
ESE20

ESE20
Electronic Storage Element
User Guide

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Digital Equipment Corporation

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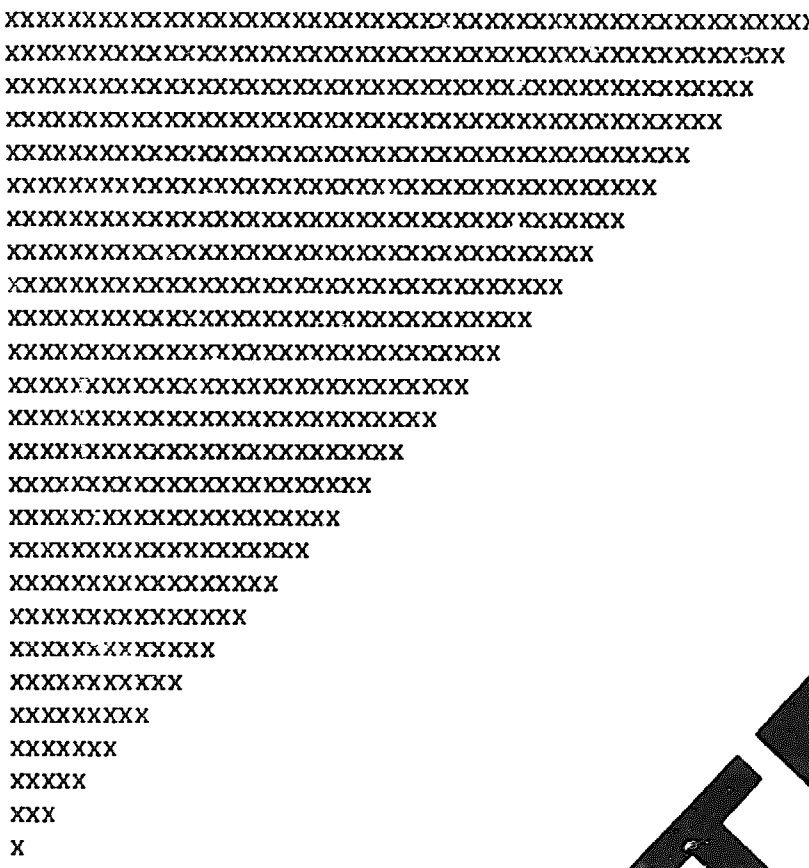
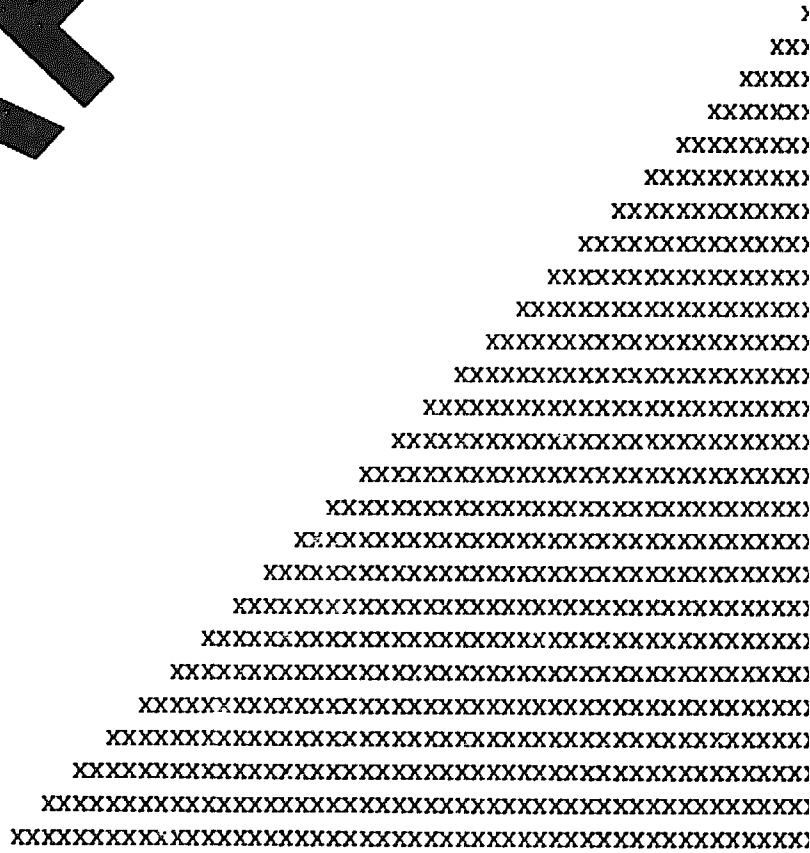


CHAPTER 1



1
System Description

1.1 Introduction

The Electronic Storage Element (ESE20) is a memory-based device that acts as a disk to the system to which it is connected. The major advantage of using the ESE20 device is improved I/O performance. This performance results from the use of dynamic random access memory chips (DRAMs) instead of rotating disks. Systems with an ESE20 device installed have lower latency levels and are able to handle more I/O requests per second than systems without the memory-based device. With the ESE20 device, I/O performance can be increased by a factor of 10 without impacting existing applications or operational procedures for customers.

The ESE20 device fills the system performance gap created by increased CPU power, especially in clusters, and magnetic disk I/O performance. This performance gap occurs when multiple CPUs access shared files. The increase in I/O performance also results in overall increased system performance.

As a high-performance secondary storage device, the ESE20 device is compatible with the standard disk interface (SDI) protocol. The ESE20 device has a capacity of 120 Mbytes, and can process up to 300 I/O requests per second under the SDI protocol. In comparison, the RA81 disk drive can only process approximately 30 I/O requests per second. When the ESE20 device is attached to either a KDA or KDB controller, the I/O throughput of the ESE20 device is approximately four times greater than the I/O throughput of other Digital Equipment Corporation disk drives.

1.2 General Characteristics

The ESE20 device is a random-access, low-latency storage device using 1-Mbit DRAMs. The device is self-contained in a cabinet that contains all the necessary power and backup capabilities. Either one or two ESE20 devices may be installed in one cabinet. Figure 1–1 shows a cabinet with two systems installed. The upper system has the access door open, and the lower system has the access door closed. During normal system operation, both access doors are closed and locked to prevent inadvertent power-down conditions created by operator intervention.

The ESE20 memory is configured with eight 16-Mbyte boards for a total capacity of 128 Mbytes. Because eight megabytes are needed for overhead, the device actually has a formatted capacity of 120 Mbytes. Data is accessed in 512-byte blocks.

For systems with an ESE20 device installed, the ESE20 device appears as a disk drive with the following parameters:

- Total of 480 cylinders
- One group per cylinder
- 128 tracks per group
- Four sectors per track

1.3 Enhanced Performance Operation

The ESE20 device provides enhanced performance operation on disk controllers supporting this functionality. This mode of operation is transparent to the host users and provides a minimum of a three-fold increase in I/O performance over normal operation. In enhanced mode, data is accessed directly from ESE20 storage by LBN rather than seeks and simulation rotation. It is the elimination of the overhead associated with seeks and rotational simulation that provides the increased I/O performance. I/O performance rates exceeding 1000/second are possible in enhanced mode for applications requiring it. The latency is reduced to less than 1 millisecond. Enhanced performance is currently supported by the KDM70 backplane controller (V2.2). Future HSC controller support for enhanced performance is expected in an upcoming release of HSC software.

Backward compatibility is maintained for controllers not supporting enhanced operation as is all data retention functionality.

1.4 ESE20 Device Configurations

There are six ESE20 device configurations. These configurations are as follows:

- ESE20-AA single system–60 Hz (mounted in bottom of cabinet)
- ESE20-AB single system–50 Hz (mounted in bottom of cabinet)
- ESE20-BA double system–60 Hz
- ESE20-BB double system–50 Hz
- ESE20-AC add-on system–60 Hz
- ESE20-AD add-on system–50 Hz

If an ESE20-AC add-on system is added to an ESE20-AA system, the complete system is designated as an ESE20-BA system. If an ESE20-AD add-on system is added to an ESE20-AB system, the complete system is designated as an ESE20-BB system. These add-ons can be performed in the field.

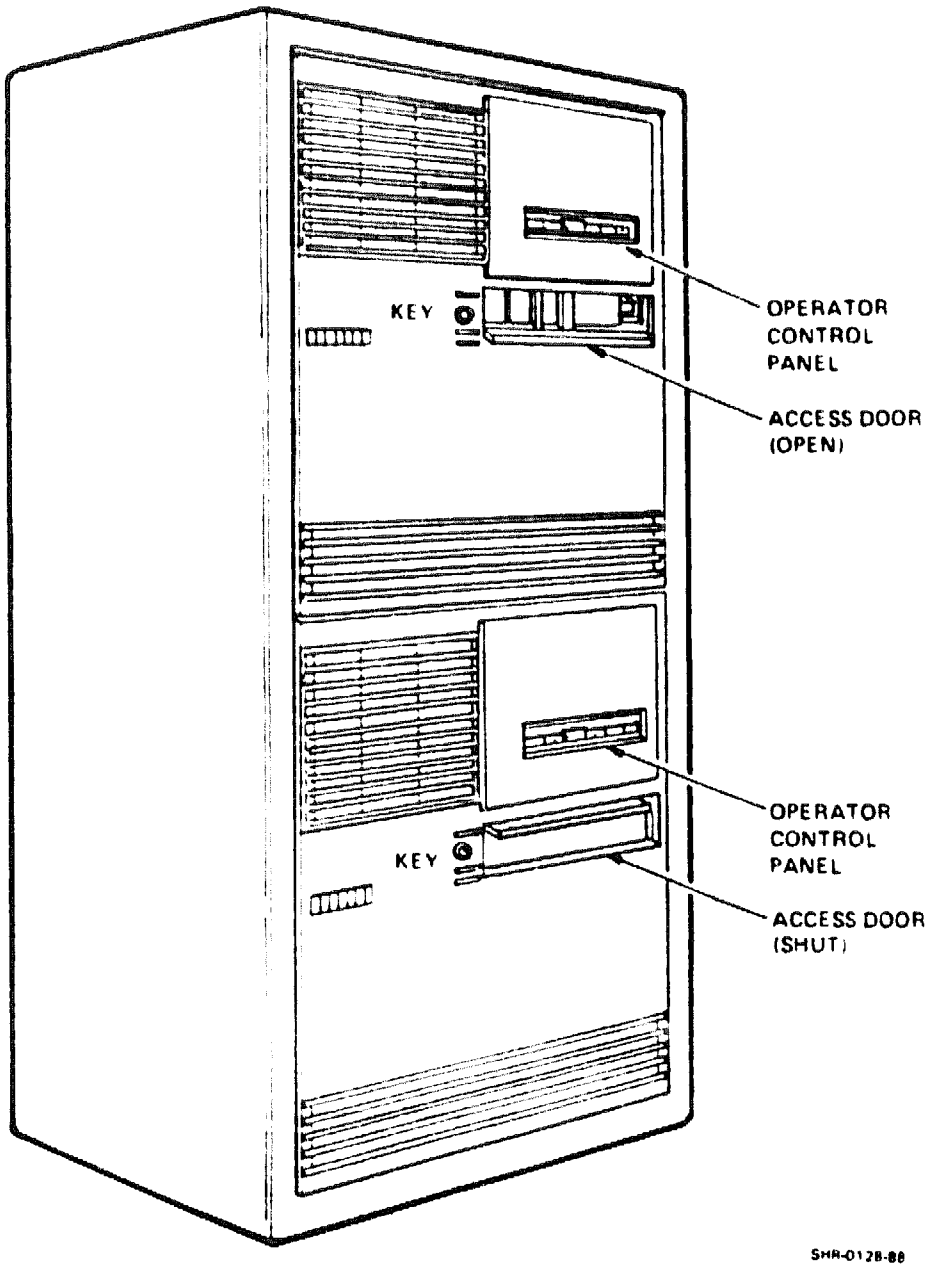


Figure 1–1 Cabinet With Two ESE20 Systems

1.5 Power-Up Diagnostic

During power-up, the ESE20 device performs a power-up diagnostic self-test. This test includes the following diagnostics:

- SDI/Microprocessor interface board register tests
- Distribution board tests
- Q-bus/CMCTL interface board register tests
- CMCTL tests
- Read/Write storage tests
- Data retention system tests

1.6 Error Recovery

The ESE20 device does not support bad block replacement due to the nature of the DRAM memory and array board architecture. Systems with an ESE20 device installed can tolerate many elemental failures with no degradation in performance or reliability.

1.7 Error Logging

The ESE20 device error log contains the error type, location, time, and other system status information. The log is available through the SDI port or the Field Service terminal port.

When an error occurs, the ESE20 device informs the host using the status and attention bits. Error information is stored in memory, and when the ESE20 device is spun down, the error data is written into an EEPROM.

1.8 Retaining Memory Data

The ESE20 device is a non-volatile device because it uses a standby power system (SPS) and a data retention system (DRS). The SPS retains ac power for the ESE20 device for up to 12 minutes after loss of ac power. This prevents the loss of ESE20 memory data while the data is unloaded into the DRS.

Data is moved from the memory arrays to the DRS during disk spin-down conditions or during power failures. The DRS saves the data from the memory arrays until power is returned. No operator intervention is required in these instances.

During power-up, data is loaded from the DRS back to the memory arrays. The transfer time is approximately 12 minutes.

The DRS performs diagnostics and monitors itself when it is not performing a load or unload operation. If a failure is detected, the host is informed, and at the user's option, the device may write protect itself. This ensures that no more changes to the stored data occur, and allows the data to be copied to another device.

NOTE

Although the ESE20 device is non-volatile, it is no more non-volatile than an ordinary disk drive. The ESE20 device should always be included in any site specific backup strategy.

1.9 Latency

Startup latency is the time necessary to run the power-up diagnostics. The ESE20 device may be brought on-line after the startup latency and before all data has been transferred from the RD54 disk drive. Startup latency for the ESE20 device is 135 seconds.

In addition to startup latency, the ESE20 device simulates both rotational and seek latency. Rotational latency is the time required for the disk to rotate to a desired sector. Seek latency is the time required for the disk to seek from one cylinder to another.

Rotational latency in the ESE20 device is less than rotational latency in true rotational disks due to its format (see Section 1.2). Seek latency in the ESE20 device is less than seek latency in true rotational disks because there are no moving parts in the ESE20 device.

1.10 Reliability

For reliability and data integrity, there are two types of error correction that occur in the ESE20 device: Hamming code, and Block ECC (Reed-Solomon) code. Hamming code detects errors on each storage word, while Block ECC code detects errors on a block basis.

Hamming ECC code is generated and stored with the data in the memory arrays. It is checked and used to correct single bit errors and detect double bit errors in the arrays. Block ECC code is generated and checked by a disk controller and stored with the data in the memory arrays. When the arrays are read, the block ECC code in the arrays is returned with the data to the disk controller for checking. This provides robust correction capability for errors that cannot be corrected by the Hamming code.

1.11 Specifications

The following tables list the nominal electrical, performance, environmental, and physical specifications for the ESE20 device.

Electrical Specifications	
Storage capacity	120 Mbyte formatted capacity using 1-Mbit DRAMs
Power requirements (two system configuration)	120/208 Vac; 9 A; 60 Hz; 3-phase WYE

Performance Specifications	
Transfer rate	20 Mbits/second
Bit width (cell period)	50 ns
Latency (rotational)	528 μs (average)
Latency (seek)	Less than 1 ms (maximum)

Environmental Specifications	
Temperature	15°C (59°F) to 32°C (90°F)
Relative Humidity	20% to 80% with maximum wet bulb temperature 25°C (77°F) and minimum dew point 2°C (36°F). Maximum allowable operating temperature reduced by a factor of 1.8°C/1000m (1°F/1000ft) for operation at high altitude sites

Physical Specifications	
Cabinet	H9546
Height	60 inches
Weight	746 pounds, including packing material
Capacity	Can house two ESE20 devices. One SPS can support two ESE20 devices.

1.12 The ESE20 Device and Forced Error Flags

The ESE20 device uses forced error flags in a somewhat different way than traditional disk drives. The ESE20 device initializes the entire drive with the forced error flags set at power-up. The data retention system (DRS) will then overwrite the forced error flags with the previously saved data.

The forced error flags are used as an indicator to show how much data was restored in the event the DRS did not fully complete an Unload operation. An Unload operation will occur in the event of an ac power failure, or from a VMS DISMOUNT command (default for DISMOUNT=DISMOUNT/UNLOAD), or when the RUN/STOP switch on the operator control panel is turned to the STOP (out) position.

Upon completion of power-up, the ESE20 device will be initialized to all zeros, and all locations will have forced error flags set. If the DRS does not contain any valid data, the ESE20 device will power up with an EO error. When the ESE20 device powers-up with an EO error, all LBNs will have forced error flags set.

You may encounter forced error flags on an ESE20 device when reading a file that did not write to the allocated blocks, but attempts to read them. If you have files on an ESE20 device and are encountering problems with forced error flags, BACKUP the files onto another disk or tape, and

initialize the ESE20 device with the / Erase modifier. After the forced error flags have been cleared, the files should be restored using BACKUP.

When installing the ESE20 device, the forced error flags should be cleared from the ESE20 device. To clear the forced error flags, run ILEXER on the HSC with Access User Data Area, and Initial Write Test Area enabled. Otherwise, use the INIT/ERASE command from the VMS prompt.

NOTE
The INIT/ERASE command will take 4 minutes to complete.

NOTE
Performing an INIT/ERASE on a volume will leave the volume status set to ERASE ON DELETE. This specifies that when a file on the volume is deleted, the space occupied by that file is erased. Do a SET VOLUME/NOERASE_ON_DELETE to return to volume status default. The disk must be mounted before the SET VOLUME command can be executed.

NOTE
ILDISK will not run on the ESE20 device with the forced error flags set, will fail Test #13, Error #45, LBN#??? Forced error flags must be cleared from the ESE20 device before running ILDISK.

1.13 Using the ESE20 as a System/Cluster Disk

Forced error flags should be cleared before using the ESE20 as a system disk. The forced error flags are written into the ESE20 memory array upon power-up. A forced error flag indicates that the location contains invalid data (the location was not written by the system).

CAUTION
The INIT/ERASE command destroys stored data. Be sure to back up all stored data before issuing the command.

The INIT/ERASE command clears the forced error flags from all locations. It rewrites all the locations and the file structure. Remember to use INIT/ERASE before installing an ESE20 device or performing a configuration change.

1.14 Improving ESE20 Device Performance

The ESE20 device is capable of completing two full data retention backup operations in 24 hours. If additional backup operations are required, the ESE20 device may lose battery power before completing a full backup. In such cases, the ESE20 device performs a partial backup.

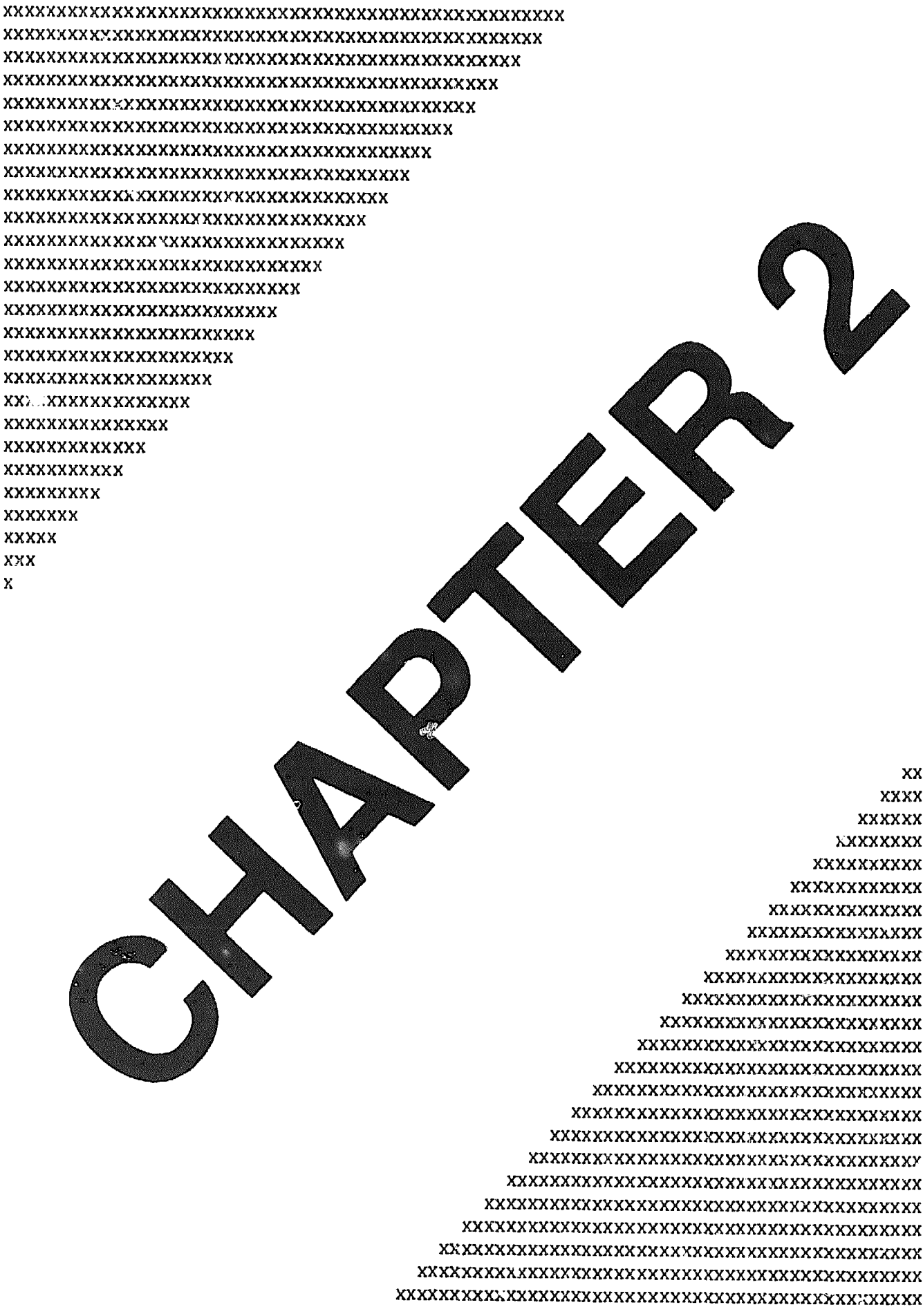
The directory structure on a disk is often located in the disk center. Moving the ESE20 directory structure to the beginning of the disk increases file accessibility in the event of a partial backup.

CAUTION
The INIT/INDEX command destroys stored data. Be sure to back up all stored data before issuing the command.

The command INIT/INDEX=BEGIN moves the directory structure to the beginning of the disk.

1.15 Related Documentation

The *ESE20 Electronic Storage Element Illustrated Parts Breakdown* (EK-ESE20-IP) contains illustrations and related parts information.


CHAPTER 2

2
Operating Controls

2.1 Control Panel Switches and Indicators

Each switch on the operator control panel (OCP) has an indicator light that displays the drive conditions. The ESE20 OCP is mounted on the front of the ESE20 device and has the following switches and indicators:

- RUN/STOP
- FAULT
- READY
- WRITE PROT
- A port
- B port

Figure 2–1 shows the arrangement of these controls on the front panel of the drive. Table 2–1 lists the conditions reflected by the state of the indicator lights.

WARNING

The standby power system (SPS) in the ESE20 device provides ac power to the system for up to 13 minutes after loss of ac power. Turn off the SPS before attempting to access the ESE20 cabinet. If ac power is turned off at the power controller, the SPS goes into active mode and supplies ac power to the BA213 boxes. Hazardous voltages are present inside this equipment. Bodily injury or equipment damage may result from incorrect servicing. Installation and servicing should be performed by a qualified service person.

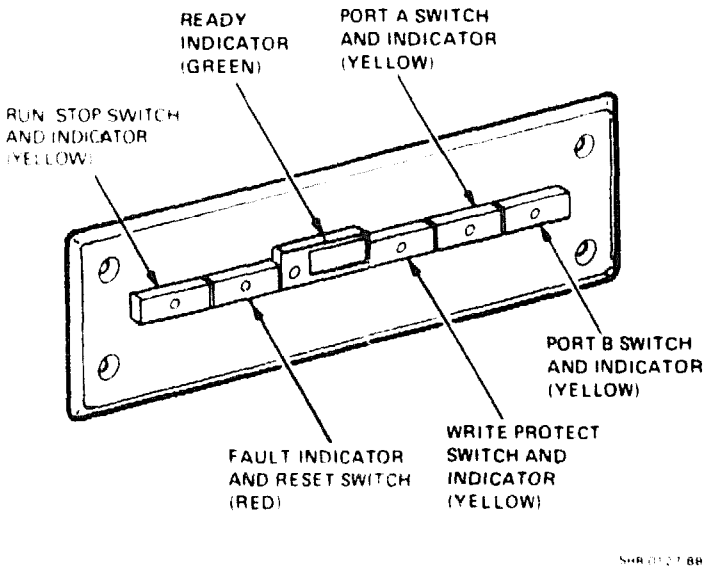


Figure 2–1 Front Panel Controls and Indicators

Table 2–1 Control Panel LED Functions

LED Indicator	Turned On
RUN/STOP	When disk is loaded.
FAULT	When drive detects a serious fault.
READY	When drive is logically ready to process host requests and is on-cylinder. Requires RUN LED on.
WRITE PROTECT	When drive is manually or logically write protected.
A	When drive is "on-line" to controller A.
B	When drive is "on-line" to controller B.

2.1.1 Drive Actions on Switch Changes

The drive manipulates the LEDs to reflect its current logical and/or physical status. Refer to Table 2–1 for a description of the LEDs and drive conditions that exist when the LEDs are illuminated.

"On-line" drives must interact with the controller before changing status due to switch manipulation. A drive that is not on-line responds to switch changes by changing status locally. The status is changed without controller intervention.

Because of explicit controller command in the ESE20 device, it is possible that an on-line drive may be running in a state different from the state indicated by its switch settings. Once an on-line drive has reported a change in switch state, it ignores the switch until it changes again or the drive leaves the on-line state.

2.1.2 RUN/STOP Switch and LED

The RUN/STOP switch functions are listed in Table 2–2. In the ESE20 device, the controller can simulate a state in which the RUN/STOP switch is in the out (unlocked) position. In this state, the drive can unload data from the storage array for transfer to the RD54 disk drive.

NOTE
If the RUN/STOP switch is in the RUN position, the drive is capable of performing on-line data transfers. If the RUN/STOP switch is in the STOP position, the drive is not spun up and cannot be brought on-line to do data transfers.

Table 2–2 RUN/STOP Switch Functions

SWITCH IN (Run) (locked)	Load data into memory arrays from the RD54 disk drive
SWITCH OUT (Stop) (unlocked)	Unload data from memory arrays into the RD54 disk drive
LED ON	Data in memory arrays
LED OFF	Data in drive (RD54 disk drive)

If you unlock the RUN/STOP switch, the LED remains lit for about 30 seconds, during which time the error logs are saved. If an Unload operation is in progress, the LED remains lit for approximately 10 minutes.

If an on-line drive is switched to STOP, it utilizes the ATTENTION mechanism to notify the controller, but remains loaded and available for processing additional commands. When the controller has completed all outstanding write operations to the ESE20 device, it initiates an Unload operation, at which point the ESE20 unloads the data and turns off the LED when the data is unloaded. If an unloaded on-line drive is switched to RUN, it utilizes the ATTENTION mechanism to notify the controller, but remains unloaded and waits for additional commands. The controller initiates a Load operation when it is appropriate for the drive to load (usually immediately). When the drive starts loading in response to the LOAD command, the RUN/STOP LED is lit.

2.1.3 FAULT

The FAULT LED is used to indicate a serious error condition in the drive. If the FAULT LED is not lit, changes in the FAULT switch are ignored by the drive.

When the drive detects a serious error, it lights the FAULT LED and remains in its current state. In addition, it can report the error to the controller if the controller issues a GET STATUS command. The controller may not see a change of state in the drive even though the FAULT condition has occurred. If the FAULT switch is pressed, the drive enters the off-line state as seen by any controllers connected to the drive.

The ESE20 device remains off-line for the duration of the time that the code is displayed. The code is displayed until the FAULT switch is pressed again, at which time the drive attempts to clear the error condition, enter the available state, and return the OCP LEDs to normal service. If the attempt to clear the error condition is unsuccessful, the FAULT LED is lit again.

If a fault is a "clearable" fault, the drive attempts to clear it upon receipt of the appropriate DRIVE CLEAR command from the controller. If the fault is successfully cleared, the FAULT LED is extinguished.

The only time the drive is allowed to "blink" any LEDs is when the fault code is displayed. The minimum blink rate is one on/off cycle per second. The maximum blink rate is four on/off cycles per second.

2.1.4 READY

The READY LED is used to display the physical on-cylinder signal only. The READY LED is only lit when the RUN/STOP switch is set to RUN and the RUN/STOP LED is lit.

2.1.5 WRITE PROTECT

The WRITE PROT switch must be set in the "on" (in) position to write protect the disk, and the "off" (out) position to write enable the disk. The WRITE PROTECT LED, when on, indicates that the disk is logically or physically write protected; the WRITE PROTECT LED, when off, indicates that the disk is write enabled.

When the drive is not READ/WRITE ready, it is always write protected regardless of the switch setting. If the WRITE PROT switch on a drive that is not on-line is set to write protect, the LED is lit and the drive refuses write operations. If the switch on a drive that is not on-line is set to write enable, the LED remains off and the drive allows write operations.

If a write-enabled on-line drive is switched to write protect, the drive utilizes the ATTENTION mechanism to report a change in switch setting. The drive leaves the LED turned on until the change is reported to the controller. At this point, the drive remains internally write enabled, but lights the LED to inform the operator that it is logically write protected. The controller completes all write operations to the drive, then issues a command to the drive to write protect. At this point, the drive becomes write protected.

If a write-protected on-line drive is switched to write enable, the drive utilizes the ATTENTION mechanism to report a change in switch setting. The drive leaves the LED turned on until the change is reported to the controller. At this point, the drive turns the LED off and remains logically write protected until the controller issues a command to the drive to physically write enable. If the controller attempts to write to a physically write protected drive, the drive negates READ/WRITE READY and reports a write error (WE) through the ATTENTION mechanism.

2.1.6 A and B LEDs

The A switch is set in the "on" (in) position to make Port A available to the controller. The switch is set in the "off" (out) position to make Port A unavailable to the controller. When the LED is turned on, it indicates that the drive is on-line to controller A. When the LED is turned off, it indicates that the drive is not on-line to controller A.

The B switch is set in the "on" position to make Port B available to the controller. The switch is set in the "off" position to make the drive unavailable to the controller. When the LED is turned on, it indicates that the drive is on-line to controller B. When the LED is turned off, it indicates that the drive is not on-line to controller B.

The drive never lights both the A and B LEDs. If the drive is on-line to a port and the port selection switch is changed to request the drive to go off-line to that port, the drive leaves the LED on until the switch change has been successfully reported to the controller. When the switch change has been reported, the drive turns off the port select LED, but remains on-line to the controller until commanded to disconnect. The drive does not light a port selection LED until the drive actually receives a command from the controller and goes on-line to the controller.

2.1.7 Unit Select Switch

The unit select switch is an 8-position DIP switch that determines the logical unit number that represents the drive for the host. Logical unit numbers from 0 through 254 are permitted. The unit select switch is located on the distribution panel and is accessible when the front door is open.

2.1.8 Distribution Panel

The distribution panel contains the unit select switches, serial number, hardware revision number, RS-232 diagnostic port, operational option switches, the RD54 write-protect switch, and error LEDs. Only the unit select switches and the OCP switches are accessible for the user.

2.1.9 Control Panel Fault Codes

Table 2–3 lists the fault code configurations for the ESE20 device. The fault conditions are determined by the combinations of LEDs in the "on" state. For example, if the FAULT LED and the PORT B LED are both turned on, it indicates a fault in the data retention system.

Table 2–3 Control Panel Fault Codes

RUN LED	FAULT LED	READY LED	WRITE PROT LED	PORT A LED	PORT B LED	Fault Condition
	On				On	Data retention fault
	On			On		Microprocessor fault
	On			On	On	SDI fault
	On		On			R/W unsafe

Table 2–3 (Cont.) Control Panel Fault Codes

RUN LED	FAULT LED	READY LED	WRITE PROT LED	PORT A LED	PORT B LED	Fault Condition
	On		On		On	R/W command error
	On		On	On		CMCTL micro interlock fault
	On		On	On	On	CTL panel micro interlock fault
	On	On				Drive disabled by "DD" bit
	On	On			On	Write and write protect
	On	On		On		CMCTL diagnostic failed
	On	On		On	On	Idle diagnostic failed
	On	On	On			Storage element failed array 0
	On	On	On		On	Storage element failed array 1
	On	On	On	On		Storage element failed array 2
	On	On	On	On	On	Storage element failed array 3
On	On					Storage element failed array 4
On	On				On	Storage element failed array 5
On	On			On		Storage element failed array 6
On	On			On	On	Storage element failed array 7
On	On		On			Multiple storage element failed

Table 2–3 (Cont.) Control Panel Fault Codes

RUN LED	FAULT LED	READY LED	WRITE PROT LED	PORT A LED	PORT B LED	Fault Condition
On	On	On	On	On	On	Power-up diagnostic failure

2.2 Option Switches

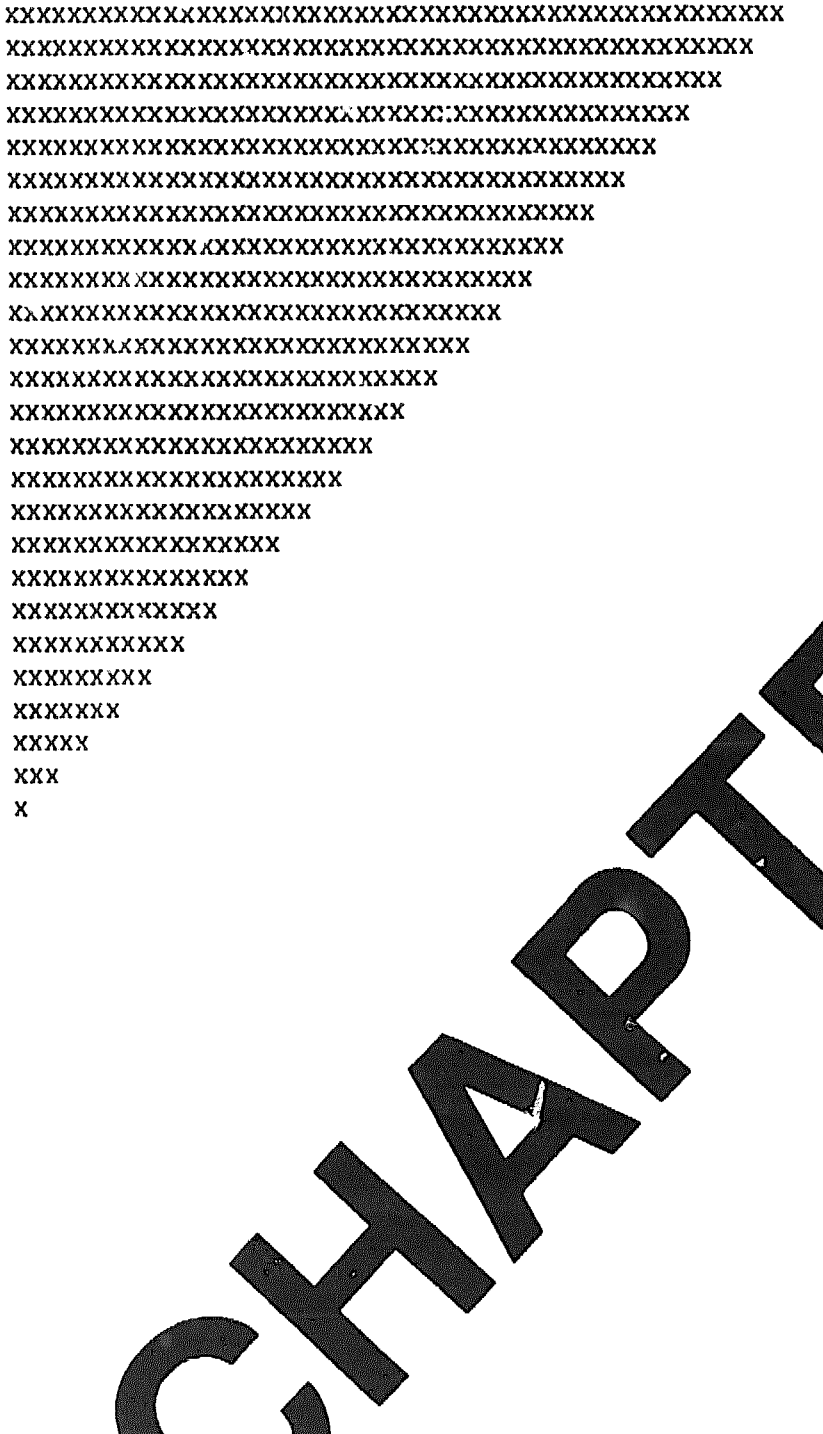
Four option switches are located on the distribution panel. Table 2–4 lists the functions enabled by these switches. The switches are "open" when pushed in from the bottom (marked 0).

Table 2–4 Option Switch Functions

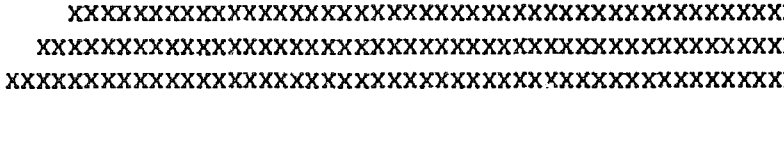
Option Switch	Function (when "open")
1	Sets the standby power system (SPS) signal polarity. When this switch is set to its open position, SPS is on high. When this switch is set to its closed position, SPS is on low. Normally the switch is open.
2	Enables or disables the write-protect switch. Setting this switch to the open position alerts the user to low battery conditions that may cause loss of volatile data. With the switch set to the open position, the WRITE PROT LED turns on during power-up if the batteries are below half of their capacity. And the WRITE PROT LED also turns on during data loads from the RD54 drive to the memory arrays if the system is unable to write to the arrays. In either case, if the system must be used despite the low batteries the customer may set the switch to its closed position. Normally the switch is open.
3	Enables data retention. Normally the switch is closed.

Table 2–4 (Cont.) Option Switch Functions

Option Switch	Function (when "open")
4	Enables RD54 write protection. The Customer Services engineer may set the switch to its closed position during ESE20 system service. This prevents data from being loaded onto the RD54 drive. Normally the switch is open.



CHAPTER 3



3
User Maintenance

3.1 Introduction

This chapter describes how to use the power-up diagnostic for user maintenance.

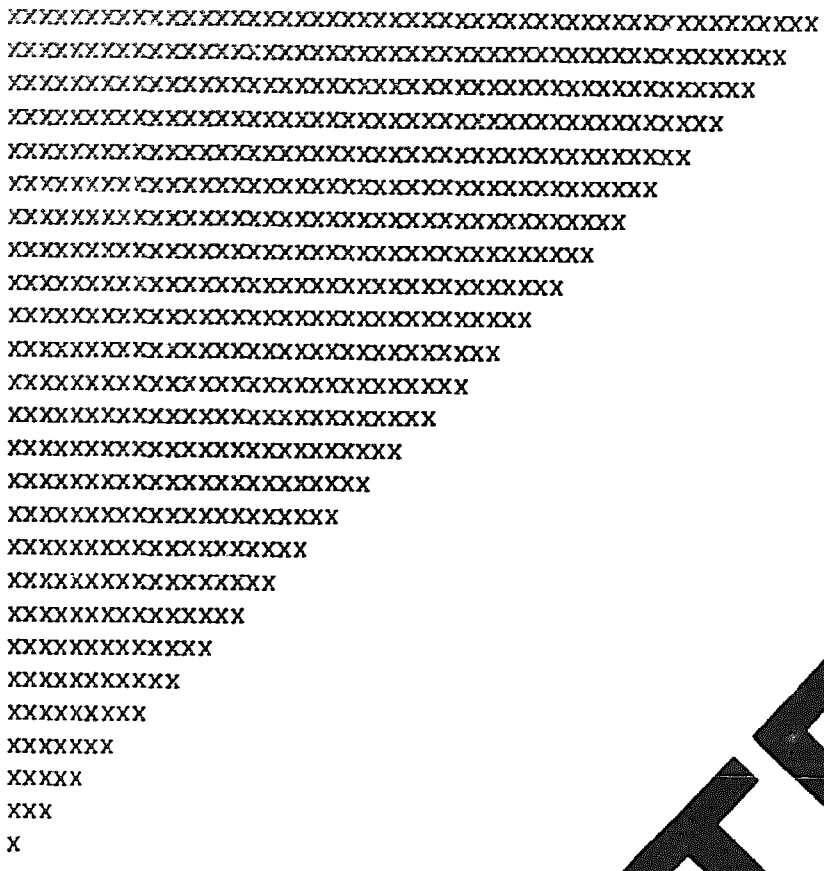
3.2 User Maintenance Guidelines

The power-up diagnostic is automatically invoked when power is applied to the system. This diagnostic, which takes approximately 2 minutes to complete, tests and formats the Q-bus CMCTL module, the SDI/ Microprocessor module, and the 128-Mbyte memory array modules.

When the diagnostic is completed, the FAULT LED on the operator control panel (OCP) is not lit if there are no faults. If a fault exists, the FAULT LED remains lit (see Figure 2–1).

Press the FAULT switch associated with the FAULT LED and a blinking code appears. To determine the category of the error, refer to Section 2.1.9. Evaluate and note the error type.

Press the FAULT switch again. This restarts the power-up diagnostic. After the diagnostic has completed, check the FAULT LED. If it is not lit, the system is operational. If the FAULT LED remains lit, press the FAULT switch again. This displays the blinking error code previously noted. Report this error code to your Customer Services representative.



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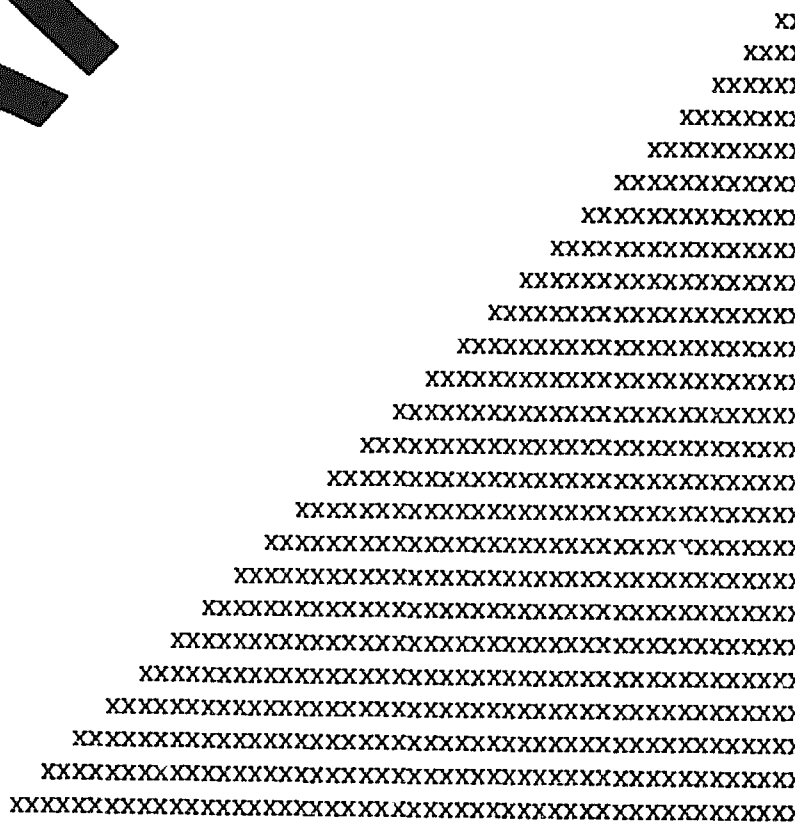


4
User Precautions

This chapter describes how to protect against loss of data.

4.1 Data Recovery and Retention

The ESE20 device uses dynamic RAM storage technology, hence the stored data is volatile. It is important to guard against loss of the stored data.

4.1.1 Recovery from AC Power Outages

When an ac line power failure occurs, the ESE20 device unloads the stored data into a rotating magnetic disk under power supplied by the standby power system (SPS). Remember, the ac power switches behind the main door must be on during this operation. The operation takes about 13 minutes. Then the SPS shuts down ac power and goes into monitor mode. If automatic recovery and reload of the data is desired, the ac power switches must stay in the on position.

The ESE20 device cannot monitor the ac power line indefinitely while awaiting the return of power. If an extended ac power outage occurs, the ESE20 device should be shut down by a Customer Services engineer.

4.1.2 Retention of Operational Data

The ESE20 device retains important service data to maximize its availability (uptime) to the user. This data may be lost if the device is incorrectly powered down.

The procedure for shutting down an ESE20 device in a planned ac power down is as follows:

1. DISMOUNT/UNLOAD Device from System. Dismount/Unload will dismount the drive from the system and start an Unload operation. An Unload operation will copy the data in the memory arrays to the RD54 disk drive. The RUN/STOP LED will go OFF when the Unload operation is complete. The time to complete the Unload operation is approximately 12.5 to 13 minutes, depending on the number of revectored blocks on the RD54 disk drive. The ESE20 device must not be remounted after the Dismount/Unload is issued, or the procedure must be restarted. Remounting the drive will invalidate the data on the RD54 drive.

   - Manual Mode: ESE20 Device Mounted to System. Set the RUN/STOP switch to STOP position (out) and wait the 12.5 to 13 minutes for the ESE20 to complete the Unload operation.

2. Powering Off the ESE20 Devices. After the ESE20 device has completed the Unload operation, the RUN/STOP LED will go off. After the RUN/STOP LED goes off, open the front door(s) of the ESE20 device and turn off the 1/0 ac power switch.

3. Powering Off the Inverter Module. After the 1/0 ac switch on each ESE20 device has been turned off, open the rear door to the device and turn off the 1/0 switch on the inverter module (PN 29-27238-01 or 29-27239-01).

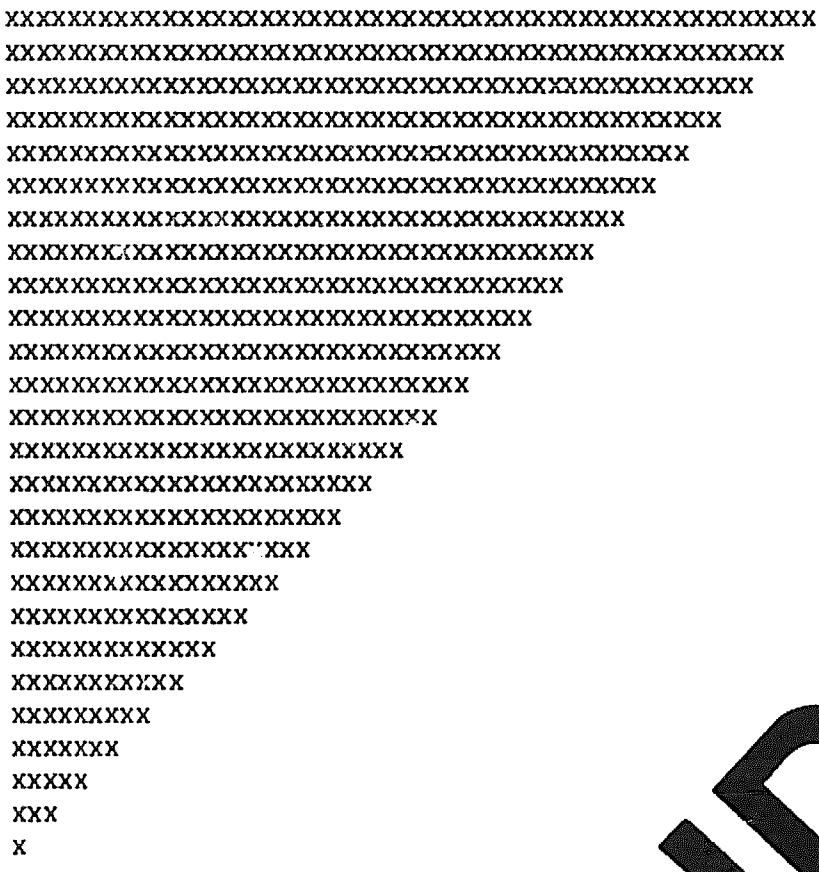
4. Powering Back Up. After ac power has been restored, turn on the 1/0 ac switch on the inverter module, then turn on the 1/0 ac power switch on each ESE20 device. The ESE20 device will take 2.5 minutes to run internal diagnostics (all LEDS on the operator control panel (OCP) lit) before a Load operation is started. A Load operation copies the data from the RD54 drive to the memory arrays. If the ESE20 device was Unloaded in the manual mode (RUN/STOP switch out), a Load operation will start when the internal diagnostics complete, and the ESE20 device will not go on-line until the RUN/STOP switch is set to the RUN position (in). Data will be available at a reduced rate until the Load operation is complete.

NOTE

Depending on the setting of option switch 2 on the distribution module, the ESE20 device may write protect (WP) itself until the Load operation is complete. The WP switch (on the OCP) can be turned off to write data before the Load operation is complete.

You must allow the ESE20 device time to copy the data from the memory arrays onto the RD54 disk drive. Turning off any 1/0 ac switch before the Load operation is complete will cause you to *lose customer data*.

The 1/0 switch on the ESE20 Standby Power System (SPS) (PN 30-29961-01, -02, or PN 29-27238-01, 29-27239-01) is **not** just an ac switch. Part of this 1/0 switch controls the dc to the ac monitor circuit, the ac monitor circuit will turn the inverter (PN 29-27238-01, 2927239-01) back on when the ac line returns from a power failure after the ESE20 device has completed an Unload operation. **If the 1/0 switch is left on with no ac to the inverter, the batteries will be discharged in less than 48 hours.** If the battery voltage drops to low, the inverter will not turn on. If you experience an ac power failure of greater than 8 hours, we recommend that the 1/0 switch be turned off until the ac power is restored.



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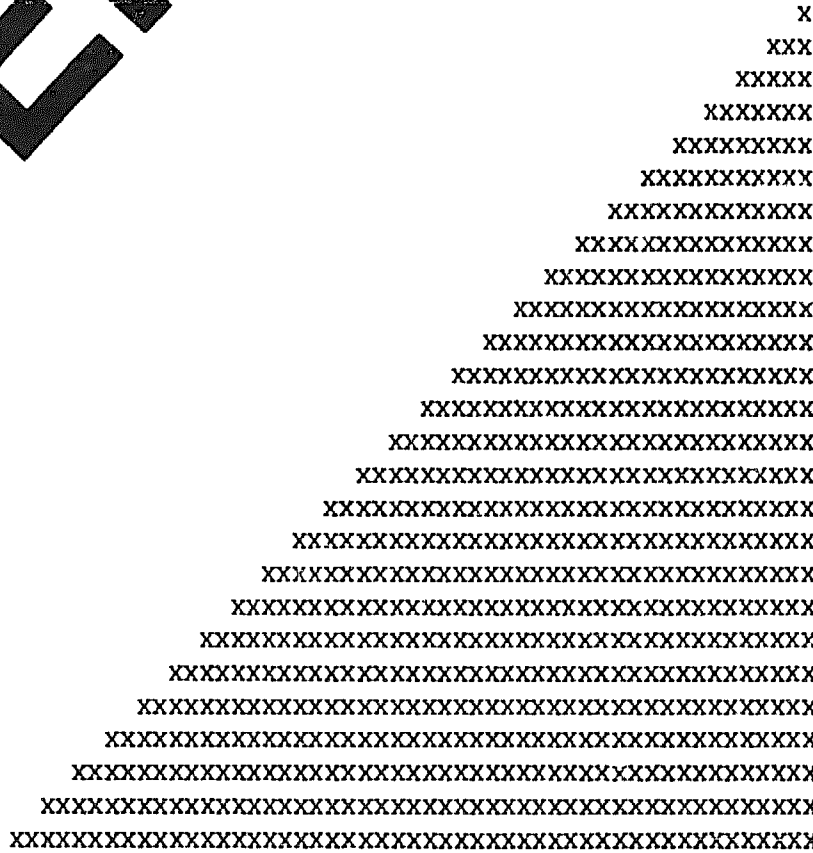

A

BF, E0, and E1 Error Codes

The three error codes described in this appendix are frequently encountered by ESE20 device users.

A.1 BF, Low Battery Charge

The battery voltage goes down to half of its capacity in one unload. After two unloads, it could take as much as 24 hours to fully recharge the batteries

A BF error code occurs during power-up when battery voltage is below half of its capacity. BF error codes are reported to VMS. The ESE20 *can* be used while the batteries are being charged, but should another power outage occur the batteries may not have enough voltage to do a complete data retention backup.

A.2 E0, Data Retention Backup Not Valid, and E1, Data Retention Load Size Mismatch

If a backup to the RD54 drive is incomplete, it may be because the batteries did not have enough voltage or because the main switch was turned off before the backup was complete. In such cases, an E0 or E1 error code appears on the next power-up