VAXft Systems

Model 810
Operating Information

Order Number: EK-VXFTA-OP. A01

June 1993

This manual is intended for system managers, users, and operators who have system management experience and fault-tolerant VAXft system training.

Digital Equipment Corporation

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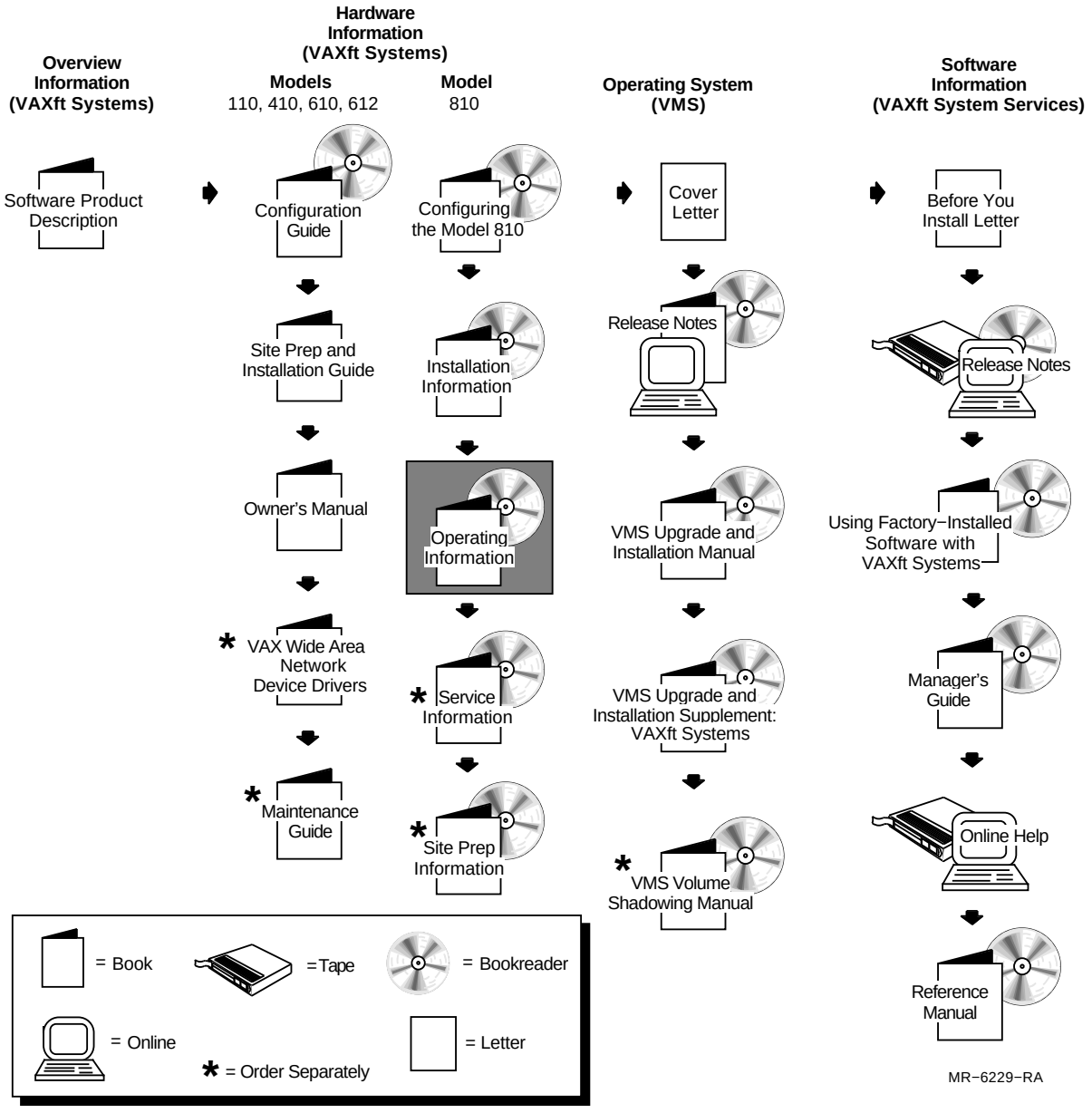
This document is available on CDROM.

Documentation Map



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Introduction

1.1 In This Chapter

This chapter includes:

- Section 1.2, System Overview
- Section 1.3, System Architecture
- Section 1.4, Hardware
- Section 1.5, Software
- Section 1.6, System Configurations

1.2 System Overview

Fault tolerance is the ability of a system to continue to provide computing service despite the occurrence of single-point hardware failures.

The VAXft Model 810 system is the third generation in the VAXft family of processors. The system achieves fault tolerance through its high levels of availability. Table 1–1 describes these features.

Figure 1–1 shows the front view of the entry system. Figure 1–2 shows the front view of the expanded system.

Table 1–1 Availability Features

Feature	Description
Data Integrity	
Dual rail internal bus	The module interconnect (MI) is a dual rail bus that allows comparison of results at the end of each transmission.
Cyclic redundancy check (CRC) and parity checking	Device codes are appended to incoming data packets. This ensures integrity when data is transferred within the system.
Self-checking checkers	On-line tests examine the checking mechanism logic for faults.
Computational Integrity	
Duplicate CPUs	Two processor chips and associated logic are present on each CPU module. The results of all computations are compared for discrepancies.
Duplicate zones	Two CPUs are present in each zone. They compare results with each other through the cross-link cable.
Fault Isolation and Containment	
Firewalls	Firewall chips are used on the I/O expansion module (EXM). They interface with the MI bus. These chips perform error checking, receive and send all data to the bus, and allow the dual rail bus to act as a single rail bus.
System Availability	
Duplicate components	All components (zones, cables, peripherals, and enclosures) are fully duplicated.
Automatic failover	Failover happens automatically, within microseconds of fault detection.
Independent zones	Risk of service and operational errors is reduced because zones are accessed independently. Each zone has a separate door.

Figure 1–1 Entry System

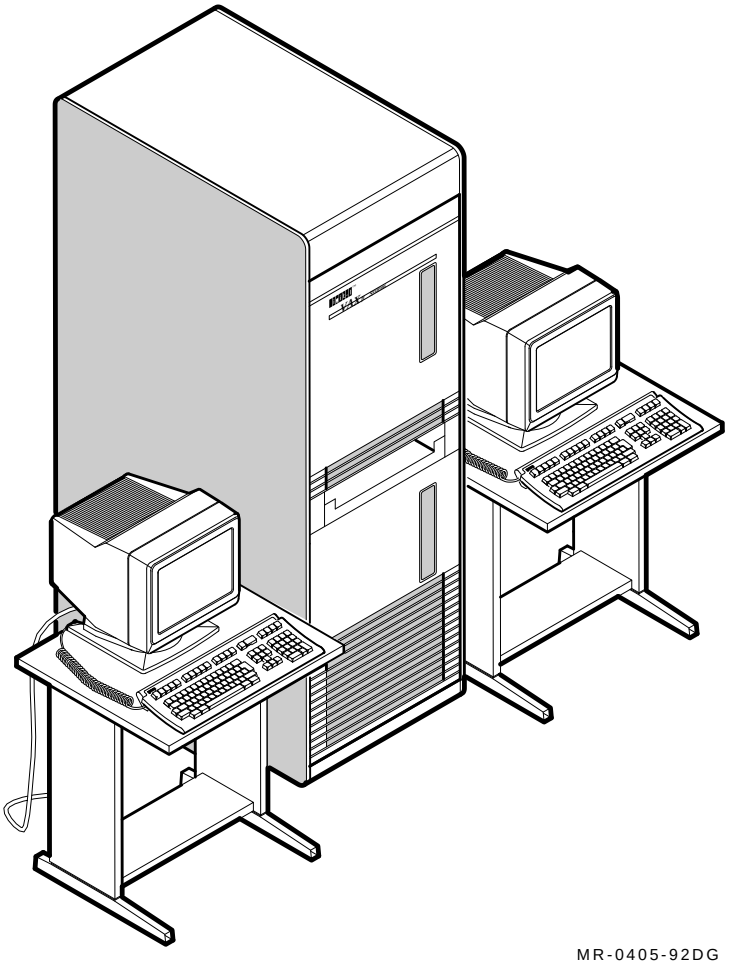

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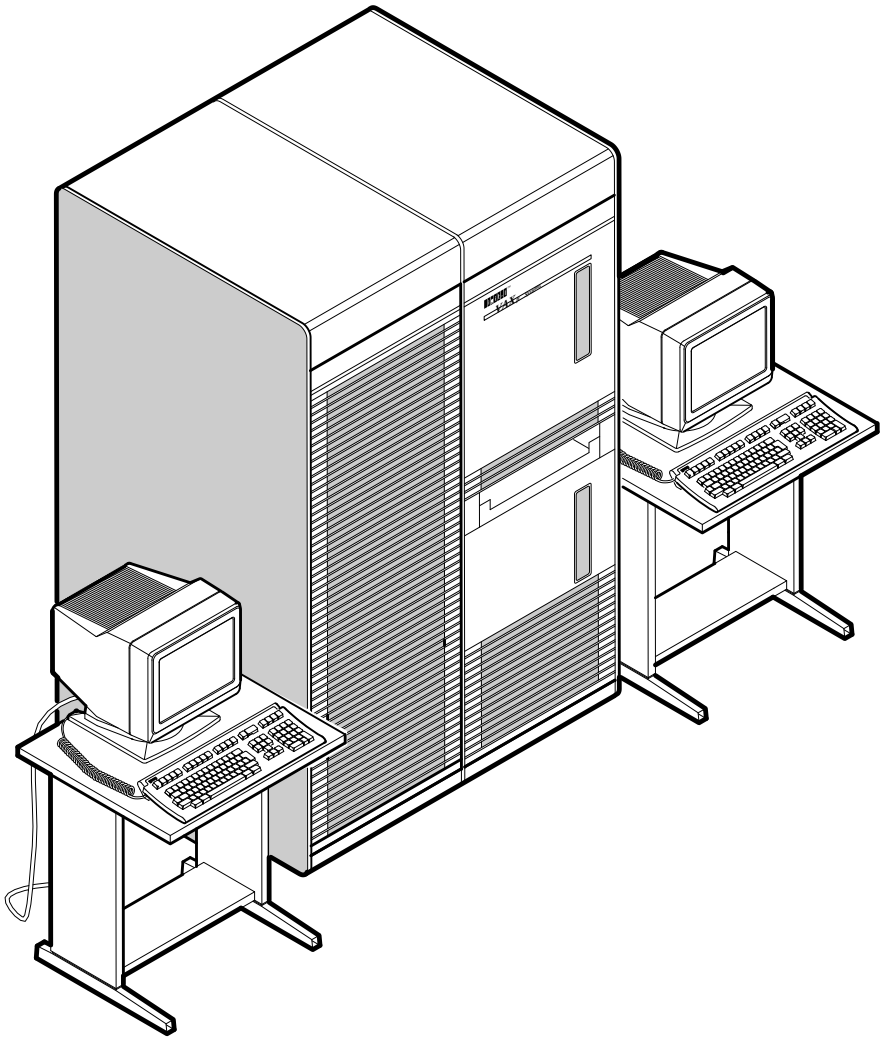
Figure 1–2 Expanded System



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1.3 System Architecture

The system platform is based on a dual zone architecture. Each zone is independent and is housed within a cabinet. The two zones communicate through a cross-link cable.

The CPU pairs run in lockstep, executing the same commands at the same time. A phase-lock loop ensures clock synchronization between zones. The I/O attachment module (ATM) provides the console terminal interface and an interface between the CPU and the ATM. The I/O interface modules connect to the I/O bus in each zone to provide console terminal, network, and mass storage interfaces.

Figure 1–3 shows the system architecture. Table 1–2 describes the components shown in Figure 1–3.

Each zone contains the following components:

- Logic card cage
- Four memory motherboards (MMBs)
- ATM with embedded I/O expansion module (EXM)
- I/O interface module cage containing up to eight DSSI and Ethernet interface modules
- Power subsystem
- Up to six 3.5-inch disks
- CPU pair
- Centerplane

Figure 1–3 System Architecture

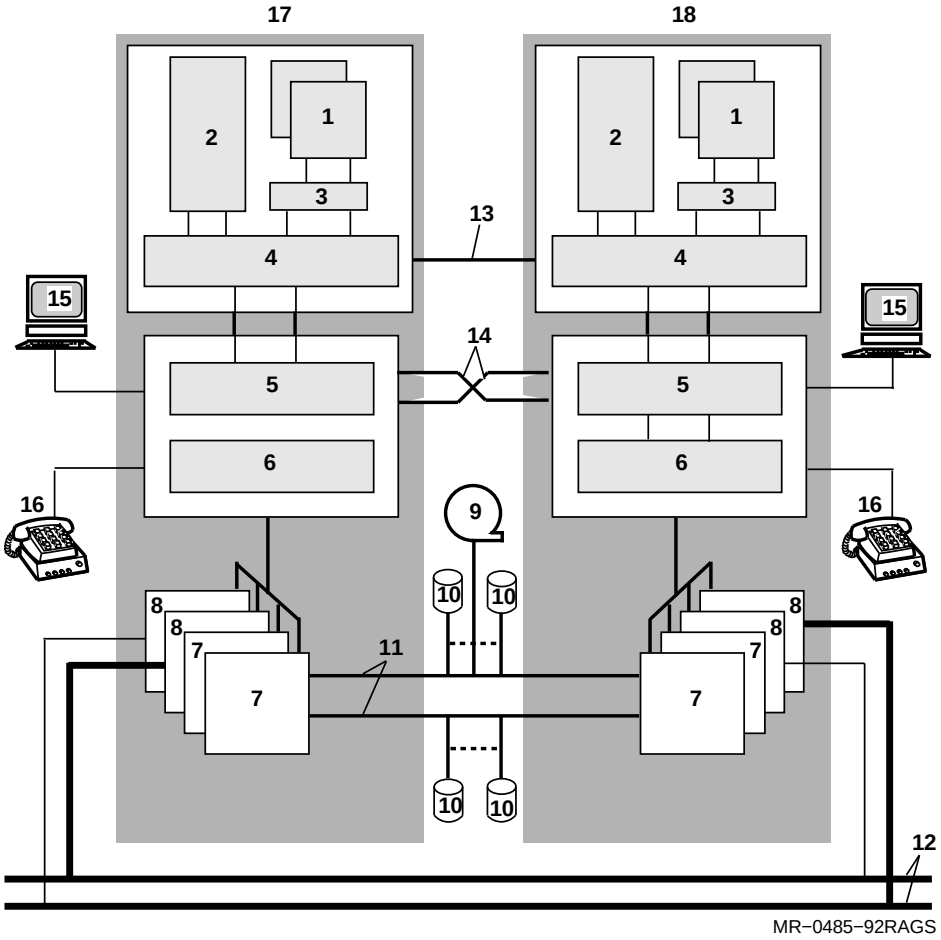


Table 1–2 Key to Figure 1–3, System Architecture

Item	Component
1	CPU
2	Memory
3	Cache
4	Memory control
5	Cross-link chips
6	Expansion module (EXM)
7	DSSI interface module (DIM)
8	Ethernet interface module (EIM)
9	Tape
10	Disk
11	DSSI bus
12	Ethernet
13	Resync cable
14	Cross-link cable
15	Local console terminal
16	Modem
17	Zone A
18	Zone B

1.4 Hardware

This section describes the hardware used with the system.

1.4.1 CPU and Memory Subsystem

The CPU module houses the CPU, cache memory, and main memory. The CPU module contains two microprocessor chips operating at a 12-nanosecond cycle time. Each of the microprocessor chips contains:

- Error correction code (ECC)
- An 8-Kbyte two-way set-associative data cache (P-cache)
- A 2-Kbyte direct-mapped virtual instruction cache (I-cache)
- An external secondary cache that contains a 512-Kbyte direct-mapped write-back cache (B-cache)

Four MMBs plug into the CPU module. The 4-MB DRAM single inline memory modules (SIMMs) plug into the MMBs. The system supports 32 MB to 256 MB of memory.

The CPU module can read eight longwords (312 bits including ECC) at a time, and can refresh the caches rapidly because memory access time is less than 200 nanoseconds.

1.4.2 I/O Subsystem

Each zone contains its own I/O, which is located in three types of modules:

- DIM
- EIM
- ATM with embedded EXM

The DIMs connect to the system's mass storage devices through the DSSI bus. One DSSI bus is provided per DIM. One DIM takes up one node on the DSSI bus.

The EIM connects to the network devices in one of two ways: through a coaxial cable connection that provides ThinWire Ethernet access, or through a 15-pin connector that provides thickwire Ethernet access.

CPU and I/O components within a zone are connected through the system MI bus, which is a 16-bit, dual rail, synchronous bus. The second rail is used for error checking. The I/O subsystem is single rail bus with ECC embedded to detect faults.

1.4.3 Power Subsystem

Table 1–3 describes the function of each power subsystem component.

Table 1–3 Power Subsystem Components

Component	Function
Uninterruptible power supply (UPS)[1]	Provides emergency power to the system for 20 to 40 minutes during a power disruption. The UPS is freestanding.
Front end unit (FEU)	Converts ac power to 48 Vdc.
Regulator	Provides +3.3 Vdc at 30 A, +12 Vdc at 12.5 A, and bias.
Regulator	Provides +5 Vdc at 90 A.
Power supply control (PSC)	Provides interface signals to the ATM and EXM.
Control and miscellaneous power (CAMP)	Provides additional control signals to the PSC.
Local disk converter (LDC)	Provides dc power to supported storage devices in the CPU cabinet.

[1]Recommended option.

1.4.4 Packaging

The CPU and expander cabinet dimensions are identical. Table 1–4 lists the cabinet specifications. Figure 1–4 shows the front layout of an expanded system. Table 1–5 describes the components shown in Figure 1–4. Figure 1–5 shows the rear layout of an expanded system. Table 1–6 describes the components shown in Figure 1–5.

Table 1–4 Cabinet Specifications

Specification	Value
Height	170.0 cm (67 in)
Width	60.0 cm (24 in)
Depth	86.0 cm (34 in)
Power	Three-phase 120/208 Vac, 30 A Single-phase 240 Vac, 30 A
Heat dissipation	300 W (13000 BTU per hour) maximum 2800 W (6800 BTU per hour) typical

Figure 1–4 Cabinet Layout, Front View

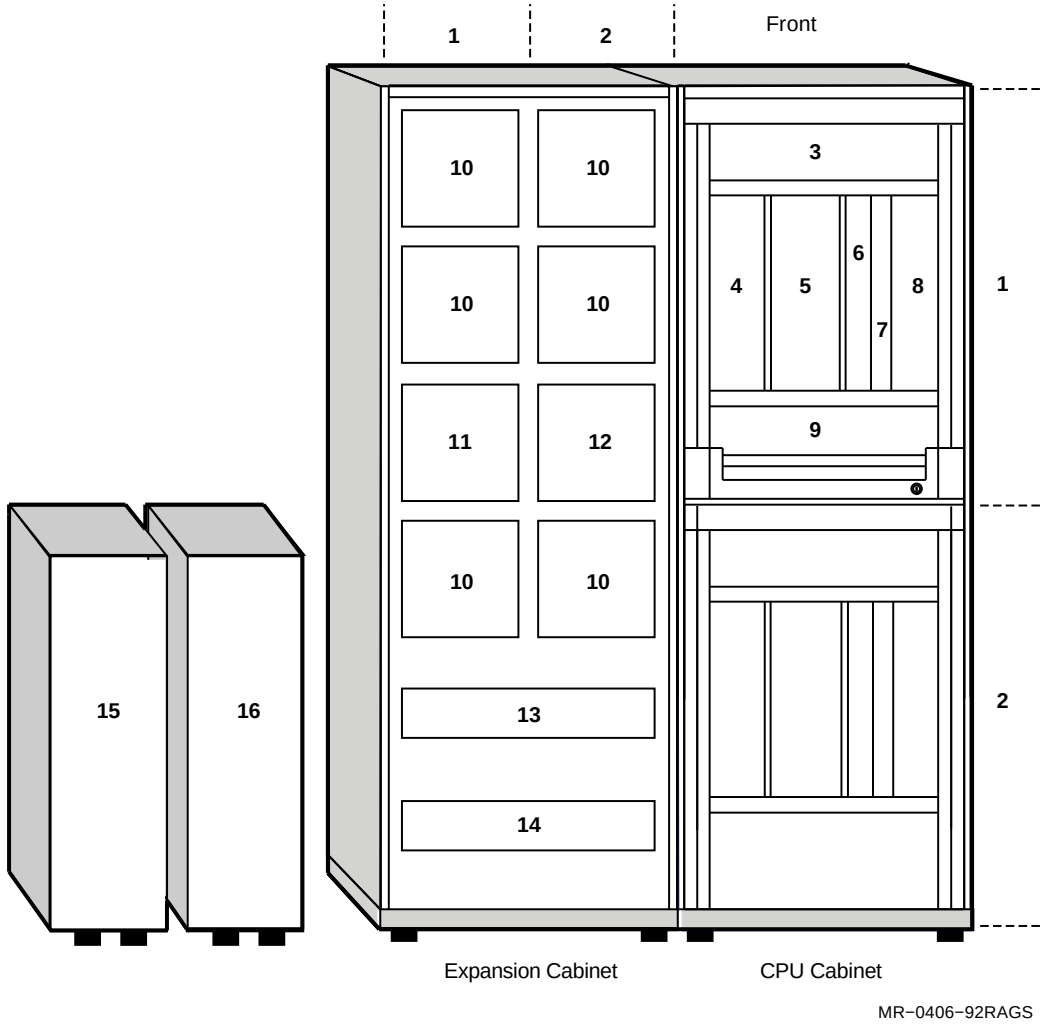


Table 1–5 Key to Figure 1–4, Cabinet Layout, Front View

Item	Component	Description
1	Zone A	Complete computer with enough elements to run an operating system.
2	Zone B	Complete computer with enough elements to run an operating system.
3	Fan assembly	Cooling device.
4	Disk drawer	Optional SF35 disk drive(s).
5	CPU	Logic chips and memory.
6	ATM	I/O logic supporting up to eight interface modules.
7	Not used	—
8	Zone control panel	Zone control panel.
9	Not used	—
10	Disk device	Location for disk device.
11	Disk/tape device	Location for disk or tape device.
12	Disk/tape/tape loader	Location for disk, tape, or tape loader device.
13	Power distribution box A	AC power source for Zone A.
14	Power distribution box B	AC power source for Zone B.
15	UPS A	Uninterruptible power source for Zone A.
16	UPS B	Uninterruptible power source for Zone B.

Figure 1–5 Cabinet Layout, Rear View

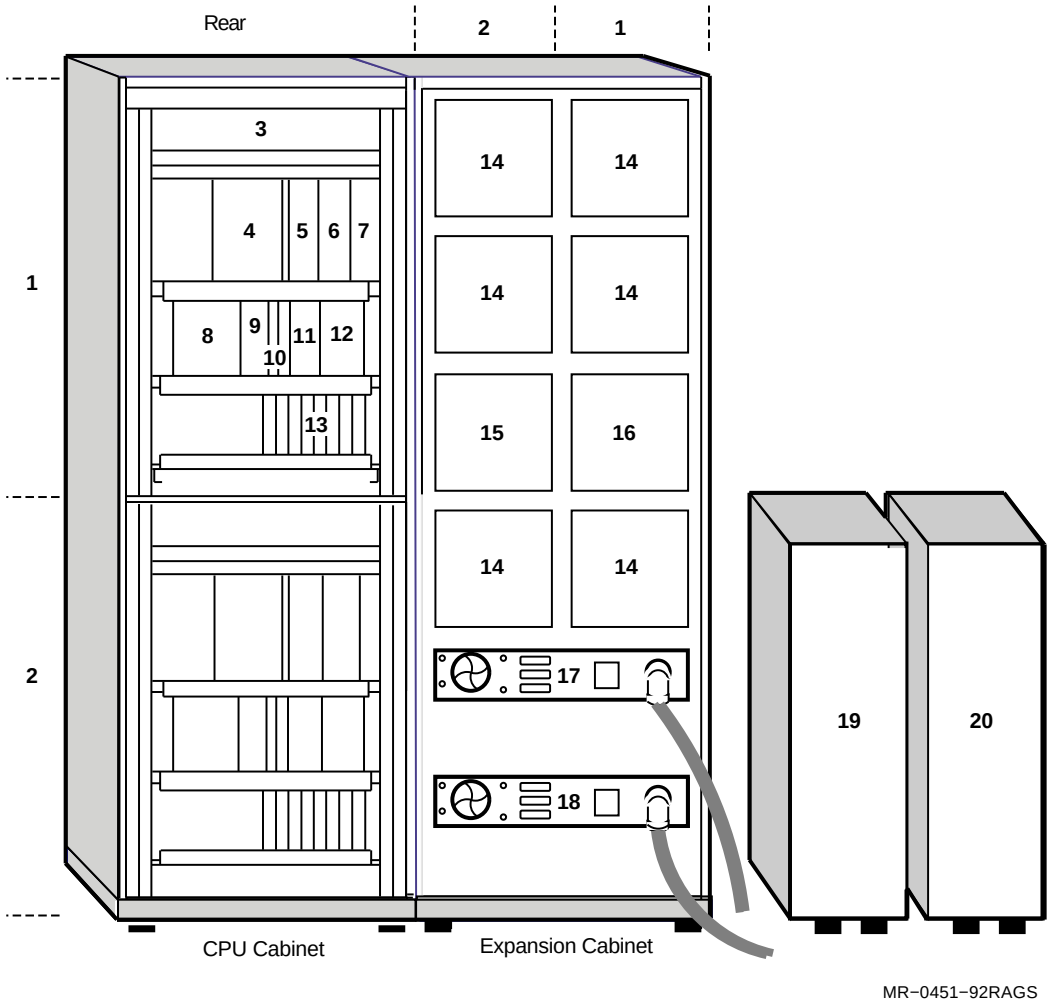


Table 1–6 Key to Figure 1–5, Cabinet Layout, Rear View

Item	Component	Description
1	Zone A	Complete computer with enough elements to run an operating system.
2	Zone B	Complete computer with enough elements to run an operating system.
3	Fan assembly	Cooling device.
4	FEU	Converts ac power to 48 Vdc.
5	Regulator	Provides +3.3 Vdc at 30 A, +12 Vdc at 12.5 A, and bias.
6	Regulator	Provides +5 Vdc at 90 A.
7	PSC	Provides interface signals to the ATM and EXM.
8	Cross-link modules	Connect Zone A and Zone B.
9	Console	Module with console port.
10	—	Slot for optional diagnostic testing.
11	Disk in/Disk out	Permits zone interconnections to access all configured disks.
12	CAMP	Provides additional control signals to the PSC.
13	—	Slots for optional DIMs and EIMs.
14	Disk device	Location for disk device.
15	Disk/tape device	Location for disk or tape device.
16	Disk/tape/tape loader	Location for disk, tape, or tape loader device.
17	Power distribution box A	AC power source for Zone A.
18	Power distribution box B	AC power source for Zone B.
19	UPS A	Uninterruptible power source for Zone A.
20	UPS B	Uninterruptible power source for Zone B.

1.4.5 Storage Devices

The system supports DSSI storage devices. To prevent a single point of failure, the system is configured for dual access with shadowing to each storage device. The DSSI cables are routed from one zone, to the storage devices, then to the other zone. Each disk connects to both zones. Each zone connects to all disks.

The disks are available even when power to the logic modules is turned off. The disks are not available when power to the zone is turned off or fails. Each disk can be powered down individually.

A CPU module can access disks in the other zone through the DSSI connections in its own zone or through the cross-link cable to the DSSI interface in the other zone.

The system cabinet provides limited storage space — up to six optional RF35-HA disks in each zone. The expander cabinet provides more storage space. Table 1–7 describes the storage devices supported by the expander cabinet.

Table 1–7 Expander Cabinet Storage Devices

Device Type	Storage Capacity	Disks or Cartridges per Device	Comment
SF35-BK/HK/JK storage array	1.7/5.1/10.2 GB	2/6/12 disks	One per zone included. Maximum of 36 RF35 disks.
SF73-HK/JK storage array	4/8 GB	2/4 disks	Optional. Maximum of 28 RF73 disks.
TF85C-BA tape cartridge	2.6 GB	1 cartridge	Optional. Maximum of two TF85C-BAs or one TF85C-BA and one TF857-AA per zone.
TF857-AA tape subsystem	18.2 GB	7 cartridges	Optional. Maximum of two TF857-AAs or one TF857-AA and one TF85C-BA per zone.

1.5 Software

The system software consists of:

- OpenVMS software
- Fault Tolerant System Services (FTSS)
- Volume shadowing

The VAXft Model 810 system runs with the OpenVMS VAX operating system, Version 5.5-2HF.

FTSS provides the error handling required by fault tolerance. FTSS operation is transparent to system users, layered OpenVMS software, and applications. FTSS functions include:

- Zone and device failover
- Zone management
- Event reporting and analysis
- Zone synchronization
- System service support routines

Volume shadowing is a layered software product that ensures uninterrupted operation upon disk failures. It is essential to fault tolerant operation.

1.6 System Configurations

The VAXft Model 810 system configurations include entry system, single cabinet package, expanded system, and advantage server. The following sections describe the components in each of these configurations.

1.6.1 Entry System

Table 1–8 describes the components in each zone of an entry system.

Table 1–8 Entry System

Component	Description	Quantity Per Zone
KA560-AA	CPU	1
KD560-AA	ATM	1
MS560-AA	8 MB MMB	4
KDXDA-AA	DIM	2
KDXRA-AA	EIM	1
QL-005A2-6Z	OpenVMS Base License	
QL-YEAAA-6Z	VAXft System Services	
QL-AB2A2-AA	OpenVMS Volume Shadowing	

1.6.2 Single Cabinet Package

Table 1–9 describes the components in each zone of a single cabinet package.

Table 1–9 Single Cabinet Package

Component	Description	Quantity Per Zone
KA560-AA	CPU	1
KD560-AA	ATM	1
MS560-BA	16 MB MMB	4
KDXDA-AA	DIM	2
KDXRA-AA	EIM	1
RF35-HA	850 MB disk drive	1
CK-KDXDA-BA	Cabinet kit for in-zone disks	
QL-005A2-6Z	OpenVMS Base License	
QL-YEAAA-6Z	VAXft System Services	
QL-AB2A2-AA	OpenVMS Volume Shadowing	

1.6.3 Expanded System

Table 1–10 describes the components in each zone of an expanded system. Table 1–7 describes the storage devices available for the expander cabinet.

Table 1–10 Expanded System

Component	Description	Quantity Per Zone
System Cabinet		
KA560-AA	CPU	1
KD560-AA	ATM	1
MS560-BA	16 MB MMB	4
KDXDA-AA	DIM	2
KDXRA-AA	EIM	2
Expander Cabinet		
SF35-HBK	1.75 GB disk drive	1
H7247-AA	3.6 kVA freestanding UPS	1
CK-KDXDA-BA	Cabinet kit for in-zone disks	
QL-005A2-6Z	OpenVMS Base License	
QL-YEAAA-6Z	VAXft System Services	
QL-AB2A2-AA	OpenVMS Volume Shadowing	

1.6.4 Advantage Server

Table 1–11 describes the components in each zone of an advantage server. Table 1–7 describes the storage options available for the expander cabinet.

Table 1–11 Advantage Server

Component	Description	Quantity Per Zone
System Cabinet		
KA560-AA	CPU	1
KD560-AA	ATM	1
MS560-BA	16 MB MMB	4
KDXDA-AA	DIM	2
KDXRA-AA	EIM	2
Expander Cabinet		
SF35-BK	1.75 GB disk drive	1
TF85C-BA	2.6 GB tape cartridge	1
H7247-AA	3.6 kVA freestanding UPS	1
CK-KDXDA-BA	Cabinet kit for in-zone disks	
QL-005A2-6Z	OpenVMS Base License	
QL-YEAAA-6Z	VAXft System Services	
QL-MC5A2-AA	NAS 400 Software	

2

Controls and Indicators

2.1 In This Chapter

This chapter explains the use of the controls and indicators for the:

- Section 2.2, Zone Control Panel
- Section 2.3, Logic Modules
- Section 2.4, Power Modules
- Section 2.5, RF35-HA Disk Drawer
- Section 2.6, SF35-BK/HK/JK Storage Array
- Section 2.7, SF73-HK/JK Storage Array
- Section 2.8, TF85C-BA Cartridge Tape Drive
- Section 2.9, CompacTape III Cartridge
- Section 2.10, TF857-AA Tape Loader

2.2 Zone Control Panel

Figure 2–1 shows the layout of the zone control panel. Table 2–1 describes the functions of the zone control panel controls and indicators.

Figure 2–1 Layout of Zone Control Panel

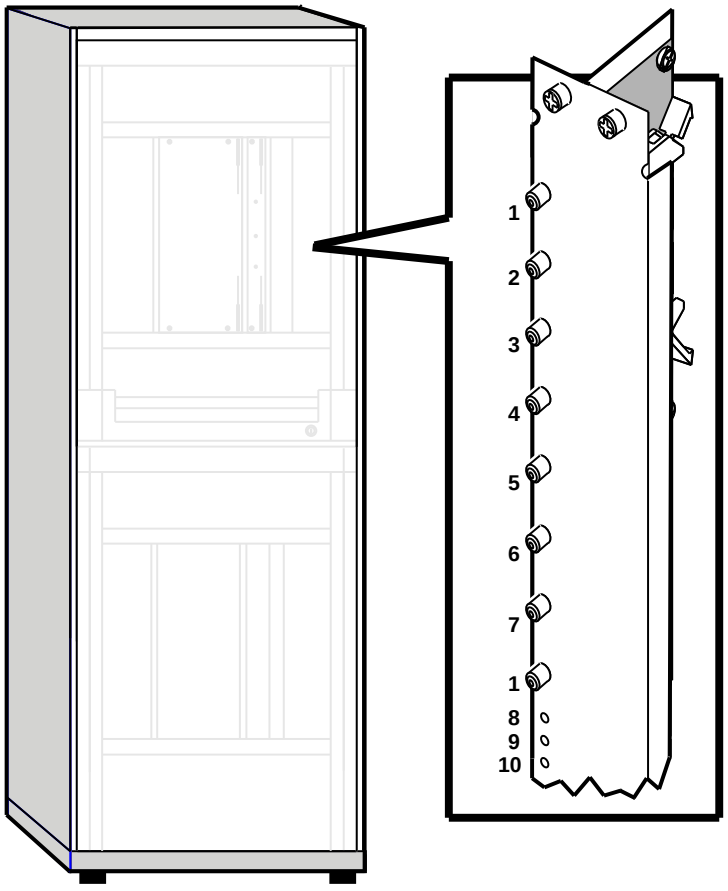


Table 2–1 Key to Figure 2–1, Layout of Zone Control Panel

Item	Control/Indicator	Function
1	Logic Power - OFF	Two switches with amber indicators. Pressing the two switches removes 48 V power and disables the zone. Pressing one switch has no effect on the operation of the zone. (CPU cabinet disk power is not affected when logic power is removed by pressing these switches.)
2	Logic Power - ON	One switch with a green indicator. Pressing this switch applies 48 V power to the zone. (CPU cabinet disk power is not affected when logic power is applied by pressing this switch.)
3	Local Console	One switch with a green indicator. Pressing this switch connects the system to the console local port for communication.
4	Remote Console	One switch with a green indicator. Pressing this switch connects the system to the remote port for communication.
5	Secure	One switch with a green indicator. Pressing this switch disables the console Break key function. The normal switch position is on. The switch setting must be identical on both zone control panels. (You cannot use the console Break key to halt the zone or system.)
6	Zone Halt Enable	One switch with a green indicator. Pressing this switch enables the console Break key function. (You can use the console Break key to halt the zone.)
7	System Halt Enable	One switch with a green indicator. Pressing this switch enables the console Break key function. (You can use the console Break key to halt both zones.)
8	System OK	Green indicator. On when the system power is on and the system is operational.
9	System Fault	Amber indicator. On when the system is not operational.
10	OS Running	Green indicator. On when the system is operational and running a customer or diagnostic application.

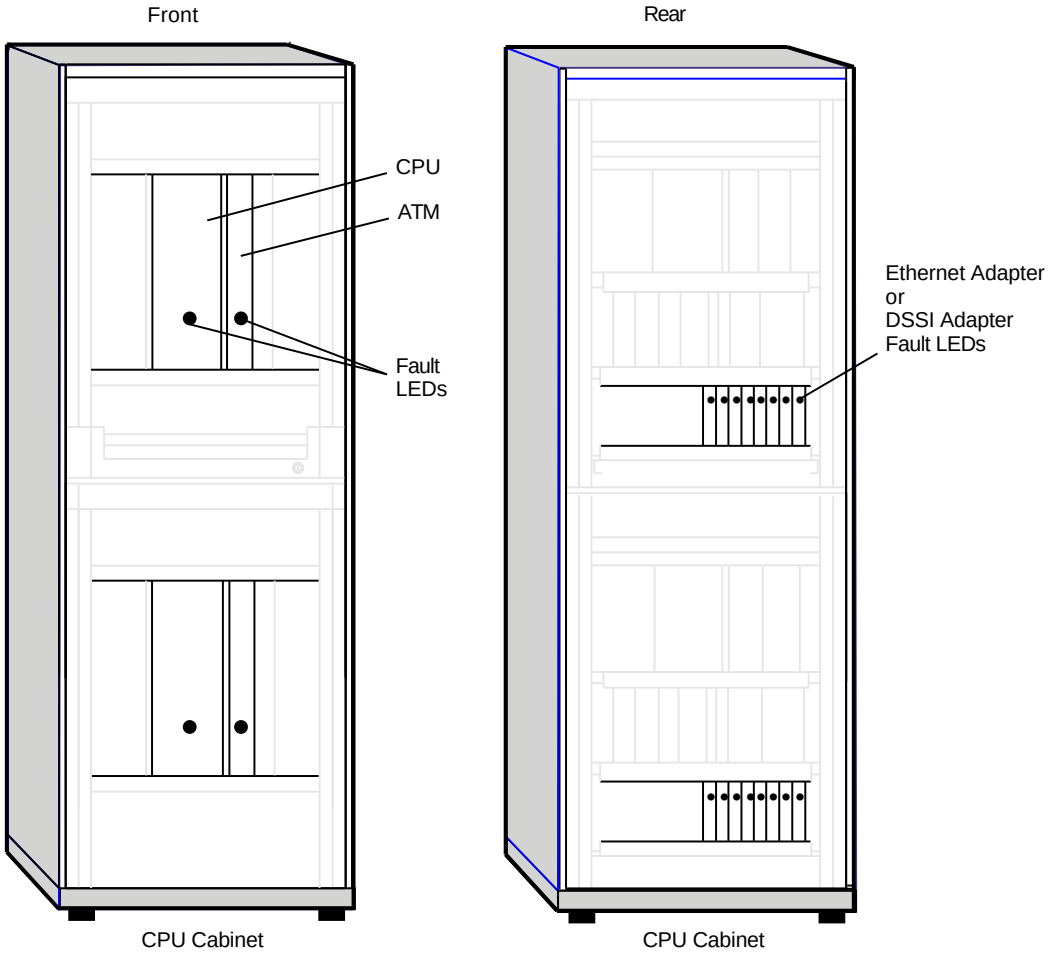
2.3 Logic Modules

The following logic modules each have one fault LED:

- CPU
- ATM
- DIM
- EIM

When on, a fault has been detected on the module and that module is marked bad. Figure 2–2 shows the location of the logic module LEDs.

Figure 2–2 Logic Module Fault LEDs



2.4 Power Modules

Figure 2–3 shows the location of the power module controls and indicators. Table 2–2 describes their functions.

Figure 2–3 Power Module Controls and Indicators

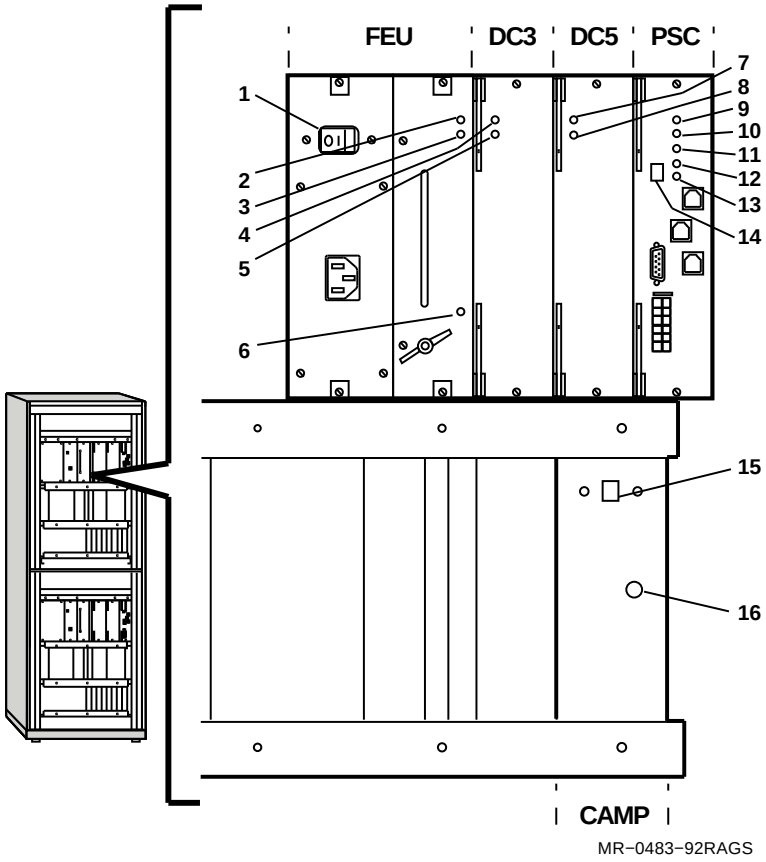


Table 2–2 Key to Figure 2–3, Power Module Controls and Indicators

Item	Control/ Indicator	Function
1	AC Circuit Breaker	
2	FEU Failure	When on, indicates the dc output voltages for the FEU are below the specified minimum.
3	FEU OK	When on, indicates the dc output voltages for the FEU are above the specified minimum.
4	DC3 Failure	When on, indicates that one of the +3 Vdc output voltages is not within the specified tolerances.
5	DC3 OK	When on, indicates that the +3 Vdc output voltages are within the specified tolerances.
6	AC Present	When on, indicates ac power is present at the ac input connector, regardless of the position of the circuit breaker.
7	DC5 Failure	When on, indicates that one of the +5 Vdc output voltages is not within the specified tolerances.
8	DC5 OK	When on, indicates that the +5 Vdc output voltages are within the specified tolerances.
9	PSC Failure	When on, indicates a PSC fault.
10	PSC OK	When blinking, indicates the PSC is performing power-on self-tests.
10		When on, indicates the PSC is functioning.
11	Over Temperature Shutdown	When on, indicates that the PSC shut down the system because of an internal overtemperature condition.
12	Fan Failure	When on, indicates a fan failure. Use the hexadecimal number in the Fault ID Display to isolate the fan.
13	Disk Drive Power Failure	When on, indicates a disk drive power failure. Use the hexadecimal number in the Fault ID Display to isolate the storage compartment that houses the disk drive.
14	Fault ID Display	Displays power subsystem fault codes.
15	PSC Reset Button	When out, indicates a PSC fault condition. Press in to reset.
16	CAMP Fan Fault	When on, indicates that a fan fault caused all disk drives and tape drives to shut down.

2.5 RF35-HA Disk Drawer

Figure 2–4 shows the layout of the RF35-HA disk drawer. Table 2–3 describes the functions of the RF35-HA controls and indicators.

Figure 2–4 RF35 Disk Drawer Controls and Indicators

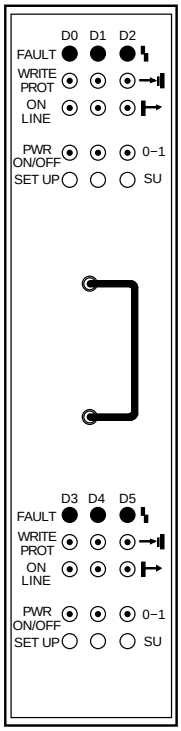


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Table 2–3 RF35 Disk Drawer Controls and Indicators

Control/Indicator	Color	State	Operating Condition
Fault	Red	On	Drive is faulty.
		Off	Drive is functioning correctly.
Write Protect	Amber	Out, off	System can read from the disk and write to the disk.
		In, on	System cannot write to the disk, but can read from the disk.
On Line	Green	Out, off	Drive is disabled.
		In, on	Drive is enabled.
Power On/Off	Green	In, on	Power is on.
		Out, off	Power is off.
Set Up Switch		In	Prevents the drive from joining the DSSI cluster. Also allows you to set the DSSI parameters for a new drive or a drive you replace in the system after repair. (If you want to set the DSSI parameters, you press the Set Up switch and the Power On/Off switch at the same time.)
		Out	Has no effect on the drive.

2.6 SF35-BK/HK/JK Storage Array

Figure 2–5 shows the front of the storage array. Table 2–4 describes the functions of the controls and indicators located on the front of the storage array. Figure 2–6 shows the rear of the storage array. Table 2–5 describes the functions of the controls and indicators located at the rear of the storage array.

Figure 2–5 Front of the SF35-BK/HK/JK Storage Array

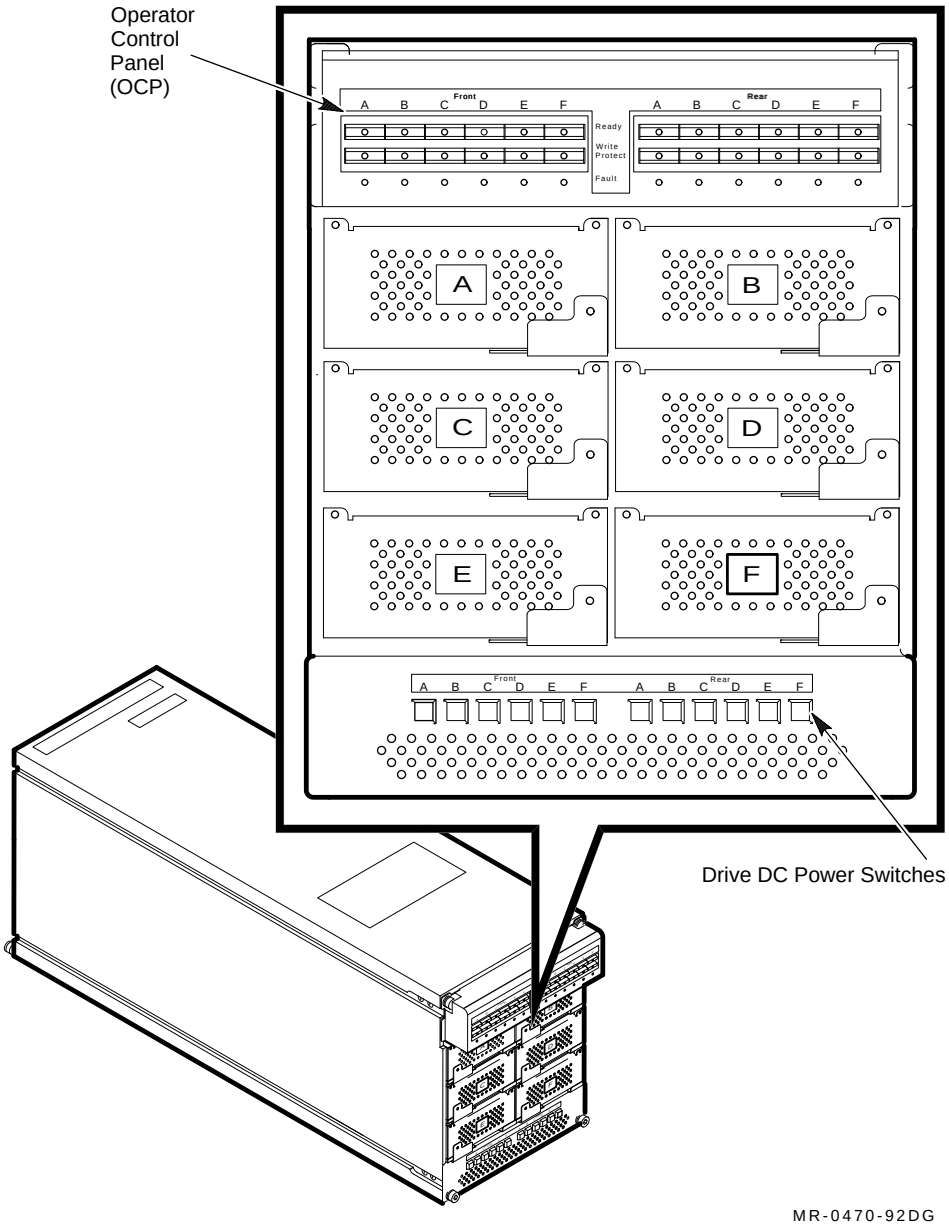

Table 2–4 SF35-BK/HK/JK Front Panel Controls and Indicators

Control/Indicator	Function
Ready	Push-to-set switch with green indicator. Brings the integrated storage element (ISE) on-line in about 10 seconds. The indicator remains on while the ISE is on-line.
Write Protect	Push-to-set switch with amber indicator. Write protects the data on the ISE. The data cannot be overwritten, nor can new data be written to the ISE.
Fault	Recessed switch with multicolor indicator. Controls the MSCP. This switch is equivalent to the SU switch. The colors indicate the following conditions: Green (in) = MSCP is disabled. Green (out) = MSCP is enabled. Amber = Fault is detected while the MSCP is disabled. Red = ISE fault. Off = Normal MSCP operation.
Drive DC Power Switches	One switch/indicator for each ISE. Each switch applies power to an ISE. Each ISE spins up and runs a self-test. The indicator shows that nominal power is being applied to the ISE. (If you want to bring the ISE on-line, you press the Ready switch next.)

Figure 2–6 Rear of the SF35-BK/HK/JK Storage Array

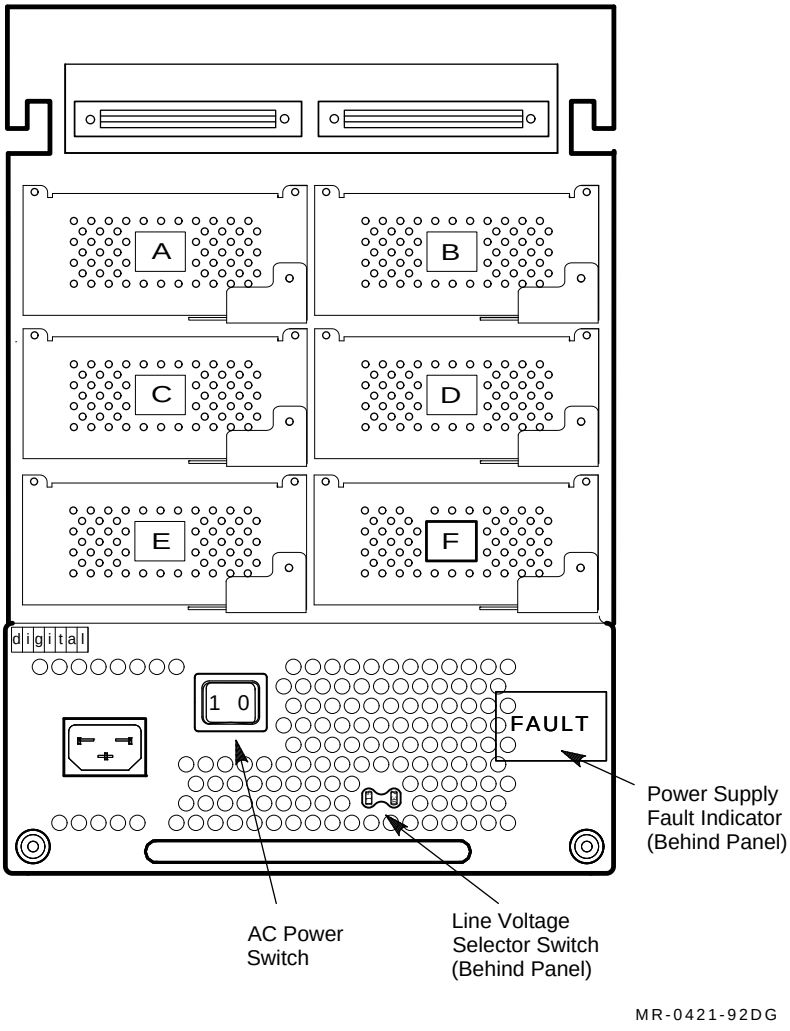

Table 2–5 SF35-BK/HK/JK and SF73 Rear Panel Controls and Indicators

Control/Indicator	Function
AC Power Switch	Applies power to the ac power supply.
Line Voltage Selector Switch	Selects 120 Vac (60 Hz) or 240 Vac (50 Hz) line voltage.
Power Supply Fault Indicator	When on, indicates an overtemperature condition.

2.7 SF73-HK/JK Storage Array

Figure 2–7 shows the front of the storage array. Figure 2–8 shows the location of the TERM PWR LED, the SPLIT LEDs, and the four switchpacks. Table 2–6 describes the functions of the controls and indicators shown in Figure 2–7 and Figure 2–8. Figure 2–9 shows the rear of the storage array. Table 2–5 describes the functions of the controls and indicators shown in Figure 2–9.

Figure 2–7 Front of the SF73-HK/JK Storage Array

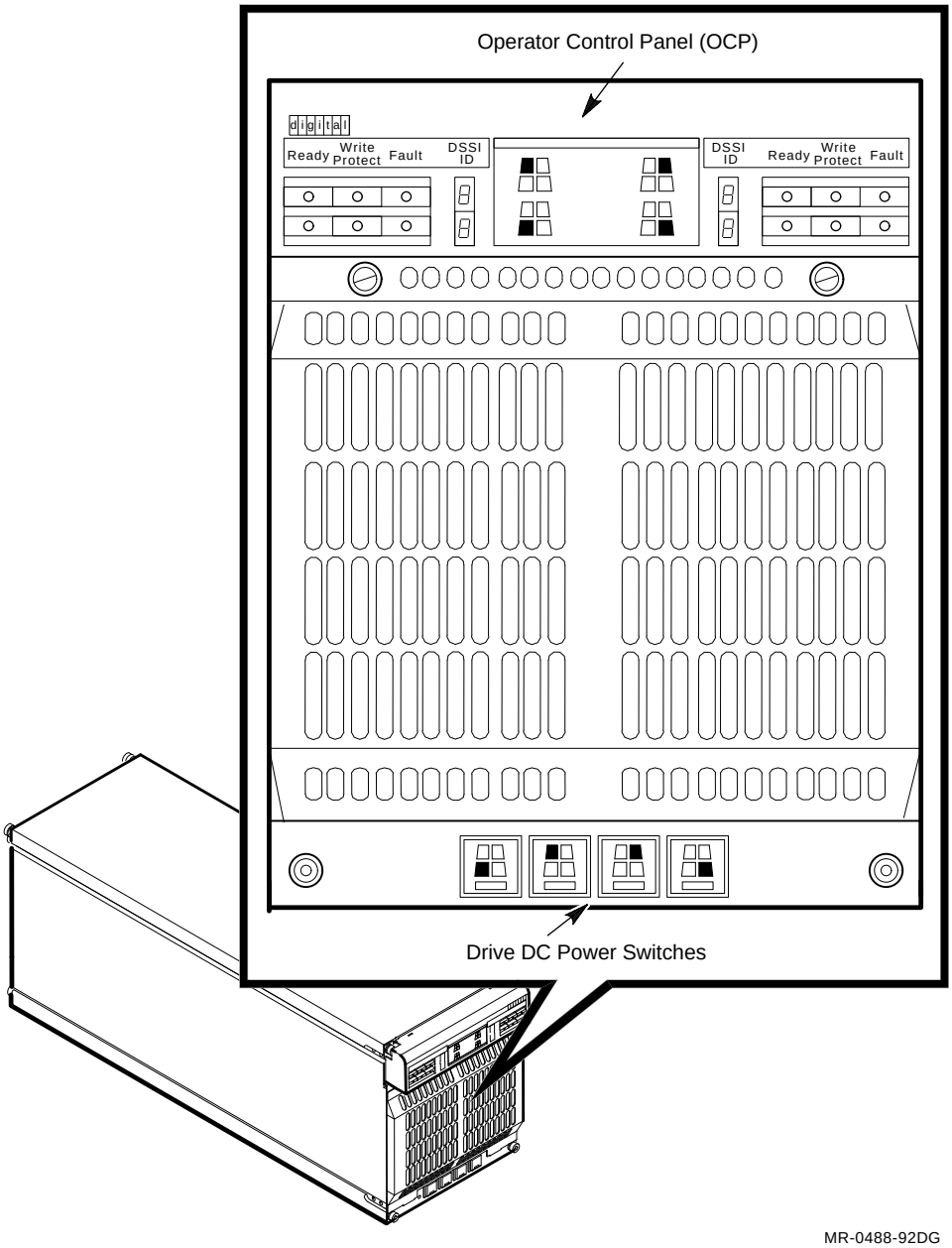

Figure 2–8 Location of SF73-HK/JK Storage Array LEDs and Switchpacks

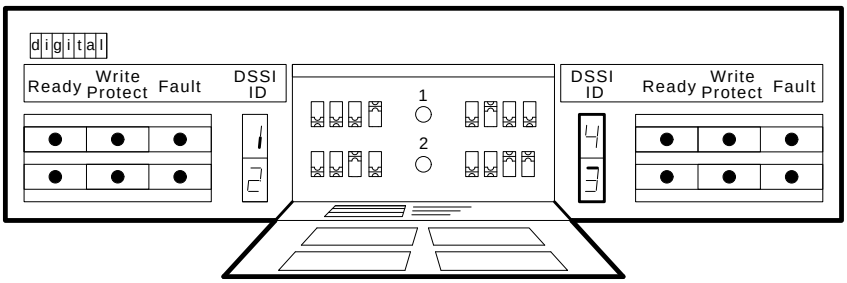

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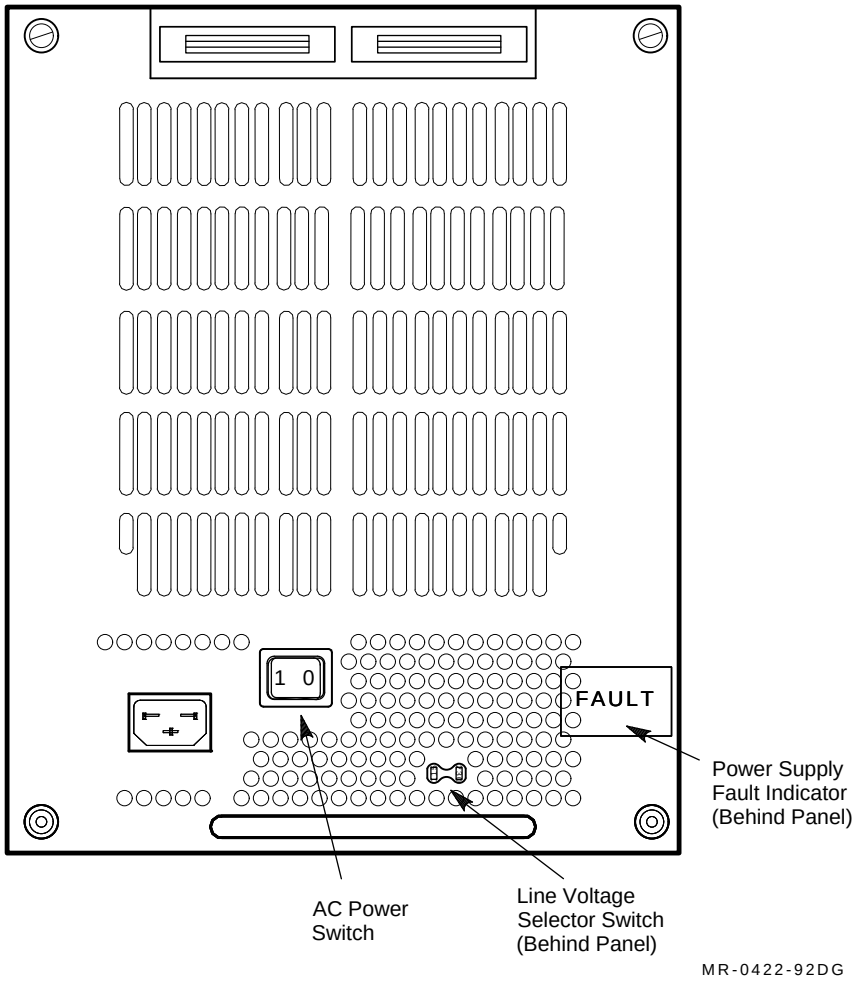
Table 2–6 SF73-HK/JK Front Panel Controls and Indicators

Control/Indicator	Function
Ready	Push-to-set switch with green indicator. Brings the integrated storage element (ISE) on-line in about 10 seconds. The indicator remains on while the ISE is on-line.
Write Protect	Push-to-set switch with amber indicator. Write protects the data on the ISE. The data cannot be overwritten, nor can new data be written to the ISE.
Fault	Switch with red indicator. When the indicator is on, the ISE failed. Press the switch to display the fault codes and clear the ISE fault. The indicator is off during normal operation.
TERM PWR LED	When on, indicates that the correct termination power is being supplied.
SPLIT LEDs (2)	When on, indicates that the storage array is operating in split-bus mode.
Switchpacks (4)	One for each of the drives in the storage array. Each switchpack is used to set the DSSI ID number. The icon on the front of the door indicates the location of the drive. The three rightmost switches of each switchpack are the DSSI ID switches. The leftmost switch is the SU switch.
Drive DC Power Switches	One switch/indicator for each ISE. Each switch applies power to an ISE. Each ISE spins up and runs a self-test. The indicator shows that nominal power is being applied to the ISE. (If you want to bring the ISE on-line, you press the Ready switch next.)

Figure 2–9 Rear of the SF73-HK/JK Storage Array



2.8 TF85C-BA Cartridge Tape Drive

The TF85C-BA cartridge tape drive serves as a system software load device. It is housed in an enclosure, and comes with a DSSI controller module and an interface module. The drive is a TK85 streaming tape drive that can store up to 2.6 GB of data on a CompacTape III cartridge. The drive can read data from a tape written by a TK70 or TK50 drive, but cannot overwrite a tape originally written by a TK50.

The TF85C-BA cartridge tape drive accepts a TK cartridge that has a single-feed reel. When a cartridge is inserted, the drive hooks the end of the tape and threads it onto a takeup reel inside the drive. The tape must be completely rewound and unloaded before the cartridge can be removed from the drive. Rewinding and unloading may take up to 90 seconds.

Figure 2–10 shows the front of the TF85C-BA cartridge tape drive. Table 2–7 summarizes the TF85C-BA cartridge tape drive controls and Table 2–8 describes the indicators shown in Figure 2–10.

Figure 2–10 TF85C-BA Cartridge Tape Drive

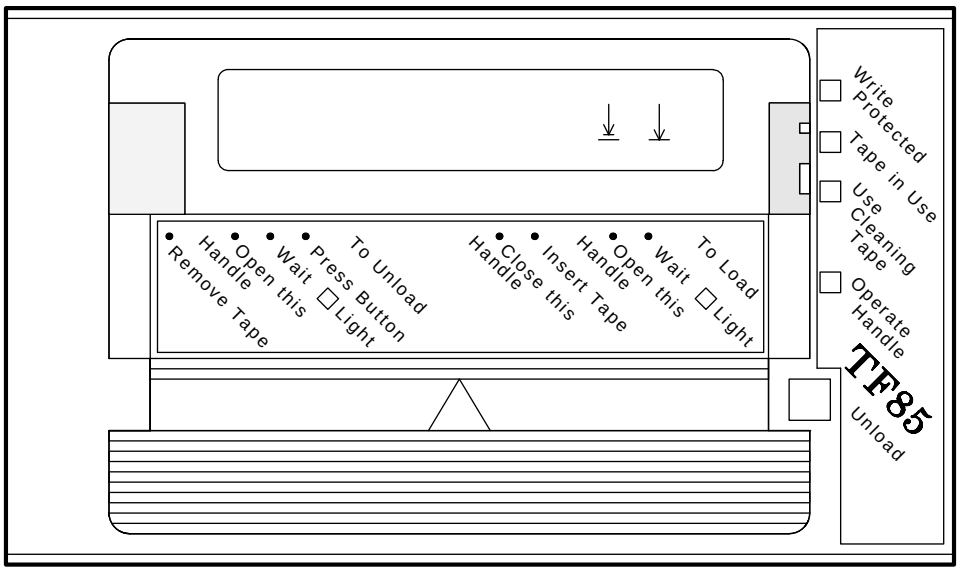


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Table 2–7 TK85C-BA Cartridge Tape Drive Controls

Control	Position	Function
Insert/Remove handle	Open	Lets you insert or remove a tape after rewind and unload operations are completed.
	Closed	Locks tape in operating position and begins load sequence.
Unload button	Momentary contact switch	Rewinds and unloads the tape.
Beeper		Sounds when you can operate the Insert/Remove handle.

Table 2–8 TK85C-BA Cartridge Tape Drive Indicators

Indicator	Color	State	Operating Condition
Write Protected	Orange	On	Tape is write-protected.
		Off	Tape is write-enabled.
Tape in Use	Yellow	Blinking	Tape is moving.
		On	Tape is loaded; ready for use.
Use Cleaning Tape	Orange	On	Drive head needs cleaning or tape is bad.
		If it remains on after you unload the cleaning tape . . .	Then the cleaning was not completed because the tape ended.
		If, after cleaning, it turns on again when the data cartridge is reloaded . . .	Then a data cartridge problem occurred. Try another cartridge.
Operate Handle	Green	On	Okay to operate the Insert/Remove handle.
		Off	Do not operate the Insert/Remove handle.
All four indicators		On	Power-on self-test is in progress.
		Blinking	A fault is occurring. Press the Unload button to unload the cartridge. If the fault is cleared, the yellow indicator blinks while the tape rewinds. When the green indicator turns on, you can move the Insert/Remove handle to remove the cartridge. If the fault is not cleared, all four indicators continue to blink. Do not attempt to remove the cartridge. Call Digital Customer Services.

2.8.1 Problems

The following may help you to define and/or correct a TF85C-BA cartridge tape drive problem:

Correctable Failure During Operation

If the TF85C-BA drive fails during operation, you may be able to reset the drive, then rewind, unload, and remove the cartridge.

If all four indicators are blinking, press the Unload button. If the failure is correctable, the tape begins to rewind and the yellow indicator blinks. When the tape is unloaded, the green indicator turns on and the beeper sounds. Then pull the Insert/Remove handle to open the drive and remove the cartridge.

Noncorrectable Failure During Tape Motion

If the tape does not rewind when you push the Unload button and all the indicators continue to blink, the failure is not correctable. The drive must be replaced or serviced.

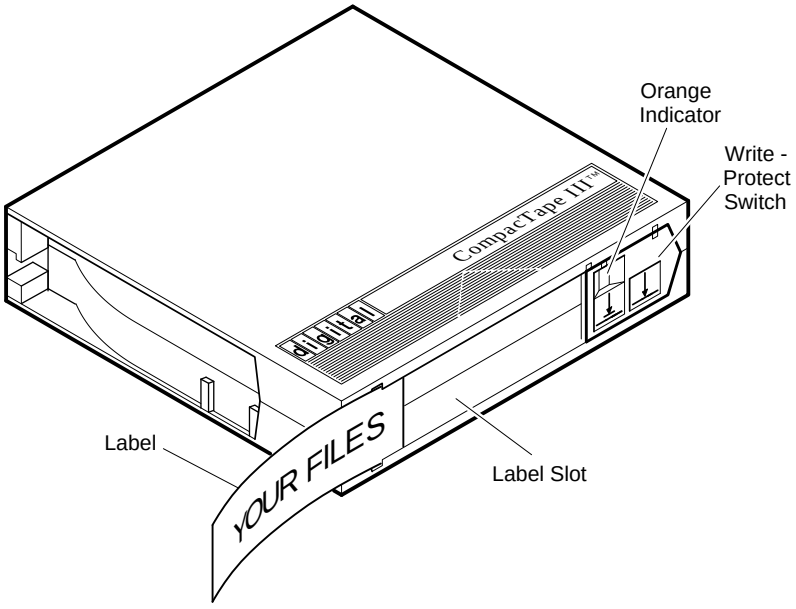
Failure During Cartridge Insertion

A cartridge failure occurs if a cartridge is damaged or if internal portions of the drive that handle the cartridge are not working. Suspect a cartridge failure if the green indicator blinks, but the tape does not move (the yellow indicator does not blink). Remove the cartridge and try another one, or inspect the tape leader and drive takeup leader.

2.9 CompacTape III Cartridge

Figure 2–11 shows the CompacTape III cartridge recommended for use in TF85C-BA drives.

Figure 2–11 CompacTape III Cartridge



The cartridge write protect switch slides to the left or right. When the orange indicator is visible, the tape is write protected. When the indicator is not visible, the tape is write enabled.

2.9.1 Loading a Cartridge

Figure 2–12 shows how to load a CompacTape III cartridge in the TF85C-BA drive. Follow the steps in Table 2–9.

Figure 2–12 Loading a Cartridge

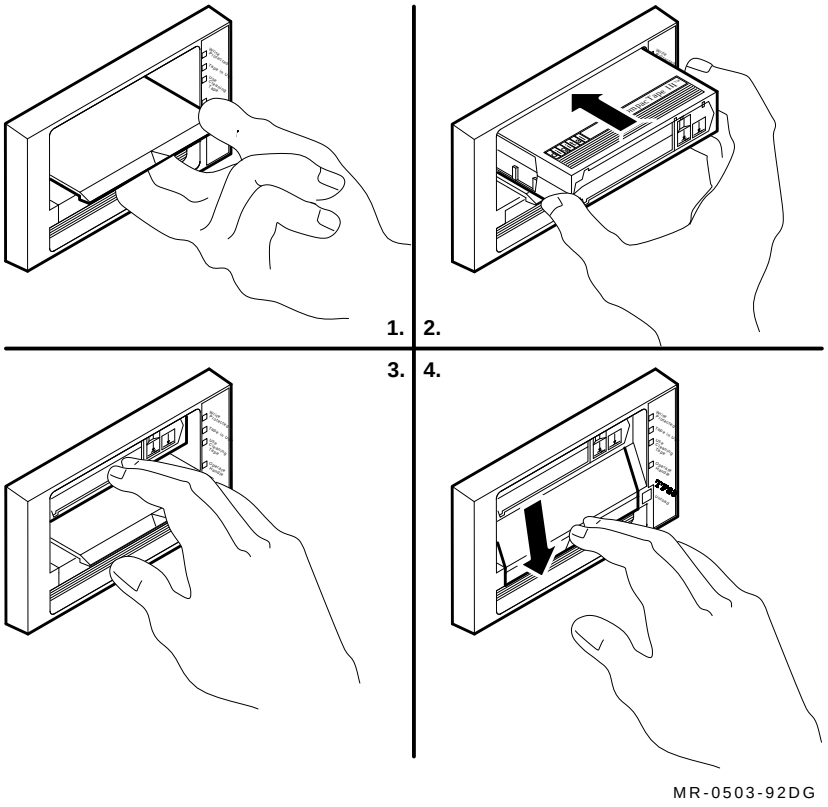


Table 2–9 Loading a Cartridge

Step	Action
1.	When the green indicator is on, pull the Insert/Remove handle to the open position.
2.	Insert the cartridge.
3.	Push the cartridge in until it is completely seated in the drive.
4.	Return the Insert/Remove handle to the closed position.

The yellow indicator blinks while the tape is loading. When it stays on steadily, the drive is ready for use.

2.9.2 Unloading a Cartridge

Figure 2–13 shows how to unload a CompacTape III cartridge from the TF85C-BA drive. Follow the steps in Table 2–10.

Figure 2–13 Unloading a Cartridge

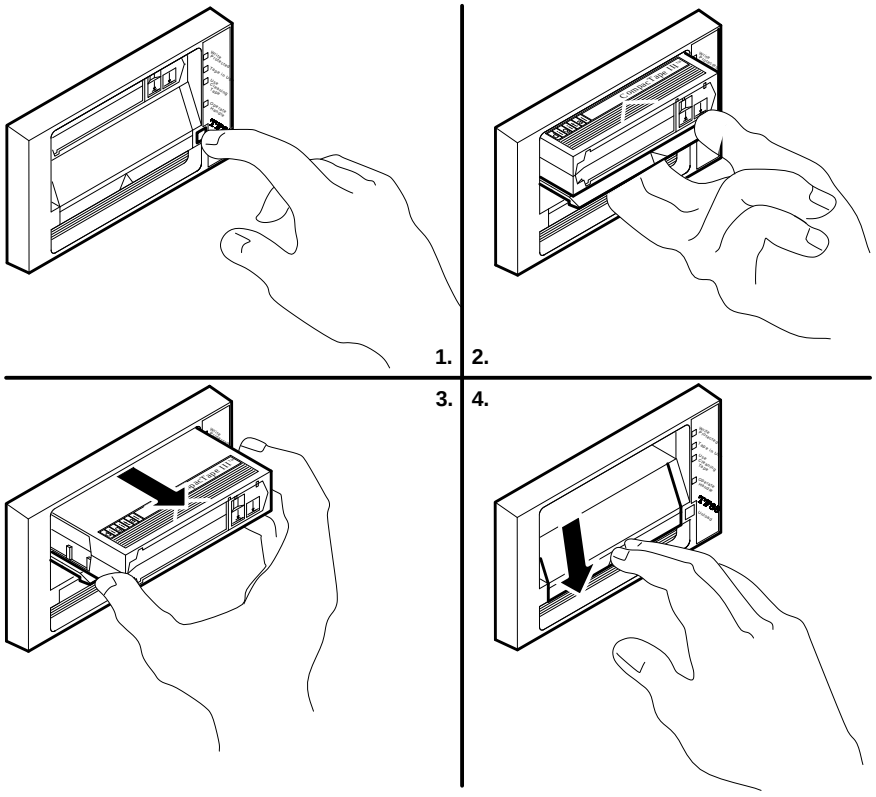


Table 2–10 Unloading a Cartridge

Step	Action
1.	Push the Unload button.
2.	When the beeper sounds and the green indicator turns on, pull the Insert/Remove handle out to eject the cartridge.
3.	Remove the cartridge and store it.
4.	Return the Insert/Remove handle to the closed position.

2.9.3 Handling and Storing Cartridges

Observe the following precautions when handling and storing cartridges:

- Do not drop or bang the cartridge. If the tape leader is displaced, the cartridge is unusable and may cause damage to the drive.
- Keep cartridges out of direct sunlight and away from heaters and other sources of heat.
- Store cartridges in a dust-free environment where the temperature is between 10°C and 38°C (50°F and 100°F) and the relative humidity is between 20% and 80%.
- If a cartridge has been exposed to extreme heat or cold, allow it to stabilize at room temperature for the same amount of time it was exposed (up to 24 hours).
- Do not place cartridges near sources of electromagnetic interference (terminals, motors, video or X-ray equipment). Data on the tape may be erased.
- Place a label on a cartridge only in the label slot shown in Figure 2–11.

2.9.4 Inspecting the Tape Leader

If you have trouble loading a cartridge, inspect the tape leader and the drive takeup leader.

Caution

Do not touch exposed portions of the magnetic tape. If the tape leader is not in the correct position, do not try to use the cartridge. Use a new cartridge instead.

Figure 2–14 shows the correct position of the tape leader inside the cartridge. Follow the steps in Table 2–11.

Figure 2–14 Inspecting the Tape Leader

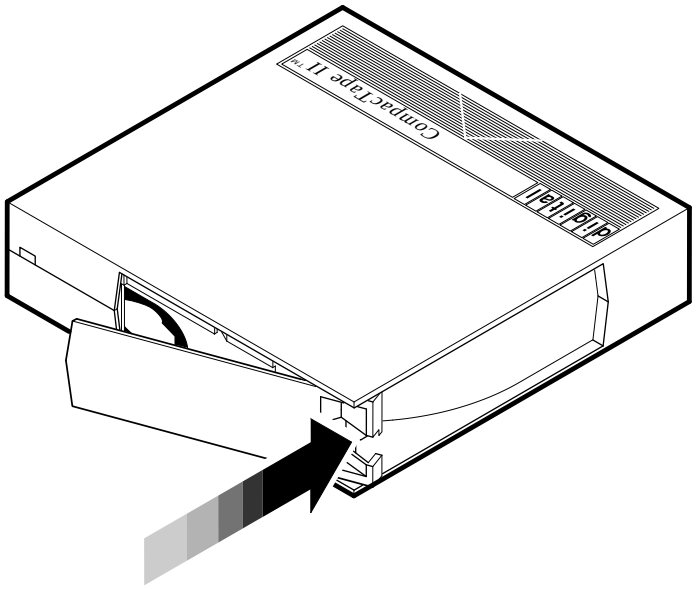


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Table 2–11 Inspecting the Tape Leader

Step	Action
1.	To release the door lock, lift the catch with your thumb.
2.	Open the access door to expose the tape leader.
3.	Make sure the tape leader is in the correct position (Figure 2–14).

2.9.5 Inspecting the Drive Takeup Leader

If you have trouble loading a cartridge, inspect the drive takeup leader and the tape leader.

Figures 2–15 and 2–16 show the correct position of the drive takeup leader inside the cartridge. If the drive takeup leader is unhooked, displaced, or damaged, call a qualified service person. Do not try to repair it.

Figure 2–15 Inspecting the Drive Takeup Leader

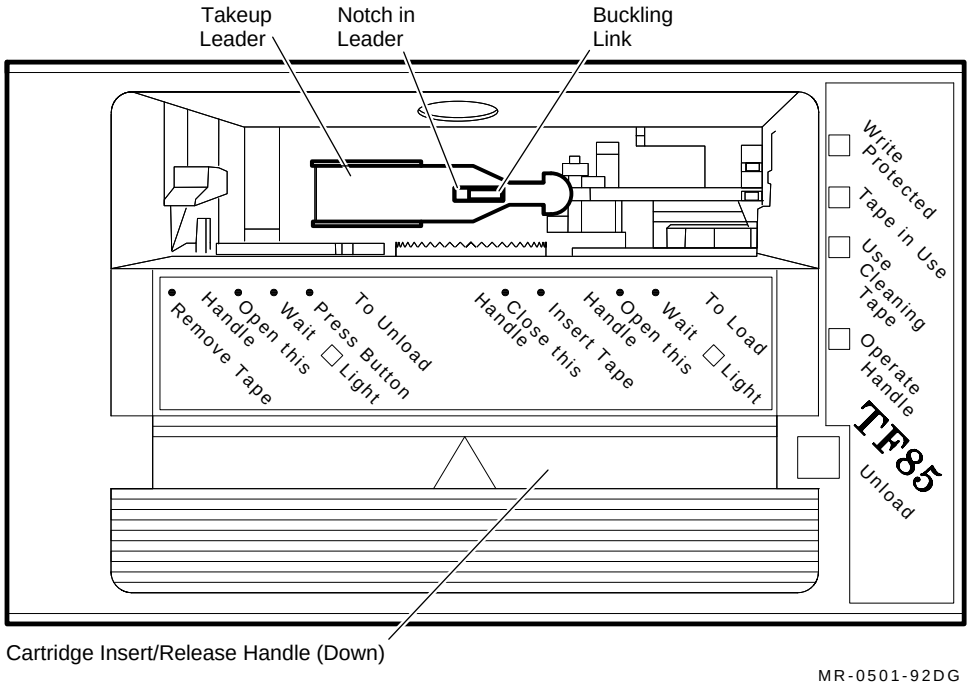

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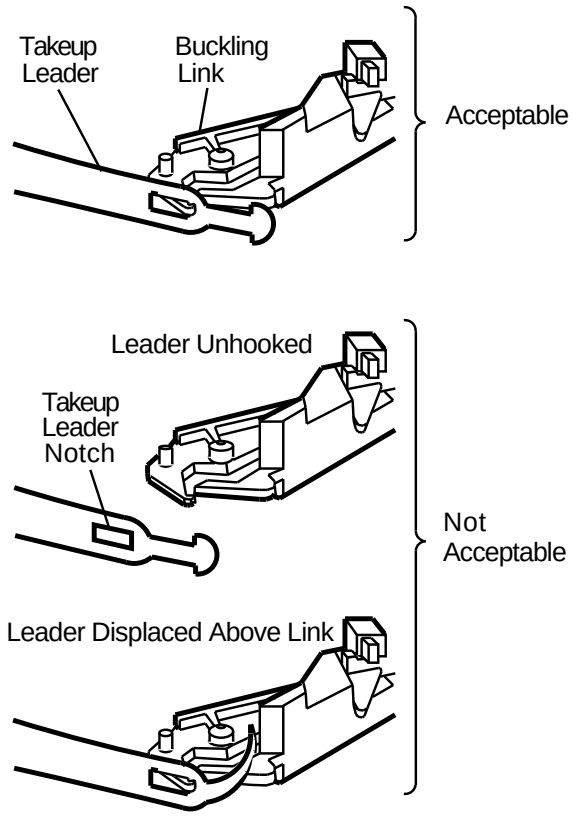
Figure 2–16 Drive Takeup Leader Components



2.10 TF857-AA Tape Loader

This section describes:

- Power-on process
- Mode Select key
- Operator control panel (OCP) indicators
- Slot Select, Load/Unload, and Eject buttons
- Magazine

2.10.1 Power-On Process

When the TF857-AA tape loader powers on, all of the indicators on the operator control panel (OCP) turn on within 15 seconds. The power-on self-test, or POST, is initializing the subsystem. When POST completes successfully, all OCP indicators, including the Magazine Fault and Loader Fault indicators, turn off — except for Power On. Then the elevator scans the magazine to find slots that contain cartridges.

Note

If the Magazine Fault or Loader Fault indicator remains on, POST has detected an error. See the *TF857 Magazine Tape Subsystem Owner's Manual* for information on error conditions.

2.10.2 Mode Select Key

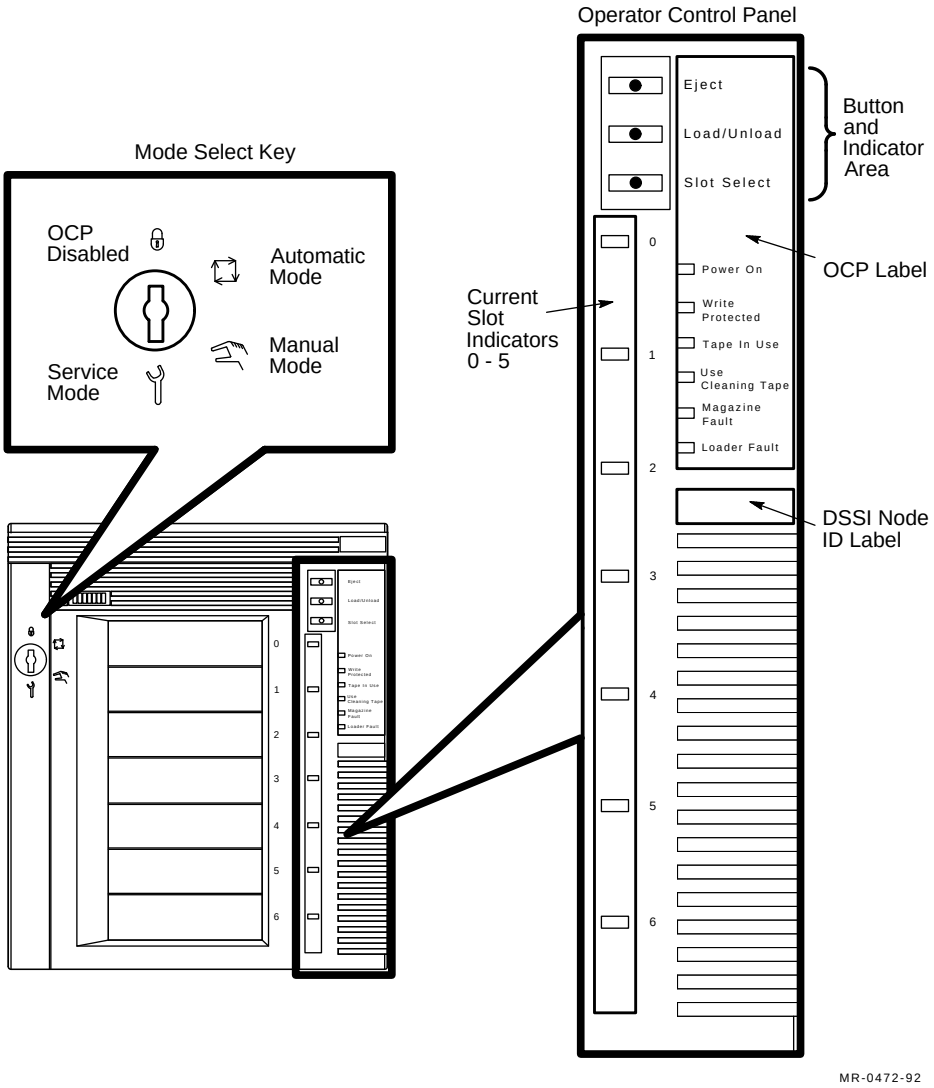
The Mode Select key can lock the tape loader transfer assembly in the enclosure, and lock the receiver in the closed position. It has four modes: OCP Disabled, Automatic, Manual, and Service. The OCP Disabled, Automatic, and Manual modes are for operational use; the Service mode is for head cleaning and service procedures. Table 2–12 describes the operating and service modes. Figure 2–17 shows the location of the Mode Select Key on the TF857-AA tape loader operator control panel.

Table 2–12 Mode Select Key Modes

Mode	Use
OCP Disabled	Locks the TF857-AA tape loader in the enclosure and locks the receiver. The OCP pushbuttons are disabled.
Automatic Mode	Locks the TF857-AA tape loader in the enclosure, but leaves the receiver unlocked. The receiver can be opened. The OCP pushbuttons are enabled.
	Automatic loading and unloading of cartridges occurs in this mode. This is the default mode of the TF857-AA tape loader.
Manual Mode[1]	Locks the TF857-AA tape loader in the enclosure. The receiver can be opened. The OCP pushbuttons are enabled.
	Automatic loading and unloading of cartridges does not occur in this mode. You must press the Load/Unload button to move each cartridge. This mode is most useful for copying specific files to or from tape.
Service Mode	Unlocks the TF857-AA tape loader so that it can be removed from the enclosure. The receiver can be opened.
	You load the Cleaning Tape III manually and perform the service procedures. See the *TF857 Magazine Tape Subsystem Owner's Manual* for information on head cleaning.

[1]In Manual Mode, the cartridge returns to the magazine, but the tape loader does not advance to the next available cartridge.

Figure 2–17 TF857-AA Operator Control Panel



2.10.3 Operator Control Panel Controls and Indicators

The TF857-AA operator control panel (OCP) has 3 pushbuttons and 16 indicators. Table 2–13 describes these controls and indicators. See Section 2.10.2 for information on the Mode Select key and its functions. See Section 2.10.4 for more details on button and indicator operations.

Table 2–13 TF857-AA OCP Controls and Indicators

Control/Indicator	Color	Function
Eject button	–	Opens the receiver, allowing access to the magazine for removal and insertion of cartridges. Also can be used to unload the tape from the drive to the magazine.
Eject indicator	Green	Indicates that pressing the Eject button opens the receiver. If a cartridge is in the drive, the cartridge unloads to the magazine and the receiver opens. If no cartridge is in the drive, the receiver opens.
Load/Unload button	–	Loads the currently selected cartridge into the drive, or unloads the cartridge from the drive to the magazine. If the Loader Fault or Magazine Fault indicators are on, can also be used to reset the subsystem.
Load/Unload indicator	Green	Indicates you can press the Load/Unload button.
Slot Select button	–	When pressed, increments the current slot indicator to the next slot.
Slot Select indicator	Green	Indicates the Slot Select button can be used. Pressing the button increments the current slot indicator to the next slot.
Power On indicator	Green	When on, indicates the TF857-AA tape loader power is good (ac and dc voltages are within tolerance). When off, indicates the tape loader power is not good.
Write Protected indicator	Orange	When on, indicates the cartridge in the drive is write protected. When off, indicates the cartridge in the drive is write enabled.
Tape in Use indicator	Yellow	Indicates tape drive activity as follows: • Slow blinking indicates tape is rewinding; rapid blinking indicates tape is reading or writing. • When on steadily, indicates a cartridge is in the drive and the tape is not moving. • When off, indicates no cartridge is in the drive.
Magazine Fault indicator	Red	Indicates a magazine failure.
Use Cleaning Tape indicator	Orange	Indicates the read/write head needs cleaning.
Loader Fault indicator	Red	Indicates a TF857-AA tape loader transfer assembly error or drive error.
Current slot indicators 0–6	Green	Identify the current slot (see Slot Select button). Each current slot indicator blinks when its corresponding cartridge moves to or from the drive. Also used with the Magazine Fault or Loader Fault indicator to indicate the type of fault.

2.10.4 Slot Select, Load/Unload, and Eject Button Functions

The Slot Select, Load/Unload and Eject buttons are OCP pushbuttons. They contain a green indicator and are operable only when their corresponding indicators are on.

Note

The Load/Unload button has three functions: *load*, *unload*, and *reset*. If the Loader Fault indicator is on, press the Load/Unload button to reset the tape loader.

2.10.4.1 Selecting a Cartridge

Press the Slot Select button to select a cartridge. The current slot indicator increments to the next available slot. After a successful initialization, the TF857-AA tape loader automatically selects slot 0 and the Slot Select button is enabled. The Load/Unload and Eject indicators remain on during the slot selection.

2.10.4.2 Loading the Cartridge

Press the Load/Unload button to load the cartridge into the drive. The Select Slot, Load/Unload, and Eject indicators turn off, and the elevator moves to the selected slot. Then the cartridge is removed from the magazine and placed in the elevator. The elevator moves to the drive position and inserts the cartridge in the drive. The indicators remain off until the tape has loaded to the beginning of the tape (BOT). After the cartridge is loaded into the drive, the Eject and Load/Unload indicators turn on, and the corresponding buttons are enabled. The Slot Select indicator remains off.

2.10.4.3 Unloading the Cartridge

Caution

Do not press the Load/Unload button until backup or other tape operations are stopped at the terminal. Doing so can result in operation failure and drive unavailability.

When you press the Load/Unload button, the Select Slot, Load/Unload, and Eject indicators turn off, and the cartridge unloads from the drive into the magazine. Now automatic operation stops; the tape loader does not advance to the next available cartridge. The indicators turn on when the cartridge is returned to the magazine.

2.10.4.4 Opening the Receiver

Press the Eject button to open the receiver for insertion or removal of the magazine. The Eject button is disabled when the Mode Select Key is in the OCP Disabled position. The Eject button can also be used to *unload* a tape from the drive.

Note

When a cartridge is not in the drive, the Slot Select, Load/Unload, and Eject indicators are on before any operation begins. Pressing the Eject button causes all indicators to turn off. The elevator then returns to its home position and the receiver opens.

When a cartridge is in the drive, the Eject and Load/Unload indicators are on before the operation begins. When you press the Eject button, both indicators turn off and the cartridge unloads from the drive and moves back into the magazine. The receiver then opens to allow access to the magazine.

In both situations, once the receiver is closed again, a magazine scan begins, and the indicators turn on when the scan is complete.

2.10.5 Magazine

The front of the magazine has numbers, 0 through 6, that indicate the number of the slot.

Note

Insert and remove all cartridges from the *front* of the magazine.

2.10.5.1 Inserting a Cartridge

First, set the write-protect switch (Figure 2–18). If you want to write on the tape, slide the switch to the right (orange indicator is not visible). If you want to write-protect the tape, slide the switch to the left (orange indicator is visible). Then follow the steps in Table 2–14.

Figure 2–18 Write-Protect Switch on a Cartridge

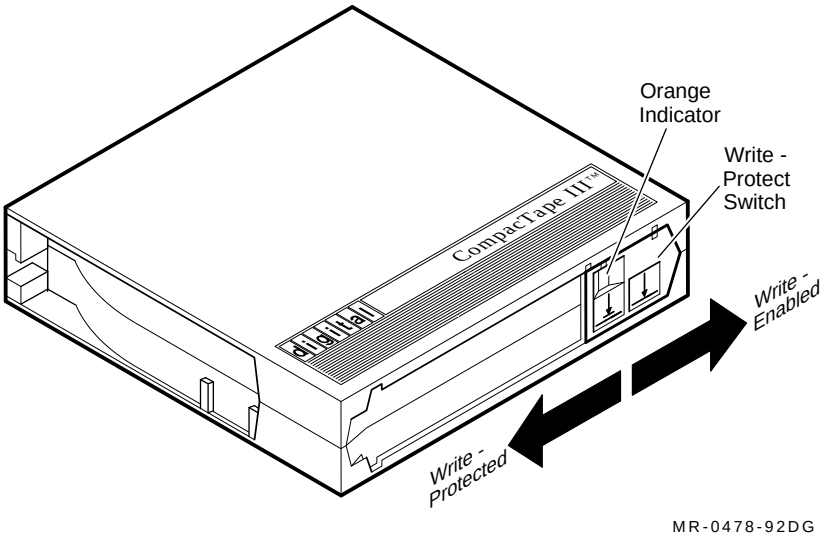


Table 2–14 Inserting a Cartridge

Step	Action
1	Hold the cartridge with the CompacTape III label facing up and the write-protect switch facing you.
2	Insert the cartridge by pushing it into the slot until you hear a click.

2.10.5.2 Removing a Cartridge

The slot uses a spring-release action. When you press the cartridge in all the way, it pops out. Refer to Table 2–15.

Table 2–15 Removing a Cartridge

Step	Action
1	From the front of the magazine, press the cartridge until you hear a click; then, release.

Note

Never apply labels to the top or bottom of cartridges. Doing so can cause cartridge jams. Use the space on the front of the cartridge for labels. If a jam occurs, call your Digital Customer Services representative.

2.10.5.3 Removing the Magazine from the Receiver

Before you remove the magazine from the receiver, be sure:

- The Power On indicator is on (Figure 2–17).
- The Eject indicator is on. (It must be on before you press the Eject button.)

Then follow the steps in Table 2–16.

Figure 2–19 Receiver in the Open Position

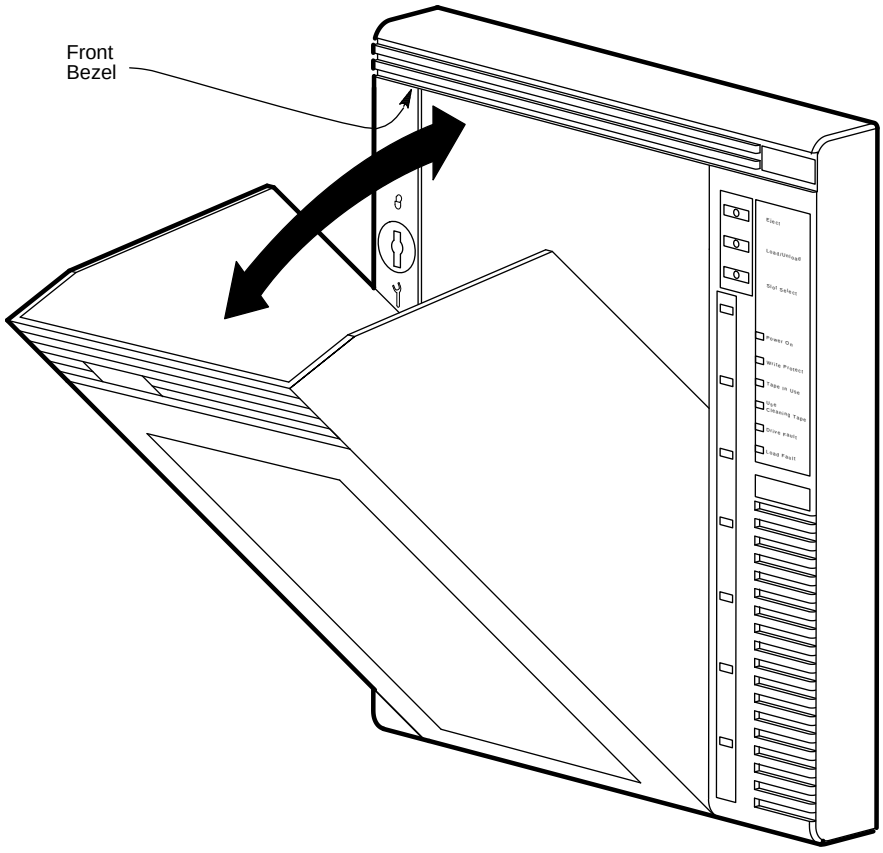


Table 2–16 Removing the Magazine

Step	Action
1	Press the Eject button (Figure 2–17) to open the receiver.
2	Gently pull the receiver forward to access the magazine (Figure 2–19).
3	Use the magazine handle to lift the magazine out of the receiver.

2.10.5.4 Installing the Magazine in the Receiver

To install the magazine into the receiver, follow the steps in Table 2–17.

Table 2–17 Installing the Magazine

Step	Action
1	Holding the magazine by its handle, slide it down into the receiver (Figure 2–19).
2	Push the receiver into the closed position.
3	Make sure that the receiver is closed completely.

3
Console Operations

3.1 In This Chapter

This chapter describes the console, console operating modes, and booting information.

This chapter includes:

- Section 3.2, Console Description
- Section 3.3, Console Operating Modes
- Section 3.4, Console Control Characters
- Section 3.5, Console Command Language Syntax
- Section 3.6, Bootstrap Procedures

3.2 Console Description

The system architecture (Figure 3–1 and Table 3–1) supports in each zone:

- A local console terminal
- The console firmware (programs located in ROM) residing on:
  - The primary NCIO module
  - The CPU module
- A remote console terminal

The remote console terminal and the local console terminal are connected to the zone through the primary NCIO module.

The console operates a terminal that may be:

- Connected to the NVAX Plus serial port
- On the system console port

Figure 3–1 System Components

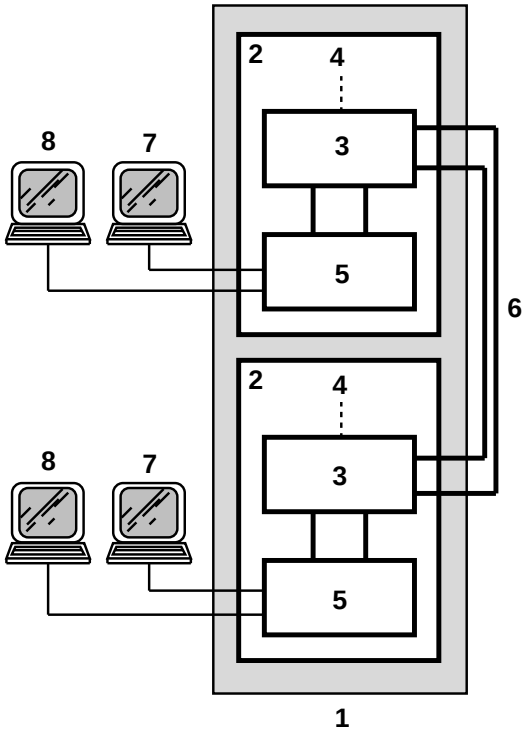


Table 3–1 Key to Figure 3–1, System Components

Item	Component
1	CPU cabinet
2	Zone (A or B)
3	CPU module
4	To memory
5	Primary NCIO module
6	Cross-link cable
7	Local console terminal
8	Remote console terminal (optional)

Table 3–2 describes the function of each console component.

Table 3–2 Function of the Console Components

Component	Function
Local console terminal	Terminal located with the system that is used for console input and display output.
Remote console port	One remote port is available in each zone. The port may be connected to a remote console terminal through a modem. There is no built-in modem control. The remote console port provides the same functions as the local console port.
Console firmware	The console firmware resides on the primary NCIO module and on the CPU module.

You can use any one of the four console terminals (local or remote) for input commands, but use only one terminal at a time. All of the console terminals echo the response of the system to a console command.

If the system is operating with a single zone running, you must use a console terminal (local or remote) that is connected to that zone for input commands.

3.3 Console Operating Modes

Operators communicate with the system in one of the following input/output modes:

- Program I/O (PIO) mode
- Console I/O (CIO) mode

Normal operation takes place in the PIO mode. From PIO mode, the operator uses the console to:

- Log in
- Use the mail facility
- Create and edit files

From CIO mode, the operator executes the console commands. These commands are described in Chapter 4.

3.3.1 Entering CIO Mode

The CIO mode is entered when you turn on system power if:

- The Zone Halt Enable switch is pressed
- A STOP/ZONE instruction is executed
- A severe processor condition occurs
- An external halt is detected

Once entered, the console prompt >>> is displayed and the CIO mode is ready to execute commands entered at the prompt.

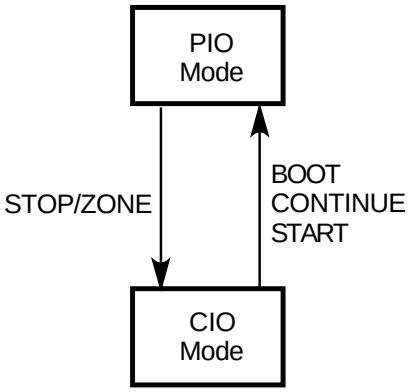
3.3.2 Exiting CIO Mode

The CIO mode is exited by issuing one of the following console commands:

- BOOT
- START
- CONTINUE

These commands are described in Chapter 4. Figure 3–2 shows how to move between PIO and CIO modes.

Figure 3–2 Console Operating Modes



3.4 Console Control Characters

The ASCII control characters and function keys listed in Table 3–3 have special meanings when typed on a console terminal.

Table 3–3 Console Control Characters and Function Keys

Character/Key	Function
Break	In CIO mode, acts like Ctrl/C. In PIO mode, causes the processor to halt and begin running the console program. If the system is in a secure mode when you press the Break key, the halt is suppressed. If you press the Zone Halt Enable or System Halt Enable switch, the halt (initiated by pressing the Break key earlier) is enabled.
Ctrl/C	Echoes ^C and causes the console to abort processing of a command, if possible.
Ctrl/O	Alternately enables and disables output.
Ctrl/Q	Resumes output previously suspended by Ctrl/S.
Ctrl/R	Echoes ^R and retypes the command line.
Ctrl/S	Stops transmission until Ctrl/Q is typed.
Ctrl/U	Echoes ^U and ignores the current command line. The console prompt is displayed on the next line. This affects only the entry of the current line. Pressing Ctrl/U does not abort a command that is executing.
<x (delete)	Deletes the character to the left of the cursor. On video terminals, the deleted characters disappear. On hard-copy terminals, the deleted characters are typed within a pair of backslash delimiters as they are deleted.
Esc or Ctrl/[	Suppresses any special meaning associated with a given character.
Return	Terminates a command line and executes the command.

3.5 Console Command Language Syntax

The console commands accept qualifiers. Qualifiers specify a numerical value or select an option from a list of options. Command elements may be abbreviated and any extra tabs or spaces are ignored. Unless otherwise noted, numerical values must be given in hexadecimal notation. The command length may not exceed 80 characters.

Table 3–4 lists the console command language syntax rules. The console commands available for the system are listed in Chapter 4.

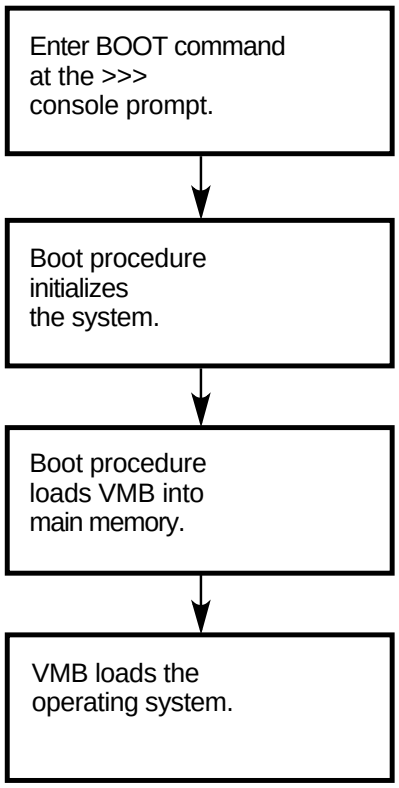
Table 3–4 Console Command Language Syntax

Command Element	Rule
Abbreviations	A command verb or argument may be abbreviated to the extent that it remains unique.
Multiple adjacent spaces and tabs	Are treated as a single space.
Qualifiers	May appear after a command verb, option, or symbol. They must be preceded by a slash (/).
Numbers	Must be hexadecimal.
No characters	Are treated as a null command. No action is taken.

3.6 Bootstrap Procedures

The BOOT command initializes the system and then loads and starts the virtual memory bootstrap (VMB) program from read-only memory (ROM). The VMB program, in turn, loads and starts the operating system from the specified boot device. Figure 3–3 shows the steps in the boot procedure.

Figure 3–3 Boot Procedure



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The VMB program is the primary bootstrap program. VMB:

- Resides in ROM on the ATM module.
- Is loaded into memory and initiated by the system console firmware.
- Provides the necessary parameters for successful operation of the VMS secondary bootstraps.
- Allows you to boot from DSSI compatible disk and tape devices over the Ethernet.

4

CIO Mode Console Commands

4.1 In This Chapter

This chapter includes:

- Section 4.2, Entering CIO Mode
- Section 4.3, CIO Mode Console Commands:

Boot	**HE**lp	**SH**ow
CLEAR	**I**nitialize	**S**tart
Continue	**M**ove	**T**est
Deposit	**MATCH_ZONES**	**X**(transfer)
DUP	**R**epeat	**Z**
Examine	**SE**t	**!**(comment)
Find		

Note

The command abbreviations are shown in bold capital letters.

4.2 Entering CIO Mode

To recognize and process CIO commands:

- The System Halt Enable switch on both zone control panels must be pressed
- The operating software must be halted
- The processor must be running the console firmware

The example below shows how to use the Break key to enter CIO mode from PIO mode and then return to PIO mode by using the CONTINUE command. (The System Halt Enable switch on both zone control panels must be pressed.)

Caution

Use CONTINUE to continue from a system halt. Use START/ZONE to continue from a zone halt.

A remote operator can use CIO mode only when full access privileges for the remote console have been set at the local console.

Example

```
$
Press the System Halt Enable switch on both zone control panels.
$
$                       ! From PIO mode, press the Break key once.
$  Break                ! This puts the processor in HALT mode.
>>>                     !
?002 External halt      !
PC = 01E01473           !

>>> CONTINUE            ! This command resumes execution of the
                        ! operating system software.
$                       ! The console returns to PIO mode.
```

Notice that comments (characters following an exclamation point (!)) are allowed on a command line. Comments are ignored by the console when the Return key is pressed. This may be useful when you document a console session on a hardcopy terminal.

Notice also that lowercase characters are accepted, but the console converts all characters to uppercase.

4.3 CIO Mode Console Commands

This section describes the CIO mode console commands.

4.3.1 BOOT

BOOT initializes the system, loads a program image from a specified boot device, and transfers control to that program image.

When you do not supply a boot-spec, the default boot device is used. When you do not supply flag(s), a value of 0 is assumed.

The console program accepts a terminating colon on the boot-spec, but ignores the colon when the name is processed.

The BOOT syntax is:

```
BOOT[/OVER][[/R5:]<flag(s)> boot-spec]
```

The boot-spec format may be **dduuu**/PATH=path-list . . . **dduuu**/PATH=path-list, where:

dd is a device mnemonic.
uuu is a unit number (0 to 999).
/PATH=path-list is a qualifier. See Table 4–1.

Or, the boot-spec format may be a variable that specifies the boot devices and paths. See Section 4.3.13.1.

Table 4–1 describes the qualifiers. Table 4–2 lists the VMB program /R5:<flag> values.

Table 4–1 Qualifiers for BOOT

Qualifier	Function
/R5:<flag>	Passes parameters to the virtual memory bootstrap (VMB) program. See Table 4–2.
/PATH=path-list	Specifies a path to a boot device. The path-list specifies zones and slot numbers in the path. When the path-list has more than one slot, you separate the slots by commas. The path-list format is **zss**, where: **z** is a zone ID (A or B).[1] **ss** is a slot number (10 to 17, 20 to 27) of an adapter connecting to a boot device.
/OVER	Overrides the results of the bootability test to allow a Simplex mode boot.

[1]The console validates this field before invoking VMB.

Table 4–2 VMB Program /R5:<flag> Values

Bit	Hex Value	Function	Action
0	1	Conversational boot	Returns to the SYSBOOT> prompt.
1	2	Debug	Maps the XDELTA program into the system page table.
2	4	Initial breakpoint	Operating system issues a breakpoint after turning on memory management.
3	8	Secondary boot	Boots from boot block specified in /R4:n.
5	20	Bootstrap breakpoint	Transfers control to the XDELTA program.
8	100	Solicit file name	VMB issues a prompt for the secondary boot procedure.
9	200	Halt before transfer	VMB executes a halt before transferring control to the secondary bootstrap procedure.
31:28	x0000000	Top-level system boot	Specifies the top-level directory number for a system disk with multiple system roots, where x = a hex value from 0 to F.

4.3.2 CLEAR

CLEAR BOOT deletes a boot-spec. CLEAR ERRORS clears the error frame of the previously detected error. If you do not clear the error frame, the next error is not recorded in the error frame. CLEAR BROKE clears the broke bit in EEPROM.

The following CLEAR syntax deletes a boot-spec:

```
CLEAR BOOT <name>
```

The following CLEAR syntax clears the error frame:

```
CLEAR ERRORS
```

The following CLEAR syntax clears the broke bit ID in EEPROM:

```
CLEAR BROKE[/PATH=path-number]
```

Table 4–3 describes the /PATH=path-number qualifier.

Table 4–3 Qualifier for CLEAR

Qualifier	Function
/PATH=path-number	Specifies the zone and slot number of the module to clear. The path-number format is **zss**, where: **z** is the zone ID (A or B). **ss** is the slot number (0 to 2, 10 to 17, 20 to 27) of an adapter connecting to a DSSI device.

CLEAR BROKE clears the module ID EEPROM in the zone that is running.

4.3.3 CONTINUE

CONTINUE exits the CIO mode and returns operation to the PIO mode.

Caution

Use CONTINUE to continue from a system halt. Use START/ZONE to continue from a zone halt.

The CONTINUE syntax is:

```
CONTINUE
```

4.3.4 DEPOSIT

DEPOSIT stores the specified data in the specified address.

When the system is initialized or when any transition from a running to a halted state occurs, the defaults are physical address space 0 and data size longword.

The DEPOSIT syntax is:

```
DEPOSIT[/{B,W,L,Q}][/{G,I,M,P,V,U}][/N:count]address-spec data-spec
```

The address-spec identifies a physical or virtual hexadecimal memory address. A qualifier may be placed before or after an address-spec or data-spec.

The data-spec identifies a hexadecimal number to be stored, unless the default radix has been changed with a %D introducer. When you do not supply a data-spec, a value of 0 is assumed.

Table 4–4 describes the qualifiers. Table 4–5 lists the address-spec symbolic addresses.

Table 4–4 Qualifiers for DEPOSIT

Qualifier	Function
/B	Sets the data size to byte.
/W	Sets the data size to word.
/L	Sets the data size to longword.
/Q	Sets the data size to quadword.
/G	Sets general purpose register address space R0 through PC.
/I	Sets internal processor register (IPR) address space accessed by the MTPR and MFPR instructions.
/P	Sets physical address space.
/V	Sets virtual address space. An EXAMINE to virtual memory returns the translated physical address. A DEPOSIT to virtual memory sets the PTE <M> bit.
/U	Sets access to console private memory. This qualifier must be specified for each command.
/N:*count*	Specifies the number of consecutive locations to modify. The console deposits to the first address, then to the specified number of succeeding addresses. This qualifier must be specified for each command.

Table 4–5 Address-Spec Symbolic Addresses

Symbolic Address	Description
R<n>	General purpose register number *n*, where *n* is a decimal number 0 to 15.
FP	Frame pointer.
AP	Argument pointer.
SP	Stack pointer.
PC	Program counter.
PSL	Program status longword.
+	A location following the last location accessed by an EXAMINE or DEPOSIT. The location is the last address *plus* the size of the last reference (1 for byte, 2 for word, 4 for longword).
-	A location preceding the last location accessed by an EXAMINE or DEPOSIT. The location is the last address *minus* the size of the last reference (1 for byte, 2 for word, 4 for longword).
*	The last location referenced by an EXAMINE or DEPOSIT.
@	Indirect addressing. The address-spec is used as a pointer to the data. The format is @address-spec, where address-spec can be any valid address except another @. See Example 4–1.

Note

Remember that the symbolic addresses from the *previous* command are used for indirect addressing. See Example 4–1.

Example 4–1 Indirect Addressing

```
>>> DEPOSIT R0 200    ! The value 200 is stored directly in R0. The defaults
                      ! are set to longword, general purpose register.

>>> DEPOSIT/P @R0 200 ! The value 200 is stored directly in the address pointed
                      ! to by R0. The /P qualifier tells the parser that the
                      ! value in R0 should be treated as a physical address.
                      ! The defaults are set to longword, physical.

>>> DEPOSIT/V @R0 200 ! The value 200 is stored directly in the address pointed
                      ! to by R0. The /V qualifier tells the parser that the
                      ! value in R0 should be treated as a virtual address.
                      ! The defaults are set to longword, virtual.

>>> DEPOSIT @200      ! The value 200 is stored in the address specified in
                      ! the previous command. The defaults are set to longword,
                      ! virtual.
```

4.3.5 DUP

DUP connects to the DSSI DUP service on a selected node. DUP is used to examine and modify the parameters of a DSSI device.

DUP syntax is:

```
DUP[/PATH:<path-number>] node-id /[TASK:task]
```

The node-spec identifies the node number (0 to 7) of a DSSI device attached to the console. Table 4–6 describes the qualifiers.

Table 4–6 Qualifiers for DUP

Qualifier	Function
/PATH=path-number	Specifies the zone and slot number of an adapter connecting to a DSSI device. The path-number format is **zss**, where: **z** is the zone ID (A or B). **ss** is the slot number (10 to 17, 20 to 27) of an adapter connecting to a DSSI device.
node-id	Specifies the DSSI node connecting to a DSSI device. Valid node-ids are 0 to 5.
TASK:task	Invokes a task from a DSSI device. Valid DUP tasks are: DRVEXR DRVTST HISTRY DIRECT ERASE VERIFY DKUTIL PARAMS

4.3.6 EXAMINE

EXAMINE displays the contents of the specified memory location or register. The display line consists of:

- A single-character address specifier
- The hexadecimal physical address to be examined
- The examined data in hexadecimal

When the system is initialized or when any transition from a running to a halted state occurs, the defaults are physical address space 0 and data size longword.

The EXAMINE syntax is:

```
EXAMINE[/{B,W,L,Q}][/{G,I,M,P,V,U}][/N:count][/A][address-spec]
```

The address-spec identifies a physical or virtual hexadecimal memory address. A qualifier may be placed before or after the address-spec or data-spec.

Table 4–7 describes the qualifiers. Table 4–8 lists the address-spec symbolic addresses.

Table 4–7 Qualifiers for EXAMINE

Qualifier	Function
/B	Sets the data size to byte.
/W	Sets the data size to word.
/L	Sets the data size to longword.
/Q	Sets the data size to quadword.
/G	Sets general purpose register address space R0 through PC.
/I	Sets internal processor register (IPR) address space accessed by the MTPR and MFPR instructions.
/P	Sets physical address space.
/V	Sets virtual address space. An EXAMINE to virtual memory returns the translated physical address. A DEPOSIT to virtual memory sets the PTE <M> bit.
/U	Sets access to console private memory. This qualifier must be specified for each command.
/N:*count*	Specifies the number of consecutive locations to modify. The console deposits to the first address, then to the specified number of succeeding addresses. This qualifier must be specified for each command.
/A	Interprets and displays the data as ASCII characters. Nonprinting characters are displayed as periods.

Table 4–8 Address-Spec Symbolic Addresses

Symbolic Address	Description
R<n>	General purpose register number *n*, where *n* is a decimal number 0 to 15.
FP	Frame pointer.
AP	Argument pointer.
SP	Stack pointer.
PC	Program counter.
PSL	Program status longword.
+	A location following the last location accessed by an EXAMINE or DEPOSIT. The location is the last address *plus* the size of the last reference (1 for byte, 2 for word, 4 for longword).
-	A location preceding the last location accessed by an EXAMINE or DEPOSIT. The location is the last address *minus* the size of the last reference (1 for byte, 2 for word, 4 for longword).
*	The last location referenced by an EXAMINE or DEPOSIT.
@	Indirect addressing. The address-spec is used as a pointer to the data. The format is @address-spec, where address-spec can be any valid address except another @. See Example 4–1.

Note

Remember that the symbolic addresses from the *previous* command are used for indirect addressing. See Example 4–1.

4.3.7 FIND

FIND searches the main memory beginning at physical address space 0 for either a page-aligned 512-Kbyte segment of memory, or a restart parameter block (RPB).

When FIND is successful, it saves the address plus the segment of memory (or RPB) in the stack pointer. When FIND is unsuccessful, an error message is displayed and the contents of the stack pointer are unpredictable.

The FIND syntax is:

```
FIND
```

Table 4–9 describes the qualifiers.

Table 4–9 Qualifiers for FIND

Qualifier	Function
/MEMORY	Searches main memory for a page-aligned 512-Kbyte segment of memory.
/RPB	Searches main memory for a restart parameter block. The search leaves memory unchanged.

4.3.8 HELP

HELP displays a summary of the commands, their arguments, and qualifiers. When you supply a command name, HELP displays the arguments and qualifiers for that command only. HELP does not provide complete descriptions of the commands.

The HELP syntax is:

```
HELP [command]
```

Or:

```
? [command]
```

4.3.9 INITIALIZE

INITIALIZE performs the steps shown in Table 4–10.

Table 4–10 INITIALIZE Steps

Step	Action
1	Do hard reset of zone (the cross-link state is set to off).
2	Do hard reset of all available ATMs.
3	Initialize hardware.
4	Reconfigure the zone and update the device configuration block (DCB) to reflect the zone status.
5	Execute the Duplex Compatibility Test.
6	Load the firmware into the console main loop.

The INITIALIZE syntax is:

```
INITIALIZE
```

4.3.10 MOVE

MOVE transfers the specified number of bytes (count) from the source-address to the destination-address.

The MOVE syntax is:

```
MOVE source-address destination-address count
```

The source-address is the starting address of the data. The destination-address is the starting address of the destination. The count is the number of bytes to be moved.

4.3.11 MATCH_ZONES

MATCH_ZONES copies the system-wide module data EEPROM from the other zone. MATCH_ZONES does not copy the zone-specific module data EEPROM. Use MATCH_ZONES *only* when:

- The cross-link state is set to off, and
- The path to the other zone is available. (The cross-link cables and other zone power is on.)

The MATCH_ZONES syntax is:

```
MATCH_ZONES
```

4.3.12 REPEAT

REPEAT continuously executes the specified command. REPEAT applies to the following commands *only*.

- DEPOSIT
- EXAMINE

REPEAT can be aborted by pressing Ctrl/C at the console keyboard.

The REPEAT syntax is:

```
REPEAT command
```

4.3.13 SET

SET modifies the value of the specified variable.

The SET syntax is:

```
SET variable value [value]
```

Note

SET does not allow abbreviations. You must enter the name of the variable completely.

Table 4–11 lists the variables with the acceptable values.

Table 4–11 SET Variables and Values

Variable	Description	Acceptable Values
BOOT DEFAULT	Default boot specification.	Up to 80 characters of ASCII text
MODE	Boot mode.	FAILSTOP = Simplex mode FAILSAFE = Duplex mode
RESTART	Halt action switch.	HALT = Enter console mode BOOT = Boot RESTART = Restart
BAUD	Console port speed.	300, 600, 1200, 2400, 4800, 9600, 19200, 38400
ZONE	Zone identification.	A = Zone A B = Zone B

4.3.13.1 SET BOOT

SET BOOT saves the values of boot-specs. Space for nine boot-specs is available on the CPU module EEPROM. The first space is reserved for the default boot-spec. The other eight spaces are available to the user.

The SET BOOT syntax is:

```
SET BOOT DEFAULT value
```

Or:

```
SET BOOT boot-spec value
```

The boot-spec may be up to 8 characters of ASCII text. The value is the ASCII text assigned to the boot-spec.

4.3.14 SHOW

SHOW displays information about the specified variable. When the cross-link state is off (Simplex mode), information about the current zone is displayed. When the cross-link state is on (Duplex mode), information about both zones is displayed.

The SHOW syntax is:

```
SHOW variable
```

Table 4–12 lists the variables. You *must* supply a variable.

Table 4–12 SHOW Variables

Variable	Description	Acceptable Values
DEFAULT	Default specification.	Up to 80 characters of ASCII text
MODE	Boot mode.	FAILSTOP = Simplex mode FAILSAFE = Duplex mode
RESTART	Halt action switch.	HALT = Enter console mode BOOT = Boot RESTART = Restart
BAUD	Console port speed.	300, 600, 1200, 2400, 4800, 9600, 19200, 38400
ZONE	Zone identification.	A = Zone A B = Zone B
BOOT	Displays the saved boot specifications.	
CONFIGURATION	Displays the current system configuration, including the identity and status of any modules in the system.	
VERSION	Displays the firmware revision of all ROMs in the system.	

(continued on next page)

Table 4–12 (Cont.) SHOW Variables

Variable	Description	Acceptable Values
DSSI/PATH=path-number	Specifies the zone and slot number of an adapter connecting to a DSSI device. The path-number format is **zss**, where: **z** is the zone ID (A or B). **ss** is the slot number (10 to 17, 20 to 27) of an adapter connecting to a DSSI device.	
ETHERNET	Displays the physical Ethernet addresses.	
MEMORY	Displays system memory information.	
STATE	Displays the state of the cross-link and the system cables.	
ERRORS	Displays the diagnostic error frames. Not allowed if the cross-link state is on.	
ALL	Displays the contents of all variables.	

4.3.15 START

START begins execution of the operating software from the specified address. START is equivalent to DEPOSIT PC followed by CONTINUE.

The START syntax is:

```
START address-spec
```

You *must* supply an address-spec.

4.3.16 TEST

TEST enables the user to test:

- The system
- A zone
- The CPU and memory

Use TEST *only* when the cross-link state is set to off.

The TEST syntax is:

```
TEST [qualifier(s)]
```

Tables 4–13 and 4–14 describe the TEST selection and control qualifiers.

Table 4–13 Qualifiers for TEST Selection

Qualifier	Function
/GROUP:*n*[1]	Specifies a decimal number from 0 to 5 that identifies the group of tests to be run.
/TEST:*n*[1]	Specifies a decimal number from 0 to 32 that identifies the tests to be run.
/SUBTEST:*n*[1]	Specifies a decimal number from 0 to 32 that identifies the subtests to be run.
/VERBOSE	Enables a display of all individual tests during execution.
/NOTRACE	Disables test traces.

[1] *n* can be a:

- Single value
- Range separated by a colon (1:5)
- List separated by commas (1,5,9)
- Combination of range and list (1:6,8,10,11:29)

Table 4–14 Qualifiers for TEST Control

Qualifier	Function
/PASSCOUNT:*n*	*n* is a decimal number from 0 to MAXINT. When *n* is 0, the passcount is infinite.
/NOTRACE	Disables the test traces.
/COE	Continues on error.
/NOCONFIRM	Disables the test confirmation on destructive tests.
/EXTENDED	Enables extended error reports.
/NOSTATUS	Disables status messages and reports.
/LIST	Lists the available tests, but does not run them.

When you do not supply the qualifier(s), TEST runs all the nonextended tests (except those that require confirmation).

4.3.17 X(transfer)

X is used by automatic systems communicating with the console. X is not intended for use by operators.

X loads or unloads the count of bytes beginning at the specified address.

When the high-order bit of the count longword is 1, the data is read from physical memory to the console terminal. When the high-order bit of the count longword is 0, the data is written from the console terminal to physical memory.

The X syntax is:

```
X address-spec count Return data-stream checksum
```

The address-spec is a hexadecimal number that specifies a physical address. The count is an 8-bit hexadecimal number that specifies a number of bytes. The data-stream contains the bytes to be transferred by X. The checksum is a 2-digit hexadecimal number that specifies the 2's complement checksum of the data-stream. The checksum verifies the data-stream.

4.3.18 Z

Z connects to the firmware of another module in the system.

The Z syntax is:

```
Z[/PATH=path-number]
```

Table 4–15 describes the qualifier.

Table 4–15 Qualifier for Z

Qualifier	Function
/PATH=path-number	Specifies the zone and slot number of a module. The path-number format is **zss**, where: **z** is the zone ID (A or B). **ss** is the slot number of the module.

When you do not supply a path, Z tries to connect to the module in slot 1 of the zone that is running.

Note

Z performs a hard reset on the ATMs, but you need to issue a programmed reset to load and start the functional firmware. After Z, you *must* issue a BOOT from the same zone, or a START/ZONE from the other zone (if that zone is running the operating system).

4.3.19 !(comment)

The ! (exclamation point) prefixes a comment. The text following the ! is ignored.

The ! syntax is:

```
!(comment)
```

Or:

```
command!(comment)
```

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