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EF5XX-Series Solid State Disk Drive
User Guide

EK–EF5XX–UG–001

Digital Equipment Corporation

German Noise Declaration: The following information is provided to meet the German Noise Declaration Decree (part of the German Equipment Safety Law).

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English:
                                            September 18, 1992
    -----------------------------------------------------------------
    Acoustics - declared values per ISO 9296 and ISO 7779:


                    Sound Power Level          Sound Pressure Level

                    L   , B                    L   , dBA
                     WAd                         pAm
                                               (operator position)

    Product         Idle    Operate    Idle    Operate

    EF51/2R-AA/F    4.4      4.5        34      35
    BA430/440 +
    3xEF51/2R       5.6      5.6        39      39
    R400X +
    7xEF51/2R       5.6      5.6        40      41

    [Current values for specific configurations are available from Digital
        representatives. 1 B = 10 dBA.]
    -----------------------------------------------------------------

German:
                                            September 18, 1992
    -----------------------------------------------------------------
Schallemissionswerte - Werteangaben nach ISO 9296 und ISO 7779/DIN EN27779:

                    Schalleistungspegel        Schalldruckpegel
                    L   , B                     L   , dBA
                     WAd                          pAm
                                               (Bediener position)

    Product         Leerlauf    Betrieb    Leerlauf    Betrieb

    EF51/2R-AA/F    4.4        4.5          34         35
    BA430/440 +
    3xEF51/2R       5.6        5.6          39         39
    R400X +
    7xEF51/2R       5.6        5.6          40         41

    [Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Digital
     Equipment Vertretungen erhältlich. 1 B = 10 dBA.]
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6   Troubleshooting Procedures

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Preface

Introduction

In This Guide   This guide introduces the EF5XX-series solid state disk drive and describes the installation and operating procedures.

Intended Audience   This guide is intended for the EF5XX disk drive user.

Chapter 1   "General Information" describes the different variations of the EF5XX solid state disk drive including the data retention system, the Digital Storage System Interconnect (DSSI) bus function, performance features, specifications, shipping contents, and related documents.

Chapter 2   "Installation Overview" describes how to prepare the EF5XX disk drive for installation and how to install the EF5XX into the BA400-series system and SF7X storage enclosures.

Chapter 3   "Controls and Indicators" describes the controls and indicators used to operate the EF5XX disk drive and how to assign the DSSI node ID.

Introduction, Continued

Chapter 4	"Local Programs" describes how to access local programs through the:

- VMS system and the console by using the SET HOST/DUP command
- MicroVAX Diagnostic Monitor (MDM)

Chapter 5	"Data Retention System" discusses integrated data retention system features including battery testing and monitoring.

Chapter 6	"Troubleshooting Procedures" describes the internal self-tests the EF5XX Integrated Storage Element (ISE) conducts and what to do if the EF5XX disk fails to operate correctly.

Conventions	The term *EF5XX* refers to the EF51R, EF52R, or the EF53 solid state disk drive.

Chapter 1
General Information

Overview

In this Chapter

This chapter includes:

- EF5XX-series solid state disk drive description
- Using the EF5XX disk drive
- EF5XX options
- Data retention system description
- Digital Storage System Interconnect (DSSI) bus function
- Integrated Storage Element (ISE)
- EF5XX-Series ISE
- Drive performance features
- Drive specifications
- Shipping contents
- Related documents

Overview, Continued

Description

The EF5XX series is Digital Equipment Corporation's first generation of solid state disk drives packaged in a full-height, 5¼-inch form factor. These DSSI ISEs supply highly reliable data storage using semiconductor memory as the storage media.

Like all DSSI ISEs, the EF5XX-series disks communicate with the host using Digital Storage Architecture (DSA) and Systems Communications Architecture (SCA) protocols such as the Mass Storage Control Protocol (MSCP). EF5XX-series disk drives retain the familiar packaging, control panel, diagnostics, and utilities of the RF series ISEs.

Overview, Continued

Using the EF5XX

You can use the EF5XX-series ISEs with these VAX family systems:

- VAX4000
- VAX6000
- VAX7000
- VAX10000

EF5XX Options

These are the EF5XX ISEs covered in this guide and their formatted storage capacities:

- EF51R, 107 megabytes
- EF52R, 205 megabytes
- EF53, 267 megabytes

Data Retention System Description

The EF51R and the EF52R ISEs provide non-volatility of data by a data retention system including:

- Power sensing logic
- An internal winchester magnetic disk drive
- A battery to power the EF5XX while dumping data to the winchester disk

For more detailed information on data retention, refer to Chapter 5.

Overview, Continued

**DSSI Bus
Function**

The DSSI bus is a logical equivalent to the CI bus used on larger Digital systems. The DSSI bus is used with low-end and mid-range VAX systems.

The DSSI bus is a 50-conductor cable that allows one or more hosts to communicate directly with storage devices. The hosts and devices communicate through the SCA protocols. As many as eight nodes (integrated storage elements and adapters) can connect to one DSSI bus.

The DSSI bus located:

- Inside an enclosure may be a flat ribbon cable or a round bundle of twisted pairs
- Between enclosures is a shielded, round cable approximately one-half inch in diameter

ISE

An ISE is a DSSI device that contains an:

- Embedded, intelligent controller
- On-board Mass Storage Control Protocol (MSCP) server

Each ISE executes commands and transfers data independently of other ISEs attached to the DSSI bus. Commands and data are transferred over the DSSI bus in small packets, allowing multiple ISE transfers to simultaneously complete successfully.

Overview, Continued

EF5XX-Series ISE

Figure 1–1 shows the EF5XX-series disk, a full-height, 5-¼inch, fixed-disk storage device. Its dimensions are 8.26 cm (3.25 in) by 14.60 cm (5.75 in) by 20.32 cm (8.00 in).

Figure 1–1   EF5XX-Series ISE–Front and Rear Views (Brackets shown are used only for certain installations.)

Bracket Slides

Bracket Slides

Front View

Rear View
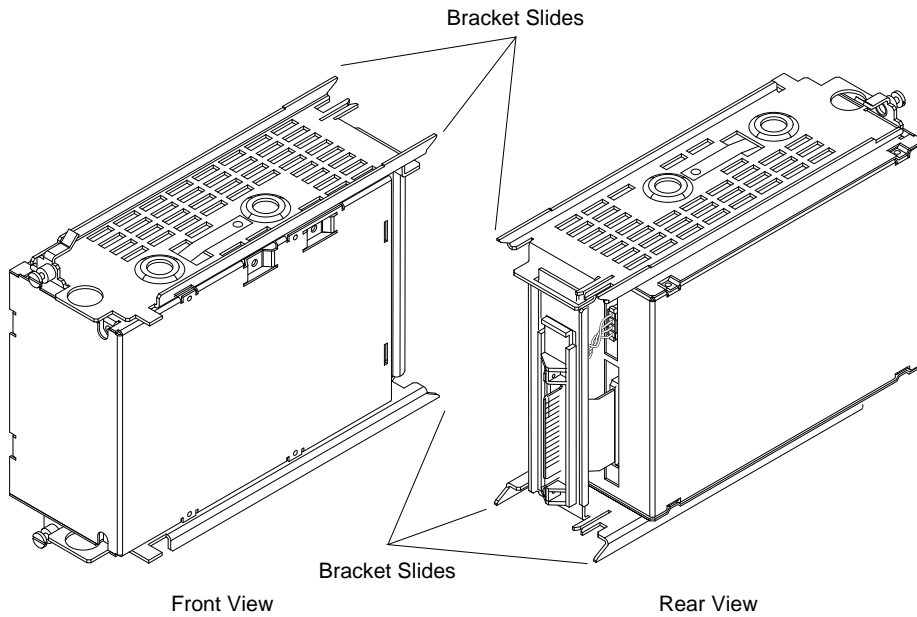
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Overview, Continued

Performance Features

EF5XX-series disks offer powerful performance features that are not typically available on disk storage devices in this form factor. Table 1–1 lists some of these features:

Table 1–1   EF5XX Series Performance Features

Feature	Function
Multihost support	This allows a single ISE to be used by more than one host at the same time. For example, two VAX4000 systems can be booted from a single ISE.
670-bit Error Correction Code (ECC)	EF5XX ISEs store a large, 670-bit ECC in each block, capable of correcting up to 320 erroneous bits.
Controller-initiated Bad Block Replacement (BBR)	With controller-initiated BBR, the ISE presents the host with a set of logically contiguous blocks, and disk capacity does not decrease because bad blocks are detected and automatically moved to spare blocks.
Replacement Control Table (RCT) Cache	DSSI ISEs cache the RCT allowing replaced blocks to be located without the time required to access the RCT stored on the media.

EF5XX ISE Specifications

Introduction

This section includes performance, power, media, and environmental specifications.

Performance Specifications

The following table lists the physical, functional, and performance specifications of the EF51R, EF52R, and EF53 ISEs:

Physical	EF51R	EF52R	EF53
Height	8.26 cm (3.25")	8.26 cm (3.25")	8.26 cm (3.25")
Width	14.60 cm (5.75")	14.60 cm (5.75")	14.60 cm (5.75")
Depth	20.32 cm (8.00")	20.32 cm (8.00")	20.32 cm (8.00")
Weight	2.55 kg (5 lbs 10 oz)	2.32 kg (5 lbs 2 oz)	2.21 kg (4 lbs 14 oz)

Functional	EF51R	EF52R	EF53
Formatted Storage Capacity (Mbytes)	107	205	267
Interface	DSSI	DSSI	DSSI
Number of Memory Modules	2	1	5
Data Retention	Yes	Yes	No

EF5XX ISE Specifications, Continued

Performance	EF51R	EF52R	EF53
Avg Access Time (ms)	.25	.25	.25
Peak Transfer Rate to DSSI Bus (Mbytes/sec)	4.00	4.00	4.00
Start Time (total min)	2.00	2.00	2.00

NOTE
The average access time includes commands, array access, Error Correction Code (ECC), and buffer delays. It does not include host software or host adapter latency.

EF5XX ISE Specifications, Continued

Current and Power Consumption

The following table lists the maximum current and power consumption and the typical current and power specifications:

Maximum Current & Power	EF51R	EF52R	EF53
5.0 V Supply Current (amps)			
Normal	0.0	0.0	2.2
Peak	0.0	0.0	3.7
12.0 V Supply Current (amps)			
Normal[1]	1.5	1.4	0.0
Peak[2]	2.3	2.2	0.1
Total Power (watts)			
Normal[1]	18.0	16.6	11.2
Peak[2]	27.6	26.2	18.4

[1]"Normal maximum" indicates the maximum power and current under normal conditions with heavy drive activity occurring.

[2]"Peak maximum" indicates the maximum power and current under peak conditions with heavy drive activity occurring. With the EF51R and EF52R, peak power occurs during the first half hour of fast charge after full discharge. With the EF53, peak power occurs during self-test, which happens during the first two minutes of operation.

Continued on next page

EF5XX ISE Specifications, Continued

Typical Current & Power	EF51R	EF52R	EF53
5.0 V Supply Current (amps)	0.0	0.0	1.8
12.0 V Supply Current (amps)	1.2	1.0	0.0
Total Power (watts)	14.3	12.4	8.9

EF5XX ISE Specifications, Continued

Environmental Specifications

The following table lists environmental specifications:

Environmental Specifications	EF51R, EF52R, EF53
Temperature	
Operating	10 to 50°C (50 to 122°F), ambient, with a gradient of 11°C (20°F) per hour (as introduced to the drive enclosure)
Non-operating	-40 to 66°C (-40 to 151°F), ambient, with a gradient of 20°C (36°F) per hour
Relative humidity	
Operating	10 to 90% with maximum wet bulb temperature of 28°C (82°F) and a minimum dew point of 2°C (36°F), with no condensation
Non-operating (storage/shipping)	8 to 95%, with no condensation
Altitude	
Operating	2,438 meters (8,000 feet)
Non-operating	4,876 meters (16,000 feet)
Noise (closed office environment)	4.2 Bels operating (ISO 779) EF51R, EF52R 0.0 Bels operating (ISO 779) EF53
Air flow	15 ft³/min (minimum)

Shipping Contents/Related Documents

Check Shipment

Ensure your shipment has all the items listed on the contents listing. If any item is missing or damaged, contact your delivery agent or your Digital representative.

NOTE
Save the packing materials until you are sure you will not reship any items.

Shipping Contents Listing

The EF5XX and its accessories are:

Part Number	Description
One of the following:	
EF51R–AA, AF	Solid state disk, 107 MB, with a 5-1/4-inch drive and a DSSI controller
EF52R–AA, AF	Solid state disk, 205 MB, with a 5-1/4-inch drive and a DSSI controller
EF53–AA, AF	Solid state disk, 267 MB, with a 5-1/4-inch drive and a DSSI controller
All of the following:	
74–45432–01	Wedges (2)
70–27049–04	Disk Drive Bezel Assembly
17–03571–01	DSSI flat cable (50 conductor)
17–03572–01	Front panel cable (10 conductor)
17–03573–01	Power cable (5 conductor)
12–28766–19	DSSI ID plug kit
36–33183–02	Label RF71 drive
36–33183–04	Label RF71 drive
EK–EF5XX–UG	User guide
EK–BA44A–IN	BA400-series installation guide

Shipping Contents/Related Documents, Continued

Related Documents

Along with your system documentation, the following documents supplement this guide:

Title	Order Number
BA400-Series Enclosures Storage Devices Installation Procedures	EK–BA44A–IN
DECarray Installation Guide	EK–SF2XX–IG

Chapter 2
Installation Overview

Introduction

In this Chapter

This chapter tells you how to prepare the EF5XX ISE and install the ISE into the:

- BA400-series system enclosure
- SF7X storage enclosure

For more detailed information about the:

- Installation into the BA400-series enclosure, refer to *BA400-Series Enclosures Storage Devices Installation Procedures*, (EK–BA44A–IN).
- SF7X enclosure, refer to *DECarray Installation Guide*, (EK–SF2XX–IG).

Installing into the BA400-Series Enclosure

Preparing for the Installation

To prepare for the installation:

> **CAUTION**
> **Static electricity can damage integrated circuits. Use the antistatic wrist strap and antistatic pad found in the static-protective field service kit (29-26246-00) when you work with the internal parts of a computer system.**
>
> **Handle the ISE with care. Dropping or bumping the ISE can damage the disk surface.**

1. After the system manager shuts down the operating system, set the lock of the enclosure to the bottom position to open both the top and bottom enclosure doors.

2. Set the enclosure power switch to off (0).

3. Always install ISEs working from right to left.

> **NOTE**
> **The first or rightmost mass storage cavity in the mass storage area is wider than the rest to accommodate a larger device such as a tape drive. A small filler panel (70-27414-01) is used to fill the gap when an EF5XX ISE is installed in this first cavity.**

4. Loosen the captive Phillips screw at the top of the blank ISE front panel assembly and remove the panel.

Before installing an EF5XX-series ISE into a BA400-series enclosure, you must first remove the skid plate, explained in the next section.

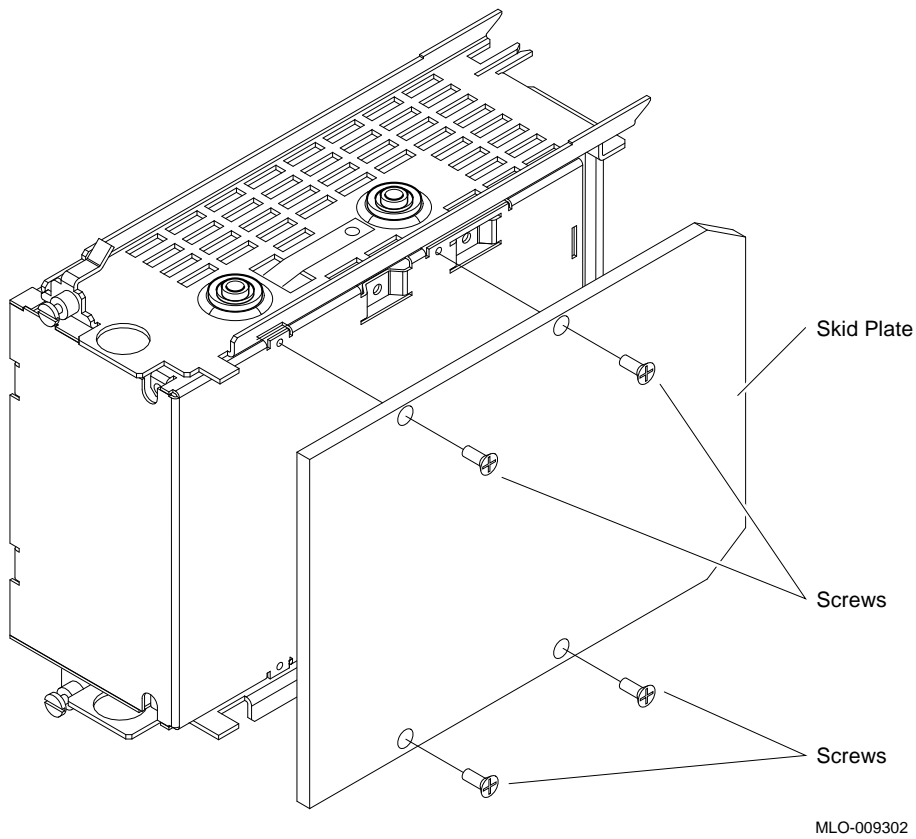## Installing into the BA400-Series Enclosure, Continued

Removing the Skid Plate

Remove the plastic skid plate from the right side of the ISE by removing the four screws (Figure 2–1). Discard the skid plate.

Figure 2–1   Removing the Plastic Skid Plate (AF or AA version only)

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Installing into the BA400-Series Enclosure, Continued

Installation Steps

To install the ISE into the BA400-series enclosure:

1. With the side that had the skid plate attached to it facing to the right, slide the ISE along the guide rails into the mass storage cavity (Figure 2–2A).

2. Using the upper and lower finger cutouts on the ISE brackets, firmly push the ISE brackets until the interface card at the rear of the ISE plugs into its backplane connector. The guide tabs on the upper and lower brackets should line up with the cutouts in the chassis. Tighten the two captive screws (Figure 2–2A).

   > **CAUTION**
   > **It is normal to have a small gap between the ISE mounting bracket tabs and the enclosure frame. Tighten the captive screws only until they are securely fastened (9 inch-pounds). Do not try to force the tabs to fit flush against the frame.**

3. Plug the remote front panel cable(s) into the connector(s) inside the ISE front panel (Figure 2–2B).

   Use Velcro on the cable and on the inside of the ISE front panel to secure the remote front panel cable.

4. Attach the ISE front panel to the enclosure by first fitting the panel's lower tabs into position. Fit the panel into position and secure the panel with its single captive Phillips screw (Figure 2–2D).

Figure 2–2   Installing the ISE in the Enclosure (RF and RZ front panels shown for reference.)

A

Captive Screws

Remote Front
Panel Cable

Guide
Tabs

Finger Cutouts

Phillips Screw

B

Remote Front
Panel Cable

Velcro

EF/RF/RZ 5.25-inch

C

Remote Front
Panel Cable

RF 3.5-inch

D

RZ 5.25-inch

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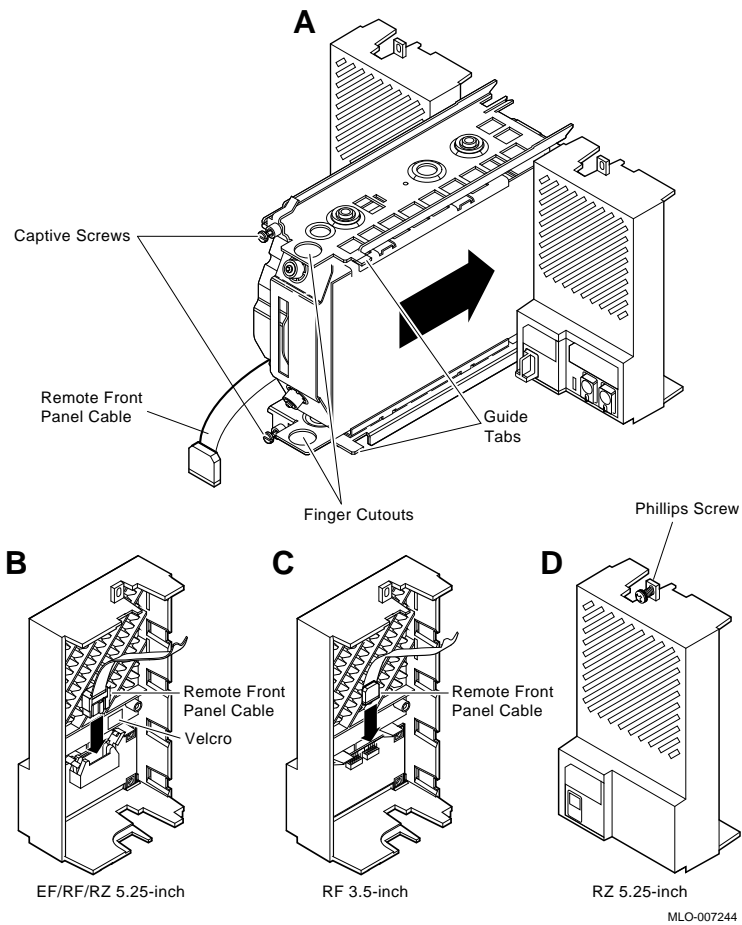
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Installing into the BA400-Series Enclosure, Continued

For further information, refer to the *BA400-Series Enclosures Storage Devices Installation Procedures*, (EK–BA44A–IN).

Installing into the SF7X Enclosure

Preparing for the Installation

Prepare for the installation into an SF7X enclosure as detailed in the *DECarray Installation Guide*, (EK–SF2XX–IG).

> **CAUTION**
>
> **Static electricity can damage integrated circuits. Use the antistatic wrist strap and antistatic pad found in the static-protective field service kit (29-26246-00) when you work with the internal parts of a computer system.**
>
> **Handle the ISE with care. Dropping or bumping the ISE can damage the disk surface.**

Before installing into the SF7X enclosure, you must first:

- Remove the ISE's top and bottom brackets
- Insert wedges on the ISE

Removing the brackets and inserting the wedges are explained in the next sections.

Removing the Brackets

To remove the ISE's top and bottom brackets:

1. Place the ISE on an antistatic mat.
2. Remove the two Phillips screws at the rubber shock bushings that secure the top bracket to the side of the chassis (Figure 2–3). Put the screws aside.
3. Slide the interface card assembly up and lift off the top bracket (Figure 2–3). Place the bracket aside.
4. Unplug the interface card assembly power cable (5 pin cable) from the drive.
5. Unplug the interface card assembly 50 pin data cable from the drive.
6. Unplug the remote front panel cable from the drive.

Installing into the SF7X Enclosure, Continued

7. Remove the ISE bottom bracket by removing the two Phillips screws at the rubber shock bushings that secure the bracket to the chassis (Figure 2–3).

> **NOTE**
> **Carefully note the orientation and routing of the remote front panel cable.**

Installing into the SF7X Enclosure, Continued

Figure 2–3   Removing the Top and Bottom Brackets (AF or AA version only)
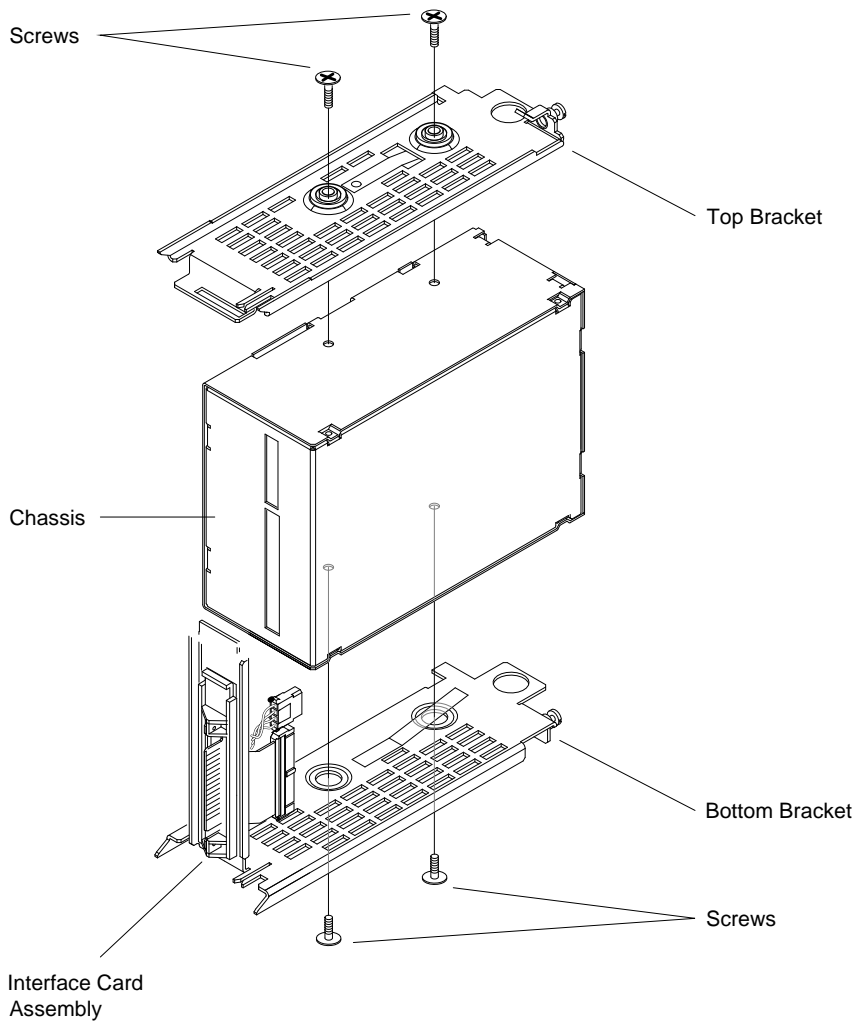
Screws

Top Bracket

Chassis

Bottom Bracket

Screws

Interface Card
Assembly

MLO-009303

Inserting the Wedges

To insert the wedges:

1. Remove the two wedges from the shipment box.
2. Hold one wedge at the front end (contains the screw) and insert the two rear prongs into the two elongated holes on the side of the chassis (Figure 2–4). The two holes are 2-3/4 inches from the rear of the chassis.
3. Lower the front end of the wedge and insert the front prongs into the two circular holes next to the connectors on the front of the drive (Figure 2–4).
4. Do the same steps to insert the other wedge on the opposite side of the chassis.

Figure 2–4   Inserting the Wedges on the EF5XX ISE
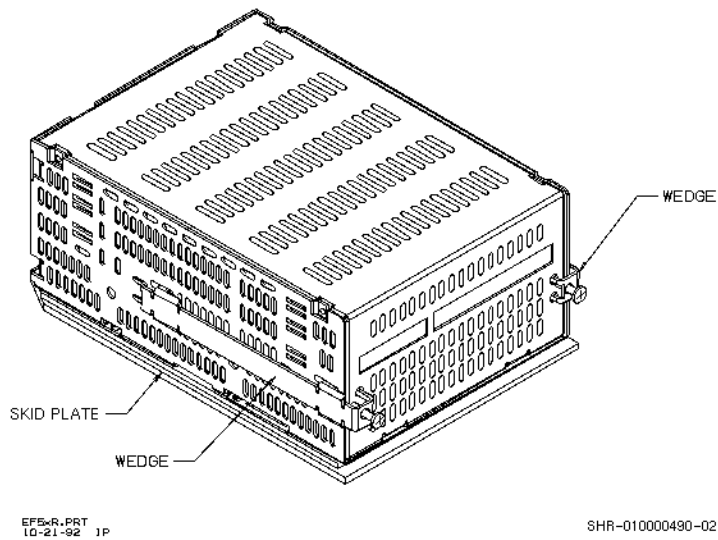
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SHR-010000490-02

Installing into the SF7X Enclosure, Continued

Installation Steps

To install the ISE into the SF7X enclosure (Figure 2–5):

1. With the ISE skid plate facing the enclosure guide rails, slide the ISE along the guide rails until the ISE is locked in place inside the SF7X enclosure.

2. Use a Phillips head screwdriver to tighten the screws on the wedges, so the ISE sets securely in the enclosure.

3. Take the three extension cables from the shipping box:

   - DSSI flat cable (50 conductor)

   - Front panel (Operator Control Panel (OCP)) cable (10 conductor)

   - Power cable (5 conductor)

4. Connect one end of each extension cable to the EF5XX ISE and the other end of each extension cable to the cables already attached (Figure 2–5) to the SF7X enclosure.

Installing into the SF7X Enclosure, Continued

Figure 2–5   The SF7X Enclosure

DSSI CABLE

10-PIN
OCP CABLE

5-PIN DRIVE
POWER CABLE

SHR-X0135A-90
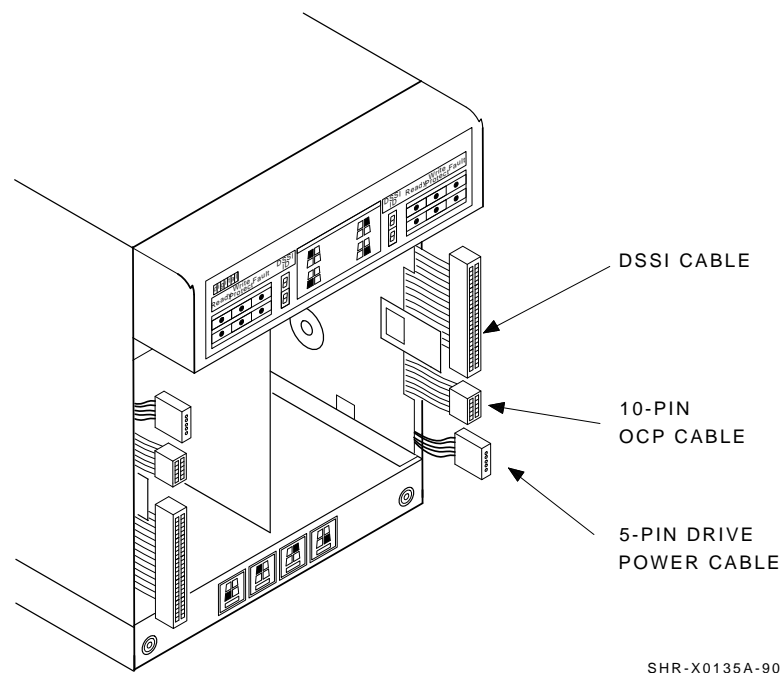
For more information about the SF7X enclosure, refer to the
DECarray Installation Guide, (EK–SF2XX–IG).

Chapter 3
Controls and Indicators

Introduction

In this Chapter

This chapter describes the controls and indicators associated with ISE operation. The controls and indicators are located on the:

- Operator control panel (OCP) on the system enclosure
- ISE front panel (Figure 3–1)

Operator Control Panel (OCP)

The operator control panel (OCP) is a set of controls on the enclosure that overrides the drive module switches and lets you set the DSSI node ID and write-protect mode for the ISE. The OCP also contains a fault LED that indicates if the ISE is malfunctioning.

Introduction, Continued

The following table compares the OCPs in the and BA400-series and SF7X enclosures.

In the ...	an OCP ...
BA400-series enclosures,	is contained on each ISE and is mounted to a panel in front of the ISE (Figure 3–1).
SF7X enclosure,	contains four identical sets of controls and indicators.

BA400-Series Controls and Indicators

OCP Each ISE installed in a BA400-series enclosure has a front
panel with the following controls and indicators:

- DSSI bus node ID plug
- Fault indicator (LED)
- Run/Ready button
- Write-Protect button

Figure 3–1   BA400-Series OCP (front panel) for DSSI ISEs
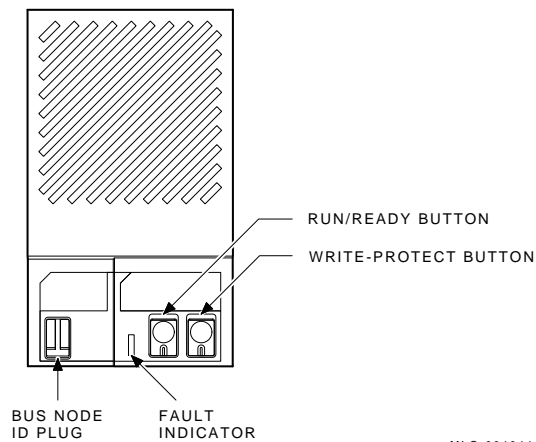
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BA400-Series Controls and Indicators, Continued

Control and Indicator Functions

The following table describes the functions of the controls and indicators on the BA400-series DSSI operator control panel:

Control	Status	Function
Fault LED	Lit	Indicates an error condition within the ISE.
	Not lit	Indicates an error-free condition within the ISE.
	Quick flash (10 Hz)	OCP failure, or drive select plug is missing.
Run/Ready Button	In (lit)	The ISE is on line. When the ISE is available for use, the green LED is lit. When the ISE is being used, the green LED flickers.
	Out (not lit)	The ISE is off line and cannot be accessed. The green LED cannot be lit when the Run/Ready button is out.
	Slow flash (1 Hz)	Data retention system is initializing, saving, or restoring data.
Write-Protect Button	In (lit)	The ISE is write-protected. System software cannot write to the ISE.
	Out (not lit)	The ISE is not write-protected. This is the normal position for software operation. System software is free to read or write to the ISE.

Changing the DSSI Node ID Plugs (BA400-Series OCPs)

Spare Plugs

Spare DSSI node ID plugs are supplied with the EF5XX. Use these spare plugs to reconfigure your DSSI system because of adding or removing ISEs or creating a multihost configuration.

Removal

The DSSI node ID plugs have prongs on the back that indicate the bus node number (and by default, the unit number) of the ISE. To remove a DSSI node ID plug, grasp it firmly and pull it straight out.

Insertion

To insert a new plug, align the two center prongs with the two center slots and press the plug into the slots.

Renumbering ISEs

Use the following rules to renumber your ISEs:

- For each DSSI bus, do not use duplicate DSSI node IDs.
- By convention, ISEs are numbered in increasing order from right to left and top to bottom.
- Use a blank DSSI node ID plug where no ISE is present.

NOTE
If you change the bus node ID plugs while the system is operating, you must turn off the system and then turn it back on for the new plug positions to take effect.

SF7X Controls and Indicators

OCP   Each ISE in the SF7X storage enclosure is represented by an icon on the door located on the OCP. Each set of controls and indicators is dedicated to one of the four storage compartments in the enclosure (Figure 3–2).

Figure 3–2   SF7X Controls and Indicators
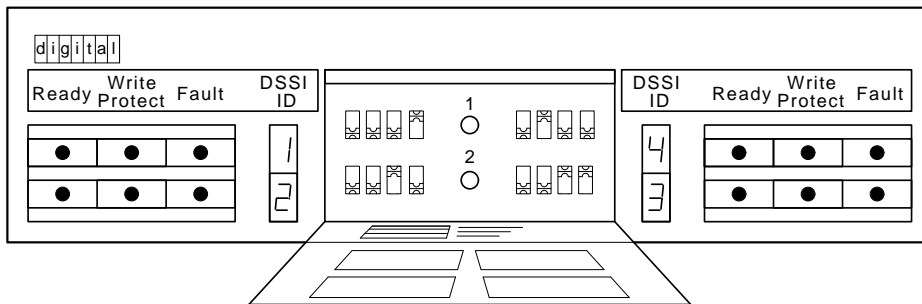
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SF7X Controls and Indicators, Continued

Control and Indicator Functions

The following table describes the functions of the controls and indicators on the front of the SF7X enclosure.

Control/ Indicator	Color	Function
Ready	Green	Illuminates when ISE is on line and read/write ready.
Fault	Red	Illuminates when fault is detected.
DSSI Node ID	Green	Displays ISE DSSI Node ID.
Write Protect	Yellow	Commands write protect mode. Shows write protect enabled.
Terminator Power	Green	On while when Terminator Power is being supplied.
Split Bus	Green	On when enclosure is in Split Bus mode.
DSSI Node ID Select	N/A	3 bits, selects DSSI node ID number.
MSCP Enable/Disable	N/A	1 bit, enables or disables the ISE MSCP server.
DC power switches (4)	Green	Applies DC power to ISE. Shows power status.

EF5XX ISE Controls and Indicators

Description

Two LEDs and a DIP switchpack containing three switches are mounted on the edge of the drive module. The switches provide a means of setting the DSSI node ID if an OCP is not connected to the drive, or if the OCP fails. The two LEDs indicate drive status:

- READY LED
- FAULT LED

Figure 3–3 shows the location of the switches and LEDs on the drive module.

EF5XX ISE Controls and Indicators, Continued

Figure 3–3   Drive Module Switch and LED Locations
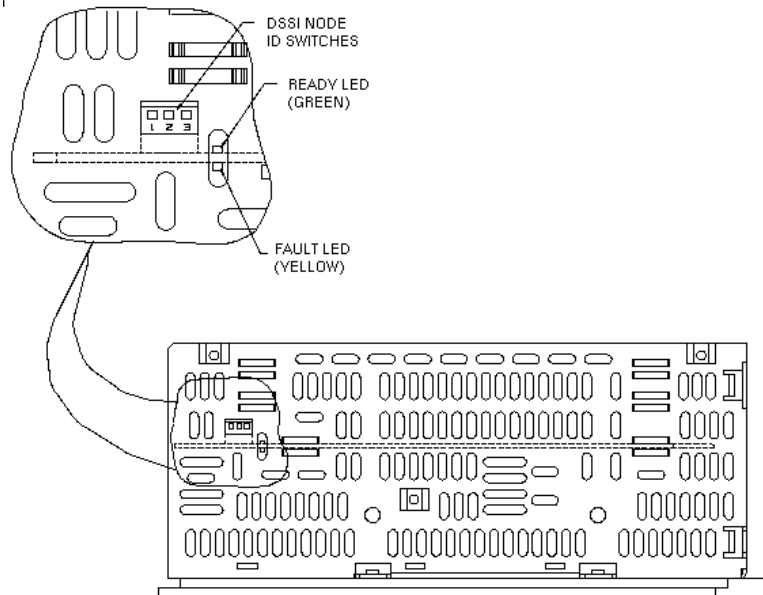
EF5xR.PRT
10-22-92 IP

SHR-010000490-01

EF5XX ISE Controls and Indicators, Continued

Assigning the DSSI Node ID

To assign the DSSI node ID, set the three switches to the binary equivalent of the selected ID number, as shown in the following table. These switches are ignored when an operator control panel is connected to the ISE.

DSSI Node ID	Switch Positions[1]		
Address	1	2	3
0	Up	Up	Up
1	Up	Up	Down
2	Up	Down	Up
3	Up	Down	Down
4	Down	Up	Up
5	Down	Up	Down
6	Down	Down	Up
7[2]	Down	Down	Down

[1]Up is toward the top cover of the EF5XX, down is toward the module.

[2]DSSI address 7 is normally assigned to a host adapter.

EF5XX ISE Controls and Indicators, Continued

Drive Module LEDs

The two LEDs mounted on the drive module monitor ISE status during operation. The following table describes the state of these two LEDs during the various phases of ISE operation.

When . . .	The green LED is . . .	And the yellow LED is . . .
The ISE is first powered up	On	On
POST has run successfully	Off	Off
The ISE is ready to accept a command	On	Off
Drive activity	Flickering	Off
A read/write or serious physical error is detected	Off	On
The ISE is saving or restoring data to the data retention system	Blinking once per second	Off

Chapter 4
Local Programs

Introduction

In this Chapter

This chapter includes:

- How to access local programs through the VMS system, the console, and the MicroVAX Diagnostic Monitor (MDM)
- Descriptions of accessible local programs

Overview

Local programs are diagnostics and utilities that are internal to the ISE. You can access them in one of three ways, depending on which system you are using.

Introduction, Continued

The following table refers to each section with instructions on how to access local programs:

To access local programs ...	Refer to ...
Through VMS, using the SET HOST command,	Using VMS
From the console, using the SET HOST command,	Using Console Commands
Through MDM, using the Device Resident Programs menu,	Using MDM

Once you establish a connection, the local program controls the operations that are performed. The following is a list of local programs and the sections in which they are located:

Introduction, Continued

Programs[1]	Section
DIRECT	DIRECT Program Description
DRVEXR	DRVEXR Program Description
DRVTST	DRVTST Program Description
HISTRY	HISTRY Program Description
DRINIT	DRINIT Program Description
BATTST	BATTST Utility Description
MEMTST	MEMTST Utility Description
PARAMS	PARAMS Utility Description

[1]For users familiar with the RF-series ISEs, notice that the DKUTIL, ERASE, and VERIFY local programs are not available in the EF5XX-series ISEs. The DRINIT local program in the EF5XX provides a function similar to the ERASE utility. The STATUS BB command in PARAMS provides the bad block information available in DKUTIL and VERIFY.

When the program ends, control returns to the system. To abort the program and return control to the system, press Ctrl/C or Ctrl/Y .

How to Access Local Programs

Using VMS

To access a local program from a MicroVAX system running VMS version 5.3-2 or greater, use the command:

```
$ SET HOST/DUP/SERVER=MSCP$DUP/TASK=taskname nodename
```

The following table defines taskname and nodename:

Term	Meaning	How to find
Taskname	Name of the local program	Descriptions found in this chapter
Nodename	Node name of the ISE	To find the node name of an ISE, type SHOW DEVICES or SHOW CLUSTER at the DCL ($) prompt and press Return

To create a file in your directory of what appears on the screen, add the qualifier:

```
/log=filename.ext
```

to:

```
$ SET HOST/DUP/SERVER=MSCP$DUP/TASK=taskname nodename
```

(Where "filename.ext" is, insert name of file and extension.)

How to Access Local Programs, Continued

Using Console Commands

Some systems allow you to access the local programs using console commands. The command you use depends on whether your system uses a Q–bus adapter such as the KFQSA module, or an embedded adapter such as the KA640 module.

Q–bus Adapters

To access a local program from a system with a Q–bus adapter, use the command:

```
>>> SET HOST/UQSSP/DUP/DISK # taskname
```

    taskname = name of the local program
    # = controller number of the ISE

To find the controller number, type SHOW UQSSP at the console prompt (>>>). An example of the SHOW UQSSP command is:

```
>>> show uqssp
UQSSP Disk Controller 0 (772150)
-DUA0 (RF31)

UQSSP Disk Controller 1 (760334)
-DUB1 (RF31)

UQSSP Disk Controller 2 (760340)
-DUC2 (RF31)

UQSSP Tape Controller 0 (774500)
-MUA0 (TK70)
>>>
```

How to Access Local Programs, Continued

**Q–bus
Adapters
(continued)**

To access a local program from a system with an embedded
adapter, use the command:

```
>>> SET HOST/DUP/DSSI/BUS:n #
```

   n = bus number where the ISE is located
   # = DSSI node number of the ISE

The system then prompts you for the name of the local program
you want to run.

To find the DSSI node number and node name, type SHOW
DSSI at the >>> prompt. To see a list of the devices on
the Q–bus, type SHOW QBUS or SHOW UQSSP at the >>>
prompt.

To abort the program and return control to the system, press
Ctrl/C or Ctrl/Y .

How to Access Local Programs, Continued

Using MDM

If neither VMS nor console commands are available on your system, you can run local programs using MDM. Use the following procedure:

1. Boot MDM.
2. Enter the date and time.
3. Select the menus in the following order:
   - Service menu
   - Device menu
   - KFQSAA-KFQSA subsystem menu
   - Device Utilities menu
   - Device Resident Programs menu

   When you select the Device Resident Programs menu, the following displays:

   ```
   RUNNING A UTILITY SERVICE TEST
   ```

   To stop the test at any time and return to the previous menu, press CTRL/C .

How to Access Local Programs, Continued

Using MDM (continued)

4. Enter the name of the local program you want to run and press $\boxed{\text{Return}}$. For information about the available local programs, refer to the program descriptions on the following pages.

5. To exit MDM, press the $\boxed{\text{Break}}$ key.

Descriptions of Local Programs

Overview

The rest of this chapter describes local programs you can access.

DIRECT Program Description

The DIRECT program provides a directory of local programs resident in the ISE.

DRVEXR

DRVEXR Program Description

The DRVEXR program is a diagnostic program that applies several types of stress to the ISE.

Access DRVEXR the same way you would the other local programs. Once a connection is established, the system prompts you to answer a series of questions. Your responses determine the mode and test duration.

Stopping DRVEXR

To stop DRVEXR in progress, press `Ctrl/C`, `Ctrl/Y`, or `Ctrl/Z`. When DRVEXR stops, a short report is printed.

Dialogue

To run DRVEXR, first respond to the following dialogue messages:

Message	Explanation
Copyright © 1989 Digital Equipment Corporation	No response is expected.
Write/read anywhere on the medium? [1=Yes/(0=No)]	Do you want to write to the user data area?
User data will be corrupted. Proceed? [1=Yes/(0=No)] (This question is omitted if you typed 0 to answer the previous question.)	Do you really want to overwrite existing data on the user data area?

DRVEXR, Continued

Dialogue (continued)

Message	Explanation
Test time in minutes? [(10)-100]	Your response determines the length of the test, in minutes.
Number of sectors to transfer at a time? [0 - 50]	This question is included for compatibility with DRVEXR in RF-series ISEs. The response can be any valid entry, 0 through 50. The entry is checked for validity, but otherwise ignored.
Compare after each transfer? [1=Yes /(0=No)]	Your response determines whether the processor "manually" compares the results of the read with the expected data (if writing is enabled) or the hardware does the compares after each read.
Test the DBN area? [2=DBN only/(1=DBN and LBN) /0=LBN only]:	Your response determines how to include the DBN area in the test. If you enter 2, the test always includes writes, even if you answered the first question with 0.

DRVEXR, Continued

**DRVEXR
Modes**

You can run the DRVEXR program in one of the following modes depending on your responses to the dialogue questions:

Mode	Function
Read/Write	Writes and reads as many blocks as possible in the given amount of time.
Data Integrity	Similar to Read/Write mode, but with a "manual" check of data buffers done by the ISE processor.
Max Stress	Reads the inner DBNs and outer DBNs alternately.

DRVEXR, Continued

Mode/Dialogue Relationship

The following table shows the relationship between the four test modes and the responses to the six questions in the dialogue:

Modes	Response to Question					
	1	2	3	4	5	6
Read/Write	1	1	Any	Any	0	Any
Data Integrity	1	1	Any	Any	1	Any
Max Stress	0	N/A	Any	0	N/A	2

Example

The following is an example of what is displayed when you run DRVEXR.

```
Copyright (C) 1990, 1991, 1992  Digital Equipment Corporation
Write/read anywhere on medium? [1=Yes/(0=No)] 1
User data will be corrupted.  Proceed? [1=Yes/(0=No)] 1
Test time in minutes? [(10)-100]
Number of sectors to transfer at a time? [0 - Device Size] 1
Compare after each transfer? [1=Yes/(0=No)]: 1
Test the DBN area? [2=DBN only/(1=DBN and LBN)/0=LBN only]: 1
 10 minutes to complete.
  249080 operations completed.
  124508 LBN blocks (512 bytes) read.
  124508 LBN blocks (512 bytes) written.
      32 DBN blocks (512 bytes) read.
      32 DBN blocks (512 bytes) written.
       0 uncorrectable ECC errors.
       0 bytes in error (soft).
Complete.
```

DRVTST

**DRVTST
Program
Description**

The DRVTST program provides a comprehensive test of the ISE hardware. Errors detected by this program can be isolated to the FRU level.

Dialogue

The following table describes the DRVTST dialogue:

Message	Explanation
Copyright © 1989 Digital Equipment Corporation	No response is expected.
Write/read anywhere on the medium? [1=Yes/(0=No)]	Do you want to write to the user data area? If you type 0, this is a read-only test. DRVTST does, however, write to a diagnostic area on the disk.
User data will be corrupted. Proceed? [1=Yes/(0=No)]	Do you really want to overwrite existing data on the user data area? If you type 0, this is a read-only test.
5 minutes to complete.	No response is expected.
Test passed.	The test was successful. Choose another local program or return control to the system.

DRVTST, Continued

Error Messages

The following table describes DRVTST error messages.

Message	Description
Unit is currently in use.	This can mean that the ISE unit is inoperative, in use by a host, or is currently running another local program.
Operation aborted by user.	This message appears if the user stops the program while it is in progress.
xxxx - Unit diagnostics failed.	This is a fatal error message where xxxx is the MSCP error code. Call Digital Services.
xxxx - Unit read/write test failed.	This is also a fatal error message where xxxx is the MSCP error code. Call Digital Services.

DRVTST, Continued

DRVTST Examples

The following is an example of what is displayed when DRVTST runs successfully:

```
Copyright (C) 1990, 1991, 1992  Digital Equipment Corporation
Write/read anywhere on medium? [1=Yes/(0=No)] 1
User data will be corrupted.  Proceed? [1=Yes/(0=No)] 1
  5 minutes to complete.
Test passed.
```

The following is an example of what is displayed when DRVTST has failed:

```
Copyright © 1989 Digital Equipment Corporation
Write/read anywhere on medium? [1=Yes/(0=No)]
0106 - Unit read/write test failed.
```

HISTRY

HISTRY Program Description

The HISTRY program displays ISE information that is used by programs running in the host (such as MDM).

The information is displayed in the following order:

    copyright notice
    product name
    serial number
    node name
    allocation class
    firmware revision level
    hardware revision level
    power-on hours
    power cycles
    last bug check codes (up to 11)

Example

The following is an example of what is displayed when you run the HISTRY program:

```
Copyright (C) 1990, 1991, 1992  Digital Equipment Corporation
EF53
GA23040879
E1ZDCI
1
RFX T043
EF53 PCB-1/ECO-00
236
1
Complete.
```

DRINIT

**DRINIT
Program
Description**

The DRINIT program initializes the firmware data structures
and on-disk structure of the internal data retention disk. This
prepares the EF5XR ISE for saving data in case of a power
failure.

CAUTION
**You should not normally need to run DRINIT. Use
the DRINIT program with caution, since running it
erases the EF5XX.**

```
Copyright (C) 1990  Digital Equipment Corporation
        User data will be corrupted.   Proceed? [1=Yes/(0=No)] 1
        Test passed.
```

BATTST

BATTST Utility Description

BATTST is a utility that allows testing the batteries in an EF51R and EF52R. It also allows for conditioning the batteries to avoid or correct the voltage depression effect that sometimes occurs in nickel-cadmium batteries after a series of incomplete discharges.

BATTST operates by continuing to exercise the memory and data retention disk under battery power after external DC power is removed. The time that the batteries lasted is stored in the PARAMS parameter BAT_TEST.

Accessing BATTST

Access the BATTST program the same way you would the other local programs. Once a connection is established, the system prompts you to answer a series of questions.

BATTST, Continued

Stopping BATTST

To stop a BATTST in progress, re-execute the BATTST local program. You will be given an opportunity to abort the test. Aborting BATTST requires the EF5XX to reset itself.

Digital recommends running the BATTST utility at least once per year, or whenever a "Battery Maintenance Error" is logged to the error log. This error is logged when EF5XX charging and battery test firmware detect potential problems with the charging or discharging of the batteries.

The result of the BATTST utility is checked by examining the BAT_TEST parameter with the PARAMS utility. BAT_TEST gives the time, in minutes and seconds, that the batteries ran under the BATTST utility. A time:

- Greater than 30 minutes indicates a good battery
- Less than 30 minutes indicates that you should call Digital Services to replace the battery

BATTST, Continued

Dialogue

The following table explains the BATTST dialogue.

Message	Explanation
Copyright © 1990,1991,1992 Digital Equipment Corporation	No response is expected.
Test requires the unit power to be removed. Proceed? [1=Yes/(0=No)]	Do you want to remove power from the EF5XX? This may affect other drives in the cabinet or may require a system shutdown.
Remove external power, Variable BAT_TEST will contain the time	Remove power from the EF5XX under test. Depending on the configuration, this may require a system shutdown. After the test is completed, the results are available in the parameter BAT_TEST.
Test passed.	This message indicates that the BATTST operation has started. The program stops automatically when the batteries are exhausted.

Continued on next page

BATTST, Continued

Example

The following is an example of the BATTST utility:

```
Copyright © 1990, 1991, 1992 Digital Equipment Corporation
Test requires the unit power to be removed.
Proceed? [1=Yes/(0=No)] 1
Remove external power, Variable BAT_TEST will contain the time
Test passed.
```

After removing the power and allowing the batteries to drain, the following example shows how to get the test results. In this case, the batteries lasted for 40 minutes and 12 seconds.

```
Copyright © 1990, 1991, 1992 Digital Equipment Corporation

PARAMS>SHOW BAT_TEST
Parameter    Current    Default    Type     Radix
---------    --------   --------   -----    ------
BAT_TEST     00:40:12   00:00:00   String   Ascii

PARAMS>EXIT
Exiting...
```

MEMTST

**MEMTST
Utility
Description**

MEMTST is a utility that allows testing of the memory modules
in EF5XX drives. Various patterns are written and read to the
memory arrays to detect problems with the memory devices,
address and data buffers, memory control, and ECC logic.

**Accessing
MEMTST**

Access the MEMTST program the same way you would the
other local programs. Once a connection is established, the
system prompts you to answer a series of questions.

MEMTST, Continued

Dialogue   The following table explains the MEMTST dialogue.

Message	Explanation
Copyright © 1990,1991,1992 Digital Equipment Corporation	No response is expected.
User data will be corrupted. Proceed? [1=Yes/(0=No)]	Do you want to overwrite the data in the memory arrays?
Test time in minutes? [0 (= 1 pass) <-> 200]	Enter the time to run the test. Enter 0 to run the test once on memory module.
Testing slot n:	Memory module n is currently being tested.
Array OK - has 2 bad blocks	The memory module has passed the test with the indicated number of bad blocks.
Test completed.	The test has finished without errors.

MEMTST, Continued

Example The following is an example of a successful run of the MEMTST utility. In this case, each memory module was tested twice and passed.

```
DUP Array Bad Block Test
Copyright © 1990, 1991, 1992  Digital Equipment Corporation

User data will be corrupted.  Proceed? [1=Yes/(0=No)] 1

Test time in minutes? [0 (= 1 pass) <-> 200] 16

Testing slot 0:
  Array OK - has 2 bad blocks
Testing slot 1:
  Array OK - has 0 bad blocks
Testing slot 2:
  No array installed
Testing slot 3:
  No array installed
Testing slot 4:
  No array installed
Testing slot 0:
  Array OK - has 2 bad blocks
Testing slot 1:
  Array OK - has 0 bad blocks
Testing slot 2:
  No array installed
Testing slot 3:
  No array installed
Testing slot 4:
  No array installed
Testing slot 0:

Test completed.
```

MEMTST, Continued

To test each memory module just once, use a test time of 0 as shown in the following example. MEMTST will calculate a test time based on the number of memory arrays installed.

```
DUP Array Bad Block Test
Copyright © 1990, 1991, 1992  Digital Equipment Corporation

User data will be corrupted.  Proceed? [1=Yes/(0=No)] 1

Test time in minutes? [0 (= 1 pass) <-> 200] 0
  1 pass (=    10 minutes) selected

Testing slot 0:
  Array OK - has 2 bad blocks
Testing slot 1:
  Array OK - has 0 bad blocks
Testing slot 2:
  No array installed
Testing slot 3:
  No array installed
Testing slot 4:
  No array installed
Testing slot 0:

Test completed.
```

The following is an example of MEMTST output when a memory module is found bad.

```
DUP Array Bad Block Test
Copyright (C) 1990, 1991, 1992  Digital Equipment Corporation

User data will be corrupted.  Proceed? [1=Yes/(0=No)] 1

Test time in minutes? [0 (= 1 pass) <-> 200] 10

Testing slot 0:
  Array OK - has 2 bad blocks
Testing slot 1:
  Array fails - has more than 20 bad blocks
```

PARAMS

PARAMS Utility Description

The PARAMS utility allows you to examine and change internal ISE parameters such as node name, allocation class, and MSCP unit number. You can also use PARAMS to display the state of the ISE and performance statistics maintained by the ISE.

The PARAMS program is an interactive, customer accessible DUP local program that functions as both a parameter editor (similar to the VMS SYSGEN utility) and a utility to display status, history, and counters. PARAMS also performs well as a manufacturing tool for gauging the *goodness* of the drive.

PARAMS polls for control characters (note that the DUP server strips control characters of interest out of the input stream and sets control flags). PARAMS processes control characters as follows:

Character	Function
CTRL/Y	Terminates the program
CTRL/C	Terminates the program
CTRL/Z	Terminates the program
CTRL/R	Ignored
CTRL/W	Ignored
CTRL/G	Emulates VMS CTRL/T behavior

PARAMS, Continued

The following is an example response given to CTRL/G:

```
PARAMS> ^G
E1QSAA::MSCP$DUP   26-APR-1990 15:01:51 PARAMS   CPU=00:00:01.09 PI=17

PARAMS>
```

**Accessing
PARAMS**

The PARAMS utility is invoked on demand from the user. Once a connection is established, all interaction occurs through the use of commands and responses. PARAMS has its own command line interpreter.

**PARAMS
Process**

- PARAMS prompts you for a command at the PARAMS> prompt.
- Once you enter a command, PARAMS executes it and then prompts you for another command.

**PARAMS
Commands**

Available PARAMS commands are:

Name	Function
ENABLE MSCP	Enables MSCP server
EXIT	Terminates PARAMS
HELP	Prints a brief list of commands and their syntax
LOCATE	Causes a soft fault in the ISE to help locate it
SET	Sets a parameter to a value
SHOW	Displays a parameter or a class of parameters
STATUS	Displays information about the drive's history
WRITE	Updates the NVR from the cached copy
ZERO	Clears a block of counters or all known blocks of counters

The following sections describe these commands.

**ENABLE
MSCP**

The ENABLE MSCP command, used with certain types of hosts/configurations, enable the MSCP server.

PARAMS, Continued

ENABLE MSCP Syntax	ENABLE MSCP

ENABLE MSCP Parameters	None

EXIT	Use the EXIT command to terminate the PARAMS utility. The message Exiting... displays on the terminal.

EXIT Syntax	EXIT

EXIT Parameters	None

HELP	HELP displays a brief list of the available commands and their syntax.

Command Syntax	HELP

HELP Parameters	None

Continued on next page

**HELP
Example**

```
PARAMS> help
  ENABLE MSCP
  EXIT
  HELP
  LOCATE
  SET {parameter | .} value
  SHOW {parameter | . | /class}
    /ALL      /CONST
    /DUP      /SCS
    /MSCP     /BSS
  STATUS [type]
    CONFIG    LOGS      DUMP
    THREADS   MEMORY
    MSCP      PATHS     DATALINK
    HOURLY    VCLOGS    BB
  WRITE
  ZERO counter
    ALL       HOURLY
    MSCP
PARAMS>
```

LOCATE

The LOCATE command causes a soft fault in the ISE (it has no effect on its current operation or state) to help find it. The fault indicator on the drive module (red LED), the OCP (red LED), or on the canister (magnetic disk with small green stripe) turn on and stay on until you press ⎡Return⎤ at the PARAMS> prompt.

**LOCATE
Syntax**

LOCATE *parameter-name value*

PARAMS, Continued

LOCATE Example

The following appears on the screen when this command is used:

```
PARAMS> locate
Drive has been soft faulted to help locate it
Press RETURN to continue:
PARAMS>
```

SET

Use the SET command to change the value of a given parameter in the cached copy of the NVR image that is maintained by PARAMS. The type and radix of the new value for the parameter is determined by the type and radix of the parameter itself ONLY and not by radix specifiers or quotes in your input. ASCII parameters are left justified and blanks are padded into their field width.

SET Syntax

SET *parameter-name value*

SET Parameters

- *parameter-name* is the name of the parameter you want to change. If abbreviated, the first matching parameter name is used without regard to uniqueness. In addition, the character "." may be used to reference the previously referenced parameter. If there is no previously referenced parameter, an error message is displayed.

- *value* is the value assigned to the parameter. The radix and type is specified by the parameter and not by radix specifiers or quotes. For example, the command SET NODE SUSAN sets parameter NODENAME equal to *SUSAN*.

PARAMS, Continued

SHOW Command Examples

                              NOTE
Since it is important to view the current value of a parameter before changing it, examples of the SHOW **command are included.**

```
PARAMS> show add_cr

Parameter  Current   Default  Type     Radix
---------  --------  -------- -------  ------
ADD_CR      0         0        Boolean  0/1

PARAMS> set . 1

PARAMS> show .

Parameter  Current   Default  Type      Radix
---------  --------  -------- --------  -----
ADD_CR      1         0        Boolean   0/1

PARAMS> set add_cr 0

PARAMS> show .

Parameter  Current   Default  Type      Radix
---------  --------  -------- --------  -----
ADD_CR      0         0        Boolean   0/1

PARAMS>
```

SHOW

The SHOW command displays the settings of a parameter or a class of parameters. The full name of the parameter (8 characters or less), the current value, the default value, radix and type, and any flag associated with each parameter is displayed.

SHOW Syntax

SHOW *param-or-class*

PARAMS, Continued

**SHOW
Parameters**

- *param-or-class* is either the parameter name, possibly
  abbreviated, or a class name. If you use an abbreviation,
  the first matching parameter displays regardless of
  uniqueness. The parameter name may also be the special
  character "." which displays the most recently-shown
  parameter. If there is no previously-shown parameter,
  an error message is displayed. If you use a class name, be
  sure to prefix it with a slash ("/"). Classes available are:
  ALL, CONST, SCS, MSCP, DUP, and BSS.

**SHOW /Class
Examples**

```
PARAMS> show /dup

Parameter   Current     Default     Type       Radix
---------   ---------   ---------   -----      ------
SDI_TMO        20          20        Byte       Dec   RO
ABT_TMO        20          20        Byte       Dec   RO
ELP_TMO        20          20        Byte       Dec   RO
DUPEXT        RFX         RFX        String     Ascii RO
ADD_CR          0           0        Boolean    0/1
ADD_LF          0           0        Boolean    0/1

PARAMS> show add_cr

Parameter   Current     Default     Type       Radix
---------   ---------   ---------   --------   -----
ADD_CR          0           0        Boolean    0/1

PARAMS> show .

Parameter   Current     Default     Type       Radix
---------   ---------   ---------   --------   -----
ADD_CR          0           0        Boolean    0/1

PARAMS>
```

STATUS

STATUS displays miscellaneous information such as module configuration, history, current counters, and so forth, depending on the type specified.

STATUS Syntax

STATUS *type*

STATUS Parameters

- The *type* is the optional ASCII string that denotes the type of data desired. You can also abbreviate *type*; an abbreviation selects all types with matching names. If omitted, all available data are displayed. The following types are available:

  - CONFIG displays the module name, node name, power on hours, power cycles, and other such configuration information. Any unit failures as well as NVR failures are displayed if applicable.

  - BB displays the bad block log for the device. A list of physical blocks that have been replaced is given.

  - LOGS displays the last eleven (11) machine and bug checks on the module. Included in each dump are the M68000 registers (D0-D7, A0-A7), the time and date of the failure (if not available, 17 November 1858 is used), and a few hardware registers.

  - DATALINK displays the data link counters.

  - PATHS displays available path information (open VCs) from the point of view of the controller. Included are the remote node names, DSSI IDs, software type and version, and counters for messages/datagrams sent /received.

  - SYSTEM displays system statistics and counters.

PARAMS, Continued

- MSCP displays MSCP statistics such as the number and type of I/O commands and various histograms.
- THREADS displays the known programs in the system, the amount of CPU time consumed, and other information.
- VC displays the last 8 virtual circuit closures.

STAT Examples

```
PARAMS> stat conf

Configuration:
  Node EQSAA is an EF51R controller using Apache V1.1
  Software EFX V100 built on 11-MAR-1990 22:21:45
  Electronics module name is EN00500250
  Last known unit failure code 300D(X)
  In 485 power-on hours, power has cycled 681 times
  System up time is   3 22:50:02.68
  System time is 23-MAR-1990 15:00:17

PARAMS> stat paths

   ID  Path Block      Remote Node      DGS_S       DGS_R       MSGS_S      MSGS_R
   -- ------------   ----------------  ----------  ----------  ----------  ----------
    1 PB  FF846D66    Internal Path        0           0           0           0
    0 PB  FF846E9A   KFQS A RFX T102       0           0           0           0
    7 PB  FF847236   KF0Y7B KFX V1.7       0           0         8393        8391

PARAMS> stat datalink

Datalink Counters:
    Interval: 341421 seconds
  Pkts Rcv'd:        53952:**************************
  Pkts Xmt'd:        53954:**************************
  Naks Rcv'd:        45717:*********************
  Naks Xmt'd:            0:
Resets Rcv'd:        99662:************************************************
Resets Xmt'd:         3040:*
 No response:        42677:********************
  Duplicates:            0:
     Unrecogs:            0:
```

PARAMS, Continued

```
PARAMS> stat logs
NOTE: bugcheck code is last word on first line of each log.

Log History:

Log #175-27-50-01/0000 17-NOV-1858 0:00:00
 FFFFFFFF 0000FFFF FFFFFFFF FFFE2801 FFFFFFFF EFFF2801 FFF7FFFB 0000A056
 FFDFC029 FFDFC74B FFFFB74C BFFEFFFF FFFF80BA FBFFFFFF FFFFBFFF FFFF807C
 00000000 00000000 00000000

Log #176-27-50-01/0000 17-NOV-1858 0:00:00
 FFFF1441 0000004D FFFFFFFF FFFE2801 FFFFFFFF EFFF2801 FFF7FFFB 0000A050
 FFDF80BE FFDFC0EB FFFFB750 BFFEFFFF FFFF80BA FBFFFFFF FFFFBFFF FFFF807C
 00000000 00000000 000006EC

 ...Eight logs omitted...

Log #174-27-50-01/0000 17-NOV-1858 0:00:00
 FFFF1441 0000004D FFFFFFFF FFFE2801 FFFFFFFF EFFF2801 FFF7FFFB 0000A050
 FFDF80BE FFDFC6AF FFFFB750 BFFEFFFF FFFF80BA FBFFFFFF FFFFBFFF FFFF807C
 00000000 00000000 000006EC

PARAMS> stat mscp
MSCP statistics:
          Interval: 341481 seconds
      I/O Commands: 0
 Primary revectors: 0
Tertiary revectors: 0
    Max Queue Depth: 0
 Queue Depth Histogram:
 Commands Processed Histogram:
  GetUnit:        5691:*******************************************
    SetCon:           2:*
 Blocks Accessed Histogram (cylinder ranges):
 Read Lengths Histogram (block count ranges):
 Write Lengths Histogram (block count ranges):
PARAMS>
```

WRITE Command

Use the WRITE command to copy the cached copy of NVR_G_IMAGE back to NVR. This is equivalent to the VMS SYSGEN WRITE command.

A WRITE command may fail for several reasons:

- If a parameter is modified that requires the unit and the unit cannot be acquired. (For example, it is not in the available state with respect to all hosts. Changing the unit number is an example of a parameter that requires the unit.)

- If a parameter is modified that requires controller initialization and the user replies negatively to the request for reboot. (Changing the nodename or the allocation class are examples of parameters that require controller initialization.)

- Initial drive calibrations are in progress on the unit. (WRITE is inhibited during this time.)

WRITE Syntax   WRITE

WRITE Parameters   None

ZERO   The ZERO command clears a block of counters or all known blocks of counters.

ZERO Syntax   ZERO counter

PARAMS, Continued

**ZERO
Parameters**

- Counter is a block of performance counters or all known counters.
- Counter types include the following:
  - * All - Clears all performance counter blocks.
  - * MSCP - Clears the MSCP performance counters and histograms.
  - * SEEKS - Clears the seek performance counters and histograms.

Chapter 5
Data Retention System

Introduction

In This Chapter

The EF51R and EF52R ISEs contain advanced hardware and firmware that protect the data in the memory arrays from loss in case of power or other system failure.

This chapter discusses the following features of the integrated data retention system:

- Continuously saving data
- Restoring data on line
- Battery testing and monitoring
- Fast charge circuit
- Automatic write protect
- Comprehensive battery test

EF5XX Data Retention Description

Continuously Saving Data

Unlike Digital's earlier ESE20 and ESE50 solid state disks, the EF5XX ISE continuously moves modified data to the internal winchester disk drive. This minimizes the amount of data that must be saved under battery power and ensures that the data retention disk is still functional. Saving of data is a low priority, background task that minimizes the effect of saving data on performance.

Upon a power failure, the EF5XX instantly switches over to battery power. Within one minute, firmware detects external power has failed. Firmware then write-protects the EF5XX ISE, preventing further data changes. Saving data to the internal winchester (magnetic) disk drive continues under battery power until all contents of the memory arrays are safely on the winchester disk.

The EF5XX ISE then shuts itself off to conserve battery power. Although continuously saving data dramatically decreases the length of time to completely save final data, the fully charged battery has sufficient power to completely save the contents of the EF5XX to the winchester disk. While saving the data under battery power, the yellow Write-Protect LED will be on and the green Run/Ready LED will blink once per second.

Restoring Data

When power is restored, the EF5XX undergoes approximately two minutes of power-on self-test (POST), which verifies the integrity of the electronics and firmware.

After POST, the EF5XX is available for mounting and begins restoring data to the memory arrays. While restoring data in the offline state, the green Run/Ready LED blinks once per second.

EF5XX Data Retention Description, Continued

After mounting, users' requests from the host receive top priority and are satisfied before restore requests. If a user requests data that has not been restored yet, the EF5XX fetches the data from the internal magnetic disk and returns the data to the user.

Battery Testing and Monitoring

The battery subsystem (BSS) firmware logs a "Battery Maintenance Error" under certain conditions. Table 5–1 lists the type of error and why it occurs:

Table 5–1   Battery Maintenance Errors

Error	Reason
Battery failed periodic test.	The batteries undergo a periodic trickle test to check for shorted cells.

.

EF5XX Data Retention Description, Continued

Table 5–1 (Continued) Battery Maintenance Errors

Error	Reason
Battery age.	The batteries have had more than 3 years of power-on time and need to be replaced. The number of power-on days until the battery needs to be replaced is available in the parameter BSS_REPL. A value of 0 indicates the age is the cause of the maintenance error.
Battery charging out-of-specification.	Battery charging time was not within specification.
Battery deep discharge.	If the parameter BSS_SHUT is 0 and the BSS_DISC is 1, the batteries were deep discharged on the last power failure and should be replaced.

EF5XX Data Retention Description, Continued

**Using
PARAMS**

Use the PARAMS local program (Chapter 4) to check the cause
of the battery maintenance error. You can use the PARAMS
command SHOW /BSS to show all BSS parameters. Except in
the case of deep discharge, use the battery test utility BATTST
to verify battery health when a "Battery Maintenance Error"
appears in the error log.

**Running
BATTST**

In addition, Digital recommends running the BATTST utility
(Chapter 4) at least once a year to condition and test the
batteries. If deep discharge occurs or the BATTST fails, please
call Digital Services to replace the battery.

**Overtemperature
Errors**

Overtemperature conditions are also logged to the error log by
BSS firmware. Frequent overtemperature conditions shorten
battery life. A battery replacement interval of less than three
years is recommended if frequent overtemperature errors are
logged to the error log.

**Fast Charge
Circuit**

The EF5XX employs a fast-charge battery charge circuit to
reduce exposure to multiple power failures. The battery charger
is capable of replacing 90% of a full discharge in 4 hours. After
the batteries are charged, the battery charger trickle charges
the batteries to maintain the charge level.

EF5XX Data Retention Description, Continued

Automatic Write Protect

The EF5XX can optionally write-protect itself automatically while the battery capacity is insufficient for saving data completely. Automatic write protect is controlled by the parameter BSS_WPLC. The default value of 1 indicates that data should be protected by write-protecting automatically.

Comprehensive Battery Test

The BATTST local program provides a comprehensive battery test that measures the life of the battery under full load. More information on the battery test is available in Chapter 4.

Battery Subsystem Parameters

**BSS
Parameter
Example**

The following shows the parameters that control the battery
subsystem (BSS).

```
Parameter  Current    Default  Type      Radix
---------  ---------  -------- -------   --------
BSS_MAXR   1095         1095    Word      Dec   B
BSS_REPL   1095         1095    Word      Dec   B
BSS_CHRG     15           15    Word      Dec   B
BSS_TINT   10020        10020   Word      Dec   B
BSS_TLEN     60           60    Byte      Dec   B
BSS_SHUT      1            0     Boolean   0/1   B
BSS_DISC      1            1     Boolean   0/1   B
BSS_WPLC      0            1     Boolean     0/1
BSS_REST      0            0     Boolean     0/1
BSS_UPNV      0            0     Boolean     0/1
```

**BSS
Parameter
Definitions**

Table 5–2 lists the BSS parameters and their definitions:

Table 5–2   BSS Parameter Definitions

Parameter	Definition
BSS_MAXR	Maximum number of days of battery life. This value is used to initialize BSS_REPL when replacing a battery.

.

Battery Subsystem Parameters, Continued

Table 5–2   (Continued)   BSS Parameter Definitions

Parameter	Definition
BSS_REPL	Number of days of battery life left for current battery when the NVRAM was last updated. This value does not represent the run-time value. To update the NVRAM, and thus cause this parameter to reflect the current run-time value, see the BSS_UPNV parameter.
BSS_CHRG	Number of minutes of charge when the NVRAM as last updated. This value does not represent the run-time value. To update the NVRAM, and thus cause this parameter to reflect the current run-time value, see the BSS_UPNV parameter.
BSS_TINT	The interval between runs of the periodic battery test in minutes.
BSS_TLEN	The length of the periodic battery test in minutes.

Battery Subsystem Parameters, Continued

Table 5–2   (Continued)   BSS Parameter Definitions

Parameter	Definition
BSS_SHUT	This flag determines whether the unit should shut-down before the battery is drained to the point where it may become damaged, and no longer hold a charge. If the flag is 0 (the default), then the battery will continue to discharge until it is dead (that is, data is prioritized above battery life). If the flag is 1, then the unit will shut down before the battery is damaged (that is, battery life is prioritized above data).
BSS_DISC	This flag represents whether the batteries where fully discharged when the unit was last shut-down. This flag is used internally by the firmware, and should not be altered by the user.
BSS_WPLC	This flag represents whether the EF5XX should write-protect when the battery charge is too low to completely save data. The default value is 1 to protect data.

Battery Subsystem Parameters, Continued

Table 5–2   (Continued)   BSS Parameter Definitions

Parameter	Definition
BSS_REST	This flag is used to reset the initial parameter when a battery is changed. After the battery is changed, the user should set this flag to 1. When the firmware detects the flag has been set (may take up to 1 minute), the firmware will reinitialize it parameters, and reset the flag to 0. The values of the parameters in NVRAM will not be updated until the unit is power-cycled, or the user sets the BSS_UPNV flag. The value of the BSS_REST flag shown by PARAMS is a local copy and is not updated when the NVRAM copy is updated by the firmware. The user must exit PARAMS and re-enter to see the updated value.
BSS_UPNV	This flag is used to update the NVRAM copies of the BSS parameters with the current run-time values. The user sets this bit, and when the firmware detects the flag, the firmware will update the NVRAM copies of the parameters and reset the BSS_UPNV flag. The value of the BSS_REST flag and other parameters shown by PARAMS are local copies and are not updated when the NVRAM copies are updated by the firmware. The user must exit PARAMS and re-enter to see the updated values.

Chapter 6
Troubleshooting Procedures

Performing Troubleshooting Procedures

In this Chapter

This chapter describes:

- Self-tests
- Failure indications
- What you should do if the ISE fails to operate correctly

NOTE
Remember that repairs to the ISE should be done by Digital Services engineers only.

Performing Troubleshooting Procedures, Continued

Self-Tests

Power-on Self-Test (POST)

The ISE automatically performs a self-test whenever power is applied. This power-on self-test (POST) detects most faults that occur in the ISE.

Internal Tests and Calibrations

Periodic internal tests and calibrations are performed as a normal part of the operation of the ISE. These tests are run automatically on a periodic basis and cause the device to appear active (although there may be no system activity at the time). This is normal, and does not indicate a problem.

Performing Troubleshooting Procedures, Continued

Failure Indications

An ISE can fail during initial power-up or during normal operation. The following table describes the states of the LEDs, what these states mean, and what actions you should take.

When . . .	It means . . .	And you . . .
The green READY LED is on and the red FAULT LED is off	the operating condition is normal	can use the ISE.
The red FAULT and green READY LEDs turn on and stay on	the ISE is unable to execute the POST	should power down the system, check DSSI cable, and try again. If failure persists, call Digital Services.
Neither LED turns on	proper amount of power may not be getting to the ISE	should check power supply and DSSI cable. If failure persists, call Digital Services.
The red FAULT LED turns on and stays on	a fault condition exists	should run local programs, as described in Chapter 4, to isolate failure. If unable to access local programs, check DSSI node ID. If failure persists, call Digital Services.
The red FAULT LED flashes (10 Hz)	an OCP failure occurs	check that the OCP contains a drive select plug and/or that the plug ID number is unique for that bus.

Performing Troubleshooting Procedures, Continued

**Before Calling
Digital
Services**

If a failure occurs with the ISE, ensure:

- The ISE has the correct DSSI node ID

- No other device on the DSSI bus has the same node ID

Refer to Chapter 3 to ensure the DSSI node ID is set correctly.
If the ID is set correctly and the ISE still fails, call Digital
Services.

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