November 1992
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**German Noise Declaration:** The following information is provided to meet the German Noise Declaration Decree (part of the German Equipment Safety Law).

**English:**

---

**Acoustics - declared values per ISO 9296 and ISO 7779:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Idle</th>
<th>Operate</th>
<th>Idle</th>
<th>Operate</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF51/2R-AA/F</td>
<td>4.4</td>
<td>4.5</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>BA430/440 +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3xEF51/2R</td>
<td>5.6</td>
<td>5.6</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>R400X +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7xEF51/2R</td>
<td>5.6</td>
<td>5.6</td>
<td>40</td>
<td>41</td>
</tr>
</tbody>
</table>

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

---

**German:**

---

**Schallemissionswerte - Werteangaben nach ISO 9296 und ISO 7779/DIN EN27779:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Leerlauf</th>
<th>Betrieb</th>
<th>Leerlauf</th>
<th>Betrieb</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF51/2R-AA/F</td>
<td>4.4</td>
<td>4.5</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>BA430/440 +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3xEF51/2R</td>
<td>5.6</td>
<td>5.6</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>R400X +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7xEF51/2R</td>
<td>5.6</td>
<td>5.6</td>
<td>40</td>
<td>41</td>
</tr>
</tbody>
</table>

[Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Digital Equipment Vertretungen erhältlich. 1 B = 10 dBA.]
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<tr>
<th>Table</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–1</td>
<td>EF5XX Series Performance Features</td>
<td>1–6</td>
</tr>
<tr>
<td>5–1</td>
<td>Battery Maintenance Errors</td>
<td>5–3</td>
</tr>
<tr>
<td>5–2</td>
<td>BSS Parameter Definitions</td>
<td>5–7</td>
</tr>
</tbody>
</table>
# Preface

## Introduction

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.

## Chapters

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>“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.</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>“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.</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>“Controls and Indicators” describes the controls and indicators used to operate the EF5XX disk drive and how to assign the DSSI node ID.</td>
</tr>
</tbody>
</table>

*Continued on next page*
### Introduction, Continued

<table>
<thead>
<tr>
<th>Chapter 4</th>
<th>“Local Programs” describes how to access local programs through the:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- VMS system and the console by using the SET HOST/DUP command</td>
</tr>
<tr>
<td></td>
<td>- MicroVAX Diagnostic Monitor (MDM)</td>
</tr>
</tbody>
</table>

| 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

Continued on next page
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.

Continued on next page
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.

Continued on next page
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.

Continued on next page
Overview, Continued

**EF5XX-Series ISE**

Figure 1–1 shows the EF5XX-series disk, a full-height, 5-¼-inch, 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.)**

Continued on next page
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>
<thead>
<tr>
<th>Feature</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multihost support</td>
<td>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.</td>
</tr>
<tr>
<td>670-bit Error Correction Code (ECC)</td>
<td>EF5XX ISEs store a large, 670-bit ECC in each block, capable of correcting up to 320 erroneous bits.</td>
</tr>
<tr>
<td>Controller-initiated Bad Block Replacement (BBR)</td>
<td>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.</td>
</tr>
<tr>
<td>Replacement Control Table (RCT) Cache</td>
<td>DSSI ISEs cache the RCT allowing replaced blocks to be located without the time required to access the RCT stored on the media.</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Physical</th>
<th>EF51R</th>
<th>EF52R</th>
<th>EF53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>8.26 cm (3.25&quot;)</td>
<td>8.26 cm (3.25&quot;)</td>
<td>8.26 cm (3.25&quot;)</td>
</tr>
<tr>
<td>Width</td>
<td>14.60 cm (5.75&quot;)</td>
<td>14.60 cm (5.75&quot;)</td>
<td>14.60 cm (5.75&quot;)</td>
</tr>
<tr>
<td>Depth</td>
<td>20.32 cm (8.00&quot;)</td>
<td>20.32 cm (8.00&quot;)</td>
<td>20.32 cm (8.00&quot;)</td>
</tr>
<tr>
<td>Weight</td>
<td>2.55 kg (5 lbs 10 oz)</td>
<td>2.32 kg (5 lbs 2 oz)</td>
<td>2.21 kg (4 lbs 14 oz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Functional</th>
<th>EF51R</th>
<th>EF52R</th>
<th>EF53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formatted Storage Capacity (Mbytes)</td>
<td>107</td>
<td>205</td>
<td>267</td>
</tr>
<tr>
<td>Interface</td>
<td>DSSI</td>
<td>DSSI</td>
<td>DSSI</td>
</tr>
<tr>
<td>Number of Memory Modules</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Data Retention</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Continued on next page
EF5XX ISE Specifications, Continued

<table>
<thead>
<tr>
<th>Performance</th>
<th>EF51R</th>
<th>EF52R</th>
<th>EF53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Access Time (ms)</td>
<td>.25</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td>Peak Transfer Rate to DSSI Bus (Mbytes/sec)</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Start Time (total min)</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
</tbody>
</table>

**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.

*Continued on next page*
Current and Power Consumption

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

<table>
<thead>
<tr>
<th>Maximum Current &amp; Power</th>
<th>EF51R</th>
<th>EF52R</th>
<th>EF53</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0 V Supply Current (amps)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>0.0</td>
<td>0.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Peak</td>
<td>0.0</td>
<td>0.0</td>
<td>3.7</td>
</tr>
<tr>
<td>12.0 V Supply Current (amps)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal(^1)</td>
<td>1.5</td>
<td>1.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Peak(^2)</td>
<td>2.3</td>
<td>2.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Total Power (watts)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal(^1)</td>
<td>18.0</td>
<td>16.6</td>
<td>11.2</td>
</tr>
<tr>
<td>Peak(^2)</td>
<td>27.6</td>
<td>26.2</td>
<td>18.4</td>
</tr>
</tbody>
</table>

\(^1\)“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.
## EF5XX ISE Specifications, Continued

<table>
<thead>
<tr>
<th>Typical Current &amp; Power</th>
<th>EF51R</th>
<th>EF52R</th>
<th>EF53</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0 V Supply Current (amps)</td>
<td>0.0</td>
<td>0.0</td>
<td>1.8</td>
</tr>
<tr>
<td>12.0 V Supply Current (amps)</td>
<td>1.2</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total Power (watts)</td>
<td>14.3</td>
<td>12.4</td>
<td>8.9</td>
</tr>
</tbody>
</table>

*Continued on next page*
The following table lists environmental specifications:

<table>
<thead>
<tr>
<th>Environmental Specifications</th>
<th>EF51R, EF52R, EF53</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>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)</td>
</tr>
<tr>
<td>Non-operating</td>
<td>-40 to 66°C (-40 to 151°F), ambient, with a gradient of 20°C (36°F) per hour</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>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</td>
</tr>
<tr>
<td>Non-operating (storage/shipping)</td>
<td>8 to 95%, with no condensation</td>
</tr>
<tr>
<td><strong>Altitude</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>2,438 meters (8,000 feet)</td>
</tr>
<tr>
<td>Non-operating</td>
<td>4,876 meters (16,000 feet)</td>
</tr>
<tr>
<td><strong>Noise (closed office environment)</strong></td>
<td>4.2 Bels operating (ISO 779) EF51R, EF52R 0.0 Bels operating (ISO 779) EF53</td>
</tr>
<tr>
<td><strong>Air flow</strong></td>
<td>15 ft³/min (minimum)</td>
</tr>
</tbody>
</table>
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:

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

Continued on next page
Shipping Contents/Related Documents, Continued

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

<table>
<thead>
<tr>
<th>Title</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA400-Series Enclosures Storage Devices Installation Procedures</td>
<td>EK–BA44A–IN</td>
</tr>
<tr>
<td>DECArray Installation Guide</td>
<td>EK–SF2XX–IG</td>
</tr>
</tbody>
</table>
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).
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.

Continued on next page
Installing into the BA400-Series Enclosure, Continued

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

Continued on next page
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).

---

Continued on next page
Installing into the BA400-Series Enclosure, Continued

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

Continued on next page
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

Preparation 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.

Continued on next page
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)

Chassis

Interface Card Assembly

Top Bracket

Bottom Bracket

Screws
Installing into the SF7X Enclosure, Continued

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.
Installing into the SF7X Enclosure, Continued

Figure 2–4 Inserting the Wedges on the EF5XX ISE
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.

---

Continued on next page
Installing into the SF7X Enclosure, Continued

Figure 2–5  The SF7X Enclosure

For more information about the SF7X enclosure, refer to the DECaray 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.

Continued on next page
The following table compares the OCPs in the and BA400-series and SF7X enclosures.

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

Continued on next page
## 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:

<table>
<thead>
<tr>
<th>Control</th>
<th>Status</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault LED</td>
<td>Lit</td>
<td>Indicates an error condition within the ISE.</td>
</tr>
<tr>
<td></td>
<td>Not lit</td>
<td>Indicates an error-free condition within the ISE.</td>
</tr>
<tr>
<td></td>
<td>Quick flash (10 Hz)</td>
<td>OCP failure, or drive select plug is missing.</td>
</tr>
<tr>
<td>Run/Ready Button</td>
<td>In (lit)</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Out (not lit)</td>
<td>The ISE is off line and cannot be accessed. The green LED cannot be lit when the Run/Ready button is out.</td>
</tr>
<tr>
<td></td>
<td>Slow flash (1 Hz)</td>
<td>Data retention system is initializing, saving, or restoring data.</td>
</tr>
<tr>
<td>Write-Protect Button</td>
<td>In (lit)</td>
<td>The ISE is write-protected. System software cannot write to the ISE.</td>
</tr>
<tr>
<td></td>
<td>Out (not lit)</td>
<td>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.</td>
</tr>
</tbody>
</table>
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

Continued on next page
### SF7X Controls and Indicators, Continued

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

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

<table>
<thead>
<tr>
<th>DSSI Node ID</th>
<th>Switch Positions¹</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Address</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>Up</td>
<td>Up</td>
<td>Up</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Up</td>
<td>Up</td>
<td>Down</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Down</td>
<td>Up</td>
<td></td>
<td>Down</td>
</tr>
<tr>
<td>4</td>
<td>Down</td>
<td>Up</td>
<td></td>
<td>Up</td>
</tr>
<tr>
<td>5</td>
<td>Down</td>
<td>Up</td>
<td></td>
<td>Down</td>
</tr>
<tr>
<td>6</td>
<td>Down</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
</tr>
<tr>
<td>7²</td>
<td>Down</td>
<td>Down</td>
<td>Down</td>
<td></td>
</tr>
</tbody>
</table>

¹Up is toward the top cover of the EF5XX, down is toward the module.
²DSSI address 7 is normally assigned to a host adapter.

Continued on next page
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.

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

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

<table>
<thead>
<tr>
<th>To access local programs ...</th>
<th>Refer to ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through VMS, using the SET HOST command,</td>
<td>Using VMS</td>
</tr>
<tr>
<td>From the console, using the SET HOST command,</td>
<td>Using Console Commands</td>
</tr>
<tr>
<td>Through MDM, using the Device Resident Programs menu,</td>
<td>Using MDM</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Programs¹</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT</td>
<td>DIRECT Program Description</td>
</tr>
<tr>
<td>DRVEXR</td>
<td>DRVEXR Program Description</td>
</tr>
<tr>
<td>DRVTST</td>
<td>DRVTST Program Description</td>
</tr>
<tr>
<td>HISTRY</td>
<td>HISTRY Program Description</td>
</tr>
<tr>
<td>DRINIT</td>
<td>DRINIT Program Description</td>
</tr>
<tr>
<td>BATTST</td>
<td>BATTST Utility Description</td>
</tr>
<tr>
<td>MEMTST</td>
<td>MEMTST Utility Description</td>
</tr>
<tr>
<td>PARAMS</td>
<td>PARAMS Utility Description</td>
</tr>
</tbody>
</table>

¹For 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:

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

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.)

Continued on next page
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:

```plaintext
>>> 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:

```plaintext
>>> 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)
>>> 
```

Continued on next page
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:

```plaintext
>>> 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`.

Continued on next page
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

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

5. To exit MDM, press the Break key.
## Descriptions of Local Programs

<table>
<thead>
<tr>
<th><strong>Overview</strong></th>
<th>The rest of this chapter describes local programs you can access.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIRECT</strong></td>
<td><strong>Program Description</strong></td>
</tr>
<tr>
<td></td>
<td>The DIRECT program provides a directory of local programs resident in the ISE.</td>
</tr>
</tbody>
</table>
# 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:

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

*Continued on next page*
**Dialogue (continued)**

<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test time in minutes? [10]-100</td>
<td>Your response determines the length of the test, in minutes.</td>
</tr>
<tr>
<td>Number of sectors to transfer at a time? [0 - 50]</td>
<td>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.</td>
</tr>
<tr>
<td>Compare after each transfer? [1=Yes /0=No]</td>
<td>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.</td>
</tr>
<tr>
<td>Test the DBN area? [2=DBN only/(1=DBN and LBN) /0=LBN only]:</td>
<td>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.</td>
</tr>
</tbody>
</table>

*Continued on next page*
**DRVEXR, Continued**

---

**DRVEXR Modes**

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

<table>
<thead>
<tr>
<th>Mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read/Write</td>
<td>Writes and reads as many blocks as possible in the given amount of time.</td>
</tr>
<tr>
<td>Data Integrity</td>
<td>Similar to Read/Write mode, but with a “manual” check of data buffers done by the ISE processor.</td>
</tr>
<tr>
<td>Max Stress</td>
<td>Reads the inner DBNs and outer DBNs alternately.</td>
</tr>
</tbody>
</table>

*Continued on next page*
The following table shows the relationship between the four test modes and the responses to the six questions in the dialogue:

<table>
<thead>
<tr>
<th>Modes</th>
<th>Response to Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read/Write</td>
<td></td>
<td>1</td>
<td>1</td>
<td>Any</td>
<td>Any</td>
<td>0</td>
<td>Any</td>
</tr>
<tr>
<td>Data Integrity</td>
<td></td>
<td>1</td>
<td>1</td>
<td>Any</td>
<td>Any</td>
<td>1</td>
<td>Any</td>
</tr>
<tr>
<td>Max Stress</td>
<td></td>
<td>0</td>
<td>N/A</td>
<td>Any</td>
<td>0</td>
<td>N/A</td>
<td>2</td>
</tr>
</tbody>
</table>

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] 10 minutes to complete.
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**

**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:

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

*Continued on next page*
The following table describes DRVTST error messages.

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

\section*{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.
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)

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

Copyright (C) 1990, 1991, 1992 Digital Equipment Corporation
EF53
GA23040879
E12DCI
1
RFX T043
EF53 PCB-1/ECO-00
236
1
Complete.
DRINIT

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.

Continued on next page
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

Continued on next page
Table 4-21: BATTST, Continued

<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test requires the unit power to be removed. Proceed? [1=Yes/(0=No)]</td>
<td>Do you want to remove power from the EF5XX? This may affect other drives in the cabinet or may require a system shutdown.</td>
</tr>
<tr>
<td>Remove external power, Variable BAT_TEST will contain the time</td>
<td>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.</td>
</tr>
<tr>
<td>Test passed.</td>
<td>This message indicates that the BATTST operation has started. The program stops automatically when the batteries are exhausted.</td>
</tr>
</tbody>
</table>

Continued on next page
The following is an example of the BATTST utility:

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.


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

PARAMS>EXIT
Exiting...
MEMTST

**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.

*Continued on next page*
**MEMTST, Continued**

The following table explains the MEMTST dialogue.

<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>User data will be corrupted. Proceed? [1=Yes/(0=No)]</td>
<td>Do you want to overwrite the data in the memory arrays?</td>
</tr>
<tr>
<td>Test time in minutes? [0 (= 1 pass) &lt;&gt; 200]</td>
<td>Enter the time to run the test. Enter 0 to run the test once on memory module.</td>
</tr>
<tr>
<td>Testing slot n:</td>
<td>Memory module n is currently being tested.</td>
</tr>
<tr>
<td>Array OK - has 2 bad blocks</td>
<td>The memory module has passed the test with the indicated number of bad blocks.</td>
</tr>
<tr>
<td>Test completed.</td>
<td>The test has finished without errors.</td>
</tr>
</tbody>
</table>

*Continued on next page*
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

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
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
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:

<table>
<thead>
<tr>
<th>Character</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTRL/Y</td>
<td>Terminates the program</td>
</tr>
<tr>
<td>CTRL/C</td>
<td>Terminates the program</td>
</tr>
<tr>
<td>CTRL/Z</td>
<td>Terminates the program</td>
</tr>
<tr>
<td>CTRL/R</td>
<td>Ignored</td>
</tr>
<tr>
<td>CTRL/W</td>
<td>Ignored</td>
</tr>
<tr>
<td>CTRL/G</td>
<td>Emulates VMS CTRL/T behavior</td>
</tr>
</tbody>
</table>

Continued on next page
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.

Continued on next page
PARAMS, Continued

Available PARAMS commands are:

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

The following sections describe these commands.

ENABLE MSCP

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENABLE MSCP</td>
<td>ENABLE MSCP</td>
</tr>
</tbody>
</table>

### ENABLE MSCP Parameters

None

### EXIT Syntax

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXIT</td>
<td>EXIT</td>
</tr>
</tbody>
</table>

### EXIT Parameters

None

### HELP Command Syntax

<table>
<thead>
<tr>
<th>Command</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>HELP</td>
<td>HELP</td>
</tr>
</tbody>
</table>

### HELP Parameters

None
PARAMS, Continued

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

Continued on next page
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.
SHOW Command Examples

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current</th>
<th>Default</th>
<th>Type</th>
<th>Radix</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD_CR</td>
<td>0</td>
<td>0</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
</tbody>
</table>

PARAMS> set . 1

PARAMS> show .

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current</th>
<th>Default</th>
<th>Type</th>
<th>Radix</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD_CR</td>
<td>1</td>
<td>0</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
</tbody>
</table>

PARAMS> set add_cr 0

PARAMS> show .

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current</th>
<th>Default</th>
<th>Type</th>
<th>Radix</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD_CR</td>
<td>0</td>
<td>0</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
</tbody>
</table>

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
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
PARAMS> show .
PARAMS>
```

Continued on next page
PARAMS, Continued

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.

Continued on next page
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 EFS1R 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

<table>
<thead>
<tr>
<th>ID</th>
<th>Path Block</th>
<th>Remote Node</th>
<th>DGS_S</th>
<th>DGS_R</th>
<th>MSGS_S</th>
<th>MSGS_R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FF846D66</td>
<td>Internal Path</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>FF846E9A</td>
<td>KFQS A RFX T102</td>
<td>0</td>
<td>0</td>
<td>8393</td>
<td>8391</td>
</tr>
<tr>
<td>7</td>
<td>FF847236</td>
<td>KF0Y7B KFX V1.7</td>
<td>0</td>
<td>0</td>
<td>8393</td>
<td>8391</td>
</tr>
</tbody>
</table>

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:

Continued on next page
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 FFEF2801 FFFFFFBF 0000A056
FFDC0B29 FFDC74B FFFFF74C BFFEFFFF FFF80BA FBFFFFFF FFFBFFFF FFF807C
00000000 00000000 00000000

Log #176-27-50-01/0000 17-NOV-1858 0:00:00
FFFF1441 0000004D FFFFFFFF FFEF2801 FFFFFFBF 0000A050
FFDF80BE FFDFCBEB FFFFF750 BFFEFFFF FFF80BA FBFFFFFF FFFBFFFF FFF807C
00000000 00000000 000006EC

...Eight logs omitted...

Log #174-27-50-01/0000 17-NOV-1858 0:00:00
FFFF1441 0000004D FFFFFFFF FFEF2801 FFFFFFBF 0000A050
FFDF80BE FFDFCBEB FFFFF750 BFFEFFFF FFF80BA FBFFFFFF FFFBFFFF FFF807C
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):

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.

Continued on next page
PARAMS, Continued

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
```

Continued on next page
**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.

Continued on next page
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.

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

<table>
<thead>
<tr>
<th>Error</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery failed periodic test.</td>
<td>The batteries undergo a periodic trickle test to check for shorted cells.</td>
</tr>
</tbody>
</table>
## EF5XX Data Retention Description, Continued

### Table 5–1 (Continued) Battery Maintenance Errors

<table>
<thead>
<tr>
<th>Error</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery age.</td>
<td>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.</td>
</tr>
<tr>
<td>Battery charging out-of-specification.</td>
<td>Battery charging time was not within specification.</td>
</tr>
<tr>
<td>Battery deep discharge.</td>
<td>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.</td>
</tr>
</tbody>
</table>

Continued on next page
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.

Continued on next page
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

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current</th>
<th>Default</th>
<th>Type</th>
<th>Radix</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS_MAXR</td>
<td>1095</td>
<td>1095</td>
<td>Word</td>
<td>Dec</td>
</tr>
<tr>
<td>BSS_REPL</td>
<td>1095</td>
<td>1095</td>
<td>Word</td>
<td>Dec</td>
</tr>
<tr>
<td>BSS_CHRG</td>
<td>15</td>
<td>15</td>
<td>Word</td>
<td>Dec</td>
</tr>
<tr>
<td>BSS_TINT</td>
<td>10020</td>
<td>10020</td>
<td>Word</td>
<td>Dec</td>
</tr>
<tr>
<td>BSS_TLEN</td>
<td>60</td>
<td>60</td>
<td>Byte</td>
<td>Dec</td>
</tr>
<tr>
<td>BSS_SHUT</td>
<td>1</td>
<td>0</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
<tr>
<td>BSS_DISC</td>
<td>1</td>
<td>1</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
<tr>
<td>BSS_WPLC</td>
<td>0</td>
<td>1</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
<tr>
<td>BSS_REST</td>
<td>0</td>
<td>0</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
<tr>
<td>BSS_UPNV</td>
<td>0</td>
<td>0</td>
<td>Boolean</td>
<td>0/1</td>
</tr>
</tbody>
</table>

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

**Table 5–2  BSS Parameter Definitions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS_MAXR</td>
<td>Maximum number of days of battery life. This value is used to initialize BSS_REPL when replacing a battery.</td>
</tr>
</tbody>
</table>

Continued on next page
## Battery Subsystem Parameters, Continued

### Table 5–2 (Continued) BSS Parameter Definitions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS_REPL</td>
<td>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.</td>
</tr>
<tr>
<td>BSS_CHRG</td>
<td>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.</td>
</tr>
<tr>
<td>BSS_TINT</td>
<td>The interval between runs of the periodic battery test in minutes.</td>
</tr>
<tr>
<td>BSS_TLEN</td>
<td>The length of the periodic battery test in minutes.</td>
</tr>
</tbody>
</table>

Continued on next page
Table 5–2 (Continued) BSS Parameter Definitions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS_SHUT</td>
<td>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).</td>
</tr>
<tr>
<td>BSS_DISC</td>
<td>This flag represents whether the batteries were 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.</td>
</tr>
<tr>
<td>BSS_WPLC</td>
<td>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.</td>
</tr>
</tbody>
</table>
### Table 5-2 (Continued)  BSS Parameter Definitions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSS_REST</td>
<td>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.</td>
</tr>
<tr>
<td>BSS_UPNV</td>
<td>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.</td>
</tr>
</tbody>
</table>
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.

Continued on next page
### 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.

*Continued on next page*
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.

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

Continued on next page
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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