN position (button pushed in), the switch indicator lights up and a spin-up sequence begins if all power has been turned on and no faults are detected. An automatic spin-up attempt will be made following power interruptions as long as the switch remains in this position.

NOTE

A three-minute delay is recommended between each stop and restart to prevent opening the thermal circuit breaker associated with the spindle motor.

In the STOP position (out), power to the spindle motor is turned off. As soon as spindle rotation stops, the RUN/STOP indicator goes off.

3.1.1.2 FAULT Indicator and Reset Switch – This is a momentary contact pushbutton switch with a built-in indicator lamp. The FAULT indicator lights up whenever a device unsafe or error condition (refer to Paragraph 3.1.3) occurs within the disk drive. If a fault occurs during a spin-up attempt, the spin-up will be aborted.

The FAULT indicator and five other front panel indicators also provide a lamp display code that identifies various faults and errors as they occur. (Fault code identification is discussed in Paragraph 3.1.3.)

3.1.1.3 READY Indicator – The READY indicator comes on following a successful (fault-free) spin-up sequence, indicating that the drive is up to speed and ready to receive commands. The READY indicator goes off during seek operations.

The numbered switch cap over the READY indicator lamp also serves as a logic plug which distinguishes one drive unit from another in multi-drive arrangements. Eight different switch caps, each with a unique cam configuration, set up a unit code corresponding to the drive number when plugged into the mating cam-encoded switch located behind the READY indicator lamp. Drive selection is accomplished when the address on the drive select lines matches the code established by the switch cap (refer to Figure 3-2).

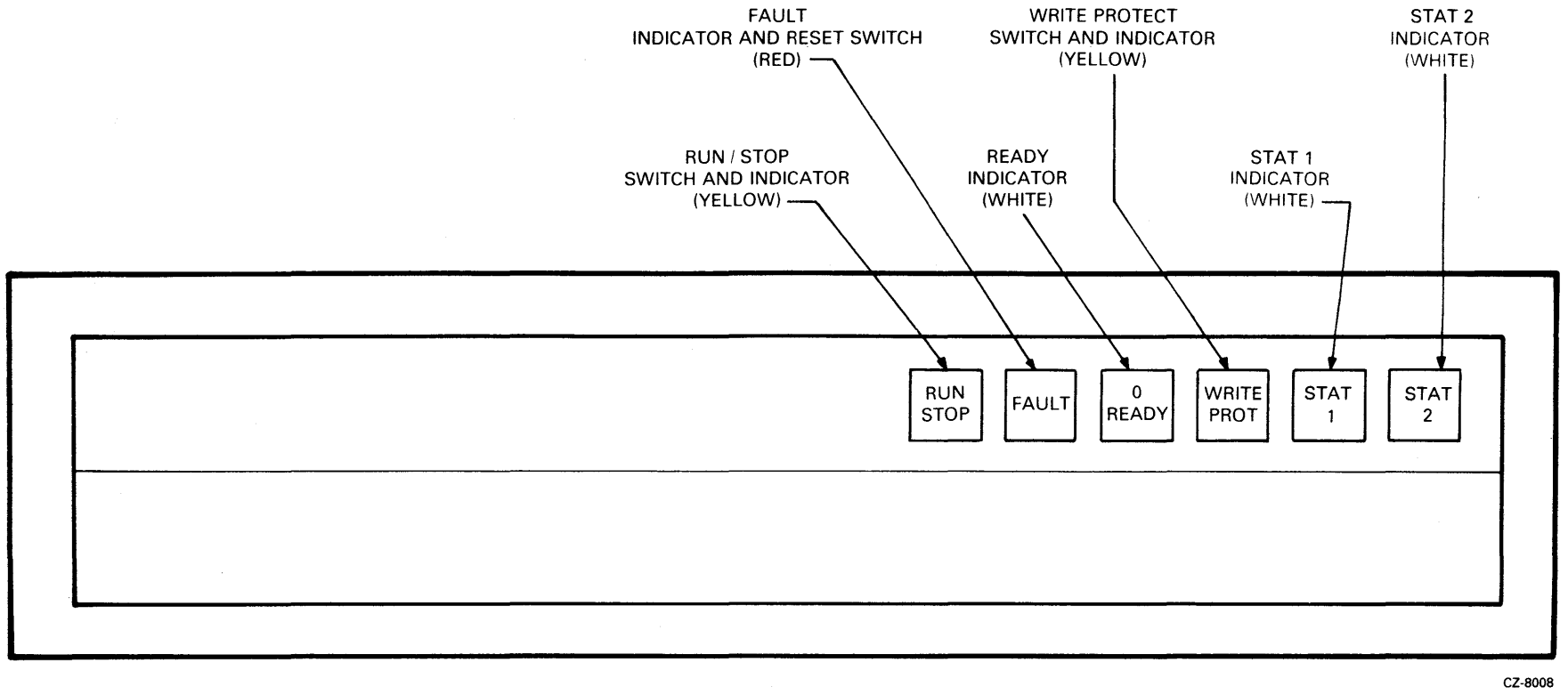


Figure 3-1 Front Panel Controls and Indicators

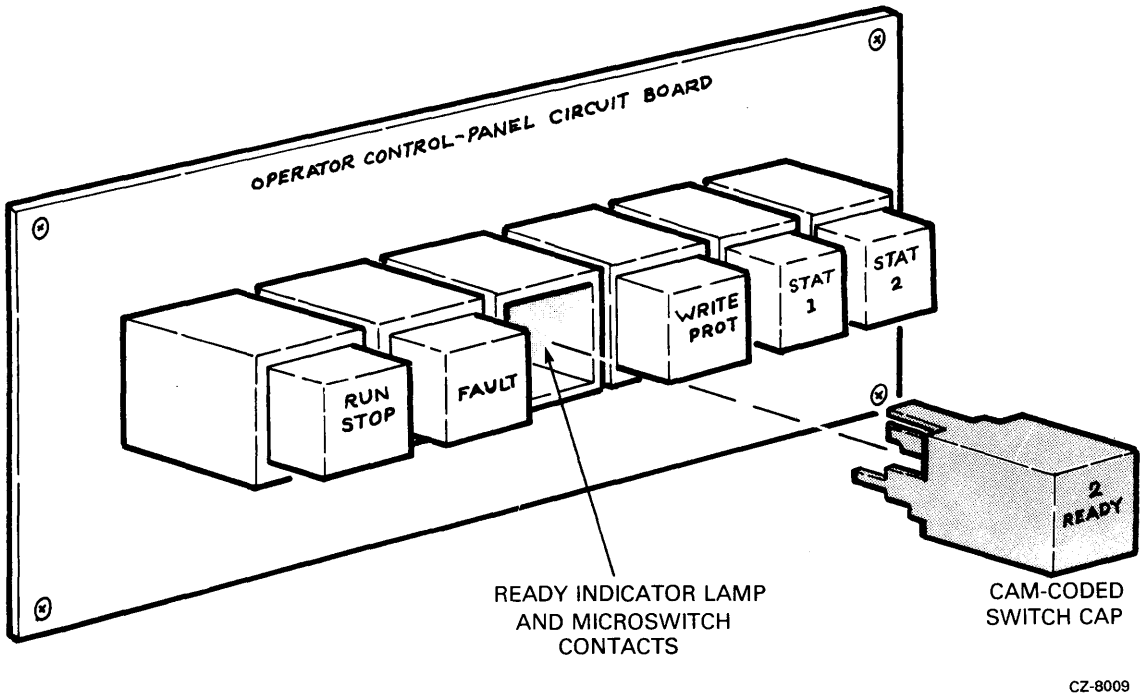


Figure 3-2 Cam-Coded Switch Cap

3.1.1.4 WRITE PROTect Switch and Indicator – This is a two-position pushbutton with a built-in indicator lamp. Pushing this switch to the IN position places the disk drive in the write protect mode and turns on the indicator lamp. In this mode, the write circuits of the disk drive are disabled and no data can be written.

Releasing the pushbutton (out position) enables the write circuitry and turns off the WRITE PROTect indicator.

3.1.1.5 Status Indicators – These indicators (STAT 1 and STAT 2) are used in conjunction with the other front panel indicators to identify specific drive unsafe or error conditions within the R80 (refer to Paragraph 3.1.3).

3.1.2 Rear Panel Control

A circuit breaker is the only operating control on the rear panel of the disk unit (see Figure 3-3). This circuit breaker controls the application of primary ac power to the dc power supply, the cooling-fan motors, and the spindle motor. This circuit breaker must be in the ON position before the drive will operate. Even then, the spindle motor will not operate until the RUN/STOP switch on the front panel has been placed in the RUN position to enable the spin-up sequence.

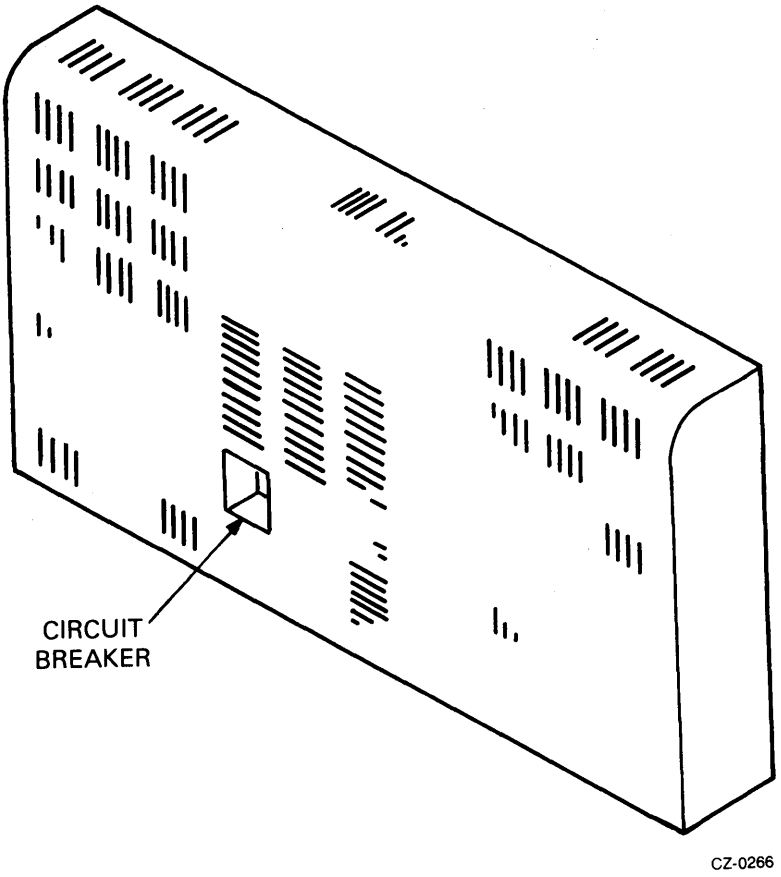


Figure 3-3 Rear Panel Circuit Breaker

3.1.3 Front Panel Fault Indicators

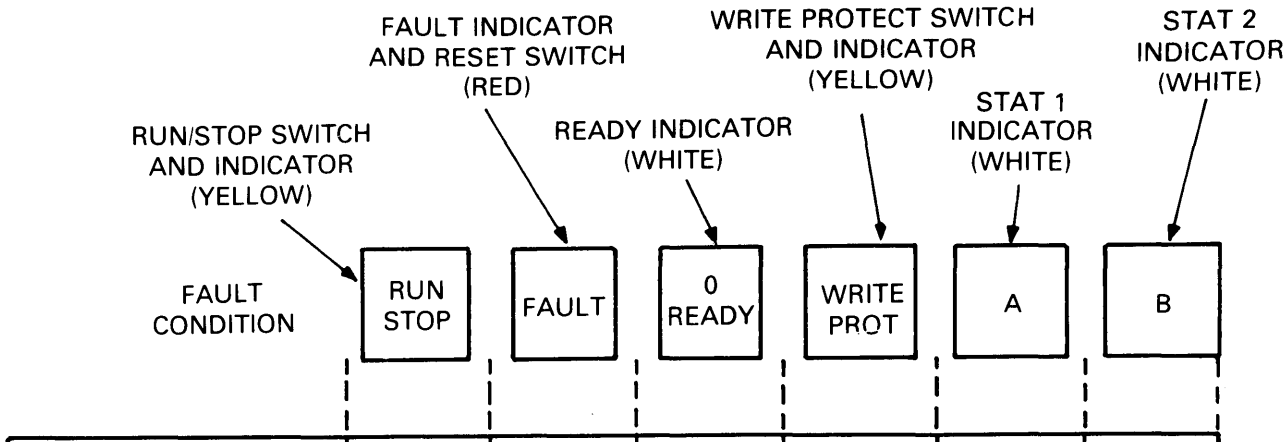
In addition to their usual functions, four of the six front panel indicators combine with the two status indicators to provide a visual code that identifies specific faults within the R80. Figure 3-4 shows the faults that can occur and the indicator lamp combinations that identify each particular fault.

When the FAULT indicator light comes on, pressing the FAULT switch once causes all the indicator lamps to light up momentarilly as a means of verifying that the lamps are functioning. Then all lamps except those displaying the fault code go off.

Pushing the FAULT switch the second time stores the identity of the fault in the microprocessor, clears the fault itself to permit a command retry, and turns off the fault code display (providing that the fault condition is no longer present).

Some faults can be corrected by the interface, in which case the FAULT lamp will go off automatically without any operator intervention. If the fault cannot be corrected by the interface, the FAULT lamp will remain on and the operator must go through the above sequence using the FAULT reset switch. Again, the FAULT indicator can only be reset if the fault condition is no longer present.

If an interface-correctable fault occurs and the FAULT switch is depressed before the automatic correction is made, the interface is relieved of the responsibility and the manual reset procedure must be completed by the operator to clear the fault.



SPIN-UP		ON				ON
R/W DIAGNOSTIC	*	ON			ON	
READ/WRITE UNSAFE	*	ON			ON	ON
SPINDLE MOTOR INTERLOCK	*	ON		ON	ON	
SPINDLE MOTOR SPEED	*	ON		ON	ON	ON
DRIVE DISABLED BY "DD" BIT	*	ON	ON			ON
HDA OR SERVO BOARD OVERTEMPERATURE	*	ON	ON		ON	
MICROCODE	*	ON	ON		ON	ON
SERVO DIAGNOSTIC	*	ON	ON	ON		ON
INITIAL RECAL	*	ON	ON	ON	ON	
MICROPROCESSOR HARDCORE TEST	ON	ON	ON	ON	ON	ON

*THE INDICATOR STATE WILL BE THE SAME AS IT WAS BEFORE THE FAULT SWITCH WAS PUSHED

CZ-8035

Figure 3-4 Fault Identification Codes

3.2 DRIVE OPERATION

3.2.1 Spin-Up

After operating power has been applied to the R80, as outlined previously in Paragraph 2.4.1, a drive spin-up can be initiated.

To spin up the disk drive, push the RUN/STOP pushbutton on the drive front panel to the RUN (in) position. The RUN indicator lamp should light up in approximately one second and, providing that no faults occur, the READY indicator should come on as soon as the drive is up to speed. At this point, the drive is ready for operation.

3.2.2 Removing R80 Power

To completely shut down the R80 Disk Drive, place the RUN/STOP pushbutton on the drive front panel in the STOP (out) position. After the RUN indicator goes off (as soon as disk rotation stops), either unplug the R80 power cord from the switched ac outlet or trip the electrical circuit breaker feeding the system outlet. This will remove the power from all assemblies within the system cabinet.

3.3 CUSTOMER CARE

The air filter in the logic chassis assembly should be inspected twice per year and removed and cleaned once per year (more often if necessary depending upon the operating environment).

3.3.1 Filter Removal

To remove the foam air filter, proceed as described below.

1. Pull down the access door on the front bezel of the drive (refer to Figure 3-5).

NOTE
Do not lay tools on the open access door or lean upon it, as the hinge mechanism can be damaged.

2. Grasp the filter material and pull outward until it is free of the bezel.

3.3.2 Cleaning

1. Wash the foam air filter in warm water using a mild detergent.

2. Rinse off the filter material with clear water and then allow it to dry.

3.3.3 Replacement

1. Slide the filter into place inside the bezel.

2. Close the access door.

NOTE
If it becomes necessary to replace the existing filter, order DIGITAL Part No. 7422816-00.

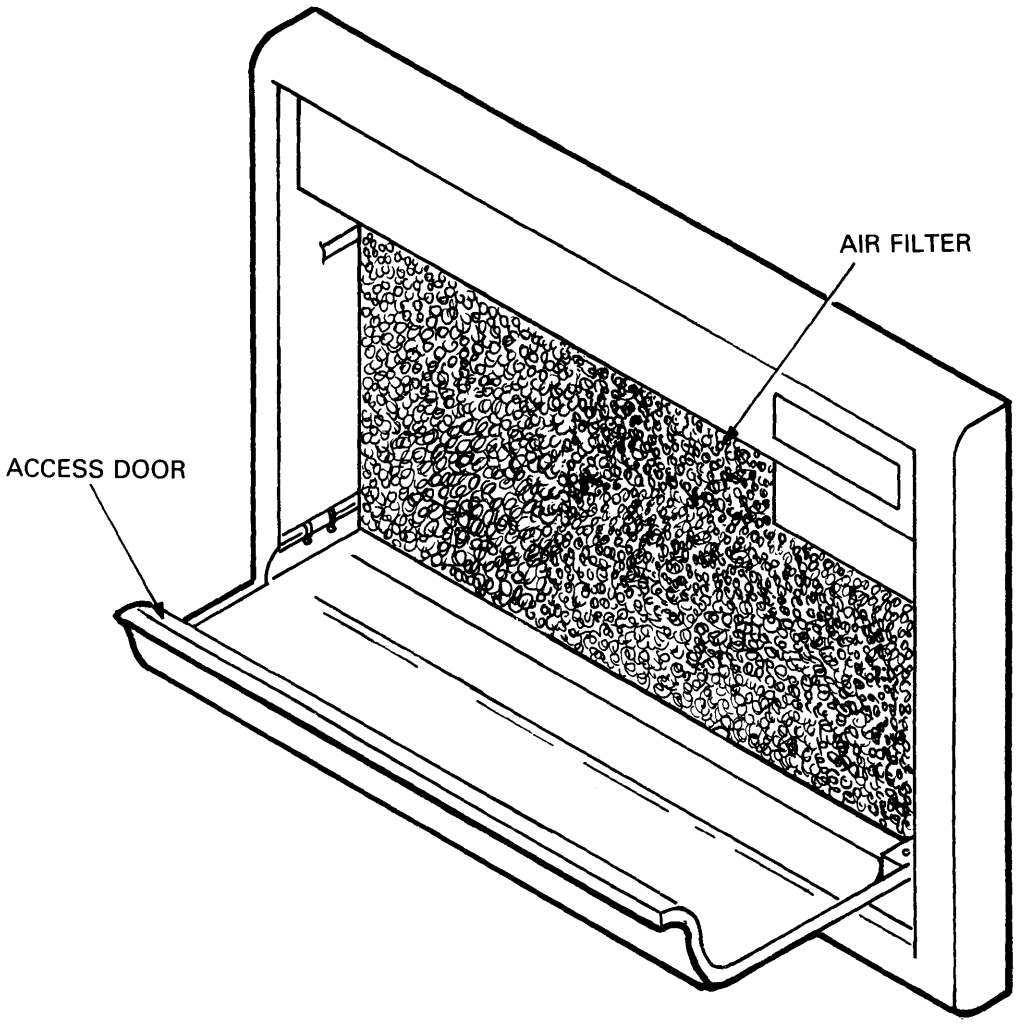


Figure 3-5 Air Filter Location

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USER'S GUIDE
EK-00R80-UG-001

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