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IBM® Maintenance Library

PSG	MIM	PCM*	MDM	ECM*	MSM*
INTRO	TRANS	VISUAL INDEX	MICROFICHE	ECDs	HELP
MLX	LGND/GLOS	CATALOG	CARD/CABLE/ VOLTAGE CHARTS	INDEX	SENSE
START	LOC	NUMERIC INDEX	A-BOARD LRM		OPER
ISOLATE	PWR		B-BOARD LRM		DIAG
REPAIR	CARR		C-BOARD LRM		INDEX
MD	MAP		POWER DIAGRAMS		
LOG	SAFETY		RD		
PROG	INDEX		INST		
SC-FRU INDEX (MASTER)					
VOL. R05	VOL. R10	VOL. R20	VOL. R30	VOL. R40	VOL. R60

* These volumes are shipped in microfiche and are located in volume R30.

3380

Direct Access Storage Models J and K Maintenance Information

P/N 4519888 2 Sides
EC 476581 01Aug89

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IBM has prepared this maintenance manual for the use of IBM service representatives in the installation, maintenance, and repair of the specific machines indicated. IBM makes no representation that it is suitable for any other purpose.

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Preface

The *Product Service Guide (PSG), Volume R05* of the maintenance library, is designed to help the IBM service representative maintain the IBM 3380 Direct Access Storage, Models AJ4, BJ4, AK4, and BK4.

When maintaining any of these models, use the IBM Maintenance Device diskette and the maintenance library manuals shipped with the machine, and/or the manuals shipped with the AJ4 or AK4 unit to which the machine and the IBM Maintenance Device connect.

Always start any maintenance action on a 3380 Model AJ4, BJ4, AK4, or BK4 by following the instructions in the *PSG, Volume R05*.

When a 3380 model AJ4 or AK4 is connected to the same storage control as a 3380 Model AA4, AD4, or AE4, instructions in the MD or notes in this manual indicate when to use the information in the other 3380 maintenance library manuals.

In this manual, the following terms are used to simplify the distinction among the various 3380 models:

3380	= all 3380 models
3380-J	= 3380 AJ4, BJ4
3380-K	= 3380 AK4, BK4
3380-JK	= 3380 AJ4, BJ4, AK4, BK4
A unit	= 3380 AJ4, AK4
B unit	= 3380 BJ4, BK4

The complete model name will be used to specify a single model. (For example, 3380 Model BJ4.)

Maintenance Manual Ordering Procedure

A Documentation Request form (order number 972-8390) is located in the microfiche pocket (see the *MDM, Volume R30*). Use this request form to order microfiche or printed volumes of the maintenance manuals. Only the most current version of any manual will be sent. No automatic updates to any manual ordered by this card will be sent.

It is recommended that one hard copy set of all microfiche manuals be ordered for each account. Because a machine serial number is not required for ordering, ECs affecting the contents of these manuals will update the microfiche copies only. The customer engineer will be instructed by the EC to reorder new printed support documentation.

For USA

Parts of this manual can be ordered from the IBM San Jose plant by using the Wiring Diagram/Logic Page Request, Order No. Z150-0130 (U/M 015). In the logic-page columns, enter the part number **[1]** and engineering change **[2]** number shown at the bottom of each page. For example,

```
PN 1234567  [1]                          PRE-1
EC 123456   [2]
```

Whole volumes can be ordered by including the volume number and the machine serial number.

For Europe, Middle East, and Africa (EMEA)

Wiring diagram and logic page requests are handled through the MLC plant in Mainz, Germany.

Printed manuals can be ordered by sending the Documentation Request form (found in the microfiche pocket) to the MLC plant in Mainz, Germany.

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Subsystem Microcode Ordering Information

Subsystem microcode diskettes must always be at compatible levels with each other and with the supporting maintenance package documentation. Updates to these diskettes will be through EC control procedures.

3380-JK/3880 Subsystem: This subsystem configuration requires three microcode diskettes as follows:

- 3380-JK/3880 subsystem functional microcode diskette.
- 3880 MD diskette.
- 3380-JK MD diskette.

3380-JK/3990 Subsystem: This subsystem configuration requires two microcode diskettes as follows:

- 3380-JK MD diskette.
- 3380-JK/3990 subsystem functional microcode diskette.

Diskette Ordering Procedure

Note: *When ordering a diskette to replace a defective diskette, the EC number of the defective diskette must be specified. Otherwise, the latest level diskette is shipped.*

To order a diskette for the 3380-JK, supply the following information indicated for that diskette:

- Storage Control functional diskette

  Machine Type = xxxx
  Serial# = xxxxx
  P/N = xxxxxxx
  GID# = xxxxxx
  EC# = xxxxxx

- 3880 MD Diskette (if the 3880 Model AJ4 or AK4 unit is attached to a 3880)

  P/N = 4518573 (No other data required)

- 3380-JK MD Diskette

  P/N = 4516289
  EC# = xxxxxx

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How To Update This Manual

This manual is under engineering change control. Put pages in by part number and page number. The EC level and date are given in the EC history block on the last page of the part-numbered group of pages. For example,

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475245	14Nov86	475248	25Apr88
475246	21Jul87		
475247	11Sep87		

Related Publications

The following is a list of documents that may help to understand and/or repair the 3380:

- *IBM 3380 Direct Access Storage General Information*, GA26-1670.
- *IBM 3380 Direct Access Storage Introduction*, GC26-4491
- *IBM 3380 Direct Access Storage User's Guide*, GA26-1671.
- *Using the IBM 3380 Direct Access Storage in an MVS Environment*, GC26-4492
- *Using the IBM 3380 Direct Access Storage in a VM Environment*, GC26-4493
- *Using the IBM 3380 Direct Access Storage in a VSE Environment*, GC26-4494
- *IBM 3880 Storage Control, Models 1, 2, 3, and 4 Reference Manual*, GA26-1661
- *IBM 3990 Storage Control Introduction*, GA32-0098
- *IBM 3990 Storage Control Reference Manual*, GA32-0099
- *Environmental Record Editing and Printing Program: User's Guide and Reference*, GC28-1378
- *Device Support Facilities User's Guide and Reference Manual*, GC35-0033-12 or later
- *Maintaining IBM Storage Subsystem Media*, GC26-4495
- *Device Support Facilities Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498.
- *Device Support Facilities Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498
- *Storage Subsystem Library Master Index*, GC26-4496

About The Maintenance Library

The Maintenance Library for the 3380 Model AJ4 and AK4, and for attached 3380 Model BJ4 and BK4 units, is comprised of the following manuals:

- *Product Service Guide, Volume R05*
- *Maintenance Information Manual, Volume R10*
- *Parts Catalog Manual, Volume R20*
- *Maintenance Diagrams Manual, Volume R30*
- *Error Condition Manual, Volume R40*
- *Maintenance Support Manual, Volume R60*

Product Service Guide, Volume R05

The *Product Service Guide, Volume R05* (PSG) is designed to teach you how to service the 3380 Models AJ4, BJ4, AK4, and BK4. For a description of the *Product Service Guide,* see "About This Manual" on page PRE-6.

Maintenance Information Manual, Volume R10

The *Maintenance Information Manual, Volume R10* (MIM) contains information about the failure symptoms for the 3380.

TRANS
The Translation section contains the Danger and Caution statements used in the 3380-JK maintenance library, translated into the necessary World Trade languages.

LGND/GLOS
The Legend/Glossary section defines the graphic symbols, abbreviations, acronyms, and terms used in the 3380 Maintenance Library.

LOC
The Location section shows the location of the assemblies in a 3380.

PWR
The Power section contains information concerning power distribution and operation, voltage checks, power failures, and power maintenance analysis procedures.

CARR
The Checks, Adjustments, Removals, and Replacements section supplies procedures to check, adjust, remove and replace assemblies in a 3380.

MAP
The Maintenance Analysis Procedure section contains maintenance procedures for detailed failure analysis. The MAP section is entered from the IBM Maintenance Device (MD).

SAFETY
The Safety section is a safety inspection guide: An aid in identifying unsafe conditions on 3380 machines. The SAFETY section ensures that all safety equipment, including safety labels, are installed.

Parts Catalog Manual, Volume R20

The *Parts Catalog Manual, Volume R20* (PCM) contains diagrams, descriptions, and part numbers of each field replaceable part and assembly in the 3380-JK subsystem.

VISUAL INDEX
The Visual Index section contains summary diagrams of the 3380-JK, defining the assembly name and the catalog figure number where the assembly can be found.

CATALOG
The Catalog section contains detailed diagrams of each field replaceable assembly in the 3380-JK, with lists of part numbers and descriptions of each part.

NUMERIC INDEX
The Numeric Index section is an index of the part numbers of field replaceable assemblies and parts in the 3380-JK.

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Maintenance Diagrams Manual, Volume R30

The *Maintenance Diagrams Manual, Volume R30* (MDM) contains the schematics and logic diagrams. It also contains the installation instructions for the 3380-JK subsystem.

MICROFICHE
The Microfiche section contains the *PCM*, *ECM*, and *MSM* manuals in microfiche form. It also contains the order card for ordering a printed copy of the *PCM*, *ECM*, and *MSM* manuals.

CARD/CABLE/VOLTAGE CHARTS
This section contains charts for the cards, cables, and voltages.

A-BOARD LRM
The A-Board Logic Reference section contains the logic reference master index, the A-board logic index, and logic charts.

B-BOARD LRM
The B-Board Logic Reference section contains the logic index and logic charts for the B-board.

C-BOARD LRM
The C-Board Logic Reference section contains the logic index and logic charts for the C-board.

POWER DIAGRAMS
The Power Diagrams section contains the power logic diagrams.

INST
The Installation section describes the procedures to install, relocate, and remove a 3380. It also includes an installation checklist.

Error Condition Manual, Volume R40

The *Error Condition Manual, Volume R40* (ECM) is used with the *PSG* to service the 3380.

ECDs
The Error Condition Descriptions section describes each circuit or function whose operation is checked or verified. Topics (for each circuit or function) include "How the check is indicated" and "How and when it works." Additional reference material, diagnostics, and service aids for each symptom code are also supplied.

Maintenance Support Manual, Volume R60

The *Maintenance Support Manual, Volume R60* (MSM) is used with the *PSG* to service the 3380.

HELP
The purpose of the Help section is to supply the customer engineer with DASD maintenance information not supplied in the *PSG* or the *MIM*.

SENSE
The Sense section contains the 3380 sense data descriptions which identify the contents of each format by messages, bytes, and bits. It supplies page references to additional information on each error symptom along with the priority of service actions and the primary symptom code.

OPER
The Operation section contains the theory of operation for the 3380.

DIAG
The Diagnosis section contains the run procedures for each diagnostic routine, along with isolation codes associated with the routine.

About This Manual

The *Product Service Guide, Volume R05* (PSG) is used with the *Maintenance Information Manual, Volume R10* (MIM) when servicing the 3380-JK subsystem:

The *PSG* is divided into ten sections, each with specific purposes. A brief description of each section follows:

INTRO

The Introduction section describes the correct service procedures for the IBM 3380 Direct Access Storage, Models AJ4, BJ4, AK4, and BK4. In addition, the INTRO section describes the 3380 device attributes, Miscellaneous Equipment Specifications, storage controller interface information, emergency procedures, microcode and documentation ordering procedures, and, tools and test equipment information.

MLX

The Maintenance Library Cross-Reference (MLX) section is the connection between this maintenance library and other machine maintenance libraries.

START

The Start section contains information about:

- How to plan a repair action with minimum impact on the customer.
- How to determine if corrective action is required.
- How to prioritize the failure.
- How to locate the failing string.
- How to determine the failing FRUs.
- How to schedule the hardware for maintenance.

The START section contains Maintenance Analysis Procedures (SMAPs), organized to guide you in diagnosis and repair. Complete the procedures in the START section before going to the ISOLATE section.

ISOLATE

The Isolate section contains information about:

- Problems found during physical inspection.
- Controller and machine checkout procedures.
- Problem analysis with Error Log data.
- Problem analysis using Console messages.
- Problem analysis using ICKDSF messages.

The ISOLATE section helps isolate a problem to a Field Replaceable Unit (FRU) or to the smallest group of FRUs possible.

REPAIR

The Repair section contains information about:

- FRU (card) replacement procedures.
- Power off/on procedures.
- Post-repair checkout procedures.
- End of guided maintenance procedures.
- End of call procedures.

The REPAIR section includes charts of FRUs, including a Repair Affects column to help you determine the portion of the machine or string that will be affected by replacement of the logic card.

MD

The Maintenance Device (MD) section describes how to connect and use the MD. It also contains explanations of MD messages.

LOG

The LOG section describes the organization and use of the error log, which is maintained in the storage control. Data from the log can be retrieved through the MD. The LOG section contains operating instructions and options. The LOG section contains information concerning the error logs, which are equipment check logs, whose functions are transfer, merge, search, erase, and change log mask.

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PROG

The Program section contains information about EREP System Exception Reports, which are needed to maintain the 3380.

SC-FRU

The Symptom Code to Field Replaceable Unit (SC-FRU) section contains tables that relate symptom codes to FRUs. The SC-FRU tables in the *PSG* are for reference only, and should not be used to determine field replaceable units (FRUs) when the IBM Maintenance Device is available.

Master Index

The Master Index section in this volume (R05) contains an alphabetical list of items contained in the 3380-JK DASD maintenance library manuals (volumes R05, R10, R30 (INST section), R40, and R60). Use the Master Index section to find items in this manual and in the other 3380-JK DASD maintenance manuals.

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SC=95XX (XX= Format 1 Byte 15) . SC-FRU-6
SC=97XX (XX= Format 1 Byte 17) SC-FRU-19
SC=98XX (XX= Format 9 Byte 18) SC-FRU-22
SC=9CXX (XX= Format 1 Bytes 11-15) SC-FRU-22
SC=9DXX (XX= Format 1 Byte 15) SC-FRU-23
SC=9E10 (Format 1) SC-FRU-23
SC=9FXX (XX= Format 1 or 9 Byte 07) SC-FRU-24
SC=9FXX (Format 1 and 9) SC-FRU-25
SC=D1XX (XX= Format 7 Byte 11) SC-FRU-26
SC=D2XX (XX= Format 7 Byte 12) SC-FRU-27
SC=D3XX (XX= Format 7 Byte 13) SC-FRU-28
SC=D4XX (XX= Format 7 Byte 14) SC-FRU-29
SC=D5XX (XX= Format 7 Byte 15) SC-FRU-30
SC=D6XX (XX= Format 7 Byte 16) SC-FRU-31
SC=D8XX (XX= Format 7 Byte 18) SC-FRU-33
SC=DEXX (XX = Format 7 Byte 11) SC-FRU-34
SC=DFXY (X= Format 7 Byte 10 Bits 0-3, Y= Byte 7 Bits 4-7) SC-FRU-35
SC=DFXX (Format 7) SC-FRU-37
SC=E0XX (XX= Format 8 Byte 10) SC-FRU-37
SC=E1XX (XX= Format 8 Byte 11) SC-FRU-38
SC=E2XX (XX= Format 8 Byte 12) SC-FRU-39
SC=E3XX (XX= Format 8 Byte 13) SC-FRU-39
SC=E5XX (XX= Format 8 Byte 15) SC-FRU-40
SC=E6XX (XX= Format 8 Byte 16) SC-FRU-41
SC=E7XX (XX= Format 8 Byte 17) SC-FRU-41
SC=E8XX (XX= Format 8 Byte 18) SC-FRU-42
SC=EBXX SC-FRU-45
SC=ECXX (XX= Format 8 Bytes 11, 12, 13, 18) SC-FRU-46
SC=EDXX (XX= Format 8 Byte 09) SC-FRU-46
SC=EEXX (XX= Format 8 Byte 14) SC-FRU-48
SC=EFXX (XX= Format 8 Byte 07) SC-FRU-49
SC=EFXX (Format 8) SC-FRU-49

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How to Use the Master Index . . MASTER INDEX-1
EC History of Master Index . . MASTER INDEX-39

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EC History of Table of Contents

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EC Number	Date Of EC	EC Number	Date Of EC
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Notes:

Introduction

Before starting service procedures on page START-1, read and become familiar with the information contained in this section. The *Product Service Guide, Volume R05* is designed to teach you how to service the 3380 Models AJ4, BJ4, AK4, and BK4. Collectively, these models are referred to in this manual as 3380-JK.

The first time you use this guide, carefully read and follow the step-by-step procedures. As you gain experience, you will not need to follow the *PSG* as carefully.

It is important that you use the correct service procedures, especially where personal safety and/or possible machine damage is involved.

When removing, replacing, or repairing any part of this machine, follow directions. This ensures that you use the correct remove, replace, or repair procedure (including the correct power on/off procedure) for this machine.

Failure to follow these instructions can cause damage to the machine.

Entry	Select one of the following	Go to page
A	About this manual	PRE-6
B	About the product	INTRO-1
C	Front Operator Panel (3880 Subsystem) Front Operator Panel (3990 Subsystem)	INTRO-7 INTRO-20
D	Service call strategy	INTRO-36
E	Ordering subsystem microcode	PRE-2
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Figure 1. INTRO Section Entries

About the 3380-JK

3380-JK consists of the following four basic models:

- Two A-unit models
  - AJ4 = A unit with two 1.26 gigabyte HDAs
  - AK4 = A unit with two 3.78 gigabyte HDAs
- Two B-unit models
  - BJ4 = B unit with two 1.26 gigabyte HDAs
  - BK4 = B unit with two 3.78 gigabyte HDAs

Each model of the 3380-JK contains two drives with one head and disk assembly (HDA) per drive. Each drive has two access mechanisms. Each model therefore contains four access mechanisms.

Each access mechanism is associated with a unique device address and operates independently of other access mechanisms in the unit.

Models AJ4 and AK4 contain controllers as well as access mechanisms. A controller, regardless of 3380 model, contains the logic needed to control and transfer data to and from access mechanisms.

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Miscellaneous Equipment Specifications (MES)

Selective Feature Codes

The A-unit models may be ordered for attachment in any one of three Subsystem Configurations. The Subsystem Configuration is determined by the customer and indicated by an associated Selective Feature Code.

The three Selective Feature codes are defined below:

- SF 9431: 3880 Model 3 or 23 Storage Control attachment.
- SF 9432: 3990 Storage Control attached in a Two Path configuration.
- SF 9433: 3990 Storage Control attached in a Four Path configuration.

The B-unit models may be attached to an A-unit model no matter what Selective Feature Code is installed. There are no Selective Features required for B units.

MES Summary

A units ship from the factory with one of the three Selective Features installed. An MES is required to convert from one Selective Feature to another.

The HDA type shipped from the factory is determined by the model ordered by the customer. A units and/or B units may have HDAs changed to increase or decrease storage capacity.

The MESs available for these changes are defined in the following table:

CONVERSION	DESCRIPTION
SF 9431 to SF 9432	3880 Attach to 3990 2-Path Attach
SF 9432 to SF 9433	3990 2-Path Attach to 3990 4-Path Attach
SF 9431 to SF 9433	3880 Attach to 3990 4-Path Attach
SF 9433 to SF 9432	3990 4-Path Attach to 3990 2-Path Attach
SF 9432 to SF 9431	3990 2-Path Attach to 3880 Attach
SF 9433 to SF 9431	3990 4-Path Attach to 3880 Attach
Model J HDA to Model K HDA	1.26 Gb/HDA to 3.78 Gb/HDA
Model K HDA to Model J HDA	3.78 Gb/HDA to 1.26 Gb/HDA

Figure 2. Miscellaneous Equipment Specifications (MES) Summary Table

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3380-JK Connected to a 3880 Storage Control

3880 Storage Control Requirements

Note: For 3990 Storage Control requirements, see page INTRO-12.

The 3380-JK connects to 3880 Models 3 and 23. The 3380-JK cannot be connected to other models of the 3880. The 3380-JK cannot be connected to a 3880 with the speed-matching buffer feature.

3880 Model 3

To connect a 3380-JK to a 3880 Model 3, the 3880 must have the following two features installed:

- The 3380 AD4/AE4 Support Feature. This feature upgrades the 3880 to include a total of 12K of high speed storage.
- The 3380-JK Support Feature. This feature upgrades the 3880 to include a full track buffer required to support improved data correction. This feature can only be installed on 3880's with 22 card position boards.

3880 Model 23

To connect a 3380-JK to a 3880 Model 23, the 3880 must have the 3380-JK Support Feature installed. This feature upgrades the 3880 to include a full track buffer required to support improved data correction. This feature can only be installed on 3880s with 22 card position boards.

Subsystem Configurations

The two controllers in a 3380 Model AJ4 or AK4 string attach to two 3880 Storage Directors. Some possible configurations are:

- To both Storage Directors in the same 3880 Model 3.
- To either Storage Director in two different 3880 Model 3s.
- To both Storage Directors in the same 3880 Model 23.
- To either of the paired Storage Directors in two different 3880 Model 23s in dual frame configuration.

The following figures illustrate some of the ways that the 3380-JK may be attached to the 3880. There are many more configurations that may be used. See the *MDM, Volume R30* INST section for more details.

Example of 3380-JK Strings Attached To a 3880 Storage Control

Figure 3 is an example of two 3380-JK 2-path strings sequentially connected to both storage directors of a 3880. In this example, one string contains a 3380 Model AJ4 controller and the other a 3380 Model AK4 controller with a mixture of BJ4 and BK4 units on both strings.

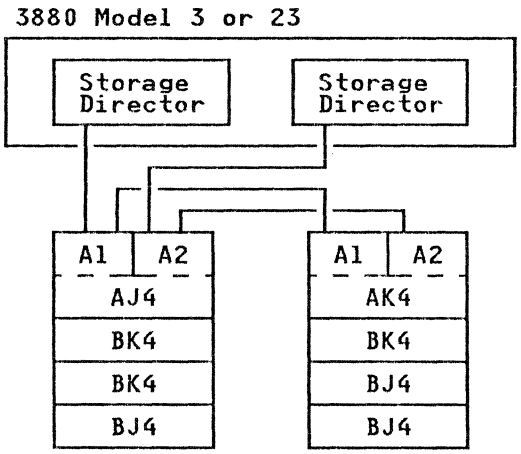

Figure 3. 3380 Model AJ4 and AK4 2-path strings attached to a 3880.

Figure 4 is an example of 3380 Models AD4, AE4, AJ4, and AK4 strings connected to two storage directors in different 3880 model 3s or in different Model 23s in dual frame configuration.

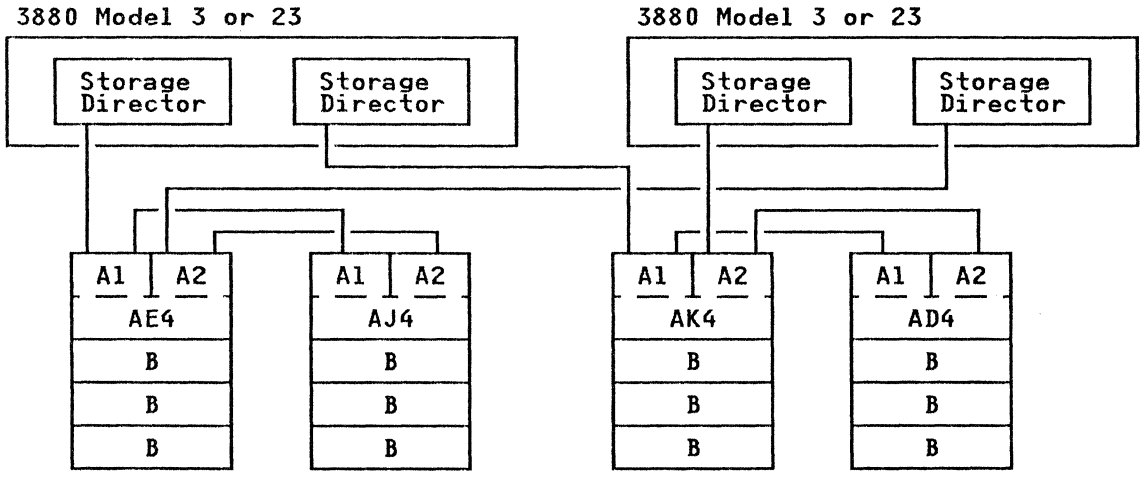

Figure 4. Intermixed 2-path strings, attached to a 3880.

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3380-JK String and Port Configurations (3880 Subsystem)

Figure 5 represents the 3380-JK maximum string configuration for 2-path attached to a 3880.

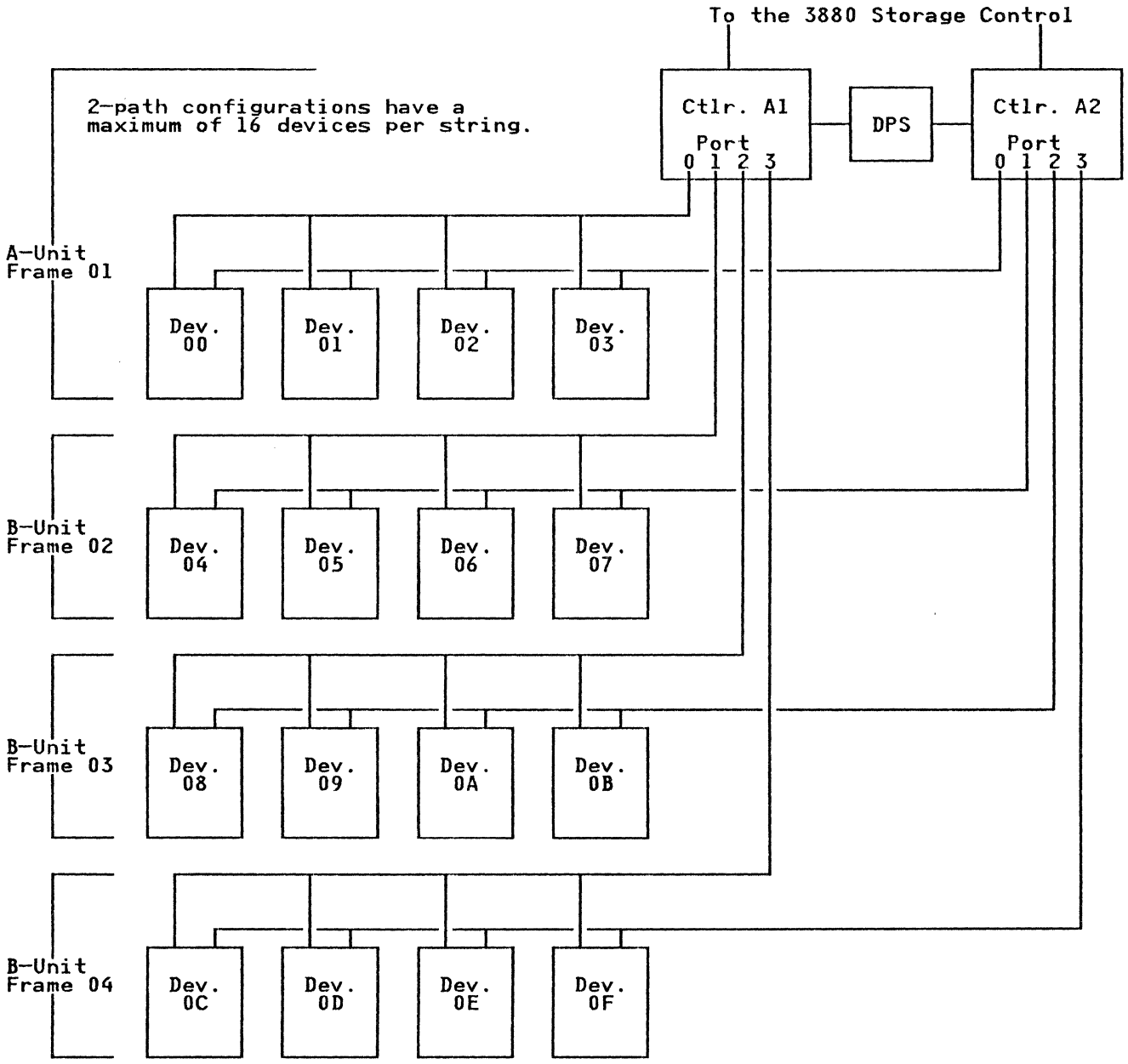

Figure 5. 2-Path String Configuration

Dynamic Path Selection (DPS)

When the 3380-JK is attached to a 3880 Storage Control, the controllers in each model have dynamic path selection (DPS). DPS controls tie breaking between storage controllers. DPS also records information about devices that are shared between controllers.

Each controller has a DPS storage matrix which contains an exact copy of the information in the DPS storage matrix in the other (companion) controller. When a controller updates its matrix, the matrix in the other (companion) controller is also updated. DPS has checking circuits to ensure that both storage matrixes always contain the same information. When a string is powered on, both DPS storage matrixes are initialized by one of the storage directors.

Device Level Selection (DLS)

Each model 3380-JK has Device Level Selection (DLS). DLS provides an independent path from each controller to each device in a string. While one controller is controlling a device, another controller can control any other device in the same string. This capability permits the transfer of data from more than one device at the same time.

Control Interface Fencing

The 3880/3380-JK subsystem supports the same control interface fencing provided on earlier models of the 3380. Control interface fencing is an operation that results in a failing controller being partitioned off a controller interface (CTL-I) so that it does not interfere with the operation of a second controller on the same CTL-I.

A controller is fenced off when an operation to it causes a permanent controller check-1 condition.

Power Sequencing

Warning: Do not use the Unit Emergency switches to normally power the string off and on. Possible data loss can occur with the heads landing on the data surface and not on the park areas of the disk surface. Use the Controller On/Off switches to power the string off and on (see Power On/Off procedures on page REPAIR-25).

Power on control is provided by the 3880 when the power control cable is connected from the 3880 to the 3380-JK, and the 3380-JK Local/Remote switch is in the Remote position.

When either Storage Director in the 3880 is powered on, the controllers attached to positions D1, D3, D5, and D7 in the 3880 will power on. Ten seconds later the controllers attached to positions D2, D4, D6, and D8 in the 3880 will power on.

A Storage Director may be powered off without dropping power on the controllers if any Storage Director is left powered on. Power will drop on the controllers when the last Storage Director is powered off.

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Front Operator Panel (3880 Subsystem)

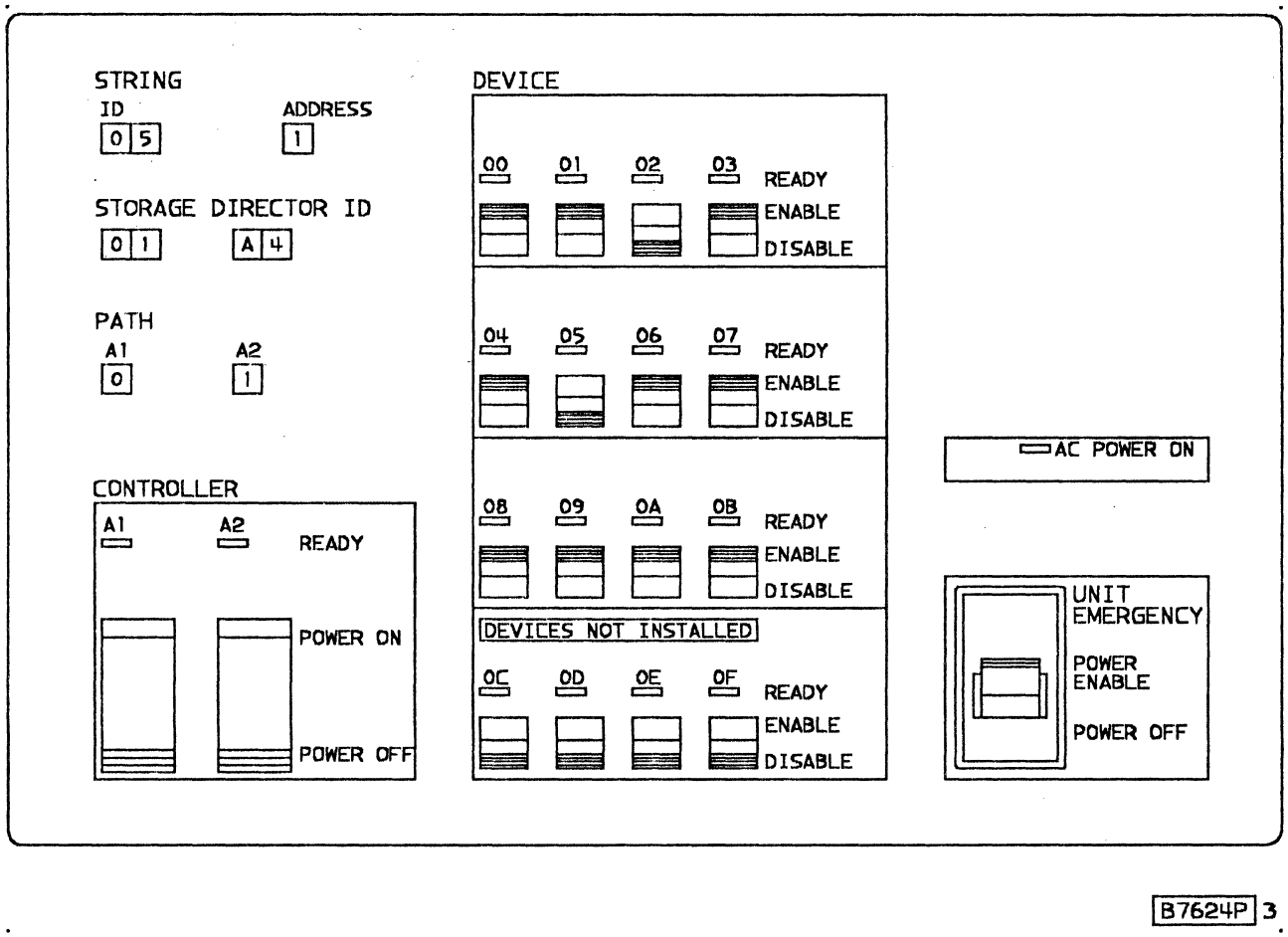

Figure 6. 3380-JK Operator Panel for 3880 Attachment

The front operator panel has the following controls and LEDs:

- Unit Emergency switch
- AC Power-On LED
- Controller Power On/Off switches for each controller
- Controller Ready LEDs
- Device Enable/Disable switches for each device
- Device Ready LEDs

Unit Emergency Switch

The Unit Emergency switch on the operator panel is only for emergency power off of the string. It switches off all power, except 24 Vdc in the A Unit only, bypassing the normal power-off sequence.

The Unit Emergency switches are normally in the Power Enable (on) position. In this position, 3380-JK power can be controlled by either the host system (remote) or the 3380-JK (local).

Warning: Do not use the Unit Emergency switches to normally power the string off and on. Possible data loss can occur with the heads landing on the data surface and not on the park areas of the disk surface. Use the Controller On/Off switches to power the string off and on (see Power On/Off procedures on page REPAIR-25).

AC Power-On LED

The AC Power-On LED is on when line voltage is present and the AC phase rotation is correct.

Controller Power On/Off Switches

Each controller in an A unit has one Power On/Off switch. These switches control powering the controller and the drives On and Off.

Setting either controller power On/Off switch to On will power on the controller and all the drives in the string.

Providing one controller power On/Off switch is set to On, setting the other controller power On/Off switch to Off will power off that controller but not the drives in the string.

Setting both controller power On/Off switches to Off will power off both controllers and all the drives in the string.

Controller Ready LEDs

Each controller has one Ready LED. The Controller Ready LED has four states. The Controller Ready LED will:

- Be Off when the controller is powered off, a controller check 1 is active, or a controller fenced condition exists.
- Blink during a controller or a string power on sequence. It is normal for the controller ready LEDs for both controllers to blink at different rates during a string power on sequence.
- Be dim (approximately half brightness) when the controller is ready and there is no activity.
- Get brighter (approach full brightness) as activity increases. Flashing or flickering is normally apparent when there is activity.

Device Enable/Disable Switch

Each device has an Enable/Disable switch. The switch permits device interrupts from the device to the storage path. The switch enables or disables the device from access by the customer program.

If the switch is in the Enable position device interrupts are permitted across the control interface (CTL-I).

If the switch is in the Disable position, it disables interrupts from the device. If the system attempts to access the disabled device the storage control responds with INTERVENTION REQUIRED.

If the switch is changed from Enable to Disable, the device will not be disabled until the device finishes the current sequence. This permits the device to complete the current operation before it is disabled.

If the switch is changed from Disable to Enable, an HDA attention interrupt is generated. The interrupt is sent by all storage directors to all the attached systems.

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Device Ready LEDs

Each of the sixteen possible devices has one Ready LED. The LEDs are active only for the installed devices.

The Ready LED is on when the device is ready for use but is not being used. When the device is being used the LED flashes off during seek operations. Because the seek times of a 3380-JK are in the millisecond range, the flashing of the ready LED may not be visible. During periods of inactivity the Device Ready LEDs will flash off periodically. The flashing indicates that a SAFE operation is being performed.

The Ready LED is off when the device is not available to the customer (disabled) or when an error condition is present on the device.

Front Operator Panel Labels

The following labels are placed on the Front Operator panel at installation time.

String ID
The physical ID set in the controller. In the 3380-JK all controllers in the string must be set to the same ID.

String Address
The address of the string (0 or 1).

Storage Director ID (SDID)
The physical IDs of the 3880 storage directors. A 3880 contains two storage directors and each storage director has a unique 2 hexadecimal digit SDID. The SDID labels identify the storage directors connected to controllers A1 and A2.

Rear Unit Emergency Power Off Panel (3880 Subsystem)

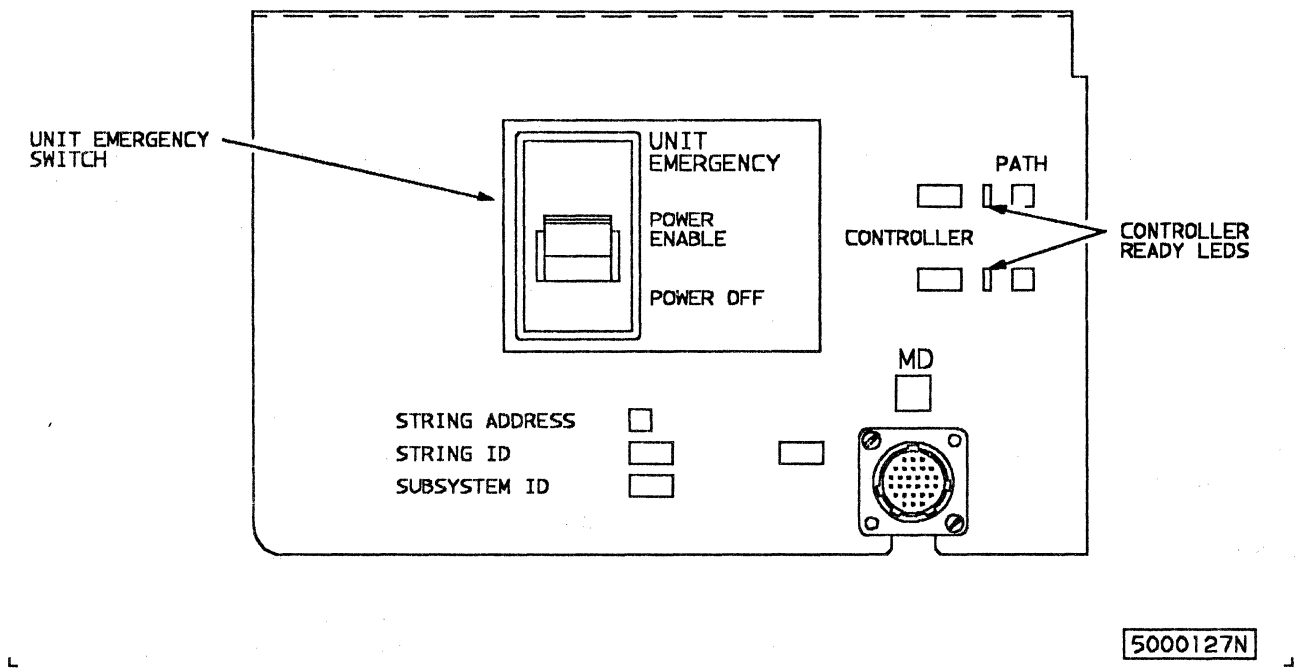

Figure 7. 3380-JK Rear Unit Emergency Power Off Panel for 3880 Attachment

The rear unit emergency power off panel has the following controls and LEDs:

- Unit Emergency switch
- Controller Ready LEDs
- Maintenance Device Connector

Unit Emergency Switch

The Unit Emergency switch on the rear Unit Emergency Power Off panel is only for emergency power off of the string. It switches off all power, except 24 Vdc in the A unit only, bypassing the normal power-off sequence.

The Unit Emergency switches are normally in the Power Enable (on) position. In this position, 3380-JK power can be controlled by either the host system (remote) or the 3380-JK (local).

Warning: Do not use the Unit Emergency switches to normally power the string off and on. Possible data loss can occur with the heads landing on the data surface and not on the park areas of the disk surface. Use the Controller On/Off switches to power the string off and on (see Power On/Off procedures on page REPAIR-25).

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Controller Ready LEDs

Each controller has one Ready LED. The Controller Ready LED has four states. The Controller Ready LED will:

- Be Off when the controller is powered off, a controller check 1 is active, or a controller fenced condition exists.
- Blink during a controller or a string power on sequence. It is normal for the controller ready LEDs for both controllers to blink at different rates during a string power on sequence.
- Be dim (approximately half brightness) when the controller is ready and there is no activity.
- Get brighter (approach full brightness) as activity increases. Flashing or flickering is normally apparent when there is activity.

Maintenance Device (MD) Connector

The MD connector provides the means to physically connect the maintenance device (MD) to the 3380-JK.

Rear Unit Emergency Power Off Panel Labels

These labels are put on the rear unit emergency power off panel during installation.

String Address
Label identifying the String Address (0 or 1).

String ID
Label identifying the physical ID set in the controller. In the 3380-JK all controllers in the string must be set to the same ID.

Subsystem ID
Not used.

Path
Label identifying the path connected to controllers A1 and A2.

Controller
Label identifying the controllers, A1 or A2.

Storage Director ID (SDID)
The SDID label locations are not shown on the panel. The SDIDs identify the storage directors that are attached to controllers A1 and A2. The SDID labels are placed on the panel below the path for each controller.

3380-JK Connected to a 3990 Storage Control

3990 Storage Control Requirements

Note: *For 3880 Storage Control requirements, see page INTRO-3.*

The 3380-JK connects to all 3990 models. No special 3990 Features are required.

Subsystem Configurations

The two controllers in a 3380 AJ4 and AK4 attach to two 3990 storage paths. Some possible configurations are:

- Storage path 0 and storage path 1 in the same 3990 Model 1.
- Storage path 0 and 2, or storage path 1 and 3 in the same 3990 Model 2 or Model 3 for a 2-path string.
- Storage path 0, 1, 2, and 3 in the same 3990 Model 2 or Model 3, for a 4-path string.

Example of 3380-JK Strings Attached To a 3880 Storage Control

The following figures illustrate some of the ways that the 3380-JK may be attached to the 3990. There are many more configurations that may be used. See the *MDM, Volume R30* INST section for more details.

Figure 8 is an example of four 2-path strings. Two string pairs are sequentially connected to each of the paired storage paths in the same 3990 Model 2 or Model 3.

Note: *One storage path from each cluster is attached to each string. This is a configuration requirement, to ensure that there will be an operational path to each string if one of the clusters is powered off.*

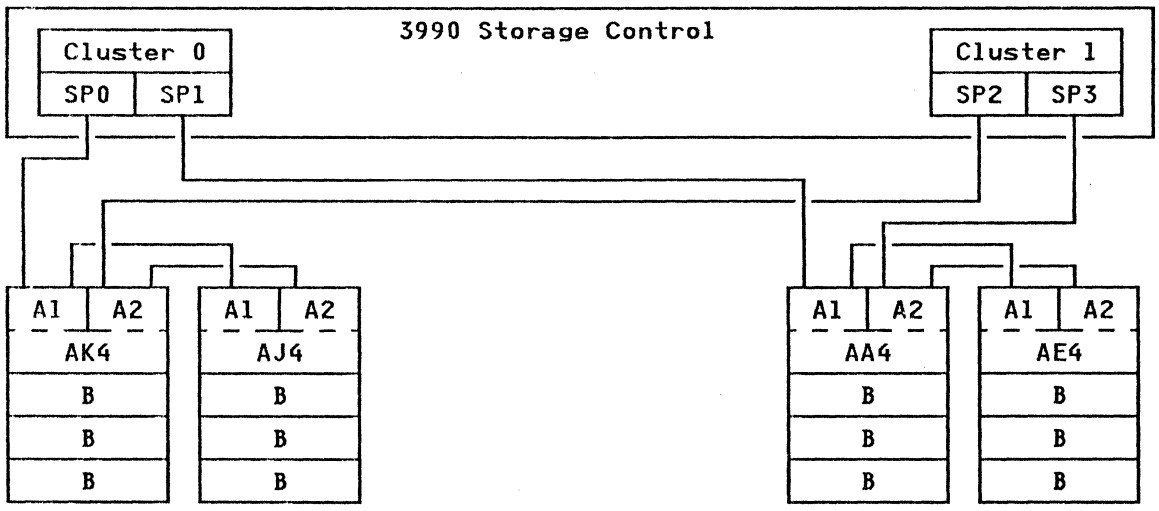

Figure 8. Intermixed 2-path Strings Attached to a 3990

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Figure 9 is an example of two 3380-JK 4-path strings sequentially connected to the paired storage paths in the same 3990 Model 2 or Model 3.

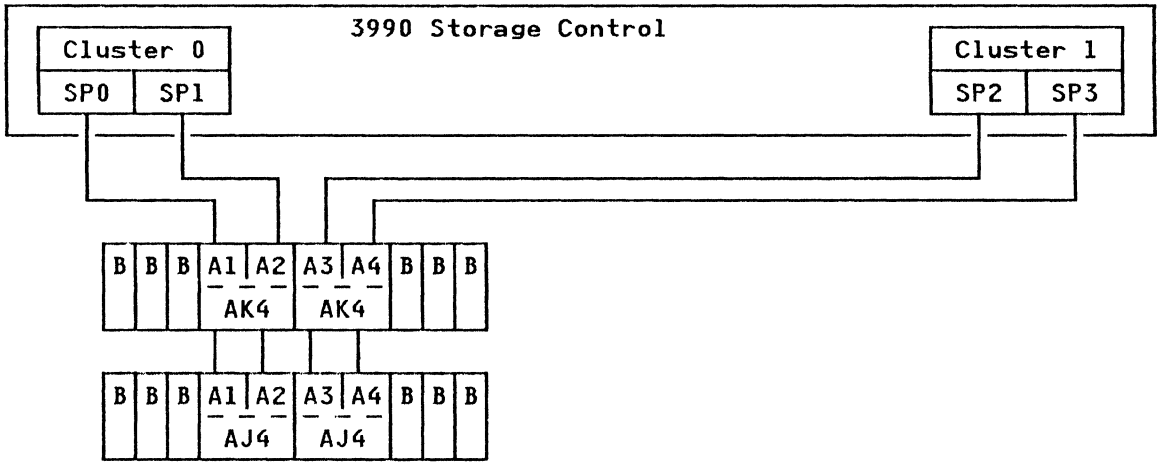

Figure 9. 3380-JK 4-path Strings Attached to a 3990

Figure 10 is an example of a 3380-JK 4-path string and two 2-path strings sequentially connected to two paired storage paths in a 3990 Model 2 or Model 3.

Note: *One storage path from each cluster is attached to each 2-path string. This is a configuration requirement. It is required to ensure that there will be an operational path to each 2-path string if one of the clusters is powered off.*

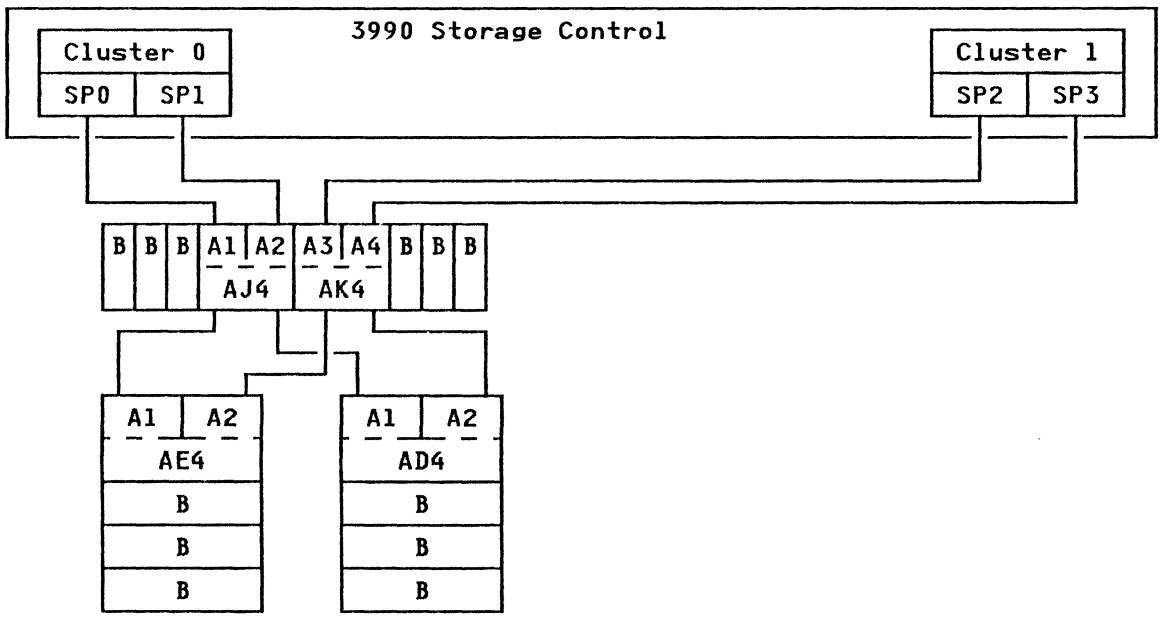

Figure 10. Intermixed 4-path and 2-path Strings Attached to a 3990.

3380-JK String and Port Configurations (3990 Subsystem)

The 3380-JK has two maximum string configurations, one for 2-path and one for 4-path when attached to a 3990. Figure 11 represents the 3380-JK maximum string configuration for 2 path. Figure 12 on page INTRO-15 represents the 3380-JK maximum string configuration for 4 path.

3380-JK 2-Path String Configuration

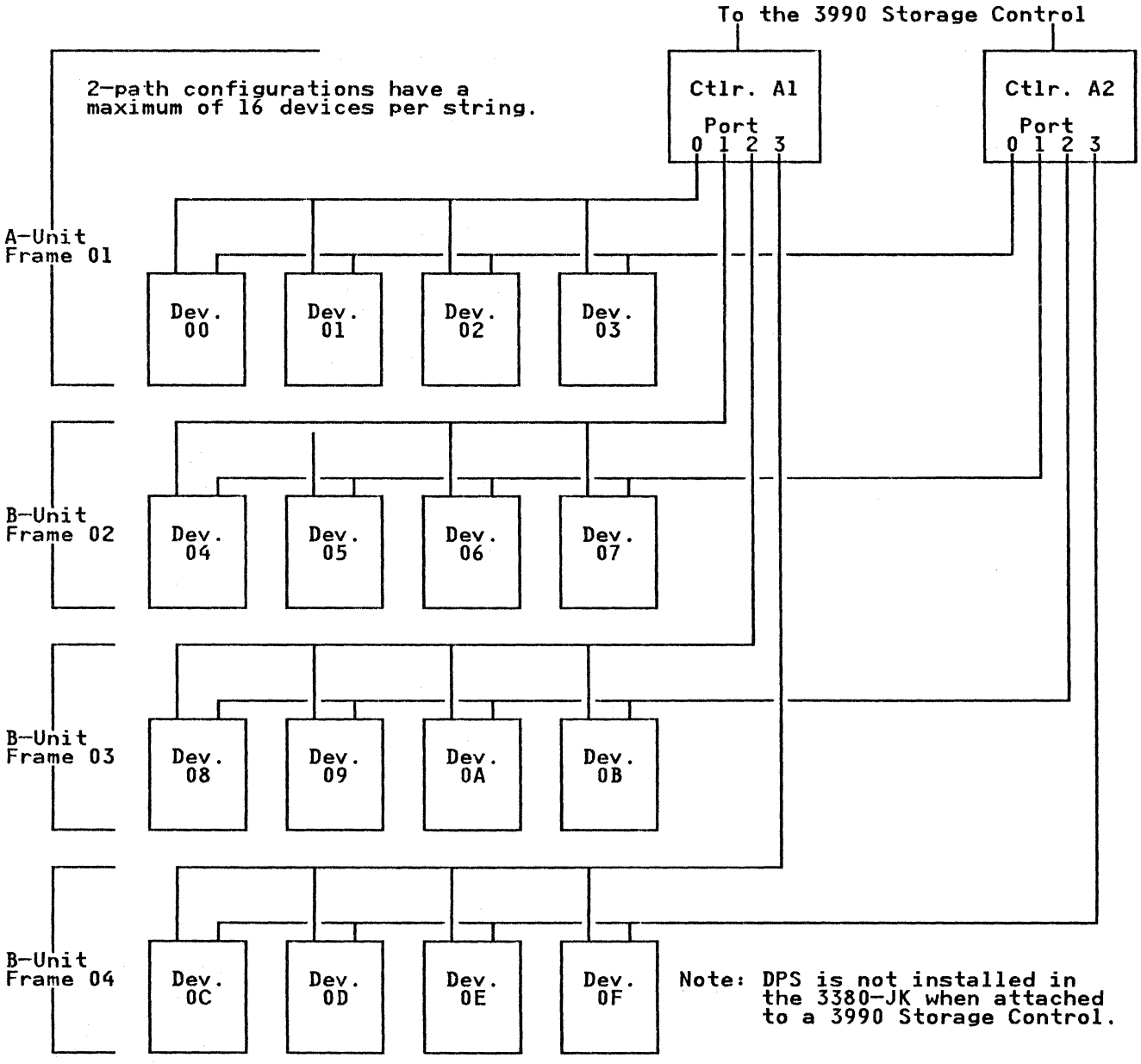

Figure 11. 2-Path String Configuration

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3380-JK 4-Path String Configuration

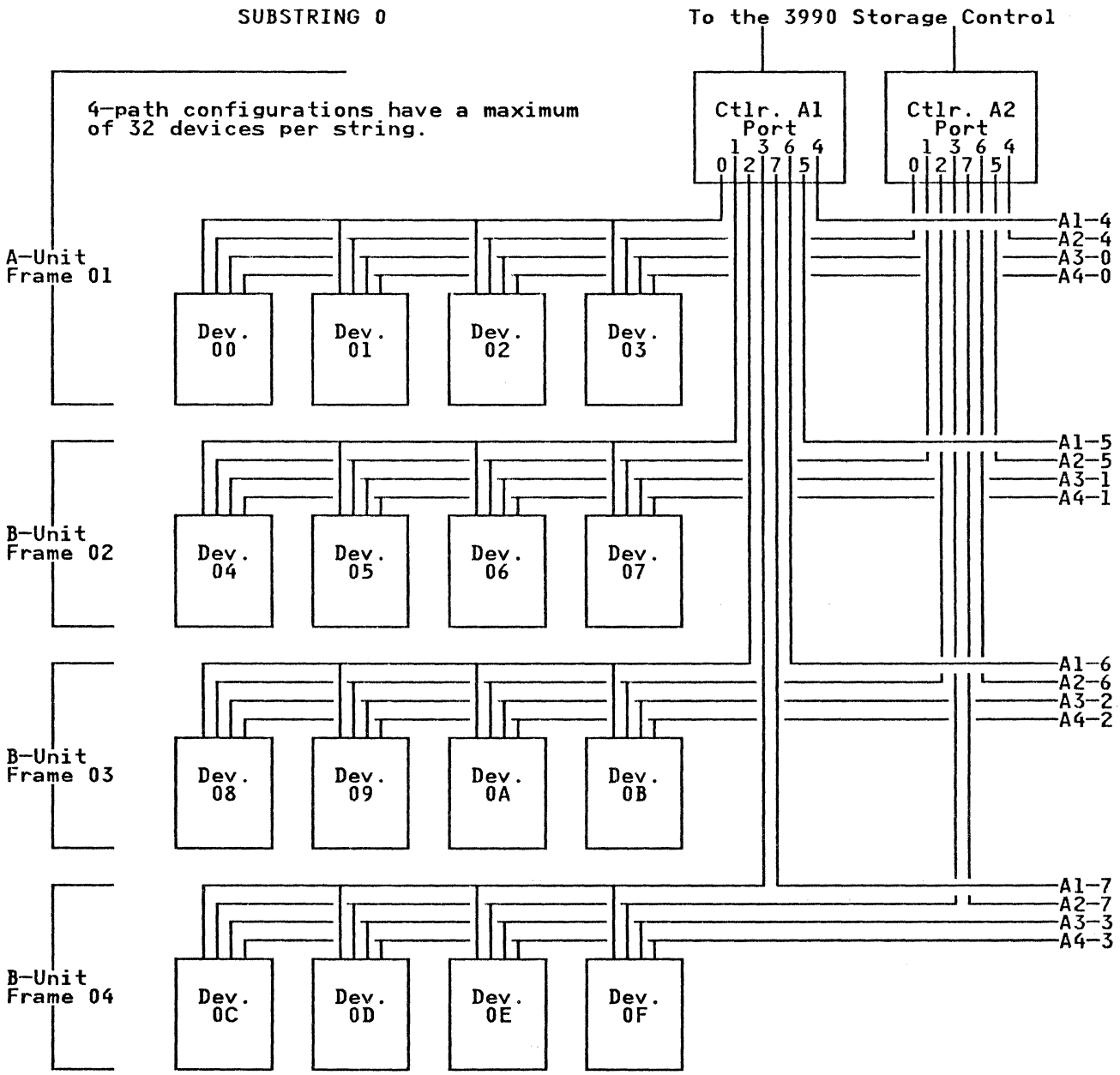

Figure 12 (Part 1 of 2). Full 4-Path String Configuration

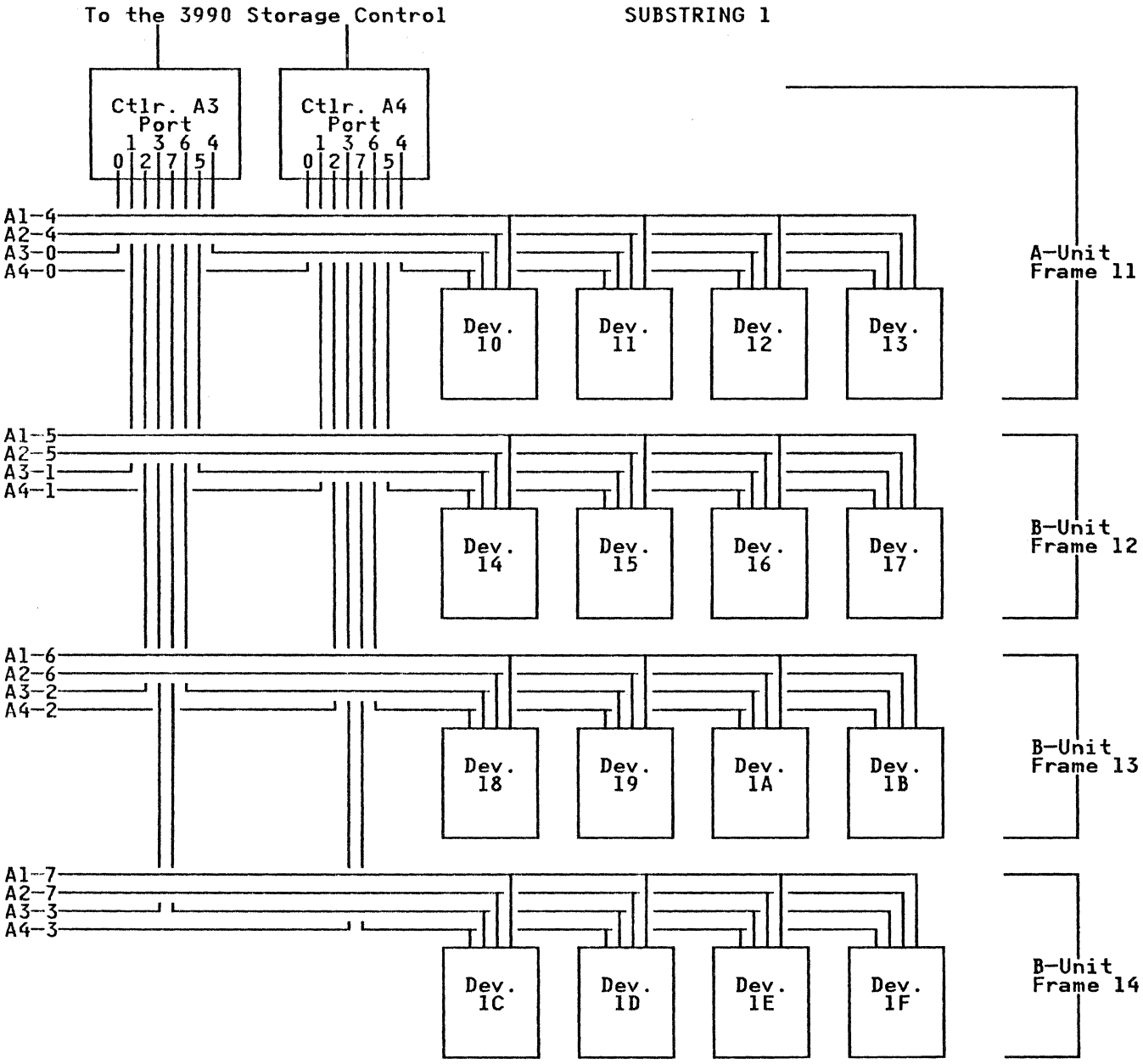

Figure 12 (Part 2 of 2). Full 4-Path String Configuration

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3380-JK Port Configurations (3990 Subsystem)

A string of 3380-JK devices consists of one or two substrings.

- Only 4-path subsystems have a second substring (CDPSS1).
- Each substring contains four ports.
- Each port connects to four devices in one unit.

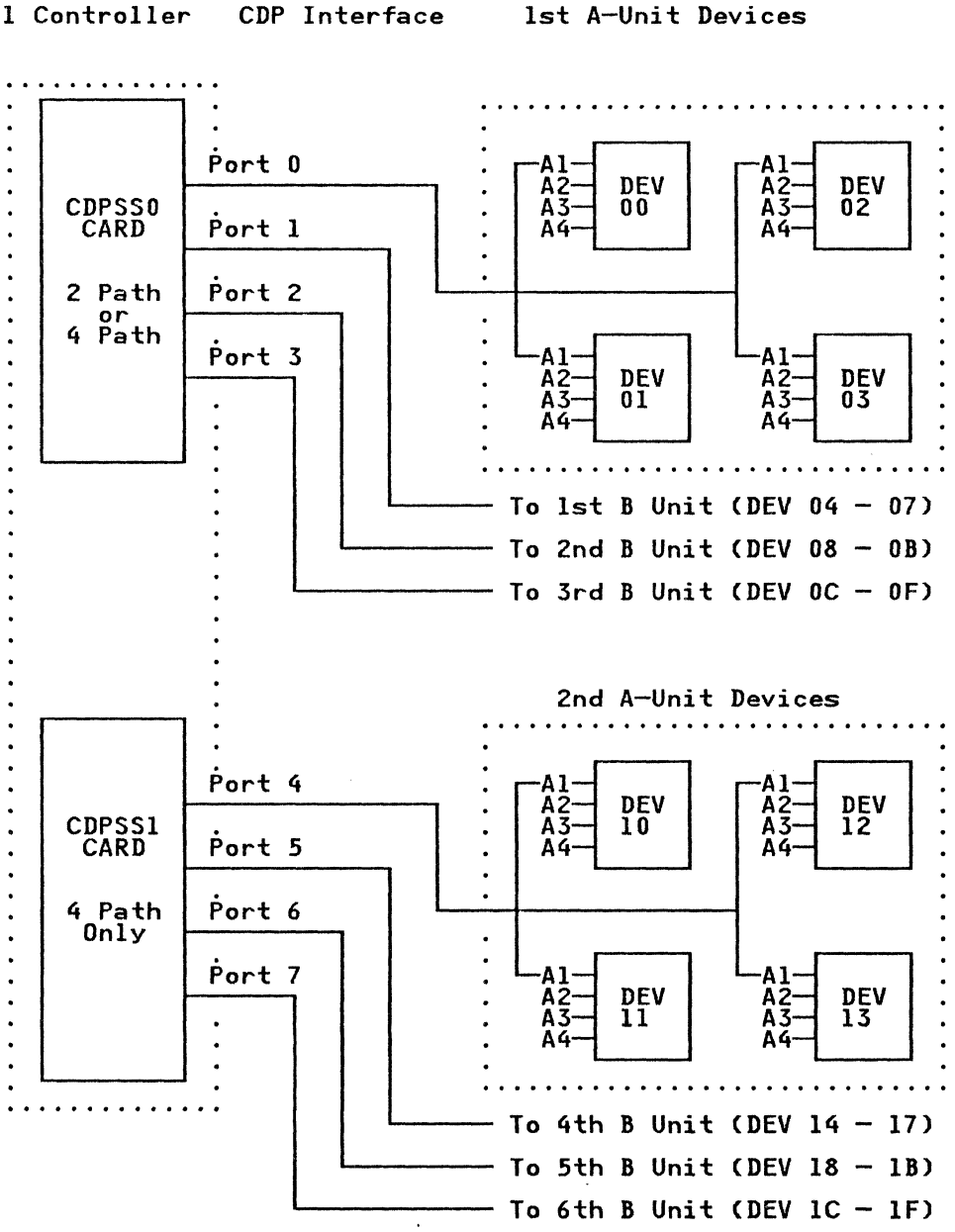

Figure 13. Port Configuration

Dynamic Path Selection (DPS)

When the 3380-JK is attached to the 3990 storage control, the DPS function is moved from the controllers to the Shared Control Array (SCA) in the 3990. The SCA controls tie breaking between storage paths and records information about devices that are shared between controllers. The information contained in the Shared Control Array is duplicated in each storage cluster in that subsystem.

Device Level Selection (DLS)

Each model 3380-JK has Device Level Selection (DLS). DLS provides an independent path from each controller to each device in a string. While one controller is controlling a device, another controller can control any other device in the same string. This capability permits the transfer of data from more than one device at the same time.

Four Path

The 4-path feature provides four controller paths to each DASD in the string. The Shared Control Array (SCA) in the 3990 storage control, along with a Path Interrupt Table in each device, coordinate the necessary information for the four paths to each device.

Four path combines two 2-path 3380-JK A units and adds another CDPSS card (ports 4-7) to each controller. Each A unit is built to attach B units from either side. This allows both A units to be bolted together and have the operator's panel from each A unit facing the same direction. The eight ports can control 32 devices. Each B-board and R/W channel board receives cables from all 4 controllers.

The maximum 4-path configuration is 32 devices in string 0 and 32 devices in string 1. This requires a 64 address range on a 64 address boundary. A substring is an A1 and A2 controller and its associated B units for substring 0 (00-0F or 20-2F) or an A3 and A4 controller and its associated B units for substring 1 (10-1F or 30-3F).

Control Interface Fencing

The 3990/3380-JK subsystem supports the same control interface fencing provided on earlier models of the 3380. Control interface fencing is an operation that results in a failing controller being partitioned off a Director Device Connection (DDC) so that it does not interfere with the operation of a second controller on the same DDC.

A controller is fenced off when an operation to it causes a permanent controller check-1 condition.

Subsystem Fencing

In addition to control interface fencing there is another level of fencing performed when the 3380-JK is attached to a 3990 in 4-Path mode.

Subsystem initiated fencing automatically removes failing components from a 4-path 3990/3380-JK subsystem, by altering the selection path to a device.

The fencing action results in a path to a device being made unavailable to the host processor. This prevents recurring path related error conditions from being posted in the system Environmental Recording Data Set (ERDS) and degrading system performance. In addition, subsystem fencing permits better identification of the failing hardware or media in console messages and EREP reports.

Subsystem fencing can be initiated by any one of the four storage paths in the 3990 4-path subsystem. Three levels of fencing are possible: Channel, Storage Path, and Device fencing. Each level of fencing has its own set of error and usage counters. When an error counter overflows, a process is started that can result in a permanent subsystem fence by the storage control to a path or subsystem component.

A permanent device fence is reported as a Format 0 message 3 with message to operator bit on. The system operator is notified of the fence condition by a console message generated from the Format 0 sense data.

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Reset of a fenced condition should only be attempted upon completion of a repair action as directed by the 3380-JK maintenance package. The following list defines the methods for resetting a fenced condition:

- Using the MD Main Menu option 2: End of Call.
- Pressing the storage path restart switch.
- Issuing a Resume Command at the 3990 maintenance panel.
- Using the ICKDSF control command with the CLEARFENCE parameter.
- Performing an IML of the fenced storage path.

Quiesce / Resume Storage Path

Quiesce storage path and Resume storage path are functions provided by a 4-path 3990 subsystem. These functions, which can be invoked at the 3990 maintenance panel, provide the ability to service a CTL-I without impacting the other storage paths in a 4-path 3990 subsystem. (This includes the non-disruptive install/remove of strings).

The Quiesce storage path command is entered at the 3990 maintenance panel. Under control of the 3990 support facility (SF), the storage path is fenced and all host activity is internally routed through another storage path. The Quiesce storage path is not successful if an alternate storage path to the devices is not available. A message is sent to the operator identifying the part of the subsystem that has been quiesced. This is an informational message and no action is required by the system operator. With the path quiesced, maintenance can be performed on the CTL-I.

Following a repair action the Resume storage path command is entered at the 3990 maintenance panel to remove the internal storage path fence condition.

Quiesce and Resume Controller

Quiesce Controller and Resume Controller are functions provided by a 3990 DASD subsystem. Quiesce controller can be used on active 2-path, 4-path, and mixed 4-path/2-path subsystems. This function is invoked at the 3990 maintenance panel. It provides the ability to service a controller, but not the CTL-I, without impacting the subsystem.

The 3990 support facility (SF) upon processing the Quiesce Controller command, fences the selected controller. No host activity will be routed to that controller. All errors developed by the selected controller are not recognized or reported by the functional code. With the controller quiesced, maintenance can be performed without impacting the other controllers operations on the CTL-I. Diagnostic routines can continue to detect all of the errors on a controller that is quiesced.

Following a repair action, a Resume Controller command removes the internal controller fence condition.

For further information, see the MNT PNL section of the 3990 maintenance documentation.

Power Sequencing

Power on control is provided by the 3990 when the power control cable is connected from the 3990 to the 3380-JK, and the 3380-JK Local/Remote switch is in the Remote position.

When either cluster in the 3990 is powered on, the controllers attached to positions D2 to D8 in the 3990 will power on. Ten seconds later the controllers attached to positions D10 to D16 in the 3990 will power on.

The clusters may be powered off without dropping power on the controllers if any cluster is left powered on. Power will drop on the controllers when the last cluster is powered off.

Front Operator Panel (3990 Subsystem)

Figure 14 shows the A unit operator panel for a 2-path 3990 attachment.

Figure 15 on page INTRO-20 shows the second A unit operator panel for a 4-path 3990 attachment.

The first A unit operator panel for a 4-path 3990 attachment is not shown. It is the same as Figure 14 except the label under PATH indicates FOUR PATH instead of TWO PATH.

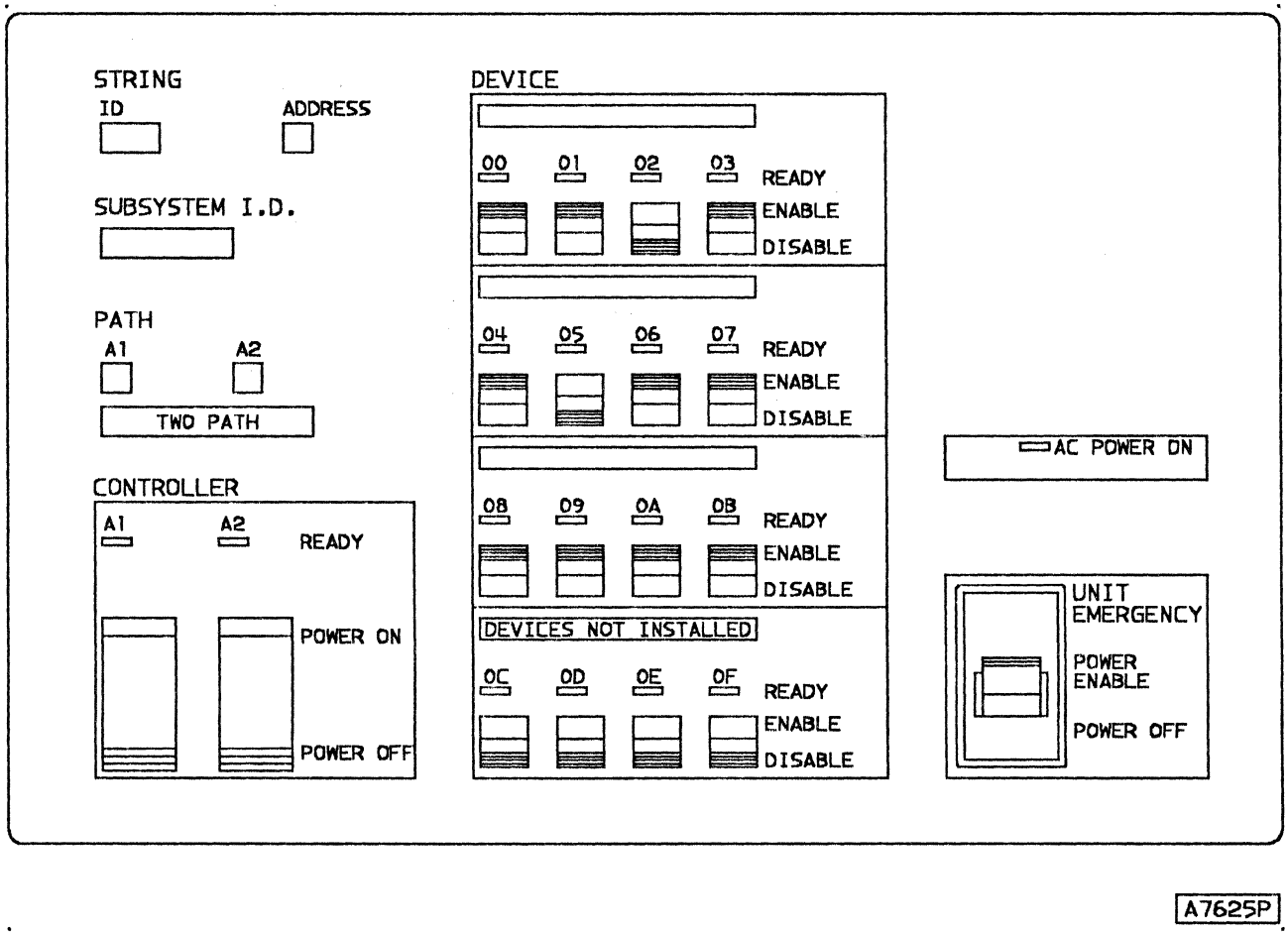

Figure 14. 3380-JK Operator Panel for 2-Path 3990 Attachment

The front operator panel for 2-path 3990 attachment has the following controls and LEDs:

- Unit Emergency switch
- AC Power-On LED
- Controller Power On/Off switches for controllers A1 and A2
- Controller Ready LEDs
- Device Enable/Disable switches for devices 00 through 0F
- Device Ready LEDs

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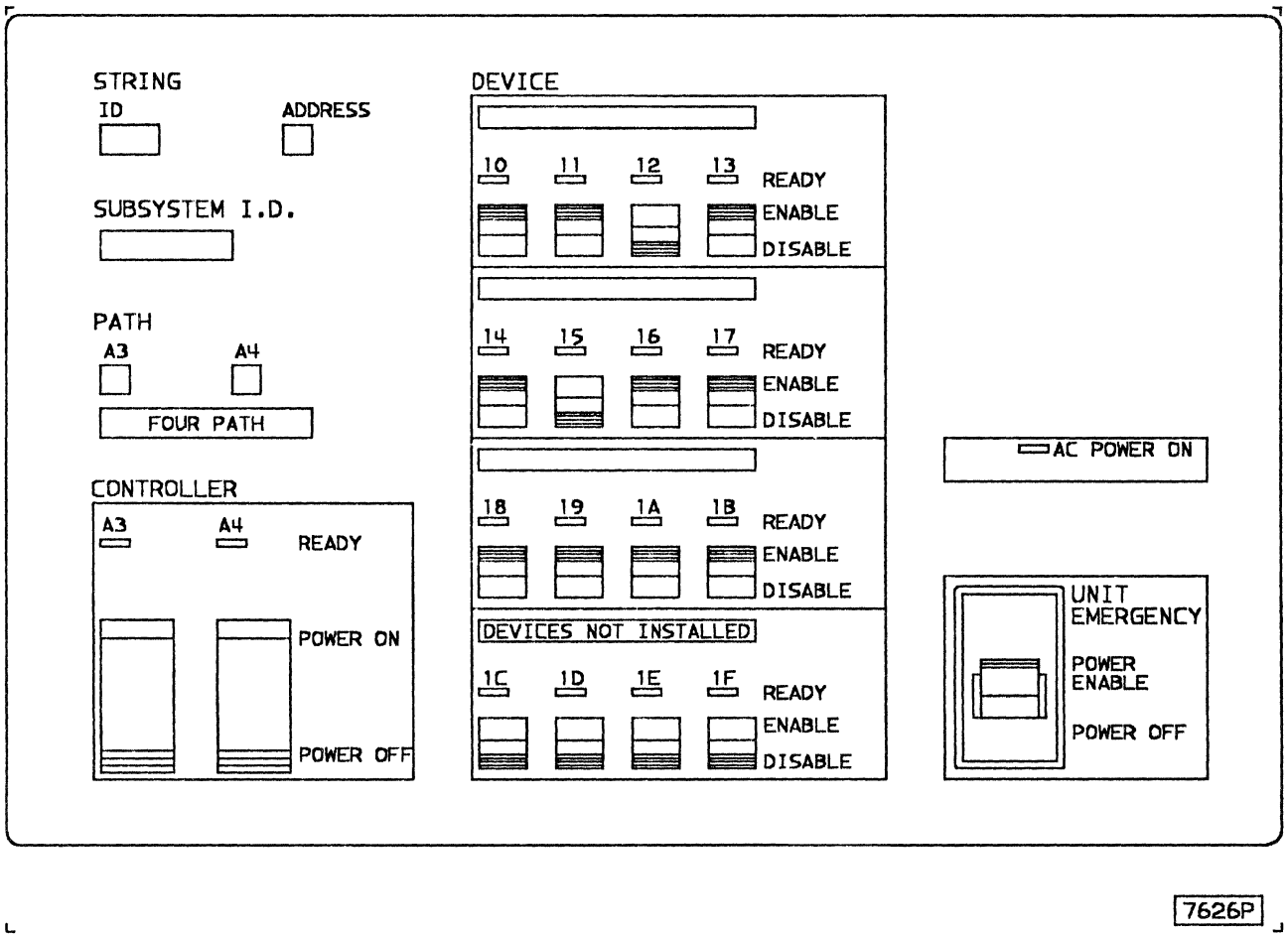

Figure 15. 3380-JK Second A unit Operator Panel for 4-Path 3990 Attachment

The second A-unit front operator panel for 4-path 3990 attachment has the following controls and LEDs:

- Unit Emergency switch
- AC Power-On LED
- Controller Power On/Off switches for controllers A3 and A4
- Controller Ready LEDs
- Device Enable/Disable switches for devices 10 through 1F
- Device Ready LEDs

Unit Emergency Switch

The Unit Emergency switch on the operator panel is only for emergency power off of the string. It switches off all power, except 24 Vdc in the A Unit only, bypassing the normal power-off sequence.

The Unit Emergency switches are normally in the Power Enable (on) position. In this position, 3380-JK power can be controlled by either the host system (remote) or the 3380-JK (local).

In 4-path configurations the Unit Emergency Switches in each A unit are interlocked. That is, either switch will power off both substrings.

Warning: Do not use the Unit Emergency switches to normally power the string off and on. Possible data loss can occur with the heads landing on the data surface and not on the park areas of the disk surface. Use the Controller On/Off switches to power the string off and on (see Power On/Off procedures on page REPAIR-25).

AC Power-On LED

The AC Power-On LED is on when line voltage is present and the ac phase rotation is correct.

Controller Power On/Off Switches

Each controller in an A unit has one Power On/Off switch. These switches control powering the controller and the drives On and Off.

Setting either controller power On/Off switch to On will power on the controller and all the drives in the string. In 4-path configurations, powering on any one of the controllers will power up all the drives in the string.

Providing there is at least one controller power On/Off switch set to On, setting another controller power On/Off switch to Off will power off that controller but not the drives in the string.

Setting all controller power On/Off switches in the string to Off will power off all controllers and all the drives in the string.

Controller Ready LEDs

Each controller has one Ready LED. The Controller Ready LED has four states. The Controller Ready LED will:

- Be Off when the controller is powered off, a controller check 1 is active, or a controller fenced condition exists.
- Blink during a controller or a string power on sequence. It is normal for the controller ready LEDs for both controllers to blink at different rates during a string power on sequence.
- Be dim (approximately half brightness) when the controller is ready and there is no activity.
- Get brighter (approach full brightness) as activity increases. Flashing or flickering is normally apparent when there is activity.

Device Enable/Disable Switch

Each device has an Enable/Disable switch. The switch permits device interrupts from the device to the storage path. The switch enables or disables the device from access by the customer program.

If the switch is in the Enable position device interrupts are permitted across the control interface (DDC).

If the switch is in the Disable position, it disables interrupts from the device. If the device is accessed by the customer program, Intervention Required is generated.

If the switch is changed from Enable to Disable, the device will not be disabled until the device finishes the current sequence. This permits the device to complete the current operation before it is disabled.

If the switch is changed from Disable to Enable, an HDA attention interrupt is generated. The interrupt is sent by all storage paths to all the attached systems.

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Device Ready LEDs

Each of the thirty-two possible devices has one Ready LED. The LEDs are active only for the installed devices.

The Ready LED is on when the device is ready for use but is not being used. When the device is being used the LED flashes off during seek operations. Because the seek times of a 3380 are in the millisecond range, the flashing of the ready LED may not be visible.

During periods of inactivity the Device Ready LEDs will flash off periodically. The flashing indicates that a SAFE operation is being performed.

The Ready LED is off when the device is not available to the customer (disabled) or when an error condition is present on the device.

Front Operator Panel Labels

The following labels are placed on the front operator panel at installation time.

String ID

The physical ID set in the controller. In the 3380-JK all controllers in the string must be set to the same ID.

Address

The address of the string (0 or 1).

Subsystem ID (SSID)

The Subsystem ID is an assigned number that identifies the physical components of a logical DASD Subsystem.

Sense byte limitations for 3380-JK require that all subsystem IDs must have "00" as the first two characters of the ID.

When looking at sense data for devices attached to 3990, 32 bytes will be displayed. Byte 21, the SSID, is the same for all paths attached to a particular device. Byte 21 is the low order byte of the SSID.

The operator panel has an area for only one SSID number on either a 2-path or 4-path panel when attached to 3990. When 2-path string(s) are attached to a four path string all strings have the same SSID number and are within one contiguous 64 address range. The 2-path string attached to 3990 paths 0 and 2 will have the lower of the 16 address range and if another 2-path string is attached to 3990 paths 1 and 3 they will occupy the higher 16 address range.

Configurations without 4-path strings will be in 2-path mode. Paths 0 and 2 will have one SSID number and paths 1 and 3 will have another SSID number.

Path

The storage path (0, 1, 2, or 3) in the 3990 that is attached to controller A1, A2, A3, or A4.

Rear Unit Emergency Power Off Panel (3990 Subsystem)

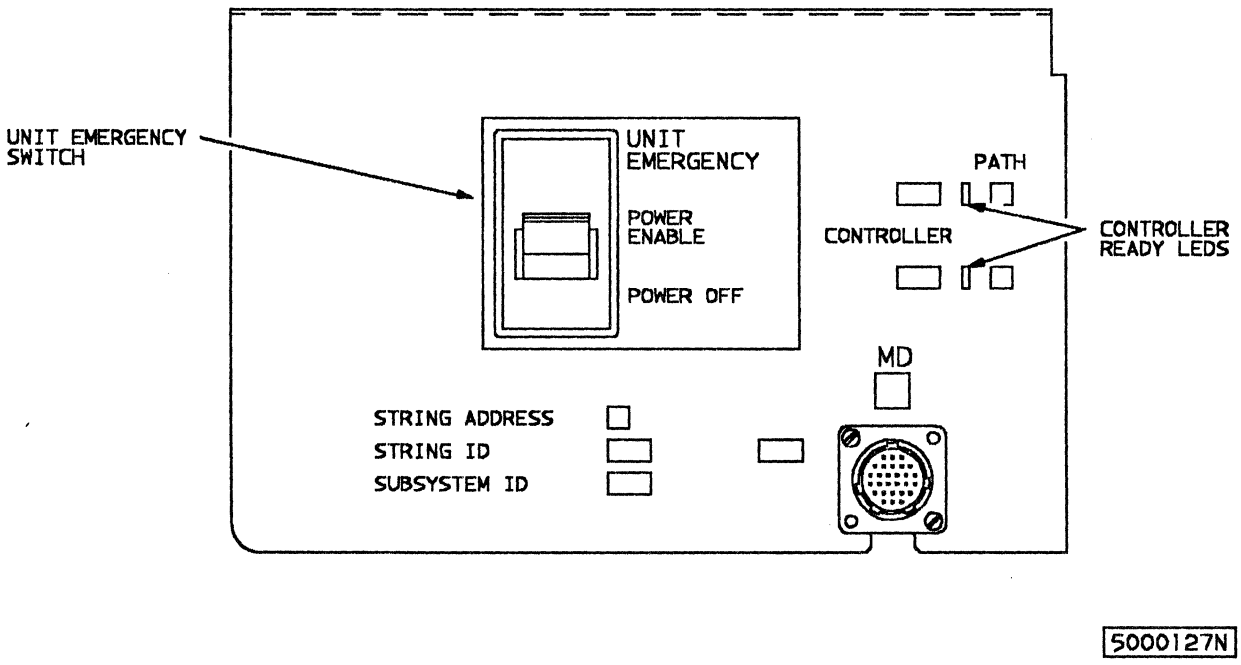

Figure 16. 3380-JK Rear Unit Emergency Power Off Panel for 3990 Attachment

The rear unit emergency power off panel has the following controls and LEDs:

- Unit Emergency switch
- Controller Ready LEDs
- Maintenance Device Connector

Unit Emergency Switch

The Unit Emergency switch on the rear unit emergency power off panel is only for emergency power off of the string. It switches off all power, except 24 Vdc in the A unit only, bypassing the normal power-off sequence.

The Unit Emergency switches are normally in the Power Enable (on) position. In this position, 3380-JK power can be controlled by either the host system (remote) or the 3380-JK (local).

In 4-path configurations the Unit Emergency Switches in each A unit are interlocked. That is, either switch will power off both substrings.

Warning: Do not use the Unit Emergency switches to normally power the string off and on. Possible data loss can occur with the heads landing on the data surface and not on the park areas of the disk surface. Use the Controller On/Off switches to

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power the string off and on (see Power On/Off procedures on page REPAIR-25).

Controller Ready LEDs

Each controller has one Ready LED. The Controller Ready LED has four states. The Controller Ready LED will:

- Be Off when the controller is powered off, a controller check 1 is active, or a controller fenced condition exists.
- Blink during a controller or a string power on sequence. It is normal for the controller ready LEDs for both controllers to blink at different rates during a string power on sequence.
- Be dim (approximately half brightness) when the controller is ready and there is no activity.
- Get brighter (approach full brightness) as activity increases. Flashing or flickering is normally apparent when there is activity.

Maintenance Device (MD) Connector

The MD connector provides the means to physically connect the maintenance device (MD) to the 3380-JK.

Rear Unit Emergency Power Off Panel Labels

The following labels are placed on the rear unit emergency power off panel during installation. These labels have the same meaning as the corresponding Front Operator Panel labels described on page INTRO-23.

String Address
Label identifying the String Address (0 or 1).

String ID
Label identifying the physical ID set in the controller. In the 3380-JK all controllers in the string must be set to the same ID.

Subsystem ID (SSID)
Label identifying the subsystem identifier when attached to 3990.

Path
Label identifying the storage path connected to controller A1, A2, A3, or A4.

Controller
Label identifying the controllers connected to 3990 storage paths 0, 1, 2, or 3.

Device Characteristics Summary

	Models AJ4 and BJ4	Models AK4 and BK4
Access Mechanisms per unit	4	4
Cylinders per access mechanism		
Data	885	2,655
Alternate data	1	1
CE	1	1
Diagnostic	4	4
Data Tracks		
per cylinder	15	15
per access mechanism	13,275	39,825
Maximum Data Capacity in bytes:		
per track	47,476	47,476
per cylinders	712,140	712,140
in Mbytes:		
per access mechanism	630 Mb	1,890 Mb
per unit	2,520 Mb	7,526 Mb
per 4-unit string	10,083 Mb	30,210 Mb
4-path configuration:		
per 8-unit string	20,166 Mb	60,500 Mb

Figure 17. Characteristics of the 3380-JK Models

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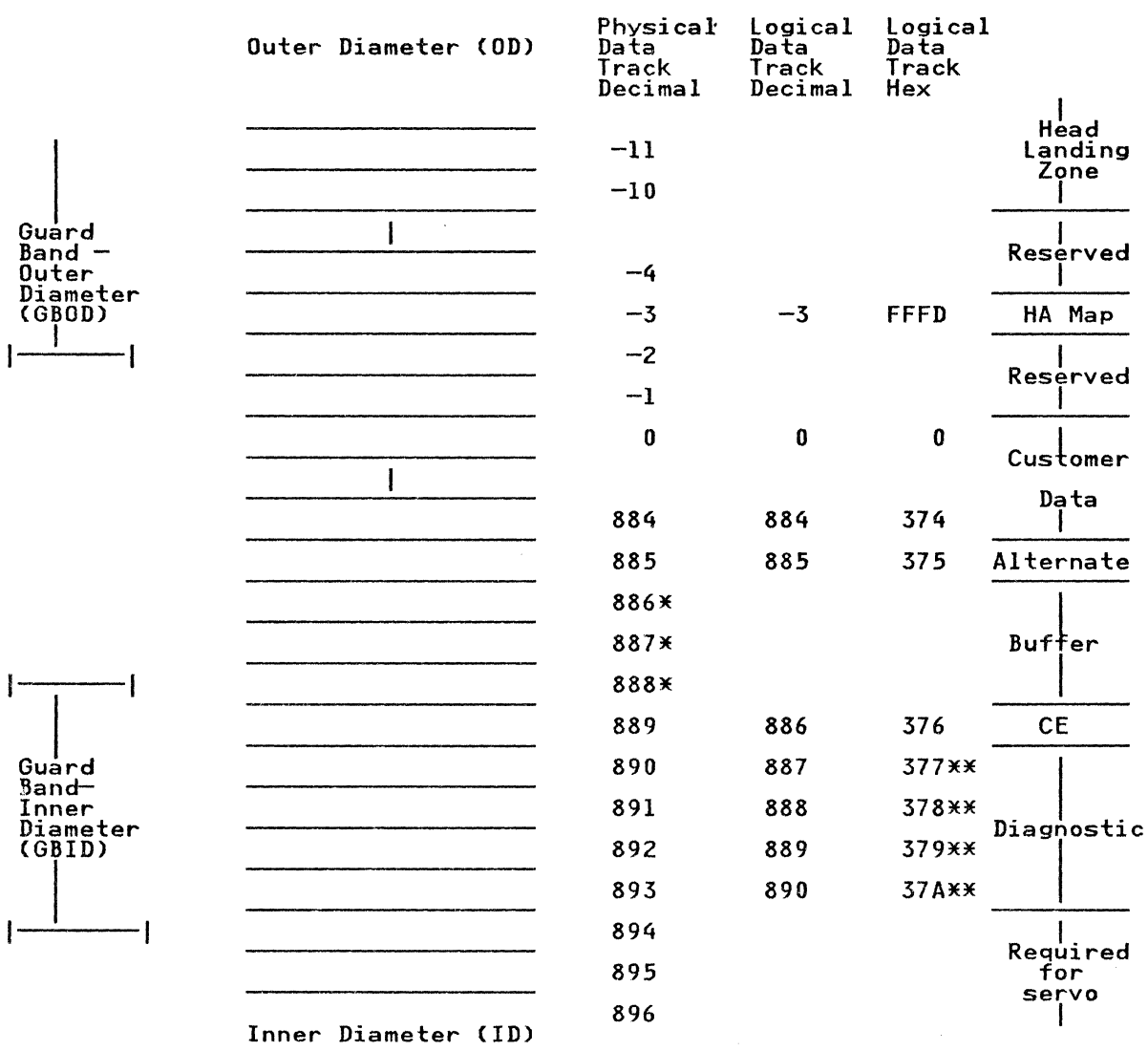
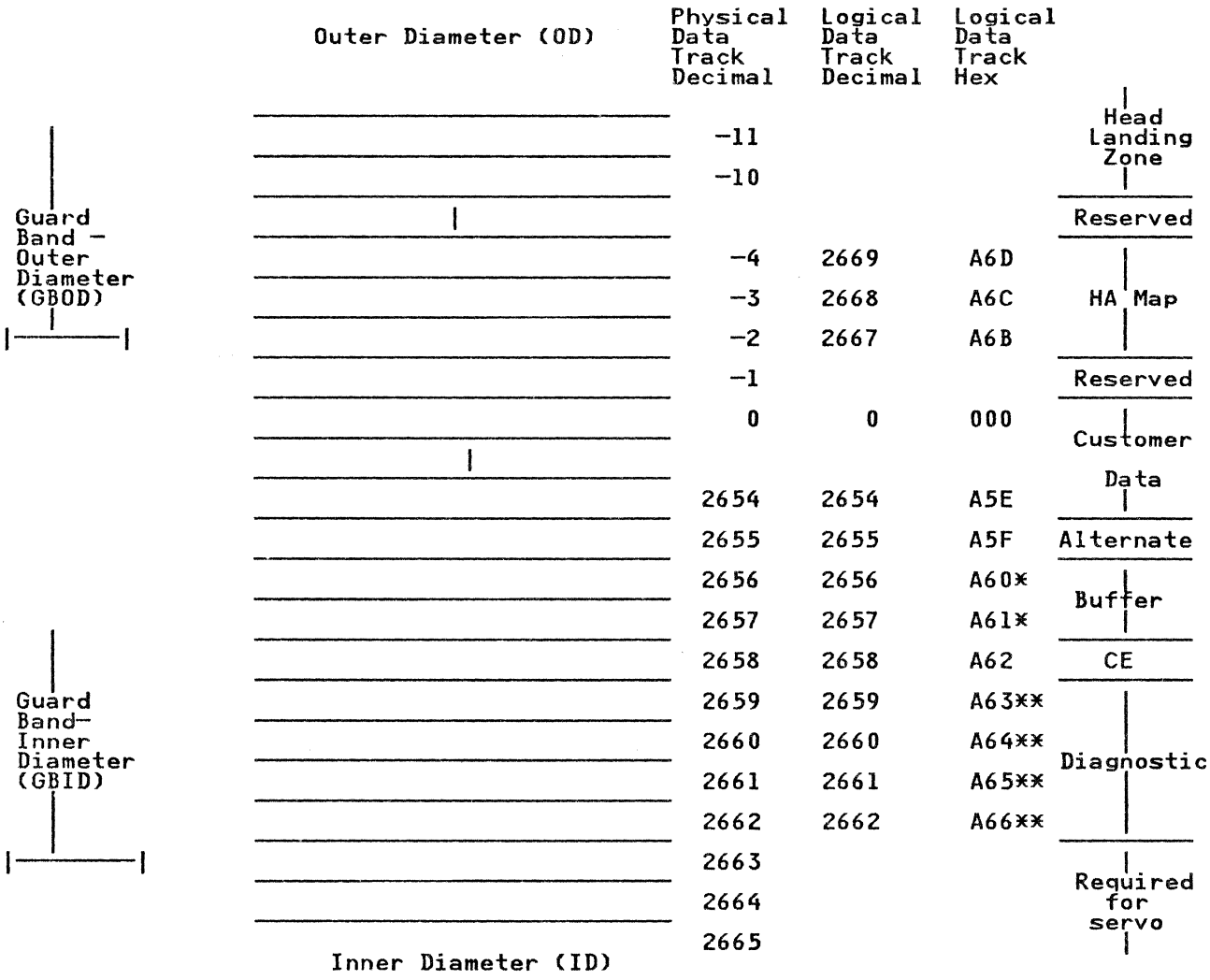
Track Layout - Models AJ4 and BJ4



* *3380-J has 3 buffer cylinders between the alternate cylinder and the CE cylinder. These cylinders are not accessible from the system. If the system attempts to access the CE cylinder (886) the access mechanism will be positioned at physical cylinder 889 (logical cylinder 886). The home addresses on the buffer cylinders are flagged as defective with no alternate assigned.*

** *Diagnostic cylinders are accessible only by the diagnostics. They cannot be accessed from the system.*

Track Layout - Models AK4 and BK4



** 3380-K has 2 buffer cylinders between the alternate cylinder and the CE cylinder. These cylinders are not accessible from the system.*

*** Diagnostic cylinders are accessible only by the diagnostics. They cannot be accessed from the system.*

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Disk, Arm, and Head Layout

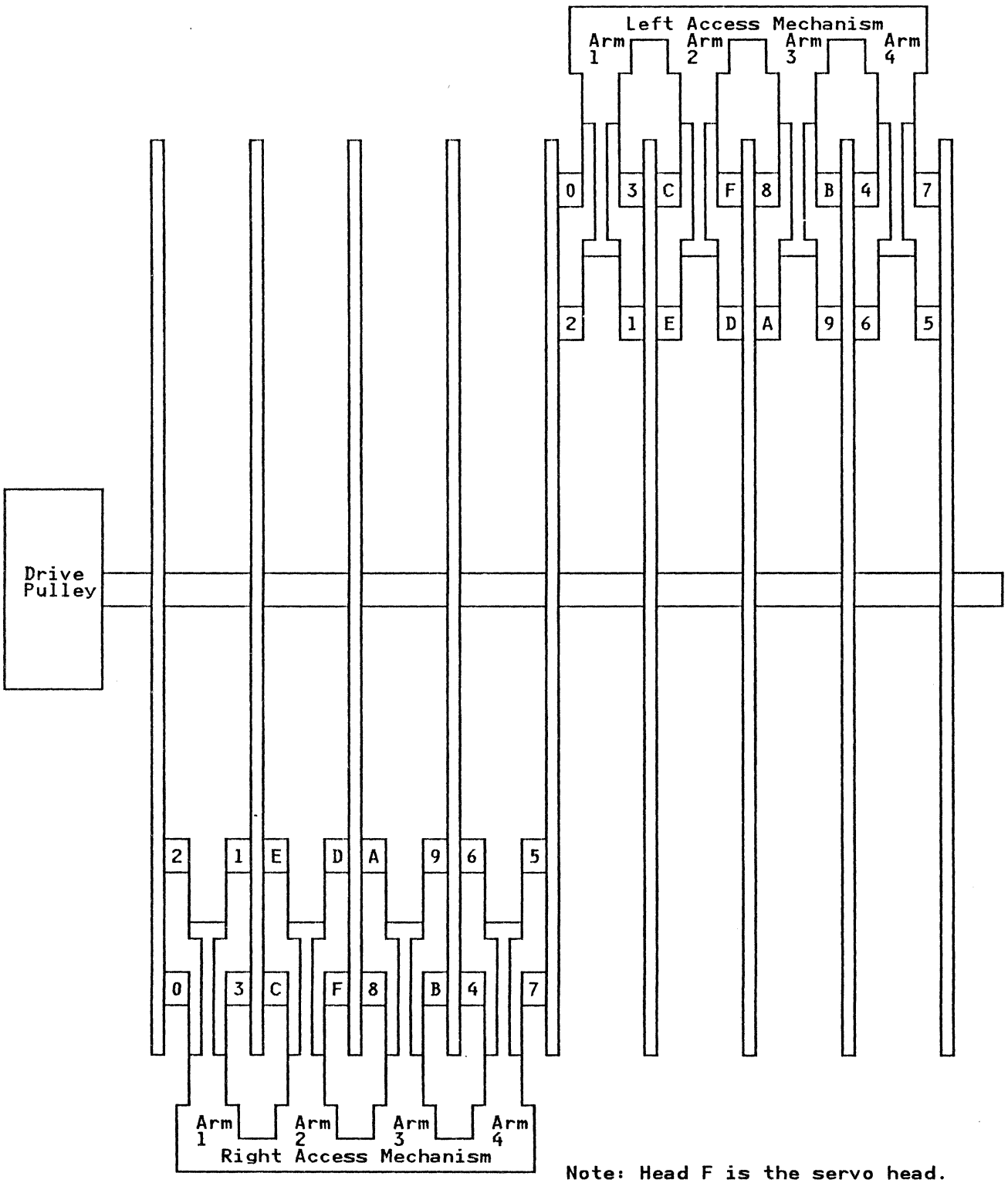


Figure 18. Arms, Heads, and Disks in the HDA

Servo System

The tracks on the 3380-K are spaced closer together than other 3380 models. The servo control loop now contains a digital control processor. The addition of the micro-processor provides improved control of the servo system.

Data Check Detection and Correction

A record is partitioned into subblocks. For each subblock there is a set of check bytes. These check bytes are used for the first-level ECC detection and correction. As in other 3380 models there are check bytes at the end of each record. In 3380-JK these bytes are used for second-level ECC detection and correction.

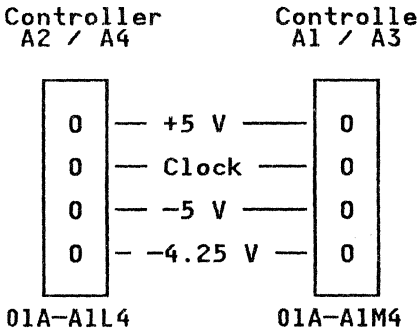
The additional check bytes used for first-level detection and correction do not decrease the maximum data capacity of the track.

This scheme provides for detecting and correcting multiple defects within a single record. ECC correction including data area ECC correction is always performed in the storage control buffer by the storage control. In previous 3380 models data area ECC correction was performed by the host.

Single data area correction is done in the storage control. The method of reporting data checks is different from previous 3380 models. Both first-level and second-level correctable data checks are reported in the format 4 sense data. The format 4 symptom codes (4xxx) in sense bytes 22 and 23 have been modified to provide additional information about the data check.

Switches and Indicators

A1 Board Voltage and Clock LEDs



Each controller has Voltage LEDs that show +5V, -5V, and -4.25V. The Voltage LEDs come on when the Controller Power On/Off switch is on.

Each controller also has a Clock LED. When the controller clocks are running, the clock LEDs are slightly dimmer than the voltage LEDs. If a clock LED is off or is at the same brightness level as the voltage LED, it means the clock is stopped.

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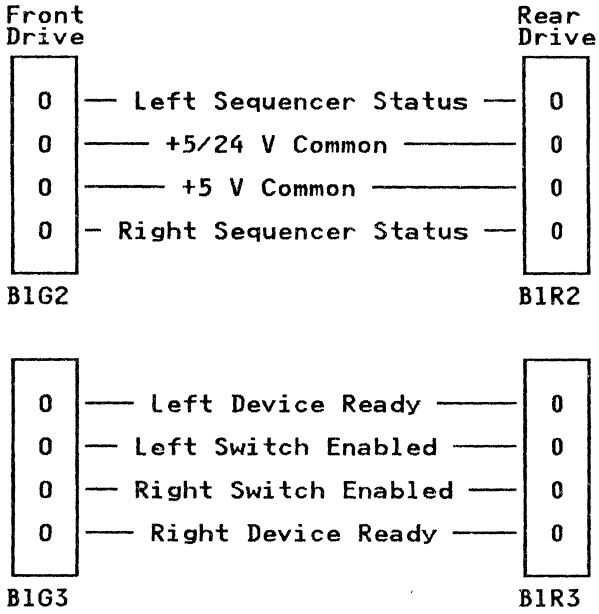
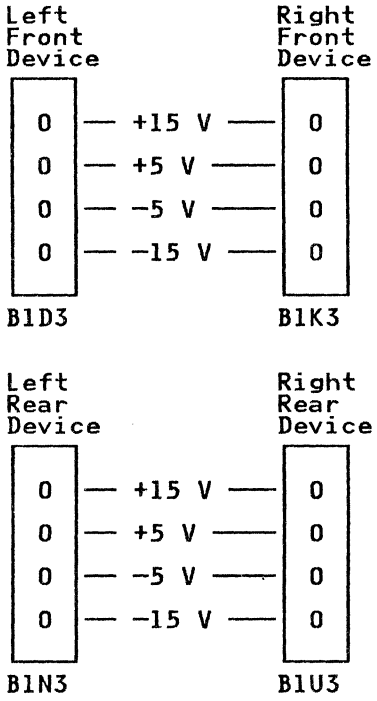
B1 Board Power Card LEDs



Each B1 Board has LEDs showing Left and Right Sequencer status, +5/24V Common, +5 V Common, Left and Right Device Ready, and Left and Right Switch Enabled for each drive.

After initial power on, the Sequencer Status LEDs for all 3380-JK models should come on for a few seconds then flash approximately 3 minutes while the heads are sweeping across the disk surface. The Sequencer Status LED is on continuously and is not flashing after the device becomes ready.

B1 Board - PES/PROM Card LEDs



Each B1 board has LEDs showing +15V, +5V, -5V, and -15V. There is one row of LEDs on each PES/PROM card for each actuator (device).

Phase Rotation LEDs

The phase LEDs are located on the primary power box in the A unit (see the LOC section in the *MIM, Volume R10*). If the Green Phase LED is on, all ac input line voltages are present and phasing is correct.

If the Red Phase LED is on, all ac input line voltages are present and the phasing is wrong, or phase C is missing.

If both Phase LEDs are off, at least one of the input voltages is missing or CB200 is tripped.

Controller Voltage Regulator Card LEDs

Each controller power supply contains a Controller Voltage Regulator Card with a +1.7 UV LED and a +5V Special UV LED.

The controller voltage regulator cards are located in the controller power supplies at the front of each A unit.

The Controller Voltage Regulator Card LEDs are normally off. When the corresponding controller is turned off or when an error prevents the controller from completing the normal power-on sequence the Controller Voltage Regulator Card LEDs will turn on.

Controller Power Supply Circuit Protectors

Each controller power supply (there are two controller power supplies in an AJ4 or AK4 unit) has three circuit protectors:

CP305 Protects the +5Vdc to the controller power supply regulator card and to the A1/A3 or A2/A4 controller.

CP306 Protects the +8.5Vdc to the controller power supply regulator card and to the A1/A3 or A2/A4 controller.

CP307 Protects the -8.5Vdc to the A1/A3 or A2/A4 controller.

24 Vdc Panel - A and B units

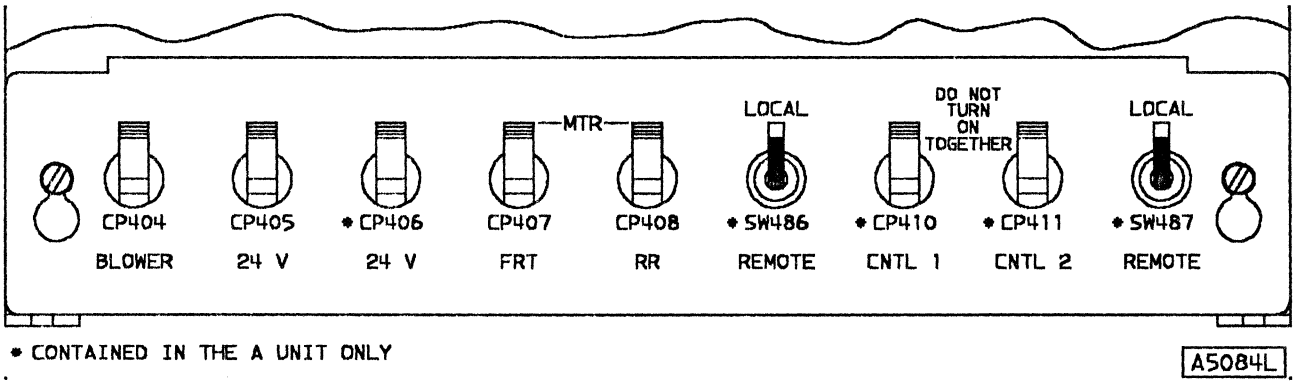


Figure 19. 24 Vdc Panel for A and B Units

The 24 Vdc Panel is located in the rear of the unit to the left of the Single Actuator Maintenance panel. The 24 Vdc panel contains the following circuit protectors and switches:

CP404 CP404 will trip when a blower motor thermal circuit problem exists.

CP405 Protects the +24 Vdc circuit to CP404, CP407, and CP408. The +24 Vdc from CP405 provides voltage to CP404, CP407, and CP408.

CP406* Protects the +24 Vdc to the Unit Emergency Power On/Off switch circuit. CP406 also protects the surge complete relay (K415) and the Phase LED Detection circuits.

CP407 Protects the +24 Vdc to the thermal in the front motor start assembly (MSA), the front motor thermal, and the front belt guard switch. If an open condition exists in this circuit, CP407 will trip, shutting off +24 Vdc to the front motor run relay (K418) and front motor brake relay (K416).

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CP408 Protects the +24 Vdc to the thermal in the rear motor start assembly (MSA), the rear motor thermal, and the rear belt guard switch. If an open condition exists in this circuit, CP408 will trip, shutting off +24 Vdc to the rear motor run relay (K419) and rear motor brake relay (K417).

SW486* Local/Remote switch for controller A1. In the Local position, +24 Vdc Source for power sequencing is provided through the Local/Remote switch. In the Remote position, +24 Vdc source for power sequencing is provided through the power control cable and relay contacts in the attached storage control.

CP410* Protects the +24 Vdc to the A1 Controller Power On/Off switch. The +24 Vdc from the A1 controller On/Off switch is distributed to the A1 controller regulator card in the controller A1 power supply and picks the A1 controller power relay (K217).

CP411* Protects the +24 Vdc to the A2 Controller Power On/Off switch. The +24 Vdc from the A2 controller On/Off switch is distributed to the A2 controller regulator card in the controller A2 power supply and picks the A2 controller power relay (K218).

SW487* Local/Remote switch for controller A2. In the Local position, +24 Vdc Source for power sequencing is provided through the Local/Remote switch. In the Remote position, +24 Vdc source for power sequencing is provided through the power control cable and relay contacts in the attached storage control.

* The switch or circuit protector is on the 24 Vdc panel of 3380 Model AJ4 and AK4 units, but not on BJ4 or BK4 units.

Single Actuator Maintenance (SAM) Control Panel - A and B Units

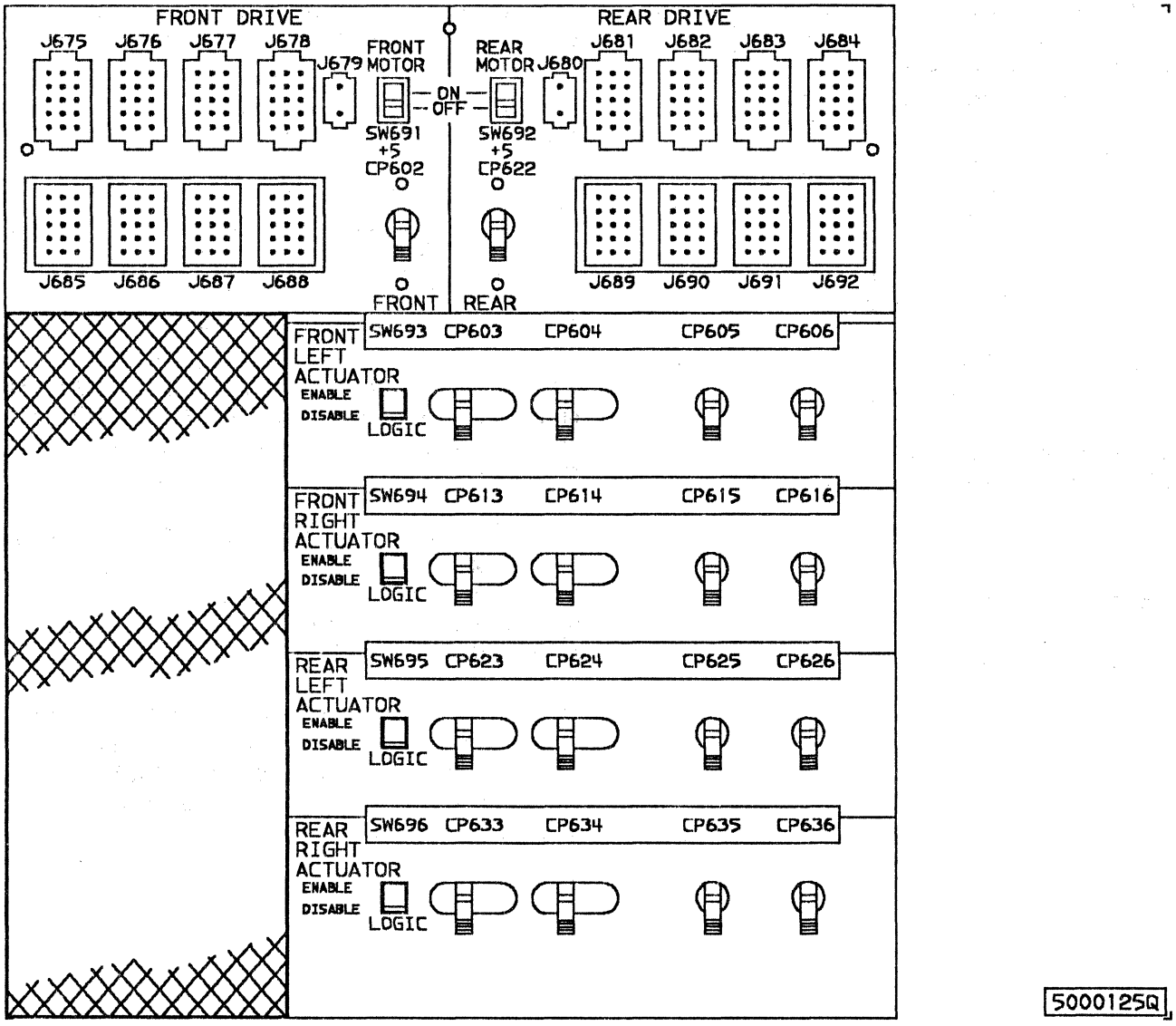

Figure 20. Single Actuator Maintenance Control Panel - A and B Units

The single actuator maintenance panel (CE power sequence panel) has the following controls:

- Motor On/Off switches (SW691, SW692)
- +5V Common Circuit Protectors (CP602, CP622)
- Logic Enable/Disable switches (SW693, SW694, SW695, SW696)
- Other Circuit Protectors (CP603 to CP606, CP613 to CP616, CP623 to CP626, and CP633 to CP636)

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Motor ON/OFF Switch

The Motor On/Off switch controls the front or rear HDA drive motor. With the switch on, the motor is powered on and off through normal power on/off sequence. If the switch is off, the motor is prevented from a normal power on.

If the switch is set to Off when the motor is running, the motor will power off.

+5 Volt Common Circuit Protectors

The +5V Common Circuit Protectors (CP602, CP622) protect the power cards.

CP602 controls the +5V to B1G2.
CP622 controls the +5V to B1R2.

Logic Enable/Disable Switches

Each actuator has one Logic Enable/Disable switch to permit single actuator maintenance.

Actuator Circuit Protectors

Each actuator has a set of circuit protectors that protect the associated logic circuits from excessive current levels. The Circuit Protectors are used for single actuator maintenance.

	Device			
	Front HDA		Rear HDA	
Voltage	Left	Right	Left	Right
+/−36v	CP603	CP613	CP623	CP633
+/−15v	CP604	CP614	CP624	CP634
−5v	CP605	CP615	CP625	CP635
+5v	CP606	CP616	CP626	CP636

Warning: Never power off the CPs for both devices on the same HDA without powering off the drive first. Machine damage will result (see Power On/Off procedures on page REPAIR-29).

Warning: Never power off the CPs (CP603 through CP636) for more than two actuators (devices) without powering off the entire unit. Machine damage will result (see Power On/Off procedures on page REPAIR-29).

Warning: When powering off a drive, NEVER power off the CPs for either of the associated actuators before turning off the Motor Switch. Machine damage will result (see Power On/Off procedures on page REPAIR-28).

Undervoltage Detection

The 3380-JK provides undervoltage detection for voltages available on the A1 and B1 boards as follows:

A1 Board, +5 volts and +8.5 volts
B1 Board, +/-5 volts and +/-15 volts

Undervoltage detection provides a means of identifying marginal voltages. An undervoltage condition by itself will not cause an equipment check condition.

An undervoltage condition will only be reported when it occurs in conjunction with a controller check-1, controller check-2, device check-1, device check-2, or data check.

The maintenance package assigns a higher priority to undervoltage check conditions and it analyzes them before attempting to analyze other failures.

Service Call Strategy

The service call strategy for the 3380-JK models is:

- Collect all available information from EREP and console messages.
- Determine if corrective action is required.
- Prioritize Symptom Codes.
- Locate the failing string and devices.
- Determine the probable failing unit.
- Perform a physical inspection of the machine.
- Vary offline (if possible) all required devices on all required paths.
- Attach the maintenance device (MD) to the MD connector in the 3380-JK A unit.
- Set the devices to be serviced in CE mode.
- Run the diagnostics.
- Analyze the SENSE data from the system or error log if the diagnostics do not fail.
- Begin problem analysis and follow instructions displayed by the maintenance device (MD). See the *PSG*, beginning with page MD-1).
- Follow correct power off/on, and repair procedures.
- Reset CE mode for all devices at the end of the call.
- Reset Write Inhibit and Fenced conditions in the Storage Control if they exist.

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EREP and Console Messages

The primary method of defining the failure type and boundary is by reviewing EREP reports and console messages. EREP is an important tool that must be in place and running when it is needed for the analysis of DASD problems.

The maintenance package for the 3380-JK requires the use of the Environmental Recording, Editing, and Printing (EREP) program at release 3.3.2 or later. If your customer has not installed EREP at release level 3.3.2 or later, provide the assistance necessary to help get it installed.

The EREP System Exception Reports (SYSEXN) are used by this maintenance package for analysis of 3380-JK problems. The customer should normally run the System Exception reports on a daily basis. For information on running the EREP System Exception reports, see *Environmental Record Editing and Printing Program: User's Guide and Reference*, GC28-1378.

For information about EREP reports, see "EREP System Exception Reports" on page PROG-1.

Physical Identifiers

The physical identifier reporting format has changed from previous DASD models (SS-CC-DD). The format for 3380-JK is "CC.P-DD" where:

CC = Controller String ID
With 3380-JK, all controllers in the same string must have the same ID.
P = Path
DD = Device

In EREP, the CC.P-DD is defined as a physical address and is used to locate the failing string, path, and device. At installation, strict guidelines are given to properly label the 3380-JK A-unit operator panel with the necessary information. The DASD Symptom Code Summary report in EREP also has a new heading "SSID-STRING" where:

SSID = Subsystem ID from sense byte 21.
STRING = String address (0 or 1) from sense byte 4, bit 2.

Maintenance Device (MD)

The maintenance device (MD) is a maintenance tool to be used under the direction of this manual. There are eight basic functions provided.

- Set/Reset CE Mode

  Permits you to set or reset CE mode in all storage paths or storage directors for the specified devices. CE mode causes the storage path or storage director to present 'Intervention Required' to any system that tries to access the specified devices.

- Run Diagnostics

  Permits you to run a specified diagnostic sequence. Nine options are available.

- Error Log Function

  Permits you to perform the following:

  - Transfer the contents of the error logs to the MD.
  - Merge the transferred logs.
  - Search the contents of each transferred log or the merged log.
  - Analyze specific log entries.
  - Change the error log mask.
  - Erase (reset) the contents of the error log in each storage director or storage path.

- Analyze Symptom Code

  Permits you to analyze a symptom code that you entered into the MD.

- Review

  Permits you to review the following:

  - Devices set in CE mode.
  - The last four diagnostic errors previously displayed.
  - The contents of the error logs.
  - The last repair action previously displayed.
  - HA scan results

- Diagnostic Aids

  Permits you to run any diagnostic and to enter parameters.

- End of Call

  Displays the status of the storage control and permits you to reset CE mode, reset write inhibit conditions, and (for 3990 storage control only) reset fenced conditions. Refer to "RMAP 0350: End of Call" on page REPAIR-15.

Error Log

The MD permits you to review error log entries that are contained in the two storage paths or storage directors attached to the 3380-JK. The error logs can be used to help isolate a failure if EREP or console messages are not available.

Failure data is displayed for review before going into analysis procedures in the MD. Devices do not need to be varied offline or placed in CE mode to use this option. Refer to "Error Log Function (MD Main menu Option 2)" on page LOG-1.

Diagnostics

Diagnostic options are selected from the MD Diagnostic menu. Errors are displayed for review before going into the analysis procedures in the MD. Before device diagnostics are run, the devices should be varied offline from all attached systems and placed in CE mode. Devices may be placed in or out of CE mode using MD Main menu option 0 (Set/Reset CE Mode). Most controller diagnostics run in-line with customer operation. Most device diagnostics run concurrent with customer operation on other devices in the string.

Analysis Procedures

The analysis procedures in the MD can be entered following the review of error log entries, following a diagnostic failure, or by entering a symptom code. The analysis procedures provide a list of suspected field-replaceable units (FRUs) and references to documentation. The MD need not be attached to the 3380-JK when entering the analysis procedures by entering a symptom code or after reviewing an error log entry that was previously transferred to the MD from the storage control.

FRU Replacement

The maintenance package provides a primary and secondary FRU list for most failure symptoms. The primary list contains all of the high probability FRUs. The FRU replacement strategy for solid failures is different from that for intermittent failures.

Solid Failures: A solid failure is indicated by a consistent physical symptom or a consistent diagnostic program detected error. Solid failures should be isolated to the failing FRU by replacing the FRUs indicated in the maintenance package one at a time until the failure symptom disappears. The FRUs are listed in the order of probability.

Intermittent Failures: An intermittent failure is a failure that is not readily reproducible by diagnostics or is only occasionally indicated by physical symptoms. On the first call, all FRUs in the primary FRU list should be replaced as a block of FRUs. On a repeat call, the secondary FRUs should be replaced as a block of FRUs and all additional action items should be reviewed to determine what type of action will be required if there is another repeat call. On a second repeat call, all additional action items should be performed. If the HDA is suspect, an HDA cable swap should be performed to help isolate the problem if there is a repeat call.

Subsystem Microcode Ordering Information

Subsystem microcode diskettes must always be at compatible levels with each other and with the supporting maintenance package documentation. Updates to these diskettes will be through EC control procedures.

3380-JK/3880 Subsystem: The 3880 subsystem configuration requires three microcode diskettes as follows:

- 3380-JK/3880 subsystem functional microcode diskette.

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- 3880 MD diskette.
- 3380-JK MD diskette.

3380-JK/3990 Subsystem: The 3990 subsystem configuration requires two microcode diskettes as follows:

- 3380-JK MD diskette.
- 3380-JK/3990 subsystem functional microcode diskette.

Microcode and diskette ordering information can be found in the Preface, on page PRE-2.

Note: *When ordering a diskette to replace a defective diskette, the EC number of the defective diskette must be specified. Otherwise, the latest level diskette is shipped.*

Documentation Ordering Procedure

A Documentation Request form (order number 972-8390) is located in the microfiche holder (see the *MDM, Volume R30*). Use this request form to order microfiche or printed volumes of the maintenance manuals. Refer to "Maintenance Manual Ordering Procedure" on page PRE-1 and "Related Publications" on page PRE-3.

Tools and Test Equipment

The following lists the special tools, test equipment, and maintenance supplies needed to provide adequate support for installation and maintenance actions. When possible, the 3380-JK uses the tools and test equipment already provided for the 3380-DE.

Description	P/N	Qty	Location
Oscilloscope		1	On site (may be located in branch office)
Maintenance Device		1	On site (may be located in branch office)
3380 on site tool kit	2759150	1	On site (may be located in branch office)
Air pressure gauge	2760742	1	
Bracket, air system tool	2135182	1	
Socket assembly ground	2759155	16	
Manifold plug	2759954	2	
Filting adapter	2760473	1	
Tubing	2760746	2	
6mm Allen extension socket	2760793	1	
Spring height gauge	2760883	1	
Duct covers	2759075	4	
Coil covers	2759076	4	
Socket Adapter, 3/8" to 1/4"	2108746	1	
3380-DE on site tool kit	2179657	1	On site (may be located in branch office)
ESD cover	2317384	4	
16mm/17mm wrench	2135145	1	
ESD handling kit	6428316	1	On site (may be located in branch office)
Small grounding wrist strap	6428167	1	On site (may be located in branch office)
Large grounding wrist strap	6428169	1	On site (may be located in branch office)
Digital voltmeter		1	On site (may be located in branch office)
Vacuum cleaner		1	Branch office
Torque wrench	2515283	1	Branch office
Ratchet drive, 3/8"	6428140	1	Branch office
High-voltage test probes			
Red	1749249		Branch office
Black	1749250		Branch office
Electrical safety analyzer	1650792	1	Branch office
Electrical safety analyzer (Not necessary, but useful.)	1650792	1	Branch office
Pulley-locking clamp	2759423	1	Shipped with each 3380-JK unit
Pulley shipping lock	00F6760	1	Shipped with each 3380-JK unit
DDC (CTLI) terminators	2315764	2	Shipped with each Storage Control

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EC History of Introduction Section

EC HISTORY OF P/N 4519893			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87	476573	30Nov88
475247	11Sep87		

Notes:

MLX

This section makes going between this maintenance library and other machine maintenance libraries easier.

When coming to this library from some other library:

1. Note the exit number on the MIM page or MD display you are leaving in the other maintenance package.

2. Find the same number in the column for that machine in the **Entries from Other Maintenance Libraries** chart on the MLX-2 page for this machine (3380).

3. Go to the page listed (in the same row) in the column labeled **Go to page (in this maintenance package)**.

When you need to go from this maintenance package to the maintenance package for some other machine, you will be given an entry number for the other package by the page or MAP doing the sending. Find that number in the 3380 column in the entry chart in the MLX pages for the other machine.

To make tracing backwards easier, the chart on MLX-3 in this manual contains a list of the entry numbers specified in this maintenance package (for 3380) and the reason for going to the other maintenance package.

P/N 4519895 04 Sides EC 476581 01Aug89

Entries from Other Maintenance Libraries

Use this page to get to the right page or procedure for a given entry to this maintenance package.

From a 3880	From a 3990	Reason for coming to this maintenance package	Go to page (in this maintenance package)
1	N/A	DDC Interface Check FRUs. SC 2004 (sync in check). No diagnostics failed.	MAP-1, Entry AG (See *MIM, Volume R10*)
2	N/A	DDC Interface Check FRUs. SC 2020 (DDC interface check). No diagnostics failed.	MAP-1, Entry AG (See *MIM, Volume R10*)
3	N/A	DDC Interface Check FRUs. SC 2080 (data overrun). No diagnostics failed.	MAP-1, Entry AG (See *MIM, Volume R10*)
4	4	DDC Interface Check FRUs. The symptom code is a Format 2. No diagnostics failed.	MAP-1, Entry AG (See *MIM, Volume R10*)
5	5	3380 symptom code indicated. Device symptom codes were entered by the CE. The control interface was tested. No diagnostics failed.	SMAP 0010 Step 001 on page START-1
6	N/A	No power sequence complete signal. The storage control did not sense a power sequence complete signal from the device.	PWR-1, Entry AS (See *MDM, Volume R30*)
7	N/A	Routine D3 failed. Routine 77 correct at the storage control tailgate. The 3380 diagnostic routine D3 found an error. The CTL-I cable wrap (routine 77) ran without error when the wrap was performed at the storage control tailgate.	MAP-1, Entry AK (See *MIM, Volume R10*)
8	N/A	Routine C0 failed. Routine D3 correct. The 3380 diagnostic routine C0 found an error. The CTL-I cable wrap (routine 77) ran without error when the wrap was performed at the storage control tailgate.	MAP-1, Entry AC (See *MIM, Volume R10*)
9	N/A	Routine D3 failed (CTRL error IC=D31B). The 3380 diagnostic routine D3 found an error. The error indicates that the 3380 controller is failing.	MAP-1, Entry AK (See *MIM, Volume R10*)
10	N/A	DDC Interface Check. The storage control directs the CE to perform a CTL-I check.	MAP-1, Entry AA (See *MIM, Volume R10*)
N/A	11	CTL-I test failed. Routine 77 correct at the storage control tailgate.	MAP-1, Entry AB (See *MIM, Volume R10*)
N/A	12	Controller not connected correctly.	IMAP 0295 Step 001 on page ISOLATE-55

Exits to Other Maintenance Libraries

Use this page when tracing back from another maintenance package to understand the condition that caused entry to that package.

Exit from 3380	Reason for going to other package	Exit to 3880	Exit to 3990
1	Exit to storage control interface analysis procedure. • If attached to a 3880, exit to storage control interface analysis procedure. Use MD option 1 at the storage control and answer yes when asked if control interface is to be tested. • If attached to a 3990, select and execute the external DDC wrap procedure when the manual intervention menu is displayed.	MLX Entry 1	MLX Entry 1
2	Exit to the storage control to run diagnostics. The 3380 diagnostics received an error code. The error was found by the storage control, probably while trying to read from a diskette.	MLX Entry 2	MLX Entry 2
3	Exit to the storage control to run diagnostics. The 3380 diagnostics found an error in the storage control. The MD display or the printed MAP contains error information.	MLX Entry 3	MLX Entry 3
4	Not used.	N/A	N/A
5	Not used.	N/A	N/A
6	Exit to the storage control to run diagnostics. The symptom code does not indicate a 3380 error.	MLX Entry 6	MLX Entry 6
7	The status pending light for the storage director is on. Perform analysis from the storage director.	MLX Entry 7	N/A
8	Exit to the storage control to quiesce a storage path.	N/A	MLX Entry 7
9	Exit to the storage control to quiesce a controller.	N/A	MLX Entry 8
10	Exit to the storage control for string removal procedure.	N/A	MLX Entry 9
11	Exit to the storage control for a B-unit removal procedure.	N/A	MLX Entry 10
12	Exit to the storage control for an HDA replacement procedure.	N/A	MLX Entry 11
13	Exit to the storage control for a procedure to deactivate the Maintenance Panel.	N/A	MLX Entry 12
14	Exit to the storage control for an installation procedure.	N/A	MLX Entry 13
15	Exit to the storage control to display 3990 Vital Product Data (VPD).	N/A	MLX Entry 14

EC History of MLX Section

EC HISTORY OF P/N 4519895			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	476573	30Nov88
475246	21Jul87	476581	01Aug89
475248	25Apr88		

Notes:

Start

SMAP 0010: Start

This section contains analysis procedures (SMAPs) that help to:

- Determine if a repair action is necessary.
- Prioritize errors.
- Locate the failing unit.
- Determine the probable failing FRUs (field replaceable units).
- Plan the repair action.

The machine does not have to be available to perform the following procedures:

001
(From Page MLX-2)

Questions you must answer and actions you must perform are printed in **bold print**. All other text is explanatory and is designed to help the service person with less experience with the 3380-JK. As experience is gained, the explanatory text may be skipped. If a question seems difficult, return to the explanation for that step.

Select an entry from the following table and go to the MAP or entry point indicated.

Entry	Select One of the Following	Go To
A	Isolate a problem (START REPAIR)	SMAP 0015 Step 001 on page START-2
B	Guidelines for Periodic Review of EREP Reports (Not problem related)	SMAP 0017 Step 001 on page START-6
C	Install, remove, or relocate a machine	*MDM, Volume R30*, INST section
D	Perform a safety check	*MIM, Volume R10*, SAFETY section
E	Power Off and On	Page REPAIR-1, Entry B through F
F	Perform preventive maintenance	Page PM-1

Figure 1. Start Section Entry Table

PN 2317352
1 of 2

EC 475254
07 Aug 92

SMAP 0015: Isolate a Problem

001
(From SMAP 0010 Step 001 on page START-1)
(From IMAP 0200 Step 002 on page ISOLATE-1)
(From IMAP 0290 Step 009 on page ISOLATE-54)
(From IMAP 0290 Step 010 on page ISOLATE-54)

The following SMAPs contain analysis procedures used to determine if a repair action is necessary. If a repair action is necessary, you can determine (if not already known) the probable failing FRUs and the impact to the customer of replacing those FRUs. Good planning allows you to schedule the correct subsystem resources. The SMAPs will analyze error data that was collected at the time of the failure. The machine does not have to be available to perform the following procedures.

Collect information about the failure

Discuss the problem with the customer and collect all available error information (for example, EREP reports and console messages).

Sources of error information are physical symptoms, EREP, Device Support Facilities messages, and console messages. The preferred information for isolating most problems is contained in the EREP System Exception reports (SYSEXN). However, if there are known physical symptoms, EREP reports or sense data will not be necessary.

Physical Symptoms: If you can locate the failing string of devices due to a physical symptom such as a Ready LED being off or a tripped CP, EREP or Sense data is probably not required because you can enter the maintenance package with the physical symptom.

EREP Reports: EREP should be installed at release level 3.3.2 or later to support the 3380-JK. If your customer has not installed release level 3.3.2, provide the assistance necessary to get it installed.

This maintenance package uses the EREP System Exception DASD Report, the DASD Symptom Code Summary report, and the DASD Data Transfer Summary report to isolate problems. These reports are part of the EREP System Exception Reports.

Refer to the *Environmental Recording and Editing Printing Program User's Guide*, GC28-1378.

The customer should normally run the System Exception reports on a daily basis. If you are isolating temporary I/O errors, it is normally sufficient to use the daily reports provided by the customer. If you are isolating a permanent I/O error, you should ask the customer to run the EREP System Exception reports for 33XX devices.

Warning:

Do not attempt to off-load device statistics when running EREP (SYSEXN) if devices or paths are failing. A device or path problem can prevent EREP from successfully collecting statistics and the EREP job will not complete successfully. To prevent off-loading statistics, a working data set must be created from ERDS and then EREP run against the working data set.

To run EREP for a specific problem, two steps are required:

1. Create a working data set. Have the customer use the following parameters: PRINT=NO, ACC=Y, ZERO=N, TYPE=0, and TABSIZE=999K.
2. Run EREP against the working data set and print. Have the customer use the following parameters: SYSEXN=Y, HIST, ACC=N, TABSIZE=999K and DEV=(3380).

The System Exception reports are normally all that is required to isolate a problem. If additional information is required, an Event History report (EVENT) may be run against the working data set. If this is done, have the customer use the following parameters: EVENT=Y, HIST, ACC-N, TABSIZE=999K, DEV=(3380), and CUA=(xxx-xxx), where xxx-xxx is the device address (CUA) range of the string.

Device Support Facilities (ICKDSF) Messages: If a customer reports a problem while trying to perform media maintenance using Device Support Facilities, collect all Device Support Facilities reports including the results of ANALYZE DRIVE TEST and ANALYZE SCAN if available. If possible, collect all EREP reports for the problem that caused the customer to initiate a media maintenance action.

Console Messages: Console messages are also a good source of information, particularly if they contain sense information that pertains to the failure. However, EREP reports will provide more detailed information and should be obtained if at all possible.

Select your best source of information about the problem from Figure 2 and go to the MAP or entry point indicated.

Information Source	Go to
Physical symptoms (sense data not required)	IMAP 0205 Step 001 on page ISOLATE-2.
EREP System Exception reports	SMAP 0017 Step 001 on page START-6.
Device Support Facilities (ICKDSF) messages	SMAP 0052 Step 001 on page START-27.
Sense data from other sources (such as other EREP reports, console messages, etc.)	SMAP 0035 Step 001 on page START-17.
Console error messages without sense data	SMAP 0070 Step 001 on page START-36.
None of the above. The customer cannot provide console messages or sense data but does provide enough information to locate the failing string.	IMAP 0205 Step 001 on page ISOLATE-2.

Figure 2. Information Sources

SMAP 0016: Using EREP to Determine If There Are 3380 Failures

001

Use the Subsystem Exception DASD report and refer to Figure 3 on page START-5 to determine if Storage Control errors have been reported. If Storage Control errors are reported, the PROBABLE FAILING UNIT column will contain SCU, a Storage Control physical identifier, and the Storage Control type.

See "DASD Subsystem Exception Report" on page PROG-5 for additional information.

Are there any Storage Control errors reported?

Yes

003
Go to the Start procedure in the Storage Control maintenance package for the indicated Storage Control type.

No

002
Go to Step 004 in this SMAP

004
(From Step 002 in this SMAP)

Determine if there are 3380 errors reported in the PROBABLE FAILING UNIT column. If there are 3380 errors reported, the PROBABLE FAILING UNIT column will contain 3380, 3380-DE, 3380-JK, or 3380-CJ.

Are there 3380 errors reported for the failing subsystem?

Yes

006
Perform the following procedure:

1. Review the PHYSICAL ADDRESS column to determine which physical addresses are reporting errors. This information will be used later to locate the failing string and devices.
2. Review the TOTALS PERM and TEMP columns to determine permanent and temporary error counts.
3. Review the IMPACT OF TEMPORARY ERRORS columns to determine the type of temporary errors. To further analyze the problem, the following procedures will use the DASD Symptom Code Summary report. In addition, if data checks are reported (determined by counts in the RD column), the following procedures will use the DASD Data Transfer Summary report. These reports should be included in the same output as the Subsystem Exception DASD report.

Go to SMAP 0020 Step 001 on page START-8.

No

005
Continue to review EREP periodically for changes in error conditions.

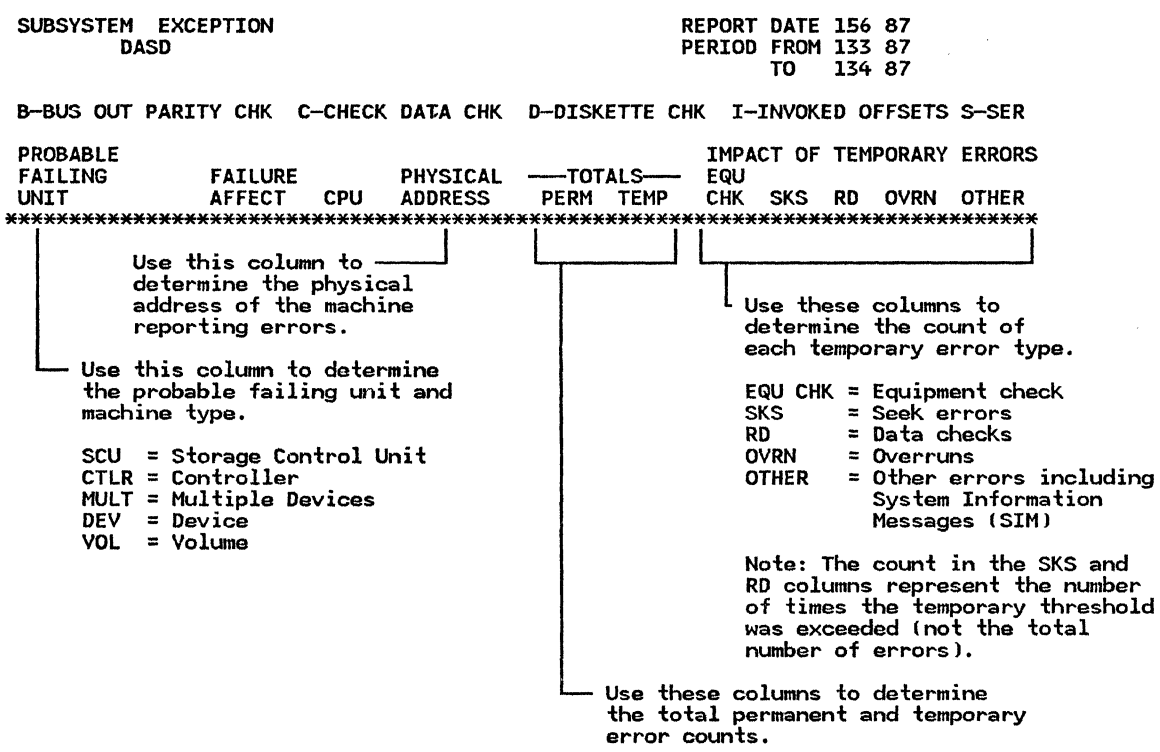


Figure 3. Subsystem Exception DASD Report

SMAP 0017: Guidelines for Periodic Review of EREP Reports

001
(From SMAP 0010 Step 001 on page START-1)
(From SMAP 0015 Step 001 on page START-3)
(From SMAP 0051 Step 007 on page START-26)

This SMAP contains guidelines for reviewing EREP on a regular basis to determine if there is a potential 3380 problem. EREP should be installed at release level 3.3.2 or later. If your customer has not installed EREP at release level 3.3.2, provide the assistance necessary to help get it installed.

The EREP report used in the following procedure is the Subsystem Exception DASD Report, which is contained in the EREP System Exception Reports (SYSEXN). System Exception Reports should be run on a daily basis. Limits should not be selected when running the reports because error thresholds are maintained in the storage control. For information on running the EREP System Exception Reports, see *Environmental Record and Editing Printing User's Guide and Reference*, GC28-1378.

A recommended schedule for reviewing the System Exception Reports is based on the number of 3380 units (all models) in the account. The schedule can vary based on account performance and customer expectations. The minimum recommended schedule is as follows:

NUMBER OF 3380 UNITS IN ACCOUNT	FREQUENCY OF REVIEW
32 or more units	Daily
8 to 31 units	Weekly
Less than 8	Monthly

When reviewing the reports, use the System Exception DASD Report and Figure 4 on page START-7 to determine the following:

- The device type is 3380-JK
- The number of permanent and temporary errors in the Totals Perm and Temp columns
- The number of each type of error from the Impact of Temporary Errors columns
  - EQU CHK - Equipment Checks
  - SKS - Seek Checks
  - RD - Read Errors (Data Checks)
  - OVRN - Overruns
  - OTHER

Determine if corrective action is required.
Use the following guidelines:

- If permanent errors are indicated in the report, corrective action is required.
- If temporary seek checks or data checks are indicated, a threshold has been exceeded, and corrective action is required.
- If 3 or more temporary errors (other than seek checks, data checks or overruns) are indicated, corrective action is required.

According to the guidelines, is corrective action required?

Yes **No**

002
Continue to review EREP periodically for error conditions.

003
Go to SMAP 0020 Step 001 on page START-8.

```
SUBSYSTEM  EXCEPTION                                        REPORT DATE 156 87
        DASD                                                PERIOD FROM 133 87
                                                                    TO   134 87

B-BUS OUT PARITY CHK  C-CHECK DATA CHK  D-DISKETTE CHK  I-INVOKED OFFSETS S-SER

     PROBABLE                                                    IMPACT OF TEMPORARY ERRORS
     FAILING          FAILURE          PHYSICAL  ---TOTALS---   EQU
     UNIT             AFFECT   CPU     ADDRESS    PERM  TEMP    CHK  SKS  RD  OVRN  OTHER
*****************************************************************************************
<1> SCU  0010123.1  SCU              TOTAL         1
         3990.02                A   0010123.1     1

-----------------------------------------------------------------------------------------
<2> CTLR 02.0-XX  SCU/CTLR           TOTAL         4      6     6
         3380-JK                A   02.0-XX       4      6     6

<3>      XX.83-XX SCU/CTLR           TOTAL                1     1
         3380-DE                A   31-83-XX             1     1

-----------------------------------------------------------------------------------------
<4> DEV  41.X-02    DEV              TOTAL               1           1
         3380-JK                A   41.0-02             1           1

-----------------------------------------------------------------------------------------
<5> VOL  ABC123   DATAXFR           TOTAL              10              10
         3380-JK                A   62.0-05             5               5
         3380-JK                A   62.1-05             5               5
```

Figure 4. Subsystem Exception DASD Report

Based on the guidelines for this report, the following actions are required:

<1> A permanent error was logged for the 3990 Storage Control 0010123, Storage Path 1. A service action is required. The probable failing unit is the storage control. More information about the error can be obtained from the DASD Informational Messages report. The service action should begin in the 3990 maintenance package.

<2> Four permanent errors and six temporary equipment checks were logged for 3380-JK string 02, path 0. A service action is required. The probable failing unit is the controller attached to path 0. More information about the errors can be determined from the DASD Symptom Code Summary Report.

<3> One temporary equipment check was logged for 3380-DE controller 83. No service action is required. If a service action were required, the 3380-DE maintenance package would be used because the failing string is a 3380-DE string.

<4> The temporary seek error threshold was exceeded once for 3380-JK string 41, path 0, device 02. The probable failing unit is device 02. Because the threshold was exceeded, the next 8 errors occurring for device 02 will be logged. A service action is required. More information about these seek errors can be determined from the DASD Symptom Code Summary report.

<5> The temporary error threshold for data checks has been exceeded ten times for 3380-JK string 62, device 05, volume ABC123. Two paths connected to device 05 are reporting errors. The probable failing unit is volume ABC123 (or device 05). Each time the threshold is exceeded, the next 24 errors are recorded. 240 temporary data checks have been logged for device 5 (10 x 24 = 240). More information about these data checks can be determined from the DASD Data Transfer Summary report.

The customer should run ICKDSF ANALYZE DRIVE TEST on device 05 (volume ABC123) to determine if there is a suspected hardware problem. If there is a suspected hardware problem, a service action is required; otherwise, the customer should perform media maintenance in accordance with instructions in *Device Support Facilities Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498 and *Maintaining IBM Storage Subsystem Media*, GC26-4495.

SMAP 0020: Corrective Action Determination With EREP

Use the EREP Subsystem Exception DASD Symptom Code Summary report and the EREP System Exception DASD Data Transfer Summary report to determine if corrective action is required. See the PROG section of this manual for sample EREP reports and descriptions.

001
(From SMAP 0016 Step 006 on page START-4)
(From SMAP 0017 Step 003 on page START-6)
(From IMAP 0233 Step 006 on page ISOLATE-21)

Determine if corrective action is required. Do you need help?
Yes **No**

002
Go to SMAP 0025 Step 001 on page START-12.

003
Use the DASD Symptom Code Summary report and Figure 5 on page START-10 to determine the following:

1. **Determine that the failure is a 3380-JK failure.** Verify that the Device Type Column contains 3380-JK or the symptom code is Dxxx.

   There are cases where 3380-JK errors (symptom code = Dxxx) are reported with the wrong device type. For these cases a symptom code of Dxxx is a definite indication of an error on a 3380-JK device type. There are also cases where 3380 and 3380-DE format 7 errors (symptom code = 7xxx or Bxxx) are reported for 3380-JK device type. For these errors, refer to the 3380 and 3380-DE maintenance package.

2. **Determine the kind of errors (Permanent or Temporary) from the OCCURRENCES PERM/TEMP columns.**

3. **Determine if corrective action is required.** Use these guidelines:

   - If permanent errors are indicated in the DASD Symptom Code report, corrective action is required. (See the EREP System Exception DASD Symptom Code Summary report, Figure 5 on page START-10.)

   - If temporary errors with one of the following symptom codes is reported in the DASD Symptom Code report, corrective action is required:

     ```
     4xCx, 9E12, 9FFF, 9F9F
     DFFF, EFFF, EFF0
     ```

     (See the EREP System Exception DASD Symptom Code Summary report, Figure 5 on page START-10.)

   - If the threshold for temporary data checks was exceeded (indicated by a nonzero value in either the TEMPORARY OFFSET INVK YES or NO columns of the Data Transfer Summary report), corrective action is required. (See the TEMPORARY OFFSET INVK YES and NO columns of the EREP System Exception DASD Data Transfer Summary report, Figure 6 on page START-11, for additional information about data checks (Symptom Code 4xxx)).

     When the threshold for data checks without offset is exceeded, the storage control goes into logging mode. After logging mode is completed, a format 0 sense record (symptom code 0002) is logged and a message is presented in the DASD Informational Messages report (see Figure 5 on page PROG-11).

   - If the threshold for temporary seek errors (symptom codes 9Dxx and 9F1E) was exceeded on the DASD Symptom Code Summary report, corrective action is required. (See the EREP System Exception DASD Symptom Code Summary report, Figure 5 on page START-10.)

     Symptom codes 9Dxx and 9F1E will not be presented in the Symptom Code Summary report unless the threshold is exceeded. When the threshold for seek checks is exceeded, a format 0 sense record (symptom code 0001) is logged and a

message is presented in the DASD Informational Messages report (see Figure 5 on page PROG-11).

- If three or more temporary errors (other than above) are indicated on the DASD Symptom Code Summary report, corrective action is required. (See the EREP System Exception DASD Symptom Code Summary report, Figure 5 on page START-10.)

- If fewer than three temporary errors (other than above) are indicated on the DASD Symptom Code Summary report, maintenance action is not generally required.

  Temporary errors are usually transparent to the customer's normal operation unless the errors are occurring so often that performance is degraded.

Continue to review EREP each day for additional errors. If the error condition persists, corrective action is required.

According to the guidelines, is corrective action required?

Yes **No**

004
Continue to review EREP daily for changes in the error conditions.

005
Go to SMAP 0025 Step 001 on page START-12.

```
DASD SYMPTOM CODE SUMMARY                         REPORT DATE 034 87
                                                  PERIOD FROM 032 87
                                                         TO   034 87

SEQUENCE BY PROBABLE FAILING UNIT

SYMPTOM  PHYSICAL OCCURRENCES FAILURE               DATE AND TIME OF
CODE     ID       PERM/TEMP   AFFECT   FIRST OCCURRENCE         LAST OCCURRENCE
                                             SENSE FROM FIRST OCCURRENCE
           DEVICE          0 0 0 0  0 0 0 0  0 0 1 1  1 1 1 1  1 1 1 1  2 2 2 2
           TYPE            0 1 2 3  4 5 6 7  8 9 0 1  2 3 4 5  6 7 8 9  0 1 2 3
                            PHYSICAL               ERROR
                            ADDRESS   SSID-STRING PATH   CPU(S)
*******************************************************************************
PROBABLE FAILING UNIT: _______________________________________________________
SEQUENCE BY __________________________________________________________________

XXXX      3380-JK  x   x
```

- x x: Look in these columns for counts of permanent and temporary errors.
- 3380-JK: Use this column to identify the device type.
- XXXX: Use this column to identify the symptom code.

Valid codes for 3380-JK are: 4xxx Dxxx 9xxx Exxx

Figure 5. Headings for the DASD Symptom Code Summary Report. See "DASD Symptom Code Summary" on page PROG-17 for additional information about this report.

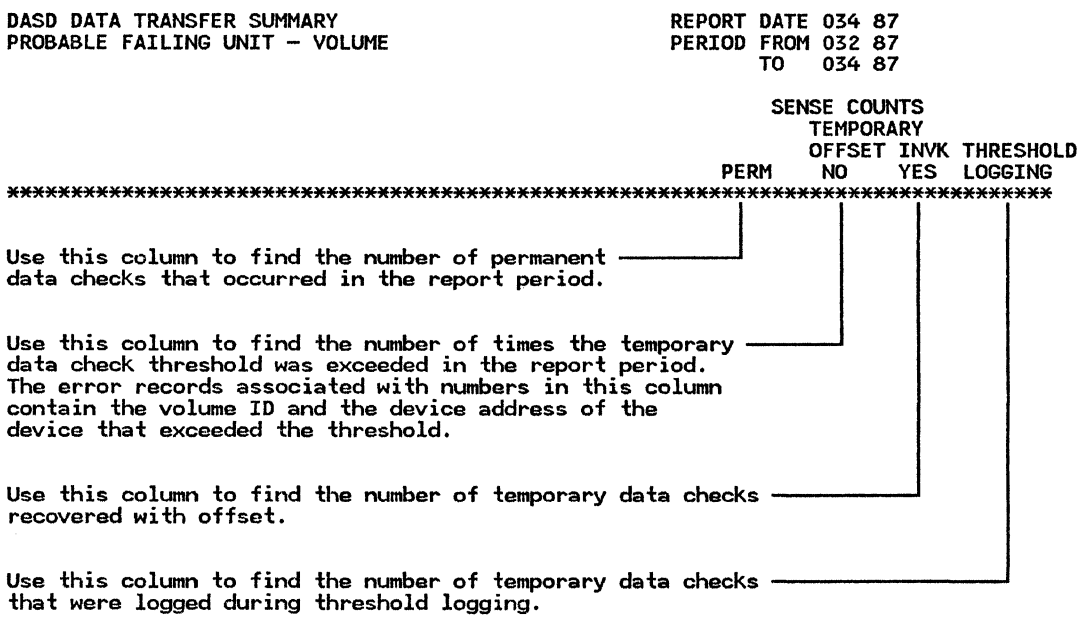


Figure 6. Headings for DASD Data Transfer Summary Report

SMAP 0025: Prioritizing Symptom Codes

001
(From SMAP 0020 Step 002 on page START-8)
(From SMAP 0020 Step 005 on page START-9)
(From SMAP 0030 Step 003 on page START-14)
(From MD 0050 Step 003 on page MD-55)

- Determine the highest priority symptom code.

Check for symptom codes that indicate undervoltage.

All undervoltage or non-repeatable runout problems should be resolved before attempting to resolve other problems. Review the symptom codes for the following:

DFFF	Controller undervoltage
EFFF	Controller undervoltage
EFF0	Device undervoltage
9FFF	Device undervoltage
9F9F	Non-repeatable runout

Do you have one of these symptom codes?
Yes **No**

002
Go to Step 004 in this SMAP.

003
This is the highest priority symptom code. Record the symptom code and go to SMAP 0030 Step 001 on page START-14.

004
(From Step 002 in this SMAP)

Use the DASD Symptom Code Summary report to answer the following questions and to find the highest priority symptom code. (A description of the DASD Symptom Code Summary report starts on PROG-17.)

Is there more than one symptom code listed?
Yes **No**

005
(Step 005 continues)

005 (continued)
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0030 Step 001 on page START-14.

006
(From Steps 010 and 012 in this SMAP)

The following symptom codes are low priority symptom codes and should not be used to isolate a problem when other symptom codes with a value of Dxxx or Exxx are reported:

Low Priority Symptom Codes

DFx3	DFx9	DFxC
DFx5	DFxA	DFxD
DFx8	DFxB	

Is there a low priority symptom code?
Yes **No**

007
Go to Step 010 in this SMAP.

008
Are there other Dxxx or Exxx symptom codes (temporary or permanent)?
Yes **No**

009
The highest priority symptom code is the first low priority symptom code listed. Record the symptom code and go to SMAP 0030 Step 001 on page START-14.

> ***Note:*** *Symptom code DF05 may be caused by a control interface fenced condition or a controller power off condition. There will usually be a preceding symptom code.*

010
(From Step 007 in this SMAP)

(Step 010 continues)

010 (continued)
Are there any symptom codes (other than the low priority symptom codes listed in Step 006 in this SMAP) with permanent errors?
Yes **No**

011
Determine the highest priority symptom code group. Use the following guidelines:

1. Symptom codes are grouped by the first character of the code.

2. If there are symptom codes in more than one of the following groups, select the group closest to the top of the list.

Symptom Code Group	Meaning
3xxx	Storage Control Check 1
2xxx	Storage Control Equipment Check
Dxxx	Controller Check 1
Exxx	Controller Check 2 or Device Check 1
9xxx	Device Check 2
4xxx	Data Check
0xxx	Program or System Check

3. After the highest priority group is determined, go to Step 015 in this SMAP.

012
Is there more than one symptom code (other than the low priority symptom codes listed in Step 006 in this SMAP) with permanent errors?
Yes **No**

013
The symptom code with permanent errors is the highest priority symptom code. Record the symptom code and go to SMAP 0030 Step 001 on page START-14.

014
Determine the highest priority symptom code group.

Symptom codes are grouped by the first character of the symptom code. Refer to the following table to group the symptom codes with permanent errors. If there are symptom codes with permanent errors in more than one of the groups listed in the table, select the group closest to the top of the table.

Symptom Code Group	Meaning
3xxx	Storage Control Check 1
2xxx	Storage Control Equipment Check
Dxxx	Controller Check 1
Exxx	Controller Check 2 or Device Check 1
9xxx	Device Check 2
4xxx	Data Check
0xxx	Program or System Check

After the highest priority group is determined, go to Step 015 in this SMAP.

015
(From Steps 011 and 014 in this SMAP)

Is there more than one symptom code in the selected group?
Yes **No**

016
The symptom code in the group selected is the highest priority symptom code. Record the symptom code and go to SMAP 0030 Step 001 on page START-14.

017
The symptom code in the selected group that occurs most often (permanent and temporary) is the highest priority symptom code. Record the symptom code and go to SMAP 0030 Step 001 on page START-14.

SMAP 0030: Locating the Failing String and Devices

001
(From SMAP 0025 Step 003 on page START-12)
(From SMAP 0025 Step 005 on page START-12)
(From SMAP 0025 Step 009 on page START-12)
(From SMAP 0025 Step 013 on page START-13)
(From SMAP 0025 Step 016 on page START-13)
(From SMAP 0025 Step 017 on page START-13)
(From IMAP 0205 Step 003 on page ISOLATE-2)
(From RMAP 0310 Step 001 on page REPAIR-5)
(From MD 0050 Step 003 on page MD-55)
(From MD 0052 Step 005 on page MD-62)

Locate the failing machine. Do you need help?
Yes **No**

002
Go to SMAP 0033 Step 001 on page START-16.

003
Use the entry with the highest priority symptom code.

Using the DASD Symptom Code Summary report (see Figure 7 on page START-15), perform the following steps.

1. **Verify that the Device Type column contains 3380-JK or the symptom code is Dxxx.**

   Note: *If two strings are attached to the control interface, there are some cases where format 7 errors (sense byte 7=7x) are reported for both strings. For these cases, it is necessary to locate both strings. To locate 3380 or 3380-DE strings, use the appropriate 3380 maintenance package.*

2. **Determine the physical string, controllers, devices, and storage control related to the failure.**

If there are multiple symptom codes in the symptom code group determined in SMAP 0025 Step 001 on page START-12, use all physical addresses listed within the selected group (both permanent and temporary errors) to make this determination (not just those physical addresses listed under the highest priority symptom code).

Warning: Use the data in the Physical Address column of the report to identify the physical controller, path, and device. Do not use the Error Path column or the Physical ID column to identify the failing paths or devices. The Error Path column identifies the path the error was reported on and the device that was selected when the error was reported, not necessarily the failing physical address.

- To identify the string, match the controller ID (CC) in the Physical Address column with the string ID on the A unit operator panel.
- To identify the Storage Control, match the SDID or SSID from the SSID-STRING column with the SDID or SSID on the storage control.
- To identify the controller, match the path bit (P) in the Physical Address column with the path character on the A unit operator panel.
- To identify devices, match the device address (DD) in the Physical Address column with the device addresses on the A unit operator panel.

Go to SMAP 0033 Step 001 on page START-16.

```
DASD SYMPTOM CODE SUMMARY                         REPORT DATE 034 87
                                                  PERIOD FROM 032 87
                                                         TO   034 87


SEQUENCE BY PROBABLE FAILING UNIT

SYMPTOM  PHYSICAL OCCURRENCES FAILURE              DATE AND TIME OF
CODE     ID        PERM/TEMP   AFFECT    FIRST OCCURRENCE        LAST OCCURRENCE
                                               SENSE FROM FIRST OCCURRENCE
           DEVICE           0 0 0 0  0 0 0 0  0 0 1 1  1 1 1 1  1 1 1 1  2 2 2 2
           TYPE             0 1 2 3  4 5 6 7  8 9 0 1  2 3 4 5  6 7 8 9  0 1 2 3
                             PHYSICAL                ERROR
                             ADDRESS   SSID-STRING  PATH      CPU(S)
*******************************************************************************
PROBABLE FAILING UNIT: ________________________________________________________
SEQUENCE BY ___________________________________________________________________

                                  - DATE TIME -          - DATE TIME -

                            ---- ---- - SENSE  - DATA  ---- ----

                             CC.P-DD      SC-S
Use this column to identify ___|          |___ Use this column to identify
the failing controllers,                       the Storage Control and
paths, and devices:                            string address (0 or 1):

     CC = Controller String ID                      SC = Storage Control
     P  = Physical Path                             S = String (0 or 1)
     DD = Device Physical Address

                             SC-CC-DD
For certain Format 7 errors,____|
the physical address is
reported in the same form
as previous 3880 models:

     SC = Storage Control
     CC = Controller String ID
     DD = Device Physical Address
```

Figure 7. DASD Symptom Code Summary Report, Physical Address field . See "DASD Symptom Code Summary" on page PROG-17 for additional information about this report.

SMAP 0033: Determine the Probable Failing Unit

001
(From SMAP 0030 Step 002 on page START-14)
(From SMAP 0030 Step 003 on page START-14)

1. Use the DASD Symptom Code Summary report to determine the probable Failing Unit.

Determine the probable failing unit from the first line following the report heading. See Figure 9.

2. Find the highest priority symptom code group in Figure 8 and go to the SMAP, MLX entry, or maintenance package indicated.

Symptom Code Groups	Go To
2xxx, 3xxx, or Fxxx Storage Control errors	The storage control maintenance package, MLX entry 6.
Dxxx	SMAP 0058 Step 001 on page START-34.
EBxx (Controller/Device Port checks)	SMAP 0057 Step 001 on page START-33.
Exxx (except EBxx)	SMAP 0058 Step 001 on page START-34.
9xxx	SMAP 0058 Step 001 on page START-34.
1xxx, 6xxx, 7xxx, or 8xxx	The 3380 Stage 2 maintenance package.
Axxx, Bxxx, or Cxxx	The 3380-DE maintenance package.
4xxx Data Check	SMAP 0050 Step 001 on page START-23.
Oxxx	The storage control maintenance package, MLX entry 6.

Figure 8. Symptom Code Groups.

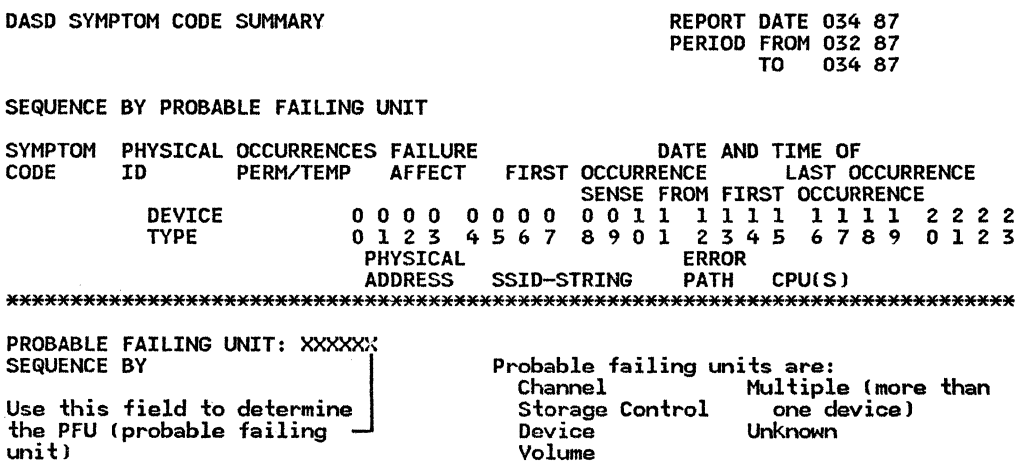


Figure 9. DASD Symptom Code Summary Report, Probable Failing Unit.

SMAP 0035: Corrective Action Determination With Sense Data

001
(From SMAP 0015 Step 001 on page START-3)

Determine if corrective action is required.

Do you need help?
Yes **No**

002
Go to SMAP 0040 Step 001 on page START-19.

003

1. **Determine if the error is permanent or temporary from console messages.**

2. **Determine the symptom code from sense bytes 22 and 23.**

3. **Determine that the failure is a 3380-JK failure from the symptom code.**

   Valid 3380-JK symptom codes are 4xxx (except 49xx), 9xxx, Dxxx, and Exxx. 49xx symptom codes are not used for the 3380-JK.

Is this a valid 3380-JK failure?
Yes **No**

004
Go to Step 006 in this SMAP.

005
Go to Step 007 in this SMAP.

006
(From Step 004 in this SMAP)

Go to the appropriate maintenance package as indicated in the following list:

Symptom Code	Meaning and Maintenance Package
1xxx	Device Check 2 - 3380 Stage 2
5xxx	Correctable data check - 3380 Stage 2 or 3380-DE
6xxx	Controller Check 2 or Device Check 1 - 3380 Stage 2
7xxx	Controller Check 1 - 3380 Stage 2
8xxx	Controller Check 2 or Device Check 1 - 3380 Stage 2
Axxx	Device Check 2 - 3380-DE
Bxxx	Controller Check 1 - 3380-DE
Cxxx	Controller Check 2 or Device Check 1 - 3380-DE

007
(From Step 005 in this SMAP)

Determine if corrective action is required. Use these guidelines:

- If permanent errors are indicated, corrective action is required.

- If temporary errors with one of the following symptom codes is reported, corrective action is required:

  4xCx, 9E12, 9FFF, 9F9F
  DFFF, EFFF, EFF0

- If the threshold for temporary data checks (symptom codes 4xxx) was exceeded, corrective action is required.

  A threshold exceeded condition can be determined from console messages or from a format 0 sense record with a symptom code of 0002.

- If the threshold for temporary seek errors (symptom codes 9Dxx and 9F1E) was exceeded, corrective action is required.

  A threshold exceeded condition can be determined from console messages or from a format 0 sense record with a symptom code of 0001.

  Note: *Symptom codes 9Dxx and 9F1E are not presented to the system unless the threshold is exceeded.*

- If three or more temporary errors (other than above) are indicated, corrective action is required.

- If fewer than three temporary errors (other than above) are indicated, maintenance action is not generally required.

  Temporary errors usually do not affect the customer's normal operation unless the errors are occurring so often that performance is degraded.

Review EREP each day for additional errors. If the error condition persists, corrective action is required.

According to the guidelines, is corrective action required?

Yes **No**

008
Review EREP daily for changes in the error conditions.

009
Go to SMAP 0040 Step 001 on page START-19.

SMAP 0040: Prioritizing Symptom Codes

001
(From SMAP 0035 Step 002 on page START-17)
(From SMAP 0035 Step 009 on page START-18)
(From SMAP 0045 Step 004 on page START-22)
(From SMAP 0053 Step 005 on page START-30)
(From MD 0050 Step 004 on page MD-56)

- Determine the highest priority symptom code.

Check for symptom codes that indicate undervoltage.

All undervoltage or non-repeatable runout problems should be resolved before attempting to resolve other problems. Review the symptom codes for the following:

DFFF	Controller undervoltage
EFFF	Controller undervoltage
EFF0	Device undervoltage
9FFF	Device undervoltage
9F9F	Non-repeatable runout

Do you have one of these symptom codes?
Yes **No**

002
Go to Step 004 in this SMAP.

003
This is the highest priority symptom code. Record the symptom code and go to SMAP 0045 Step 001 on page START-21.

004
(From Step 002 in this SMAP)

Perform the following MAP steps to find the highest priority symptom code.

Is there more than one symptom code listed?
Yes **No**

005
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0045 Step 001 on page START-21.

006
(From Steps 010 and 012 in this SMAP)

The following symptom codes are low priority symptom codes and should not be used to isolate a problem when other symptom codes with a value of Dxxx or Exxx are reported:

Low Priority Symptom Codes

DFx3	DFx9	DFxC
DFx5	DFxA	DFxD
DFx8	DFxB	

Is there a low priority symptom code?
Yes **No**

007
Go to Step 010 in this SMAP.

008
Are there other Dxxx or Exxx symptom codes (temporary or permanent)?
Yes **No**

009
The highest priority symptom code is the first low priority symptom code listed. Record the symptom code and go to SMAP 0045 Step 001 on page START-21.

> ***Note:*** *Symptom code DF05 may be caused by a control interface fenced condition or a controller power off condition. There will usually be a preceding symptom code.*

010
(From Step 007 in this SMAP)

Are there any symptom codes (other than the low priority symptom codes listed in Step 006 in this SMAP) with permanent errors?
Yes **No**

(Step 011 continues)

011

Determine the highest priority symptom code group. Use the following guidelines:

1. Symptom codes are grouped by the first character of the code.

2. If there are symptom codes in more than one of the following groups, select the group closest to the top of the list.

Symptom Code Group	Meaning
3xxx	Storage Control Check 1
2xxx	Storage Control Equipment Check
Dxxx	Controller Check 1
Exxx	Controller Check 2 or Device Check 1
9xxx	Device Check 2
4xxx	Data Check
0xxx	Program or System Check

3. After the highest priority group is determined, go to Step 015 in this SMAP.

012

Is there more than one symptom code (other than the low priority symptom codes listed in Step 006 in this SMAP) with permanent errors?

Yes **No**

013

The symptom code with permanent errors is the highest priority symptom code. Record the symptom code and go to SMAP 0045 Step 001 on page START-21.

014

Determine the highest priority symptom code group.

Symptom codes are grouped by the first character of the symptom code. Refer to the following table to group the symptom codes with permanent errors. If there are symptom codes with permanent errors in more than one of the groups listed in the table, select the group closest to the top of the table.

Symptom Code Group	Meaning
3xxx	Storage Control Check 1
2xxx	Storage Control Equipment Check
Dxxx	Controller Check 1
Exxx	Controller Check 2 or Device Check 1
9xxx	Device Check 2
4xxx	Data Check
0xxx	Program or System Check

After the highest priority group is determined, go to Step 015 in this SMAP.

015

(From Steps 011 and 014 in this SMAP)

Is there more than one symptom code in the selected group?

Yes **No**

016

The symptom code in the group selected is the highest priority symptom code. Record the symptom code and go to SMAP 0045 Step 001 on page START-21.

017

The symptom code in the selected group that occurs most often (permanent and temporary) is the highest priority symptom code. Record the symptom code and go to SMAP 0045 Step 001 on page START-21.

SMAP 0045: Locating the Failing String and Devices

001
(From SMAP 0040 Step 003 on page START-19)
(From SMAP 0040 Step 005 on page START-19)
(From SMAP 0040 Step 009 on page START-19)
(From SMAP 0040 Step 013 on page START-20)
(From SMAP 0040 Step 016 on page START-20)
(From SMAP 0040 Step 017 on page START-20)
(From IMAP 0205 Step 003 on page ISOLATE-2)
(From RMAP 0310 Step 001 on page REPAIR-5)
(From MD 0050 Step 004 on page MD-56)

Locate the failing machine. Do you need help?
Yes **No**

002
Go to Step 004 in this SMAP.

003
Determine the physical strings, controllers, and devices (CC.P-DD).

If there are multiple symptom codes in the symptom code group determined on page START-19, use all sense records in the selected group to make the following determination (not just those sense records associated with the highest priority symptom code).

> ***Note:*** *If there are two strings attached to the control interface, there are some cases where format 7 errors (sense byte 7=7x) are reported for both strings. For these cases it is necessary to locate both strings. To locate 3380 or 3380-DE strings, use the appropriate 3380 maintenance package.*

1. Use sense byte 3 or 14 to determine the string ID. See Figure 11 on page START-22.

   For example, if the symptom code is 9xxx, Dxxx, or Exxx, use sense byte 3 to determine the String ID. If the symptom code is 4xxx, use sense byte 14.

2. To identify the string, match the string ID obtained from sense byte 3 or 14 with the String ID on the A-unit operator panel. For 3880 subsystems, see page INTRO-7; for 3990 subsystems, see page INTRO-20 or INTRO-22.

3. Use sense byte 4 to determine the path, the string address, and the device address:

Sense Byte 4	**Path**
00xx xxxx	Path 0
01xx xxxx	Path 1
10xx xxxx	Path 2
11xx xxxx	Path 3

Sense Byte 4	**String Address**
xx0x xxxx	String 0
xx1x xxxx	String 1

Sense Byte 4	**Device Address**
xxx0 0000	Device 00
xxx0 0001	Device 01
xxx0 0010	Device 02
xxx0 0011	Device 03
...	...
xxx1 1110	Device 1E
xxx1 1111	Device 1F

4. To identify the controller, use sense byte 4 to determine the path and device address. Next, match the path and device address from sense byte 4 with the Path and Device on the A-Unit operator panel. For 3880 subsystems, see page INTRO-7; for 3990 subsystems, see page INTRO-20 or INTRO-22.

5. To identify a device, match the device address from sense byte 4 with the Device on the A unit operator panel. For 3880 subsystems, see page INTRO-7; for 3990 subsystems, see page INTRO-20 or INTRO-22.

Continue with Step 004 in this SMAP.

004
(From Steps 002 and 003 in this SMAP)

Find your highest priority symptom code group in Figure 10 (determined in SMAP 0040 Step 001 on page START-19) and go to the SMAP, MLX entry, or maintenance package indicated.

Symptom Code Groups	Go To
2xxx, 3xxx, or Fxxx Storage Control errors	The storage control maintenance package, MLX entry 6.
Dxxx	SMAP 0058 Step 001 on page START-34.
EBxx (Controller/Device Port checks)	SMAP 0057 Step 001 on page START-33.
Exxx (except EBxx)	SMAP 0058 Step 001 on page START-34.
9xxx	SMAP 0058 Step 001 on page START-34.
1xxx, 6xxx, 7xxx, or 8xxx	The 3380 Stage 2 maintenance package.
Axxx, Bxxx, or Cxxx	The 3380-DE maintenance package.
4xxx Data Check	SMAP 0050 Step 001 on page START-23.
0xxx	The storage control maintenance package, MLX entry 6.

Figure 10. Symptom Code Groups

Sense Byte 7	Symptom Code (bytes 22 and 23)	Error Type	Storage Director ID Byte	Controller or String ID Byte	Device ID and Path Byte
0x	0xxx	Program or system check	Byte 21	*	*
1x	9xxx	Device check-2 (except R/W checks)	Byte 21	Byte 3	Byte 4
2x	2xxx	Storage Control equipment checks	Byte 21	*	*
3x	3xxx	Storage Control check-1	Byte 21	*	*
4x	4xxx	Data checks	Byte 21	Byte 14	Byte 4
7x	Dxxx	Controller check-1	Byte 21	Byte 3	Byte 4
8x	Exxx	Controller check-2 or device check-1	Byte 21	Byte 3	Byte 4
9x	9xxx	Device check-2 (R/W checks)	Byte 21	Byte 3	Byte 4
Fx	Fxxx	Storage Control check or message	Byte 21	*	*

Figure 11. Physical ID Bytes by Sense Format

* See the Storage Control maintenance package for sense byte definitions.

SMAP 0050: Planning the Repair Action for Data Checks

001
(From SMAP 0033 Step 001 on page START-16)
(From SMAP 0045 Step 004 on page START-22)

The highest priority symptom found was data checks (symptom code group 4xxx).

Use the EREP System Exception report, DASD Data Transfer Summary if available. See Figure 12 on page START-24. An analysis of this report will assist you in making the decisions that are required to isolate and fix data check problems.

Defects in the media will be fixed by the Device Support Facilities program or other programs.

Hardware errors will require a repair action.

For information about media maintenance, see *Maintaining IBM Storage Subsystem Media*, GC26-4495 and *Device Support Facilities Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498.

1. **Determine if there are permanent data checks.**

   Examine the PERM column in the DASD Data Transfer Summary or examine console messages for permanent data checks.

   Warning: Do not use sense byte 1, bit 0 to determine if a data check is permanent.

2. **Determine if there are data checks that required offset for recovery.**

   Examine the OFFSET INVK YES column in the DASD Data Transfer Summary report or examine sense byte 23 to determine if data checks with offset were reported. If byte 23 contains hex 2x, 6x, or Ax, offset was active.

3. **Determine if there are data check threshold exceeded conditions.**

   Examine the OFFSET INVK NO column in the DASD Data Transfer Summary report or sense byte 2, bit 2 of each sense record to find entries for devices that were put in Logging mode. Sense byte 2, bit 2 (first logging mode) identifies the first record logged for a device in logging mode.

   A data check with a symptom code of 4xCx may be reported in this column. 4xCx symptom codes are all logged. (The threshold does not apply.)

   4xCx indicates that the data check was not recoverable with one or more control unit retry sequences. A data check of this type should be treated as permanent. For additional information on data check reporting, see "Understanding Temporary Data Check Reporting" on page PROG-15.

Did more than one device in the failing string report data checks.

Yes **No**

002
Go to SMAP 0051 Step 001 on page START-25.

003
Go to SMAP 0056 Step 001 on page START-32.

```
DASD DATA TRANSFER SUMMARY                          REPORT DATE 034 85
PROBABLE FAILING UNIT - VOLUME                      PERIOD FROM 032 85
                                                           TO   032 85

                                                      SENSE COUNTS
                                                         TEMPORARY
                                                       OFFSET INVK THRESHOLD
                                                PERM     NO    YES  LOGGING
*************************************************************************************
SEQUENCE BY VOLUME LABEL, PHYSICAL ADDRESS, HEAD, CYLINDER

UNITADDRESS xxxx   DEVTYPE 3380-JK     VOLUME  HSM800
     CPU A   PHYSICAL ADDRESS 52.1-0A

       FAILURE AT ADDRESS: CYLINDER 0087  HEAD 01       0      1      0       15
 00001000 4A570143 00570001 00035200 00010000 00804340
                   LAST SENSE AT: 032/85  15:29:50:71

       FAILURE AT ADDRESS: CYLINDER 0095  HEAD 02       0      0      0        1
 00001000 4A5F0243 005F0002 00035200 00010000 00804340
                   LAST SENSE AT: 032/85  18:33:51:07

       FAILURE AT ADDRESS: CYLINDER 0105  HEAD 04       0      1      0       30
 00001000 4A690443 00690004 00035200 00040000 00804340
                   LAST SENSE AT: 032/85  18:33:51:07
```

Use this column to find the number of permanent data checks that occurred in the report period.

Use this column to find the number of times the temporary data check threshold was exceeded in the report period.

Use this column to find the number of temporary data checks recovered with offset.

Use this column to find the number of temporary data checks that were logged during threshold logging.

Above example shows:

Device 0A on string 52, path 1, has exceeded the temporary data check (no offset) threshold two times.

cylinder 87 head 1 - a temporary error on this track caused the threshold to be exceeded. The track had a total of 16 temporary errors.

cylinder 95 head 2 - this track had a total of 1 temporary error recorded while in threshold logging mode.

cylinder 105 head 4 - a temporary error on this track caused the threshold to be exceeded. The track had a total of 31 temporary errors.

Recommended repair action for the above example:

Ask the customer to run ICKDSF INSPECT with PRESERVE and CHECK(1) on cylinder 87 head 1 and on cylinder 105 head 4.

Figure 12. Sample of DASD Data Transfer Summary Report

SMAP 0051: Determining Tracks Reporting Data Checks

001
(From SMAP 0050 Step 002 on page START-23)

Use this SMAP to determine the failing track addresses.

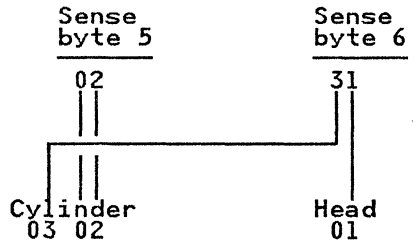
Do you need help?
Yes **No**

002
Go to Step 004 in this SMAP.

003
Determine the failing cylinder and head address.

Use the EREP System Exception report, DASD Data Transfer Summary if available. Refer to Figure 12 on page START-24 for an example of this report. Record the CYLINDER and HEAD values for each head reporting errors from the "FAILURE AT ADDRESS" lines. Cylinder and head values are in decimal.

If a DASD Data Transfer Summary report is not available, the cylinder and head address (hexadecimal) may be determined from sense bytes 5 and 6 using the following diagram:



In this example, byte 5 contains 02 and byte 6 contains 31. The address is cylinder X"0302," head X "01."

Bytes 8 to 11 may or may not contain the CCCC HHHH in hexadecimal for the track having the data check, depending on the nature of the data check.

Go to Step 004 in this SMAP.

004
(From Steps 002 and 003 in this SMAP)

Warning: Have the customer dump the data from the volume if one of the following conditions exist:

- **Permanent data checks on eleven or more tracks.**
- **Permanent data checks on any head at three or more consecutive track addresses.**

Have the customer perform media maintenance in accordance with the procedures described in *Maintaining IBM Storage Subsystem Media*, GC26-.195.

> ***Note:*** *Before using the Device Support Facilities INSPECT command to inspect tracks, the customer should always run the Device Support Facilities ANALYZE DRIVETEST to ensure there are no hardware problems.*

For additional information about media maintenance, see "Part 3: Using Device Support Facilities" in *Device Support Facilities Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498.

Did Device Support Facilities indicate a suspected drive problem or present error messages?
Yes **No**

005
Go to Step 007 in this SMAP.

006
Go to SMAP 0052 Step 001 on page START-27.

007
(From Step 005 in this SMAP)

Device Support Facilities does not indicate a suspected drive problem and does not present error messages.

Perform the following actions:

1. Determine if the problem was corrected.

2. Continue to review EREP reports as required to verify that the media maintenance action was successful. Refer to SMAP 0017 Step 001 on page START-6 for the guidelines to be used for the review procedure.

3. If the problem was not corrected, perform the following:

   - If possible, collect additional information by having the customer run Device Support Facilities ANALYZE SCAN.

   - Obtain all error data from Device Support Facilities.

Go to SMAP 0056 Step 001 on page START-32.

SMAP 0052: Corrective Action Determination from Device Support Facilities Messages

001
(From SMAP 0015 Step 001 on page START-3)
(From SMAP 0051 Step 006 on page START-25)

Device Support Facilities reports can be used to supplement the EREP System Exception reports for isolating data check problems. This MAP deals with error messages that can be presented in the Device Support Facilities reports for the following Device Support Facilities commands:

- ANALYZE DRIVETEST
- ANALYZE SCAN
- INSPECT
- INIT

Collect information about the problem.

1. Collect Device Support Facilities reports.

2. If possible collect EREP System Exception Reports prior to running Device Support Facilities programs. These reports will assist with problem determination.

For information about Device Support Facilities, and error messages, refer to *Device Support Facilities User's Guide and Reference*, GC35-0033, Level 12 or later.

For information on when and how to perform media maintenance, refer to:

- *Maintaining IBM Storage Subsystem Media*, GC26-4495.
- *Device Support Facilities: Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498.

These manuals contain guidelines the customer uses to determine when and how to perform media maintenance and when to call IBM for service.

Determine that the failure is a 3380-JK failure.

Review the Device Support Facilities reports to ensure that PHYSICAL DEVICE = 3380 and that DEVICE DESCRIPTOR = 16 or 1E.

3380 device descriptor codes are as follows:

- 02 = 3380 Stage 1 or 2
- 06 = 3380-D
- 0A = 3380-E
- 16 = 3380-J
- 1E = 3380-K

Determine if corrective action is required.
Do you need help?
Yes **No**

002
Go to Step 005 in this SMAP.

003
Corrective action is required if one of the following messages is presented:

SUSPECTED DRIVE PROBLEM
This message is an indication of a hardware problem. For most hardware problems, one or more of the following messages may also be reported.

EQUIPMENT CHECK (permanent or temporary)
Equipment checks are indicated by the term "EQUIPMENT CHECK" or by Sense byte 07 as follows: 0X, 1X, 2X, 3X, 7X, 8X, 9X, or FX.

UNCORRECTABLE DATA CHECK OCCURRED ON CE CYLINDER
This message can indicate either correctable or uncorrectable data checks.

CE CYLINDER DATA CHECK THRESHOLD EXCEEDED
This message can indicate either correctable or uncorrectable data checks.

CORRECTABLE DATA CHECK LIMIT EXCEEDED ON CE CYLINDER
This message is used to show that the indicated head has exceeded the error criterion. A previous message has indicated the detailed sense information associated with the failing head.

DATA CHECK THRESHOLD EXCEEDED ON ONE OR MORE HEADS

This message is produced if one or more heads exceed a threshold for data checks. These data checks may be either correctable or uncorrectable. The head or heads that exceed the threshold are indicated in the MOVEABLE HEAD ERROR TABLE that follows the message.

DATAVER DATA CHECK EXCEEDED THRESHOLD

The number of data checks detected while running ANALYZE SCAN exceeded a threshold established for data checks on this volume.

DATAVER UNCORRECTABLE ERROR

This message is used by ANALYZE SCAN to indicate that it has found a track that is not correctable using ECC correction algorithms. It does not mean that it would not be read correctly using rereads, read with offset or be ECC correctable as a result of those rereads.

DATAVER CORRECTABLE ERROR

This message is produced whenever ANALYZE detects a correctable data check which persists through multiple attempts to read the data. The multiple read is intended to eliminate data checks caused by random noise.

Corrective action is not required for the following messages unless one or more of the above messages also occur.

SKIP DISPLACEMENTS CHANGED FOR TRACK X"cccc hhhh."

This message is generated each time INSPECT determines a media defect and bypasses it by assigning a skip displacement. It is normal and expected that some skip displacements will be assigned when INSPECT is run. It should be noted that skip displacements may be changed even when the NOSKIP option is selected.

TRACK X"cccc hhhh" EXPERIENCED NON-RECURRING DATA CHECKS

This message occurs when the INSPECT function detects a non-recurring (non-repeatable) data check during surface analysis of the indicated track. It is normal and expected that some data checks could be detected when INSPECT is run. This message by itself is not necessarily cause for concern.

CORRECTABLE DATA CHECK OCCURRED ON CE CYLINDER

It is expected that there will be some data checks during a run of ANALYZE DRIVETEST.

According to the guidelines, is corrective action required?

Yes **No**

004
Continue to review EREP periodically for error conditions.

005
(From Step 002 in this SMAP)

Go to the message in Figure 13 on page START-29 and perform the indicated corrective action.

006
(From Step 011 in this SMAP)
Do the Device Support Facilities messages contain sense data?

Yes **No**

007
A media maintenance action is required. Have the customer perform media maintenance in accordance with the procedures in *Maintaining IBM Storage Subsystem Media*, GC26-4495.

For additional information about media maintenance, see *Device Support Facilities: Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498.

If the media maintenance procedures indicate that a maintenance action is required (for example, "Call your Service Representative"), go to SMAP 0053 Step 001 on page START-30.

(Step 008 continues)

008
Determine if there is an undervoltage or loss of track following condition:

- Sense byte 23, bit 4 = 1, indicates that a device undervoltage condition was detected.
- Sense byte 23, bit 5 = 1, indicates that a controller undervoltage condition was detected.
- Sense byte 23, bit 7 = 1, indicates that a loss of track following was detected.

Is there an undervoltage condition or loss of track following condition?
Yes **No**

009
Go to Step 011 in this SMAP.

010
A maintenance action is required. Go to SMAP 0053 Step 001 on page START-30.

011
(From Step 009 in this SMAP)

A media maintenance action is required. Have the customer perform media maintenance in accordance with the procedures in *Maintaining IBM Storage Subsystem Media*, GC26-4495.

For additional information about media maintenance, see *Device Support Facilities: Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498.

If the media maintenance procedures indicate that a maintenance action is required (for example, "Call your Service Representative"), go to SMAP 0053 Step 001 on page START-30.

Message	Action
SUSPECTED DRIVE PROBLEM	Go to SMAP 0053 Step 001 on page START-30
EQUIPMENT CHECK	Go to SMAP 0053 Step 001 on page START-30
UNCORRECTABLE DATA CHECK OCCURRED ON CE CYLINDER	Go to SMAP 0053 Step 001 on page START-30
CE CYLINDER DATA CHECK THRESHOLD EXCEEDED	Go to SMAP 0053 Step 001 on page START-30
CORRECTABLE DATA CHECK LIMIT EXCEEDED ON CE CYLINDER	Go to SMAP 0053 Step 001 on page START-30
DATA CHECK THRESHOLD EXCEEDED ON ONE OR MORE HEADS	Go to SMAP 0053 Step 001 on page START-30
DATAVER DATA CHECK EXCEEDED THRESHOLD	Go to SMAP 0053 Step 001 on page START-30
DATAVER UNCORRECTABLE ERROR	Go to Step 006 in this SMAP
DATAVER CORRECTABLE ERROR	Go to Step 006 in this SMAP
SKIP DISPLACEMENTS CHANGED FOR TRACK X"cccc hhhh"	No action is required.
TRACK X"cccc hhhh" EXPERIENCED NON-RECURRING DATA CHECKS	No action is required.
CORRECTABLE DATA CHECK OCCURRED ON CE CYLINDER	No action is required.

Figure 13. Device Support Facilities messages

SMAP 0053: Locating the Failing Unit from Device Support Facilities Messages

001
(From SMAP 0052 Step 007 on page START-28)
(From SMAP 0052 Step 010 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)
(From SMAP 0052 Step 011 on page START-29)

The best way to locate the failing unit is with the physical address information contained in a sense record.

Does the report contain error messages with sense data?
Yes **No**

002
Use the Channel Unit Address (CUU) or the volume identifier (DNAME, DDNAME or SYSNAME) from the input statement with existing CE or customer procedures to locate the failing unit.

Schedule machine with customer and go to IMAP 0230 Step 001 on page ISOLATE-16.

003
All Equipment Check problems should be resolved before attempting to resolve a Data Check problem.

Is there an Equipment Check message?
Yes **No**

004
Go to Step 006 in this SMAP.

005
Go to SMAP 0040 Step 001 on page START-19.

006
(From Step 004 in this SMAP)

The sense data is from a Data Check. Locate the failing unit with the physical ID information contained in sense bytes 4 and 14 as follows:

1. To identify the string, match the String ID contained in sense byte 14 with the string ID on the A-unit operator panel. For 3880 subsystems, see Figure 6 on page INTRO-7;for 3990 subsystems, see Figure 14 on page INTRO-20 and Figure 15 on page INTRO-20.

2. To identify the controller, use sense byte 4 to determine the path and device address. Next, match the path and device address from sense byte 4 with the Path and Device on the A-unit operator panel.

Sense Byte 4	**Path**
00xx xxxx	Path 0
01xx xxxx	Path 1
10xx xxxx	Path 2
11xx xxxx	Path 3

Sense Byte 4	**String Address**
xx0x xxxx	String 0
xx1x xxxx	String 1

Sense Byte 4	**Device Address**
xxx0 0000	Device 00
xxx0 0001	Device 01
xxx0 0010	Device 02
xxx0 0011	Device 03
...	...
xxx1 1110	Device 1E
xxx1 1111	Device 1F

Go to SMAP 0054 Step 001 on page START-31.

SMAP 0054: Prioritizing Data Check Symptom Codes using Device Support Facilities Messages

001
(From SMAP 0053 Step 006 on page START-30)

Use the following guidelines to determine the highest priority symptom code.

Is there more than 1 symptom code listed?
Yes **No**

002
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

003
Determine the highest priority group of symptom codes from the following list. Select the applicable group that is closest to the top of the list.

Priority 1 Sense Byte 23, bits 4 or 5 = 1 (undervoltage)
Priority 2 Sense Byte 23, bit 7 = 1 (lost track following)
Priority 3 Message indicates uncorrectable
Priority 4 Other

Is there more than one symptom code in the selected group?
Yes **No**

004
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

005
Reduce the size of the selected group by selecting only those symptom codes that are in the group closest to the top of the following table of sense byte 22 values:

Group	Sense Byte 22 Value	Description
1	44	No Sync Byte Found, HA Area
2	45	No Sync Byte Found, Count Area
3	46	No Sync Byte Found, Key Area
4	47	No Sync Byte Found, Data Area
5	40	ECC Data Check, HA Area
6	41	ECC Data Check, Count Area
7	42	ECC Data Check, Key Area
8	43	ECC Data Check, Data Area

Is there more than one symptom code in the selected group?
Yes **No**

006
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

007
The symptom code that occurs most often is the highest priority symptom code.

Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

SMAP 0056: Prioritizing Data Check Symptom Codes using Sense Data

001
(From SMAP 0050 Step 003 on page START-23)
(From SMAP 0051 Step 007 on page START-26)

Use the following guidelines to determine the highest priority symptom code.

Is there more than 1 symptom code listed?
Yes **No**

002
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

003
Determine the highest priority group of symptom codes from the following list. Select the applicable group that is closest to the top of the list.

Priority 1 Sense Byte 23, bits 4 or 5 = 1 (undervoltage)
Priority 2 Sense Byte 23, bit 2 = 1 (offset active)
Priority 3 Sense Byte 23, bit 7 = 1 (lost track following)
Priority 4 Permanent Data Check (Indicated in EREP Data Transfer Summary or console message)
Priority 5 Other

Is there more than one symptom code in the selected group?
Yes **No**

004
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

005
Reduce the size of the selected group by selecting only those symptom codes that are in the group closest to the top of the following list of sense byte 22 values:

Group	Sense Byte 22 Value	Description
1	44	No Sync Byte Found, HA Area
2	45	No Sync Byte Found, Count Area
3	46	No Sync Byte Found, Key Area
4	47	No Sync Byte Found, Data Area
5	40	ECC Data Check, HA Area
6	41	ECC Data Check, Count Area
7	42	ECC Data Check, Key Area
8	43	ECC Data Check, Data Area

Is there more than one symptom code in the selected group?
Yes **No**

006
The symptom code listed is the highest priority symptom code. Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

007
The symptom code that occurs most often is the highest priority symptom code.

Record the symptom code and go to SMAP 0058 Step 001 on page START-34.

SMAP 0057: Determining the Failing Ports (EBxx)

001

(From SMAP 0033 Step 001 on Page START-16)
(From SMAP 0045 Step 004 on Page START-22)
(From IMAP 0220 Step 001 on Page ISOLATE-12)

Determine the failing ports and the devices and controllers that must be removed from customer operation to repair the problem.

The EBxx Symptom Code represents a failure of the Controller/Device Port (CDP) interface. Failing Ports and Devices ***cannot*** be determined from the physical address column in the EREP DASD Symptom Code Summary report or from sense byte 4.

Multiple Port Failures

Failing ports are determined from the EBxx symptom code where bits 4-7 of "xx" identify the failing port. See Figure 14. Multiple EBxx symptom codes with different values of "xx" indicate that multiple ports are failing and that the failure is probably in the controller.

Repairing the problem requires that the controller and one failing device be removed from customer operation.

Single Port Failures

If all EBxx symptom codes have the same value of "xx," a single port is failing. The failure may be in the controller, or in the CDP interface, or in one of the four devices on the port.

If devices on more than one drive are reporting errors, failing devices ***cannot*** be determined from sense data. Isolating the problem requires that the controller and all four devices on the failing port be removed from customer operation. See Figure 14 to determine which port and devices are associated with the failure.

Note: Failure boundary definition for EBXX symptom codes requires the use of MD procedure 0051 (see MD 0051 Step 001 on page MD-58).

Go to SMAP 0058 Step 001 on page START-34.

Table 1. Port/Device Service Groups

EBxx Bits 4-7	Port	Device Address	EBxx Bits 4-7	Port	Device Address
x4	4	10-13	x8	0	00-03
x5	5	14-17	x9	1	04-07
x6	6	18-1B	xA	2	08-0B
x7	7	1C-1F	xB	3	0C-0F

SMAP 0058: Determining the Failing FRUs

001

(From SMAP 0033 Step 001 on page START-16)
(From SMAP 0033 Step 001 on page START-16)
(From SMAP 0033 Step 001 on page START-16)
(From SMAP 0045 Step 004 on page START-22)
(From SMAP 0045 Step 004 on page START-22)
(From SMAP 0045 Step 004 on page START-22)
(From SMAP 0054 Step 002 on page START-31)
(From SMAP 0054 Step 004 on page START-31)
(From SMAP 0054 Step 006 on page START-31)
(From SMAP 0054 Step 007 on page START-31)
(From SMAP 0056 Step 002 on page START-32)
(From SMAP 0056 Step 004 on page START-32)
(From SMAP 0056 Step 006 on page START-32)
(From SMAP 0056 Step 007 on page START-32)
(From SMAP 0057 Step 001 on page START-33)

If the symptom code is 7xxx or Bxxx, ensure that the string is a 3380-JK string before continuing.

If the symptom code is 9F9F, go to START-39, Entry 001 (do not continue with this SMAP).

Is the failing machine available for running diagnostics?

Yes **No**

002

Go to Step 006.

003

Are you working on a data check problem (symptom code 4xxx)?

Yes **No**

004

Go to IMAP 0205 Step 001 on page ISOLATE-2.

005

Go to IMAP 0228 Step 001 on page ISOLATE-15.

006

(Step **006** continues)

006 (continued)

The failing machine is not available for running diagnostics.

Follow this path to determine the probable failing FRUs, based on the sense information that has been collected. You can also determine the part of the string that will be affected by the repair action.

Use MD main menu option 3 to determine the probable failing FRUs. For additional information on the use of MD option 3, see page MD-42.

1. Power-on and IML the MD. The MD need not be attached to the 3380.
2. From the MD Main menu, select option 3 (ANALYZE SYMPTOM CODE).
3. In response to the prompt, enter the symptom code to be analyzed.
4. If possible, answer all questions and enter all data requested by the MD. If asked to enter sense data when the data is not available, the step can be bypassed by pressing the enter key. If a step is bypassed, a larger FRU group will be given or the FRUs will not be listed in order of highest probable failure.
5. When a FRU group is displayed, record the list of FRUs from the primary FRU list and the secondary FRU list if there is one. **Do not replace any of these FRUs at this time.**
6. If there is a MAP referenced under additional action, review the map to determine the additional action that may be needed to isolate the problem. **Do not perform any of these actions at this time.**
7. If you have time and want to learn more about the problem, look up the error condition in the ECD section of the *ECM, Volume R40*.

Go to SMAP 0060 Step 001 on page START-35.

SMAP 0060: Scheduling the Hardware

001
(From SMAP 0058 Step 006 on page START-34)

Ensure that the FRUs are available before scheduling the 3380 unit for maintenance. Look up the probable failing FRUs and determine what part of the string will be affected by the repair action:

- For FRUs on the A1 board, see Figure 15.
- For FRUs on the B1 or Cx boards, see Figure 16.

Schedule maintenance time for the affected devices and controllers with the customer. Arrange to have the affected devices varied offline. When the 3380 unit is available for service, continue with this step.

Are you working on a data check problem (symptom code 4xxx)?
Yes **No**

002
Equipment checks: Go to IMAP 0205 Step 001 on page ISOLATE-2.

003
Data checks: Go to IMAP 0228 Step 001 on page ISOLATE-15.

A1 Board Cards

Controller Logic Card Name	Ctlr A1/A3	Ctlr A2/A4	Repair Affects
DDC/DTB I/O Control	A1W2 A1V2	A1B2 A1C2	Controller
CDPSS0 CDPSS1 (note 1)	A1U2 A1T2	A1D2 A1E2	Controller
DPS (note 2) Controller Sequencer	A1S2 A1R2	A1F2 A1G2	String Controller
DHPLO MD adapter	A1Q2 A1M4	A1H2 A1L4	Controller
Clock/SERDES/ECC 1 Clock/SERDES/ECC 2	A1P2 A1N2	A1J2 A1K2	Controller

Notes:

1. AJ4 and AK4 units do not have CDPSS1 cards unless the 4-path feature is installed.
2. AJ4 and AK4 units attached to a 3990 storage control do not have DPS cards.

Figure 15. Probable Failing FRU on the A1 Board

B1 and Cx Board Cards

Device Logic Card Name	Left Front	Right Front	Left Rear	Right Rear	Repair Affects
PES/PROM SEQ/Servo/RPS	B1D2 B1E2	B1K2 B1J2	B1N2 B1P2	B1U2 B1T2	Device
Port/R-W R/W channel board Servo power amp	B1F2 C0B2 C4P1	B1H2 C1B2 C4P2	B1Q2 C2B2 C4P3	B1S2 C3B2 C4P4	Device
Power	B1G2	B1G2	B1R2	B1R2	Drive
A1 Port Term A2 Port Term A3 Port Term A4 Port Term	B1W2 B1W3 B1B2 B1B3	B1W2 B1W3 B1B2 B1B3	B1W2 B1W3 B1B2 B1B3	B1W2 B1W3 B1B2 B1B3	All devices in the unit

Figure 16. Probable Failing FRU on the B1 or Cx Board

SMAP 0070: Locate the Failing Machine with Console Messages

001
(From SMAP 0015 Step 001 on page START-3)

Do you need aid in locating the failing machine?
Yes **No**

002
Go to IMAP 0205 Step 001 on page ISOLATE-2.

003
See the console message manual. Look for the physical ID in the console messages. If present, it will be in one of the following forms:

SSID.P-CC-DD
SS-CC-DD

Is one of these physical ID forms in the console messages?
Yes **No**

004
Use one of the following to locate the failing machine:

- The Channel Unit Address (CUA).
- The Channel Path Identifier (CHPID) and device number.

Locate the failing string of devices by using the CUA (or the CHPID and device number) and existing customer or CE procedures. Go to IMAP 0205 Step 001 on page ISOLATE-2.

005
Is the physical ID form "SSID.P-CC-DD"?
Yes **No**

006
Go to Step 009 in this SMAP.

007
Go to Step 008 in this SMAP.

008
(From Step 007 in this SMAP)

The physical ID form is "SSID.P-CC-DD," where:

SSID = Storage Control subsystem ID or Storage Director ID (SDID)
P = Path
CC = String ID
DD = Device address

Determine the failing string, paths, and devices using the following procedure:

1. To identify the string, match the String ID (CC), obtained from the console messages, with the String ID on the A unit operator panel. For 3880, see page INTRO-7; for 3990, see page INTRO-20 or INTRO-22.

2. To identify the controllers, match the path (P) obtained from the console message, with the path character on the A unit operator panel. If P = X in the console message, the path must be determined from the Channel Unit Address (CUA) or the Channel Path ID (CHPID) in the console messages. Match the path determined with the path character on the A-unit operator panel.

3. To identify devices, match the device address (DD), obtained from the console messages, with the device addresses on the A unit operator panel. For 3880, see page INTRO-7; for 3990, see page INTRO-20 or INTRO-22.

Schedule the machine with the customer and go to IMAP 0205 Step 001 on page ISOLATE-2.

009
(From Step 006 in this SMAP)

The physical ID form is "SS-CC-DD," where:

SS = Storage director ID or
Storage Control subsystem ID
CC = String ID
DD = Device address

Determine the failing string, paths, and devices using the following procedure:

1. To identify the string, match the string ID (CC) obtained from the console messages with the string ID on the A unit operator panel. For 3880, see page INTRO-7; for 3990, see page INTRO-20 or INTRO-22.

2. This form of physical ID does not contain path information. The path must be determined from the Channel Unit Address (CUA) or the Channel Path ID (CHPID) in the console messages. Match the path determined with the path character on the A unit operator panel.

3. To identify devices, match the device address (DD), obtained from the console messages, with the device addresses on the A unit operator panel. For 3880, see page INTRO-7; for 3990, see page INTRO-20 or INTRO-22.

Schedule the machine with the customer and go to IMAP 0205 Step 001 on page ISOLATE-2.

EC History of Start Section

EC HISTORY OF P/N 4519897			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87	476573	30Nov88
475247	11Sep87	476581	01Aug89

Notes:

SMAP 0059: Determining the Failing FRUs (9F9F)

(From SMAP 0058 Step 001 on Start-34)

001

Symptom code 9F9F is designed to give an early indication of 3380-JK bearing instabilities and is not an error condition.

A cold operating environment and/or a wide fluctuation in operating temperatures might cause symptom code 9F9F and result in unnecessary HDA replacement. Replacing the HDA might ***NOT*** fix the 9F9F symptom code if the environmental issue is not first addressed.

Balancing the room temperature to the recommended operating environment of 72°F, ±2°F has proven to eliminate 9F9F symptom codes in many cases.

Go to "3380-JK Input Air Temperature Check" on page PM-2. Return here when finished.

Was the air intake temperature within specifications?

Yes **No**

002

After modifications are made to correct the temperature, monitor for symptom code 9F9F for a minimum of 24 hours. If symptom code 9F9F reoccurs, go to Step 005.

003

Is byte 9 of any symptom code 9F9F greater than or equal to 10?

Yes **No**

004

Monitor EREP for the next occurrence of symptom code 9F9F. No further action is required.

005

Go to page MD-1, Entry C, and run Option A (Non-repeatable Runout (NRRO) Test).

(Step **005** continues)

005 (continued)

Is the problem fixed?

Yes **No**

006

Call the next level of support.

007

No further action is required.

Preventive Maintenance

3380 Models J and K Preventive Maintenance Procedures

Perform the preventive maintenance procedures shown in Table 2 at the intervals shown.

Table 2. Preventive Maintenance for 3380 Models AJ4, AK4, BJ4, and BK4

Task	Frequency In Months	Comments
Check the box intake air temperature	6	Refer to "3380-JK Input Air Temperature Check" on page PM-2.
Check the blower motor	6	Refer to "Blower Vibration Measurement Procedure" on page PM-4.
Check the gate fans	6	Check the A and B gates for excessively noisy or failed gate fans. Replace the fans as necessary. Refer to "Gate Fan" on page CARR-43, Vol. R10.
Check the primary air filter	6	Check the primary air filter and replace as necessary. Do not attempt to clean the filter. Refer to page LOC-6, Vol. R10.
Check the air pressure	6	Go to "Air Pressure Checks" on page CARR-20, Vol. R10.
Check the HDA motor brakes	6	Check both motor brakes for excessive red dust around the brake housing per ECA149/150. Order the EC if required.
Check for cable chafing	12	Order the cable chafe inspection kit, P/N 2317345. This kit supplies instructions for the recommended inspection points, cable ties, and cable wrap tape.

3380-JK Input Air Temperature Check

Background

A cold operating environment might cause symptom code 9F9F and result in unnecessary HDA replacement. Replacing the HDA might ***NOT*** fix the 9F9F symptom codes if the environmental issue is not addressed.

Note. Generally, out-of-specification environmental temperatures can be observed by a clustering of 9F9F symptom codes (multiple devices in the same physical area within a 24 hour period).

Balancing the room temperature to the recommended ideal operating environment of 72°F, ±2°F, as specified in the *IBM General Information Installation Physical Planning Manual*, has proven to eliminate 9F9F symptom codes in many cases.

Note: Symptom code 9F9F is ***NOT*** an error condition, but is an environmental symptom code that might require further action to be taken. Ensure that your customer understands that symptom code 9F9F is ***NOT*** an error, but an indication that further diagnostics might be required.

Tools Required

The following tools are required to perform this procedure:

- Temperature strips, P/N 2179638
- NFPA approved pillows, P/N 2317361

  These pillows are approved by the National Fire Protection Agency (NFPA). If IBM takes the responsibility for plugging the cable cutouts, then this product (P/N 2317361) must be used. If the customer chooses to do this job, this is the recommended material.

Measuring the Input Air Temperature

Note: Use SC 08 for all temperature checking activities.

To measure the input air temperature, perform the following:

1. Check for the presence of temperature strips (P/N 2179638) on the pre-filter of all A and B boxes. These were installed by ECA163, and measure the temperature of the input air entering the pre-filter. See Figure 2.

   If the temperature strips are not installed, order one temperature strip (P/N 2179368) for each J or K box in your account. Install the strips as shown in Figure 2.

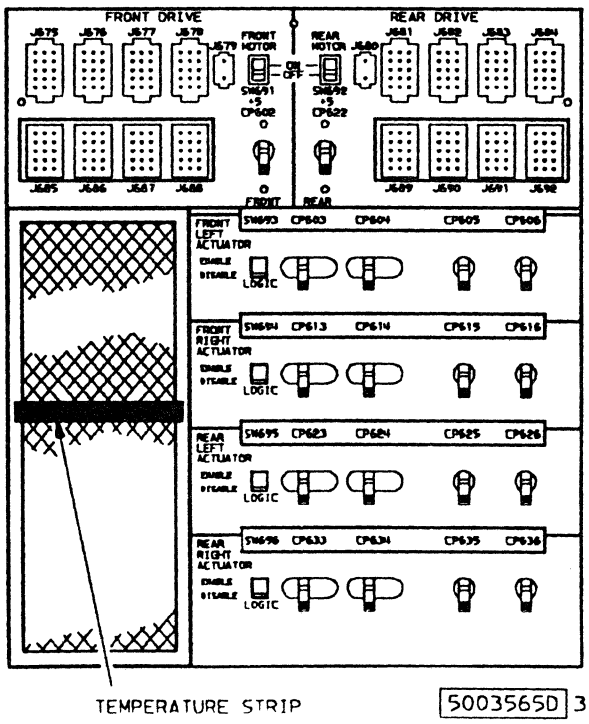


Figure 2.

2. Read the temperature on each strip and record the value read for each box.
3. Determine if the air entering the pre-filter is within the limits of 18° to 32°C (65° to 90°F). It is desirable to have the temperature measure a few degrees above the 18C minimum. The recommended ideal temper-

ature range of air entering the 3380 pre-filter is 21°C to 23°C (70°F to 74°F).

If the temperature is below the minimum of 18°C, do steps 4 through 6 on page PM-3, then recheck the temperature again in 24 hours.

4. **Warning:**

   Do not decrease the number of vented floor tiles in the computer room. It is important to ensure that there is an adequate number of vented floor tiles to maintain the proper circulation of air to and from the air handlers. Without the proper circulation, the under floor temperature can be too cold and the room temperature too warm.

   Seal or replace all missing and perforated floor panels under, or partially under, the 3380 string.

5. Ensure that all vented floor tiles are 3 feet (1 meter) away from the louvered door.

6. Pack the floor panel cable openings under the A boxes with a fire rated pillow. This is very important if the air under the floor is below 18°C (65°F). See "Tools Required" on page PM-2 for the recommended pillow.

7. If the recommended input temperature cannot be reached using the above steps, contact your Branch Office Installation Planning Representative (IPR) for a thermal balance review of your customer's DASD area.

Reference Documentation

1. *IBM General Information Installation Physical Planning Manual*, GC22-7072-2 dated August, 1990.

   Note: Chapter 4 - Air Conditioning, defines the latest IBM temperature and humidity design criteria. The design criteria is 72°F, ±2°F and 45% RH, ±5% relative humidity.

2. *IBM System/360, System/370, 4300 and 9370 Processors Input/Output Equipment Installation Manual-Physical Planning*, GC22-7064-12 dated February, 1990.

   Note: The 370 I/O IMPP dated February 1991 reflects that the minimum temperature entering the 3380-JK pre-filter is 18°C (65°F).

Blower Vibration Measurement Procedure

This procedure requires the use of a vibration monitor 1, P/N 2317360. This is a branch office tool. If your branch does not have it, order the tool and place it in the B/O tool inventory.

1. Connect the cable end of the magnetic mounting base 2 to the 'XDCR' jack of the vibration monitor.
2. Switch the vibration monitor power on by pushing the Power On switch to On. The red LED lights if the power is on.
3. Test the batteries using the Battery Test switch and meter battery indicator. If the batteries are low, replace both batteries with 9-volt batteries.
4. Test the bias using the Bias Test switch and meter indicator. If the bias reading is not within the indicated range, return the meter to the vendor for repair.
5. Remove the cover on the vibration monitor magnetic base by sliding it sideways.
6. Attach the vibration monitor magnetic base to the end cap of the blower motor 4 in the 12 o'clock position 2. See Figure 3.

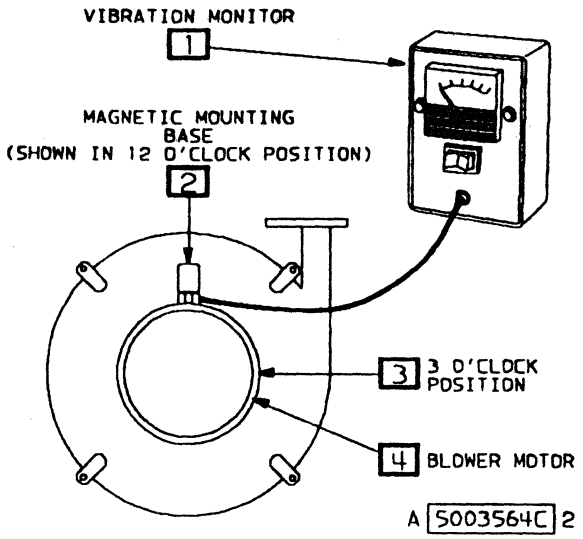


Figure 3. Blower Motor Vibration Monitor Placement

7. With the blower motor running, read and record the vibration monitor reading.
8. Move the vibration monitor magnetic base to the 3 o'clock position 3 of the blower motor end cap. See Figure 3.
9. With the blower motor running, read and record the vibration monitor reading.
10. The highest of the two readings is the measured vibration level for that particular blower motor.
11. If either reading is .25 or above, replace the blower motor. See page CARR-22 in the MIM for the blower motor replacement procedure.

Isolate Procedures

IMAP 0200: Isolate the Problem

001

The procedures in this section are designed to help isolate the problem to a Field Replaceable Unit (FRU) or to the smallest group of FRUs possible. FRU isolation is based upon the results of diagnostic programs and the data collected at the time of the original failure. **The machine must be available for you to perform these procedures.**

Before starting the procedures in this section, you should have completed the analysis procedures in the START section.

Have you completed the analysis procedures in the START section?

Yes **No**

002
Go to SMAP 0015 Step 001 on page START-2 and collect information about the failure.

003
Locate the entry point (A, B, C, etc. determined from the START section procedures) in the following table and go to the map and step indicated.

If an entry point is not available, select a symptom from the Description column and go to the map and step indicated.

Entry	Description	Go to
A	**Physical Inspection**	IMAP 0205 Step 001 on page ISOLATE-2.
B	**Equipment Checks** (Sense data is available)	IMAP 0205 Step 001 on page ISOLATE-2.
C	**Data Checks** (Sense data is available)	IMAP 0228 Step 001 on page ISOLATE-15.
D	**Console Message** (Sense data is NOT available)	IMAP 0205 Step 001 on page ISOLATE-2.
E	**Status Pending LED** is lit continuously on the storage control (3880 only).	IMAP 0252 Step 001 on page ISOLATE-33.
F	**Run Diagnostics**	IMAP 0215 Step 001 on page ISOLATE-8.
G	**Problem Analysis with Error Log Data**	IMAP 0240 Step 001 on page ISOLATE-24.
H	**Trouble Setting CE Mode**	IMAP 0225 Step 001 on page ISOLATE-14.
J	**Symptom Code Analysis**	IMAP 0235 Step 001 on page ISOLATE-23.

Figure 1. ISOLATE Section Entry Table

IMAP 0205: Physical Inspection

001
(From SMAP 0015 Step 001 on page START-3)
(From SMAP 0015 Step 001 on page START-3)
(From SMAP 0058 Step 004 on page START-33)
(From SMAP 0060 Step 002 on page START-34)
(From SMAP 0070 Step 002 on page START-35)
(From SMAP 0070 Step 004 on page START-35)
(From SMAP 0070 Step 008 on page START-35)
(From SMAP 0070 Step 009 on page START-36)
(From IMAP 0200 Step 003 on page ISOLATE-1)
(From IMAP 0200 Step 003 on page ISOLATE-1)
(From IMAP 0200 Step 003 on page ISOLATE-1)

Will the customer allow service at this time?
Yes **No**

002
Schedule the machine for service, then continue with Step 003 in this IMAP when the machine is available.

003
(From Step 002 in this IMAP)

1. **Locate the rear of the failing string.**

   Locate the rear of the string you are going to work on by referencing the STRING ID on the rear Unit Emergency Power Off panel of each A unit in the string. See SMAP 0030 Step 001 on page START-13 or SMAP 0045 Step 001 on page START-20.

2. **Check rear circuit breakers and protectors.**

   Check that all circuit breakers and protectors at the rear of each A unit and each B unit affected by the failure are ON. If you are not sure which B units are affected, check the circuit protectors on all B units in the string.

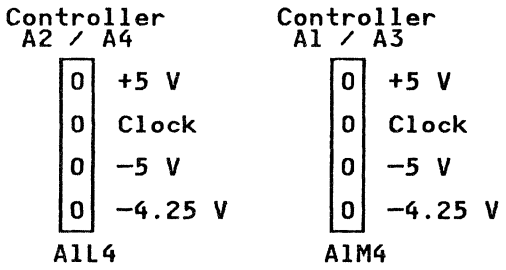
Are all circuit breakers and protectors on?
Yes **No**

004
Go to page PWR-1, Entry C, in the *MIM, Volume R10.*

(Step 005 continues)

005
Check MDA (Maintenance Device Adapter) card LEDs, A1-Board.

For each A unit in the string, remove the A1-board logic card cover and check that both controller clock LEDs and all voltage LEDs are on. When the controller clocks are running, the clock LEDs are slightly dimmer than the voltage LEDs. If a clock LED is off or is at the same brightness level as the voltage LEDs, it means that the clock is stopped.



Are all voltage LEDs on (disregard the clock LED)?
Yes **No**

006
Go to the front of the string and use the following list to check each item in each A unit in the string:

AC POWER-ON LED
Check that the AC Power-On LED located on the front Operator panel is on.

PHASE DETECTION LEDs
Check the green and red phase detection LEDs to ensure that the green LED is on and the red LED is off. The green and red phase detection LEDs are located on the primary power box at the front of the A unit.

FRONT CIRCUIT BREAKERS AND PROTECTORS
Check that all circuit breakers and protectors at the front of the machine are on.

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CONTROLLER POWER SUPPLY VOLTAGE REGULATOR CARD LEDs

Check that the two LEDs for +1.7 Vdc and the +5 Vsp on both controller power supply regulator cards are off. The +1.7 Vdc LED is yellow and the +5 Vsp is red.

The controller power supplies are located at the front lower right of the A unit (see the LOC section in the *MIM, Volume R10*).

After checking each item, refer to the following list and find the first item, from the top, that matches your findings. Go to the specified reference.

Physical Symptom	Go to page PWR-1 (*MIM, Volume R10*)
Tripped CB or CP	Entry C
Green and red phase LEDs are both off	Entry J
Red phase LED is on	Entry AM
AC Power On LED is off or dim	Entry AM
Controller power supply voltage regulator card LED(s) are on	Entry AI
None of the above	Entry AI

007

Are the clock LEDs on and dimmer than the voltage LEDs?

Yes **No**

008

Go to IMAP 0215 Step 001 on page ISOLATE-8.

009

Check A1-board gate fans. For each A unit in the string, check to ensure that the gate fans for the A1-board are running.

Are all A1-board fans running?

Yes **No**

010

Refer to page PWR-1, Entry N, in the *MIM, Volume R10* to correct the problem. After the problem is corrected, return to Step 011 in this IMAP.

011

(From Step 010 in this IMAP)

Check Controller Ready LEDs. For each A unit in the string, check that the Controller Ready LEDs (located on the rear operator panel beside the MD receptacle) are ON.

Are the Controller Ready LEDs on?

Yes **No**

012

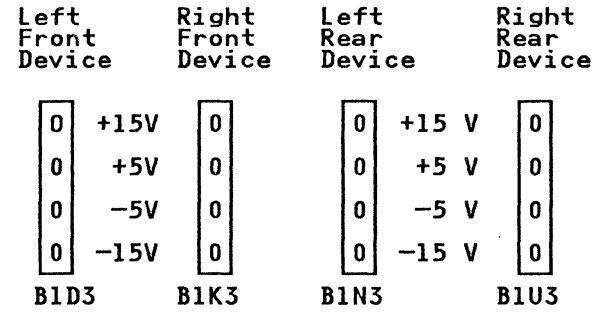
Go to IMAP 0250 Step 001 on page ISOLATE-32.

013

Check the PES/PROM card LEDs.

Remove the B1-board logic card cover of the machines that are affected by this failure and check that the four LEDs on each PES/ PROM card are on.

Note: *LEDs may appear to be dim when they are not on at all. This is due to light from the adjacent LEDs.*



(Step 013 continues)

013 (continued)
Are all PES/PROM card LEDs on?
Yes **No**

014
Go to page PWR-1, Entry AJ, in the *MIM, Volume R10.*

015
Check the B1-Board gate fans. Check to ensure that the gate fans for the B1-boards of the affected units are running.

Are all B1-board fans running?
Yes **No**

016
Refer to page PWR-1, Entry N, in the *MIM, Volume R10* to correct the problem. After the problem is corrected, return to Step 017 in this IMAP.

017
(From Step 016 in this IMAP)

Are any of the drive motors in the string running?
Yes **No**

018
Perform one of the following.

1. If you are attempting to isolate a problem where none of the drive motors start during a normal string power up sequence, go to page PWR-1, Entry L, in the *MIM, Volume R10.*

2. If you are trying to isolate a problem other than in item 1 above, go to Step 019 in this IMAP.

019
(From Step 018 in this IMAP)

Check B1-Board Power Card LEDs. While the B1-board logic card covers are removed, check that the eight LEDs on each Power card are on (see Figure 2 on page ISOLATE-5).

- If the HDA cables **are not swapped**, refer to the **left side** of Figure 2 on page ISOLATE-5 for the meaning of the LEDs on cards B1G2 and B1R2.

- If the HDA cables **are swapped**, refer to the **right side** of Figure 2 on page ISOLATE-5 for the meaning of the LEDs on cards B1G2 and B1R2.

Are all B1-Board Power Card LEDs on?
Yes **No**

020
Determine if the HDA cables are swapped. If the cables are swapped, there should be a cable swap label at the top of the B1-board gate. If so, use Figure 2 on page ISOLATE-5 to determine the meaning of the LEDs.

In the following list, find the first item (from the top) that matches your findings. Then go to the specified reference.

Physical Symptom	Reference
+5/24 Vdc or +5 Vdc Common LED off	Page PWR-1, Entry AJ (*MIM, Volume R10*)
One or more Device Ready LEDs are off	IMAP 0245 Step 001 on page ISOLATE-27
SW ENABLED LED is off	IMAP 0247 Step 001 on page ISOLATE-30
One or more Device Sequencer Status LEDs are off	IMAP 0248 Step 001 on page ISOLATE-31

021
Go to IMAP 0210 Step 001 on page ISOLATE-6.

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B1 Board LEDs - Cable Swap

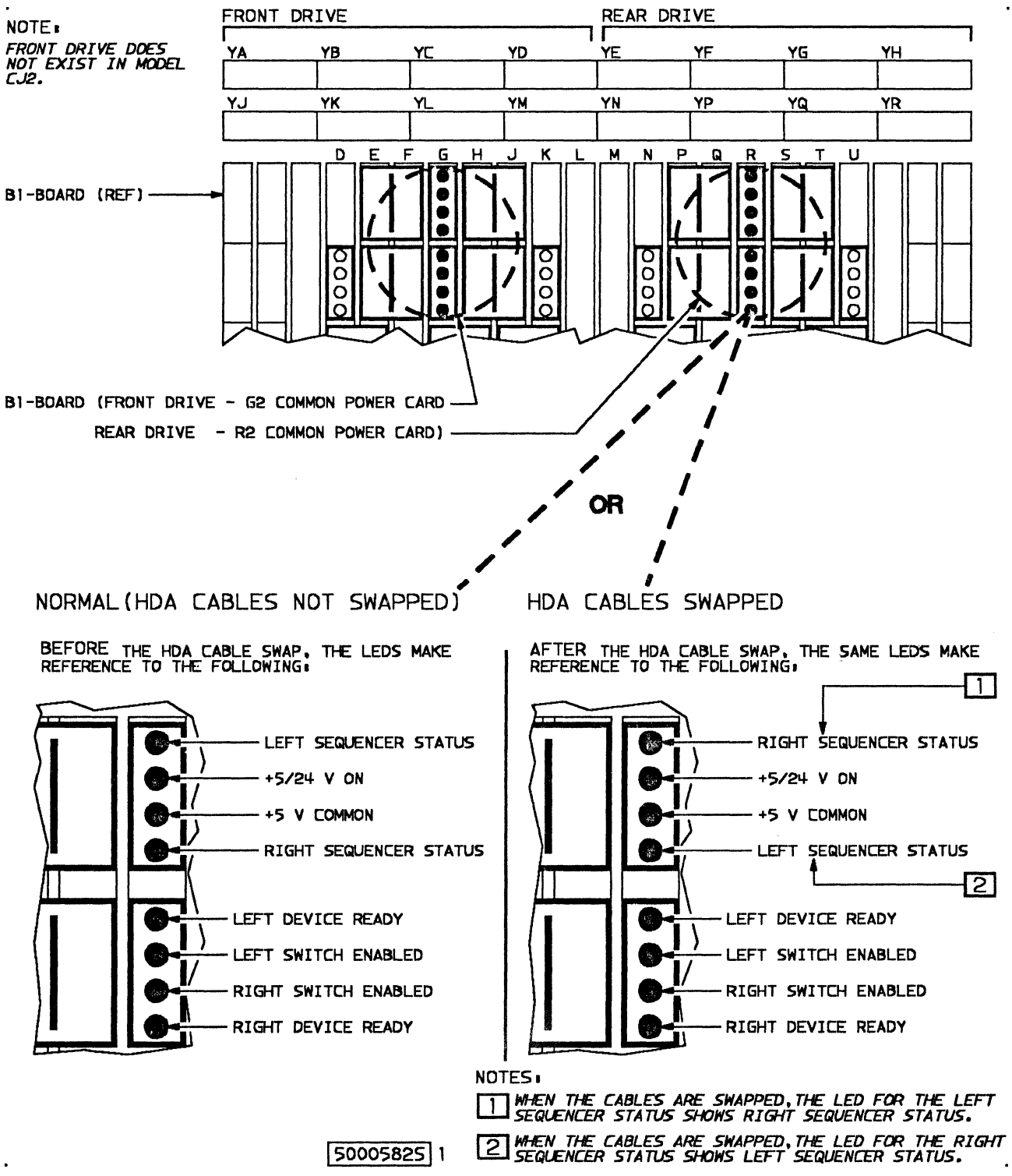

Figure 2. B1 Board LEDs

IMAP 0210: Miscellaneous Physical Symptoms

001
(From IMAP 0205 Step 021 on page ISOLATE-4)

Do you have one of the physical symptoms listed in Figure 3?
Yes **No**

002
Select an entry from the following list and go to the specified MAP:

- Sense data is available. Go to IMAP 0212 Step 001 on page ISOLATE-7.
- Console message is available and sense data is not. Go to IMAP 0255 Step 001 on page ISOLATE-34.
- Sense data and console messages are not available. Go to IMAP 0232 Step 001 on page ISOLATE-18.

003
Find the first item (from the top) in Figure 3 that matches the physical symptom. Then go to the specified reference.

Physical Symptom	Reference
Failure to power off string or controller	Page PWR-1, Entry AR (*MIM, Volume R10*)
Failure to power off device logic	Page PWR-1, Entry AR (*MIM, Volume R10*)
Failure to power off drive motor	Page PWR-1, Entry H (*MIM, Volume R10*)
Device Ready LED is on when Device Enable/Disable switch is set to Disable	Page MAP-1, Entry CE (*MIM, Volume R10*)
No power at convenience outlet	Page PWR-1, Entry AM (*MIM, Volume R10*)
Motor braking problem (Drive coasts to stop on power off)	Page PWR-1, Entry K (*MIM, Volume R10*)
Controller Ready LED not on (operator panel)	Page PWR-1, Entry BT (*MIM, Volume R10*)
Device Ready LED not on (operator panel)	Page PWR-1, Entry BS (*MIM, Volume R10*)
Status Pending LED is on continuously on the storage control (3880 only)	IMAP 0252 Step 001 on page ISOLATE-33.

Figure 3. Physical Symptom Table

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IMAP 0212: Checking For Undervoltage

001
(From IMAP 0210 Step 002 on page ISOLATE-6)

Determine if there is an undervoltage condition.

Review all sense records for the failing string. Undervoltage is determined from the symptom code (sense bytes 22 and 23) as follows:

9FFF Device Undervoltage
DFFF Controller Undervoltage
EFF0 Device Undervoltage
EFFF Controller Undervoltage

Is there an undervoltage condition?
Yes **No**

002
Go to IMAP 0215 Step 001 on page ISOLATE-8.

003
Check the device and controller voltages and ripple.

Do the procedures referenced by page PWR-1, Entry A in the *MIM, Volume R10* and then return here.

Are the voltages and ripple OK?
Yes **No**

004
Repair or replace FRUs as directed by the procedures in the PWR MAPs.

Then go to RMAP 0320 Step 001 on page REPAIR-8to run diagnostics.

005
Go to IMAP 0215 Step 001 on page ISOLATE-8.

IMAP 0215: Running Diagnostics

001
(From IMAP 0200 Step 003 on page ISOLATE-1)
(From IMAP 0205 Step 008 on page ISOLATE-3)
(From IMAP 0212 Step 002 on page ISOLATE-7)
(From IMAP 0212 Step 005 on page ISOLATE-7)
(From IMAP 0232 Step 002 on page ISOLATE-18)
(From IMAP 0233 Step 011 on page ISOLATE-22)
(From IMAP 0252 Step 001 on page ISOLATE-33)

Perform the following steps:

1. Attach and prepare the MD. See page MD-4 for directions.

   Warning: Never power the MD on or off with the diskette inserted.

2. Ensure that the storage control is powered on and has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

3. Determine if the controller is the probable failing unit. The probable failing unit is the controller if one of the following conditions exist:

   - EREP Symptom Code Summary report indicates probable failing unit: "Controller" or "Storage Control Unit."
   - Highest priority symptom code (sense bytes 22 and 23) is Dxxx.
   - Clock LED is off or is as bright as the voltage LEDs.

Does one of these conditions exist?
Yes **No**

002
Go to IMAP 0220 Step 001 on page ISOLATE-12.

003
Go to IMAP 0218 Step 001 on page ISOLATE-9.

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IMAP 0218: Controller Diagnostics

001
(From IMAP 0215 Step 003 on page ISOLATE-8)

The controller tests can be run in-line with customer operations on the controller. Therefore, controller paths and devices do not need to be varied off line.

Run the Controller tests:

1. From the MD Main Menu, select option 1 (RUN DIAGNOSTICS).
2. From the Diagnostic Menu, select option 1 (RUN CONTROLLER TESTS).

See page MD-12 for directions.

Did the controller diagnostics run to normal end without an error?

Yes **No**

002
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

Answer questions and follow instructions given by the MD. If you are asked "DO YOU WANT TO RUN CONNECTION TESTS?" you are advised to answer "YES." The connection tests provide better isolation.

The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS ?"

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

(Step 003 continues)

003
Some configurations do not use the DPS cards. The DPS cards are used when the string is attached to a 3880, but they are not used when the string is attached to a 3990.

Is the string attached to a 3880?

Yes **No**

004
Go to Step 007 in this IMAP.

005
To completely test the DPS function run the extended DPS tests. The extended DPS tests check the correct interaction of DPS on both controllers (A1 and A2). These tests can be run inline with customer operations on both controllers. Therefore, controller paths and devices do not need to be varied offline.

Run the extended DPS tests:

1. Press the PF key to return to the MD Main menu.
2. From the MD Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostic menu, select option 2 (EXTENDED DPS TESTS).

See page MD-13 for more complete directions.

Did the extended DPS tests run to normal end without an error?

Yes **No**

006
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

(Step 006 continues)

006 (continued)
Go to RMAP 0300 Step 001 on page REPAIR-2.

007
(From Step 004 in this IMAP)

To completely test controller operation, run device tests on one or more devices.

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE mode for the devices to be tested:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 0 (SET/RESET CE MODE).
3. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?

Yes **No**

008
Go to IMAP 0225 Step 001 on page ISOLATE-14.

(Step 009 continues)

009
Run the device tests:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 3 (DEVICE TESTS).

See page MD-10 for directions.

Did the device tests run to normal end without an error?

Yes **No**

010
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

011
Do you have SENSE data from EREP or the system console for the original failure?

Yes **No**

012
Go to IMAP 0240 Step 001 on page ISOLATE-24.

013
Using Figure 4, find the highest priority symptom code group identified in the START section.

Go to the MAP step, MLX entry, or maintenance procedure indicated.

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Symptom Code Groups	Go To
9xxx, Dxxx, or Exxx (controller or device equipment checks)	IMAP 0235 Step 001 on page ISOLATE-23
4xxx (data check)	Page MAP-1, Entry EB, in the *MIM, Volume R10.*
0xxx, 2xxx, 3xxx, or Fxxx (storage control errors)	The storage control maintenance package, MLX entry 6
1xxx, 6xxx, 7xxx, or 8xxx	The 3380 Stage 2 maintenance package
Axxx, Bxxx, or Cxxx	The 3380-DE maintenance package

Figure 4. Symptom Code Groups

IMAP 0220: Normal Sequence Diagnostics

001
(From IMAP 0215 Step 002 on page ISOLATE-8)
(From IMAP 0232 Step 011 on page ISOLATE-19)
(From IMAP 0247 Step 002 on page ISOLATE-30)

Determine which devices to test.

If a device sequence status LED is off, use that device to test. Otherwise, the failing device can usually be determined from the Physical Address Column of the EREP DASD Symptom Code Summary or from Sense byte 4 unless the symptom code is EBxx.

If the symptom code is EBxx, it may be necessary to run diagnostics on each device on the failing port to determine which device is failing. See SMAP 0057 Step 001 on page START-32for additional information.

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

002
Go to IMAP 0225 Step 001 on page ISOLATE-14.

003
(From Step 005 in this IMAP)

Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

004
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

005
Run the Normal Sequence diagnostics on other controllers.

If the failing path is not known and any of the other controllers have not been tested, go to Step 003 in this IMAP. Repeat the normal sequence tests with another controller (if possible) and on other devices.

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005 (continued)
- or -
If all controllers (or all that can be) have been tested, go to Step 006 in this IMAP.

006
(From Step 005 in this IMAP)

Some configurations do not use the DPS cards. The DPS cards are used when the string is attached to a 3880, but they are not used when the string is attached to a 3990.

Is the string attached to a 3880?
Yes **No**

007
Go to Step 010 in this IMAP.

008
To completely test the DPS function, it is necessary to run the extended DPS tests. The extended DPS tests check the interaction of DPS on both controllers (A1 and A2). These tests can be run inline with customer operations on both controllers. Therefore, controller paths and devices do not need to be varied offline.

Run the Extended DPS Tests:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostic menu, select option 2 (EXTENDED DPS TESTS).

See page MD-13 for directions.

Did the Extended DPS Tests run to normal end without an error?
Yes **No**

009
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

010
(From Step 007 in this IMAP)

Do you have SENSE data available from the original failure?
Yes **No**

011
Go to IMAP 0240 Step 001 on page ISOLATE-24.

012
Go to IMAP 0235 Step 001 on page ISOLATE-23.

IMAP 0225: Trouble Setting CE Mode

001

(From IMAP 0200 Step 003 on page ISOLATE-1)
(From IMAP 0218 Step 008 on page ISOLATE-10)
(From IMAP 0220 Step 002 on page ISOLATE-12)
(From IMAP 0230 Step 002 on page ISOLATE-16)
(From IMAP 0232 Step 004 on page ISOLATE-18)
(From IMAP 0245 Step 014 on page ISOLATE-28)
(From IMAP 0248 Step 004 on page ISOLATE-31)
(From IMAP 0260 Step 011 on page ISOLATE-36)
(From IMAP 0265 Step 013 on page ISOLATE-39)
(From IMAP 0270 Step 012 on page ISOLATE-43)
(From IMAP 0275 Step 004 on page ISOLATE-46)
(From IMAP 0280 Step 004 on page ISOLATE-49)
(From IMAP 0285 Step 004 on page ISOLATE-51)
(From IMAP 0290 Step 004 on page ISOLATE-53)
(From RMAP 0320 Step 006 on page REPAIR-8)

The Set/Reset CE Mode diagnostic may not run if certain errors are present in the storage control, controller, or control interface. If the diagnostic does not run, CE mode for the specified devices does not change and the MD displays an error message. See "Isolation Code Error Display" on page MD-36.

Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

If the MD reports a 00xx isolation code and suggests that you run the connection tests, run them if possible. The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS ?"

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

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IMAP 0228: Undervoltage With Data Checks

001
(From SMAP 0058 Step 005 on page START-33)
(From SMAP 0060 Step 003 on page START-34)
(From IMAP 0200 Step 003 on page ISOLATE-1)

Determine if there is an undervoltage condition.

Examine all 4XYY symptom codes to determine if there is an undervoltage condition as follows:

YY, Bit 4 = Device Undervoltage
YY, Bit 5 = Controller Undervoltage

Is there a symptom code that indicates undervoltage?
Yes **No**

002
Go to IMAP 0230 Step 001 on page ISOLATE-16.

003
Check the Device and Controller voltages and ripple.

Do the procedures referenced by page PWR-1, Entry A, in the *MIM, Volume R10*, and then return here.

Are the voltages and ripple OK?
Yes **No**

004
Repair or replace FRUs as directed by the procedures in the PWR section MAPs (see the *MIM, Volume R10*).

Go to RMAP 0320 Step 001 on page REPAIR-8 to run diagnostics.

005
Go to IMAP 0230 Step 001 on page ISOLATE-16.

IMAP 0230: Diagnostics for Data Checks

001
(From SMAP 0053 Step 002 on page START-29)
(From IMAP 0228 Step 002 on page ISOLATE-15)
(From IMAP 0228 Step 005 on page ISOLATE-15)

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

002
Go to IMAP 0225 Step 001 on page ISOLATE-14.

003
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the MD Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

004
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

005
Repeat the Normal Sequence diagnostics on other controllers.

If the failing path is not known and other controllers have not been tested, repeat the normal sequence tests with other controllers until all the controllers (or all that can be) have been tested.

Did the diagnostics run to normal end without error with all controllers?
Yes **No**

006
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

(Step 007 continues)

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007

Is sense data available?

Yes **No**

008

Go to page MAP-1, Entry EB, in the *MIM, Volume R10*.

009

Go to IMAP 0235 Step 001 on page ISOLATE-23.

IMAP 0232: Determine the Failing Devices and Controllers with the Device Status Test

001
(From IMAP 0210 Step 002 on page ISOLATE-6)
(From MD 0050 Step 002 on page MD-50)
(From MD 0051 Step 016 on page MD-54)

Do you need help to determine which devices and controllers are failing?
Yes **No**

002
Go to IMAP 0215 Step 001 on page ISOLATE-8.

003
The following procedure uses the Device Status test to determine the failing paths and devices.

The Device Status test selects each device in the string and performs a Read Home Address operation. The Device Status test runs inline with customer operation. Devices do not need to be varied offline or placed in CE mode unless there are no channels enabled to the storage path. See "Diagnostic Menu Option 7 - Device Status" on page MD-25 for additional information.

Run the Device Status test:

1. Attach and IML the MD to one of the A units in the failing string. See page MD-4 for directions.

   Warning: Never power the MD on or off with the diskette inserted.

2. Ensure that the storage control is powered on and has completed its initial microcode load (IML) and that the functional diskette for the 3380-JK is installed.

3. Check the channel enable/disable switches at each attached storage control.

Is there at least one channel enabled on the attached storage control?
Yes **No**

(Step 004 continues)

004
CE mode must be set before running the Device Status test.

Set CE mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

After CE mode is set, go to Step 005 in this IMAP.
- or -
If CE mode does not set, go to IMAP 0225 Step 001 on page ISOLATE-14.

005
(From Steps 004 and 007 in this IMAP)

Continue to run the Device Status Test:

1. From the MD Main menu, select option 1 (RUN DIAGNOSTICS).
2. From the Diagnostic menu, select option 7 (DEVICE STATUS TEST).

The test should run until an error occurs or until configuration data is displayed.

See page MD-25 for directions.

Did the test display configuration data?
Yes **No**

006
The test stopped with an isolation code displayed.

Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group or list of action items.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

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006 (continued)
Go to RMAP 0300 Step 001 on page REPAIR-2.

007
Review the configuration data to ensure that it is correct. See page MD-27 for 3990 Configuration data; see page MD-26 for 3880 Configuration data.

If the configuration data is not correct or you are not sure, If the configuration data is not correct or you are not sure, perform an analysis as instructed by the MD. Correct any problems. If there were any problems, rerun the Device Status test, then return here.

Record the device status for each device. See "Device Status" on page MD-29.

Repeat the test on each controller. Start at Step 005 in this IMAP on a 4-path (4 controllers) subsystem. You will have to move the MD plug to the other A unit in the string to run the Device Status Test with the controllers in that A unit. Operational devices should report a status of "O." A status of "N" will be reported for devices that are not attached.

Did any attached devices report a status other than "O" through any controller?

Yes **No**

008
To determine which devices and paths are failing, use the error log.

Go to IMAP 0233 Step 001 on page ISOLATE-20.

009
Did any devices report a status of "D," "E," or "I"?

Yes **No**

010
Devices reporting a status of "B" or "S" are busy. This may occur if the Device Status test is run during periods of heavy usage. It is usually a good indication that the device is operational. However, you may want to rerun the test to ensure that these devices are operational.

To determine which devices and paths are failing, use the error log.

Go to IMAP 0233 Step 001 on page ISOLATE-20.

011
Record the devices that report a status of "D," "E" or "I". These are failing devices.

Select one of these devices and failing paths to run diagnostics. Then go to IMAP 0220 Step 001 on page ISOLATE-12.

IMAP 0233: Determine the Failing Devices and Controllers with the Error Log

001
(From IMAP 0232 Step 008 on page ISOLATE-19)
(From IMAP 0232 Step 010 on page ISOLATE-19)

The error log is collected and maintained by the storage control. The error log is an equipment check log. Data checks are not included unless the error log mask is changed to include them.

There is an error log for each controller.

Each error log contains a maximum of 16 entries for errors that occurred on the string when using the controller. Each entry contains 32 bytes (24 sense bytes and 8 bytes of additional information).

Each error log entry contains a counter. If an error occurs that is the same as the previous error (same controller and symptom code for format 7, or same controller, device, and symptom code for formats 1, 8, and 9) the counter in the last entry is updated and a new log entry is not generated.

The error log may be transferred to the MD and then searched, based on search parameters entered on the MD. The error logs for all controllers can be transferred to the MD and then merged together into one error log. The merged error log can then be searched for errors on any device and any controller.

The error log is accessed by an inline diagnostic routine that runs in the storage control under control of the MD. Devices need not be in CE mode.

Is the MD already attached and loaded?
Yes **No**

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

(Step 002 continues)

002 (continued)
Ensure that the storage control you are going to use is powered on and has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Go to Step 003 in this IMAP.

003
(From MD 0050 Step 002 on page MD-50)
(From Steps 002 and 005 in this IMAP)

Warning: If the MD diskette is from another string, all logs must be transferred before searching any of the logs. Otherwise, the results of the search will be unpredictable.

Use the transfer log function to collect error information from the error logs:

1. From the MD Main menu, select option 2 (ERROR LOG FUNCTION).
2. From the Error Log Function menu, select option 1 (TRANSFER LOG).
3. Specify your choice for the controller.

During the transfer, the most recent entry is first and the oldest entry is last. When the transfer is complete, the log can be searched or merged with other transferred logs.

The transfer uses a diagnostic program that runs in the storage control. Some problems with the storage control, with the controller, or with the control interface (DDC) do not allow the diagnostic to run. The error log is not transferred, and the MD displays a diagnostic error message.

Was the transfer completed without a diagnostic error message?
Yes **No**

004
Press ENTER to begin analysis in the MD.

Note: *See "Isolation Code Error Display" on page MD-36.*

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004 (continued)
When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR pages to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

005
The error log for the selected controller was written on the MD diskette during the transfer. The error log in the storage control is not reset.

Transfer error logs for all other controllers:.

1. From the MD Main Menu, select option 2 (ERROR LOG FUNCTION).
2. From the Error Log Function menu, select option 1 (TRANSFER LOG)
3. Specify your choice for the controller.

Repeat Step 003 in this IMAP for the other controllers.

If the string is a 4-path string, move the MD plug to the other A unit in the string and repeat Step 003 in this IMAP for both controllers in the other A unit.

Search transferred logs.

The error log can now be searched using option 2 of the error log function menu. For instructions, see "Search Log (Option 2)" on page LOG-5.

Alternatively, a merge (option 3) can be done with other transferred error logs and a search done on the merged error logs. For instructions, see "Merge Log (Option 3)" on page LOG-8.

If the string is attached to a 3990 Storage Control, merge the error logs just transferred using Error Log Function Menu option 3. Error log entries for all specified logs are merged in chronological order. Records in the merged log can then be searched and displayed without searching each individual log.

Display each entry in each log transferred or in the merged log using Error Log Function Menu option 2 (Search Log Function). Specify ALL records. The most recent entries are displayed first. For instructions, see "Search Log (Option 2)" on page LOG-5.

Record each symptom code, device address, controller, and age, for the errors that occurred since the customer started having problems. If the age is not known because the error log came from a 3880 Storage Control, it is difficult to determine which records are associated with the problem.

If possible, obtain information from the customer about the nature and frequency of the problem. This information, combined with your knowledge of the devices in this account, can sometimes be used to determine which records are associated with the problem. The most recent entry in the log is labeled ENT=01; the last entry in the log is the oldest.

Are there any entries in the transferred logs?
Yes **No**

006
Have the customer run EREP.

An EREP report will be required to determine failing devices and controllers. Ask the customer to run the EREP Exception reports.

Then go to SMAP 0020 Step 001 on page START-8.

007
Prioritize the errors in the log using the following procedure.

Note: *All undervoltage problems should be resolved before attempting resolve other problems.*

Review the system codes for the following undervoltage conditions:

DFFF Controller undervoltage
EFFF Controller undervoltage
EFF0 Device undervoltage
9FFF Device undervoltage

(Step 007 continues)

007 (continued)
Do you have one of these symptom codes?
Yes **No**

008
All symptom codes associated with the string of drives should be considered.

1. Determine the highest priority symptom code group from the following list:

   - Dxxx (except low priority SCs)
   - Exxx
   - Low priority symptom codes:
     DFx3 DFx9 DFxC
     DFx5 DFxA DFxD
     DFx8 DFxB
   - 9xxx

2. Determine the highest priority symptom code within the selected group. Select the symptom code that occurs most often or has the highest count.

3. Determine which Devices and Controller paths are reporting the selected symptom code from the information previously recorded.

Go to Step 011 in this IMAP.

009
Check the Device and Controller voltages and ripple. See page PWR-1, Entry A, in the *MIM, Volume R10*.

Are the voltages and ripple OK?
Yes **No**

010
Repair or replace FRUs as directed by the procedures in the PWR section MAPs (see the *MIM, Volume R10*).

Next, go to RMAP 0320 Step 001 on page REPAIR-8 to run diagnostics.

011
(From Step 008 in this IMAP)

(Step 011 continues)

011 (continued)
The procedure in IMAP 0215 Step 001 on page ISOLATE-8uses device diagnostics to help isolate the problem.

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IMAP 0235: Symptom Code Analysis

001
(From IMAP 0200 Step 003 on page ISOLATE-1)
(From Page ISOLATE-11)
(From IMAP 0220 Step 012 on page ISOLATE-13)
(From IMAP 0230 Step 009 on page ISOLATE-17)
(From IMAP 0240 Step 006 on page ISOLATE-25)
(From IMAP 0245 Step 023 on page ISOLATE-29)
(From IMAP 0250 Step 007 on page ISOLATE-32)
(From IMAP 0280 Step 009 on page ISOLATE-50)
(From IMAP 0285 Step 009 on page ISOLATE-52)
(From IMAP 0290 Step 009 on page ISOLATE-54)

Use the MD to determine the probable failing FRUs:

If you already have the FRU list, go to step 5 in the following procedure.

1. Press the PF key to return to the MD Main menu.

2. From the Main menu, select option 3 (ANALYZE SYMPTOM CODE).

3. In response to the prompt, enter the highest priority symptom code. This code should have been previously determined in the START procedures. See "Analyze Symptom Code (Main Menu Option 3)" on page MD-37 for directions on entering symptom codes.

4. Answer all questions and perform all steps requested by the MD until a FRU list is displayed. If the MD asks for additional sense information, entering the requested sense bytes will provide the smallest possible FRU list. If the sense bytes are not available, bypass the step by pressing the enter key.

5. **Perform actions indicated by the MD.** When replacing FRUs, use the following guidelines:

   - On the first call, replace all FRUs in the primary FRU list.

   - On a repeat call, replace all FRUs in the secondary FRU list. If there is a MAP indicated by the MD, go to the MAP to determine any additional actions.

   - If the HDA is suspected, the HDA cable swap procedure should be performed to help isolate the problem if there is another repeat call. See page CARR-1, Entry Q, in the *MIM, Volume R10.*

   - On a second repeat call, perform all additional action items.

Go to RMAP 0300 Step 001 on page REPAIR-2 to replace the recommended FRUs.

IMAP 0240: Problem Analysis With Error Log Data

001
(From IMAP 0200 Step 003 on page ISOLATE-1)
(From IMAP 0218 Step 012 on page ISOLATE-10)
(From IMAP 0220 Step 011 on page ISOLATE-13)
(From IMAP 0250 Step 006 on page ISOLATE-32)
(From IMAP 0265 Step 016 on page ISOLATE-40)
(From IMAP 0270 Step 016 on page ISOLATE-44)
(From IMAP 0270 Step 017 on page ISOLATE-44)
(From IMAP 0275 Step 009 on page ISOLATE-47)
(From IMAP 0280 Step 008 on page ISOLATE-50)
(From IMAP 0285 Step 008 on page ISOLATE-52)
(From IMAP 0290 Step 008 on page ISOLATE-54)
(From RMAP 0340 Step 003 on page REPAIR-13)

The error log is collected and maintained by the storage control. The error log is an equipment check log. Data checks are not included unless the error log mask is changed to include them.

There is an error log for each controller.

Each error log contains a maximum of 16 entries for errors that occurred on the string when using the controller. Each entry contains 32 bytes (24 sense bytes and 8 bytes of additional information).

Each error log entry contains a counter. If an error occurs that is the same as the previous error (same controller and symptom code for format 7, or same controller, device, and symptom code for formats 1, 8, and 9) the counter in the last entry is updated and a new log entry is not generated.

When attached to a 3990 storage control, each error log entry contains the age of the entry in hours. When attached to a 3380 storage control, age is not provided.

The error log may be transferred to the MD and then searched, based on search parameters entered on the MD. The error logs for all controllers can be transferred to the MD and then merged together into one error log. The merged error log can then be searched for errors on any device and any controller.

The error log is accessed by an inline diagnostic routine that runs in the storage control under control of the MD. Devices need not be in CE mode.

Is the MD already attached and loaded?
Yes **No**

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on and has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Go to Step 003 in this IMAP.

003
(From Steps 002 and 005 in this IMAP)

Warning: If the MD diskette is from another string, all logs must be transferred before searching any of the logs. Otherwise, the results of the search will be unpredictable.

If not already done, use the transfer log function to collect error information from the error logs:

1. From the MD Main menu, select option 2 (ERROR LOG FUNCTION).
2. From the Error Log Function menu, select option 1 (TRANSFER LOG).
3. Specify your choice for the controller.

If the error log has already been transferred, go to Step 005 in this IMAP.

During the transfer, the most recent entry is first and the oldest entry is last. When the transfer is complete, the log can be searched or merged with other logs that have been transferred.

The transfer uses a diagnostic program that runs in the storage control. Some problems with the storage control, with the controller, or with the

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control interface (DDC) do not allow the diagnostic to run. The error log is not transferred, and the MD displays a diagnostic error message.

Was the transfer completed without a diagnostic error message?

Yes **No**

004

Press ENTER to begin analysis in the MD.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR pages to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

005

(From Step 003 in this IMAP)

The error log for the selected controller was written on the MD diskette during the transfer. The error log in the storage control is not reset. Perform the following steps:

1. Repeat Step 003 in this IMAP for the other controller in the A unit.

2. If the string is a 4-path string, move the MD plug to the other A Unit in the string and repeat Step 003 in this IMAP for the controllers in that A Unit.

3. The error log can now be searched using option 2 of the error log function menu or a merge (option 3) can be done with other transferred error logs and a search done on the merged error logs.

   See "Search Log (Option 2)" on page LOG-5.

Were error log entries found?

Yes **No**

006

An EREP report or a system console message with sense data is needed for analysis. When sense data is available, go to IMAP 0235 Step 001 on page ISOLATE-23.

Before returning the machine to the customer, perform the End of Call procedure.

Go to RMAP 0350 Step 001 on page REPAIR-15.

007

A summary of each log entry is displayed.

Select a symptom code for analysis.

Review all entries before selecting an entry for analysis.

1. Record each symptom code, device address, controller, and age, for the errors that occurred since the customer started having problems. If the age is not known because the error log came from a 3880 Storage Control, it is difficult to determine which records are associated with the problem.

   If possible, obtain information from the customer about the nature and frequency of the problem. This information combined with your knowledge of the devices in this account, can sometimes be used to determine which records are associated with the problem.

   The most recent entry in the log is labeled ENT=01; the last entry in the log is the oldest.

2. **Use the following guidelines to prioritize the failures:**

   - Resolve undervoltage conditions first:

     DFFF Controller undervoltage
     EFFF Controller undervoltage
     EFF0 Device undervoltage
     9FFF Device undervoltage

     Note: *All undervoltage problems should be resolved before attempting resolve other problems.*

   - If there are multiple symptom codes and no undervoltage symptom codes, determine the highest priority symptom code group from the following list:

- Dxxx (except low priority SCs)
- Exxx
- Low priority symptom codes:
  DFx3 DFx9 DFxC
  DFx5 DFxA DFxD
  DFx8 DFxB
- 9xxx

  - If there are multiple symptoms within the selected group, select the symptom code that occurs most or has the highest count.

3. After each error display, the search function allows you to analyze the error by entering "A." If "A" (Analyze the Error) is chosen, the 24 sense bytes are displayed, then analysis is done on the error.

Follow directions from the MD until a FRU group is displayed. When replacing FRUs, use the following guidelines:

- On the first call, replace all FRUs in the primary FRU list.

- On a repeat call, replace all FRUs in the secondary FRU list. If there is a MAP indicated by the MD, go to the MAP to determine any additional actions.

- If the HDA is suspected, the HDA cable swap procedure should be performed to help isolate the problem if there is another repeat call. See page CARR-1, Entry Q, in the *MIM, Volume R10*.

- On a second repeat call, perform all additional action items.

Go to RMAP 0300 Step 001 on page REPAIR-2 to replace the recommended FRUs.

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IMAP 0245: Device Not Ready

001
(From IMAP 0205 Step 020 on page ISOLATE-4)
(From IMAP 0248 Step 002 on page ISOLATE-31)

Device not ready is indicated when a Device Ready light on the operator panel is off.

A Device Ready light is off when one or more of the following conditions are present:

- The drive associated with the device is powered off or did not power on.
- The device is powered off.
- The device logic is disabled.
- The ENABLE/DISABLE switch associated with the device is in the DISABLE position.
- There is a device Check 1.
- There is a device Check 2.
- A hardware fault in the device dropped Online. (Online is indicated in sense format 1 or 8, sense byte 19, bit 4.)
- There is a hardware fault in the servo system.

Check the Enable/Disable switch (on the operator panel) for the not ready device to verify that the switch is in the Enable position.

Is the switch in the Enable position?
Yes **No**

002
Set the switch to the Enable position.

If the device becomes ready, go to Step 011 in this IMAP.
- or -
Otherwise, go to Step 003 in this IMAP.

003
(From Step 002 in this IMAP)

Inspect the HDA access mechanism lock for the device that is not ready. See page CARR-1, Entry AB, in the *MIM, Volume R10*.

(Step 003 continues)

003 (continued)
Is the lock in the unlocked position?
Yes **No**

004
Perform the following steps:

1. Unlock the access mechanism lock.

2. Set the actuator logic switch for the failing device to the Disable position, then back to the Enable position. See page REPAIR-27.

3. The device should come ready within 10 seconds.

If the device becomes ready, go to Step 011 in this IMAP.
- or -
Otherwise, go to Step 005 in this IMAP.

005
(From Step 004 in this IMAP)

Check the status of the drive (running or stopped).
Is the drive stopped?
Yes **No**

006
Go to Step 011 in this IMAP.

007

Does the drive belt appear to be in good condition and in the correct position on the pulleys?
Yes **No**

008
Replace the belt. See page CARR-1, Entry E, in the *MIM, Volume R10* for the procedure.

If this corrects the Device Not Ready problem, go to RMAP 0320 Step 001 on page REPAIR-8.
- or -
Otherwise, go to Step 009 in this IMAP.

009
(From Step 008 in this IMAP)

Check the fit of the drive belt cover to the belt cover switch.

Does the belt cover switch appear to be correctly operating?
Yes **No**

010
Correct the problem with the belt cover switch.

If this corrects the Device Not Ready problem, go to RMAP 0320 Step 001 on page REPAIR-8.
- or -
Otherwise, go to Step 011 in this IMAP.

011
(From Steps 002, 004, 006, and 010 in this IMAP)

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

012
(Step 012 continues)

012 (continued)
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 013 in this IMAP.

013
(From Step 012 in this IMAP)

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

014
Go to IMAP 0225 Step 001 on page ISOLATE-14.

015
(From Step 018 in this IMAP)

Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

(Step 015 continues)

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015 (continued)
Did the diagnostics run to normal end without an error?

Yes **No**

016
Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR pages to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

017
Has the failing device been tested with all controllers?

Yes **No**

018
Go to Step 015 in this IMAP and repeat the normal sequence tests with all controllers.

019
Is the Device Ready LED on now?

Yes **No**

020
Use the PWR section MAPs in the *MIM, Volume R10* to isolate the problem.

Go to page PWR-1, Entry BS, in the *MIM, Volume R10*.

021
Is sense data available from the system (EREP, console, ICKDSF, etc.)?

Yes **No**

022
It is not unusual for device ready LEDs to go off during long periods of non-operation. This may be due to a loss of track following. If this happens, using the device will cause the storage control to rezero the actuator. This will bring the device back to the ready state.

022 (continued)
If this is of concern, replace the Sequencer/Servo/RPS card and Servo Power Amplifier card for the affected actuator.

Next, go to RMAP 0300 Step 001 on page REPAIR-2.
- or -
Otherwise, go to RMAP 0350 Step 001 on page REPAIR-15.

023
Go to IMAP 0235 Step 001 on page ISOLATE-23.

IMAP 0247: Device Switch Enabled LED Off

001
(From IMAP 0205 Step 020 on page ISOLATE-4)

Check the front of the A unit to ensure that the suspect device Enable/Disable switch is in the Enable position.

Is the switch in the Enable position?
Yes **No**

002
Switch to Enable, then go to IMAP 0220 Step 001 on page ISOLATE-12 to run diagnostics.

003
Go to page MAP-1, Entry CE, in the *MIM, Volume R10.*

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IMAP 0248: Device Sequencer Status LED Off

001
(From IMAP 0205 Step 020 on page ISOLATE-4)

The Device Sequencer Status LED should not be used to isolate a problem if the Device Ready LED is off.

Is the Device Ready LED on?
Yes **No**

002
If the device ready LED is off, go to IMAP 0245 Step 001 on page ISOLATE-27.

003
The Device Sequencer Status LED should normally be on when the device is ready. However, there are certain problems with the hardware that can cause the Device Sequencer Status LED to turn off and stay off until power is turned off, then on again.

Run diagnostics on the failing device using the following procedure:

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.
Did CE mode set OK for all the devices specified?
Yes **No**

004
Go to IMAP 0225 Step 001 on page ISOLATE-14.

005
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

006
Press the ENTER key on the MD to analyze the error and to obtain a FRU group. When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

007
Replace the following logic cards for the failing device:

PES/PROM card
Power card
Sequencer/Servo/RPS card

Go to RMAP 0300 Step 001 on page REPAIR-2 and follow the directions in the repair procedures.

IMAP 0250: Controller Not Ready

001
(From IMAP 0205 Step 012 on page ISOLATE-3)

Controller not ready is indicated when a Controller Ready light on the operator panel is off. A Controller Ready light is off when:

- The controller is powered off.
- There is a Controller Check 1.
- The controller is "fenced" from the DDC interface.

Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on and has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Run the Controller tests on the failing controller:

1. From the MD Main menu, select option 1 (RUN DIAGNOSTICS).
2. From the Diagnostic menu, select option 1 (RUN CONTROLLER TESTS)

See page MD-12 for more complete directions.

Did the Controller diagnostics run to normal end without an error?
Yes **No**

002
Press the ENTER key to analyze the error and to obtain a FRU list.

Answer questions and follow instructions given by the MD. If you are asked "DO YOU WANT TO RUN CONNECTION TESTS?" you are advised to answer "YES." The connection tests provide better isolation.

The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS ?"

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

003
Is the Controller Ready light on now?
Yes **No**

004
Use the PWR section in the *MIM, Volume R10* to isolate the problem.

Go to page PWR-1, Entry BT, in the *MIM, Volume R10*.

005
Is sense data available from the system (EREP, console, ICKDSF, etc.)?
Yes **No**

006
Go to IMAP 0240 Step 001 on page ISOLATE-24.

007
Go to IMAP 0235 Step 001 on page ISOLATE-23.

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IMAP 0252: Status Pending LED Is On Continuously

001
(From IMAP 0200 Step 003 on page ISOLATE-1)
(From Page ISOLATE-6)

The 3880 status pending light is turned on when the channel fails to respond to one of the following conditions:

- The 3880 has retry reconnection status to present to the channel.
- Ending status has been presented, but was stacked.
- A contingent connection exists for one device (unit check was presented to the channel, but the channel failed to return a sense command).

Status pending must be reset before diagnostics can be run. Perform the following steps:

1. Refer to the 3880 maintenance package to reset the status pending condition. See page MLX-3, Exit 7.
2. After the status pending condition is reset, go to IMAP 0215 Step 001 on page ISOLATE-8.

IMAP 0255: Console Messages

001
(From IMAP 0210 Step 002 on page ISOLATE-6)

Find the console message associated with your problem (refer to Figure 5) and proceed as directed.

Record the message number and the message. Find the message in the appropriate manual in the customer library. Try to determine whether the message was caused by a hardware problem, a software problem, or a microcode problem. Consult next level of support if necessary.

Console Messages	Go To
Intervention Required	IMAP 0260 Step 001 on page ISOLATE-35.
Condition Code 1	IMAP 0265 Step 001 on page ISOLATE-38.
Condition Code 3	IMAP 0270 Step 001 on page ISOLATE-42.
Missing Channel End or Device End (missing interrupt)	IMAP 0275 Step 001 on page ISOLATE-46.
Write Inhibited	IMAP 0280 Step 001 on page ISOLATE-49.
Volume Fenced from Storage Path	IMAP 0285 Step 001 on page ISOLATE-51.
Other	IMAP 0290 Step 001 on page ISOLATE-53.

Figure 5. Console Messages

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IMAP 0260: Console Message — Intervention Required

001
(From Page ISOLATE-34)

An attempt to use a device results in the Intervention Required console message if:

- The Device ENABLE/DISABLE switch on the operator panel is set to DISABLE.
- The device is in CE mode.
- The device has been powered on but has not yet become ready.
- The device is not installed.
- The device address switches are set incorrectly.

Is the Device ENABLE/DISABLE switch (operator panel) in the ENABLE position for each failing device?

Yes **No**

002
Consult the customer about the switch settings to determine customer intentions. If the switch setting was intentional, advise the customer about varying the device offline to prevent "Intervention Required" messages.

If the switch setting is not intentional, correct the problem by setting the switch to ENABLE.

Go to RMAP 0320 Step 001 on page REPAIR-8.

003
Is the MD already attached to the A unit, powered on, and ready for use?

Yes **No**

004
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 005 in this IMAP.

005
(From Step 004 in this IMAP)

Use the Review CE Mode function to determine if the failing device is in CE mode:

1. If necessary, press the PF key to return to the MD Main menu.
2. From the MD Main menu, select option R (REVIEW).
3. From the Review Option List, select option 0 (REVIEW CE MODE).
4. Follow directions from the MD.

See page MD-44 for directions.

Does the MD display the CE mode status of the devices?

Yes **No**

006
The review CE mode function uses a diagnostic program that runs in the storage control. Some problems with the storage control, the controller, or the control interface do not allow the diagnostic to run. If the diagnostic does not run, CE mode cannot be sensed and the MD displays an error message.

Press the ENTER key on the MD to analyze the error. Follow the directions from the MD.

If the MD reports a 00xx isolation code and suggests that you run the connection tests, run them if possible. The connection tests do not run inline with customer operation.

Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS?"

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

007
Is the failing device in CE mode?
Yes **No**

008
Go to Step 010 in this IMAP.

009
The problem is that the device is in CE mode.

Go to RMAP 0350 Step 001 on page REPAIR-15 to reset CE mode.

010
(From Step 008 in this IMAP)

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

011
Go to IMAP 0225 Step 001 on page ISOLATE-14.

012
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

013
Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

014
Replace the following logic cards for the failing device:

Power card
Sequencer/Servo/RPS card
Port/R-W card

Read the following note, then go to RMAP 0300 Step 001 on page REPAIR-2 and follow the directions in the repair procedures.

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Note: *If replacing these cards does not correct the problem, there could be a noisy Device Enable/Disable switch or an associated circuit problem. See page MAP-1, Entry CE, in the MIM, Volume R10 and check the switch.*

Repair or replace the switch if required, then go to RMAP 0340 Step 001 on page REPAIR-13.

IMAP 0265: Console Message — Condition Code 1

001
(From Page ISOLATE-34)

Condition Code 1 (CSW stored) is caused by any non-zero status condition in the system Channel Status Word (CSW). All Unit Check conditions (CSW bit 38) cause a Condition Code 1. Under most Unit Check conditions, sense data should be available and should be used to resolve the problem. This procedure is for those cases when a Unit Check condition occurs, but sense data is not available.

Check the CSW in the console message or in system storage for a Unit Check condition (CSW bit 38). If the failure occurred during IPL and the console is not operational, check the system main storage. The CSW is located in main storage at X"40."

Is CSW bit 38 set?
Yes **No**

002
The Condition Code 1 was probably caused by some problem that is not in the 3380-JK. The remainder of this procedure is probably not appropriate.

However, if you want to run diagnostics, continue with Step 003 in this IMAP.

003
(From Step 002 in this IMAP)

Check that the Motor switch for the failing device is ON and the Logic Enable/Disable switch is set to ENABLE.

Was the Motor switch on, and was the Logic Enable/Disable switch at ENABLE?
Yes **No**

004
Correct the switch settings and go to RMAP 0350 Step 001 on page REPAIR-15.

(Step 005 continues)

005
Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

006
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 007 in this IMAP.

007
(From Step 006 in this IMAP)

Use the Review CE Mode function to determine if the failing device is in CE mode. Directions follow.

1. If necessary, press the PF key to return to the MD Main menu.
2. From the MD Main Menu, select option R (REVIEW).
3. From the Review Option List, select option 0 (REVIEW CE MODE).
4. Follow directions from the MD.

See page MD-44 for directions.

Does the MD display the CE mode status of the devices?
Yes **No**

008
The review CE mode function uses a diagnostic program that runs in the storage control. Some problems with the storage control, with the controller, or with the control interface do not allow the diagnostic to run. If the diagnostic does not run, CE mode cannot be sensed and the MD displays

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an error message.

Correct this problem before continuing with the original problem.

Press the ENTER key on the MD to analyze the error. Follow the directions from the MD.

If the MD reports a 00xx isolation code and suggests that you run the connection tests, run them if possible. The connection tests do not run inline with customer operation.

Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS?."

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

009
Is the failing device in CE mode?
Yes **No**

010
Go to Step 012 in this IMAP.

011
The problem is that the device is in CE mode. Go to RMAP 0350 Step 001 on page REPAIR-15.

012
(From Step 010 in this IMAP)

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE mode for affected devices.

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

013
Go to IMAP 0225 Step 001 on page ISOLATE-14.

014
Run the Normal Sequence diagnostics.

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

015
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the

guided FRU replacement procedures in the REPAIR pages to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

016
Review the error logs in the Storage Control.

Review the error logs in the storage control to determine if errors are reported for the failing device. Use the procedure in IMAP 0240 Step 001 on page ISOLATE-24, then return here.

Were error log entries found for the failing device?
Yes **No**

017
Replace cards. Replace the Port/R-W card for the failing device.

Go to RMAP 0300 Step 001 on page REPAIR-2 and follow the directions in the REPAIR section.

018
Select a symptom code for analysis. Review all entries before selecting an entry for analysis.

1. Record each symptom code, device address, controller, and age, for the errors that occurred since the customer started having problems. If the age is not known because the error log came from a 3880 Storage Control, it is difficult to determine which records are associated with the problem.

   If possible, obtain information from the customer about the nature and frequency of the problem. This information, combined with your knowledge of the devices in this account, can sometimes be used to determine which records are associated with the problem.

   The most recent entry in the log is labeled ENT=01, the last entry in the log is the oldest.

2. **Use the following guidelines to prioritize the failures:**

   - Resolve undervoltage conditions first:

     DFFF Controller undervoltage
     EFFF Controller undervoltage
     EFF0 Device undervoltage
     9FFF Device undervoltage

     Note: *All undervoltage problems should be resolved before attempting to resolve other problems.*

   - If there are multiple symptom codes and no undervoltage symptom codes, determine the highest priority symptom code group from the following list:

     - Dxxx (except low priority SCs)
     - Exxx
     - Low priority symptom codes:
       DFx3 DFx9 DFxC
       DFx5 DFxA DFxD
       DFx8 DFxB
     - 9xxx

   - If there are multiple symptoms within the selected group, select the symptom code that occurs most or has the highest count.

3. After each error display, the search function allows you to analyze the error by entering "A." If "A" (Analyze the Error) is chosen, the 24 sense bytes are displayed, then analysis is done on the error.

Follow directions from the MD until a FRU group is displayed. When replacing FRUs, use the following guidelines:

- On the first call, replace all FRUs in the primary FRU list.
- On a repeat call, replace all FRUs in the secondary FRU list. If there is a MAP indicated by the MD, go to the MAP to determine any additional actions.
- If the HDA is suspected, the HDA cable swap procedure should be performed to help isolate the problem if there is another repeat call. See page CARR-1, Entry Q, in the *MIM, Volume R10.*
- On a second repeat call, perform all additional

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action items.

Go to RMAP 0300 Step 001 on page REPAIR-2 to replace the recommended FRUs.

IMAP 0270: Console Message — Condition Code 3

001
(From Page ISOLATE-34)

Condition Code 3 occurs when:

- The channel or the storage control fails to recognize its address.
- The unit control blocks (UCBs) for the string have not been generated in the operating system.
- The storage control times out waiting for the controller to respond at initial selection time.
- The controller that is addressed by the storage control during initial selection does not exist.

Has the system recently been reconfigured, or is this a new installation?
Yes **No**

002
Go to Step 005 in this IMAP.

003
Check hardware and software addressing.

1. Verify with the customer that the correct UCBs for the string have been generated in the operating system.

2. Verify that the correct unit control words (UCWs) have been generated for the channel, and that the storage control device address ranges have been set correctly.

   The storage control address range, the channel UCW range, and the operating system UCB range should all be the same.

Are the UCB, UCW, and Storage Control address ranges correct?
Yes **No**

004
Correct the problem. After the problem has been corrected, go to RMAP 0350 Step 001 on page REPAIR-15.

(Step 005 continues)

005
(From Step 002 in this IMAP)

Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

006
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 007 in this IMAP.

007
(From Steps 006 and 010 in this IMAP)

Run the Device Status Test.

Use the Device Status test to verify the switch settings on the DDC/DTB cards. For the correct switch settings, see page REPAIR-17 (2-path) or page REPAIR-18 (4-path).

1. If necessary, press the PF key to return to the MD Main menu.
2. From the MD Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostic Menu, select option 7 (DEVICE STATUS TEST).
4. Follow directions from the MD.

See page MD-25 for directions.

First, the controller tests (routine 80) run on the controller you specify. Next, the device status test (routine 96) runs.

(Step 007 continues)

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007 (continued)
Did the device status test run without the MD displaying an error?
Yes **No**

008
Analyze the Error. Press the ENTER key to analyze the error and to obtain a FRU list.

Answer questions and follow instructions given by the MD. If you are asked "DO YOU WANT TO RUN CONNECTION TESTS?," you are advised to answer "YES." The connection tests provide better isolation.

The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS ?."

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

009
Review configuration data.

Configuration data is being displayed on the MD. Review the configuration data to ensure that the string address (0 or 1) is correct. See page MD-69.

For 2-path strings:
See page REPAIR-17 to determine how to set the string address switches.

For 4-path strings:
See page REPAIR-18 to determine how to set the string address switches.

Has device status been collected through all controllers?
Yes **No**

(Step 010 continues)

010
Return to Step 007 in this IMAP and run the device status test using another controller.

Repeat until the device status has been run using all controllers.

011
Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

012
Go to IMAP 0225 Step 001 on page ISOLATE-14.

013
(From Step 016 in this IMAP)

Run the Normal Sequence diagnostics.

1. Press the PF key to return to the MD Main

menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?

Yes **No**

014

Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

015

Have all controllers in the string been tested?

Yes **No**

016

Go to Step 013 in this IMAP. Repeat the normal sequence tests with the other controller(s) and on other devices if possible. For 4-path configurations the MD plug must be moved to the other A unit in the string to test that A-unit's controllers.

Review the error logs in the Storage Control to determine if errors are reported for the failing paths and devices. Use the procedure in IMAP 0240 Step 001 on page ISOLATE-24, then return here.

017

Review the error logs in the Storage Control to determine if errors are reported for the failing paths and devices. Use the procedure in IMAP 0240 Step 001 on page ISOLATE-24, then return here.

(Step 017 continues)

017 (continued)

Were error log entries found?

Yes **No**

018

Replace the DDC/DTB card in the controller suspected of causing the condition code 3.

Go to RMAP 0300 Step 001 on page REPAIR-2 and follow the directions in the REPAIR section.

019

Select a symptom code for analysis. Review all entries before selecting an entry for analysis.

1. Record each symptom code, device address, controller, and age, for the errors that occurred since the customer started having problems. If the age is not known because the error log came from a 3880 Storage Control, it is difficult to determine which records are associated with the problem.

   If possible, obtain information from the customer about the nature and frequency of the problem. This information, combined with your knowledge of the devices in this account, can sometimes be used to determine which records are associated with the problem.

   The most recent entry in the log is labeled ENT=01, the last entry in the log is the oldest:

2. **Use the following guidelines to prioritize the failures:**

   - Resolve undervoltage conditions first:

DFFF	Controller undervoltage
EFFF	Controller undervoltage
EFF0	Device undervoltage
9FFF	Device undervoltage

     Note: *All undervoltage problems should be resolved before attempting resolve other problems.*

   - If there are multiple symptom codes and no

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undervoltage symptom codes, determine the highest priority symptom code group from the following list:

- Dxxx (except low priority SCs)
- Exxx
- Low priority symptom codes:
  DFx3 DFx9 DFxC
  DFx5 DFxA DFxD
  DFx8 DFxB
- 9xxx

- If there are multiple symptoms within the selected group, select the symptom code that occurs most or has the highest count.

3. After each error display, the search function allows you to analyze the error by entering "A." If "A" (Analyze the Error) is chosen, the 24 sense bytes are displayed, then analysis is done on the error.

Follow directions from the MD until a FRU group is displayed. When replacing FRUs, use the following guidelines:

- On the first call, replace all FRUs in the primary FRU list.

- On a repeat call, replace all FRUs in the secondary FRU list. If there is a MAP indicated by the MD, go to the MAP to determine any additional actions.

- If the HDA is suspected, the HDA cable swap procedure should be performed to help isolate the problem if there is another repeat call. See page CARR-1, Entry Q, in the *MIM, Volume R10.*

- On a second repeat call, perform all additional action items.

Go to RMAP 0300 Step 001 on page REPAIR-2 to replace the recommended FRUs.

IMAP 0275: Console Message — Missing Channel End and Device End (Missing Interrupt)

This message may be caused by the controller failing to interrupt the storage control after one of the following operations:

- Seek
- Set Sector

001
(From Page ISOLATE-34)

Vary devices off line.

If the devices are not already offline, ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the desired devices are not varied offline successfully, proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Go to Step 003 in this IMAP.

003
(From Step 002 in this IMAP)

Set CE mode.

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

004
Go to IMAP 0225 Step 001 on page ISOLATE-14.

005
(From Step 008 in this IMAP)

Run the Normal Sequence diagnostics.

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

006
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

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006 (continued)
Then go to RMAP 0300 Step 001 on page REPAIR-2.

007
Have all controllers been tested?
Yes **No**

008
Go to Step 005 in this IMAP and repeat the diagnostic on the other controllers in the string.

For 4-path configurations, the MD plug must be moved to the other A-unit in the string to test that A-unit's controllers.

009
Review the error logs in the Storage Control to determine if errors are reported for the failing paths and devices. Use the procedure in IMAP 0240 Step 001 on page ISOLATE-24, then return here.

Were error log entries found?
Yes **No**

010
Replace the Port/R-W card and the Sequencer/Servo/RPS card in the failing device. If the DPS feature is present, replace the DPS cards in both controllers.

See RMAP 0300 Step 001 on page REPAIR-2and follow the directions in the REPAIR section.

011
Select a symptom code for analysis. Review all entries before selecting an entry for analysis.

1. Record each symptom code, device address, controller, and age, for the errors that occurred since the customer started having problems. If the age is not known because the error log came from a 3880 Storage Control, it is difficult to determine which records are associated with the problem.

   If possible, obtain information from the customer about the nature and frequency of the problem. This information, combined with your knowledge of the devices in this account, can sometimes be used to determine which records are associated with the problem. The most recent entry in the log is labeled ENT=01, the last entry in the log is the oldest.

2. **Use the following guidelines to prioritize the failures:**

   - Resolve undervoltage conditions first:

     DFFF Controller undervoltage
     EFFF Controller undervoltage
     EFF0 Device undervoltage
     9FFF Device undervoltage

     Note: *All undervoltage problems should be resolved before attempting resolve other problems.*

   - If there are multiple symptom codes and no undervoltage symptom codes, determine the highest priority symptom code group from the following list:

     – Dxxx (except low priority SCs)
     – Exxx
     – Low priority symptom codes:
       DFx3 DFx9 DFxC
       DFx5 DFxA DFxD
       DFx8 DFxB
     – 9xxx

   - If there are multiple symptoms within the selected group, select the symptom code that occurs most or has the highest count.

3. After each error display, the search function allows you to analyze the error by entering "A." If "A" (Analyze the Error) is chosen, the 24 sense bytes are displayed, then analysis is done on the error.

Follow directions from the MD until a FRU group is displayed. When replacing FRUs, use the following guidelines:

- On the first call, replace all FRUs in the primary FRU list.

- On a repeat call, replace all FRUs in the secondary FRU list. If there is a MAP indicated by the MD, go to the MAP to determine any additional actions.

- If the HDA is suspected, the HDA cable swap procedure should be performed to help isolate the problem if there is another repeat call. See page CARR-1, Entry Q, in the *MIM, Volume R10.*

- On a second repeat call, perform all additional action items.

Go to RMAP 0300 Step 001 on page REPAIR-2 to replace the recommended FRUs.

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IMAP 0280: Console Message — Write Inhibited

001
(From Page ISOLATE-34)
(From Page MD-34)
(From Page MD-35)

A single controller, a single channel, or an entire storage path or storage director becomes write inhibited when a read/write unsafe condition is detected by the 3380 or the storage control.

To recover from write inhibited, repair the problem and follow the End of Call procedures in RMAP 0350 Step 001 on page REPAIR-15. Alternatively, have the customer run Device Support Facilities (ICKDSF), CONTROL function with the ALLOWWRITE parameter specified. See the *Device Support Facilities User's Guide and Reference*, GC35-0033.

For additional information on Write Inhibit, see the HELP section in the *ECM, Volume R40*.

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

(Step 002 continues)

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 003 in this IMAP.

003
(From Step 002 in this IMAP)

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

004
Go to IMAP 0225 Step 001 on page ISOLATE-14.

005
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?

Yes **No**

006

Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

> **Note:** *After the problem is corrected, go to RMAP 0350 Step 001 on page REPAIR-15to reset the Write Inhibit condition.*

Go to RMAP 0300 Step 001 on page REPAIR-2.

007

Determine the error that caused the write inhibit condition.

Review the console messages to find the sense record that occurred just before the storage control became write inhibited.

Was a sense record found?

Yes **No**

008

Go to IMAP 0240 Step 001 on page ISOLATE-24.

009

Go to IMAP 0235 Step 001 on page ISOLATE-23.

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IMAP 0285: Console Message — Volume Fenced from Storage Path

Fencing is a technique used by the 3990 Storage Control microcode to remove a failing path from system operation. This technique prevents path related failures from significantly degrading subsystem performance.

Device fencing (for each volume) is used to remove devices from a failing path, one at a time, as they are used. Devices are removed from the failing path one at a time to ensure that error data is logged in the System error recording data set (ERDS) for each device that fails.

Do not reset fenced conditions at this time.

After you have completed a repair action, device fenced conditions may be reset by using the End of Call option (Main menu option Z).

Alternatively, you can have the customer run Device Support Facilities (ICKDSF) CONTROL function with the CLEARFENCE parameter specified. See the *Device Support Facilities Users Guide and Reference*, GC35-0033.

For additional information on Fencing, see the HELP section in the *ECM, Volume R40.*

001
(From Page ISOLATE-34)

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Is the MD already attached to the A unit, powered on, and ready for use?

Yes **No**

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Go to Step 003 in this IMAP.

003
(From Step 002 in this IMAP)

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?

Yes **No**

004
Go to IMAP 0225 Step 001 on page ISOLATE-14.

005
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).

3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?

Yes **No**

006

Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

> **Note:** *After the problem is corrected, go to RMAP 0350 Step 001 on page REPAIR-15to reset the fenced conditions.*

Go to RMAP 0300 Step 001 on page REPAIR-2.

007

Determine the error that caused the fenced condition.

Review the console messages to find the sense record that occurred just before the storage control became fenced.

Was a sense record found?

Yes **No**

008

Go to IMAP 0240 Step 001 on page ISOLATE-24.

009

Go to IMAP 0235 Step 001 on page ISOLATE-23.

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IMAP 0290: Miscellaneous Console Messages

001
(From Page ISOLATE-34)

Record the message number and the message.
Find the message in the appropriate manual in the customer library. Try to determine whether the message was caused by a hardware problem, a software problem, or a microcode problem. Consult the next level of support if necessary.

If a hardware problem is suspected, continue with the following procedure. Otherwise consult the next level of support.

Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-4 for directions.

(Step 002 continues)

002 (continued)
Ensure that the storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 003 in this IMAP.

003
(From Step 002 in this IMAP)

Set CE Mode:

1. From the MD Main menu, select option 0 (SET/RESET CE MODE).
2. Use the Set/Reset CE Mode option to set the devices to be tested in CE mode.

See page MD-6 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

004
Go to IMAP 0225 Step 001 on page ISOLATE-14.

005
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the main menu, select option 1 (RUN DIAGNOSTICS).
3. From the diagnostics menu, select option 0 (NORMAL SEQUENCE).

See page MD-10 for directions.

Did the diagnostics run to normal end without an error?
Yes **No**

006
Analyze the error. Press the ENTER key on the MD to analyze the error and to obtain a FRU group.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

007

Isolate the problem with sense data. The problem must be isolated using sense data from the system or from the Error Log.

Is the sense data from the system?

Yes **No**

008

Sense data from the Error Log:

1. Go to IMAP 0240 Step 001 on page ISOLATE-24. Refer to SMAP 0015 Step 001 on page START-2 for information on sense data.

2. **Before returning the machine to the customer, be sure to reset CE mode.**

Go to RMAP 0350 Step 001 on page REPAIR-15 for the End of Call procedure.

For details about the Error Log, see "Select Error Log Function" on page LOG-2.

009

Sense data from the system:

1. Go to IMAP 0235 Step 001 on page ISOLATE-23. Refer to SMAP 0015 Step 001 on page START-2 for information on sense data.

2. **Before returning the machine to the customer, be sure to reset CE mode.**

Go to RMAP 0350 Step 001 on page REPAIR-15 for the End of Call procedure.

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IMAP 0295: Controller Not Connected Correctly

The storage control has determined that the controller is not correctly connected to the storage control. This problem can be caused by:

- DDC interface cables are not connected correctly or are crossed.
- The "controller A-board to A-board" cable is not connected correctly.

001
(From Page MLX-2)

Verify that the "A-board to A-board" cable is correctly installed. See page INST-1, Entry Q in the *MDM, Volume R30.*

Did the device status test run without the MD displaying an error?

Yes **No**

002

Analyze the Error. Press the ENTER key to analyze the error and to obtain a FRU list.

Answer questions and follow instructions given by the MD. If you are asked "DO YOU WANT TO RUN CONNECTION TESTS?," you are advised to answer "YES." The connection tests provide better isolation.

The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS ?."

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

003
(Step 003 continues)

003 (continued)
Configuration data is displayed on the screen.

Perform the following procedure:

1. Record the configuration data.
2. Press the Enter key.
3. Record the number of units in the string.
4. Press the Enter key and answer "YES" to "DO YOU WANT AN ANALYSIS OF THIS CONFIGURATION DATA?"
5. Correct any problems found by following instructions from the MD.
6. After any problems have been corrected, repeat the Device Status test for the remaining controllers, one at a time, and correct any problems found (repeat steps 1 through 5 for each controller).

Go to RMAP 0340 Step 001 on page REPAIR-13.

EC History of Isolate Section

EC HISTORY OF P/N 4519899			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87		
475247	11Sep87		

Notes:

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Repair Procedures

Entry	Select One of the Following	Go To
A	FRU Replacement Procedures	RMAP 0300 Step 001 on page REPAIR-2.
B	String Power Off/On Procedure	Page REPAIR-25.
C	Unit Power Off/On Procedure	Page REPAIR-26.
D	Controller Power Off/On Procedure	Page REPAIR-27.
E	Device Power Off/On Procedure	Page REPAIR-29.
F	Drive Power Off/On Procedure	Page REPAIR-28.
H	DDC/DTB Card Switch Setting	Page REPAIR-18.
I	I/O Control Card Switch Setting	Page REPAIR-20.
J	Servo Power Amplifier Card Replacement	RMAP 0300 Step 001 on page REPAIR-2.
K	Post Repair Checkout	RMAP 0320 Step 001 on page REPAIR-8.
L	End Of Guided Maintenance	RMAP 0340 Step 001 on page REPAIR-13.
M	Reset CE Mode (Use End of Call)	RMAP 0350 Step 001 on page REPAIR-15.
O	DPS Card Replacement	RMAP 0300 Step 001 on page REPAIR-2.
P	End Of Call	RMAP 0350 Step 001 on page REPAIR-15.

Figure 1. REPAIR Section Entry Table

RMAP 0300: FRU Replacement Procedures

001

(From IMAP 0218 Step 002 on page ISOLATE-9)
(From IMAP 0218 Step 006 on page ISOLATE-10)
(From IMAP 0218 Step 011 on page ISOLATE-10)
(From IMAP 0220 Step 004 on page ISOLATE-12)
(From IMAP 0220 Step 009 on page ISOLATE-13)
(From IMAP 0225 Step 001 on page ISOLATE-14)
(From IMAP 0230 Step 004 on page ISOLATE-16)
(From IMAP 0230 Step 006 on page ISOLATE-16)
(From IMAP 0232 Step 006 on page ISOLATE-19)
(From IMAP 0233 Step 004 on page ISOLATE-21)
(From IMAP 0235 Step 001 on page ISOLATE-23)
(From IMAP 0240 Step 004 on page ISOLATE-25)
(From IMAP 0240 Step 009 on page ISOLATE-26)
(From IMAP 0245 Step 016 on page ISOLATE-29)
(From IMAP 0245 Step 022 on page ISOLATE-29)
(From IMAP 0248 Step 006 on page ISOLATE-31)
(From IMAP 0248 Step 007 on page ISOLATE-31)
(From IMAP 0250 Step 002 on page ISOLATE-32)
(From IMAP 0260 Step 008 on page ISOLATE-36)
(From IMAP 0260 Step 015 on page ISOLATE-37)
(From IMAP 0260 Step 016 on page ISOLATE-37)
(From IMAP 0265 Step 008 on page ISOLATE-39)
(From IMAP 0265 Step 015 on page ISOLATE-40)
(From IMAP 0265 Step 017 on page ISOLATE-40)
(From IMAP 0265 Step 018 on page ISOLATE-41)
(From IMAP 0270 Step 008 on page ISOLATE-43)
(From IMAP 0270 Step 014 on page ISOLATE-44)
(From IMAP 0270 Step 018 on page ISOLATE-44)
(From IMAP 0270 Step 019 on page ISOLATE-45)
(From IMAP 0275 Step 008 on page ISOLATE-47)
(From IMAP 0275 Step 012 on page ISOLATE-47)
(From IMAP 0275 Step 013 on page ISOLATE-48)
(From IMAP 0280 Step 006 on page ISOLATE-50)
(From IMAP 0285 Step 006 on page ISOLATE-52)
(From IMAP 0290 Step 006 on page ISOLATE-54)
(From IMAP 0295 Step 002 on page ISOLATE-55)
(From Page REPAIR-1)
(From Page REPAIR-1)
(From Page REPAIR-1)
(From RMAP 0320 Step 010 on page REPAIR-9)
(From RMAP 0320 Step 014 on page REPAIR-9)
(From RMAP 0330 Step 006 on page REPAIR-11)
(From RMAP 0330 Step 010 on page REPAIR-12)
(From RMAP 0340 Step 003 on page REPAIR-13)
(From RMAP 0340 Step 003 on page REPAIR-13)

1. Find the card or cards you want to replace in the charts on page REPAIR-4.

2. Use the Repair Affects column to determine what portion of the machine or string is affected by replacement of the card.

Does the Repair Affects column indicate Controller?
Yes **No**

002

Refer to the Vary Offline column to determine which devices the customer must vary offline. If not already done, ask the customer to vary offline each of the affected devices. Devices should be varied offline on each attached system.

Place the affected devices in CE mode. Use MD Main Menu Option 0. Refer to "Set/Reset CE Mode (MD Main Menu Option 0)" on page MD-7.

After the device or devices are placed in CE mode, go to RMAP 0310 Step 001 on page REPAIR-5.

003

Determine if the failing controller can be quiesced.

It is easier to Quiesce a controller than it is to have the customer vary the failing path offline from each attached system, but there are some limitations:

- Quiesce controller can be used on both 4-way and 2-way subsystems. On a 2-way subsystem the path must be varied offline by the customer before the Quiesce Controller is executed.

- Quiesce path or controller cannot be used when attached to a 3880 storage control.

Quiesce is a function performed at the Storage Control support facility keyboard and does not involve system operators.

(Step 003 continues)

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003 (continued)
Can the failing controller be quiesced?
Yes **No**

004
Ask the customer to vary offline the affected path on each attached system.

Go to RMAP 0310 Step 001 on page REPAIR-5.

005
To locate the attached storage control and determine the storage path, refer to the SSID and Storage Path labels on either the A-Unit front operator panel or the rear Unit Emergency Power Off panel.

To Quiesce a controller, use instructions in the storage control maintenance package. Refer to MLX Exit 9 on page MLX-3.

After the controller is quiesced, go to RMAP 0310 Step 001 on page REPAIR-5.

A1 Board (Controller) Cards

Controller Logic Card Name	Controller A1(A3)	Controller A2(A4)	Repair Affects	Vary Offline or Quiesce
DDC/DTB	A1W2	A1B2	Controller	Affected storage path
I/O Control (IOC)	A1V2	A1C2	Controller	
CDPSS0	A1U2	A1D2	Controller	Affected storage path
CDPSS1 (Note 1)	A1T2	A1E2	Controller	
DPS (Note 3)	A1S2	A1F2	String	All devices in the string (Devices cannot be quiesced)
Controller Sequencer	A1R2	A1G2	Controller	Affected storage path
DHPLO	A1Q2	A1H2	Controller	Affected storage path
Clock/SERDES/ECC 1	A1N2	A1J2	Controller	
SERDES 2 (Note 2)	A1P2	A1K2	Controller	
MD Adapter	A1M4	A1L4	Controller	

Notes:

1. *Controllers in 2-path strings do not have CDPSS1 cards.*
2. *Late level machines do not have SERDES 2 cards.*
3. *Strings attached to a 3990 storage control do not have DPS cards.*

B1 and Cx Board (Device) Cards

Device Logic Card Name	Left Front	Right Front	Left Rear	Right Rear	Repair Affects	Vary Offline
PES/PROM	B1D2	B1K2	B1N2	B1U2	Device	Affected devices
Seq/Servo/RPS	B1E2	B1J2	B1P2	B1T2	Device	
Port/R-W	B1F2	B1H2	B1Q2	B1S2	Device	
R/W Channel Board	C0B2	C1B2	C2B2	C3B2	Device	Affected Devices
Servo Power Amp	C4P1	C4P2	C4P3	C4P4	Device	
Power	B1G2	B1G2	B1R2	B1R2	Drive	Both devices in drive
A1 Port Term	B1W2	B1W2	B1W2	B1W2	All devices in the unit	All devices in the unit
A2 Port Term	B1W3	B1W3	B1W3	B1W3		
A3 Port Term	B1B2	B1B2	B1B2	B1B2		
A4 Port Term	B1B3	B1B3	B1B3	B1B3		

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RMAP 0310: Replacing FRUs

001
(From RMAP 0300 Step 002 on page REPAIR-2)
(From RMAP 0300 Step 004 on page REPAIR-3)
(From RMAP 0300 Step 005 on page REPAIR-3)
(From RMAP 0320 Step 011 on page REPAIR-9)
(From RMAP 0320 Step 015 on page REPAIR-10)
(From RMAP 0330 Step 007 on page REPAIR-11)
(From RMAP 0330 Step 011 on page REPAIR-12)

Follow this procedure when replacing FRUs:

1. Locate the unit in which FRUs will be replaced. The unit can be determined as follows:

   - The string can be determined by the String ID on the rear Unit Emergency Power Off panel.

   - When replacing controller logic cards, the controller board (A1/A2 or A3/A4) can be determined by the Controller ID labels on the rear Unit Emergency Power Off panel and on the A-Gate logic card cover label.

   - When replacing device logic cards, the unit containing the device can be determined by the device physical address labels on the Single Actuator Maintenance (SAM) Control Panel.

   For additional information about locating the failing string and device, refer to SMAP 0030 Step 001 on page START-14 and SMAP 0045 Step 001 on page START-21.

2. Power off the affected portion of the string. Use the Power Off procedure for the card you are replacing, as indicated in the Power Off/On Procedure column of Figure 2 on page REPAIR-6.

3. Read any additional action items.

   The Additional Action column refers you to important information related to the cards you are replacing.

4. Attach the ESD wrist strap to your wrist and ground it to the machine frame of logic gate.

5. Remove the card being replaced.

6. Set the switches on the new card if required. See note in additional action column of charts.

7. Power On. Use the Power On procedure as indicated in the Power Off/On Procedure column of Figure 2 on page REPAIR-6.

8. Perform the Post Repair Checkout.

Go to RMAP 0320 Step 001 on page REPAIR-8.

A1 Board (Controller) Cards

Controller Logic Card Name	Controller A1(A3)	Controller A2(A4)	Power Off	Power Off/On Procedure on page	Additional Action
DDC/DTB	A1W2	A1B2	Controller	REPAIR-27	Set switches (see page REPAIR-18).
I/O Control (IOC)	A1V2	A1C2	Controller	REPAIR-27	Set switches (see page REPAIR-20).
CDPSS0	A1U2	A1D2	Controller	REPAIR-27	
CDPSS1 (Note 3)	A1T2	A1E2	Controller	REPAIR-27	
DPS (Note 5)	A1S2	A1F2	String	REPAIR-25	See Note 1. **Warning**
Controller Sequencer	A1R2	A1G2	Controller	REPAIR-27	
DHPLO	A1Q2	A1H2	Controller	REPAIR-25	
Clock/SERDES/ECC	A1N2	A1J2	Controller	REPAIR-27	
SERDES 2 (Note 4)	A1P2	A1K2	Controller	REPAIR-25	
MD Adapter	A1M4	A1L4	Controller	REPAIR-27	See Note 2. **Warning**

Notes:

1. **Warning: Always power off the string (both controllers) before replacing a DPS card, to ensure that both DPS card arrays will be correctly initialized. If one DPS card has power on and the storage array on that card contains data that is not correct, the array on the card being replaced will be loaded with the data that is not correct when the new DPS card is powered on.**

   If the problem is intermittent or you cannot determine which card is faulty, replace both DPS cards. Do not swap DPS cards.

2. **Warning: Do not swap MD Adapter cards. These cards are not the same. Swapping these cards will result in the MD addressing the wrong storage path or storage director.**

3. *Controllers in 2-path strings do not have CDPSS1 cards.*

4. *Late level machines do not have SERDES 2 cards.*

5. *Strings attached to a 3990 storage control do not have DPS cards.*

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B1 and Cx Board (Device) Cards

Device Logic Card Name	Left Front	Right Front	Left Rear	Right Rear	Power Off	Power Off/On Procedure on page	Additional Action
PES/PROM	B1D2	B1K2	B1N2	B1U2	Device	REPAIR-29	See **Warning**
Seq/Servo/RPS Port/R-W R/W Channel Board	B1E2 B1F2 C0B2	B1J2 B1H2 C1B2	B1P2 B1Q2 C2B2	B1T2 B1S2 C3B2	Device Device Device	REPAIR-29 REPAIR-29 REPAIR-29	
Servo Power Amp	C4P1	C4P2	C4P3	C4P4	Device	REPAIR-29	*MIM, Volume R10* Page CARR-1, Entry N
Power	B1G2	B1G2	B1R2	B1R2	Drive	REPAIR-28	
A1 Port Term A2 Port Term A3 Port Term A4 Port Term	B1W2 B1W3 B1B2 B1B3	B1W2 B1W3 B1B2 B1B3	B1W2 B1W3 B1B2 B1B3	B1W2 B1W3 B1B2 B1B3	Unit Unit Unit Unit	REPAIR-26 REPAIR-26 REPAIR-26 REPAIR-26	

Warning: Do not swap PES/PROM cards. A Defective PES/PROM card can cause data to be written off track.

RMAP 0320: Post-Repair Checkout

001
(From IMAP 0212 Step 004 on page ISOLATE-7)
(From IMAP 0228 Step 004 on page ISOLATE-15)
(From IMAP 0233 Step 010 on page ISOLATE-22)
(From IMAP 0245 Step 008 on page ISOLATE-27)
(From IMAP 0245 Step 010 on page ISOLATE-28)
(From IMAP 0260 Step 002 on page ISOLATE-35)
(From Page REPAIR-1)
(From RMAP 0310 Step 001 on page REPAIR-5)
(From Page REPAIR-25)
(From Page REPAIR-26)
(From Page REPAIR-27)
(From Page REPAIR-28)
(From Page REPAIR-29)

To completely test the machine the normal sequence of diagnostics must be run on one or more devices, even if the problem that was repaired was in the controller.

Can the devices you want to test be taken from customer operation?
Yes **No**

002
The repaired problem was in the controller or controller path and device diagnostics can not be run.

Go to the Post-Repair Controller Checkout procedure (RMAP 0330 Step 001 on page REPAIR-11).

003
Vary devices offline.

Ask the customer to vary offline each of the devices you want to test. Devices should be varied offline on each attached system.

If the devices are not varied offline successfully, avoid using those devices or proceed only with customer permission.

Advise the customer that devices to be tested must be placed in CE mode for the tests to run. If a system attempts to use a device that has been placed in CE mode, the storage control responds with unit check and sends an Intervention Required sense byte record to that system.

When a device is taken out of CE mode, an interrupt is generated to each using system and normal operation of the device should be resumed.

Is the MD already attached to the A unit, powered on, and ready for use?
Yes **No**

004
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-5 for directions.

Ensure that the attached storage control you are going to use is powered on, has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 005 in this RMAP.

005
(From Step 004 in this RMAP)

If not already done, use MD Main menu option 0 to put the devices to be tested into CE mode.

See page MD-7 for directions.

Did CE mode set OK for all the devices specified?
Yes **No**

006
Go to IMAP 0225 Step 001 on page ISOLATE-14.

007
Run the Normal Sequence diagnostics:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).

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3. From the Diagnostics menu, select option 0 (NORMAL SEQUENCE).

If possible, use both controllers in the A unit.

See page MD-11 for directions.

Did the diagnostics run to normal end without an error?

Yes **No**

008
Go to Step 010 in this RMAP.

009
Go to Step 011 in this RMAP.

010
(From Step 008 in this RMAP)

Press the ENTER key to analyze the error and to obtain a FRU list.

Answer questions and follow instructions given by the MD. If you are asked "DO YOU WANT TO RUN CONNECTION TESTS?" you are advised to answer "YES." The connection tests provide better isolation.

The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS?" . When a FRU group is displayed, use the guided FRU replacement procedures to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

If the problem is not corrected, perform the additional action indicated by the MD.

If the additional action has already been performed or if there is no additional action indicated, go to RMAP 0340 Step 001 on page REPAIR-13.

011
(From Step 009 in this RMAP)
Some configurations do not use the DPS cards. The DPS cards are used when the string is attached to a 3880, but they are not used when the string is attached to a 3990.

For DPS card replacement information, refer to RMAP 0310 Step 001 on page REPAIR-5.

Did you replace a DPS card?

Yes **No**

012
Go to Step 015 in this RMAP.

013
To completely test the DPS function run the extended DPS tests. The extended DPS tests check the correct interaction of DPS on both controllers (A1 and A2).

Run the Extended DPS tests:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostic menu, select option 2 (EXTENDED DPS TESTS).

See page MD-14 for directions.

Did the extended DPS tests run to normal end without an error?

Yes **No**

014
Press the ENTER key to analyze the error and to obtain a FRU list.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR pages to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

If the problem is not corrected, perform the

additional action indicated by the MD.

If the additional action has already been performed or if there is no additional action indicated, go to RMAP 0340 Step 001 on page REPAIR-13.

015
(From Step 012 in this RMAP)

For DDC/DTB card and I/O Control card replacement information, refer to RMAP 0310 Step 001 on page REPAIR-5.

Did you replace a DDC/DTB card or an I/O Control card?
Yes **No**

016
Go to RMAP 0350 Step 001 on page REPAIR-15.

017
Run the Device Status test to check the switch settings on the replaced card.

Refer to switch setting procedures:

DDC/DTB Card (A1W2 and A1B2)

For 2-path switch settings, see "DDC/DTB Card (A1W2 and A1B2) Switch Settings (2-Path)" on page REPAIR-18.

For 4-path switch settings, see "DDC/DTB Card (A1W2 and A1B2) Switch Settings (4-Path)" on page REPAIR-19.

I/O Control Card (A1V2 and A1C2)

For string ID switch settings, see "I/O Control Card (A1V2 and A1C2) Switch Settings (String ID)" on page REPAIR-20.

For 2-path switch settings, see "I/O Control Card (A1V2 and A1C2) Switch Settings (2-Path String Configuration)" on page REPAIR-21.

For 4-path switch settings, see "I/O Control Card (A1V2 and A1C2) Switch Settings (4-Path String Configuration)" on page REPAIR-22.

(Step 017 continues)

017 (continued)
When you are sure that the switches are set correctly, go to RMAP 0350 Step 001 on page REPAIR-15 to end the call.

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RMAP 0330: Post-Repair Controller Checkout

001
(From RMAP 0320 Step 002 on page REPAIR-8)

Is the MD attached to the A unit, powered on, and ready for use?
Yes **No**

002
Attach and prepare the MD.

Warning: Never power the MD on or off with the diskette inserted.

See page MD-5 for directions.

Ensure that the attached storage control you are going to use is powered on and has completed its initial microcode load (IML), and that the functional diskette for the 3380-JK is installed.

Continue with Step 003 in this RMAP.

003
(From Step 002 in this RMAP)

Run the controller tests.

The controller tests can be run in-line with customer operations on the controller. Therefore, controller paths and devices do not need to be varied off line.

1. From the MD Main Menu, select option 1 (RUN DIAGNOSTICS).
2. From the Diagnostic Menu, select option 1 (CONTROLLER TESTS).

See page MD-13 for directions.

Did the controller diagnostics run to normal end without an error?
Yes **No**

004
Go to Step 006 in this RMAP.

(Step 005 continues)

005
Go to Step 007 in this RMAP.

006
(From Step 004 in this RMAP)

Press the ENTER key to analyze the error and to obtain a FRU list.

Answer questions and follow instructions given by the MD. If you are asked "DO YOU WANT TO RUN CONNECTION TESTS?" you are advised to answer "YES." The connection tests provide better isolation.

The connection tests do not run inline with customer operation. Before running the connection tests, all paths to the failing controller should be varied offline. If this cannot be done, answer "NO" to "DO YOU WANT TO RUN CONNECTION TESTS?"

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

If the problem is not corrected, perform the additional action indicated by the MD.

If the additional action has already been performed or if there is no additional action indicated, go to RMAP 0340 Step 001 on page REPAIR-13.

007
(From Step 005 in this RMAP)
Some configurations do not use the DPS cards. The DPS cards are used when the string is attached to a 3880, but they are not used when the string is attached to a 3990.

For DPS card replacement information, refer to RMAP 0310 Step 001 on page REPAIR-5.

(Step 007 continues)

007 (continued)
Did you replace a DPS card?
Yes **No**

008
Go to Step 011 in this RMAP.

009
To completely test the DPS function, run the Extended DPS tests. The Extended DPS tests check the correct interaction of DPS on both controllers (A1 and A2).

Run the Extended DPS tests:

1. Press the PF key to return to the MD Main menu.
2. From the Main menu, select option 1 (RUN DIAGNOSTICS).
3. From the Diagnostic menu, select option 2 (EXTENDED DPS TESTS).

See page MD-14 for directions.

Did the Extended DPS tests run to normal end without an error?
Yes **No**

010
Press the ENTER key to analyze the error and to obtain a FRU list.

When a FRU group is displayed, use the guided FRU replacement procedures in the REPAIR section to replace the indicated FRUs.

Go to RMAP 0300 Step 001 on page REPAIR-2.

If the problem is not corrected, perform the additional action indicated by the MD.

If the additional action has already been performed or if there is no additional action indicated, go to RMAP 0350 Step 001 on page REPAIR-15.

011
(Step 011 continues)

011 (continued)
(From Step 008 in this RMAP)

For DDC/DTB card and I/O Control card replacement information, refer to RMAP 0310 Step 001 on page REPAIR-5.

Did you replace a DDC/DTB card or an I/O Control card?
Yes **No**

012
Go to RMAP 0350 Step 001 on page REPAIR-15.

013
Run the Device Status test to check the switch settings on the replaced card.

Refer to switch setting procedures:

DDC/DTB Card (A1W2 and A1B2)

For 2-path switch settings, see "DDC/DTB Card (A1W2 and A1B2) Switch Settings (2-Path)" on page REPAIR-18.

For 4-path switch settings, see "DDC/DTB Card (A1W2 and A1B2) Switch Settings (4-Path)" on page REPAIR-19.

I/O Control Card (A1V2 and A1C2)

For string ID switch settings, see "I/O Control Card (A1V2 and A1C2) Switch Settings (String ID)" on page REPAIR-20.

For 2-path switch settings, see "I/O Control Card (A1V2 and A1C2) Switch Settings (2-Path String Configuration)" on page REPAIR-21.

For 4-path switch settings, see "I/O Control Card (A1V2 and A1C2) Switch Settings (4-Path String Configuration)" on page REPAIR-22.

When you are sure that the switches are set correctly, go to RMAP 0350 Step 001 on page REPAIR-15 to end the call.

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RMAP 0340: End of Guided Maintenance

001
(From IMAP 0260 Step 016 on page ISOLATE-37)
(From IMAP 0295 Step 003 on page ISOLATE-55)
(From Page REPAIR-1)
(From RMAP 0320 Step 010 on page REPAIR-9)
(From RMAP 0320 Step 014 on page REPAIR-10)
(From RMAP 0330 Step 006 on page REPAIR-11)

Is the machine still failing?
Yes **No**

002
Go to RMAP 0350 Step 001 on page REPAIR-15.

003
Perform a top-card-connector check.

Check the affected A1 and/or B1 board top card connectors to ensure that they are all in place and seated correctly. See the decal on the gate cover(s) for correct locations.

Check the operator panel switches.

Ensure that the switches on the operator panel are set to Enable.

Perform voltage and ripple checks.

If not already done, perform voltage and ripple checks on the affected controller and devices. See page PWR-1, Entry A, in the *MIM, Volume R10* to perform voltage checks.

If not already done, consider the following:

- If sense data is available, use MD option 3 to analyze the highest priority symptom code.

  Go to "Analyze Symptom Code (Main Menu Option 3)" on page MD-40.

- If sense data is available, the highest priority symptom code has been analyzed, and there are additional symptom codes, use MD option 3 to analyze the next highest priority symptom code.

  Go to "Analyze Symptom Code (Main Menu Option 3)" on page MD-40.

- If sense data is not available, perform error log analysis.

  Go to IMAP 0240 Step 001 on page ISOLATE-24.

- If the MD asked that you define a failure boundary, you may have selected the wrong boundary. If you have not followed the 'define failure boundary' procedures closely, perform the analysis again.

  Go to MD 0050 Step 001 on page MD-53.

- If a device problem seems to be indicated, replace all B1-board cards (for the failing device) that were not previously replaced.

  Go to RMAP 0300 Step 001 on page REPAIR-2.

- If a controller problem seems to be indicated, replace all A1-board cards (for the failing controller) that were not previously replaced.

  Go to RMAP 0300 Step 001 on page REPAIR-2.

- Order the A1 and/or B1 boards.

- If EREP or sense data is available, check for the FSCs in the following list. If you have any of the FSCs listed, go to page MD-1, Entry C, Option A before continuing:

  9F9F

  E108
  E180
  4x2x
  4x6x
  4xAx
  → With failures on heads 4, 5, 6, and/or 7

Call your next level of support for assistance.

When contacting your next level of support, it is important that the following information be readily available.

- Machine type and model
- Machine serial number
- System type/serial number
- Severity status
- A telephone number where you can be reached at the account
- Customer problem indications (symptom codes, message numbers, visual symptoms).
- Parts replaced and actions previously taken
- Sense data obtained from LOGREC printouts, ICKDSF printouts, and console messages.
- The type of storage control unit (3880 or 3990) and its functional microcode including EC level.
- Physical address of the failing device(s).
- The physical configuration of the subsystem, including
  - Whether it is a 2-path or 4-path configuration.
  - Whether there are one or two strings on the CTL-I interface.
- If diagnostic errors occurred while running the MD, record the IC codes and the E-bytes.
- Field manager's name and office phone number.

You have reached the end of the guided maintenance procedures.

To continue with unguided problem analysis, refer to page HELP-1 in the *ECM, Volume R40*. The *ECM* is shipped in microfiche form with each A unit. The microfiche is located in the *MDM, Volume R30*.

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RMAP 0350: End of Call

001
(From IMAP 0240 Step 008 on page ISOLATE-26)
(From IMAP 0245 Step 022 on page ISOLATE-29)
(From IMAP 0260 Step 011 on page ISOLATE-36)
(From IMAP 0265 Step 004 on page ISOLATE-38)
(From IMAP 0265 Step 011 on page ISOLATE-39)
(From IMAP 0270 Step 004 on page ISOLATE-42)
(From IMAP 0280 Step 001 on page ISOLATE-49)
(From IMAP 0280 Step 006 on page ISOLATE-50)
(From IMAP 0285 Step 006 on page ISOLATE-52)
(From IMAP 0290 Step 009 on page ISOLATE-54)
(From IMAP 0290 Step 010 on page ISOLATE-54)
(From Page REPAIR-1)
(From Page REPAIR-1)
(From RMAP 0320 Step 016 on page REPAIR-10)
(From RMAP 0320 Step 017 on page REPAIR-10)
(From RMAP 0330 Step 010 on page REPAIR-12)
(From RMAP 0330 Step 012 on page REPAIR-12)
(From RMAP 0330 Step 013 on page REPAIR-12)
(From RMAP 0340 Step 002 on page REPAIR-13)
(From Page MD-1)
(From Page MD-6)
(From Page MD-35)

The end of call procedure prepares a subsystem for system operation after failing conditions have been corrected.

The End of Call procedure uses the End of Call option on the MD. The End of Call option provides for displaying and resetting the following conditions:

- Devices in CE Mode.
- Write inhibit conditions.
- Fenced conditions (3990 Storage Control only).

Use the following procedure to prepare the subsystem for customer use:

1. Select End of Call.
From the MD Main Menu, select option Z (End of Call). The MD will prompt you for the following steps:

2. Select a Controller.
A controller must be selected to perform the following procedures. Any one of the controllers in the string may be used to start the end of call procedure. However, if you have been working on a particular controller, that controller should be selected first. The procedure will have you select other controllers as required.

After a controller is selected, the status of the following conditions is displayed:

- Devices in CE Mode
- Write Inhibit Conditions

  Write inhibit is a condition set in the Storage Control for a storage path. It is set when an error occurred on the path during a write operation. It is set to prevent a defective storage path from destroying customer data. There are two write inhibit conditions:

  – Controller Write Inhibit is set for a controller if a controller error or storage path error is detected during a write operation.

  – Channel Write Inhibit is set for a channel if a channel or channel related storage path error is detected during a write operation.

  Note: *When a write inhibit condition is set in a 4-path subsystem, it is set for both storage paths in a cluster.*

- Fenced Conditions (3990 Storage Control only)

  Fencing is a technique used by the 3990 storage path functional microcode to remove a failing path from system operation. This is done to prevent path-related failures from degrading subsystem performance any more than necessary. There are three types of

fencing:

Channel Fenced
Set when there are excessive channel or channel related failures. Channel fenced conditions are not displayed with storage control status.

Storage Path Fenced
Set when there are excessive storage path errors or when a Quiesce path is set from the Storage Control Support Facility. Storage path fencing is used on 4-path subsystems only.

Controller Fenced
Set when the Quiesce Controller is used from the Storage Control Support Facility. Controller Quiesce can be used on 2-path or 4-path systems.

Device Fenced
Set for a device when there are excessive controller errors on a single path to that device. The device remains operational on other paths. Device fencing is used on 4-path subsystems only.

3. Reset CE Mode.
If devices are in CE mode, the MD asks if you want to reset CE Mode for these devices.

CE Mode must be reset before returning devices to normal operation. Regardless of which controller was selected in step 2, CE mode is reset for all devices and attached storage paths.

4. Reset Write Inhibit and Fenced Conditions.
If Write Inhibit or Fenced conditions were detected, the MD asks if you want to reset them. These conditions should be reset.

The MD resets Write Inhibit and Devices Fenced conditions in the storage director or storage path attached to the controller selected in step 2.

Note: *When a Write Inhibit condition is reset in a 4-path subsystem, it is reset for both storage paths in the storage path cluster.*

5. Reset Write Inhibit and Fenced Conditions for the other controller in the A unit.
The MD asks if you want to test the other controller for Write Inhibit and Fenced conditions.

If Write Inhibit and Fenced conditions are detected when testing the other controller, the MD asks if you want to reset them. These conditions should be reset.

6. Test the other A unit in the string.
The MD asks you to move the MD cable to the other A unit. Next, repeat steps 2 through 5 to reset all Write Inhibit and Fenced conditions.

Note: *This step is for 4-path strings only.*

7. Check the Air Filter.
Check the primary air filter located on the actuator power supply. Replace if necessary.

8. Check all gate fans in the unit.
If a gate fan is not turning, repair or replace as necessary. See page PWR-1, Entry N, in the *MIM, Volume R10.*

9. Advise the customer to vary the failing paths and devices online.

Note: *Resetting Write Inhibit and Fenced conditions will not cause the failing path to automatically come online. The customer must vary the path online.*

10. If necessary, reinitialize the volume.
If maintenance was done because at three or more track addresses data was read successfully with offset invoked (sense byte 7 = 48 through 4F or sense byte 7 = 58 through 5B), the customer must dump the data and initialize the volume at the medial level before the machine is returned to operation.

To do this, use the Device Support Facilities INITIALIZE command with the VALIDATE and NOCHECK parameters specified. See the

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Device Support Facilities Users Guide and Reference, GC35-0033.

DDC/DTB Card (A1W2 and A1B2) Switch Settings (2-Path)

Note: *For 4-path switch settings, see page REPAIR-19.*

Both controllers in the string must be set with the same string address.

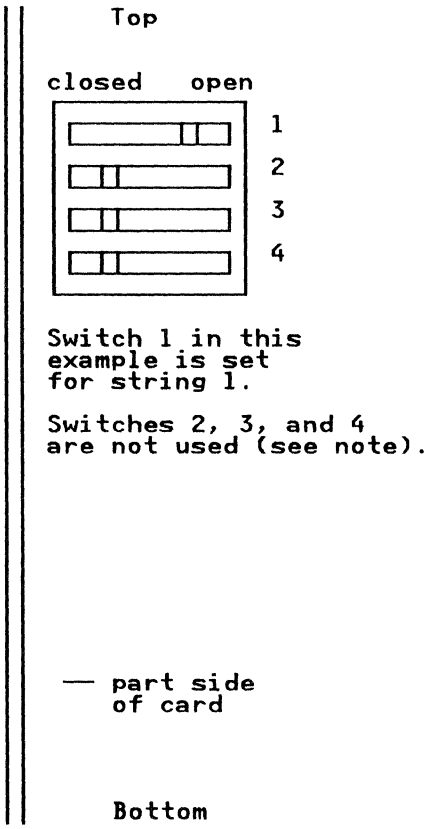
String Address

Set the string address switch (switch 1) on the new card to the same settings as on the card being replaced. Set switches 2, 3, and 4 to zero (0). If you are not sure of the correct switch settings, refer to the string address on the operator panel and the following table.

After setting the string address, verify that the string address you've set (either 0 or 1) is the same as the string address shown on the rear Unit Emergency Power Off panel (for an example, see Figure 7 on page INTRO-10 (3880 subsystem) or Figure 16 on page INTRO-24 (3990 subsystem)).

Note: *The addressing on all the A1W2 and A1B2 cards for the string must be set the SAME. All controllers are set to either 0 or 1. Each device must have the same controller-device address regardless of the selection path to the device.*

2-Path String Address Range	String	String Address Switch 1
00–0F	0	closed
10–1F	1	open
20–2F	0	closed
30–3F	1	open
40–4F	0	closed
50–5F	1	open
60–6F	0	closed
70–7F	1	open
80–8F	0	closed
90–9F	1	open
A0–AF	0	closed
B0–BF	1	open
C0–CF	0	closed
D0–DF	1	open
E0–EF	0	closed
F0–FF	1	open



Note: *Switches 2, 3, and 4 are actually not used. However, you are advised to set them to the closed position to eliminate any confusion as to their correct setting.*

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DDC/DTB Card (A1W2 and A1B2) Switch Settings (4-Path)

Note: *For 2-path switch settings, see page REPAIR-18.*

Both controllers in the string must be set for the same string address.

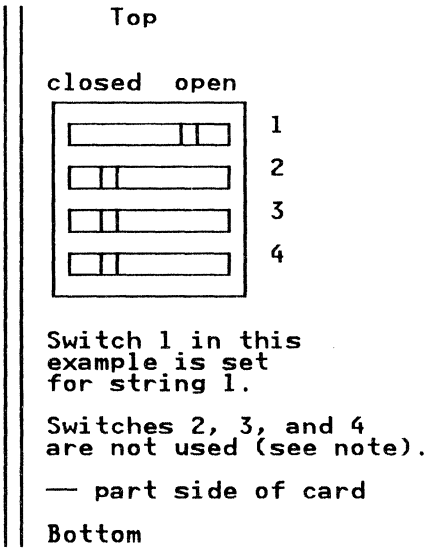
String Address

Set the string address switch (switch 1) on the new card to the same settings as on the card being replaced. Set switches 2, 3, and 4 to zero (0). If you are not sure of the correct switch settings, refer to the string address on the operator panel and the following table.

After setting the string address, verify that the string address you've set (either 0 or 1) is the same as the string address shown on the rear Unit Emergency Power Off panel (for an example, see Figure 16 on page INTRO-24)

Note: *The addressing on all the A1W2 and A1B2 cards for the string must be set the SAME. All controllers are set to either 0 or 1. Each device must have the same controller-device address regardless of the selection path to the device.*

4 Path String Address Range	String	String Address Switch 1
00–1F	0	closed
20–3F	1	open
40–5F	0	closed
60–7F	1	open
80–9F	0	closed
A0–BF	1	open
C0–DF	0	closed
E0–FF	1	open



Note: *Switches 2, 3, and 4 are not used. However, you are advised to set them to the closed position to eliminate any confusion as to their correct setting.*

I/O Control Card (A1V2 and A1C2) Switch Settings (String ID)

The string ID switches set the string ID that is reported to the system in sense data. The switches for each controller in the string must be set the same. The switches should be set to the value indicated on the operator panel. DO NOT USE 00 or FF for a string ID.

String ID

Use the following table to set the string ID switches on the I/O Control card (A1V2, A1C2) in each controller.

After setting the string ID, verify that the string ID you've set is the same as the string ID shown on the rear Unit Emergency Power Off panel (for an example, see Figure 7 on page INTRO-10 (3880 subsystem) or Figure 16 on page INTRO-24 (3990 subsystem)).

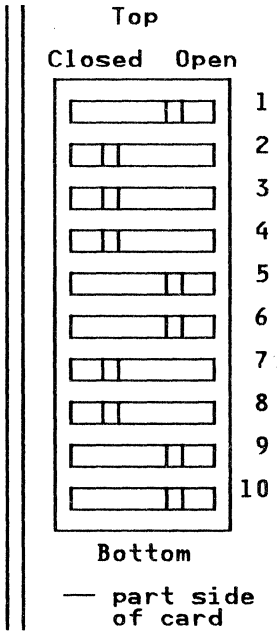
Switch	1	2	3	4	5	6	7	8
Binary	8	4	2	1	8	4	2	1

Switches 1 through 8:
  Closed = 1
  Open   = 0

In this example, switches 1 through 8 are set to 0111 0011 = X'73'.

Switch 9 (single HDA 3380 Model CJ2) must be set to 0 (open) for 3380-AJ4 and 3380-AK4 strings.

Switch 10 is not used: Set to 0 (open).



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I/O Control Card (A1V2 and A1C2) Switch Settings (2-Path String Configuration)

Note: *For 4-path string configuration switch settings, see page REPAIR-22.*

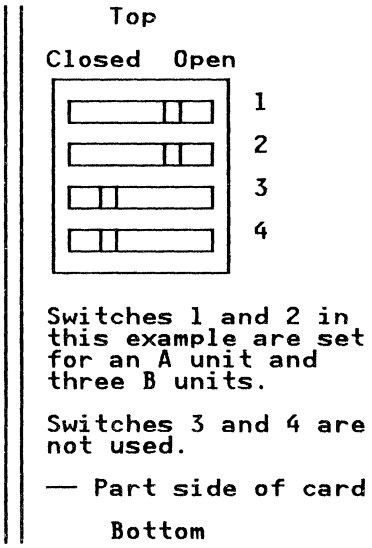
The string-configuration switches describe the configuration of the string to the storage control microcode. These switches must be set the same for both controllers in the string.

String Configuration: Switches 1 and 2

Use the following table to set configuration switches 1 and 2 on the I/O Control Card (A1V2, A1C2) in each controller.

String Configuration (2 - Path)	Switches	
	1	2
A unit only	Closed	Closed
A unit and one B unit	Closed	Open
A unit and two B units	Open	Closed
A unit and three B units	Open	Open

Switches 3 and 4 must be set to "Closed".



I/O Control Card (A1V2 and A1C2) Switch Settings (4-Path String Configuration)

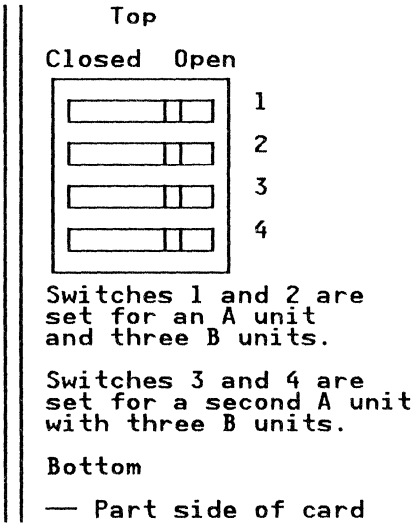
Note: *For 2-path string configuration switch settings, see page REPAIR-21.*

These switches must be set the same for each controller in the string.

String Configuration: Switches 1 and 2

Use the following table to set configuration switches 1 and 2 on the I/O Control Card (A1V2, A1C2) for device address range 00-0F.

String Configuration (4 – Path) Device Addresses 00 – 0F	Switches	
	1	2
A unit only	Closed	Closed
A unit and one B unit	Closed	Open
A unit and two B units	Open	Closed
A unit and three B units	Open	Open



String Configuration: Switches 3 and 4

Use the following table to set configuration switches 3 and 4 on the I/O Control card (A1V2, A1C2) for device address range 10-1F.

String Configuration (4 – Path) Device Addresses 10 – 1F	Switches	
	3	4
One A unit only	Closed	Closed
A unit and two B units	Closed	Open
A unit and two B units	Open	Closed
A unit and three B units	Open	Open

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Power On/Off Procedures

Warning: Never switch off the CPs for both actuators on the same HDA without powering off the drive first. Machine damage will result. See "Drive Power Off Procedure" on page REPAIR-28.

Warning: Never switch off the CPs (CP603 through CP636) for more than two actuators (devices) without powering off the entire unit. Powering off more than two devices may cause the voltages on the remaining device to exceed specification which could cause damage to the device or its associated circuits.

Warning: If the HDA cables are swapped, all of the logic cards that are normally used with the left actuator in the HDA are used with the right actuator, and the logic cards that are normally used with the right actuator are used with the left actuator. The Single Actuator Maintenance (SAM) panel switches and CPs control power to the same logic cards whether or not the cables are swapped. The MD always calls out the appropriate logic cards for replacement, even if the cables are swapped. The same CPs and switches must be used to power on or to power off specific logic cards whether or not the cables are swapped.

For example, if you plan to replace the PES/PROM card located at B1N2, always switch off SW695 and CP623 through CP626. to power off the "Left Rear" device.

See Figure 2 on page REPAIR-6 and Figure 2 on page REPAIR-7 to determine the affected portion of the string (what to power off) before replacing a specific FRU. Next, see Figure 3 on page REPAIR-24 and Figure 2 to locate the switches used to power off the affected portion of the string.

Warning: The device address associated with an actuator remains the same whether or not the cables are swapped. While the cables are swapped, power any specific device address off and on with the SAM CPs and switches that normally control the other actuator in the same HDA.

24 Vdc Panel for A and B units

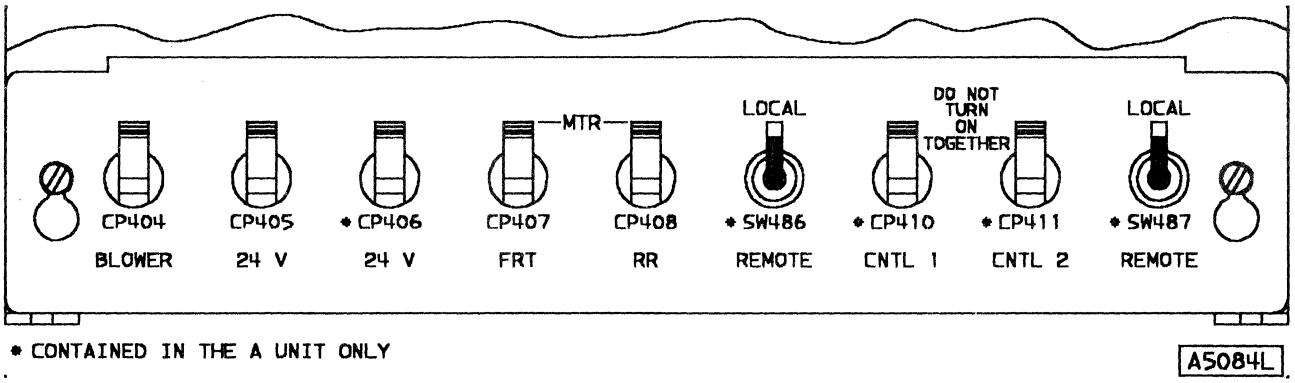

Figure 2. 24 Vdc Panel - A and B Units

Single Actuator Maintenance Control Panel for A and B Units

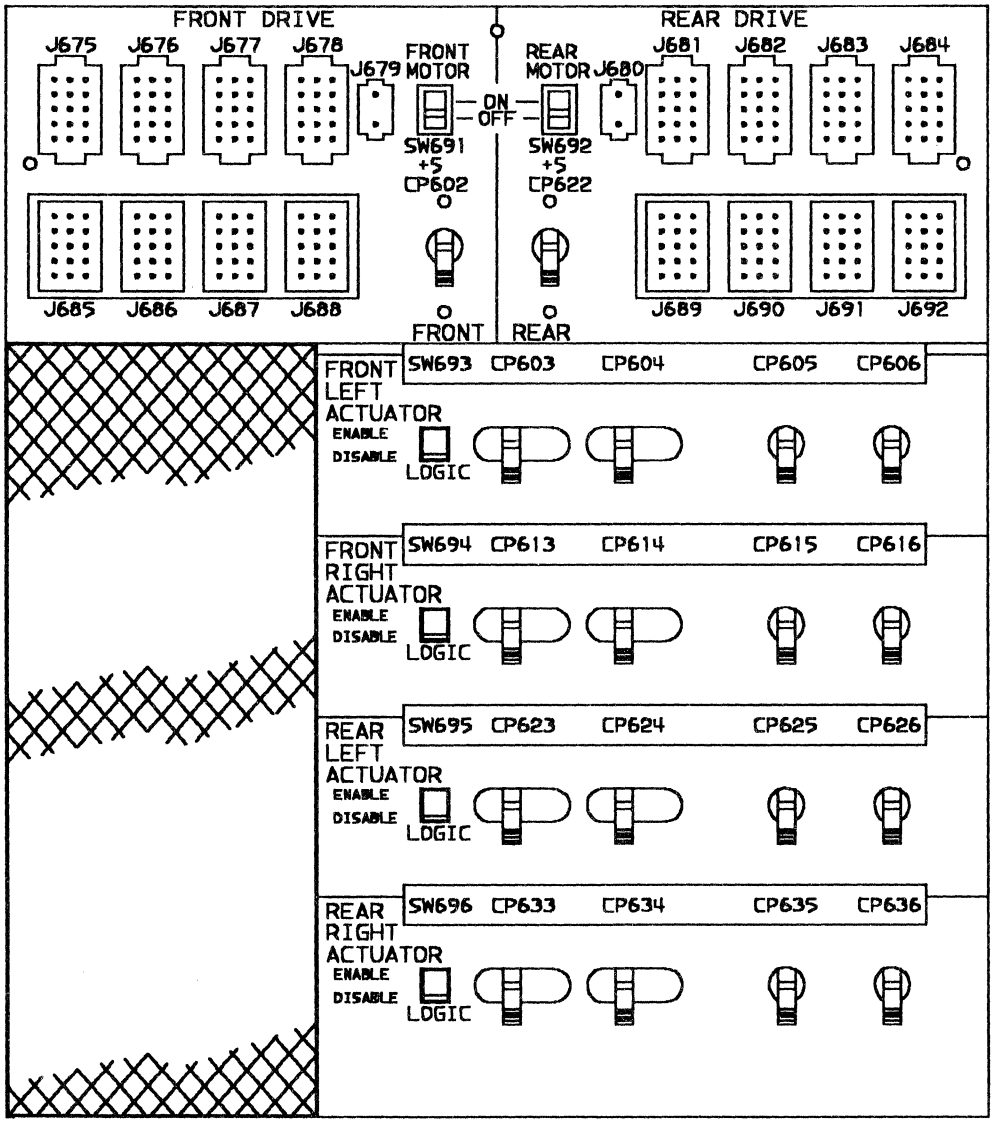

Figure 3. Single Actuator Maintenance Control Panel

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String Power Off Procedure

1. Unload the MD diskette and turn off the MD.

   Warning: Never power off the MD with the diskette inserted.

2. Set CP410 and CP411, located on the 24 Vdc panel in each A unit, to off (see Figure 2 on page REPAIR-23).

3. Wait until all the drives on the string have stopped.

   If any of the drives do not stop, go to page PWR-1, Entry H, in the *MIM, Volume R10*.

String Power On Procedure

1. Set CP410 and CP411, located on the 24 Vdc panel, to On (see Figure 2 on page REPAIR-23).

2. Turn on the MD and load the MD diskette.

   Warning: Never power on the MD with the diskette inserted.

3. Wait for all the drives on the string to power on.

   If any of the drives do not power on, run diagnostics on the failing drive(s). Use the procedure on page REPAIR-8.

4. After the drives have powered on, the Sequencer Status LED (on the B1-board) for each actuator begins to flash. Wait for 3 minutes or until the LED for the device becomes solid On before running diagnostics on the device.

   If the string has been powered down less than 10 minutes, the 3 minute waiting period may be bypassed by using the following procedure.

   a. After the drives have powered on and the Sequencer Status LED (on the B1-board) for each actuator begins to flash, operate the Logic Enable/Disable Switch for each actuator, first to Disable, then back to Enable.

   b. When the LED on the B1-board for the actuator becomes solid On, diagnostics may be run on the device.

   c. If the LED does not become solid On, wait 1 minute before running diagnostics.

   Warning: Do not return a string to the customer until all drives have been running for at least 3 minutes.

5. After FRU replacement, run the diagnostics to verify the repair and to ensure that there are no new problems.

6. Go to RMAP 0320 Step 001 on page REPAIR-8.

Unit Power Off Procedure

This procedure powers off all drives in the unit, but does not power off the entire unit.

1. Set both motor switches (SW691 and SW692) on the Single Actuator Maintenance (SAM) control panel to Off (see Figure 3 on page REPAIR-24).

2. Wait until both drives in the unit have stopped.

   If either drive does not stop, go to page PWR-1, Entry H, in the *MIM, Volume R10*.

3. Set CP405 (on the 24 Vdc panel) to Off (see Figure 2 on page REPAIR-23).

Unit Power On Procedure

1. Set CP405 located on the 24 Vdc panel to On (see Figure 2 on page REPAIR-23).

2. Wait five seconds.

3. Set the motor switch, SW691, on the Single Actuator Maintenance control panel to On (see Figure 3 on page REPAIR-24).

4. Wait 25 seconds.

5. Set the motor switch, SW692, on the Single Actuator Maintenance control panel to On.

6. Wait for the drives to power on.

   If either drive does not power on, run diagnostics on the failing drive. Use the procedure on page REPAIR-8.

7. After the drives have powered on, the Sequencer Status LED (on the B1-board) for each actuator begins to flash. Wait for 3 minutes or until the LED for the device becomes solid ON before running diagnostics.

   If the unit has been powered off less than 10 minutes, the 3 minute waiting period may be bypassed by using the following procedure:

   a. After the drives have powered on and the Sequencer Status LED (on the B1-board) for each actuator begins to flash, operate the Logic Enable/Disable Switch for each actuator, first to Disable, then back to Enable.

   b. When the LED on the B1-board for the actuator becomes solid On, diagnostics may be run on that device.

   c. If the LED does not become solid On, wait 1 minute before running diagnostics.

   Warning: Do not return a unit to the customer until both drives have been running for at least 3 minutes.

8. After each FRU replacement, run the diagnostics to verify the repair and to ensure that there are no new problems.

9. Go to RMAP 0320 Step 001 on page REPAIR-8.

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Controller Power Off Procedure

Warning: Setting both controller power switches to OFF will power off all drives in the string.

1. Set CP410 (controller A1/A3) or CP411 (controller A2/A4) located on the 24 Vdc panel (on the 3380-AJ4 or AK4 unit) to off (see Figure 2 on page REPAIR-23).

Controller Power On Procedure

1. Set CP410 (controller A1/A3) or CP411 (controller A2/A4) located on the 24 Vdc panel (on the 3380-AJ4 or AK4 unit) to ON (see Figure 2 on page REPAIR-23).

2. After FRU replacement, run the diagnostics to verify the repair and to ensure that no new problems exist.

3. Go to RMAP 0320 Step 001 on page REPAIR-8.

Drive Power Off Procedure

Warning: When powering off a drive, NEVER power off the CPs for either of the associated actuators before turning off the Motor Switch. Machine damage will result.

Warning: The drive cannot power off when either of the logic switches associated with the motor is in the Disable position.

1. Set the Front or Rear Motor switch (SW691 or SW692) to Off and wait for the motor to stop (refer to Figure 3 on page REPAIR-24).

   If the drive motor does not stop, go to page PWR-1, Entry H, in the *MIM, Volume R10*.

2. Set the Front (CP602) or Rear (CP622) +5V CP to Off.

3. Set the two Logic switches for the front or rear drive to Disable.

4. Set the actuator CPs to Off (left to right) for both actuators associated with the drive.

5. Set the front motor CP (CP407) or rear motor CP (CP408) to Off. These CPs are on the 24 Vdc Panel (shown in Figure 2 on page REPAIR-23).

Drive Power On Procedure

1. Set the motor CP (CP407 or CP408) located on the 24 Vdc Panel to On (see Figure 2 on page REPAIR-23).

2. Set the actuator CPs to On (right to left) for both actuators.

3. Set the two Logic switches to Enable.

4. Set the Front (CP602) or Rear (CP622) +5V CP to On.

5. Wait five seconds.

6. Set the Motor switch (SW691 or SW692) to On.

7. Wait for the drive to power on.

   If the drive does not power on, run diagnostics on the drive. Use the procedure on page REPAIR-8.

8. After the drive has powered on, the Sequencer Status LED (on the B1-board) for each actuator begins to flash. Wait for 3 minutes or until the LED for the device becomes solid ON before running diagnostics.

   If the drive has been powered down less than 10 minutes, the 3 minute waiting period can be bypassed by doing the following:

   a. After the Sequencer Status LED for each actuator begins to flash, operate the Logic Enable/Disable Switch for each actuator, first to Disable, then back to Enable.

   b. When the LED on the B1-board for the actuator becomes solid ON, diagnostics can be run.

   c. If the LED does not become solid ON, wait 1 minute before running diagnostics.

   Warning: Do not return a unit to the customer until both drives have been running for at least 3 minutes.

9. After FRU replacement, run the diagnostics to verify the repair and to ensure that no new problems exist.

10. Go to RMAP 0320 Step 001 on page REPAIR-8.

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Device Power Off Procedure

1. Set the correct actuator Logic switch (SW693, SW694, SW695 or SW696) to Disable. See Figure 3 on page REPAIR-24.

2. Set the associated actuator CPs to Off (left to right).

Device Power On Procedure

1. Set the actuator CPs located on the Single Actuator Maintenance (SAM) Control panel to On (right to left). See Figure 3 on page REPAIR-24.

2. Set the actuator logic switch to Enable.

3. After FRU replacement, run the diagnostics to verify the repair and to ensure that no new problems exist.

4. Go to RMAP 0320 Step 001 on page REPAIR-8.

EC History of Repair Section

EC HISTORY OF P/N 4519901			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87	476573	30Nov88
475247	11Sep87		

Notes:

Maintenance Device (MD) Operation

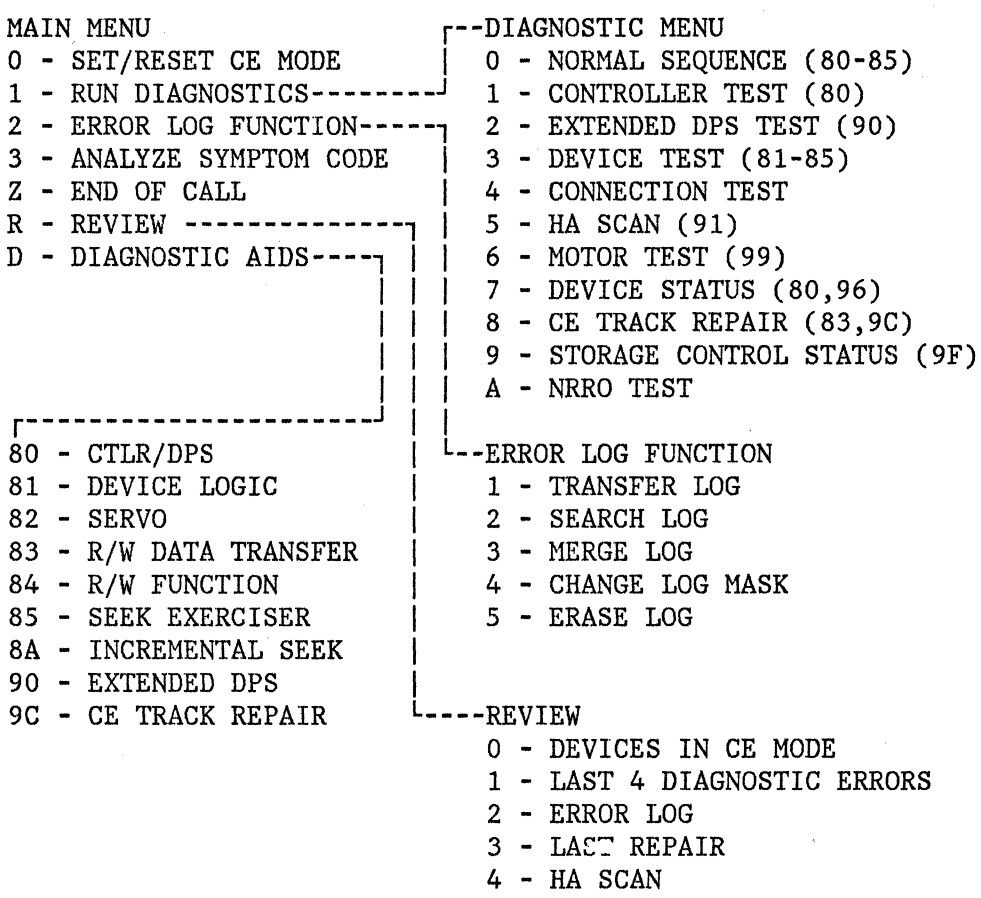
The MD section contains instructions for attaching and using the IBM maintenance device (MD) and references that explain messages from the MD.

When you attach the MD to the 3380 to isolate a problem, you should always start at page START-1 in this manual and follow the instructions on that page. Refer to "MD Menus" on page MD-2 for a diagram of the MD menus and options.

Use the following Entry Table to quickly find the information in this section.

Entry	Select one of the following:	Go to page
A	Prepare the MD	MD-5
B	Set/reset CE mode (MD Main menu option 0)	MD-7
C	Run diagnostics (MD Main menu option 1) 0 - Normal sequence 1 - Controller test 2 - Extended DPS test 3 - Device test 4 - Connection test 5 - HA Scan 6 - Motor test 7 - Device status 8 - CE track repair 9 - Storage Control Status A - Non-repeatable Runout Test	MD-10 MD-11 MD-13 MD-14 MD-15 MD-17 MD-19 MD-24 MD-26 MD-32 MD-34 MD-37
D	Error log function (MD Main menu option 2)	LOG-1
F	Analyze symptom code (MD Main menu option 3)	MD-42
G	Review Option List (MD Main menu option R) 0 - Review CE mode 1 - Review Diagnostics 2 - Review Error Log 3 - Review Repair 4 - Review HA Scan	MD-49 MD-49 MD-50 MD-50 MD-50 MD-51
H	Use diagnostic aids (MD Main menu option D)	MD-44
J	End of call (MD Main menu option Z)	RMAP 0350 Step 001 on page REPAIR-15

MD Menus



Maintenance Device (MD) Display — Reference Number Table

When an MD display refers to this page, find the reference number in the following table. Go to the referenced page for instructions and information.

REF	Title of the MD Frame	See Page
005	NRRO test	MD-37
010	Select An Option	MD-52
020	Select controller	MD-52
030	Set/reset CE mode	MD-53
035	Devices in CE Mode/Default Devices	MD-54
050	Define the failure boundary	MD-55
051	Define the failure boundary (EBXX)	MD-58
052	Define the failure boundary (Data Checks)	MD-61
090	Write Inhibit	MD-63
092	Storage Path Fenced	MD-63
093	Fenced Devices	MD-64
100	Diagnostic menu	MD-64
200	Select controller	MD-65
205	Invalid controller selected	MD-65
210	Select device(s)	MD-65
215	Invalid device selected	MD-65
310	Do not forget to reset CE mode	MD-65
320	Do you want to run connection tests?	MD-66
330	Which controller connection do you want to test?	MD-66
340	Controller AX connection tests ready	MD-67
350	DPS tests cannot be run	MD-67
360	HA Scan	MD-67
395	Scan Complete/Scan Review	MD-70
400	Select one of the following error log functions	MD-71
405	Select controller (Error Log)	MD-71
410	Enter search arguments	MD-72
415	Enter log number	MD-72
420	Enter the date	MD-72
425	Enter logs to be merged	MD-72
430	Enter the sense formats to be logged	MD-73
440	Error Log Mask/Transfer stopped by keyboard entry	MD-73
460	Configuration	MD-73
462	Configuration Data/Unknown Storage CTRL	MD-75
465	Device status	MD-76
468	Device type	MD-77
480	Storage Control Status	MD-78
500	Isolation code error display	MD-78
550	Enter the symptom code	MD-79
605	Warning: HDA cables swapped	MD-79
615	MD does not provide analysis for displayed IC	MD-81
700	Select review option from following list	MD-81
742	Press Enter to analyze, or "N" to display next error	MD-81
800	Diagnostic aids	MD-82

REF	Title of the MD Frame	See Page
900	Control unit and MD disks are not compatible	MD-83

Prepare the MD

When preparing to use the IBM maintenance device (MD) to service the 3380-JK, use the following procedure.

1. Attach the MD at the rear of the A unit.

   The signal cable socket is located at the right edge of the A unit. The power convenience outlet is located in the lower left corner of the A unit.

2. Ensure that the storage control is powered on and has completed its initial microcode load (IML).

   Verify that the functional diskette for the 3380-JK is installed.

Warning: Never power the MD on or off with the diskette inserted.

3. Power on the MD.

   Take the MD diskette from the holder inside the right rear door of the A unit and insert the diskette into the MD. Press the IML pushbutton.

   The MD performs a check of its functions. (This check takes only a few seconds.) After the checking process, the MD loads information from the diskette and displays the following frame:

```
**DISK LOADED**
    3380-JK
PN xxxxxxx
EC xxxxxx
```

   The frame shows the machine type and the EC number of the diskette. Always check this frame to ensure that you are using the correct 3380-JK diskette.

4. Press the ENTER key to advance to the next frame:

```
     GO TO
  PSG MD-1
FOR OPERATIONAL
  INSTRUCTIONS
```

   Note: *When you attach the MD to the 3380 to isolate a problem, you should always start at page START-1 in this manual and follow the instructions on that page.*

5. Press the ENTER key to advance to the next frame:

```
CONFIGURATION
INFORMATION IS BEING
GATHERED.
PLEASE WAIT.      ...
```

   The MD will attempt to gather configuration information about the subsystem. If the MD is connected to the controller and no error occurs, the next display will be the MD Main menu (see step 7 on page MD-6).

   If an error occurs while trying to get configuration information, the following frame is displayed:

```
AN ERROR OCCURRED
WHILE TRYING TO GET
CONFIGURATION
INFORMATION       ...
```

   Continue with the next step.

6. Press the ENTER key to advance to the next frame:

```
SELECT THE TYPE OF
DASD STRING:
1. 3380 AJ4/AK4
2. 3380 CJ2
```

7. Select option 1 and press the ENTER key to advance to the next frame:

```
SELECT THE TYPE OF
CONTROL UNIT:
1. 3880
2. 3990
```

If the reply to this request is "1," then the MD displays the MD Main menu.

If the reply to this request is "2," then the following frame is displayed:

```
ARE THE CONTROLLERS
CABLED AS A 4 PATH
SUBSYSTEM?
```

After the yes/no reply is entered, the MD displays the MD Main menu.

```
 *** MAIN MENU ***
(SEE PSG MD-3, 010)
0-SET/RESET CE MODE
1-RUN DIAGNOSTICS...
```

The MD Main menu identifies the major functions that can be performed with the MD.

The second line of the MD Main Menu frame means that entry 010 in the table on page MD-3 in this manual identifies reference material to explain the frame.

The ellipsis (three dots ...) in the lower right corner of the frame indicates message continuation in successive frames.

8. Press the ENTER key to advance to the remaining frames of the MD Main menu:

```
2-ERROR LOG FUNCTION
3-ANALYZE SYMPTOM
  CODE
Z-END OF CALL     ...
```

```
R-REVIEW (0-4)
D-DIAGNOSTIC AIDS
```

You can return to the first frame of the MD Main menu by pressing the PF key at almost any time.

The options available from the MD Main menu are:

Option	Meaning
0	Set or reset CE mode for selected devices. CE mode must be set prior to running device diagnostics. See page MD-7.
1	Run diagnostics on selected controllers and devices. This option selects the diagnostic menu. See page MD-10.
2	Perform various functions on the error log contained in the storage control. See page LOG-1.
3	Accept input of symptom codes and sense data for analysis. The MD need not be attached to the 3380. See page MD-42.
Z	Resets CE mode and refers to the end-of-call procedure on RMAP 0350 Step 001 on page REPAIR-15.
R	Review status from previous operations with the MD. See page MD-49.
D	Allow manual control of the diagnostics. See page MD-44.

9. Select an option from the MD Main menu by keying the option number or letter and then pressing the ENTER key on the MD.

Set/Reset CE Mode (MD Main Menu Option 0)

Before diagnostics can be run on a device, the device must be in CE mode. The device diagnostics do not run if the device is not in CE mode.

Before a device is returned to the customer for normal use, CE mode must be reset for that device.

Ensure that devices are varied offline before they are set into CE mode. When a device is varied offline, it should be varied offline to all attaching systems. If a system attempts to use a device that is in CE mode, the storage control responds with unit check and indicates INTERVENTION REQUIRED in the sense data.

If the devices to be tested are not varied offline successfully, only set CE mode with customer permission. Explain to the customer that when CE mode for a device is reset, an interrupt is generated to each using system and normal operations should be resumed.

The Set/Reset CE Mode option uses a diagnostic program (in the storage control) to set CE mode bits in the DPS arrays for the devices specified. Each device in CE mode is unavailable to all attached systems.

1. Ask the customer to Vary offline each of the devices you want to test or put in CE mode. Devices should be varied offline on each attached system. If the desired devices are not varied offline successfully, proceed with customer permission.

2. If necessary, press the ENTER key to advance to the MD Main menu or use the PF key to return to the MD Main menu.

   The PF key always causes the MD to return to the MD Main menu.

3. While the MD Main Menu is displayed, select option 0: Set/Reset CE Mode (key in 0 and press the ENTER key.) The MD displays the following frame:

```
SELECT OPTION:
 1. SET CE MODE
 2. RESET CE MODE
```

Select option 1 to set specified devices in CE mode or select option 2 to reset CE mode for specified devices.

(If you want to review the devices that are already in CE mode without performing a set or reset operation, you should use MD Main menu option R. See page MD-49.)

4. Enter either a 1 or a 2 to select an option from this frame. Regardless of your selection (Set or Reset), one of the following frames is displayed:

```
SELECT CONTROLLER:

(SEE PSG MD-3,020)
```

— or —

```
SELECT CONTROLLER:
DEFAULT IS: x

(SEE PSG MD-3,020)
```

The "x" indicates the default controller. The default controller is the controller selected during a previous operation. If none was used no default is displayed.

Regardless of which controller is used, the CE mode function (set or reset) applies to all paths (controllers). The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

5. Select an operational controller to use for setting or resetting CE mode. Depending on your mode selection (Set or Reset), one of the following frames is displayed.

Setting CE Mode

```
ENTER 2-DIGIT ADDR.
OF DEVICE(S) TO BE
SET IN CE MODE.
(SEE PSG MD-3, 030)
```

— or —

Resetting CE Mode

```
ENTER 2-DIGIT DEVICE
ADDRESSES OR PRESS
ENTER TO RESET ALL.
(SEE PSG MD-3, 030)
```

CE mode may be set or reset for one or more devices in a string. There are several ways to enter device addresses. Two digits must be used for each address entered.

- Enter a single device address, "00" through "1F."
- Enter multiple device addresses separated with a single space (for example, 02 05 07 0A).
- Enter a range of addresses separated with the character "T" (for example, 02T07).
- Enter multiple ranges of addresses, separating each range with a space (for example, 02T04 08T0B).
- With "Reset CE Mode" selected, press the ENTER key without specifying devices to reset CE mode for all devices that were previously set in CE mode.

6. Specify the devices for which you want to change CE mode. One of the following frames is then displayed:

Setting CE Mode

```
CE MODE IS BEING
SET.
PLEASE WAIT.
```

— or —

Resetting CE Mode

```
CE MODE IS BEING
RESET.
PLEASE WAIT.
```

Immediately after the message is displayed, an inline diagnostic routine is started using the specified controller. CE mode is set or reset for all specified devices.

After the inline diagnostic has completed setting or resetting CE mode, one of the following frames is displayed:

Setting CE Mode

```
DEVICES IN CE MODE:
0X: .123.........
1X: ..............
(SEE PSG MD-3, 035)
```

— or —

Resetting CE Mode

```
CE MODE IS RESET
FOR ALL DEVICE
ADDRESSES.
```

In the preceding frame, devices 01, 02, and 03 are in CE mode. Devices 00 and 04 through 0F are represented by dots in the second line of the display. Devices 10 through 1F are displayed on the third line if the string has 4 paths.

Some problems with the storage control, the controller, or the control interface do not allow the CE mode diagnostic to run and CE mode can not be set. The MD displays an error message similar to that shown below. If this happens, analyze the error and correct the problem before continuing.

```
IC**** CTL=A* DEV=**
MD DETECTED ERROR
EB=** **** **** ****
 **** **** **** ****
```

```
PRESS ENTER TO
ANALYZE OR PF KEY
FOR MAIN MENU.
(SEE PSG MD-3, 500)
```

Run Diagnostic Tests (MD Main Menu Option 1)

1. Press the PF key to return to the MD Main menu.

2. Select option 1 (Run Diagnostics) and advance to the MD Diagnostics menu:

```
* DIAGNOSTIC MENU  *
(SEE PSG MD-3,100)
0-NORMAL SEQUENCE
1-CONTROLLER TEST...
```

```
2-EXTENDED DPS TEST
3-DEVICE TEST
4-CONNECTION TEST
5-HA SCAN        ...
```

```
6-MOTOR TEST
7-DEVICE STATUS
8-CE TRACK REPAIR
9-STORAGE CTL STATUS
```

The diagnostic options and their meanings are:

Option	Meaning
0	Run controller and device diagnostics on the specified controllers and devices. See page MD-11.
1	Run controller tests on the specified controllers. See page MD-13.
2	Run the extended DPS tests on both controllers. This option can not be used when the string is attached to a 3990. See page MD-14.
3	Run device tests on the specified devices. See page MD-15.
4	Test for connection errors between the MD, the specified controller and the storage path or storage director. See page MD-17.
5	Scan Home Address on the specified device. See page MD-19.
6	Run the motor test on the specified drive. See page MD-24.
7	Test the controller and collect the status of all devices in the string without putting the devices in CE mode. See page MD-26.
8	Locate and repair defects on the CE cylinder and on the four diagnostic cylinders. All home addresses on these cylinders are rewritten. See page MD-32.
9	Collect the following status from the Storage Control. • Devices in CE Mode • Device and Storage Path Fenced conditions (3990). • Write Inhibit conditions See page MD-34.
A	Run the NRRO test on a specific drive. See page MD-37.

3. Go to the referenced pages for information about the diagnostic options.

Diagnostic Menu Option 0 - Normal Sequence

The normal sequence is a set of linked diagnostics used to perform a machine checkout. The controller and device tests in the following list are run in sequence.

- 80 - Controller/DPS
- 81 - Device Logic
- 82 - Servo
- 83 - Read/Write Data Transfer
- 84 - Read/Write Function
- 85 - Seek Exerciser

The normal sequence runs on controllers and devices as specified by the user.

One or more controllers may be specified. If multiple controllers are specified the normal sequence is run on one controller and on each device specified. An abbreviated normal sequence is then run with the other controllers and on each device specified. The abbreviated normal sequence consists of diagnostics 80, 81, and 83. Diagnostics 82, 84 and 85 are excluded. If it is necessary to run the complete normal sequence with multiple controllers, each controller must be selected individually.

The devices to be tested must be in CE mode. The normal sequence runs inline while customer operation continues on devices not specified for testing. See the DIAG section in the *MSM, Volume R60*, for information about the diagnostics.

To run the Normal Sequence diagnostics:

1. From the Diagnostic Menu, select option 0.

   The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 200)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: x x

(SEE PSG MD-3, 200)
```

   The "x"s shown in the preceding frame identify the last controller or controllers used to run diagnostics in this session. If none was used, no default is displayed.

   The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4
1 2	Controllers A1 and A2
3 4	Controllers A3 and A4
1 2 3 4	Controllers A1, A2, A3 and A4

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths. The MD will instruct you when it is necessary to move the MD plug.*

2. Enter your response for controller use.

   The MD displays one of the following frames:

```
SELECT DEVS. (00-0F)
(SEE PSG MD-3,210)

DEFAULT IS:      ...
```

   — or —

```
SELECT DEVS. (00-1F)
(SEE PSG MD-3,210)

DEFAULT IS:      ...
```

   Press the ENTER key to display the default devices (if any), as shown in one of the following frames:

```
  DEFAULT DEVICES
0X: .123.........

(SEE PSG MD-3,035)
```

   — or —

```
  DEFAULT DEVICES
0X: .123.........
1X: .............
(SEE PSG MD-3,035)
```

   Default devices (01, 02, and 03) are shown as an example. Default devices are those that were specified during the previous diagnostic. If no device was tested during the current diagnostic session, no default is displayed.

   There are several ways to enter device addresses. Two digits must be used for each address entered.

   - Enter a single device address, "00" through "1F."
   - Enter multiple device addresses separated with a single space (for example, 02 05 07 0A).
   - Enter a range of addresses separated with the character "T" (for example, 02T07).
   - Enter multiple ranges of addresses separated with a space (for example, 02T04 08T0B).
   - Press the ENTER key without specifying devices to accept the default devices.

   Devices to be tested must be in CE mode. If any device specified for testing is not in CE mode, an error message is displayed.

3. Specify the devices to be tested.

   When the ENTER key is pressed, the diagnostics start. The diagnostics continue until:

   a. An error is detected, or

   b. All specified controllers in the A unit to which the MD is attached, and all specified devices have been tested.

   When controllers in both A units of a 4-path string are specified, the MD stops after all devices have been tested using the controllers in the A-unit attached to the MD. The MD instructs you to move the MD connector to continue testing with the controllers in the adjacent A-unit. Do not power off the MD when moving the MD connector.

4. If an error is detected, go to "Isolation Code Error Display" on page MD-41.

5. If no errors are detected, the MD displays the following frame:

```
END OF NORMAL TEST
SEQUENCE. DO YOU
WANT TO RUN THE
SAME TESTS AGAIN?
```

6. Respond to the question by pressing the YES key or the NO key.

7. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 1 - Controller Test

The controller test (diagnostic routine 80) checks the basic controller and DPS operation. This test runs inline with customer operation. (When attached to a 3990 storage control, the DPS portion of the test is bypassed.) Devices need not be in CE mode.

To run the Controller Test:

1. From the Diagnostic menu, select option 1.

   The MD displays one of the following frames:

   ```
   SELECT CONTROLLER:

   (SEE PSG MD-3, 200)
   ```

   — or —

   ```
   SELECT CONTROLLER:
   DEFAULT IS: x x
   (SEE PSG MD-3, 200)
   ```

   The "x"s identify the last controller or controllers used to run diagnostics in this session. If none was used, no default is displayed.

   Valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4
1 2	Controllers A1 and A2
3 4	Controllers A3 and A4
1 2 3 4	Controllers A1, A2, A3 and A4

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths. The MD will instruct you when it is necessary to move the MD plug.*

2. Enter your response for controller use.

   When the ENTER key is pressed, the diagnostics start. The diagnostics continue until:

   a. An error is detected, or

   b. The specified controllers have been tested in the A unit attached to the MD.

   If controllers in both A units of a 4-path string are specified, the MD stops after the controllers in the A unit attached to the MD have been tested. The MD instructs you to move the MD connector to continue testing the controllers in the adjacent A unit. Do not power off the MD when moving the MD connector.

3. If an error is detected, go to "Isolation Code Error Display" on page MD-41.

4. If no errors are detected, the MD displays the following frame:

   ```
   END OF CONTROLLER
   TESTS. DO YOU WANT
   TO RUN THE SAME
   TESTS AGAIN?
   ```

5. Respond to the question by pressing the YES key or the NO key.

6. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 2 - Extended DPS Test

The Extended DPS test (diagnostic routine 90) provides a complete checkout of the DPS hardware. This test checks the interaction between the two controllers. (The Extended DPS tests cannot be run on a 3380-JK attached to a 3990.)

The test runs inline with customer operation. Devices need not be in CE mode.

To run the Extended DPS Test:

1. From the Diagnostic menu, select option 2. When the ENTER key is pressed, the diagnostics start running.

   The MD displays the following frame:

   ```
   DPS TESTS ARE NOW
   STARTED.
   ```

   The diagnostics continue until normal end or until an error is detected. If an error occurs, go to "Isolation Code Error Display" on page MD-41.

   If no errors are detected, the MD displays the following frame:

   ```
   END OF DPS TESTS.
   DO YOU WANT TO RUN
   THE SAME TESTS
   AGAIN?
   ```

2. Respond to the question by pressing the YES key or the NO key.

3. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 3 - Device Test

The device test runs the following device diagnostics in the sequence shown.

- 81 - Device Logic
- 82 - Servo
- 83 - Read/Write Data Transfer
- 84 - Read/Write Function
- 85 - Seek Exerciser

The controller test is not included.

The device test runs on one or more devices as specified by the user.

One or more controllers may be specified for running the device test. If multiple controllers are specified, the device test is run with one controller on each device specified. An abbreviated device test is then run with the other controllers on each device specified. The abbreviated device test consists of diagnostics 81 and 83. Diagnostics 82, 84, and 85 are excluded. If it is necessary to run the complete device test with other controllers, each controller must be selected individually.

The devices to be tested must be in CE mode. The device tests run inline while customer operation continues on devices not specified for testing. See the DIAG section in the *MSM, Volume R60,* for information about the diagnostics.

To run the Device Test:

1. From the Diagnostic menu, select option 3.

   The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 200)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: x x

(SEE PSG MD-3, 200)
```

   The "x"s shown in the preceding frame identify the last controller or controllers used to run diagnostics in this session. If none was used, no default is displayed.

   The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4
1 2	Controllers A1 and A2
3 4	Controllers A3 and A4
1 2 3 4	Controllers A1, A2, A3, and A4

   | ***Note:*** *Selecting controller A3 or A4 is valid only on strings with four storage paths. The MD will instruct you when it is necessary to move the MD plug.*

   Device tests will run using the specified controller. The controller selected should be operational. If you suspect that the controller that you want to use is not operational, use diagnostic option 0 (normal sequence) rather than diagnostic option 3.

2. Enter your response about controller use.

   The MD displays one of the following frames:

```
SELECT DEVS. (00-0F)
(SEE PSG MD-3,210)

DEFAULT IS:      ...
```

— or —

```
SELECT DEVS. (00-1F)
(SEE PSG MD-3,210)

DEFAULT IS:      ...
```

   Press the ENTER key to display the default devices (if any), as shown in one of the following frames:

```
  DEFAULT DEVICES
0X: .123.........

(SEE PSG MD-3,035)
```

— or —

```
  DEFAULT DEVICES
0X: .123.........
1X: ..............
(SEE PSG MD-3,035)
```

   Default devices (01, 02, and 03) are shown as an example. Default devices are those that were specified during the previous diagnostic. If no device was tested during the current diagnostic session, no default is displayed.

   There are several ways to enter device addresses. Two digits must be used for each address entered.

   - Enter a single device address, "00" through "1F."
   - Enter multiple device addresses separated with a single space (for example, 02 05 07 0A).
   - Enter a range of addresses separated with the character "T" (for example, 02T07).
   - Enter multiple ranges of addresses, separating each range with a space (for example, 02T04 08T0B).
   - Press the ENTER key without specifying devices to accept the default devices.

   Devices to be tested must be in CE mode. If any device specified for testing is not in CE mode, an error message is displayed.

3. Specify the devices to be tested.

   When the ENTER key is pressed, the diagnostics start. The diagnostics continue until:

   a. An error is detected.

   b. All devices have been tested with the AJ4/AK4 unit attached to the MD.

   If controllers in both A-units of a 4-path string are specified, the MD stops after all devices have been tested using the controllers in the A-unit attached to the MD. The MD instructs you to move the MD connector to continue testing with the controllers in the adjacent A-unit. Do not power off the MD when moving the MD connector.

4. If an error is detected, go to "Isolation Code Error Display" on page MD-41.

5. If no errors are detected, the MD displays the following frame:

```
END OF DEVICE TESTS.
DO YOU WANT TO RUN
THE SAME TESTS
AGAIN?
```

6. Respond to the question by pressing the YES key or the NO key.

7. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 4 - Connection Test

The connection test checks the connection between the MD, the specified controller, and the storage path or storage director. The connection test does not run concurrently with customer operation on the controller being tested. Before this option is used, the path must be varied offline to all devices from each attached system. Devices need not be in CE mode.

The MD connection test is run by the controller sequencer (not the storage control). There are three parts to the test.

- MD to controller connection
- Controller function
- Storage control

To run the connection test, the MD will instruct you to power the controller off and then on. During the power-on sequence, the controller sequencer (if operating correctly) establishes communication with the MD and the connection test starts.

Warning: The connection test does not run concurrently with customer operation on the controller being tested. Ensure that the controller can be taken from the customer.

Warning: If any drives in the string are not running, place the drive motor switches for those drives to OFF because those drives might not sequence on correctly.

To run the Connection Test:

1. From the MD Diagnostic Menu, select option 4.

   The MD displays the following frames:

```
******WARNING*******
CONNECTION TEST
CAN NOT RUN
CONCURRENTLY WITH...
```

```
CUSTOMER OPERATION
ON THE CONTROLLER
BEING TESTED.
                  ...
```

```
SEE PSG MD-3,320 FOR
INSTRUCTIONS OR USE
THE PF KEY TO RETURN
TO THE MAIN MENU.
```

2. Press the ENTER key to advance to the next frame. The following prompt appears:

```
WHICH CONTROLLER
C^NNECTION DO YOU
WANT TO TEST?
(SEE PSG MD-3, 330)
```

   The valid responses are:

Response	Meaning
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths. The MD will instruct you when it is necessary to move the MD plug.*

3. Enter your response to identify the controller to be tested.

   The MD displays the following instructions:

```
CTLR x CONNECTION
TESTS ARE READY. DO
THE FOLLOWING (SEE
PSG MD-3, 340)  ...
```

```
1. POWER OFF CTLR x
2. PRESS ENTER
3. WITHIN 5 SECONDS,
   POWER ON CTLR x.
```

4. Follow the instructions on the MD.

   a. Turn off the indicated controller. Use one of the following CPs to power off and on:

      - Controller A1 or A3 - CP410 in the A unit being tested.
      - Controller A2 or A4 - CP411 in the A unit being tested.

   b. Press the ENTER key. **You must turn the controller on within 5 seconds or the MD will time out.**

      Press the ENTER key now to cause the MD to start polling the controller sequencer.

   c. Turn on the indicated controller.

   When the controller is powered on, the controller sequencer branches to a program step that looks for the MD poll. If the controller sequencer is started successfully and if the sequencer sees the MD poll, communication is established between the controller sequencer and the MD. The connection test then starts.

5. If an error is encountered, go to "Isolation Code Error Display" on page MD-41.

6. If no errors are detected, the following is displayed:

```
END OF CONNECTION
TESTS. DO YOU WANT
TO RUN CONNECTION
TESTS AGAIN?
```

7. Respond to the question by pressing the YES key or the NO key.

8. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 5 - HA Scan

HA Scan (diagnostic routine 91) reads all the home addresses (HAs) on the specified range of cylinder addresses. If data checks are detected, the error information is saved until the scan is completed. At the end of the scan, error data is summarized and presented by the MD. The selected device must previously be placed in CE mode. The HA Scan diagnostic runs inline with customer operation on devices not selected by the user.

To run the HA Scan test:

1. From the MD Diagnostic Menu, select option 5.

   The MD displays one of the following frames:

   ```
   SELECT CONTROLLER:

   (SEE PSG MD-3, 360)
   ```

   — or —

   ```
   SELECT CONTROLLER:
   DEFAULT IS: x

   (SEE PSG MD-3, 360)
   ```

   The x shown in the preceding frame is replaced by 1, 2, 3, 4 or a blank to identify the last controller used to run diagnostics in this session. If none was used, no default is displayed.

   The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Options 3 and 4 are only valid on strings with four storage paths when the MD is attached to the unit that contains controllers A3 and A4.*

2. Enter your response for controller use.

   The MD displays one of the following frames:

   ```
   SELECT DEVICE:

   (SEE PSG MD-3, 360)
   ```

   — or —

   ```
   SELECT DEVICE:
   DEFAULT IS: xx

   (SEE PSG MD-3, 360)
   ```

Default device was specified during the previous diagnostic. If no single device was tested during the current diagnostic session, no default is displayed.

Device addresses are in hexadecimal (00 through 1F). The response may have the following forms:

Response	Meaning
ENTER	Accepts the default device shown for testing.
0B	Specifies device 0B for testing (only one device can be tested at a time).

The device must be in CE mode.

3. Enter your response to identify the device to be used.

   The MD displays the following frame:

```
SELECT CONTROL MODE:
 1. AUTOMATIC
 2. MANUAL
(DEFAULT IS AUTO)
```

   Automatic mode automatically continues after errors until the scan is completed or until there are 80 tracks in error. At the end of the scan, error data is presented in either detail form or summary form (at your option).

   Manual mode stops on each error and displays the error information. You can continue the scan by pressing the ENTER key.

   When an error is displayed in manual mode, you have the opportunity to change the mode to automatic mode. At the end of the scan, error data is presented in either detail or summary form (at your option).

4. Select the mode of operation from the display.

   The MD displays the following frame allowing you to select the track type:

```
SELECT TRACK TYPE:
1. CUSTOMER TRACKS
2. CE TRACKS
3. HA MAP TRACKS
```

   The valid responses are:

Response	Meaning
1	Customer tracks: Tracks used for customer data.
2	CE tracks: Tracks on the CE cylinder and on the four diagnostic cylinders.
3	HA MAP tracks: Tracks that contain factory-assigned skip displacement information for the volume.

5. Respond to the track type prompt.

   - If CE tracks or HA MAP tracks are specified, skip to step 9 on page MD-21.
   - If customer tracks are specified, the MD prompts for track range information:

```
DO YOU WANT TO SCAN
ALL CUSTOMER TRACKS?
(SEE PSG MD-3,360)
```

6. Respond with either the YES key or the NO key. (If the response is YES, skip the next two steps.)

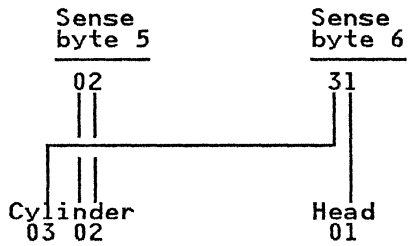
   If you respond with the NO key, you must specify a range of cylinders to be scanned.

   The MD prompts first for a beginning cylinder number, then for an ending cylinder number. The ending cylinder number must be higher than, or equal to, the beginning cylinder number.

The range of cylinder numbers are in hexadecimal:

Cylinder Number	3380-J	3380-K
Lowest	000	000
Highest	375	A5F

Note: *The Physical Address (PA) bytes, from the error bytes of another diagnostic or from sense bytes 5 and 6, may be converted to cylinder and head by using the following diagram.*



In this example, byte 5 contains 02 and byte 6 contains 31. The address is cylinder X"0302," head X "01."

7. Enter the three-digit hexadecimal number of the beginning cylinder.

   After the beginning cylinder is entered, the MD prompts for the ending cylinder number. The ending cylinder number must be equal to or greater than the number for the beginning cylinder.

8. Enter the three-digit hexadecimal number of the ending cylinder.

   The MD displays the following frame:

```
HOW MANY TIMES DO
YOU WANT TO READ
EACH HA?
(DEFAULT IS 2)
```

   HA Scan cannot directly determine if a data check in the home address area is permanent. To determine that a data check is permanent, the home address (HA) must be read multiple times. If a data check occurs each time the HA is read, the data check can be considered permanent. If the HA is sometimes read without error, the data check can be considered temporary.

   It follows that the separation of permanent and temporary data checks is more reliable when the reading is repeated more. But repeating reading takes time.

   The minimum run time for scanning all home addresses on the volume (reading each HA one time) is:

   - 6 minutes for a model AJ4 or BJ4 actuator
   - 18 minutes for a model AK4 or BK4 actuator

   Valid responses to the "How many times ... to read" prompt are:

Response	Meaning
ENTER	Default: Read each track 2 times
1	Read each track 1 time
2	Read each track 2 times
...	...
F	Read each track 15 times

9. Enter your response for the number of times the tracks are to be read. (If the response is not 1, skip to step 10 on page MD-22.

   If the number of times for reading the tracks is 1, the MD asks "HOW MANY TIMES DO YOU WANT TO RETRY IF DATA CHECKS OCCUR?"

   Valid responses to the "How many times ... to retry" prompt are:

Response	Meaning
1	Retry each track in error 1 time
2	Retry each track in error 2 times
...	...
F	Retry each track in error 15 times

10. Enter your response to select the number of retries. (When a single read is selected, select multiple retries to make it easier to determine if the error is solid or intermittent.)

    The scan starts. During the scan, the MD displays the following frame:

```
   ***HA SCAN***
RUNNING ON DEVICE xx
   CYLINDER      xxx
   ERROR COUNT    xx
```

    The cylinder number (hexadecimal) is updated every 16 (X"10") cylinders. The error count is updated each time a data check is encountered.

    The scan continues until one of the following occurs:

    - Normal end, with no errors detected.
    - An equipment check (any isolation code other than IC 9180). See "Isolation Code Error Display" on page MD-41. The following options are provided:
      - Analyze the error
      - Quit and return to the MD Main menu
      - Continue scanning with the next track
    - A data check occurs during manual mode (IC 9180). See "Isolation Code Error Display" on page MD-41. (The scan can be continued after the error display. The option to switch to automatic mode is available.)
    - More than 80 data checks detected. (The scan ends, and detail or summary information may be displayed. See following.)
    - Normal end with data checks detected. (Detail or summary information may be displayed. See following.)

11. **If no errors are detected, the next two frames are displayed:**

```
  *SCAN COMPLETE*
     NO ERRORS
       WERE
     DETECTED    ...
```

```
DO YOU WANT TO RUN
HA SCAN AGAIN ?
```

12. Respond to the question by pressing the YES key or the NO key.

13. Press the PF key to return to the MD Main menu.

14. **If data checks are detected during the scan,** one of the following frames is displayed to show the error condition:

```
 * SCAN COMPLETE *
   xx TRACKS HAD
     DATA CHECKS
SEE PSG MD-3,395...
```

— or —

```
  * SCAN STOPPED *
THE DATA CHECK LOG
IN THE MD IS FULL.
SEE PSG MD-3,395...
```

The "xx" in the first frame is the number of tracks (in hexadecimal) that had errors. The maximum number of tracks that can be stored by the MD is 80 (X"50"). If more than 80 tracks had errors, the scan is terminated and the second display is generated.

After the scan is completed or stopped, a display of the information can be selected from the Select Display Mode menu:

```
SELECT DISPLAY MODE:
 1-HEAD/ARM SUMMARY
 2-TRACK SUMMARY
 3-TRACK DETAIL  ...
```

```
 4-RUN HA SCAN
   AGAIN
 5-RETURN TO MAIN
   MENU
```

Display Modes

After displaying the selected information, the MD returns to the Select Display Mode menu and another mode can be selected. The following display modes can be specified:

Display Mode 1: Head/Arm Summary

The Head/Arm Summary mode presents a summary (by head) of the number (in hexadecimal) of tracks that had data checks. The summary is presented in four displays, one for each head arm:

```
   **  ARM x  **

HEAD:    xx xx xx xx
ERRORS:  xx xx xx xx
```

ERRORS = Number of errors for each head

Display Mode 2: Track Summary

The Track Summary mode presents one or more displays with a one-line entry for each track that had errors:

```
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
```

CYL = Cylinder number (hexadecimal)
HD = Head number (hexadecimal)
CNT = Number of errors (hexadecimal)

Display Mode 3: Track Detail

Track detail mode presents one display for each track in error. There are two types of error displays:

```
  ** DATA CHECK **
HOME ADDRESS AREA
CYL = xxx   HEAD = x
ERROR COUNT = x
```

— or —

```
NO SYNC BYTE FOUND
HOME ADDRESS AREA
CYL = xxx  HEAD = x
ERROR COUNT = x
```

CYL = Cylinder number (hexadecimal)
HEAD = Head number (hexadecimal)
ERROR COUNT = Number of errors (hexadecimal)

Display Mode 4: Run HA Scan Again

Repeat the HA Scan test.

Display Mode 5: Return to Main Menu

Return to the MD Main Menu.

Diagnostic Menu Option 6 - Motor Test

The motor test (routine 99) is used to isolate problems resulting in a motor stopped condition. The drive motor must be stopped before the test is started. Both devices associated with the stopped HDA and motor are required, and both should be varied offline from the system. Controllers and devices are selected by the user. The devices must be in CE mode. The motor test runs inline with customer operation on devices not selected by the user.

To run the Motor Test:

1. From the Diagnostic Menu, select option 6.

   The MD displays the following frames:

```
WARNING - BOTH
DEVICES OF THE SAME
DRIVE WILL BE USED.
PROPER OPERATION...
```

```
OF THIS ROUTINE
REQUIRES THE MOTOR
TO BE STOPPED.
SEE MIM,  PWR-1, A0
```

   The MD advances to one of the following frames when the ENTER key is pressed:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 200)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: x x

(SEE PSG MD-3, 200)
```

   The "x"s shown in the preceding frame identify the last controller or controllers used to run diagnostics in this session. If none was used, no default is displayed.

   The valid responses are:

Response	**Meaning**
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Selecting controller A3/A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

2. Enter your response for controller use.

   The MD advances to one of the following frames:

```
SELECT DEVICE:

(SEE PSG MD-3, 210)
```

   — or —

```
SELECT DEVICE:
DEFAULT IS: xx

(SEE PSG MD-3, 210)
```

   The response to this prompt must be two hexadecimal digits representing one of the two devices in the drive being tested. Either device address is permitted.

3. Specify a single device in the drive to be tested. The MD displays the following frame:

```
TURN MOTOR SWITCH
SWxxx OFF. MOTOR
MUST BE STOPPED BE-
FORE CONTINUING  ...
```

   To begin the test, the drive motor switch must be off and the motor must be stopped.

   The xxx part of SWxxx in the frame above is replaced by 691 (if the front drive was identified for testing) or by 692 (if the rear drive was identified). See page INTRO-34 for the switch locations.

4. Turn off the switch indicated in the display. Then press the ENTER key to advance to the next frame. The MD displays the following frame:

```
DISABLE DEVICES aa,
bb WITH SWxxx AND
SWyyy AT SAM PANEL.
THEN PRESS ENTER.
```

   In the preceding frame, the aa and bb are replaced by the addresses of the devices in the drive to be tested. The xxx and yyy parts of SWxxx and SWyyy in the frame are replaced by 693 and 694 (if a front drive is to be tested) or 695 and 696 (if a rear drive is to be tested).

5. After the drive motor has stopped, set the switches indicated by the MD to the DISABLE position to disable the device logic for both actuators in the drive. Then press the ENTER key to start the test. Follow instructions given by the MD until the test is completed.

6. If the test completes without errors, the motor starts and the following frame is displayed:

```
END OF TEST. DO YOU
WANT TO RUN AGAIN?
```

7. Respond to the question by pressing the YES key or the NO key.

8. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 7 - Device Status

The Device Status test is used for the following purposes:

- Testing controller operation.
- Testing communication with each device in the string without having to put devices in CE mode.
- Testing device enable/disable switches on the operator panel.
- Displaying string configuration information.
- Displaying device status information.

The Device Status test may be run inline with customer operation. Devices need not be in CE mode unless the storage path or storage director is disabled from all system channels. If the storage path or storage director is disabled from all channels, place all devices in CE mode before running the Device Status test. Devices in CE mode are tested the same as those not in CE mode.

The Device Status test begins by running the controller test (diagnostic routine 80). If no errors are detected, the Device Status test (diagnostic routine 96) is run.

The Device Status test selects each device on the string and performs a Read Home Address operation (without moving the access mechanism). String configuration information is displayed.

To run the Device Status test:

1. From the Diagnostic menu, select option 7.

The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 200)
```

— or —

```
SELECT CONTROLLER:
DEFAULT IS: x

(SEE PSG MD-3, 200)
```

The "x" shown in the preceding frame identifies the last controller used to run diagnostics in this session. If none was used or if two controllers were used, no default is displayed.

The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

2. Enter your response for controller use.

The diagnostic routines start running and continue until string configuration information is displayed or until an error is encountered.

- If an error is encountered, go to "Isolation Code Error Display" on page MD-41.
- If no error is detected, the MD displays configuration information in one of the following series of frames. The configuration information displayed is dependent on storage control type:
  - For a 3880 subsystem, see "Configuration (3880)" on page MD-27.
  - For a 3990 subsystem, see "Configuration (3990)" on page MD-28.

Configuration (3880)

For strings attached to a 3990 storage control, refer to page MD-28.

If no error is detected, the MD displays configuration information as shown in the following frames.

```
STRING CONFIGURATION
CTLR Ax ADR=x ID=xx
3880  SDID=xx
                  ...
```

```
THE STRING HAS:
A*
                  ...
```

```
DO YOU WANT AN
ANALYSIS OF THIS
CONFIGURATION DATA?
(SEE PSG MD-3, 460)
```

CTLR Ax

x = the controller number that was selected to run the test.

ADR=x

x = the string number (0 or 1) set in the subsystem configuration switches on the DDC/DTB card. See page REPAIR-18.

The string number is normally put on the operator panel at installation time. All controllers in the string must be set the same.

ID=xx

xx = the physical ID of the controller (A1 or A2) set in the physical address switches on the I/O control card. See page REPAIR-20. The controller physical ID is normally put on the 3380 operator panel at installation time (String ID).

The physical ID must be set the same for all controllers in the string.

SDID=xx

xx = The physical ID of the storage director in the 3880. The SDID is normally put on the 3380 operator panel at installation time. Each storage director attached to the string has a unique SDID.

CTLR PATH=x

x = The path that was sensed from the controller by the storage control during a sense controller path operation.

0 = Controller A1 Path
1 = Controller A2 Path

A*

* = The number of units that are in the string. One of the following lines is displayed.

A- UNIT ONLY
A- AND 1 B UNIT
A- AND 2 B UNITS
A- AND 3 B UNITS

The last frame of the series asks if you want the configuration data analyzed. To respond, press the YES key or the NO key:

YES The MD has you check for inconsistencies in the collected data. If no inconsistencies are found, the following menu is displayed. If inconsistencies are found, the test must be rerun to display device status.

NO The MD displays the following menu.

3. Enter your response about the analysis of the configuration data:

If you do not want to analyze the configuration data or if no inconsistencies were found during the analysis of collected data, the MD displays the following menu:

```
SELECT OPTION:
1 = DISPLAY DEVICE
    STATUS
2 = REVIEW CONFIG...
```

```
3 = RERUN CONFIG.
4 = END
                  ...
```

1 = Continue the Device Status test and display the device status. See "Display the Device Status" on page MD-30.

2 = Review the configuration data just displayed.

3 = Collect the configuration data again and display it.

4 = End the Device Status test without displaying device status.

4. Select an option from the preceding menu.

5. To continue the device status test, go to "Display the Device Status" on page MD-30.

Configuration (3990)

For strings attached to a 3880 storage control, see "Configuration (3880)" on page MD-27.

One series of frames is for 2-path configurations and the other series of frames is for 4-path configurations.

2-Path Configurations

```
STRING CONFIGURATION
CTLR Ax ADR=x  ID=xx
3990 SSID=xxxx  SP=x
CTLR PATH=x     ...
```

```
THE STRING HAS:
A*
                ...
```

```
DO YOU WANT AN
ANALYSIS OF THIS
CONFIGURATION DATA?
(SEE PSG MD-3, 460)
```

4-Path Configurations

```
STRING CONFIGURATION
CTLR Ax ADR=x  ID=xx
3990 SSID=xxxx  SP=x
CTLR PATH=x     ...
```

```
SUB-STRING 0 HAS:
A*
SUB-STRING 1 HAS:
A*              ...
```

```
DO YOU WANT AN
ANALYSIS OF THIS
CONFIGURATION DATA?
(SEE PSG MD-3, 460)
```

CTLR Ax

x = the controller number that was selected to run the test.

ADR=x

x = the string number (0 or 1) that is set in the subsystem configuration switches on the DDC/DTB card. See page REPAIR-18.

The string number is normally put on the operator panel at installation time. All controllers in the string must be set the same.

ID=xx

xx = the physical ID of the controller (A1, A2, A3 or A4) set in the physical address switches on the I/O control card. See page REPAIR-20. The controller physical ID is normally put on the 3380 operator panel at installation time (String ID).

The physical ID must be set the same for all controllers in the string.

SSID=xxxx

xxxx = The physical ID of the Storage Path in the 3990. The SSID is normally put on the 3380 operator panel at installation time. The SSID must be set the same for all storage paths attached to the string at installation time.

SP=x

x = The storage path (SP0-SP3) connected to the controller that was selected to run the test. The storage path is normally put on the 3380 operator panel at installation time.

CTLR PATH=x

x = The path that was sensed from the controller by the storage control during a sense controller path operation.

0 = Controller A1 Path
1 = Controller A2 Path
2 = Controller A3 Path
3 = Controller A4 Path

A*

* = The number of units that are in the string or sub-string (4 path). One of the following lines is displayed.

A- UNIT ONLY
A- AND 1 B UNIT
A- AND 2 B UNITS
A- AND 3 B UNITS

The last frame of the series asks if you want the configuration data analyzed. To respond, press the YES key or the NO key:

YES The MD has you check for inconsistencies in the collected data. If no inconsistencies are found, the following menu is displayed. If inconsistencies are found, the test must be rerun to display device status.

NO The MD displays the following menu.

3. Enter your response about the analysis of the configuration data.

If you do not want to analyze the configuration data or if no inconsistencies were found during the analysis of collected data, the MD displays the following menu:

```
SELECT OPTION:
1 = DISPLAY DEVICE
    STATUS
2 = REVIEW CONFIG...

3 = RERUN CONFIG.
4 = END
```

1 = Continue the Device Status test and display the device status.
2 = Review the configuration data just displayed.
3 = Collect the configuration data again and display it.
4 = End the Device Status test without displaying device status.

4. Select an option from the preceding menu.

5. To continue the device status test, go to "Display the Device Status" on page MD-30.

Display the Device Status

6. To continue the device status test (option 1 from the "Select Option" menu is selected), the following frames are displayed:

2-Path Subsystem

```
   DEVICE STATUS:
X = 0123456789ABCDEF
0X: ****************
                 ...
```

```
DO YOU WANT A
DESCRIPTION OF THE
STATUS CODES?
(SEE PSG MD-3, 465)
```

X = Device Number (0-F)
0X: Represents devices 00-0F

4-Path Subsystem

```
   DEVICE STATUS:
X = 0123456789ABCDEF
0X: ****************
1X: ****************
```

```
DO YOU WANT A
DESCRIPTION OF THE
STATUS CODES?
(SEE PSG MD-3, 465)
```

X = Device Number
0X: Represents devices 00-0F
1X: Represents devices 10-1F

The asterisks (*) in the top frame are replaced by device status (for details, see step 7). The bottom frame asks if you want the status codes (used in the frame on the top) described. To respond, press the YES key or the NO key:

YES Status code information (shown below) is displayed. Press the ENTER key to continue with the display of device type information.

NO The MD displays device type information.

7. Enter your response about the device status code descriptions.

Displayed status code information is:

B Device Busy
D Data Check
E Equipment Check

I Intervention Required: Device is disabled and not on-Line; this code has nothing to do with whether or not a device is in CE mode.

N Not Installed

O Operational: An operational device normally reports a status of "O."

S Servo busy: If a device has been powered on without at least one storage path channel interface enabled, the device usually reports a status of "S" because there is no attached system to handle the attention interrupt. To eliminate this problem, place the device in CE mode (use MD Main menu Option 0) and rerun the device status test.

Display Device Type Information

8. To continue the device status test: after the device status code description response is completed, device type information is displayed in one of the following series of frames. One series is for 2 path configurations and the other series of frames is for 4 path configurations.

2-Path Configurations

```
DEVICE TYPE:
FR01=xxx     FR03=xxx
FR02=xxx     FR04=xxx
                 ...
```

```
DO YOU WANT AN
ANALYSIS OF THE
DEVICE TYPE DATA?
(SEE PSG MD-3, 468)
```

FR01 = AJ4 or AK4 unit unit
FR02 = 1st B unit attached to A unit
FR03 = 2nd B unit attached to A unit
FR04 = 3rd B unit attached to A unit

XXX = Model designation (AJ4, AK4, BJ4, or BK4) of the installed machine frame(s). Frame members are not displayed if they are not installed.

XXX = ??? The diagnostic routine was unable to determine the 3380 model. This occurs when the diagnostic cannot select any of the devices in the unit due to heavy system activity.

4-Path Configurations

```
DEVICE TYPE - SS0:
FR01=xxx    FR03=xxx
FR02=xxx    FR04=xxx
                ...
```

```
DEVICE TYPE - SS1:
FR11=xxx    FR13=xxx
FR12=xxx    FR14=xxx
                ...
```

```
DO YOU WANT AN
ANALYSIS OF THE
DEVICE TYPE DATA?
(SEE PSG MD-3, 468)
```

FR01 = 1st AJ4 or AK4 unit unit
FR02 = 1st B unit attached to 1st A unit
FR03 = 2nd B unit attached to 1st A unit
FR04 = 3rd B unit attached to 1st A unit

FR11 = 2nd AJ4 or AK4 unit unit
FR12 = 1st B unit attached to 2nd A unit
FR13 = 2nd B unit attached to 2nd A unit
FR14 = 3rd B unit attached to 2nd A unit

XXX = Model designation (AJ4, AK4, BJ4, or BK4) of the installed machine frame(s). Frame members are not displayed if they are not installed.

XXX = ??? The diagnostic routine was unable to determine the 3380 model. This occurs when the diagnostic cannot select any of the devices in the unit due to heavy system activity.

SS0 = (Substring 0) is the first substring in a 4-path configuration. Substring 0 contains ports 0-3 (devices 00 - 0F).

SS1 = (Substring 1) is the second substring in a 4-path configuration. Substring 1 contains ports 4-7 (devices 10 - 1F).

The last frame displayed asks if you want the device type information analyzed. To respond, press the YES key or the NO key:

YES The MD has you check the data for inconsistencies. If no inconsistencies are found and no errors occur, the MD displays the following frame.

NO The MD displays the following frame.

```
SELECT OPTION:
1.= REVIEW
2.= RERUN TEST
3.= END
```

9. Enter your response about the analysis of the device-type data.

10. Select option 1, 2, or 3.

11. Press the PF key to return to the MD Main menu.

Diagnostic Menu Option 8 - CE Track Repair

The CE track repair option uses diagnostic routines 83 and 9C to perform the following functions to the CE cylinder and the four diagnostic cylinders.

- Test each track for data checks
- Inspect each track with data checks for defects
- Skip all defects found

The CE track repair routines are designed to run inline while customer operation continues on devices not selected by the user. The selected device must be previously placed in CE mode. For additional information about CE track repair, see page MAP-1, Entry EF, in the *MIM, Volume R10.*

To run the CE Track Repair option:

1. From the Diagnostic Menu, select option 8.

   The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 200)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: x

(SEE PSG MD-3, 200)
```

   The "x" shown in the preceding frame is replaced by 1, 2, 3, 4, or a blank to identify the last controller used to run diagnostics in this session. If none was used, no default is displayed.

   The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   CE track repair will run using the specified controller. The controller specified should be operational.

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

2. Enter your response about controller use.

   The MD displays one of the following frames:

```
SELECT DEVICE:

(SEE PSG MD-3, 210)
```

   — or —

```
SELECT DEVICE:
DEFAULT IS: xx

(SEE PSG MD-3, 210)
```

   Default devices are those that were specified during the previous diagnostic. If no device was tested during the current diagnostic session, no default is displayed.

   Device addresses are in hexadecimal (00 through 1F).

   The device to be tested must be in CE mode. If the device specified for testing is not in CE mode, an error message is displayed.

3. Specify a single device.

   When the ENTER key is pressed, the CE track repair diagnostic starts. The diagnostic continues until normal end or until an unrecoverable error is encountered. Several displays appear while the routines are running. These frames are to keep you informed of what is happening:

```
  * CE CYLINDER *
 WRITE/READ ROUTINE
RUNNING ON DEVICE xx
   (ROUTINE 83)  ...
```

```
* CE TRACK REPAIR *
RUNNING ON DEVICE XX
CYLINDER XXX HEAD X
   (ROUTINE 9C)
```

   The CE track repair process may take several minutes. The amount of time depends on the extent of the problem. It takes a little more than 2.0 minutes for each defect found.

4. If an unrecoverable equipment check error is encountered, go to "Isolation Code Error Display" on page MD-41.

5. If no errors are detected and the repair process is completed successfully, the following frame is displayed.

```
* REPAIR COMPLETE  *
   NO DATA CHECKS
WERE DETECTED ON THE
     CE TRACKS.
```

6. Press ENTER to return to the MD Main menu.

Diagnostic Menu Option 9 - Storage Control Status

The Storage Control Status option uses diagnostic routine 9F to collect status information from the Storage Control. The status information collected includes the following:

- Devices in CE Mode
- Controller Write Inhibit conditions
- Channel Write Inhibit conditions
- Storage Path Fenced conditions
- Device Fenced conditions

The Storage Control Status test is designed to run inline with customer operation. Devices do not need to be placed in CE Mode.

To run the Storage Control Status option:

1. From the Diagnostic Menu, select option 9.

   The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 200)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: X

(SEE PSG MD-3, 200)
```

   The X shown in the preceding frame identifies the last controller used to run diagnostics in this session. If none was used, no default is displayed.

   The valid responses are:

Response	**Meaning**
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   The storage control status test will run using the specified controller. The controller specified should be operational.

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

2. Enter your response for controller use.

   When the ENTER key is pressed, the Storage Control Status test starts and continues until Storage Control Status is displayed or until an error is encountered.

3. If an error is encountered, go to "Isolation Code Error Display" on page MD-41.

4. If no error is detected, the following frame is displayed:

```
STORAGE CONTROL
    STATUS
      FOR
  CONTROLLER A*
```

5. Press the ENTER key to display status information:

```
xxxx  S*ID: xx
STORAGE PATH: x
CONTROLLER: Ax
SEE PSG MD-3, 480...
```

If line 1 is "3880 SDID: xx,"
xx = the Storage Director identifier.

If line 1 is "3990 SSID: xx,"
xx = the Subsystem identifier.

STORAGE PATH: x
x = the Storage Path (0-3)

CONTROLLER: Ax
Ax = the Controller (A1, A2, A3, or A4)

6. Press the ENTER key to display devices in CE Mode. The following frame is displayed:

2-Path Configurations

```
DEVICES IN CE MODE:
0X: ................

(SEE PSG MD-3, 035)
```

0X: = Devices 00 - 0F

4-Path Configurations

```
DEVICES IN CE MODE:
0X: ................
1X: ................
(SEE PSG MD-3, 035)
```

0X: = Devices 00 - 0F
1X: = Devices 10 - 1F

7. Press the ENTER key to determine if the storage control has set write inhibit for the controller selected in step 2 on page MD-34. One of the following frames is displayed:

```
NO WRITE INHIBIT
CONDITIONS WERE
  DETECTED FOR
 CONTROLLER Ax.  ...
```

— or —

```
WRITE INHIBIT IS SET
FOR CONTROLLER Ax.

SEE PSG MD-3,090 ...
```

Controller Write Inhibit is set for a controller if a controller error or storage path error is detected during a functional write operation (diagnostics do not cause write inhibit conditions). Write inhibit is set to prevent a defective storage path from destroying customer data.

Write inhibit can be reset as follows:

- Use the MD Main Menu option Z (End of Call -- see RMAP 0350 Step 001 on page REPAIR-15).
- If the MD is attached to a 3990 storage control, use the Storage Path Restart switch.
- Issue the ICKDSF CONTROL command with the ALLOWWRITE parameter specified. See the *Device Support Facilities Users Guide and Reference*, GC35-0033 and IMAP 0280 Step 001 on page ISOLATE-49.

8. Press the ENTER key to determine if the storage control has set write inhibit on one or more channels. One of the following frames is displayed:

```
NO CHANNEL WRITE
INHIBIT CONDITIONS
  WERE DETECTED FOR
 CONTROLLER Ax.  ...
```

— or —

```
CHANNEL WRITE
INHIBIT IS SET FOR
CHANNELS: ........
SEE PSG MD-3,090 ...
```

Channel Write Inhibit is set in the storage control for a channel if a channel or channel related storage path error is detected during a functional write operation (diagnostics do not cause channel write inhibit conditions). Write Inhibit conditions may reset as described in step 7 on page MD-35.

9. Press the ENTER key to display Fenced conditions (3990 4-path only).

   Fencing is a technique used by the storage path functional microcode to remove a failing path from system operation. This is done to prevent path related failures from degrading subsystem performance.

   - If the string is a 2-path string, only Controller Fenced applies.

   - If the string is a 4-path string, Storage Path Fenced conditions are displayed as follows.

```
NO STORAGE PATH
FENCED CONDITIONS
WERE DETECTED FOR
 CONTROLLER Ax.  ...
```

— or —

```
STORAGE PATH FENCED
CONDITION IS SET
FOR CONTROLLER Ax.
(SEE PSG MD-3,092)
```

   Storage Path Fenced is set when there are excessive storage path errors or when a Quiesce is set from the Storage Control Support Facility. Diagnostics do not cause fenced conditions to be set.

   Controller Fenced is set by a Quiesce from the Storage Control Support Facility.

10. Press the ENTER key to display Device Fenced conditions. One of the following frames is displayed:

```
NO FENCED CONDITIONS
WERE DETECTED FOR
ANY DEVICES.
                 ...
```

— or —

```
DEVICE FENCED
IS SET FOR CTLR Ax.

DEVICES ARE:     ...
```

```
***FENCED DEVICES***
0X: ................
1X: 0...............
(SEE PSG MD-3,093)
```

   Device Fenced is set for a device when there are excessive controller errors for a single path to the device. The device remains operational on other paths. In the above frame, device 10 is fenced.

   Storage path controller and device fenced conditions can be reset as follows:

   - Use MD Main Menu option Z: End of Call.
   - Use the storage path restart switch at the storage control.
   - Perform a RESUME operation on the quiesced storage path or controller.
   - Issue a ICKDSF CONTROL command with the CLEARFENCE parameter specified. See the *Device Support Facilities Users Guide and Reference*, GC35-0033 and IMAP 0280 Step 001 on page ISOLATE-49.
   - IML the storage path.

11. Press the PF key to return to the MD Main Menu.

Diagnostic Menu Option A - Non-Repeatable Runout (NRRO) Test

The Non-Repeatable Runout Test (Routine 89) measures differences in the servo position error signal on successive disk revolutions. This is used to indicate conditions other than normal track runout that may adversely affect servo tracking.

This routine has been designed to run along with customer operation on the selected devices. The devices that are selected should not be in CE mode.

Routine 89 will alternately test the two devices on the selected HDA when only one device was selected.

Routine 89 does not have a normal ending point. The routine will run indefinitely until a fault exists or until the routine is terminated by the user. The minimum run time is 24 hours, or until an error stop is presented. For more information, see the DIAG section in the MSM, Vol. R60.

This routine is not to be run unless instructed by the maintenance information.

If you were sent here from the MD for FSC E180, E108, or 9302, verify that the errors are on heads 4, 5, 6, and/or 7 (see sense byte 6). If the errors are not on these heads, return to the MD frame that sent you here and continue with the procedure. If the errors are on heads 4, 5, 6, and/or 7, continue with the non-repeatable runout (NRRO) test.

To run the Non-Repeatable Runout option:

1. From the Diagnostic Menu, select option A.

   The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 005)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: x

(SEE PSG MD-3, 005)
```

   The X shown in the preceding frame identifies the last controller or controllers used to run diagnostic routines in this session. If none were used, no default is displayed.

   The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths. The MD will instruct you when it is necessary to move the MD plug.*

2. Enter your response for controller use.

   The MD displays the following frames:

```
  *** CAUTION ***
A PHYSICAL DEVICE
WITH 9F9F FSC
ENVIRONMENTAL   ...
```

```
DATA CAN BE REPORTED
THROUGH OTHER
DEVICES. THE CORRECT
PHYSICAL ADDRESS ...
```

```
IS FOUND IN
SENSE BYTE 4.
SEE THE PSG START
SECTION SMAP 0045.
```

3. You are then asked to select a device with one of the following frames:

```
SELECT DEVICE:

(SEE PSG MD-3, 210)
```

   — or —

```
SELECT DEVICE:
DEFAULT IS: xx

(SEE PSG MD-3, 210)
```

Enter a single device. Multiple addresses are not permitted and will be ignored. If the configuration is 2-way, then enter 00 through 0F. If the configuration is 4-way, then 00 through 1F is permitted.

The device should not be in CE mode.

4. Enter your response for device address.

   The MD displays the following frame:

```
WAS FSC 9F9F POSTED
AGAINST THE HDA
UNDER TEST?
```

   Respond to the question by pressing the YES or NO key.

   If the answer is YES, go to step 7.

   If the answer is NO, go to step 5.

5. The MD displays the following frame:

```
ENTER OTHER POSTED
FSC, OR, PRESS ENTER
FOR NONE.
```

6. Enter your response for other posted FSCs.

   If the FSC is 9302, E180, E108, or none go to step 8.

   If the FSC was not 9302, E108, or E180 the MD displays the following frame:

```
USE FSC ANALYSIS
(MENU OPTION-3) TO
ANALYZE FSC xxxx.
```

   Press the ENTER key to return to the MD Main menu.

7. If FSC 9F9F was posted against the HDA under test, the following frame will be displayed:

```
WHICH ACTUATOR
POSTED THE 9F9F FSC?
(1) LEFT, (2) RIGHT
OR (3) BOTH?
```

   Enter the response for which actuator posted the FSC 9F9F and go to step 8.

8. The MD displays the following frame:

```
THE NRRO TEST IS NOW
RUNNING ON DEVICES
xx AND yy
(SEE PSG MD-3, 005)
```

   xx = even device
   yy = odd device

9. The test has no normal end and will run continuously until the MD has determined that a fault exists or until it is stopped by pressing the ENTER key on the MD keyboard. The minimum run time is 24 hours, or until an error stop is presented.

10. If system activity is large enough that it prevents routine 89 from collecting test data on a continuing basis, the following frame is displayed:

```
DEVICE(S) ARE BUSY.
THIS MAY BE DUE TO
HEAVY SYSTEM USAGE.
RETRY WILL CONTINUE.
```

    The system activity is too high. Re-schedule your maintenance activity for a less busy time.

11. If an unexpected error occurs, the following frames will be displayed:

```
AN UNEXPECTED ERROR
WAS RECEIVED. TO
ISOLATE THE PROBLEM,
CHOOSE THE NORMAL...
```

```
SEQUENCE OPTION FROM
THE DIAGNOSTIC MENU.
PRESS ENTER TO
RETURN TO MAIN MENU.
```

12. The CE can stop the routine by pressing the ENTER key while the routine is running. If an insufficient number of samples were taken for

calculations the MD will display the frame in step 22 on page MD-40. If there were enough samples taken, the MD display will be explained in step 23 on page MD-40. If the CE does not stop the routine, go to the next step.

13. If the NRRO test determines that the results of the value calculations is in excess of permissible limits and the problem is with one device (left or right), the frames in step 15 will be displayed. If the NRRO test determines that the problem is with both devices, go to step 14.

14. The following will be displayed:

```
REPLACE THE HDA.
SEE CARR-1, ENTRY-A
FOR REPLACEMENT
PROCEDURE.
```

    This is the end of the NRRO routine, pressing ENTER will return you to the main menu.

15. The left or right device NRRO calculations are high. The following frames will be displayed:

```
THE xxxxx device
HAS HIGH NRRO.
                ...
```

xxxxx = LEFT OR RIGHT

```
IS THE CABLE SWAP IN
PLACE?
```

16. Respond to the question by pressing the YES or NO key.

    If the answer is YES, go to step 18.

    If the answer is NO, the following frame will be displayed:

```
ELECTRONICS MAY BE
CAUSING THE ERROR.
CAN YOU PERFORM A
CABLE SWAP?
```

17. Respond to the question by pressing the YES or NO key.

    If the answer is NO, go to step 19.

    If the answer is YES, the following frame will be displayed:

```
PERFORM THE CABLE
SWAP, THEN RE-RUN
THE NRRO TEST.
```

    Pressing ENTER returns you to the main menu.

18. The cables have been swapped. The following frames will be displayed:

```
IS THE SAME DEVICE
POSTING 9F9F FSC'S
OR HIGH NRRO VALUES
BOTH BEFORE AND  ...
```

```
AFTER THE CABLE
SWAP?
```

    Respond to the question by pressing the YES or NO key.

    If the answer is NO, go to step 19.

    If the answer is YES, go to step 14.

19. The following frame will be displayed:

```
HAVE THE FRU'S
FOR THE FAILING
ACTUATOR BEEN
REPLACED?
```

    Respond to the question by pressing the YES or NO key.

    If the answer is YES, go to step 21 on page MD-40.

    If the answer is NO, go to step 20.

20. The following frames will be displayed:

```
REPLACE THE FRU'S
FOR THE FAILING
ACTUATOR.  THEN RUN
NRRO TEST AGAIN  ...
```

```
* PRIMARY FRU LIST *
   -- WARNING --
 SEE PROCEDURE ON
REPAIR 1,ENTRY-A ...
```

```
  C0B2 RW CHANL  DEV
  B1F2 PORT R/W  DEV
  B1E2 SEQ/SERVO DEV
```

This is the end of the NRRO routine, pressing ENTER will return you to the main menu.

21. The following frame will be displayed:

```
WATCH FOR ADDITIONAL
9F9F FSC'S AGAINST
THESE SAME DEVICE(S)
AND HDA.  IF THIS...
```

```
CONDITION CONTINUES,
GO TO PSG MD-1,
ENTRY-C, OPTION-A,
TO RERUN NRRO TESTS.
```

This is the end of the NRRO routine, pressing ENTER will return you to the main menu.

22. The MD will display the following frame:

```
AN INSUFFICIENT
NUMBER OF SAMPLES
HAVE BEEN COLLECTED.
 (LESS THAN xx%) ...
```

```
PRESS <ENTER> TO
RESUME.  OR PF TO
TERMINATE TEST.  ALL
DATA WILL BE LOST.
```

PF will return you to the MD MAIN MENU. If ENTER is pressed the test is resumed. Go to step 8 on page MD-38.

23. A sufficient number of samples were taken. If the NRRO did not test normal, the frames in step 24, step 14 on page MD-39, or step 15 on page MD-39 will be displayed depending on the the calculations. If the NRRO tested normal, the following frames will be displayed.

```
NRRO TESTED NORMAL.
BE SURE THAT THE
SELECTED DEVICE IS
CORRECT.  IF NEEDED,
```

```
GO TO PSG START
SECTION SMAP 0045.
```

This is the end of the NRRO routine, pressing ENTER will return you to the main menu.

24. If the samples are not indicating a defective HDA, the the following frame will be displayed:

```
SUCCESSFUL TEST END.
PRESS ENTER KEY TO
RETURN TO MAIN MENU.
```

Isolation Code Error Display

If an error is encountered, the following is displayed:

```
IC**** CTL=A* DEV=**
RTN=** TEST=**
EB=** **** **** ****
 **** **** **** ****
```

IC Isolation Code

CTL Controller Number (A1, A2, A3, or A4)

DEV Device Address (in hexadecimal)

RTN Diagnostic Routine ID

TEST Test Number within the Routine

EB Error Bytes (see note)

Note: *The error bytes are used by the MD for FRU isolation. The guided maintenance procedures do not require you to use these bytes for any purpose. They are displayed primarily for support personnel.*

If you are preparing to discuss this problem with support personnel, you may want to record these error byte values.

Further definition of the information contained in these displays can be found in the DIAG section of the *MSM, Volume R60* and in the IC section of the *ECM, Volume R40.*

Depending on the operation being performed at the time of the error, one of the following frames will be displayed:

```
PRESS ENTER TO
ANALYZE OR "N" TO
RUN NEXT TEST.
(SEE PSG MD-3, 500)
```

— or —

```
PRESS ENTER TO
ANALYZE OR "N" TO
RUN NEXT CONTROLLER
(SEE PSG MD-3, 500)
```

— or —

```
PRESS ENTER TO
ANALYZE OR PF KEY TO
RETURN TO MAIN MENU
(SEE PSG MD-3, 500)
```

To analyze an error and obtain a FRU group, press the ENTER key only.

To test the next controller or device (if multiple controllers or devices were specified), enter N and then press the ENTER key.

To return to the MD Main menu, press the PF key.

Analyze Symptom Code (Main Menu Option 3)

This option can be used to get a FRU list from the MD by entering a symptom code and some device information. The MD does not need to be attached to the 3380 to analyze a symptom code.

1. From the MD Main menu, select option 3.

   The MD displays the following frame:

   ```
   ENTER THE SYMPTOM
   CODE.

   (SEE PSG MD-3, 550)
   ```

   Enter a four-character symptom code from system sense bytes 22 and 23.

   The MD then displays the following frame:

   ```
   ENTER THE FAILING
   CONTROLLER TO
   ANALYZE THE ERROR
   (xxxxxxxxxxxxx)
   ```

   A controller must be identified so that the MD can determine a FRU group when controller FRUs are involved. If both controllers are failing or if specific devices are failing through both controllers, select either controller. If the MD analysis procedure needs to know if both controllers are failing, the question will be asked.

   The last line of the display (xxxxxxxxxxxxx) displays valid controller options 1 or 2 for 2 path strings and 1, 2, 3, or 4, for 4 path strings.

   The valid responses are:

Response	Meaning
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

2. Enter your response to identify the controller.

   The MD next asks for device information with the following frame:

   ```
   ENTER THE FAILING
   DEVICE TO ANALYZE
   THE ERROR (00 TO XX)
   ```

   00 to XX indicates the valid range of devices that may be entered:

   "00 TO 0F" for 2-path strings
   "00 TO 1F" for 4-path strings

   A device must be selected so that the MD can determine a FRU group when device FRUs may be involved. If multiple devices are failing, select one of the devices. If the MD analysis procedure needs to know if multiple devices are failing, the appropriate questions will be asked.

3. Enter a valid device address, "00" through "0F" or "00" through "1F."

   Next, the MD asks about the HDA Cable Swap. If the cables are swapped, the FRU group is affected:

   ```
   ARE THE HDA CABLES
   SWAPPED?
   ```

   If the HDA cables are swapped on the actuator for which you are doing analysis, press the YES key. Otherwise, press the NO key. The MD will display the correct FRU list for the logic that is operating the actuator.

4. Answer the question about the cable swap.

   Other questions regarding the sense information might be asked. Most other questions may be bypassed by pressing the ENTER key. If questions are bypassed, the result is larger FRU groups.

5. Answer all questions to the best of your ability.

   When the answers to the questions have been processed, the MD displays FRU information:

```
* PRIMARY FRU LIST *
   — WARNING —
SEE PROCEDURE ON
REPAIR 1,ENTRY A ...
```

```
 ****************
 ****************
 ****************
 ****************
```

— and then —

```
 SECONDARY FRU LIST
   — WARNING —
SEE PROCEDURE ON
REPAIR 1,ENTRY A ...
```

```
 ****************
 ****************
 ****************
 ****************
```

   Ensure that the correct power on/power off procedures are used. See page REPAIR-1 to determine the correct procedure for replacing each FRU.

Diagnostic Aids (Main Menu Option D)

Diagnostic Aids provides a method of running individual diagnostics and allows entry of parameters to control them. With few exceptions, maintenance procedures do not need Diagnostic Aids. The diagnostic menu provides most needed functions in a much easier to use form. See "Run Diagnostic Tests (MD Main Menu Option 1)" on page MD-10.

Any routine may be run using the Diagnostic Aids option, and you have full control of routine execution. But if you enter inappropriate control parameters for the routine being run, some very misleading results can occur.

1. From the MD Main menu, select option D.

   The MD displays one of the following frames:

```
SELECT CONTROLLER:

(SEE PSG MD-3, 800)
```

   — or —

```
SELECT CONTROLLER:
DEFAULT IS: x

(SEE PSG MD-3, 800)
```

   The "x" shown in the preceding frame identifies the last controller used to run diagnostics in this session. If none or two were used, no default is displayed. The valid responses are:

Response	**Meaning**
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Selecting controller A3/A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

2. Enter your response for controller selection.

   The MD displays one of the following frames to prompt for the ID of the routine you want to run:

```
* DIAGNOSTIC AIDS  *
  ENTER ROUTINE ID.
  (2 HEX DIGITS)
```

   — or —

```
* DIAGNOSTIC AIDS  *
  ENTER ROUTINE ID.
  DEFAULT IS: xx
```

   Selection of a routine is always required. If a routine ID is not specified, the MD provides (as a default value) the last routine ID specified by the user.

   To select a diagnostic routine, key in the two-character routine ID of the routine to be run and then press the ENTER key. The following routine IDs can be selected:

80	Controller Tests
81	Device Logic Tests
82	Servo Tests
83	Read/Write Data Transfer Tests
84	Read/Write Function Tests
85	Seek Exerciser
8A	Incremental Seek Exerciser
90	Extended DPS Tests (see note)
91	HA Scan
93	DDC Tests (see Warning)
96	Device Status Test (see Warning)
97	Sense Utility (see Warning)
98	Error Log Search (see Warning)
99	Motor Start Test (see Warning)
9C	CE Track Repair
9D	DPS Array Display/Dump Utility (see Warning)
9E	Diagnostic Microcode Patch (see Warning)

9F Set/Reset/Sense CE Mode (see Warning)

Note: *If the 3380-JK is attached to a 3990, the extended DPS tests (Routine 90) cannot be run.*

Warning: Although any of the above routines may be selected, routines 93, 96, 97, 98, 99, 9D, 9E and 9F provide special purpose functions and may produce confusing results if run under the Diagnostic Aids option.

See the routine descriptions in the DIAG section of the *MSM, Volume R60* for additional information.

3. Enter your routine selection. Press the ENTER key to rerun the default or enter the two-character ID.

   Next, the MD prompts for device information:

```
* DIAGNOSTIC AIDS *
SELECT DEVICE(00-XX)
OR PRESS ENTER IF
NO DEVICE IS NEEDED.
```

— or —

```
* DIAGNOSTIC AIDS *
SELECT DEVICE(00-XX)
DEFAULT IS: xx
```

   SELECT DEVICE (00-XX) indicates the valid range of devices that may be selected.

   XX = 0F for 2 path strings
   XX = 1F for 4 path strings

   When the MD requests that a device be selected, determine if the routine being run requires use of a device. Routines 81, 82, 83, 84, 85, 8A, 97, 99, and 9C all require that a device be selected.

   Routines 80, 90, 93, 96, 98, 9D, 9E and 9F do not require device selection but can be run even if a device is selected.

   Once a device is selected, the MD continues to use that device address as a default value until a different routine is selected. When a new routine is selected, the default is reset to no device selection.

   Warning: An attempt to run a diagnostic routine for a device without specifying a device for selection causes an error. The error message that results does not mention that this error can be caused by user failure to specify a device. It is the user's responsibility to ensure that a device is selected when running a device test under the Diagnostic Aids option.

   Warning: A device specified for selection must be in CE mode. Failure to set CE mode for the selected device results in IC 1101 (byte 1 of the error message is the address of the device being tested). Use MD Main option 0 to set or reset CE mode as required.

4. Respond to the prompt for device selection. Enter no more than one device address.

   00 - 0F for 2 path strings
   00 - 1F for 4 path strings

   The MD next prompts for parameters:

```
ENTER PARAMETERS
IF REQUIRED

(SEE PSG MD-3, 800)
```

   Each diagnostic routine except routine 9C has default parameter values that are correct for the routine so that the entry of control parameters is not usually required. However, in special cases, the user may want to enter parameters to provide some unusual diagnostic function. (Routine 9C is equipped with default parameters that cause an error, preventing the accidental running of that diagnostic routine.)

   The number of parameters required and the meaning of each parameter (except for parameter 0) varies depending on the routine being run.

   Each parameter is two hexadecimal digits. Up to sixteen parameters (numbered 0 to F) may be entered consecutively with no spaces between successive parameters. If more than

one parameter is entered, then all the parameters used by the routine must be entered before the ENTER key is pressed. (Remaining default parameter values are ignored after the second parameter is entered.)

The first parameter (parameter 0) is the "run control" parameter. Parameter 0 provides control functions that are the same for all routines. Some of the run control functions are not appropriate for some of the routines and can cause unexpected results. See the descriptions of the routines (in the DIAG section of the *MSM, Volume R60*) for restrictions on the selection of the run control parameter.

The control functions provided by parameter 0 are:

00	Allow Routine Linking, No Loop, Halt On Error
01	Allow Routine Linking, No Loop, Bypass Error Halt
02	Allow Routine Linking, Loop, Halt On Error
03	Allow Routine Linking, Loop, Bypass Error Halt
04	Inhibit Routine Linking, No Loop, Halt On Error
05	Inhibit Routine Linking, No Loop, Bypass Error Halt
06	Inhibit Routine Linking, Loop, Halt On Error
07	Inhibit Routine Linking, Loop, Bypass Error Halt

The ***Allow Routine Linking*** function allows routine 80 to link to routine 96, and allows routines 81 through 85 to link and run in sequence.

If the ***Inhibit Routine Linking*** function is selected, or if any routine other than 80 through 85 is selected, only the selected routine is run.

The ***Loop*** function causes the selected routine (or the linked series of routines) to be repeated. The ***Loop*** function in combination with the ***Allow Routine Linking*** function causes routines 81 through 85 to repeatedly run in sequence.

If the ***No Loop*** function is used, the selected routine or linked series of routines run only once.

The ***Bypass Error Halt*** function allows routine execution to continue after an error is detected. This function may be used in combination with the ***Loop*** function to create a scope loop.

If the ***Halt On Error*** function is selected, routine execution stops and an error message is displayed when an error is detected.

If only the first parameter (Parameter 0) is entered, the default values built into the routine being run are used for the remaining parameters. This permits the user to specify only the ***run control*** parameter if desired. If more than one parameter is entered, then all parameters applicable to the routine being run should be entered. If too few parameters are entered, the MD supplies X"00" for the remaining parameters. If too many parameters are entered, the excess parameters are ignored.

The meaning of parameter entries 1 through F varies depending on the routine being run. See the routine description in the DIAG section of the *MSM, Volume R60.*

After parameters have been entered, the MD uses those parameters as default values until a different routine is selected. When a new routine is selected, the default parameter values are reset to the built-in default values for the new routine.

Warning: Entry of parameter values that are incorrect or inappropriate for the routine being run can cause some very confusing or misleading results.

See the description for the routine being run for the parameters applicable to that routine.

5. Press the ENTER key to use the default parameter values, or enter the run control parameter (parameter 0) only and use the remaining default parameters, or enter all of the parameters and then press the ENTER key.

   If you enter no parameters, the MD displays the following frame. (If parameters were entered, the MD bypasses the next two frames.)

```
DO YOU WANT TO LOOP
THE ROUTINE ?
```

   Press the YES key or the NO key to respond:

   YES Looping is desired. The MD displays the frame that follows.
   NO Looping is not desired. The routine will stop if an error occurs. The MD bypasses the next frame shown in this sequence.

6. Enter your response about routine looping.

   The following frame appears only if no parameters were entered and routine looping was specified:

```
DO YOU WANT TO HALT
WHEN AN ERROR
OCCURS ?
```

   Press the YES key or the NO key to respond:

   YES Stopping is desired when an error is detected.
   NO The routine is to continue when an error is detected.

7. Enter your response about stopping on errors.

   The MD displays the following frame:

```
* DIAGNOSTIC AIDS  *
ROUTINE ** RUNNING
ON CONTROLLER x,
DEVICE xx.     (****)
```

   Immediately after this message is displayed, the selected inline diagnostic routine is started using the specified controller and device.

   No response is required, but the keyboard is enabled. If any MD key is pressed while this message is being displayed, the routine being executed stops.

   The (****) on the bottom line of the above frame is the dynamic display area for those diagnostics that present dynamic displays.

   When the diagnostic ends without errors, the MD displays the following frame:

```
ROUTINE xx ENDED.
DO YOU WANT TO RUN
THE SAME TEST AGAIN?
```

   Press the YES key, the NO key, or the PF key to respond:

   YES Repeat the same routine.
   NO Return to the beginning of the Diagnostic Aids option.
   PF Return to the MD Main menu.

8. Respond to the question by pressing the YES key or the NO key.

9. Press the PF key to return to the MD Main menu.

Error Display

If an error is detected during the execution of the diagnostic routine (and stopping on errors is permitted), the MD displays the following frames:

```
* DIAGNOSTIC AIDS *
RTN=**       IC=****
EB=** **** **** ****
 **** **** **** ****
```

```
PRESS ENTER TO RE-
START OR "A" TO
ANALYZE. PF KEY TO
RETURN TO MAIN MENU.
```

RTN = Diagnostic routine ID
IC = Isolation code
EB = Error bytes

Note: *The error bytes are used by the MD for FRU isolation. The guided maintenance procedures do not require you to use these bytes for any purpose. They are displayed primarily for support personnel.*

If you are preparing to discuss this problem with support personnel, you may want to record these error byte values.

See the DIAG section in the *MSM, Volume R60*, and the IC section in the *ECM, Volume R40* for more information about this display.

Review Option List (Main Menu Option R)

From the MD Main menu, select option R.

The MD displays the following frames:

```
SELECT REVIEW OPTION
FROM FOLLOWING LIST.
(SEE PSG MD-3, 700)
0-REVIEW CE MODE ...
```

```
1-REVIEW DIAGNOSTICS
2-REVIEW ERROR LOG
3-REVIEW REPAIR
4-REVIEW HA SCAN
```

The following options are valid.

0 — Review CE mode
A diagnostic routine will be invoked to find out which devices are currently set in CE mode. See page MD-49.

1 — Review diagnostics
The last 4 diagnostic errors are saved on the MD diskette. The most recent error is shown first and subsequent errors can be displayed by entering "N" (Next). See page MD-50.

2 — Review error log
Use Review Error Log to go directly to the Search Log Function of the MD. For a description of how to use the Search Log Function, see page LOG-5.

3 — Review repair
Display the last repair specified by a maintenance analysis procedure. See page MD-50.

4 — Review HA Scan
Display the HA Scan results from the last HA Scan that was run. See page MD-51.

REVIEW CE MODE (Option 0)

Use the review CE mode option to display the addresses of devices that are in CE mode. The MD must be attached to the 3380-JK.

1. From the MD review options menu, select option 0.

   The MD displays one of the following frames:

   ```
   SELECT CONTROLLER:

   (SEE PSG MD-3, 020)
   ```

   — or —

   ```
   SELECT CONTROLLER:
   DEFAULT IS: x

   (SEE PSG MD-3, 020)
   ```

   The **x** shown in the preceding frame identifies the last controller used to run diagnostics in this session. If none or two were used, no default is displayed.

   The valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

   Note: *Responses 3 and 4 are valid only on strings with four storage paths when the MD is attached to the unit that contains controller A3 and A4.*

2. Enter your response for controller use.

   Which controller is specified makes no difference if both controllers are operational.

3. The MD advances to the following frame:

```
CE MODE IS BEING
SENSED.
PLEASE WAIT.
```

Immediately after this message is displayed, an inline diagnostic routine is started (or restarted) using the specified controller. If the routine is completed without errors, the MD displays the CE mode status of the devices:

2-path subsystem

```
DEVICES IN CE MODE:
0X: ..23.............

(SEE PSG MD-3, 035)
```

— or —

4-path subsystem

```
DEVICES IN CE MODE:
0X: ..23.............
1X: 01...............
(SEE PSG MD-3, 035)
```

— or —

```
CE MODE IS RESET
FOR ALL DEVICE
ADDRESSES.
```

Some problems with the storage control, with the controller, or with the control interface will not allow the diagnostic routine to run and CE mode is not sensed. The MD displays an error message. Analyze that error and correct the problem before continuing.

REVIEW DIAGNOSTICS (Option 1)

Use review option 1 to display the last 4 errors detected by the diagnostic routines or by the MD. The MD need not be attached to the 3380-JK.

1. From the MD review options menu, select option 1.

   The MD displays the following frames:

```
LAST ERROR DETECTED
BY DIAGNOSTICS (OR
MD) WAS AS FOLLOWS:
                   ...
```

```
IC**** CTL=A* DEV=**
RTN=** TEST=**
EB=** **** **** ****
 **** **** **** ****
```

```
PRESS ENTER TO
ANALYZE OR "N" TO
DISPLAY NEXT ERROR.
(SEE PSG MD-3, 742)
```

2. Follow the directions displayed by the MD.

REVIEW ERROR LOG (Option 2)

Use Review Error Log to go directly to the Search Log Function of the MD. For a description of how to use the Search Log Function, see page LOG-5.

REVIEW REPAIR (Option 3)

Select option 3 to display the last repair (FRU group) that was displayed. The MD does not need to be attached to the 3380-AJ4 or AK4 unit.

The last repair displayed is a result of the last symptom analyzed. The FRU group displayed may be from analysis of one of the following:

- Diagnostic error
- Symptom code
- Error Log Entry

```
LAST REPAIR
DISPLAYED BY ERROR
ANALYSIS PROCEDURES
WAS AS FOLLOWS:  ...
```

Following this display, the primary FRU group, the secondary FRU group, and any additional action are displayed.

REVIEW HA SCAN (Option 4)

Select option 4 to review HA Scan results from the last time the HA Scan diagnostic was run. The MD does not need to be attached to the 3380-AJ4 or 3380-AK4 unit. One of the following frames is displayed:

```
  * SCAN REVIEW *
NO ERROR DATA STORED
PRESS PF KEY TO
RETURN TO MAIN MENU
```

— or —

```
  * SCAN REVIEW *
   xx TRACKS HAD
    DATA CHECKS
SEE PSG MD-3, 395...
```

xx indicates the number of tracks, in hexadecimal, that had errors. The maximum number of tracks that can be stored by the MD is 80 (X"50")

After the scan is recalled from the MD diskette, summary or detailed information may be displayed by selecting the display mode from this menu:

```
SELECT DISPLAY MODE:
 1-HEAD/ARM SUMMARY
 2-TRACK SUMMARY
 3-TRACK DETAIL  ...
```

```
 4-RUN HA SCAN
   AGAIN
 5-RETURN TO MAIN
   MENU
```

Display Modes

After displaying summary or detail information, the MD returns to this menu and another mode may be selected.

Display Mode 1: HEAD/ARM SUMMARY

This display mode presents a summary by head of the number of tracks in hexadecimal that had data checks. The summary is presented in four displays, one for each head arm:

```
   **  ARM x  **

HEAD:    xx xx xx xx
ERRORS: xx xx xx xx
```

ERRORS = Number of errors for each head

Display Mode 2: TRACK SUMMARY

Presents one or more displays with a one line entry for each track that had errors:

```
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
```

CYL = Cylinder number (hexadecimal)
HD = Head number (hexadecimal)
CNT = Number of errors (hexadecimal)

Display Mode 3: TRACK DETAIL

Presents one display for each track in error. There are two types of error displays:

```
  ** DATA CHECK **
HOME ADDRESS AREA
CYL = xxx    HEAD = x
ERROR COUNT = x
```

— or —

```
NO SYNC BYTE FOUND
HOME ADDRESS AREA
CYL = xxx   HEAD = x
ERROR COUNT = x
```

CYL = Cylinder number (hexadecimal)
HEAD = Head number (hexadecimal)
ERROR COUNT = Number of errors (hexadecimal)

Display Mode 4: RUN HA SCAN AGAIN

Repeat the Review HA Scan option.

Display Mode 5: RETURN TO MAIN MENU

Return to the MD Main Menu.

010 SELECT AN OPTION

This is the MD Main Menu. Valid responses are:

0 = SET/RESET CE MODE
Devices must be set in CE Mode before diagnostics are run. CE mode must be reset before they are returned to customer operation. More than one device may be placed in CE mode at a time.

1 = RUN DIAGNOSTICS
Used to select the diagnostic option menu.

2 = ERROR LOG FUNCTION
Used to set the log mask, transfer the log, or search the log previously transferred to the MD, or erase the error log in the specified storage path or storage director.

3 = ANALYZE SYMPTOM CODE
Used for entering symptom codes for analysis. The MD does not need to be attached to the 3380.

Z = END OF CALL
References end of call procedure and resets CE mode for all devices.

D = DIAGNOSTIC AIDS
Provides for manually controlling diagnostic execution.

R = Review (0 - 4)
Used to review the following:

R0 = Review which devices are in CE mode.

R1 = Review the last 4 diagnostic errors. Error analysis procedures may be invoked after the error is displayed.

R2 = Review the last error log entry that was previously displayed or display the error log summary that was previously transferred from the storage control. Error analysis procedures may be invoked from the error display.

R3 = Review the last repair that was displayed by an error analysis procedure.

R4 = Review HA scan results from the last time HA SCAN was run.

For additional information, see Review Option List on page MD-49.

020 SELECT CONTROLLER

The selected controller is used to run the diagnostic that sets, resets, or provides for reviewing devices in CE mode.

Valid responses are:

Response	Meaning
ENTER	Default (if shown)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

Enter your response for controller use.

030 SET / RESET CE MODE

CE mode must be set for any given device before device diagnostics can be run on that device. Device diagnostics do not run on a device that is not in CE mode.

Before a device is set into CE mode, the device should be varied offline to each attaching system. CE mode must be reset for any given device before the device is returned to the customer or varied on-line.

If a system attempts to use a device that is not varied offline and is in CE Mode, the storage control reports Intervention Required to that system for that device. When CE mode is reset for a device, an interrupt is generated. The interrupt should restore normal operation.

Setting CE Mode

```
ENTER 2-DIGIT ADDR.
OF DEVICE(S) TO BE
SET IN CE MODE.
(SEE PSG MD-3, 030)
```

CE Mode will be set for the specified device(s) on all paths. More than one device may be set in CE Mode. All device addresses in the range 00 through 0F are valid. Device addresses in the range 10 through 1F are valid for 4-path strings. Devices previously set in CE mode remain in CE mode.

Resetting CE Mode

```
ENTER 2-DIGIT DEVICE
ADDRESSES OR PRESS
ENTER TO RESET ALL.
(SEE PSG MD-3, 030)
```

CE Mode will reset for the selected device(s) on all paths. More than one device may be reset. All device addresses in the range 00 through 0F are valid. Device addresses in the range 10 through 1F are valid for 4-path strings.

There are several ways to enter device addresses. Two digits must be used for each address entered.

- Enter a single device address, "00" through "1F."
- Enter multiple device addresses separated with a single space (for example, 02 05 07 0A).
- Enter a range of addresses separated with the character "T" (for example, 02T07).
- Enter multiple ranges of addresses separated with a space (for example, 02T04 08T0B).
- With "Reset CE Mode" selected, press the ENTER key without specifying devices to reset CE mode for all devices that were previously set in CE mode.

035 DEVICES IN CE MODE/DEFAULT DEVICES

When CE Mode has been reset

The MD displays the following frame:

```
CE MODE IS RESET
FOR ALL DEVICE
ADDRESSES.
```

When CE Mode has been set

The MD displays one of the following frames:

2-path subsystem:

```
DEVICES IN CE MODE:
0X: ..23............

(SEE PSG MD-3, 035)
```

— or —

4-path subsystem:

```
DEVICES IN CE MODE:
0X: ..23............
1X: 01..............
(SEE PSG MD-3, 035)
```

In the frames above, devices 02 and 03 are in CE mode. Devices 00, 01, and 04 through 0F are represented by dots and are not in CE Mode.

In the 4-path display, devices 02, 03, 10, and 11 are in CE Mode. Devices 00, 01, 04 through 0F, and 12 through 1F are represented by dots and are not in CE Mode.

When default devices are listed

The MD displays one of the following frames:

2-path subsystem:

```
  DEFAULT DEVICES
0X: ..23............

(SEE PSG MD-3, 035)
```

— or —

4-path subsystem:

```
  DEFAULT DEVICES
0X: ..23............
1X: 01..............
(SEE PSG MD-3, 035)
```

In the frames above, devices 02 and 03 are default devices. Devices 00, 01, and 04 through 0F are represented by dots and are not default devices.

In the 4-path display, devices 02, 03, 10, and 11 are default devices. Devices 00, 01, 04 through 0F, and 12 through 1F are represented by dots and are not default devices.

Default devices are those that were specified during the previous diagnostic. If no device has been tested during the current diagnostic session, there are no default devices.

050 DEFINE THE FAILURE BOUNDARY

MD 0050:

001
(From RMAP 0340 Step 003 on page REPAIR-13)

The best method for defining the failure boundary is to use the DASD Symptom Code Summary report (see "DASD Symptom Code Summary" on page PROG-17).

If the DASD Symptom Code Summary report is not available, the failure boundary can be defined using multiple sense records from other sources. These sources include console messages, other EREP reports, and the error log in the storage control. If the problem produces a solid failure, the failing devices and paths can usually be determined by running the Device Status Test with each controller.

Is there a DASD Symptom Code Summary report available?
Yes **No**

002
Go to Step 004 in this MD.

003
A DASD Symptom Code Summary report is available:

1. Determine the highest priority symptom code obtained from SMAP 0025 Step 001 on page START-12.

2. Determine the highest priority **symptom code group**. The highest priority symptom code group includes the highest priority symptom code and all other symptom codes with the same first character. Include all permanent and temporary error records.

3. Examine all entries in the physical address column for all symptom codes in the **group** to identify the failing device addresses. Refer to SMAP 0030 Step 001 on page START-14.

4. Determine the probable failing unit (PFU) for the symptom code group.

   The DASD Symptom Code Summary report is divided into sections by PFU. The PFUs are: Channel, Storage Control Unit, Controller, Multiple, Device, Volume and Unknown. The PFU sections are included in the report by order of importance, with the most important PFU listed first.

   If there are symptom codes listed under more than one PFU, select the PFU listed first.

5. Use the following guidelines to define the failure boundary.

PFU = CHANNEL: Indicates that the probable failing unit and failure boundary is the channel or storage control. You should not be starting analysis with this maintenance package.

PFU = STORAGE CONTROL UNIT: Indicates that the controller is the probable failing unit.

Note: *If the failure affect column indicates SCU/CTLR, a PFU of Storage Control Unit indicates that both controllers (0 and 1) on the control interface are reporting errors.*

PFU = CONTROLLER: Be careful if the symptom code is DF05. DF05 can be caused by the customer switching off controller power and may not have anything to do with the real problem.

Look at the FAILURE AFFECT column and assign the failure boundary in the following way. If the FAILURE AFFECT is:

- CTLR - the failure boundary is controller.
- SCU/CTLR - The failure boundary is controller.
- CTLR/DEV - The failure boundary is:

  Drive - if only two devices are listed in the physical address column and both devices are

on the same HDA.

Port - if more than one device on more than one HDA is listed in the physical address column, all the devices are in the same unit and the string contains at least one B unit.

Controller - if multiple devices are listed in the physical address column and they are on more than one port (there must be at least one B unit in the string).

Do not know - if other.

PFU = MULTIPLE: Indicates that multiple devices may be involved. The failure boundary is:

Device - if only one device is listed in the physical address column.

Drive - if only two devices are listed in the physical address column and both devices are in the same HDA.

Port - if there are more than two devices listed in the physical address column and all the devices are in the same unit.

Do Not Know - if other.

PFU = DEVICE: The failure boundary is normally device, however, if the FAILURE AFFECT is CTLR/DEV, EREP has determined that only one device is failing. The failure boundary is device. However, consider that there is a slight chance that the controller is failing and that because of low usage of other devices on the string, only one device reported the error.

Use the DASD String Summary report to determine usage.

PFU = UNKNOWN: Indicates that the failure boundary is unknown.

004
(From Step 002 in this MD)

If sense data is available, determine the failure boundary using the following procedure:

1. Determine the highest priority Symptom Code obtained from SMAP 0040 Step 001 on page START-19 or from IMAP 0233 Step 003 on page ISOLATE-20.

2. Determine the highest priority **symptom code group**. The highest priority **Symptom Code group** includes the highest priority symptom code and all other symptom codes with the same first character. Include all permanent and temporary error records.

3. Examine all sense records in the **symptom code group** to identify the failing device addresses. Refer to SMAP 0045 Step 001 on page START-21.

If sense data is not available and the device status test indicates failing devices, the device status test results may be used to determine the failure boundary. See IMAP 0232 Step 001 on page ISOLATE-18.

Select the failure boundary from the following list, then return to the procedure that sent you here:

Device
A failure of only one device or access mechanism, or the failure of the media associated with that device or access mechanism, regardless of which controller paths are failing.

Drive
A failure of two devices in a single head-disk-assembly (HDA) regardless of which controller paths are failing.

Port
A failure of two or more devices on different HDAs and limited to a single port (1 unit) regardless of which controller paths are failing (see note).

Note: *If only one port is in use, the*

determination between port and controller cannot be made. Specify the failure boundary as "DO NOT KNOW."

Controller

A failure of two or more devices on two or more ports and limited to a single controller (see note).

Note: *If only one controller is in use, the determination between port and controller cannot be made. Specify the failure boundary as "DO NOT KNOW."*

Do not know

The failure boundary cannot be determined.

---

051 DEFINE THE FAILURE BOUNDARY (EBXX)

MD 0051:

001
(From SMAP 0057 Step 001 on page START-33)

The best method for defining the failure boundary is to use the DASD Symptom Code Summary report (see "DASD Symptom Code Summary" on page PROG-17).

If the DASD Symptom Code Summary report is not available, the failure boundary can be defined using multiple sense records from other sources. These sources include console messages, other EREP reports, and the error log in the storage control. If the problem produces a solid failure, the failing devices and paths can usually be determined by running the Device Status Test with each controller.

Is there a DASD Symptom Code Summary report or multiple sense records with an EBXX symptom code?
Yes **No**

002
Go to Step 015 in this MD.

003
The EBXX Symptom Code represents a failure of the Controller/Device Port (CDP) Interface. Defining the failure boundary correctly requires an EREP System Exception report, a DASD Symptom Code Summary Report, or multiple sense records. The failure boundary cannot always be determined from the Physical Address column in the Symptom Code Summary, or from Sense Byte 4. The EBXX Symptom Code must be used. The EBXX Symptom Code contains substring select bits and port select bits. These bits will define the failing substrings and ports.

2-Path strings contain one substring (substring 0).

4-path strings are divided into two substrings (substring 0 and substring 1).

- Substring 0 contains ports 0-3 (devices 00-0F)
- Substring 1 contains ports 4-7 (devices 10-1F)

If devices in the range of 00-0F are failing, then Substring 0 is failing. If devices in the range of 10-1F are failing, then Substring 1 is failing.

- For symptom code EBXX, the substring is determined from XX, bits 4 - 5

```
10 = Sub-string 0
01 = Sub-string 1
```

- The port is determined from XX, bits 4 - 7

```
SUB-STRING 0          SUB-STRING 1
8 (1000) = Port 0     4 (0100) = Port 4
9 (1001) = Port 1     5 (0101) = Port 5
A (1010) = Port 2     6 (0110) = Port 6
B (1011) = Port 3     7 (0111) = Port 7
```

Look at the EBXX symptom codes then define the failing substrings and ports using the above information. Use the following procedure to define the failure boundary:

Is there more than one value of XX?
Yes **No**

004
Go to Step 008 in this MD.

005
Does the subsystem have 4 paths?
Yes **No**

006
The failure boundary is "CONTROLLER."

007
The failure boundary is "MULTIPLE PORTS."

008
(From Step 004 in this MD)

(Step 008 continues)

008 (continued)
Determine the failing device addresses. Look at the Physical Address column of the Symptom Code Summary Report or Sense Byte 4, bits 3 - 7.

Is there more than one device failing?
Yes **No**

009
The failure boundary is "DEVICE."

010
Is there more than one drive failing?
Yes **No**

011
The failure boundary is "DRIVE."

012
Are there any B-units in the substring?
Yes **No**

013
The failure boundary is "DO NOT KNOW."

014
The failure boundary is "PORT."

015
(From Step 002 in this MD)

The Device Status test should have been run to determine which devices and paths are failing.

Has the Device Status test been run?
Yes **No**

016
Go to IMAP 0232 Step 001 on page ISOLATE-18.

017
Did any devices report a status of "E"?
Yes **No**

018
The failure boundary is "DO NOT KNOW."

(Step 019 continues)

019
Go to Step 020 in this MD.

020
(From Step 019 in this MD)
Is there more than one device failing?
Yes **No**

021
The failure boundary is "DEVICE."

022
Determine if there is more than one drive failing. A drive is two devices on the same HDA.

Is there more than one drive failing?
Yes **No**

023
The failure boundary is "DRIVE."

024
Determine which substrings are failing. The failing substring can be determined as follows:

- Substring 0: If devices in the range 00-0F are failing.
- Substring 1: If devices in the range 10-1F are failing.

Determine if there are any B units in the substring. The following question pertains to any B units in the substring, whether they are failing or not.

Are there any failing B units in the failing substring?
Yes **No**

025
The failure boundary is "DO NOT KNOW."

026
Determine which ports are failing. Use the following chart:

Substring 0:		Substring 1:	
Failing Devices	Port	Failing Devices	Port
00-03	0	10-13	4
04-07	1	14-17	5
08-0B	2	18-1B	6
0C-0F	3	1C-1F	7

Are all the failing devices on one port?

Yes **No**

027

The failure boundary is:

- "CONTROLLER" in a 2-path string.
- "MULTIPLE PORTS" in a 4-path string.

028

The failure boundary is "PORT."

052 DEFINE THE FAILURE BOUNDARY (DATA CHECKS)

MD 0052:

001

The following procedure is used to define the failure boundary for data checks (symptom code 4XXX) and for a no data found condition (symptom code ED0D).

The best method of defining the failure boundary is by using the EREP DASD Symptom Code Summary report. See page PROG-17 for a sample of this report.

If this report is not available, then sense data from other sources such as EREP Event History report, Console messages, or ICKDSF messages should be used.

If sense data is not available and the diagnostics produce a solid failure, then diagnostic results can be used.

Is an EREP Symptom Code Summary report or sense data available?

Yes **No**

002

Use diagnostics and the following procedure to define the failure boundary.

If diagnostics do not fail consistently, the failure boundary cannot be defined.

If not already done, run the diagnostics on different devices with each controller as necessary

Select the failure boundary from the following list, then return to the procedure that sent you here.

Device A failure of only one device or access mechanism, or the failure of the media associated with that device or access mechanism, regardless of which controller paths are failing.

Drive A failure of two devices in a single head-disk-assembly (HDA) regardless of which controller paths are failing.

Port A failure of two or more devices on different HDAs and limited to a single port (1 unit), regardless of which controller paths are failing (see note).

Note: *If only one port is in use, the determination between port and controller cannot be made. Specify the failure boundary as "CONTROLLER."*

Controller A failure of two or more devices on two or more ports (see note).

Do not know The failure boundary cannot be determined.

003

Is an EREP Symptom Code Summary report available?

Yes **No**

004

Examine all sense records with symptom codes 4XXX or ED0D to identify the failing device addresses and failing paths. Determine the failing device and path from sense byte 4 using the following list:

Sense Byte 4	Path
00xx xxxx	Path 0
01xx xxxx	Path 1
10xx xxxx	Path 2
11xx xxxx	Path 3

Sense Byte 4	String Address
xx0x xxxx	String 0
xx1x xxxx	String 1

Sense Byte 4	Device Address
xxx0 0000	Device 00
xxx0 0001	Device 01

xxx0 0010	Device 02
xxx0 0011	Device 03
...	...
xxx1 1110	Device 1E
xxx1 1111	Device 1F

Select the failure boundary from the following list, then return to the procedure that sent you here.

Device A failure of only one device or access mechanism, or the failure of the media associated with that device or access mechanism, regardless of which controller paths are failing.

Drive A failure of two devices in a single head-disk-assembly (HDA) regardless of which controller paths are failing.

Port A failure of two or more devices on different HDAs and limited to a single port (1 unit) regardless of which controller paths are failing (see note).

Note: *If only one port is in use, the determination between port and controller cannot be made. Specify the failure boundary as "CONTROLLER."*

Controller A failure of two or more devices on two or more ports (see note).

Do not know The failure boundary cannot be determined.

005

Examine all entries in the physical address column for all symptom codes 4XXX or ED0D, to identify the failing device addresses. Refer to SMAP 0030 Step 001 on page START-14.

The physical address is presented as CC.P-DD, where:

CC = The physical ID of the string
P = Storage Path (0-3)
DD = The physical ID of the device

- To identify the string, match the controller ID (CC) in the Physical Address column with the string ID on the A unit operator panel.
- To identify the controller, match the path bit (P) in the Physical Address column with the path character on the A unit operator panel.
- To identify devices, match the device address (DD) in the Physical Address column with the device addresses on the A unit operator panel.

Define the failure boundary as follows:

Device

If only one device is listed in the physical address column.

Drive

If only two devices are listed in the physical address column and both devices are in the same HDA.

Port

If one of the following conditions exists:

- Multiple devices are listed in the physical address column, all the errors are related to one unit, and multiple controllers are reporting errors.
- Multiple devices are listed in the physical address column, all the errors are related to one unit, only one controller is reporting errors, and there is at least one B unit in the string.

If there are no B units in the string and only one controller is reporting errors, select a failure boundary of controller.

Controller

If multiple devices are listed in the physical address column and they are on more than one port, or, there is only one controller reporting errors and there are no B units on the string.

---

090 WRITE INHIBIT

When the set/reset CE mode diagnostic resets CE mode for all devices, it checks the storage path or storage director that is attached to the selected controller to determine if the controller, or any of the attached system channels, are write inhibited.

If a write inhibit condition exists, one of these messages is displayed:

- NOTE: WRITE INHIBIT IS SET FOR
  CONTROLLER A*

  Write inhibit is set for a controller if a controller error is detected during a write operation.

- NOTE: WRITE INHIBIT IS SET FOR
  CONTROLLER A*
  CHANNELS **

  Write inhibit is set for a channel if a storage control or channel error is detected during a write operation.

Write inhibit prevents all further write operations through the write inhibited controller or channel.

Write Inhibit conditions may be reset as follows:

- Storage path restart switch on the Storage Control (3990 only)
- MD Main Menu option Z: End of Call
- ICKDSF CONTROL command with the ALLOWWRITE parameter specified.

When a write inhibit condition is indicated for a controller or one or more of its associated channels, it is a good idea to check the other controller(s) to see if a similar condition exists. Use MD Main Menu option 0 (SET/RESET CE MODE), select the other controller(s) and reset CE mode for all devices. If the controller(s) or any of its associated channels are write inhibited, this display will be repeated.

092 STORAGE PATH FENCED

Fencing is a technique used by 3990 storage path functional microcode to remove a failing path from system operation. This prevents path-related failures from degrading subsystem performance.

Storage Path Fenced is set when there are excessive storage path errors or when a Quiesce is set from the Storage Control Support Facility. Diagnostics do not cause Storage Path Fenced conditions to be set.

Do not confuse Storage Path Fenced with Control Interface Fencing. Control Interface Fencing is a hardware fenced condition where controller drivers are disabled. Storage Path Fenced is a condition that exists in storage control microcode only.

Storage Path Fenced may be reset as follows:

- MD Main Menu option Z: End of Call.
- Storage Path Restart switch on the Storage Control.
- By performing a RESUME operation on the quiesced storage path. See MLX Exit 8 on page MLX-3.
- By issuing the ICKDSF CONTROL command with the CLEARFENCE parameter specified.
- By IMLing the storage path.

093 FENCED DEVICES

Fencing is a technique used by 3990 storage path functional microcode to remove a failing path from system operation. This prevents path-related failures from degrading subsystem performance.

Device Fence is set for a device when there are excessive controller errors for a single path to the device. The device remains operational on other paths.

Do not confuse Device Fence with Control Interface Fencing. Control Interface Fencing is a hardware fenced condition where controller drivers are disabled. Device Fenced is a condition that exists in storage control microcode only.

Device Fence may be reset as follows:

- MD Main Menu option Z: End of Call
- Storage Path Restart switch on the Storage Control
- By performing a RESUME operation on the quiesced storage path
- By ICKDSF CONTROL command with the CLEARFENCE parameter specified.
- By IMLing the storage path

100 DIAGNOSTIC MENU

Select one of the following options:

0 = Normal Sequence
Runs the controller test on the selected controller(s), and runs the device test on the selected device(s). Customer operation can continue on devices not selected.

1 = Controller test
Runs the controller test on the selected controller(s). Devices do not have to be in CE mode to run this test. The controller test runs inline with customer operation.

2 = Extended DPS test (3880 Storage Control only)
Runs the extended DPS test. Devices do not have to be in CE mode to run this test. The extended DPS test runs inline with customer operation.

3 = Device tests
Runs the device tests on the selected device(s). Customer operation can continue on devices not selected.

4 = Connection test
Checks out the communication between the MD, the 3380 controller, and the Storage Control. The connection test does not run concurrently with customer operation on the selected controller.

5 = HA Scan
Scan home address on the specified device.

6 = Motor test
Both devices on the drive must be selected. Customer operation can continue on devices not selected. See page PWR-1, Entry AO, in the *MIM, Volume R10.*

7 = Device Status
Tests the controller and collects the status of all devices in the string without putting the devices in CE mode. The device status test runs concurrently with customer operation.

8 = CE Track Repair
Writes all the home addresses on the CE tracks and the diagnostic tracks. Checks each track for defects and skips any defects that are found. Customer operation can continue on devices not selected.

200 SELECT CONTROLLER

A default controller is displayed if a controller was specified during a previous operation. No default is displayed if the MD has just been IMLed.

Valid responses are:

Response	Meaning
ENTER	default (if default is displayed)
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4
1 2	Controllers A1 and A2 (note)
3 4	Controllers A3 and A4 (note)
1 2 3 4	Controllers A1, A2, A3, and A4 (note)

Note: *Multiple controllers are valid only when using diagnostic menu option 0, 1, or 3. Selecting controller A3 or A4 is valid only on strings with four storage paths. The MD will instruct you when it is necessary to move the MD plug.*

For diagnostic menu options 0, 1, or 3, more than one controller may be specified. If controllers in both A-units of a 4-path string are specified, the MD stops after testing is completed with the A-unit that is attached to the MD. The MD instructs you to move the MD connector to continue testing with the adjacent A-unit. Do not power off the MD when moving the connector.

205 INVALID CONTROLLER SELECTED

The controller selected is not valid for this subsystem configuration. For example, controller A3 or A4 are valid only if the subsystem is a 4-path configuration.

Press the PF key to return to the MD Main Menu.

210 SELECT DEVICE(S)

Respond with one of the following:

- Specify device to be tested (for example, "03" = Device 3 will be tested.)
- Specify devices with a space in between (for example, "02 04 05" = Devices 2, 4 and 5 will be tested.)
- Specify a single range of devices (xxTyy) (for example, "02T05" = Devices 2, 3, 4 and 5 will be tested.)
- Specify multiple ranges of devices (xxTyy xxTyy) (for example, "02T05 0CT0E" = Devices 2, 3, 4, and 5, and devices C, D, and E will be tested.)
- Press the ENTER key to use the default devices (if any). Devices previously used are displayed as default devices. No device will be shown as a default device if the MD has just been IMLed.

Note: *If diagnostic menu option 6 (motor start test) or option A (non-repeatable runout test) was selected, only 1 device address can be entered. Either device address associated with the drive can be used.*

215 INVALID DEVICE SELECTED

The device selected is not valid for this subsystem configuration. For example, device 1F is valid only if the subsystem is a 4-path configuration.

Press the PF key to return to the MD Main Menu.

310 DO NOT FORGET TO RESET CE MODE

Devices in CE mode must be reset before returning them to the customer. Use the MD Main Menu option 0 or Z to reset devices in CE mode.

320 DO YOU WANT TO RUN CONNECTION TESTS?

Warning: The connection test cannot run concurrently with customer operation on the controller being tested. Ensure that the controller can be taken from the customer.

Warning: If one or more drives in the string are not running, place the drive motor switches for those drives to OFF. If this is not done, those drives might not sequence on correctly.

The MD connection test is run by the controller sequencer (not the storage control). There are three parts to this test.

- MD to controller connection
- Controller function
- Storage control test

To run the connection test, the MD instructs you to power the controller OFF and then on. During the power-on sequence, the controller sequencer (if operating correctly) establishes communication with the MD, and the connection tests start.

When running the test, follow the instructions given by the MD.

330 WHICH CONTROLLER CONNECTION DO YOU WANT TO TEST?

Warning: The connection test cannot run concurrently with customer operation on the controller being tested. Ensure that the controller can be taken from the customer.

Warning: If one or more drives in the string are not running, place the drive motor switches for those drives to off. If this is not done, those drives might not sequence on correctly.

Valid responses are:

1 = Controller A1
2 = Controller A2
3 = Controller A3
4 = Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

340 CONTROLLER AX CONNECTION TESTS READY.

Warning: The connection test cannot be run concurrently with customer operation on the controller being tested. Ensure that the controller can be taken from the customer.

The MD will instruct you to turn off the indicated controller and press ENTER. Pressing ENTER causes the MD to start polling the controller sequencer.

The MD will next instruct you to turn on the indicated controller. Turning on the indicated controller causes the controller sequencer to branch to a program step that looks for the MD poll. If the controller sequencer is started successfully and if the sequencer sees the MD poll, communication is established between the controller sequencer and the MD. The connection test is then started.

Use the Controller Power On/Off switch on the operator panel or one of the following CPs to power off and on.

- CP410 for controller A1 or A3
- CP411 for controller A2 or A4

350 DPS TESTS CANNOT BE RUN

The MD is attempting to run DPS test on a 3990 Storage Control. The DPS test will not run on a 3990 Storage Control. Press the PF key to go to the MD Main Menu.

360 HA SCAN

Respond to the following:

SELECT CONTROLLER

Valid responses are:

1 = Controller A1
2 = Controller A2
3 = Controller A3
4 = Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

SELECT DEVICE

Select one valid device address (00 through 1F)

SELECT CONTROL MODE

Valid responses are:

1 = Automatic (default)
2 = Manual

Automatic mode automatically continues on error and presents the error data at the end of the scan or until 80 data checks have been detected.

Manual mode stops on each error and displays the error information. The error can be analyzed, or the scan can be continued until the end of the scan or when 80 data checks have been detected.

If an error is detected when in manual mode, the user is provided the option of changing to automatic mode.

SELECT TRACK TYPE

Valid responses are:

1 = Customer tracks
2 = CE/Diagnostic tracks

3 = HA Map tracks

On a 3380-AJ4 and 3380-BJ4 volume,

- Customer tracks are on cylinders 0 through 375 hexadecimal.
- CE tracks are on cylinder 376 hexadecimal.
- Diagnostic tracks are on cylinders 377 through 37A, near the guard band inner diameter (GBID) and servo tracks.
- HA Map tracks are on cylinder FFFD (-3), near the guard band outer diameter (GBOD) and head loading zone.

On a 3380-AK4 and 3380-BK4 volume,

- Customer tracks are on cylinders 0 through A5F hexadecimal.
- CE tracks are on cylinder A62 hexadecimal.
- Diagnostic tracks are on cylinders A63 through A66, near the guard band inner diameter (GBID) and servo tracks.
- HA Map tracks are on cylinders A6D through A6B (-4 through -2), near the guard band outer diameter (GBOD) and head loading zone.

If CE/Diagnostic tracks or HA Map tracks are selected, the diagnostic program determines the cylinders to be tested.

DO YOU WANT TO SCAN ALL CUSTOMER TRACKS?

(This question is asked only when customer tracks are selected.) Valid responses are:

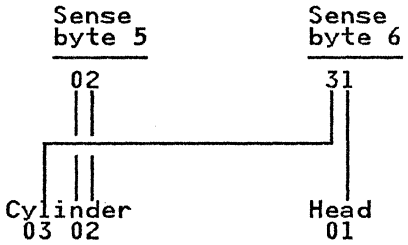
YES key = Scan the whole pack
NO key = Specify a range of cylinders to be scanned, based on the response to the next two messages.

ENTER THE THREE-DIGIT HEX NUMBER OF THE BEGINNING CYLINDER.

(This question is asked only when customer tracks are selected.) The maximum valid ranges (hexadecimal) are:

	Model J	Model K
Beginning Cylinder	000 - 375	000 - A5F

Note: *The Physical Address (PA) bytes from the error bytes of another diagnostic or from sense bytes 5 and 6 may be converted to cylinder and head by using the following diagram.*



In this example, byte 5 contains 02 and byte 6 contains 31. The address is cylinder X"0302," head X "01."

ENTER THE THREE-DIGIT HEX NUMBER OF THE ENDING CYLINDER.

(This question is asked only when customer tracks are selected.) The maximum valid ranges (hexadecimal) are:

	Model J	Model K
Ending Cylinder	000 - 375	000 - A5F

Note: *The ending cylinder must be greater than or equal to the beginning cylinder.*

HOW MANY TIMES DO YOU WANT TO READ EACH HA?

HA Scan cannot directly determine if a data check in the home address area is permanent. To determine that a data check is permanent, the home address (HA) must be read multiple times. If a data check occurs each time the HA is read, the data check can be considered permanent. If the HA is sometimes read without error, the data check can be considered temporary.

It follows that the separation of permanent and temporary data checks is more reliable when the reading is repeated more. But repeating reading takes time.

The minimum run times for scanning all home addresses on the volume are:

	Model J	Model K
1 read	6 minutes	18 minutes
2 reads	12 minutes	36 minutes

Valid responses are "1" through "F":

1 = Read each HA 1 time
2 = Read each HA 2 times (default)
...
F = Read each HA 15 times

If the response is "1," the following question is asked:

HOW MANY TIMES DO YOU WANT TO RETRY IF DATA CHECKS OCCUR?

Valid responses are "1" through "F":

1 = Retry 1 time for each track in error
2 = Retry 2 times for each track in error
...
F = Retry 15 times for each track in error

When a single read is selected, select multiple retries to determine if the error is solid or intermittent.

395 SCAN COMPLETE / SCAN REVIEW

One of following is displayed if data check errors are detected during the scan operation:

```
* SCAN COMPLETE *
  xx TRACKS HAD
    DATA CHECKS
SEE PSG MD-3,395...
```

— or —

```
*  SCAN REVIEW  *
  xx TRACKS HAD
    DATA CHECKS
SEE PSG MD-3,395...
```

"xx" in the previous displays indicates the number of tracks, in hexadecimal, that had errors.

The maximum number of tracks that can be stored by the MD is 80 (X"50"). If more than 80 tracks had errors, the scan is terminated with this frame:

```
 * SCAN STOPPED *
THE DATA CHECK LOG
IN THE MD IS FULL.
SEE PSG MD-3,395...
```

After the scan is completed, stopped, or reviewed, summary or detailed information can be displayed by selecting the display mode from the "Select Display Mode" menu:

```
SELECT DISPLAY MODE:
 1-HEAD/ARM SUMMARY
 2-TRACK SUMMARY
 3-TRACK DETAIL   ...
```

```
 4-RUN HA SCAN
   AGAIN
 5-RETURN TO MAIN
   MENU
```

After displaying summary or detail information, the MD returns to the "Select Display Mode" menu and another mode can be selected.

Display Mode 1: HEAD/ARM SUMMARY

This display mode presents a summary by head of the number of tracks in hexadecimal that had data checks. The summary is presented in four displays, one for each head arm:

```
   **  ARM x  **

HEAD:    xx xx xx xx
ERRORS:  xx xx xx xx
```

ERRORS = Number of errors for each head

Display Mode 2: TRACK SUMMARY

Presents one or more displays with a one line entry for each track that had errors:

```
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
CYL=xxx  HD=x  CNT=x
```

CYL = Cylinder number (hexadecimal)
HD = Head number (hexadecimal)
CNT = Number of errors (hexadecimal)

Display Mode 3: TRACK DETAIL

Presents one display for each track in error. There are two types of error displays:

```
  ** DATA CHECK **
HOME ADDRESS AREA
CYL = xxx   HEAD = x
ERROR COUNT = x
```

— or —

```
NO SYNC BYTE FOUND
HOME ADDRESS AREA
CYL = xxx  HEAD = x
ERROR COUNT = x
```

CYL = Cylinder number (hexadecimal)
HEAD = Head number (hexadecimal)
ERROR COUNT = Number of errors (hexadecimal)

Display Mode 4: RUN HA SCAN AGAIN

Repeat the Review HA Scan option.

Display Mode 5: RETURN TO MAIN MENU

Return to the MD Main Menu.

400 SELECT ONE OF THE FOLLOWING ERROR LOG FUNCTIONS

1 = Transfer Log
Transfers up to 16 error log entries for the selected controller to the MD and stores them on the MD diskette. Any specific entry may be subsequently selected for analysis. The log records are assigned numbers for reference.

2 = Search Log
Search any error log previously transferred to the MD with the specified search argument and return the first (newest) entry that matches the search argument for analysis.

3 = Merge Logs
Merge any or all of the log files previously transferred to the MD into a single merged log file. If the log records contain age (3990 only), the merged log will contain all the records in age order (newest to oldest). If the records do not contain age, the controller A1 log records are placed before the controller A2 log records. The log records are assigned record numbers for reference.

4 = Change Log Mask
Change the error log mask to log information other than the default. The default is to log sense formats 1, 7, 8 and 9 and not to log intervention required or data check errors. The mask can be changed to log any of the formats (1 through 4 and 7 through 9) and to log intervention required.

5 = Erase Log
Reset the error log in the storage control to an empty state.

For additional information, see "Select Error Log Function" on page LOG-2.

405 SELECT CONTROLLER (ERROR LOG)

Select a controller for the function to be performed. Only the error log in the storage path or storage director attached to the selected controller will be affected. Valid responses are:

Response	Meaning
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

Enter your response for controller use.

410 ENTER SEARCH ARGUMENTS

The search of an error log can be for a specific controller, a specific device, or a specific symptom code (or group of codes). Except for controller, the search can be performed on any combination of these search parameters. The controller can be specified only for the merged log.

Controller

Enter A1 (or 1), A2 (or 2), A3 (or 3), A4 (or 4), or press ENTER for all controllers (merged log only).

Device

Enter 2 digit device number or press ENTER for all devices.

Symptom Code

Enter a valid symptom code or enter a symptom code with "X"s (for example: DXXX for any symptom code that starts with a "D," or D2XX for any symptom code that starts with "D2") or press ENTER for all symptom codes.

See the LOG section of this manual for a description of the messages which are a result of the search option.

415 ENTER LOG NUMBER

Valid responses are:

1 for Controller A1 log
2 for Controller A2 log
3 for Controller A3 log (4-path subsystems)
4 for Controller A4 log (4-path subsystems)
M for merged log
R to return to the Main Log menu

The log number refers to a log previously transferred and stored on the MD diskette. "M" refers to the merged log (see Item 3 in "400 SELECT ONE OF THE FOLLOWING ERROR LOG FUNCTIONS" on page MD-71).

Entering an "R" will cause the MD to return to the Main Log menu. For additional information, see "Search Log (Option 2)" on page LOG-5.

420 ENTER THE DATE

The date entered will be included in the log stored on the MD diskette.

Enter 6 characters of date information in the format MMDDYY.

425 ENTER LOGS TO BE MERGED

The numbers entered will cause the corresponding logs previously transferred and stored on the MD diskette to be merged (combined) into a single log file on the MD diskette. The original log files are unchanged. A previously merged file will be replaced by the newly merged file.

430 ENTER THE SENSE FORMATS TO BE LOGGED

Press the ENTER key to accept the default values (formats 1, 7, 8, 9).

Enter the formats to be logged, separated with a single space. The following options are available. All formats to be logged must be entered. Defaults will not be assumed.

0 - Log format 0 errors (Program or system checks)
1 - Log format 1 errors (Device check 2s)
2 - Log format 2 errors (Storage Control check 2s)
3 - Log format 3 errors (Storage Control check 1s)

4 - Log format 4 errors (Data checks)
7 - Log format 7 errors (Controller check 1s)

8 - Log format 8 errors (Controller check 2s/device check 1s)
9 - Log format 9 errors (Device check 2s)
F - Log format F errors (Storage Control error)

440 ERROR LOG MASK/TRANSFER STOPPED BY KEYBOARD ENTRY

Error log diagnostic routine is interrupted by a keyboard entry. Press ENTER to continue the function from the point of interruption.

460 CONFIGURATION

The MD displays configuration information in one of the following series of frames. One series is for 2-path configurations and the other series is for 4-path configurations.

2-Path Configurations

```
STRING CONFIGURATION
CTLR Ax ADR=x  ID=xx
3xx0 SxID=xxxx  SP=x
CTLR PATH=x      ...
```

```
THE STRING HAS:
A*
                 ...
```

4-Path Configurations

```
STRING CONFIGURATION
CTLR Ax ADR=x  ID=xx
3990 SSID=xxxx  SP=x
CTLR PATH=x      ...
```

```
THE STRING HAS:
A*
                 ...
```

```
SUBSTRING 0 HAS:
A*
SUBSTRING 1 HAS:
A*               ...
```

CTLR Ax

x = the controller number selected to run the test.

ADR=x

x = the string number (0 or 1) set in the subsystem configuration switches on the DDC/DTB card. See page REPAIR-18 for 2-path switch settings and page REPAIR-19 for 4-path switch settings. The string number is normally put on the operator panel at installation time. All controllers in the string must be set the same.

ID=xx

xA = the physical ID of the controller (A1, A2, A3, or A4) set in the physical address switches on the I/O control card. See page REPAIR-20 for 2-path switch settings and page REPAIR-22 for 4-path switch settings. The

controller physical ID is normally put on the operator panel at installation time (STRING ID). The physical ID (STRING ID) must be set the same for all controllers in the string.

3xx0

The type of storage control:

xx=88 for 3880 storage control.
xx=99 for 3990 storage control.

SSID=xxxx or SDID=xx

xxxx = the physical ID of the storage path (SSID) in a 3990 storage control. The SSID is normally put on the 3380 operator panel at installation time. The SSID must be set the same for all storage paths attached to the string.

xx = the physical ID of the storage director (SDID) in a 3880 storage control. The SDID is normally put on the 3380 operator panel at installation time. Each 3880 storage director attached to the string has a unique SDID.

SP=x (3990 only)

x = the storage path (0-3) that is connected to the controller selected to run the test. The storage path is normally put on the 3380 operator panel at installation time.

Note: *3880 storage controls do not have storage paths and SP=x is not displayed.*

CTLR PATH = x

x = The path sensed from the controller by the storage control during a sense controller path operation.

0 = Controller A1 Path
1 = Controller A2 Path
2 = Controller A3 Path
3 = Controller A4 Path

A*

A*= the number of units that are in the string or substring (4-path). One of the following lines is displayed:

```
A-UNIT ONLY
A-AND 1 B UNIT
A-AND 2 B UNITS
A-AND 3 B UNITS
```

Note: *Substring 0 refers to those devices or units (devices 00-0F) that are attached to ports 0-3. Substring 1 refers to those devices or units (devices 10-1F) that are attached to ports 4-7.*

For additional information, see "Diagnostic Menu Option 7 - Device Status" on page MD-26. The MD provides the option to have you check for inconsistencies in the configuration information. If you would like to check for these inconsistencies, press the YES key to "DO YOU WANT AN ANALYSIS OF THIS CONFIGURATION DATA?"

If you find inconsistencies, they must be corrected and the test must be rerun to get beyond this point in the test.

462 CONFIGURATION DATA/UNKNOWN STORAGE CTRL

The following frames display configuration data:

```
CONFIGURATION DATA
TYPE=XX FEATURES=XX
(SEE PSG MD-3, 462)
ENTER TO CONTINUE
```

```
UNKNOWN STORAGE CTRL
TYPE=XX FEATURES=XX
(SEE PSG MD-3, 462)
ENTER TO CONTINUE
```

The above frame indicates that the storage control type is not known by the MD. If the storage control type is not valid, the MD assumes a storage control type of 3990.

TYPE=XX

XX= Storage control type.

For 3880, this byte is 00.

For 3990 family storage control, the type information is determined from vital product data in the storage control:

00= 3880
05= 3990 Model 2
06= 3990 Model 3
0F= 3380 Model CJ2
10= 3990 Model 1

FEATURES=XX

XX= String features. String features is the data returned from the controller during a Sense Features command (command 11).

Bit	Bit Name
0	DPS installed
1	4-path
2	Second CDP card installed
3	0
4	Single HDA
5	0
6	0
7	1

See *MSM, Volume R60* SENSE Section, Format 1, byte 8 for additional information about string features. Press the ENTER key to continue.

465 DEVICE STATUS

2-path subsystem

```
   DEVICE STATUS:
X = 0123456789ABCDEF
0X: ****************
```

— or —

4-path subsystem

```
   DEVICE STATUS:
X = 0123456789ABCDEF
0X: ****************
1X: ****************
```

X= Device number (0-F)
0X: Represents devices 00-0F.
1X: Represents devices 10-1F (4-path subsystems).

The asterisks (*) are replaced by device status.

The device status codes are:

B Device Busy
D Data Check
E Equipment Check

I Intervention Required: Device is disabled and not on-Line; this code has nothing to do with whether or not a device is in CE mode.

N Not Installed

O Operational: An operational device normally reports a status of "O."

S Servo busy: If a device has been powered on without at least one storage path channel interface enabled, the device usually reports a status of "S" because there is no attached system to handle the attention interrupt. To eliminate this problem, place the device in CE mode (use MD Main menu Option 0) and rerun the device status test.

A status of "B" or "S" is reported if a device is busy. This may occur if the Device Status test is run during periods of heavy usage. It is usually a good indication that the device is operational. For example,

```
   DEVICE STATUS:
X = 0123456789ABCDEF
0X: OOOOOOOONNNNNNN
1X: OEOOOOOONNNNNNN
```

The above example indicates:

- The string is a 4-path string because there are devices in both the 0X range and in the 1X range.
- Devices 00-07 are installed and operational.
- Devices 10 and 12-17 are installed and operational.
- Devices 08-0F and 18-1F are not installed.
- Device 11 is failing with an equipment check.

The MD provides the option to display a description of the status codes listed above.

468 DEVICE TYPE

Device type information is displayed in one of the following series of frames. One series is for 2-path configurations and the other series of frames is for 4-path configurations.

2-Path Configurations

```
DEVICE TYPE:
FR01=XXX     FR03=XXX
FR02=XXX     FR04=XXX
                  ...
```

```
DO YOU WANT AN
ANALYSIS OF THE
DEVICE TYPE DATA?
(SEE PSG MD-3, 468)
```

FR01 = AJ4 or AK4 unit
FR02 = 1st B unit attached to A unit
FR03 = 2nd B unit attached to A unit
FR04 = 3rd B unit attached to A unit

XXX = Model designation (AJ4, AK4, BJ4, or BK4) of the installed machine frame(s). Frame members are not displayed if they are not installed.

XXX = ??? The diagnostic routine was unable to determine the model. This occurs when the diagnostic cannot select any of the devices in the unit due to heavy system activity.

4-Path Configurations

```
DEVICE TYPE - SS0:
FR01=XXX     FR03=XXX
FR02=XXX     FR04=XXX
                  ...
```

```
DEVICE TYPE - SS1:
FR11=XXX     FR13=XXX
FR12=XXX     FR14=XXX
                  ...
```

```
DO YOU WANT AN
ANALYSIS OF THE
DEVICE TYPE DATA?
(SEE PSG MD-3, 468)
```

FR01 = 1st AJ4 or AK4 unit
FR02 = 1st B unit attached to 1st A unit
FR03 = 2nd B unit attached to 1st A unit
FR04 = 3rd B unit attached to 1st A unit
FR11 = 2nd AJ4 or AK4 unit
FR12 = 1st B unit attached to 2nd A unit
FR13 = 2nd B unit attached to 2nd A unit
FR14 = 3rd B unit attached to 2nd A unit

XXX = Model designation (AJ4, AK4, BJ4, or BK4) of the installed machine frame(s). Frame members are not displayed if they are not installed.

XXX = ??? The diagnostic routine was unable to determine the model. This occurs when the diagnostic cannot select any of the devices in the unit due to heavy system activity.

SS0 Substring 0 = the first substring in a 4-path configuration. Substring 0 contains ports 0-3 (devices 00 - 0F).

SS1 Substring 1 = the second substring in a 4-path configuration. Substring 1 contains ports 4-7 (devices 10 - 1F).

Note: *Models AJ4 and BJ4 have a large letter J on the HDAs. Models AK4 and BK4 have a large letter K on the HDAs.*

The number of B units in the string is determined from the string configuration switches on the I/O control card. See page REPAIR-20 for 2-path switch settings and page REPAIR-22 for 4-path switch settings.

480 STORAGE CONTROL STATUS

Storage control status identifies the physical ID of the storage control or storage director and the physical path attached to the controller:

```
xxxx  S*ID: xx
STORAGE PATH: x
CONTROLLER: Ax
SEE PSG MD-3, 480...
```

If line 1 is "3880 SDID: xx"
xx = Storage Director identifier.

If line 1 is "3990 SSID: xx"
xx = Subsystem identifier.

STORAGE PATH: x
x = Storage Path (0-3)

CONTROLLER: Ax
Ax = Controller (A1, A2, A3, or A4)

Status of conditions in the storage control is displayed in the following frames.

- Devices in CE mode
- Write Inhibit conditions
- Fenced conditions (3990 only)
  - Storage path fenced conditions
  - Device fenced conditions

For additional information, see Diagnostic menu option 9 (Storage Control Status) on page MD-34.

500 ISOLATION CODE ERROR DISPLAY

Select the specific MD display from the following:

PRESS ENTER TO ANALYZE OR "N" TO RUN NEXT CONTROLLER

An error has occurred during a controller test. The user has the option to analyze it or to continue running on the next controller (if both controllers were selected).

If both controllers were selected, entering "N" will start the controller diagnostics for the untested controller. For additional information, see page MD-41.

PRESS ENTER TO ANALYZE OR "N" TO RUN NEXT DEVICE

An error has occurred during a device test. The user has the option to analyze it or to continue running on the next device (if another device was selected).

Entering "N" will start the device diagnostic tests for remaining specified devices. For additional information, see page MD-41.

PRESS ENTER TO ANALYZE OR "PF" KEY TO RETURN TO MAIN MENU

An error has occurred and user has the option of analyzing it or returning to the MD Main Menu.

550 ENTER THE SYMPTOM CODE

Enter a valid symptom code. Symptom codes that are not valid are rejected and this message is displayed again. Symptom codes are obtained from the EREP System Exception Report, from the Symptom Code Summary, or from sense bytes 22 and 23. Valid symptom codes for the 3380-JK are:

- 4xxx, 9xxx, Dxxx, Exxx,
- 7xxx - In some cases, when the functional microcode is not able to identify the failing device type, 3380 stage 1/stage 2 sense data is generated. For these cases, 7xxx symptom code entry is permitted and the appropriate 3380-JK FRUs are displayed.
- 2xxx - In other cases, when errors are propagated to the storage control, the storage control generates 2xxx symptom codes. For these cases, 2xxx symptom code entry is permitted and the appropriate 3380-JK FRUs are displayed.

605 WARNING: HDA CABLES SWAPPED

The MD detected that the HDA cables are swapped. Review the following to determine how the hardware and maintenance package are affected.

DEVICE ADDRESSES

A device address always identifies the same actuator and the data that is accessed by that actuator whether or not the cables are swapped.

OPERATOR PANEL DEVICE READY LIGHTS AND SWITCHES

Swapping cables on a 3380 HDA does **not** change the relationship between the device address, or physical actuator, and the operator panel Enable/Disable switch and Ready LED for that device.

Therefore, there is **no** need to apply a label to the operator panel as was done for 3380-DE devices.

MD LOGIC CARD CALLOUT

The MD always calls out the correct group of logic cards whether or not the cables are swapped.

SINGLE ACTUATOR MAINTENANCE (SAM) PANEL SWITCHES AND CIRCUIT PROTECTORS (CPs)

The SAM panel switches and CPs are always associated with the same logic cards. When the cables are swapped, the left set of device logic cards and its associated CPs and switches control the right actuator in the HDA, and vice versa. Always ensure that you use the correct switches for the logic card you plan to replace.

POWER CARD LEDs

The Sequencer Status LEDs on the power cards are reversed when the cables are swapped. See Figure 1 on page MD-80. The other LEDs retain their original meaning (do not reverse).

B1 Board Power Card LEDs / Cable Swap

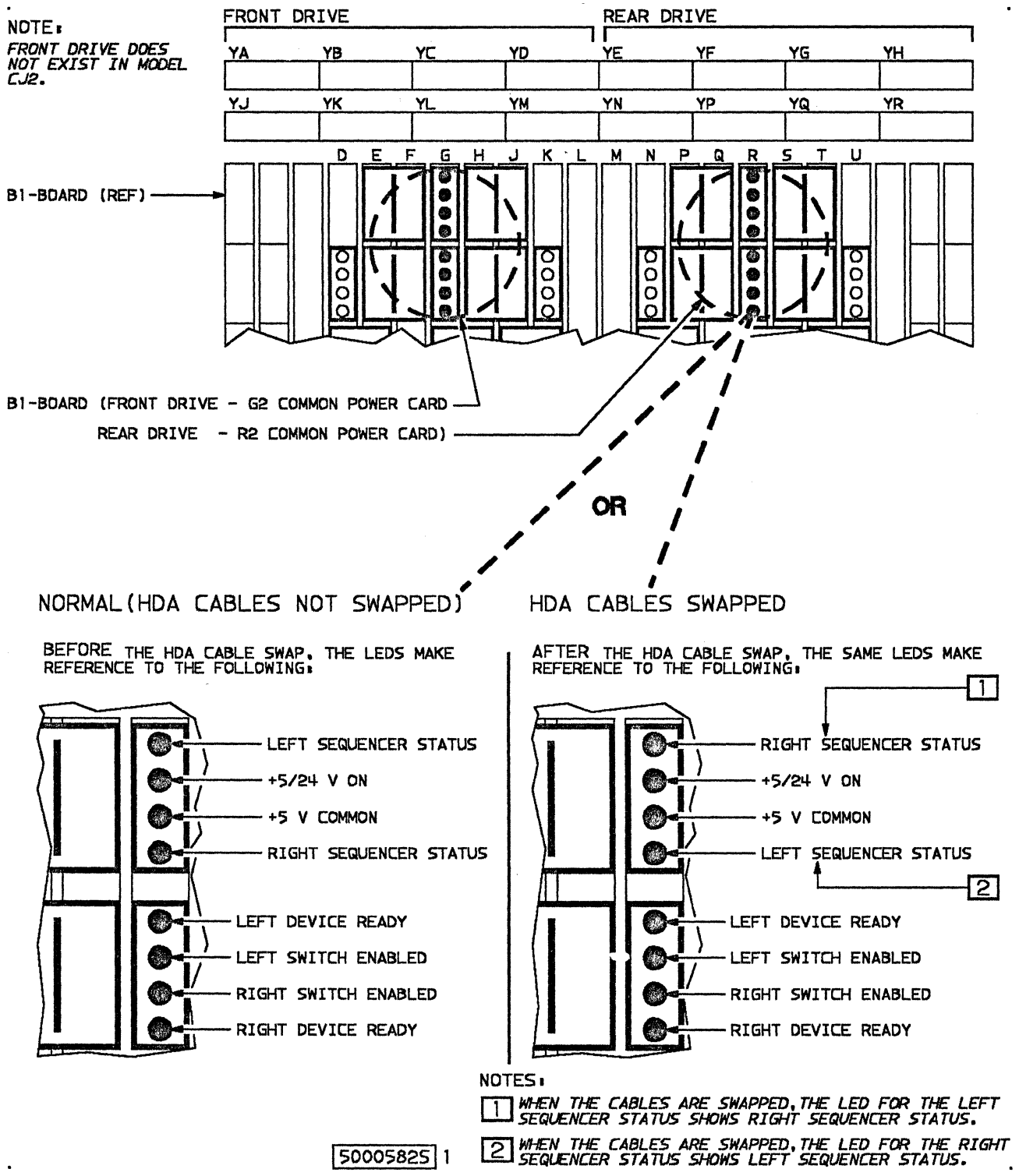


Figure 1. B1 Board Power Card LEDs / Cable Swap

615 MD DOES NOT PROVIDE ANALYSIS FOR DISPLAYED IC

For more information on these ICs (Isolation Codes), see the DIAG section of the *MSM, Volume R60* for a description for the diagnostic that you are running.

700 SELECT REVIEW OPTION FROM FOLLOWING LIST

Review CE mode

A diagnostic routine is invoked to find out which devices are currently set in CE mode.

Review diagnostics

The last 4 diagnostic errors are saved on the MD diskette. The most recent error is shown first and previous errors can be displayed by entering "N" (next). Maintenance analysis can be invoked from the error display.

Review error log

Display the error log summaries that were previously transferred to the MD diskette. Maintenance analysis can be invoked from the summary display.

This is the same function as the Search Log Function. For additional information, see "Search Log (Option 2)" on page LOG-5.

Review repair

Display the last repair specified by a maintenance analysis procedure.

742 PRESS ENTER TO ANALYZE, OR 'N' TO DISPLAY NEXT ERROR

A diagnostic error has been recalled from the MD diskette while using the Review option. You have the option to analyze it or to display the previous error that was stored on the MD diskette.

Up to four diagnostic errors are saved on the MD diskette for review. The most recent error is displayed first. Entering "N" displays the previous error saved. Valid responses are:

Response	Meaning
ENTER	Analyze the error
N	Display the previous error saved

For additional information, see "MD Main Menu Option R" on page MD-49.

SELECT CONTROLLER

Valid responses are:

1 = Controller A1
2 = Controller A2
3 = Controller A3
4 = Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

ENTER ROUTINE ID

Valid responses are:

80 = Controller/DPS tests
81 = Device logic tests
82 = Servo tests
83 = R/W data transfer tests

84 = R/W function tests
85 = Seek Exerciser tests
8A = Incremental seek test
90 = Extended DPS tests (3880 only)

91 = HA Scan (see note 1)
93 = DDC Tests (see note 1d)
96 = Device status test (see note 1a)
97 = Sense Utility (see note 2)

98 = Error log search (see note 1b)
99 = Motor Start Test (see note 1a)
9C = CE track repair routine
9D = DPS Array Dump Routine (3880 only -- see note 2)

9E = Diagnostic Microcode Patch Routine (see note 2)
9F = Set/reset CE mode (see note 1c)
C0 = 3380 A04/AA4 Controller Tests (see note 1d)
D3 = 3380 A04/AA4 DDC Tests (see note 1d)

Notes:

1. *Routines 91, 93, 96, 98, 99, 9F, C0, and D3 should not be run with diagnostic aids:*
   a. *Use MD Main Menu option 1 to run 96 and 99.*
   b. *Use MD Main Menu option 2 to run 98.*
   c. *Use MD Main Menu option 0 to run 9F.*
   d. *Routines 93, C0 and D3 should be run from the storage control.*
2. *Routines 97, 9D and 9E are for product engineering and normally should not be run without assistance from product engineering.*

For additional information, refer to the DIAG section in the *MSM, Volume R60.*

SELECT DEVICE

Select one device address. Valid responses are:

"00" through "0F" for 2-path strings

"00" through "1F" for 4-path strings

ENTER: No device is needed

ENTER PARAMETERS IF REQUIRED

See the DIAG section in the *MSM, Volume R60* to determine diagnostic parameters. Each parameter is entered as two hexadecimal digits. Up to sixteen parameters can be entered with no spaces between each parameter.

Press the ENTER key to enter default parameters. You will be asked the following:

DO YOU WANT TO LOOP THE ROUTINE?

Press the YES key or the NO key to respond:

NO = Run routine to completion or until stopped by an error.
YES = Loop routine and continue looping until stopped by keyboard entry.

If the response is "YES," you will be asked the following:

DO YOU WANT TO HALT WHEN AN ERROR OCCURS?

Press the YES key or the NO key to respond:

YES = When an error occurs, stop.
NO = When an error occurs, continue looping.

If other options are needed, you will have to enter parameters. See the DIAG section in the *MSM, Volume R60.*

900 CONTROL UNIT AND MD DISKS ARE NOT COMPATIBLE

Make sure the diskettes being used are the correct level for the machine being tested.

This message indicates that the storage control diskette is down-level. Pressing the ENTER key allows you to continue with the maintenance procedures. However, be aware that there can be functional differences between the two diskettes and the supporting documentation.

Contact your next level of technical support if necessary.

EC History of Maintenance Device Section

EC HISTORY OF P/N 4519903			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87	476573	30Nov88
475247	11Sep87	476581	01Aug89

Notes:

Error Log Function (MD Main menu Option 2)

The storage control contains error logs for the most recent errors sent to the system. These logs may be transferred to the MD, then searched and analyzed by the MD. Use the following entry table to quickly find the information in this section.

Entry	Select One of the Following	Go to page
A	Introduction	LOG-1
B	Select Error Log Function	LOG-2
C	Transfer Log (Option 1)	LOG-4
D	Search Log (Option 2)	LOG-5
E	Merge Log (Option 3)	LOG-8
F	Change Log Mask (Option 4)	LOG-9
G	Erase Log (Option 5)	LOG-10

Figure 1. LOG Section Entry Table

Introduction

- Each attached storage path or storage director contains 2 error logs, one for each attached string.
- With the default error log mask, the error logs are equipment check logs. They contain entries for all format 1, 7,8 and 9 (sense byte 7 = 1x, 7x, 8x, or 9x) sense byte records that are sent to the system. They do not contain data check records (sense format 4).
- Each log contains up to sixteen 32-byte entries for errors that occurred on the associated path, 24 sense bytes and 8 bytes of additional information. Only the first 24 bytes of the 32 sense bytes generated by a 3990 are put in the error log when attached to a 3990. All 24 bytes that are generated go into the error log when attached to a 3880.
- When a log is full, the oldest entry is overlaid.
- The error log functions are transfer, merge, search, erase, and change log mask.
- Transfer, erase, and change log mask are performed by an inline diagnostic (routine 98) and do not impact customer operation (devices do not need to be placed in CE mode).
- The merge and search functions are done within the MD. The MD does not have to be connected to a string for these functions.
- The 3990 storage paths will log a relative time with each record. The age of the record relative to the time it was transferred to the MD can then be determined and displayed. Relative time is not logged when attached to a 3880 storage control.

Select Error Log Function

From the MD Main menu, select option 2.

The MD displays the following frames:

```
SELECT ONE OF THE
FOLLOWING ERROR LOG
FUNCTIONS:
(SEE PSG MD-3, 400)
```

```
1. TRANSFER LOG
2. SEARCH LOG
3. MERGE LOGS
               ....
```

```
4. CHANGE LOG MASK
5. ERASE LOGS IN THE
   CONTROL UNIT.
  PF FOR MAIN MENU
```

Press the ENTER key to display the next frame.

These frames show the functions that can be performed with the error log.

1. TRANSFER LOG

Transfers all log records from the specified storage path or storage director to the MD. The log in the storage path or storage director is not changed or erased. The storage area in the MD for the selected storage path or storage director will be erased and new data (if any) will be stored on the MD diskette. See "Transfer Log (Option 1)" on page LOG-4.

2. SEARCH LOG

Any of the logs which have previously been transferred to the MD, or the merged log, can be searched for specified entries. The search can be made by controller (storage path), device, or symptom code. The selected records will be displayed one at a time for examination or analysis. See "Search Log (Option 2)" on page LOG-5.

3. MERGE LOGS

Selected logs which have been previously transferred to the MD can be merged together into a storage area on the MD diskette. A previously merged log is erased and new merged log data is stored. If the log records contain age (3990 storage control only) the merged log puts all records in sequential order, with the newest records appearing first in the merged log. See "Merge Log (Option 3)" on page LOG-8.

4. CHANGE LOG MASK

Change the logging algorithm from the default values. The logging algorithm controls the selection of sense data for logging. The choices are:

- Log format 0 errors
- Log format 1 errors (default)
- Log format 2 errors
- Log format 3 errors
- Log format 4 errors
- Log format 7 errors (default)
- Log format 8 errors (default)
- Log format 9 errors (default)
- Log format F errors
- Log Intervention Required

See "Change Log Mask (Option 4)" on page LOG-9.

5. ERASE LOGS IN THE CONTROL UNIT

Erase the log in the specified storage path or storage director. See "Erase Log (Option 5)" on page LOG-10.

PF FOR MAIN MENU

Press the PF key to return to the MD Main menu.

Enter the option number for the error log function you want to perform. Go to the reference shown.

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Error Log Diagnostic Error

Some problems with the storage control, the controller, or the control interface do not allow the error log diagnostic to run. The MD displays an error message. You must analyze the error and correct the problem before continuing.

When an error is detected, the MD displays the following frames:

```
IC**** CTL=A* DEV=**
RTN=** TEST=**
EB=** **** **** ****
 **** **** **** ****
```

```
PRESS ENTER TO
ANALYZE OR PF KEY TO
RETURN TO MAIN MENU.
(SEE PSG MD-3, 500)
```

The labels in the frame have the following meanings:

Label	Meaning
IC	Isolation code
CTL	Controller number (A1, A2, A3, or A4)
DEV	Device address (in hexadecimal)
RTN	Diagnostic routine ID
TEST	Test number within the routine
EB	Error bytes

Note: *The error bytes are used by the MD for FRU isolation. The bytes are displayed here primarily for support personnel.*

If you are preparing to discuss this problem with support personnel, you may want to record these error byte values.

Transfer Log (Option 1)

The Transfer Log function transfers all error log entries from the selected storage path or storage director to the MD and stores then on the MD diskette. Each storage path or storage director path log is stored in a separate log file on the MD diskette. The log file on the MD diskette is erased before the transfer begins.

Warning: If the MD diskette is from another string, all logs must be transferred before searching any of the logs. Otherwise, the results of the search will be unpredictable.

When the transfer log function is initially selected, the MD displays the following:

```
WHICH CONTROLLER
ERROR LOG DO YOU
WANT TO TRANSFER?
(SEE PSG MD-3, 405)
```

The response to this display selects the log in the storage path or storage director attached to the controller indicated in the response.

To review all errors for a given device or to determine if multiple controllers are failing, the error log in each storage path or storage director should be transferred. They can then be merged into a single log using the merge function.

The valid responses are:

Response	Meaning
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

Enter your response to select the error log.

The MD next displays this frame:

```
ENTER THE DATE:
MMDDYY
(SEE PSG MD-3,420)
```

The date entered (maximum of 8 characters) will be stored with the transferred log data on the MD diskette.

```
ERROR LOG TRANSFER
NOW RUNNING ON
CONTROLLER Ax
PLEASE WAIT.       xx
```

Immediately after this display, a diagnostic routine starts to transfer the error log from the storage path or storage director through the specified controller to the MD. The diagnostic runs until all error log records for the string (up to 16) have been transferred (about 2 minutes for a full log).

The "xx" in the bottom line of the frame is the transfer count. Each time an error log entry is transferred, the number (in hexadecimal) is updated. The transfer begins with the most recent entry and continues with successively older entries.

When the transfer of the error log is completed, the MD displays one of the following frames. The frame on the top indicates entries were transferred. The frame on the bottom shows that no entries were found in the error log selected for transfer.

```
*TRANSFER COMPLETE*
CONTROLLER Ax ERROR
  LOG IS STORED.
```

— or —

```
*TRANSFER COMPLETE*
CONTROLLER Ax ERROR
  LOG IS STORED.
NO ENTRIES FOUND.
```

When the transfer is complete, press the ENTER key to return to "Select Error Log Function" on page LOG-2.

Press the PF key to return to the MD Main menu.

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Search Log (Option 2)

The search log function uses search arguments to search a selected error log in the MD. The search log function returns the first (newest) entry that matches the search argument. The entry may be analyzed or the search may be continued. The search can be made by the controller, device, or symptom code, or any combination of these search criteria.

The logs are transferred from the storage control and stored on the MD diskette. Following the transfer, the MD does not require attachment to the 3380-JK to search the logs.

When the search log function is selected, the MD displays the following frame:

```
DO YOU WANT TO SEE
THE PRESENT MD LOG
STATUS?
```

If a YES response is given, one of the following series of frames is displayed. If a NO response is given, the following series of frames is bypassed:

2-Path Subsystem

```
MD ERROR LOG STATUS:
1. DATE       **RECS
2. DATE       **RECS
M. DATE       **RECS
```

4-Path Subsystem

```
MD ERROR LOG STATUS:
1. DATE       **RECS
2. DATE       **RECS
                 ...
```

```
MD ERROR LOG STATUS:
3. DATE       **RECS
4. DATE       **RECS
M. DATE       **RECS
```

DATE The date is the date entered when the log was transferred or merged.

****RECS** The number of records (decimal) in the log.

Press the ENTER key and one of the following frames is displayed:

2-Path Subsystem

```
ENTER LOG NUMBER
1, 2, M,
OR "R" TO RETURN.
(SEE PSG MD-3, 415)
```

4-Path Subsystem

```
ENTER LOG NUMBER
1, 2, 3, 4, M,
OR "R" TO RETURN.
(SEE PSG MD-3, 415)
```

The response to this frame selects a log to be searched. The numbers 1, 2, 3, 4 are the controller path from which the log was retrieved. "M" is the merged log. The logs may be empty if a transfer or a merge function has not been done.

Press the ENTER key and the MD will display the following:

```
SEARCH CRITERIA:
1. ALL RECORDS
2. SELECTED RECORDS
3. SPECIFIC RECORD
```

ALL RECORDS

If "1" is selected, each record in the log is displayed. See "Error Log Record Found" on page LOG-6. Any error record may be analyzed.

SELECTED RECORDS

If "2" is selected, the specified error log is searched for records based on the search argument(s) entered as follows:

```
SEE PSG MD-3,410
FOR INFORMATION ON
HOW TO ENTER SEARCH
ARGUMENTS.     ...
```

Press the ENTER key. If the merged log was selected, the MD asks for the controller to search for. If any other log was selected, the MD does not ask for a controller, but goes on to ask for the device to search for:

```
ENTER CONTROLLER TO
SEARCH FOR OR PRESS
ENTER KEY FOR ANY
CONTROLLER.
```

Enter the controller to search for. Valid entries are 1 or A1, 2 or A2, etc. Search comparison is made between the entered value and the controller through which the log was transferred. Invalid entries will not be accepted.

If the ENTER key is pressed without entering a value, search comparison will not be done for any particular controller.

Enter your response. The MD then asks for the device to search for:

```
ENTER 2 DIGIT DEVICE
SEARCH ARGUMENT OR
PRESS ENTER FOR ALL
DEVICES.
```

Enter device to search for. Valid response is "00" through "1F." Invalid responses will cause the above display to be repeated. The value entered will be compared to sense byte 4, bits 3-7. If the ENTER key is pressed without entering a value, search comparison will not be done for any particular device. The device entered does not have to be in CE mode.

Enter your response. The MD then asks for the symptom code to search for:

```
ENTER SYMPTOM CODE
TO SEARCH FOR OR
PRESS ENTER FOR ALL
SYMPTOM CODES.
```

Enter symptom code to search for. Responses may have the following forms:

Response Meaning

ENTER Specifies all symptom codes

DXXX Specifies all format 7 symptom codes. The character "x" can be used anywhere in the symptom code to specify a mask. The hexadecimal characters in the "x" position are automatic matches.

DC7F Specifies symptom code DC7F.

Any symptom code can be specified.

The specified error log is searched until the first (most recent) error record that matches the search argument is found. See "Error Log Record Found."

SPECIFIC RECORD

If "3" is selected, the specified error log is searched for a specific record number as follows:

```
ENTER 2-DIGIT RECORD
NUMBER TO SEARCH FOR
OR PRESS ENTER FOR
RECORD 01.
```

Enter the 2-digit record number to display. The specific error log is searched until the specific record is found. See "Error Log Record Found."

Error Log Record Found

When a match for all the search arguments is found in the error log, the MD displays the following frame:

```
REC=**          ENT=**
PATH=* CTL=A* DEV=**
SC=****      COUNT=**
AGE=***.* HOURS ...
```

The labels in the display have the following meanings:

Label Meaning

REC A decimal number assigned sequentially when the records were written on the MD diskette.

ENT Log entry record number (1 through 10 in hexadecimal) (newest entry to oldest entry)

The record numbers are displayed in ascending numerical sequence as the log is searched. The newest or most

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recent entry that satisfies the search argument is displayed first.

PATH The storage control from which the log was transferred

CTL Controller number (A1, A2, A3, or A4)

DEV Device address (actually the same as sense data byte 4 bits 3-7)

SC Symptom code (sense bytes 22 and 23)

COUNT The number (in hexadecimal) of occurrences of that symptom code

Each error log entry contains a counter. If another error occurs that is the same as the preceding error, the counter in the preceding record is incremented and a new log entry is not created.

The following comparisons are made to determine if the previous record is the same:

- Format 1 - Device address, string ID, and symptom code.
- Format 7 - String ID and symptom code.
- Format 8 - Device Address, string ID, and symptom code.
- Format 9 - Device Address, string ID, and symptom code.

AGE (3990 storage control only) The hours between occurrence of the error and the time the error log was transferred to the MD.

The following display shows the options available for each displayed log record:

```
ENTER = NEXT RECORD
"A"   = ANALYZE
"NN"  = SHOW REC NN
"R"   = RETURN
```

ENTER Continue to search the log using the same search arguments.

A Perform error analysis and display FRU information. Sense information will be displayed before the analysis is done (see below).

NN A two digit number may be entered and the error record with that "REC" number will be displayed if it exists.

R Will cause a return to the beginning of the SEARCH function.

Sense data display:

```
*** SENSE DATA ***
xxxx xxxx xxxx xxxx
xxxx xxxx xxxx xxxx
xxxx xxxx xxxx xxxx
```

This frame shows the first 24 sense bytes of the 32 sense bytes sent to the system if attached to a 3990 or the 24 sense bytes if attached to a 3880.

- The sense bytes are used by the MD for FRU isolation. They are available here primarily for support personnel.
- If you are preparing to discuss this problem with support personnel, you may want to record these sense byte values.
- Information about the meanings of the sense bytes can be found in the SENSE section of the *ECM, Volume R40.*

When no error log entry that matches the search arguments is found, the MD displays this frame showing the search arguments used during the search:

```
NO RECORDS FOR:
CONTROLLER:AX
DEVICE:    XX
SYMPT CODE:XXXX ...
```

Press the ENTER key to return to the "Select Error Log Function" on page LOG-2.

Press the PF key to return to the MD Main menu.

Merge Log (Option 3)

The Merge Log function merges logs that have been previously transferred, so that records can be searched and displayed from all logs without searching each individual log. A previously merged log is erased and new merged log data is stored. Logs obtained from a 3990 storage control are merged by age with the newest record first. Logs obtained from a 3880 storage control are not merged, but concatenated (A1 first, then A2).

When the Merge Log function is selected, the MD displays the following frame:

```
DO YOU WANT TO SEE
THE PRESENT MD LOG
STATUS?
```

If a YES response is given, one of the following series of frames is displayed. If a NO response is given, the following series of frames is bypassed:

2-Path subsystem

```
MD ERROR LOG STATUS
1. DATE        **RECS
2. DATE        **RECS
M. DATE        **RECS
```

DATE The date is the date entered when the log was transferred or merged.

****RECS** The number of records (decimal) in the log.

4-Path subsystem

```
MD ERROR LOG STATUS
1. DATE        **RECS
2. DATE        **RECS
                  ...
```

```
MD ERROR LOG STATUS
3. DATE        **RECS
4. DATE        **RECS
M. DATE        **RECS
```

DATE The date is the date entered when the log was transferred or merged.

****RECS** The number of records (decimal) in the log.

Press the ENTER key. The following frame is displayed:

```
ENTER LOGS TO BE
MERGED. EXAMPLE:1 2
FOR LOGS 1 AND 2.
(SEE PSG MD-3, 425)
```

Enter the logs to be merged with a space between each entry. Valid entries are:

1 = Controller A1
2 = Controller A2
3 = Controller A3 (3990 4-Path only)
4 = Controller A4 (3990 4-Path only)

For example, if you want to merge logs A1 and A2, enter "1 2."

After selecting the logs to merge, the following frame is displayed:

```
ENTER THE DATE FOR
THE NEW MERGED LOG:
MMDDYY
(SEE PSG MD-3, 420)
```

Enter the current date (MMDDYY). This is done so that if the log is reviewed at a later date, the date the log was merged can be determined.

Press the ENTER key. The following frame is displayed:

```
MERGE IS COMPLETE.
THE MERGED LOG IS
STORED.
```

The specified logs have been merged. Press the ENTER key to return to the "Select Error Log Function" on page LOG-2.

Press the PF key to return to the MD Main menu.

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Change Log Mask (Option 4)

The change error log mask option provides for logging format 0, 2, 3, 4, and F errors and also Intervention Required messages in addition to the errors that are logged with the default mask. The default mask provides for logging format 1, 7, 8 and 9 errors except those indicating Intervention Required.

When this function is selected, the MD displays the following frame:

```
WHICH CONTROLLER
ERROR LOG MASK DO
YOU WANT TO CHANGE?
(SEE PSG MD-3, 405)
```

The response to this frame selects a log for the string to which the MD is attached. The log is in the storage path or storage director attached to the controller indicated in the response. The valid responses are:

Response	Meaning
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

Enter your response to select the error log for which the mask is to be changed.

When the log has been specified, the MD displays the following frame:

```
ENTER THE SENSE
FORMATS TO LOG
DEFAULT IS: 1 7 8 9
(SEE PSG MD-3, 430)
```

To select the sense formats to be logged, enter the format numbers. Each format number must be separated from a preceding number by a single space.

The valid numbers are:

Number	Meaning
0	Log format 0 errors (Program or system checks)
1	Log format 1 errors (Device check 2s)
2	Log format 2 errors (Storage Control check 2s)
3	Log format 3 errors (Storage Control check 1s)
4	Log format 4 errors (Data checks)
7	Log format 7 errors (Controller check 1s)
8	Log format 8 errors (Controller check 2s / device check 1s)
9	Log format 9 errors (Device check 2s)
F	Log format F errors (Storage Control Cache errors)

Enter "1 7 8 9" if you want to select the default mask.

Enter your response to create the error log mask.

The MD displays the following frame:

```
DO YOU WANT TO
LOG INTERVENTION
REQUIRED MESSAGES?
```

Intervention required messages should not normally be logged because they have a tendency to fill the log. For example, during a system IPL, the system control program normally tries to select all devices that have been generated into the system even if they do not actually exist. When the system tries to select a device that does not exist, the storage control presents "Intervention Required."

Press the YES key to log intervention required messages or the NO key to prevent logging intervention required messages.

After the question has been answered, the error log diagnostic sets the error log mask as specified. If the same mask is desired for another log, the

process must be repeated with the other controller specified.

When the set log mask function is complete, one of the following frames is displayed:

```
THE ERROR LOG IS SET
TO LOG FOR FORMATS:
X X X X X X X X
BUT NOT INTERV. REQ.
```

— or —

```
THE ERROR LOG IS SET
TO LOG FOR FORMATS:
X X X X X X X X
AND INTERV. REQD.
```

The log mask has been changed. Press the ENTER key to return to the "Select Error Log Function" on page LOG-2.

Press the PF key to return to the MD Main menu.

Erase Log (Option 5)

The Erase Log function resets the error log storage area in the control unit to an empty state. The error logs in the MD are not erased.

When the Erase Log function is selected, the MD displays the following frame:

```
WHICH CONTROLLER
ERROR LOG DO YOU
WANT TO ERASE?
(SEE PSG MD-3, 405)
```

The response to this display selects a log for the string to which the MD is attached. The log is in the storage path or storage director attached to the controller indicated in the response.

The valid responses are:

Response	**Meaning**
1	Controller A1
2	Controller A2
3	Controller A3
4	Controller A4

Note: *Selecting controller A3 or A4 is valid only on strings with four storage paths, and only when the MD is attached to the A unit that contains controllers A3 and A4. Controllers A1 and A2 cannot be selected when the MD is attached to the A unit that contains controllers A3 and A4.*

Enter your response to select the error log to be reset (erased).

When the controller is selected, the error log diagnostic starts and the error log is erased.

Press the ENTER key to return to the "Select Error Log Function" on page LOG-2.

Press the PF key to return to the MD Main menu.

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EC History of Log Section

EC HISTORY OF P/N 4519905			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87		
475247	11Sep87		

Notes:

EREP Reports

The EREP section contains descriptions of the EREP System Exception reports and the EREP Event History report. Select the report you want to review from the following table.

Entry	Select One of the Following	Go to page
A	Introduction	PROG-1
B	EREP System Exception Reports System Error Summary (Part 2) Report DASD Subsystem Exception DASD String Summary DASD Informational Messages DASD Data Transfer Summary DASD Symptom Code Summary	PROG-1 PROG-2 PROG-4 PROG-8 PROG-10 PROG-11 PROG-16
C	EREP Event History Report	PROG-20

Figure 1. PROG Section Entry Table

EREP System Exception Reports

The EREP (Environmental Recording, Editing, and Printing) System Exception reports (SYSEXN) are used to support the 3380. The specific reports used are:

- System Error Summary (Part 2)
- DASD Subsystem Exception Report
- DASD String Summary
- DASD Informational Messages
- DASD Data Transfer Summary
- DASD Symptom Code Summary

The preferred information for isolating problems is contained in these reports. This maintenance package uses the DASD Symptom Code Summary report to isolate equipment checks and the DASD Data Transfer Summary report to isolate data checks. Both of these reports are part of the EREP System Exception Reports. Refer to the *Environmental Recording, Editing, and Printing Program User's Guide*, GC28-1378.

The customer should normally run the System Exception on a daily basis. If you are isolating temporary I/O errors, it is normally sufficient to use the daily reports provided by the customer. If you are isolating a permanent I/O error, you should ask the customer to run the EREP System Exception reports (SYSEXN) for 33XX devices.

Warning: Do not attempt to off-load device statistics when running EREP (SYSEXN) if devices or paths are failing. A device or path problem can prevent EREP from successfully collecting statistics and the EREP job will not complete successfully. To prevent off-loading statistics, a working data set must be created from ERDS (Error Recording Dataset) and then EREP must be run against the working data set.

To run EREP for a specific problem, two steps are required:

1. Create a working data set. Have the customer use the following parameters: PRINT=NO, ACC=Y, ZERO=N, TYPE=O, and TABSIZE=999K.

2. Run EREP against the working data set and print. Have the customer use the following parameters: SYSEXN=Y, HIST, ACC=N, TABSIZE=999K, and DEV=(3380).

System Error Summary (Part 2) Report

The System Error Summary (Part 2) report lists all the permanent DASD errors. Permanent errors are those that the DASD subsystem and/or the operating system were unable to correct with the defined recovery procedure.

See Figure 2 for an example of this report.

How to Use This Report

The report may be used as follows:

- An error record may be found in this report if the time of the failure is known or the job name is known.
- When the error record is located, the probable failing unit (PFU) will determine which report to examine next:

If the PFU is VOLUME,
The DASD Data Transfer Summary report can be used for the volume defined to determine the next action to be performed. This report supplies the necessary information for service using the ICKDSF program routines. For media maintenance, refer to:

> *Storage Subsystem Library: Maintaining IBM Storage Subsystem Media*, GC26-4495
>
> *Device Support Facilities: Primer for the User of IBM 3380 Direct Access Storage*, GC26-4498

If the PFU is CONTROLLER, DEVICE, or MULTIPLE,
The maintenance package for that device should be used. The DASD Symptom Code Summary report will give symptom codes, physical ID, and sense information for use in the maintenance package. Use the PFU and physical ID to identify the unit in the Symptom Code Summary report.

If the PFU is CHANNEL or SCU,
Enter the maintenance package for the channel or storage control.

SYSTEM ERROR SUMMARY (PART 2)

<7> REPORT DATE 155 87
PERIOD FROM 148 87
TO 149 87

<1> TIME	<2> JOBNAME	<3> CPU	<4> PHYSICAL ID	<5> TYPE	<6> PHYS ADDR	<8> ERROR PATH	<9> VOL	<10> ERROR DESC	<11> PROB FAILING UNIT
DATE 148/87									
08:39:33:52	DASD0001	A	20-60-xx	3380	0992	21-0992	SAS992	PERM EQUIP CHK	CONTROLLER
09:15:54:97	DASD0001	B	20-60-xx	3380	0992	21-0992	SAS992	PERM EQUIP CHK	CONTROLLER
13:58:08:25	MIN8C3	A	05.x-03	3380	08C3	24-08C3	SAS8C3	PERM EQUIP CHK	UNKNOWN
13:58:08:30	MIN8C3	B	05.x-03	3380	08C3	24-08C3	SAS8C3	PERM EQUIP CHK	UNKNOWN
14:38:29:95	ABC8C0	A	05.X-00	3380	08C0	24-08C0	SAS8C0	PERM EQUIP CHK	MULTIPLE
14:38:29:95	ABC8C1	B	04.X-01	3380	08C1	20-08C1	SAS8C1	PERM EQUIP CHK	MULTIPLE
14:38:30:08	ABC8C0	B	05.X-00	3380	08C0	24-08C0	SAS8C0	PERM EQUIP CHK	MULTIPLE
14:38:30:12	ABC8C1	A	05.X-01	3380	08C1	24-08C1	SAS8C1	PERM EQUIP CHK	MULTIPLE
14:38:30:25	ABC8C1	B	04.X-01	3380	08C1	20-08C1	SAS8C1	PERM EQUIP CHK	MULTIPLE
14:38:30:75	ABC8C0	B	04.X-00	3380	08C0	20-08C0	SAS8C0	PERM EQUIP CHK	MULTIPLE
15:21:35:28	ABC980	B	20-60-00	3380	0980	21-0980	SAS980	PERM EQUIP CHK	DEVICE
15:21:36:32	ABC980	A	20-60-00	3380	0980	21-0980	SAS980	PERM EQUIP CHK	DEVICE
19:58:45:86	ABC8C3	A	04.X-03	3380	08C3	20-08C3	SAS8C3	PERM DATA CHK	VOLUME
19:58:49:15	ABC8C0	A	04.X-00	3380	08C0	20-08C0	SAS8C0	PERM DATA CHK	VOLUME
19:58:49:29	ABC8C3	A	05.X-03	3380	08C3	24-08C3	SAS8C3	PERM DATA CHK	VOLUME
19:58:50:35	ABC8C0	A	04.X-00	3380	08C0	20-08C0	SAS8C0	PERM DATA CHK	VOLUME

****

<12>

CPU	MODEL	SERIAL NUMBER
A	3081XA	021170
B	3081XA	221170

Figure 2. Sample of System Error Summary (Part 2) Report

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Field Descriptions

<1> TIME
The TIME field is the date and time the error was detected or logged.

<2> JOB NAME
The JOB NAME field is the name of the job that was being performed when the error occurred.

<3> CPU
The alphabetic identifier of the CPU (processor) that received the error records. At the bottom of the report, all processor alphabetic identifiers are given with their model and serial numbers.

<4> PHYSICAL ID
The PHYSICAL ID field contains the physical ID of the unit affected by the failure. This field should be used to identify the physical failing unit(s).

The physical ID format for the 3380 is CC.P.DD (3380-JK) and SS-CC-DD (device types prior to 3380-JK), where:

SS = Storage Control/storage director ID
CC = A one byte controller string ID
P = Path
DD = Device ID

<5> TYPE
The TYPE field is the device type of the Probable Failing Unit: 3380 for any model.

<6> PHYSICAL ADDRESS
The PHYSICAL ADDRESS (PCUA) field is obtained from the outboard recorder (OBR) record.

When there are multiple paths to a device, the first path defined by the system is called the primary path (primary channel, primary control unit, and physical ID). All paths to a device are defined during system generation of the operating system.

<7> REPORT PERIOD
The REPORT PERIOD lines show the day and the year the report was requested and the days and the year requested in the EREP keyword input parameters.

<8> ERROR PATH
The error path (SCUA) field is obtained from the OBR record.

Note: *The physical address (PCUA) and the error path (SCUA) are four and six character fields respectively. The channel and/or the control unit address will be different when the program selects the device through a path other than the primary path.* An example of the meaning of the PCUA and SCUA is:

PCUA = 0197 and SCUA = 0497, where 1 and 4 are the primary and secondary channels, 9 is the control unit, and 7 is the device physical ID (the device portion is the low-order byte, bits 5-7).

<9> VOLUME
The VOLUME field is the volume in use at the time of the error.

<10> ERROR DESCRIPTION
The ERROR DESCRIPTION field is a description of the type of error that was detected and recorded by EREP.

<11> PROBABLE FAILING UNIT
The PROBABLE FAILING UNIT field identifies the unit which is most probably the source of the failure. The EREP program does an analysis relative to error records in the error recording data set (ERDS). The probable failing unit in this section is a result of that analysis.

<12> CPU ... MODEL ... SERIAL NUMBER
The model and serial number of the CPU (processor) alphabetic character used in the CPU field.

DASD Subsystem Exception Report

The Subsystem Exception DASD report lists accumulated permanent and temporary errors relative to the DASD subsystems. Outboard recorder (OBR) and miscellaneous data recorder (MDR) records are analyzed by the program for symptom code, unit identification, type of error, and other information. The accumulated errors are given for each unit in the probable failing unit category from channel to volume. Within each section, the probable failing units are sequenced by most permanent errors and then by most temporary errors.

This report highlights problems related to disk storage operation and should be used to identify problems and to determine if previous corrective action fixed a problem.

If the span of error records in the report covers more than three days, a message is printed at the top of the report. A report that spans a broad period of time may not provide the most accurate probable failing unit indication, because corrective action may have been taken.

See Figure 3 on page PROG-5 for an example of this report.

How to Use This Report

The 3380-JK temporary data checks and temporary seek errors are only printed on this report when the error rate exceeds a threshold in the storage control. Therefore, any 3380-JK reporting read or seek errors in this report needs servicing.

First determine the probable failing unit (PFU), then check for the following:

If the PFU is VOL,

The DASD Data Transfer Summary report should be used. This report supplies the necessary information for service using the ICKDSF program routines. For media maintenance, refer to:

Storage Subsystem Library: Maintaining IBM Storage Subsystem Media, GC26-4495

Device Support Facilities: Primer for the User of IBM 3380 Direct Access Storage, GC26-4498

If the PFU is CTLR, DEV, or MULT,

The DASD Symptom Code Summary report should be used. The symptom codes, unit identifier, and other error information can be used to enter the maintenance package.

If the PFU is CHAN or SCU,

Enter the storage control or channel maintenance package to identify the failing unit.

If a single device shows more than one PFU,

Determine which error has the highest priority by using the procedures in the START section of this manual.

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```
                                <1>
SUBSYSTEM  EXCEPTION                         REPORT DATE 155 87     <13>
        DASD                                 PERIOD FROM 148 87
                                                    TO   149 87
<2>
B-BUS OUT PARITY CHK   C-CHECK DATA CHK D-DISKETTE CHK
I-INVOKED OFFSETS      S-SERVICE INFORMATION MESSAGE

PROBABLE                                                ---IMPACT OF TEMPORARY ERRORS---     ---USAGE---
FAILING          FAILURE            PHYSICAL  ---TOTALS---  EQU                                  1000   MB.
UNIT             AFFECT     CPU     ADDRESS    PERM  TEMP   CHK     SKS     RD     OVRN   OTHER   SKS   READ
 <3>    <4>       <5>       <6>       <7>         <8>                        <9>                     <10>
*****************************************************************************************************************
SCU  0010123.1  SCU                 TOTAL        1
     3990.02                A       0010123.1    1

------------+------------+--------+----------+------+-----------+-------+-------+-------+-----------+-----+---
CTLR 02.0-XX    SCU/CTLR            TOTAL        4     6     6                                        N/A   N/A
  <11> 3380-JK              A       02.0-XX      4     6     6                                         34   280

     XX-83-XX   SCU/CTLR            TOTAL              1     1                                        N/A   N/A
       3380-DE              A       XX-83-XX           1     1                                         48   320

------------+------------+--------+----------+------+-----------+-------+-------+-------+-----------+-----+---
DEV  41.X-02    DEV                 TOTAL              1             1                                N/A   N/A
       3380-JK              A       41.0-02            1             1                                  5   120

------------+------------+--------+----------+------+-----------+-------+-------+-------+-----------+-----+---
VOL  ABC123     DATAXFR             TOTAL              10                    10                       N/A   N/A
       3380-JK              A       62.0-05            10                    10                        50   240

*****************************************************************************************************************
   0 UNIT(S) EXCLUDED DUE TO LIMITS

CPU    MODEL    SERIAL NUMBER   <12>
 A     3081XA       021170

*  ENTRIES WITH AN ASTERISK INDICATE THAT DASDID CARDS WERE NOT
   FOUND FOR THE UNIT.
NOTE: IMPACT OF TEMPORARY ERRORS IS THE NUMBER OF TIMES ERROR
      THRESHOLD HAS BEEN EXCEEDED.
NOTE: BLANK ENTRIES INDICATE ZERO VALUES OR NOT APPLICABLE.
      N/A MEANS NOT AVAILABLE.
NOTE: ZERO ENTRIES INDICATE RECORDS EXIST IN EREP REPORTS BUT
      THRESHOLDS WERE NOT EXCEEDED.
```

Figure 3. Sample of DASD Subsystem Exception Report

Field Descriptions

<1> MESSAGE AREA

This space at the top of the report is used for messages specific to this subsystem exception report. For example: **WARNING** REPORT SPANS MORE THAN 3 DAYS. PFU ANALYSIS MAY BE IN ERROR.

The warning is given when the error input records are collected over three days or more. When the time is over three days, the probable failing unit analysis could be in error.

<2> B-BUS OUT PARITY CHECK C-CHECK DATA CHK D-DISKETTE CHK I-INVOKED OFFSETS S-SERVICE INFORMATION MESSAGE

These are definitions of the suffixes for the counters that may appear in the column identified in the IMPACT OF TEMPORARY ERRORS column under the heading of "OTHER."

<3> PROBABLE FAILING UNIT

The Probable Failing Unit (PFU) is the unit which is most probably the source of the failure. EREP identifies the PFU based on the failure affect and the units reporting errors. The seven PFUs assigned by EREP are as follows:

CHAN Channel (channel, program, or CPU)
SCU Storage Control (storage control function which resides between a channel(s) and a controller(s)).
CTLR Controller (function that provides an interface between one storage control and a group of devices).
MULT Identifies the failure as being common to MULTIPLE addresses on the same string.
DEV Device (addressable unit)
VOL Volume (data on volume)
UNK Unknown

The line for each PFU describes its identifier, the Failure Effect, and the total error counts attributed to the respective combination of PFU and Failure Effect. Usage counts for this line are not available (N/A) since the total usage of the unit is not determined.

<4> PFU Identifier

All units in each PFU category that had errors are listed with probable failing unit identifiers. The PFU identifier identifies the probable failing unit. The PFU identifier contains the address of the primary path to the failing unit. It is not necessarily the address of the failing path or the path that the error was reported on. To determine the physical ID of the failing path, use the PHYSICAL ADDRESS column.

If the PFU is SCU - Storage Control,
the PFU identifier is:

SS.X-XX 3880-3 with 3380-JK attachment feature

SS-XX-XX 3880 except Model 3880-3 with 3380-JK feature

SEQNUM.P 3990

SEQNUM.P 3380-CJ2

Where:

SS = storage control/storage director ID
SEQNUM = a 7-digit manufacturer's sequence number
P = the storage path within the unit (storage path 0-3)

If the PFU is CTLR - Controller,
the PFU identifier is:

CC.P-XX 3380-JK
XX-CC-XX device types prior to 3380-JK
Where:

CC = controller ID, and
P = storage path

If the PFU is MULT - Multiple,
the PFU identifier is:

CC.X-XX 3380-JK
XX-CC-XX 3380-DE
Where CC=controller ID

If the PFU is DEV - Device,
the PFU identifier is:

CC.X-DD 3380-JK
XX-CC-DD devices prior to 3380-JK
Where:

CC = controller ID, and
DD = physical device ID.

If the PFU is VOL - Volume,
the PFU identifier is "nnnnnn," the volume serial number from the OBR/MDR device-dependent VOLID field.

<5> FAILURE AFFECT

The FAILURE AFFECT field defines the function or machine area affected by the failure. The following ten failure affects are used for the 3380-JK:

CHAN/SCU Channel/Storage Control Unit
SCU Storage Control Unit
SCU/CTLR Storage Control Unit/Controller (DDC Interface)
CTLR Controller
CTLR/DEV Controller/Device Interface

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MULTIPLE Failure common to more than one device
DEV Device
SEEK Servo mechanism or associated logic
DATAXFR Read/Write heads or associated logic
UNK Unknown

<6> CPU

The alphabetic identifier of the processor (CPU) that received the error records. At the bottom of the report, all processor alphabetic identifiers are given with their model and serial numbers.

<7> PHYSICAL ADDRESS

The PHYSICAL ADDRESS field is the physical ID of the unit affected by the failure. This field should be used to identify the physical failing unit(s) and as a means of locating information on other EREP reports.

The physical address format for the 3380 is CC.P.DD (3380-JK) and SS-CC-DD (device types prior to 3380-JK), where:

SS = Storage Control/storage director ID
CC = A one-byte controller string ID
P = Path
DD = Device ID

<8> TOTALS (PERM/TEMP)

PERM TOTALS: This is the count of permanent errors recorded against the unit and totaled for the Probable Failing Unit for the given FAILURE AFFECT.

TEMP TOTALS: This is the sum of the counts shown under IMPACT OF TEMPORARY ERRORS.

<9> IMPACT OF TEMPORARY ERRORS

These fields indicate the number of temporary errors when the count exceeds a limit value. A zero (0) entry indicates that records exist in EREP but their rate did not exceed threshold. A blank entry indicates that no error condition occurred in the device, but sense data may still exist in EREP.

EQU CHK Temporary Equipment Checks
SKS Temporary Seek Checks
RD The sum of the temporary data checks during reading which were corrected by retrying plus the sum of the temporary data checks during reading which were corrected by ECC.
OVRN Counts of overruns which are system retried (only applicable to a PFU of CHAN)
OTHER All other temporary errors. The types are identified by the letter suffix. In the case of multiple error types, multiple letters follow the counter.

<10> USAGE

The usage figures are in units of one thousand for seeks and megabytes for data checks.

<11> Device Type

The device type of the Probable Failing Unit:

3380 for models A04, AA4, and B04
3380-DE for models AD4, AE4, BD4, and BE4
3380-JK for models AJ4, AK4, BJ4, and BK4
3380-CJ for model CJ2

<12> CPU ... MODEL ... SERIAL NUMBER

The model and serial number of the processor (CPU) alphabetic character used in the CPU field.

Note: *"XA" following the CPU model number indicates that the processor complex was running in 370-XA mode.*

<13> REPORT PERIOD

The REPORT PERIOD lines show the day and the year the report was requested and the day and the year of the earliest and latest record.

DASD String Summary

The DASD String Summary report lists all usage for any device reporting errors or usage during the reporting period.

The DASD String Summary can also help you determine the Storage Control Unit/Controller paths involved in a failure. The information at the beginning of each string contains the physical ID for all the SCU/Controller paths that reported either usage or errors.

Information is grouped by CTLR ID if the Subsystem ID (SSID) is not available. If the SSID is available, information is grouped by SSID.

See Figure 4 for an example of this report.

How to Use This Report

The usage information in this report can help you determine whether a failure affect reported in the Subsystem Exception DASD report is unique to a particular device or is common to more than one device in the same controller string.

```
DASD STRING SUMMARY                          REPORT DATE  155 87
                                             PERIOD FROM  148 87
                                                    TO    149 87
REPORT INCLUDES ALL DASD WITH PHYSICAL IDS OR A VALID DASDID
                                               ERROR TYPES        SEEK              MEGABYTES
                  CTLR                         EQU.  |SEEK |DATA    ACC  MEGABYTES   WRITTEN
SSID   SCUID       ID     DEV    VOLUME        CHKS  |     |XFER   X1000    READ     W/VERIFY
*************************************************************************************************
             <1>                                <2>
         20        02.0
         23        02.1
                           01    RAS301                          150     340
                           02    RAS302
                           03    RAS303                    Y       2    1331
         32        8C
         37        8D
                           02    DSKF90                           50       3
                           03    DSKF93                           50       3
0022   0010114.2   40.2
                           03    SAS841                           80     240
0080   0010214.0   60.0
                           09    SAS849                          220     640
                           0A    SAS84A                           12     220
                           0B    SAS84B                           50     240
<3>
ALL DASD PROCESSED FOR EXCEPTION REPORT                          615    3017     <3>
*************************************************************************************************
<4>
CPU    MODEL     SERIAL NUMBER
 A     3081XA       021170          <4>
 B     3081XA       221170
```

Figure 4. Sample of DASD String Summary Report

Note: *The counts for "SEEK ACC X1000" (thousands of seek accesses), "MEGABYTES READ," and "MEGABYTES WRITTEN W/VERIFY" are six digit positions. If the space is exceeded, the count is divided by 1000 and a "K" suffix is added to the number. If the count exceeds 99,999,000, "99999K" will be printed.*

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Field Descriptions

The string summary is in four parts as follows:

<1> Part One

The first part shows usage data for each unique combination of volume, SSID, and physical ID. The physical ID is presented by SCUID, string ID and device fields.

Failure Affects of CTLR, CTLR/DEV, and DEV are grouped under the heading of EQU CKS; SEEK and DATA TRANSFER errors are noted under their own headings.

The usage data for each volume/physical ID appears under three possible headings as follows:

- Seek Accesses × 1000
- Megabytes Read
- Megabytes Written with VERIFY

<2> Part Two

The second part (right hand part of the report) shows failure affects and usage data for each unique combination of volume and device ID.

Failure Affects of CTLR, CTLR/DEV, and DEV are grouped under the heading of EQU CKS; SEEK and DATA TRANSFER errors are noted under their own headings.

The usage data for each volume/physical ID appears under three possible headings as follows:

- Seek Accesses × 1000
- Megabytes Read
- Megabytes Written with VERIFY

<3> Part Three

The third part of the report shows the usage statistics for all DASD with a valid physical ID processed for the Subsystem Exception report, regardless of failure affect or whether any failures were reported.

<4> Part Four

The fourth part of the summary shows all CPUs processed for the exception report, by letter identifier, model number, and serial number.

DASD Informational Messages

The DASD Informational Messages report provides information about conditions in the DASD subsystem. The messages are sequenced by physical ID and symptom code. See Figure 5.

The messages for the 3380-JK are:

- Threshold logging complete for seek checks.
- Threshold logging complete for data checks without offset.
- Device fenced from storage path.

```
DASD INFORMATIONAL MESSAGES                                  REPORT DATE 304 87
                                                             PERIOD FROM 304 87
                                                                    TO   304 87

<1>       <2>       <3>              <4>
PHYSICAL  SYMPTOM
ID         CODE     COUNT            MESSAGE
*********************************************************************************
20.2-09     0001       3   THRESHOLD LOGGING COMPLETE FOR SEEK CHECKS
40.1-00     0002       6   THRESHOLD LOGGING COMPLETE FOR DATA CHECKS WITHOUT OFFSET
62.2-05     0225       1   DEVICE FENCED FROM STORAGE PATH
```

Figure 5. Sample of DASD Informational Message Report

Field Descriptions

<1> PHYSICAL ID
For a 3380-JK, the physical ID field is the ID of the unit that recorded the error. The format is: CC.P-DD, where CC equals the hexadecimal ID for the controller, P equals the hexadecimal storage path, and DD equals the hexadecimal ID for the device.

<2> SYMPTOM CODE
The Symptom Code field is generated in the storage control. Symptom codes for 3380-JK are:

- 0001 = Threshold Logging complete for seek checks
- 0002 = Threshold Logging complete for data checks without offset
- For the Device Fenced from Storage Path message, the symptom code field contains the device address (CUU) instead of a symptom code.

<3> COUNT
The number of records of this type for the defined storage control.

<4> MESSAGE
This field contains the messages for each physical ID.

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DASD Data Transfer Summary

The DASD Data Transfer Summary report lists permanent and excessive temporary data check errors. Temporary errors are listed only when a specified error rate, which is monitored in the storage control functional microcode, is exceeded.

The report lists each volume that had data checks reported in the Subsystem Exception DASD report. Refer to Figure 6 and the field descriptions on page PROG-12.

```
    DASD DATA TRANSFER SUMMARY                          <8> REPORT DATE 034 86
    PROBABLE FAILING UNIT - VOLUME                          PERIOD FROM 032 86
                                                                   TO   032 86
                                                        <9>          SENSE COUNTS
                                                                        TEMPORARY
                                                                     OFFSET INVK THRESHOLD
                                                                PERM   NO    YES  LOGGING
    ********************************************************************************
<1> SEQUENCE BY VOLUME LABEL, PHYSICAL ADDRESS, HEAD, CYLINDER

<2> UNITADDRESS 03C3   DEVTYPE 3380-JK     VOLUME  RAS3C3
<3>      CPU 8   PHYSICAL ADDRESS 22.X-03 ?

<4>      FAILURE AT ADDRESS: CYLINDER 0793  HEAD 05            0    0     8     0
<5>    00003013 03193541 03190005 08C02131 00010015 00F44160
<6>    140004E0 00031905 LAST SENSE AT: 060/88  15:00:40:11

         FAILURE AT ADDRESS: CYLINDER 0793  HEAD 10            0    0     2     0
       00003010 83193A41 0319000A 07412220 00010015 00f44160
       140004F2 0003190A LAST SENSE AT: 060/86  15:00:48:39

<2> UNITADDRESS 0287   DEVTYPE 3380-JK     VOLUME HSM800
<3>      CPU A   PHYSICAL ADDRESS 42.X-07

<4>      FAILURE AT ADDRESS: CYLINDER 0087  HEAD 01            0    1     0    15
<5>    00003000 07570143 00590001 0CA64200 0100B3E6 00064380
<6>                      LAST SENSE AT: 032/86  15:38:35:31

         FAILURE AT ADDRESS: CYLINDER 0095  HEAD 02            0    0     0     8
       00001000 075F0243 005F0002 06B64200 00010000 00064340
                         LAST SENSE AT: 032/86  15:39:44:36

         FAILURE AT ADDRESS: CYLINDER 0105  HEAD 04            0    1     0    16
       00003001 47690443 00690004 06AE4200 01000000 00054340
                         LAST SENSE AT: 032/86  15:47:13:08

         FAILURE AT ADDRESS: CYLINDER 1648  HEAD 10            0    0     0     6
       00001001 47706A43 0670000A 06AE4200 01000000 00054340
                         LAST SENSE AT: 032/86  15:47:13:08

    ********************************************************************************
<7> CPU     MODEL     SERIAL NUMBER
     8       3081XA      021170

    NOTE: CYLINDER/HEAD/BLOCK NUMBERS ARE DECIMAL VALUES
    NOTE: UNITADDRESS IS THE LOGICAL ADDRESS OF THE DEVICE
    NOTE: ? FOLLOWING THE PHYSICAL ADDRESS DENOTES MULTIPLE
          PHYSICAL UNITS HAD ERRORS WITH THIS VOLUME LABEL
```

Figure 6. Sample of DASD Data Transfer Summary Report

Figure 6 on page PROG-11 shows:

- Device 03 on string 22, has exceeded the temporary data check (OFFSET=YES) threshold ten times (eight times on head 05 and two times on head 10):
  - Cylinder 793 head 05 - Eight temporary data checks on this track caused the threshold to be exceeded. The track had 8 temporary errors.
  - Cylinder 793 head 10 - This track had two temporary data checks recorded while the device was in logging mode.
- Device 07 on string 42, has exceeded the temporary data check (OFFSET=NO) threshold two times.
  - Cylinder 87 head 1 - One temporary data check on this track caused the threshold to be exceeded. The track had a total of 16 temporary errors.
  - Cylinder 95 head 2 - This track had eight temporary errors recorded while the device was in logging mode.
  - Cylinder 105 head 4 - One temporary data check on this track caused the threshold to be exceeded. The track had a total of 17 temporary errors.
  - Cylinder 1648 head 10 - This track had six temporary errors recorded while the device was in logging mode.
- Sense byte 21 shows the Physical ID of the Storage Control.
- Sense byte 14 shows the Controller String ID in format 4 and 5 sense.
- Sense byte 4 bits 0 and 1 tell which path the error occurred on:

Sense Byte 4	Path
00xx xxxx	Path 0
01xx xxxx	Path 1
10xx xxxx	Path 2
11xx xxxx	Path 3

Field Descriptions

<1> SEQUENCE BY VOLUME, PHYSICAL ADDRESS, HEAD, AND CYLINDER.
Entries are in sequence by volume, physical address, head, and cylinder.

<2> UNITADDRESS ... DEVTYPE ... VOLUME
UNITADDRESS is the key word used by Device Support Facilities to identify the device. The device is the logical address of the volume reporting the error.

DEVTYPE contains the device type:

3380	for models A04, AA4, and B04
3380-DE	for models AD4, AE4, BD4, and BE4
3380-JK	for models AJ4, AK4, BJ4, and BK4
3380-CJ	for model CJ2

VOLUME is the customer assigned volume label.

<3> CPU ... PHYSICAL ADDRESS
The CPU field identifies which processing unit supplied records for this report.

The PHYSICAL ADDRESS field identifies the device physical address. The physical address format is CC.P-DD, where:

CC	= A one-byte Controller String ID
P	= Path
DD	= Device ID

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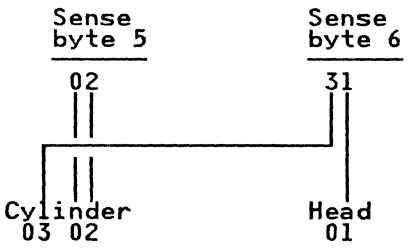
<4> FAILURE AT ADDRESS

The failure at address field defines the logical cylinder and head entries (in decimal numbers) for the recorded errors. The hexadecimal cylinder and head number can be determined from sense bytes 5 and 6 using the following diagram.



In this example, byte 5 contains 02 and byte 6 contains 31. The address is cylinder X"0302," head X "01."

<5> Sense Records

The last sense record is given for each cylinder and head address recorded for each volume reporting errors. Sense records are listed in sequence by head and cylinder:

- For a 3880 subsystem, 24 bytes of sense data are displayed on this line.
- For a 3990 or 3380-CJ2 subsystem, 32 bytes of sense data are displayed: 24 bytes of sense data on this line and 8 bytes preceding the words "LAST SENSE AT" on the next line.
- The format of the record (4) is in byte 7.
- The symptom code is in sense bytes 22 and 23.

<6> LAST SENSE AT

The LAST SENSE AT field is the date and time of the last sense record received for the specified cylinder/head.

<7> CPU ... MODEL ... SERIAL NUMBER

The CPU, MODEL, SERIAL NUMBER field identifies the processing units that supplied records to this report.

<8> REPORT PERIOD

The REPORT PERIOD lines show the day and year the report was requested and the day and year of the earliest and latest records.

<9> SENSE COUNTS

See Figure 7 for an explanation of the sense count data:

PERM
TEMPORARY OFFSET INVK NO
TEMPORARY OFFSET INVK YES
THRESHOLD LOGGING

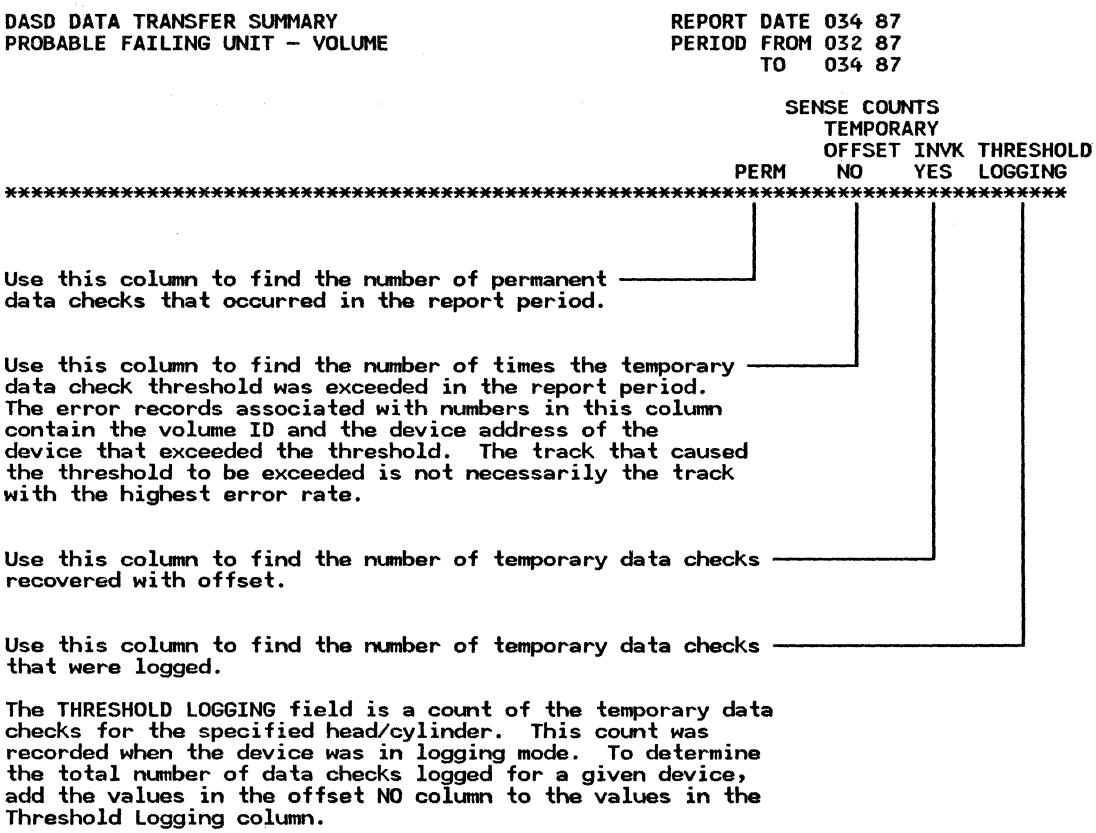


Figure 7. Headings for DASD Data Transfer Summary Report

Understanding Temporary Data Check Reporting

Use Figure 7 on page PROG-13 for reference.

Data checks recovered without offset have thresholds in the storage control. Occasional temporary data checks are expected and do not appear in the EREP reports unless the threshold is exceeded.

When a threshold is exceeded, the RD column of the System Exception DASD report contains a count of the number of times the threshold was exceeded. See Figure 3 on page PROG-5.

Thresholds (3880)

For 3880 storage controls, there is a temporary data check threshold counter for each device in each storage director. If the threshold is exceeded, the storage director goes into logging mode for data checks and logs the next 24 data checks that occur on the device. If the data checks are caused by the device or media (not the path), both storage directors will usually exceed threshold and report data checks. If the data check problem is path related, usually only one storage director will exceed threshold and data checks will be reported for multiple devices (depending on usage).

Thresholds (3990)

For 3990 storage controls, there is a temporary data check threshold counter for each device, regardless of path. If the threshold is exceeded, the storage control goes into logging mode for data checks that occur on the device regardless of path.

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Data Check Reporting

When a threshold is exceeded, and the storage director or storage control goes into logging mode, the first sense records logged will update the count in the DASD Data Transfer Summary report, OFFSET INVK - NO column. An additional 23 data checks are logged and the count in the THRESHOLD LOGGING column is updated for each one. At the completion of logging mode (24 data checks logged), a message is presented to the operator, a Format 0 sense record is logged, and a message is presented in the DASD Informational Messages report (symptom code 0002).

Temporary Data Checks without Thresholds

Temporary data checks with offset active and temporary data checks with symptom codes 4xCx do not have thresholds and are all logged and reported. Temporary data checks with offset active update the count in the OFFSET INVK - YES column and data checks with symptom codes 4xCx, update the count in the OFFSET INVK - NO column.

DASD Symptom Code Summary

This report provides information required for hardware servicing. Each sense record reported in the exception report is listed by PFU, symptom code, and physical ID.

The symptom code is to be used with the 3380-JK service procedures in the START section of this manual. The report allows you to locate the failures noted in the DASD Subsystem Exception report and it allows you to note the symptom code and first sense record for each failure. Data checks (symptom codes 4XXX), which appear in the DASD Data Transfer Summary, also appear here, for use when hardware repair is required.

Use Figure 8 on page PROG-17 with the field descriptions that follow.

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```
                                                    <6>  REPORT DATE 034 86
                                                         PERIOD FROM 032 86
                                                                TO   032 86
<1> SEQUENCE BY PROBABLE FAILING UNIT

<2> SYMPTOM  PHYSICAL OCCURRENCES FAILURE              DATE AND TIME OF
    CODE     ID       PERM/TEMP   AFFECT   FIRST OCCURRENCE      LAST OCCURRENCE
<3>                                         SENSE FROM FIRST OCCURRENCE
              DEVICE          0 0 0 0  0 0 0 0  0 0 1 1  1 1 1 1  1 1 1 1  2 2 2 2
              TYPE            0 1 2 3  4 5 6 7  8 9 0 1  2 3 4 5  6 7 8 9  0 1 2 3
<4>                            PHYSICAL                ERROR
                               ADDRESS   SSID-STRING    PATHS   CPU(S)
    ********************************************************************************

<1> PROBABLE FAILING UNIT: CHANNEL-------------------------------------------------
    PROBABLE FAILING UNIT: STORAGE CONTROL ---------------------------------------
    SEQUENCE BY SCUID, SYMPTOM CODE ----------------------------------------------
<2> 0F00 *   05.        0   1   CHAN/SCU   032/86 01:02:47:49    032/86 01:02:47:49
<3>             3880          04000000 45C42000 00000000 00000000 00000000 00050F00
<4>                             05.       0005-X       12-0285  A


    PROBABLE FAILING UNIT: CONTROLLER--------------------------------------------
    SEQUENCE BY CTLID, SYMPTOM CODE ----------------------------------------------
    E2C0 *   80.0-xx    1   0   SCU/CTLR   032/86 10:46:50:27    032/86 10:46:50:27
              3380-JK          10008280 24000183 81100100 C0000000 0804C868 0007E2C0
                               80.0-04   0004-1      07-0794   A


    PROBABLE FAILING UNIT: DEVICE------------------------------------------------
    SEQUENCE BY CTLID, DEVID, SYMPTOM CODE ---------------------------------------
    9302 *   40.X-00    8   0   DEV        032/86 01:14:14:01    032/86 01:14:18:42
              3380-JK          10000040 001E3C96 89041E04 58020427 00005838 00049302
                               40.0-00   0004-0      07-0780   A
                               40.1-00   0007-0      17-0780   B


    PROBABLE FAILING UNIT: VOLUME------------------------------------------------
    SEQUENCE BY CTLID, DEVID, SYMPTOM CODE ---------------------------------------
    43A0 *   42.X-02    0   2   DATAXFER   032/86 15:21:50:71    032/86 18:33:51:07
              3380-JK          00003000 02360A43 0036000A 00034210 00000000 000643A0
                               42.0-02   0006-0      02-0282   A

    4000 *   42.X-07    0  06   DATAXFER   032/86 15:21:50:71    032/86 18:33:51:07
              3380-JK          00003000 47706a40 FF6DDED8 00FF4200 02000000 00054000
                               42.1-07   0005-0      12-0287   A

    4300 *   42.X-07    0  17   DATAXFER   032/86 15:21:50:71    032/86 18:33:51:07
              3380-JK          00003000 47690443 000B000A 06B64200 00010000 00054300
                               42.1-07   0005-0      12-0287   AB

    4340 *   42.X-07    0   8   DATAXFER   032/86 15:21:50:71    032/86 18:33:51:07
              3380-JK          00001000 075F0243 000B000A 06B64200 00000000 00064340
                               42.0-07   0006-0      02-0287   A

    4380 *   42.X-07    0  16   DATAXFER   032/86 15:21:50:71    032/86 18:33:51:07
              3380-JK          00003000 07180B43 0018000B 0CA64200 01000000 00064380
                               42.0-07   0006-0      02-0287   A
    ********************************************************************************

<5> CPU     MODEL     SERIAL NUMBER

     A      3081XA      021170
     B      3081XA      221170

    NOTE: SYMPTOM CODES WITH AN ASTERISK ARE COUNTED AS ERRORS IN EXCEPTION REPORT
    NOTE: PHYSICAL ID OF N/A MEANS THERE WERE NO DASDID CARDS
```

Figure 8. Sample of DASD Symptom Code Summary Report

Field Descriptions

<1> SEQUENCE BY PROBABLE FAILING UNIT

The DASD Symptom Code Summary is divided into seven separate sections by probable failing unit (PFU). The PFU assigned by EREP can be used to help define the failure boundary. The seven PFUs are:

- Channel
- Storage control
- Controller
- Multiple devices
- Device
- Volume
- Unknown

If there are no entries for a unit, nothing is printed in the report for that PFU.

<2> SYMPTOM CODE ... PHYSICAL ID ... OCCURRENCES ... FAILURE AFFECT ... DATE AND TIME

The SYMPTOM CODE field contains the symptom code from bytes 22 and 23 of the sense data. The sense data, collected and assembled by the storage control, documents the conditions that surround an error. For details of the individual sense bytes, see the SENSE section in the *ECM, Volume R40*.

The asterisk (*) indicates that the record is not generated by logging mode.

The PHYSICAL ID is the physical address of the primary path to the failing unit. It is not necessarily the address of the failing path or the path that the error was reported on. To determine the physical ID of the failing path, use the PHYSICAL ADDRESS column. The physical address format for the 3380 is CC.P-DD (3380-JK) and SS-CC-DD (device types prior to 3380-JK), where:

SS = Storage Control/Storage Director
CC = A one byte Controller String ID
P = Path
DD = Device ID

The OCCURRENCES field contains a count of permanent (PERM) and temporary (TEMP) errors.

The FAILURE AFFECT field defines the function or machine area affected by the failure. The following ten failure affects are used for the 3380-JK:

CHAN/SCU = Channel/Storage Control Unit
SCU = Storage Control Unit
SCU/CTLR = Storage Control Unit/Controller (DDC Interface)
CTLR = Controller
CTLR/DEV = Controller/Device Interface
MULTIPLE = Failure common to more than one device
DEV = Device
SEEK = Servo mechanism or associated logic
DATAXFR = Read/Write heads or associated logic
UNK = Unknown

The DATE AND TIME field contains the date and time of the first and last occurrence of the symptom code.

<3> DEVICE TYPE ... SENSE BYTES

The DEVICE TYPE field is the machine type (device) affected by the failure:

3380 for models A04, AA4, and B04
3380-DE for models AD4, AE4, BD4, and BE4
3380-JK for models AJ4, AK4, BJ4, and BK4
3380-CJ for model CJ2

The SENSE BYTES fields contain the first sense record received for the symptom code. The sense record contains 24 bytes for 3880 attachment and 32 bytes for 3990 attachment.

<4> PHYSICAL ADDRESS ... SSID-STRING ... ERROR PATH ... CPU(S)

The PHYSICAL ADDRESS field is the physical ID of the unit affected by the failure. This field should be used to identify the physical failing unit(s). The physical address format is CC.P-DD, where:

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CC = A one-byte Controller String ID
P = Path
DD = Device ID

The SSID-STRING identifies the Storage control and String address where:

SSID = Storage control physical ID
STRING = Controller string address (0 or 1)

The ERROR PATH field identifies the path returning the sense information and does not necessarily identify the failing unit. In 370 mode this will be a 4 digit address, in XA-mode it will be a 2-digit CHPID (Channel Path Identifier) and a 4-digit Device number.

Use the PHYSICAL ADDRESS to identify the failing unit.

The CPU(S) field defines the processing units which have EREP records for the device.

<5> CPU, MODEL, SERIAL NUMBER

The CPU, MODEL, SERIAL NUMBER field indicates all the processing units that supplied records to this report.

<6> REPORT PERIOD

The REPORT PERIOD lines show the day and the year the report was requested and the day and the year of the earliest and latest record.

Event History Report

The System Exception reports are normally all that is required to isolate a problem. If additional information is required, an Event History report (EVENT) may be run against the working data set. If this is done, have the customer use the following parameters:

```
EVENT=Y, HIST, ACC=N,
TABSIZE=999K,
DEV=(3380), CUA=(xxx-xxx)
```

where xxx-xxx is the device address (CUA) range of the string.

This report provides a one-line summary of each entry in the System Error Record Data Set (ERDS). Selection parameters can be used to select records by device type, date, and time. Refer to *Environmental Recording, Editing, and Printing Program User's Guide and Reference*, GC28-1378.

```
EVENT HISTORY (S/370XA)                                                                                              REPORT DATE  338 87
                                                                                                                     PERIOD FROM  338 87
                                               <6>       <7> <8>  <9>                        <14>                             TO  338 87
   <1>         <2>        <3>  <4> <5>                            SPID                       SNID                     <10>     <11>     <12>    <13>
                                               SSYS ID   REASON   PSW-MCH /PROG-EC  RCYRYXIT  COMP/MOD  CSECTID  ERROR-ID
   TIME       JOBNAME    RECTYP CP CUA         DEVT      CMD CSW  SENSE     04  06  08  10   12  14   16  18   20  22   VOLUME     SEEK     SD      CT
                                *  DNO         CRW  CHP      SCSW                       ESW

DATE  338 87

11 33 52 43 GAM3C2   OBRTMP *A 03C2 3380  03   1D 0E40 10000063 02030190 01201E04 08500507 0000004B 00F49350 040D0CE0 00000301 63.0
11 33 52 60 GAM3C2   OBRTMP *B 03C2 3380  03   1D 0E40 10000063 02030190 01201E04 08500407 0000004B 00F49350 040D0CE0 00000301 63.0
11 33 52 99 GAM3C2   OBRPRM *A 03C2 3380  03   1D 0E40 10000063 02030290 01201E04 08500407 0000004B 00F49350 040D0CE0 00000302 63.0
11 33 55 09 GAM3C2   OBRPRM *B 03C2 3380  03   31 0E00 10000063 02000190 01201E04 08100007 00000049 00F49310 040D0CE0 00000001 63.0
11 33 57 53 GAM3C2   OBRPRM *B 03C2 3380  03   31 0E00 10000063 02000190 01201E04 08100007 00000049 00F49310 040D0CE0 00000001 63.0
11 37 10 76   N/A    ASYNCH *B 09E2 3380-CJ RAS9E2     00101000 00008FE0 2380001F FF000804 23013AE0 00332B01 05100201 F1003300
11 37 13 49   N/A    ASYNCH *B 09E2 3380-CJ RAS9E2     00101000 00008FE0 2380000F FF000604 23013AE0 00332620 05100200 F1003300
11 37 14 77   N/A    ASYNCH *B 09E3 3380-CJ RAS9E3     00901000 00008FE0 4300001F FF000404 23013AE0 00EE2C01 05100201 F100EE00
13 12 12 25 GAM321   OBRPRM *A 0321 3380  13   31 0600 10000063 41030890 81201E04 49800817 00004818 00799349 RAS321       3  8   63.1
13 12 12 36 GAM321   OBRPRM *B 0321 3380  13   31 0600 10000063 41193890 81201E04 49800817 00004818 00799249 RAS321     793  8   63.1
13 12 13 21 GAM320   OBRTMP *B 0320 3380  03   1D 0E00 10008263 00193D83 81100130 00000000 0F04CA08 0078E130 RAS320     793 13   63.0
13 12 13 24 GAM320   OBRTMP *B 0320 3380  03   1D 0E00 10008263 00030D83 81100130 00000000 0F04CA08 0078E130 RAS320       3 13   63.0
13 12 13 64 GAM321   OBRTMP *A 0321 3380  03   31 0600 10000063 01193890 81201E04 A8020407 00008F18 00789302 RAS321     793  8   63.0
13 12 37 46 GAM321   OBRTMP *B 0321 3380  03   31 0600 10000063 01050190 81201E04 A8020407 00008F18 00789302 RAS321       5  1   63.0
13 13 23 16   N/A    MDRDAS *B 0320 3380  13           00001063 40007969 0000E4E8 00000000 04370000 00790000 RAS320              63.1
```

Figure 9. Sample Event History Report

Comments about the sample Event History Report:

- The first five lines could be produced by 3380-JK devices attached to a 3380-CJ2 or a 3990 storage control.
- The next three lines were produced by 3380-CJ2 storage control errors.
- The next six lines were produced by 3380-JK devices attached to a 3880 storage control.
- The last line shows one MDRDAS record type for a 3380-JK device attached to a 3880 storage control (the remaining MDRDAS records are not shown).

Field Descriptions

<1> TIME

The Event History report lists each of the logged errors ordered by time (hour, minute, second, hundredths of a second) provided by the error recovery procedure (ERP) of its associated operating system. This time is usually not the time of error, but (in most cases) the time of recording. If any of the attached operating systems have incorrect time-of-day clocks, relationships may not be initially understandable until this difference is taken into account.

<2> JOBNAME

The JOBNAME field indicates the job name being processed at the time of the failure.

<3> RECTYP

The record type (RECTYP) field indicates whether the outboard recorder (OBR) record:

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OBRPRM
A permanent error.

OBRTMP
A temporary error. The system error recovery procedures permitted a successful recovery from the error.

ASYNCH
Asynchronous data records contain the 32-byte service information message (SIM) generated by the storage control.

MDRDAS
Miscellaneous data records: the statistical data (number of seeks and number of bytes read) for the device reported by the storage director to the system.

<4> CP
The CP field indicates the system (CPU) where the error was logged.

<5> CUA
The control unit address (CUA) field contains the primary channel and unit address (PCUA) used by the operating system to select the device. This CUA may not be the CUA used to select this device at the time of failure.

For the 3380, the unit's position is the physical ID of the device.

<6> DEVT
The DEVT field indicates the type of device that this record was generated for. Device models are not identified.

<7> CMD
The command (CMD) field contains the command that was being executed when the error occurred.

<8> CSW
The channel status word (CSW) field indicates the CSW that existed when the error occurred.

<9> SENSE
The SENSE field contains the sense data collected for an OBR or MDR record. The high-order hex character in byte 7 indicates the format for 3380 OBR and MDR records. See the SENSE section in the *ECM, Volume R40* to identify the individual bits. MDR records do not have their first eight bytes (0 through 7) printed.

Note: *24 sense bytes are reported when attached to a 3880 storage control. 32 sense bytes are reported when attached to a 3990 storage control.*

<10> VOLUME
When the 3380-JK is attached to a 3880 storage control, the VOLUME field contains the volume identifier (VOLID) of the volume.

When the 3380-JK is attached to a 3990 storage control,

- For Format 4 errors and record type "MDRDAS," the VOLUME field contains the volume identifier (VOLID).
- For other than Format 4 errors and record type "MDRDAS," the VOLUME field contains sense bytes 24 through 27.

<11> SEEK
When the 3380-JK is attached to a 3880 storage control, the SEEK field contains the cylinder and head address for record types "OBRPRM" and "OBRTMP."

When the 3380-JK is attached to a 3990 storage control,

- For Format 4 errors, the SEEK field contains the cylinder and head address for record types "OBRPRM" and "OBRTMP."
- For other than Format 4 errors, the SEEK field contains sense bytes 28 through 31 for record types "OBRPRM" and "OBRTMP."

<12> SD

For 3380-JK devices, the SD field contains the physical identifier of the string and the storage path that the string is connected to (CC.P). For previous models of the 3380, the SD field contains the storage director physical identifier.

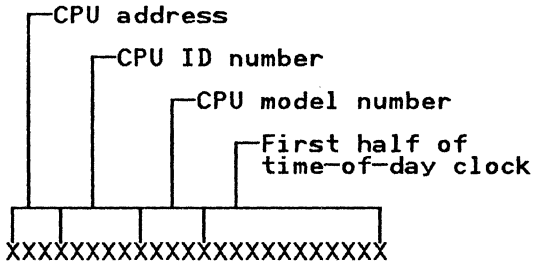
Note: *This field is not used for storage control ASYNCH data records.*

<13> CT

Not used for 3380-JK devices.

<14> SNID

The SNID (sense path group ID) indicates the ID that was sent back from the storage director in reply to a Sense Path Group ID command.



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EC History of Program Section

EC HISTORY OF P/N 4519907			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87		
475247	11Sep87		

Notes:

Symptom Code to FRU Charts

The charts on the following pages indicate the FRUs that can cause a specific symptom code (SC) to be presented.

The FRUs are listed in the order of probability that could cause the symptom code.

The FRU lists in this section are for reference only.

DO NOT use these lists to make the final determination on which FRUs to replace.

Use the MD Main Menu menu Option 3. The MD uses additional information supplied by you and normally provides better FRU isolation than these lists. See "Analyze Symptom Code (Main Menu Option 3)" on page MD-42.

Most of the symptom codes are described in detail in the ECD section of the *ECM, Volume R40*. Tables on the SC-FRU pages include page references to the ECD section. If an ECD page reference is not listed for the symptom code you're interested in, see page HELP-1 in the HELP section of the *MSM, Volume R60*.

How to Use the SC-FRU Charts

1. Find the major symptom code group

The major symptom code group is listed at the top of each chart. The major symptom code groups are in numerical (hexadecimal) sequence.

2. Find the value for X, XX, or XXX in the chart.

The value for X, XX, or XXX within any major symptom code group is given in the first column of the chart. This value is shown in two different forms:

- Actual value = X, XX, or XXX, equals the actual value of the low-order part of the symptom code.
- Bit= X, XX, or XXX, is expressed in binary form where each bit is represented by its position. *All bit positions should be considered when there is a combination of bits.*

If the XXX or bit column contains an asterisk (*) the MD will definitely provide better isolation than the SC FRU charts.

3. Find the FRUs

Look across the chart to find the FRUs that are associated with the controller and/or device that is failing. Again, the MD should be used for FRU isolation if at all possible.

In the SC-FRU charts, **primary FRUs are in bold**; *secondary FRUs are in italics.*

> ***Note:*** *Sometimes a defective FRU in a controller can cause a symptom code associated with a device. In this case, primary FRUs listed for the device should be suspected as the cause of the symptom code. Secondary FRUs listed for the device or controller can also cause the symptom code.*

4. Determine the probability

The FRUs are listed in the order of their probability of causing the symptom code. See the following example:

Controller A1 (A3)	Controller A2 (A4)
A1Q2,A1N2 *A1V2,A1U2*	**A1H2,A1J2** *A1C2,A1D2*

If the failing controller is A1 or A3, the order of probability (highest to lowest) is as follows:

A1Q2 and **A1N2** are primary FRUs:

1. **A1Q2**
2. **A1N2**

A1V2 and *A1U2* are secondary FRUs:

3. *A1V2*
4. *A1U2*

SC=4XYY (4X= Format 4 Byte 07, YY= Format 4 Byte 23)

Data Checks (SC = 40YY through 47YY)

4XYY	Description
4X (Sense Byte 22)	YY (Sense Byte 23)
40* – HA Area; Data Check 41* – Count Area; Data Check 42* – Key Area; Data Check 43* – Data Area; Data Check 44** – HA Area; No Sync Byte Found 45** – Count Area; No Sync Byte Found 46** – Key Area; No Sync Byte Found 47** – Data Area; No Sync Byte Found 48 through 4F – not used	Bits 0, 1 00 – Recovered without ECC 01 – Correctable with first level ECC 10 – Correctable w/second level ECC 11 – Permanent, not correctable Bit 2 – Offset Active Bit 3 – Always 0 Bit 4 – Device undervoltage Bit 5 – Controller undervoltage Bit 6 – Offset recovery bypassed Bit 7 – Track following lost
Notes: * For details about SC 40XX through 43XX, see page ECD-185 in the *ECM, Volume R40*. ** For details about SC 44XX through 47XX, see page ECD-183 in the *ECM, Volume R40*.	

YY Bits 0123 4567	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
xx1x 00xx *	Offset active			B1D2,B1E2 C0B2	B1K2,B1J2 C1B2	B1N2,B1P2 C2B2	B1U2,B1T2 C3B2
		See *MIM Volume R10*, page MAP-1, Entry EB					
xxxx 1xxx	Device undervoltage			B1D2,B1F2	B1K2,B1H2	B1N2,B1Q2	B1U2,B1S2
		See *MIM Volume R10*, page PWR-1, Entry P before replacing FRUs.					
xxxx x1xx	Controller undervoltage	A1Q2,A1R2	A1H2,A1G2				
		See *MIM Volume R10*, page PWR-1, Entry O before replacing FRUs.					
xxxx 00x1 *	Loss of track following			B1D2,B1E2 C0B2	B1K2,B1J2 C1B2	B1N2,B1P2 C2B2	B1U2,B1T2 C3B2
		See *MIM Volume R10*, page MAP-1, Entry EB					
xx0x 00x0 *	All other data check conditions	A1Q2,A1N2 *A1V2*	A1H2,A1J2 *A1C2*	C0B2,B1F2 *B1G2,C1B2* *B1D2,B1E2*	C1B2,B1H2 *B1G2,C0B2* *B1K2,B1J2*	C2B2,B1Q2 *B1R2,C3B2* *B1N2,B1P2*	C3B2,B1S2 *B1R2,C2B2* *B1U2,B1T2*
		See *MIM Volume R10*, page MAP-1, Entry EB					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

Figure 1. SC=4XYY (4X = Format 4 Byte 07, YY = Format 4 Byte 23)

SC=90XX (XX= Format 1 Byte 10)

Device Power Status (SC = 90XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
2 *	No air flow			B1E2,B1G2 *B1J2*	B1J2,B1G2 *B1E2*	B1P2,B1R2 *B1T2*	B1T2,B1R2 *B1P2*
	(ECD-13)	See *MIM Volume R10*, page PWR-1, Entry EI					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 9020, see page ECD-13 in the *ECM, Volume R40*.

Figure 2. SC=90XX (XX = Format 1 Byte 10)

SC=91XX (XX= Format 1 or 9 Byte 11)

Device Check-2 Status (SC = 91XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	Device Sequencer check			B1E2,B1D2 *B1F2,B1G2*	B1J2,B1K2 *B1H2,B1G2*	B1P2,B1N2 *B1Q2,B1R2*	B1T2,B1U2 *B1S2,B1R2*
	(ECD-14)	No further action — go to RMAP 340 on page REPAIR-13.					
2	RPS check			B1D2,B1E2 B1F2,*C0B2* *B1G2,C4P1*	B1K2,B1J2 B1H2,*C1B2* *B1G2,C4P2*	B1N2,B1P2 B1Q2,*C2B2* *B1R2,C4P3*	B1U2,B1T2 B1S2,*C3B2* *B1R2,C4P4*
	(ECD-16)	See *MIM Volume R10*, page MAP-1, Entry DJ					
4	HDA Cable Swap check			B1E2,B1F2 B1G2	B1J2,B1H2 B1G2	B1P2,B1Q2 B1R2	B1T2,B1S2 B1R2
	(ECD-18)	No further action — go to RMAP 340 on page REPAIR-13.					
5	Read/Write check			B1F2	B1H2	B1Q2	B1S2
	(ECD-365)	See *MIM Volume R10*, page MAP-1, Entry EA					
6	Power Card check			B1E2,B1F2 B1G2	B1J2,B1H2 B1G2	B1P2,B1Q2 B1R2	B1T2,B1S2 B1R2
	(ECD-19)	No further action — go to RMAP 340 on page REPAIR-13.					
7	Funnel Parity check			B1F2,B1E2 *B1G2*	B1H2,B1J2 *B1G2*	B1Q2,B1P2 *B1R2*	B1S2,B1T2 *B1R2*
	(ECD-20)	No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 91XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 3. SC=91XX (XX= Format 1 or 9 Byte 11)

SC=92XX (XX= Format 9 Byte 12)

Read/Write Status 1 (SC = 92XX)

Bits 0123 4567	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
01X1 XXX1 *	Write Mode Verify error *(ECD-367)* *(ECD-375)*	A1N2,A1Q2	A1J2,A1H2	C0B2,B1F2 B1E2,B1D2	C1B2,B1H2 B1J2,B1K2	C2B2,B1Q2 B1P2,B1N2	C3B2,B1S2 B1T2,B1U2
		See *MIM Volume R10*, page MAP-1, Entry EA					
11XX XXX1	Read Data Cable error *(ECD-375)* *(ECD-367)* *(ECD-367)*	A1Q2	A1H2	C0B2,*C1B2* *B1F2*	C1B2,*C0B2* *B1H2*	C2B2,*C3B2* *B1Q2*	C3B2,*C2B2* *B1S2*
		See *MIM Volume R10*, page MAP-1, Entry EC					
XXXX XXXX	Read/Write Channel check *(ECD-376)*			B1F2,C0B2	B1H2,C1B2	B1Q2,C2B2	B1S2,C3B2
		See *MIM Volume R10*, page MAP-1, Entry ED					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 92XX, see page *(ECD-376)* in the *ECM, Volume R40*.

Figure 4. SC=92XX (XX= Format 9 Byte 12)

SC=93XX (XX= Format 9 Byte 13)

Read/Write Status 2 (SC = 93XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0	False Read/Write check *(ECD-365)*			B1F2	B1H2	B1Q2	B1S2
		See *MIM Volume R10*, page MAP-1, Entry ED					
1	Padding check *(ECD-378)*			B1F2,*B1E2* *B1D2*	B1H2,*B1J2* *B1K2*	B1Q2,*B1P2* *B1N2*	B1S2,*B1T2* *B1U2*
		See *MIM Volume R10*, page MAP-1, Entry EA					
2 *	Read/Write Sequence check *(ECD-380)*	*A1U2,A1T2*	*A1D2,A1E2*	B1F2	B1H2	B1Q2	B1S2
		See *MIM Volume R10*, page MAP-1, Entry ED					
3	Index/Cell check *(ECD-382)*			B1F2,B1E2 *B1D2*	B1H2,B1J2 *B1K2*	B1Q2,B1P2 *B1N2*	B1S2,B1T2 *B1U2*
		See *MIM Volume R10*, page MAP-1, Entry EA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 93XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 5 (Part 1 of 2). SC=93XX (XX= Format 9 Byte 13)

Read/Write Status 2 (SC = 93XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
4	Servo Cable check			B1D2,B1F2 B1E2,*B1K2* *B1H2,B1J2*	B1K2,B1H2 B1J2,*B1D2* *B1F2,B1E2*	B1N2,B1Q2 B1P2,*B1U2* *B1S2,B1T2*	B1U2,B1S2 B1T2,*B1N2* *B1Q2,B1P2*
	(ECD-383)	See *MIM Volume R10*, page MAP-1, Entry DF					
5	Write Overrun check			B1F2	B1H2	B1Q2	B1S2
	(ECD-384)	See *MIM Volume R10*, page MAP-1, Entry EA					
6	Read/Write Servo check			B1E2,B1D2 C4P1,*B1F2*	B1J2,B1K2 C4P2,*B1H2*	B1P2,B1N2 C4P3,*B1Q2*	B1T2,B1U2 C4P4,*B1S2*
	(ECD-385)	See *MIM Volume R10*, page MAP-1, Entry DN					
7	Head Address Register parity check *(ECD-387)*			B1F2	B1H2	B1Q2	B1S2
		See *MIM Volume R10*, page MAP-1, Entry ED					

NOTE: For details about symptom code 93XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 5 (Part 2 of 2). SC=93XX (XX= Format 9 Byte 13)

SC=94XX (XX= Format 9 Byte 14)

Read/Write Status 3 (SC = 94XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0	Check Inhibit check			B1F?,C0B2	B1H2,C1B2	B1Q2,C2B2	B1S2,C3B2
	(ECD-388)	See *MIM Volume R10*, page MAP-1, Entry EA					
1	Read/Write Channel Status parity check *(ECD-389)*			C0B2,B1F2	C1B2,B1H2	C2B2,B1Q2	C3B2,B1S2
		See *MIM Volume R10*, page MAP-1, Entry EA					
2	Read Transmit/Select Alternate check *(ECD-390)*			B1F2	B1H2	B1Q2	B1S2
		See *MIM Volume R10*, page MAP-1, Entry EA					
3	Read/Write Control Cable check *(ECD-391)*			B1F2,C0B2	B1H2,C1B2	B1Q2,C2B2	B1S2,C3B2
		See *MIM Volume R10*, page MAP-1, Entry EA					

NOTE: For details about symptom code 93XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 6. SC=94XX (XX= Format 9 Byte 14)

SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 10 through 3A (SC = 9510 through 953A)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
10	Index failure during Idle	**B1D2,B1E2** *C0B2,C4P1*	**B1K2,B1J2** *C1B2,C4P2*	**B1N2,B1P2** *C2B2,C4P3*	**B1U2,B1T2** *C3B2,C4P4*
	(ECD-21)	*MIM Volume R10*, page MAP-1, Entry DJ			
13	Cell Pulse failure during Idle	**B1D2,B1E2** *C0B2,C4P1*	**B1K2,B1J2** *C1B2,C4P2*	**B1N2,B1P2** *C2B2,C4P3*	**B1U2,B1T2** *C3B2,C4P4*
	(ECD-22)	*MIM Volume R10*, page MAP-1, Entry DJ			
15	DCP Servo Write Inhibit detected inactive during Rezero	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-23)	*MIM Volume R10*, page MAP-1, Entry DN			
16	DCP Servo Write Inhibit or Write Inhibit found active at end of Rezero	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-24)	*MIM Volume R10*, page MAP-1, Entry DN			
17	Write Inhibit active during a Load HAR command	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
		MIM Volume R10, page MAP-1, Entry DN			
18	Half Track active at end of Rezero	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-25)	*MIM Volume R10*, page MAP-1, Entry DN			
1A	DCP found busy with Not Write Inhibit	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-26)	*MIM Volume R10*, page MAP-1, Entry DN			
2F	Motor turning without the relay picked during power-on reset (POR)	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-28)	*MIM Volume R10*, page PWR-1, Entry AO			
31	Actuator moved too far during Safe	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-29)	*MIM Volume R10*, page MAP-1, Entry DN			
34 *	Either a DCP detected error or a Check-2 Reset command	**B1D2,B1E2** *C0B2*	**B1K2,B1J2** *C1B2*	**B1N2,B1P2** *C2B2*	**B1U2,B1T2** *C3B2*
	(ECD-30)	*Mlm Volume R10*, page MAP-1, Entry DJ			
39	DCP in an error state or wrong command issued during Safe	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-31)	No further action — go to RMAP 340 on page REPAIR-13.			
3A	Drive motor slowing down	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-32)	*MIM Volume R10*, page PWR-1, Entry AO			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 1 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 3B through 4F (SC = 953B through 954F)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
3B	The DCP either did not take or complete the Safe command	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-34)	No further action — go to RMAP 340 on page REPAIR-13.			
3F	Motor relay is stuck active during a power-on reset (POR) or a power off	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-35)	*MIM Volume R10*, page PWR-1, Entry A0			
41	DCP Track Follow bit active when not expected during Rezero	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-36)	*MIM Volume R10*, page MAP-1, Entry DN			
44 *	DCP error during Rezero	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-37)	*MIM Volume R10*, page MAP-1, Entry DN			
45	DCP Servo Check 2 bit active during Rezero	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-38)	*MIM Volume R10*, page MAP-1, Entry DN			
46	DCP Busy found inactive during Rezero	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-39)	*MIM Volume R10*, page MAP-1, Entry DN			
47	Servo Check 2 active prior to issuing Rezero command	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-40)	*MIM Volume R10*, page MAP-1, Entry DN			
48	AGC lost during Rezero	**B1D2,B1E2** *C0B2*	**B1K2,B1J2** *C1B2*	**B1N2,B1P2** *C2B2*	**B1U2,B1T2** *C3B2*
	(ECD-41)	*MIM Volume R10*, page MAP-1, Entry DJ			
49	Track following not found at end of Rezero	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-42)	*MIM Volume R10*, page MAP-1, Entry DN			
4C	Rezero failed to start after DCP command issued	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-43)	*MIM Volume R10*, page MAP-1, Entry DN			
4D	DCP Half Track not active when expected during Rezero	**B1E2,B1D2** *C4P1,B1F2*	**B1J2,B1K2** *C4P2,B1H2*	**B1P2,B1N2** *C4P3,B1Q2*	**B1T2,B1U2** *C4P4,B1S2*
	(ECD-44)	*MIM Volume R10*, page MAP-1, Entry DN			
4F	DCP Busy active detected before Rezero command	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-45)	No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 2 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 50 through 5C (SC = 9550 through 955C)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
50	Seek routine took too long	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-46)	*MIM Volume R10*, page MAP-1, Entry DN			
52	Guard band detected during Seek	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-46)	*MIM Volume R10*, page MAP-1, Entry DN			
53	DCP Busy not active at beginning of Seek command	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-47)	*MIM Volume R10*, page MAP-1, Entry DN			
54 *	DCP Error bit detected active during Seek	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-48)	*MIM Volume R10*, page MAP-1, Entry DN			
55	DCP detected failure during Seek	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-49)	*MIM Volume R10*, page MAP-1, Entry DN			
56	Invalid DCP command for Seek operation	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-50)	*MIM Volume R10*, page MAP-1, Entry DN			
57	AGC signal inactive during Seek	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-51)	*MIM Volume R10*, page MAP-1, Entry DN			
58	Not track following after fourth settling delay during Seek	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-52)	*MIM Volume R10*, page MAP-1, Entry DN			
59	DCP Track Follow and Offset not active at beginning of Seek	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-53)	No further action — go to RMAP 340 on page REPAIR-13.			
5A	DCP Busy before or after Seek	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-54)	No further action — go to RMAP 340 on page REPAIR-13.			
5B	DCP fails to accept Seek command or DCP Hang condition detected	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-55)	No further action — go to RMAP 340 on page REPAIR-13.			
5C	DCP Busy bit goes inactive during Seek	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-56)	No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 3 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 5D through 6A (SC = 955D through 956A)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
5D	DCP Half Track bit in wrong state during Seek	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-57)	*MIM Volume R10*, page MAP-1, ENTER DN			
5E	DCP Track Following bit active too soon during Seek	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-58)	*MIM Volume R10*, page MAP-1, ENTER DN			
5F	Write Inhibit or DCP Servo Write Inhibit in wrong state	**B1E2,B1D2** *B1F2,C4P1*	**B1J2,B1K2** *B1H2,C4P2*	**B1P2,B1N2** *B1Q2,C4P3*	**B1T2,B1U2** *B1S2,C4P4*
	(ECD-59)	*MIM Volume R10*, page MAP-1, ENTER DN			
60	DCP Offset bit in wrong state during Offset	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-60)	*MIM Volume R10*, page MAP-1, Entry DN			
62	Invalid command in DCP command register for Offset	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-61)	*MIM Volume R10*, page MAP-1, Entry DN			
63	DCP Busy bit active before issuing Offset	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-61)	No further action — go to RMAP 340 on page REPAIR-13.			
64 *	DCP Error active during Offset routine	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-62)	*MIM Volume R10*, page MAP-1, Entry DN			
65	DCP detected failure during Offset	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-63)	*MIM Volume R10*, page MAP-1, Entry DN			
66	DCP fails to accept Offset command or DCP Hang condition detected	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-64)	No further action — go to RMAP 340 on page REPAIR-13.			
67	DCP Busy bit not active at beginning of Offset command	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-65)	No further action — go to RMAP 340 on page REPAIR-13.			
68	AGC signal inactive during Offset	**B1D2,B1E2** *C0B2*	**B1K2,B1J2** *C1B2*	**B1N2,B1P2** *C2B2*	**B1U2,B1T2** *C3B2*
	(ECD-66)	*MIM Volume R10*, page MAP-1, Entry DJ			
6A	DCP Track Following bit in wrong state during Offset	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-67)	*MIM Volume R10*, page MAP-1, Entry DN			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*

Figure 7 (Part 4 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 6B through 7A (SC = 956B through 957A)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
6B	Offset routine took too long (ECD-68)	B1E2,B1D2 C4P1	B1J2,B1K2 C4P2	B1P2,B1N2 C4P3	B1T2,B1U2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
6C	Write Inhibit signal or DCP Servo Write Inhibit bit in wrong state (ECD-69)	B1E2,B1D2 C4P1	B1J2,B1K2 C4P2	B1P2,B1N2 C4P3	B1T2,B1U2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
6D	DCP Track Follow and Offset inactive at beginning of Offset (ECD-70)	B1E2,B1D2 C4P1	B1J2,B1K2 C4P2	B1P2,B1N2 C4P3	B1T2,B1U2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
6E	Write Inhibit signal or DCP Servo Write Inhibit active at the end of Zero Offset (ECD-71)	B1E2,B1D2 C4P1	B1J2,B1K2 C4P2	B1P2,B1N2 C4P3	B1T2,B1U2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
6F	DCP Busy bit active at end of Offset (ECD-72)	B1E2,B1D2 C4P1	B1J2,B1K2 C4P2	B1P2,B1N2 C4P3	B1T2,B1U2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
74 *	DCP Error bit detected active during search (ECD-73)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
75	DCP Check 2 bit detected active during search (ECD-74)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
76	DCP Busy bit active before issuing Search command (ECD-75)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
77	Record Ready Interrupt is active too long during Search (ECD-76)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
78	AGC signal detected inactive during Search (ECD-77)	B1D2,B1E2 C0B2,C4P1	B1K2,B1J2 C1B2,C4P2	B1N2,B1P2 C2B2,C4P3	B1U2,B1T2 C3B2,C4P4
		MIM Volume R10, page MAP-1, Entry DJ			
79	RPS Failed To Lock detected during Search (ECD-78)	B1D2,B1E2 C0B2,C4P1	B1K2,B1J2 C1B2,C4P2	B1N2,B1P2 C2B2,C4P3	B1U2,B1T2 C3B2,C4P4
		MIM Volume R10, page MAP-1, Entry DJ			
7A	RPS check active during Search (ECD-79)	B1D2,B1E2 C0B2,C4P1	B1K2,B1J2 C1B2,C4P2	B1N2,B1P2 C2B2,C4P3	B1U2,B1T2 C3B2,C4P4
		MIM Volume R10, page MAP-1, Entry DJ			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 5 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 7B through 88 (SC = 957B through 9588)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
7B	Index/Record Ready Interrupt check during Search	B1D2,B1E2 *C0B2,C4P1*	B1K2,B1J2 *C1B2,C4P2*	B1N2,B1P2 *C2B2,C4P3*	B1U2,B1T2 *C3B2,C4P4*
	(ECD-80)	*MIM Volume R10*, page MAP-1, Entry DJ			
7C	Time between Record Ready interrupts too short during search	B1D2,B1E2 *C0B2,C4P1*	B1K2,B1J2 *C1B2,C4P2*	B1N2,B1P2 *C2B2,C4P3*	B1U2,B1T2 *C3B2,C4P4*
	(ECD-81)	*MIM Volume R10*, page MAP-1, Entry DJ			
7D	Time between Record Ready interrupts too long during search	B1D2,B1E2 *C0B2,C4P1*	B1K2,B1J2 *C1B2,C4P2*	B1N2,B1P2 *C2B2,C4P3*	B1U2,B1T2 *C3B2,C4P4*
	(ECD-82)	*MIM Volume R10*, page MAP-1, Entry DJ			
7F	Servo Check 2 active before issuing Search command	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-83)	No further action — go to RMAP 340 on page REPAIR-13.			
80 *	Received a command that does not match the HDA model	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-84)	*MIM Volume R10*, page MAP-1, Entry DP *MIM Volume R10*, page MAP-1, Entry DI			
82	Read/Write mode active during Safe	B1F2,B1E2 B1G2	B1H2,B1J2 B1G2	B1Q2,B1P2 B1R2,	B1S2,B1T2 B1R2
	(ECD-85)	No further action — go to RMAP 340 on page REPAIR-13.			
83	Invalid Warm-Up command	B1E2,B1D2 B1F2	B1J2,B1K2 B1H2	B1P2,B1N2 B1Q2	B1T2,B1U2 B1S2
		No further action — go to RMAP 340 on page REPAIR-13.			
84	Either an invalid command or parameter was received	B1E2,B1F2 *B1D2*	B1J2,B1H2 *B1K2*	B1P2,B1Q2 *B1N2*	B1T2,B1S2 *B1U2*
	(ECD-86)	No further action — go to RMAP 340 on page REPAIR-13.			
85 *	Received a command that does not match the HDA Model	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-87)	*MIM Volume R10*, page MAP-1, Entry DI			
86	Lost track following during Data Check Recovery	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-88)	*MIM Volume R10*, page MAP 1, Entry DN			
87	Check Reset command fails to reset Busy	B1E2,B1D2 B1F2	B1J2,B1K2 B1H2	B1P2,B1N2 B1Q2	B1T2,B1U2 B1S2
	(ECD-89)	No further action — go to RMAP 340 on page REPAIR-13.			
88	Invalid or illegal command received with Device Busy	B1E2,B1D2 B1F2,*B1G2*	B1J2,B1K2 B1H2,*B1G2*	B1P2,B1N2 B1Q2,*B1R2*	B1T2,B1U2 B1S2,*B1R2*
	(ECD-89)	No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 6 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks 8A through A6 (SC = 958A through 95A6)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
8A	DCP Sample Interrupt out of specification during Idle	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-90)	No further action — go to RMAP 340 on page REPAIR-13.			
8B	DCP Sample Interrupt signal not changing changing states during Idle	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-91)	No further action — go to RMAP 340 on page REPAIR-13.			
8D	Sequencer failed to receive required data from the controller-device port (CDP)	**B1E2,B1D2 B1F2**	**B1J2,B1K2 B1H2**	**B1P2,B1N2 B1Q2**	**B1T2,B1U2 B1S2**
	(ECD-92)	No further action — go to RMAP 340 on page REPAIR-13.			
8E *	Received a command that does not match the HDA model	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-93)	*MIM Volume R10*, page MAP-1, Entry DI			
8F	Both guard bands detected; actuator seems to oscillate	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-94)	*MIM Volume R10*, page MAP-1, Entry DN			
92	Command gate stuck active	**B1E2,B1F2** *B1D2*	**B1J2,B1H2** *B1K2*	**B1P2,B1Q2** *B1N2*	**B1T2,B1S2** *B1U2*
	(ECD-95)	No further action — go to RMAP 340 on page REPAIR-13.			
A1	No air pressure detected during Motor Start	**B1E2,B1G2** *B1F2*	**B1J2,B1G2** *B1H2*	**B1P2,B1R2** *B1Q2*	**B1T2,B1R2** *B1S2*
	(ECD-96)	*MIM Volume R10*, page PWR-1, Entry I			
A2	Motor relay not active during Power On	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-97)	*MIM Volume R10*, page PWR-1, Entry AO			
A3	No air pressure detected during Power On	**B1E2,B1G2** *B1F2*	**B1J2,B1G2** *B1H2*	**B1P2,B1R2** *B1Q2*	**B1T2,B1R2** *B1S2*
	(ECD-98)	*MIM Volume R10*, page PWR-1, Entry I			
A4 *	Motor switch off after motor started during Power On	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-99)	*MIM Volume R10*, page PWR-1, Entry AC			
A5 *	Drive Motor switch momentarily off during Search / Idle	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-100)	*MIM Volume R10*, page PWR-1, Entry AC			
A6	Motor relay active at beginning of Motor Start	**B1G2,B1E2 B1J2**	**B1G2,B1J2 B1E2**	**B1R2,B1P2 B1T2**	**B1R2,B1T2 B1P2**
	(ECD-101)	*MIM Volume R10*, page PWR-1, Entry AO			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 7 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks A7 through B4 (SC = 95A7 through 95B4)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
A7	DCP detected error in Motor Start Decompress	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
	(ECD-102)	*MIM Volume R10*, page MAP-1, Entry DC			
A8	AGC not active with motor turning at more than 3150 RPM	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-103)	*MIM Volume R10*, page PWR-1, Entry A0			
A9	DCP Command bit active when not expected during Compress	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
	(ECD-104)	*MIM Volume R10*, page MAP-1, Entry DC			
AA	DCP detected error or timeout during Compress	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,B1U2 B1U2
	(ECD-105)	*MIM Volume R10*, page MAP-1, Entry DC			
AC	DCP detected error in Motor Start Decompress	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
	(ECD-106)	*MIM Volume R10*, page MAP-1, Entry DC			
AD	DCP detected error during Crash Stop Recovery routine	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-107)	No further action — go to RMAP 340 on page REPAIR-13.			
AE	DCP Timeout during Crash Stop Recovery	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-108)	*MIM Volume R10*, page MAP-1, Entry DN			
B0	DCP detected error during a Seek of the Crash Stop Recovery	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
	(ECD-109)	*MIM Volume R10*, page MAP-1, Entry DC			
B1	DCP detected error after park prior to starting the motor	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
	(ECD-111)	*MIM Volume R10*, page MAP-1, Entry DC			
B2	Motor or Soft Start Thermal or Belt Guard switch open	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-112)	*MIM Volume R10*, page PWR-1, Entry F			
B3	No Air Pressure detected	B1E2,B1G2 *B1F2*	B1J2,B1G2 *B1H2*	B1P2,B1R2 *B1Q2*	B1T2,B1R2 *B1S2*
	(ECD-113)	*MIM Volume R10*, page PWR-1, Entry I			
B4 *	Motor switch off at beginning of Power On or during Idle	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-114)	*MIM Volume R10*, page PWR-1, Entry E			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 8 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks B5 through C0 (SC = 95B5 through 95C0)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
B5	AGC still active with motor off	B1E2,B1D2 *B1F2*	B1J2,B1K2 *B1H2*	B1P2,B1N2 *B1Q2*	B1T2,B1U2 *B1S2*
	(ECD-115)	*MIM Volume R10*, page PWR-1, Entry E			
B6	Drive motor slowing down during Idle	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-116)	*MIM Volume R10*, page PWR-1, Entry A0			
B7	DCP detected error or servo failure during Power On	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
	(ECD-117)	*MIM Volume R10*, page MAP-1, Entry DN			
B8	Brake test failed at beginning of the Power On	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-118)	*MIM Volume R10*, page PWR-1, Entry A0			
B9	Soft Start relay active when not expected	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-119)	*MIM Volume R10*, page PWR-1, Entry A0			
BA	Soft Start relay not active at beginning of Motor Start	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-120)	*MIM Volume R10*, page PWR-1, Entry A0			
BB	Soft Start relay active at beginning of Motor Start	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-121)	*MIM Volume R10*, page PWR-1, Entry A0			
BC	DCP detected external error after any Sequencer-to-DCP command	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-122)	No further action — go to RMAP 340 on page REPAIR-13.			
BD	DCP detected internal error after any Sequencer-to-DCP command	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-123)	No further action — go to RMAP 340 on page REPAIR-13.			
BE	DCP Hang after any Servo command	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-124)	No further action — go to RMAP 340 on page REPAIR-13.			
BF	DCP Command bit active when not expected during Decompress	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
	(ECD-125)	*MIM Volume R10*, page MAP-1, Entry DC			
C0	Servo Inhibit active during Data Check Recovery	B1E2,B1D2 B1F^,*C0B2* *C4P1*	B1J2,B1K2 B1H2,*C1B2* *C4P2*	B1P2,B1N2 B1Q2,*C2B2* *C4P3*	B1T2,B1U2 B1S2,*C3B2* *C4P4*
	(ECD-127)	No further action — go to RMAP 340 on page REPAIR-13.			

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 9 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks C1 through CA (SC = 95C1 through 95CA)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
C1	DCP IML failure	B1E2,B1D2 B1F2,*B1G2*	B1J2,B1K2 B1H2,*B1G2*	B1P2,B1N2 B1Q2,*B1R2*	B1T2,B1U2 B1S2,*B1R2*
	(ECD-128)	No further action — go to RMAP 340 on page REPAIR-13.			
C2	DCP BAT failure	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-129)	No further action — go to RMAP 340 on page REPAIR-13.			
C3	AGC not active 18 seconds after the motor was started	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
	(ECD-130)	No further action — go to RMAP 340 on page REPAIR-13.			
C4	DCP detected failure during the handling of Sweep commands	B1E2,B1D2 *C4P1,B1F2*	B1J2,B1K2 *C4P2,B1H2*	B1P2,B1N2 *C4P3,B1Q2*	B1T2,B1U2 *C4P4,B1S2*
	(ECD-131)	*MIM Volume R10*, page MAP-1, Entry DN			
C5	External timer from other device not running	B1J2,B1E2 *B1K2,B1D2*	B1E2,B1J2 *B1D2,B1K2*	B1T2,B1P2 *B1U2,B1N2*	B1P2,B1T2 *B1N2,B1U2*
	(ECD-132)	No further action — go to RMAP 340 on page REPAIR-13.			
C6	Motor Run relay not active after Soft Start relay dropped	B1G2,B1E2 B1J2	B1G2,B1J2 B1E2	B1R2,B1P2 B1T2	B1R2,B1T2 B1P2
	(ECD-133)	*MIM Volume R10*, page PWR-1, Entry A0			
C7	Sector Compare not found during Data Check Recovery	B1E2,B1D2 B1F2,*C0B2* *C4P1*	B1J2,B1K2 B1H2,*C1B2* *C4P2*	B1P2,B1N2 B1Q2,*C2B2* *C4P3*	B1T2,B1U2 B1S2,*C3B2* *C4P4*
	(ECD-134)	No further action — go to RMAP 340 on page REPAIR-13.			
C8	Offset command not saved prior to Data Check Recovery	B1E2,B1F2 B1D2	B1J2,B1H2 B1K2	B1P2,B1Q2 B1N2	B1T2,B1S2 B1U2
	(ECD-135)	No further action — go to RMAP 340 on page REPAIR-13.			
C9	Sector Compare stuck on during Data Check Recovery	B1E2,B1D2 B1F2,*C0B2* *C4P1*	B1J2,B1K2 B1H2,*C1B2* *C4P2*	B1P2,B1N2 B1Q2,*C2B2* *C4P3*	B1T2,B1U2 B1S2,*C3B2* *C4P4*
	(ECD-136)	No further action — go to RMAP 340 on page REPAIR-13.			
CA	DCP Busy detected during Data Check Recovery	B1E2,B1D2 B1F2,*C0B2* *C4P1*	B1J2,B1K2 B1H2,*C1B2* *C4P2*	B1P2,B1N2 B1Q2,*C2B2* *C4P3*	B1T2,B1U2 B1S2,*C3B2* *C4P4*
	(ECD-137)	No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 10 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks CB through D6 (SC = 95CB through 95D6)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
CB	RPS Lock inactive during Data Check Recovery	**B1E2,B1D2 B1F2,***C0B2* ***C4P1***	**B1J2,B1K2 B1H2,***C1B2* ***C4P2***	**B1P2,B1N2 B1Q2,***C2B2* ***C4P3***	**B1T2,B1U2 B1S2,***C3B2* ***C4P4***
	(ECD-138)	No further action — go to RMAP 340 on page REPAIR-13.			
CC	DCP detected Checksum error during DCP IML or DCP BAT	**B1E2,B1D2**	**B1J2,B1K2**	**B1P2,B1N2**	**B1T2,B1U2**
	(ECD-139)	No further action — go to RMAP 340 on page REPAIR-13.			
CD	Guard band detected at cylinder 0 during a minus cylinder Seek command	**B1E2,B1D2** ***C4P1***	**B1J2,B1K2** ***C4P2***	**B1P2,B1N2** ***C4P3***	**B1T2,B1U2** ***C4P4***
	(ECD-140)	*MIM Volume R10*, page MAP-1, Entry DN			
CE	Abnormal termination of Data Check Recovery	**B1E2,B1F2 B1D2**	**B1J2,B1H2 B1K2**	**B1P2,B1Q2 B1N2**	**B1T2,B1S2 B1U2**
	(ECD-141)	No further action — go to RMAP 340 on page REPAIR-13.			
CF	GBOD not found after a Seek to a minus cylinder	**B1E2,B1D2** ***C4P1***	**B1J2,B1K2** ***C4P2***	**B1P2,B1N2** ***C4P3***	**B1T2,B1U2** ***C4P4***
	(ECD-142)	*MIM Volume R10*, page MAP-1, Entry DN			
D1 *	Servo failure during Sweep or Heat Up routines of Power On	**B1E2,B1D2** ***C4P1,B1F2***	**B1J2,B1K2** ***C4P2,B1H2***	**B1P2,B1N2** ***C4P3,B1Q2***	**B1T2,B1U2** ***C4P4,B1S2***
	(ECD-143)	*MIM Volume R10*, page MAP-1, Entry DN			
D2	DCP timeout doing a compress during Motor Start	**B1E2,C4P1 B1D2**	**B1J2,C4P2 B1K2**	**B1P2,C4P3 B1N2**	**B1T2,C4P4 B1U2**
	(ECD-144)	*MIM Volume R10*, page MAP-1, Entry DC			
D3	DCP timeout failure during Sweep	**B1E2,B1D2** ***C4P1,B1F2***	**B1J2,B1K2** ***C4P2,B1H2***	**B1P2,B1N2** ***C4P3,B1Q2***	**B1T2,B1U2** ***C4P4,B1S2***
	(ECD-145)	*MIM Volume R10*, page MAP-1, Entry DN			
D4	Park failed before starting motor during Power On	**B1E2,C4P1 B1D2**	**B1J2,C4P2 B1K2**	**B1P2,C4P3 B1N2**	**B1T2,C4P4 B1U2**
	(ECD-146)	*MIM Volume R10*, page MAP-1, Entry DC			
D5	DCP detected error at the beginning of Motor Start	**B1E2,C4P1 B1D2**	**B1J2,C4P2 B1K2**	**B1P2,C4P3 B1N2**	**B1T2,C4P4 B1U2**
	(ECD-147)	*MIM Volume R10*, page MAP-1, Entry DC			
D6	Motor sensed off, but still turning at more than 3440 RPM	**B1E2,B1G2** ***B1F2,B1D2***	**B1J2,B1G2** ***B1H2,B1K2***	**B1P2,B1R2** ***B1Q2,B1N2***	**B1T2,B1R2** ***B1S2,B1U2***
	(ECD-149)	*MIM Volume R10*, page PWR-1, Entry H			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 11 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks D7 through F2 (SC = 95D7 through 95F2)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
D7	Unexpected Offset active during Data Check Recovery	**B1E2,B1D2 B1F2,***C0B2*	**B1J2,B1K2 B1H2,***C1B2*	**B1P2,B1N2 B1Q2,***C2B2*	**B1T2,B1U2 B1S2,***C3B2*
	(ECD-150)	No further action — go to RMAP 340 on page REPAIR-13.			
D8	Index Not Found during Data Check Recovery	**B1D2,B1E2** *C0B2*	**B1K2,B1J2** *C1B2*	**B1N2,B1P2** *C2B2*	**B1U2,B1T2** *C3B2*
	(ECD-151)	*MIM Volume R10*, page MAP-1, Entry DJ			
D9	Device Selected dropped during Data Check Recovery	**B1E2,B1D2 B1F2,***C0B2*	**B1J2,B1K2 B1H2,***C1B2*	**B1P2,B1N2 B1Q2,***C2B2*	**B1T2,B1U2 B1S2,***C3B2*
	(ECD-152)	No further action — go to RMAP 340 on page REPAIR-13.			
DA	DCP error detected during Data Check Recovery	**B1E2,B1D2 B1F2,***C0B2*	**B1J2,B1K2 B1H2,***C1B2*	**B1P2,B1N2 B1Q2,***C2B2*	**B1T2,B1U2 B1S2,***C3B2*
	(ECD-152)	No further action — go to RMAP 340 on page REPAIR-13.			
DB	Unexpected sector compare during Data Check Recovery	**B1E2,B1D2 B1F2,***C0B2*	**B1J2,B1K2 B1H2,***C1B2*	**B1P2,B1N2 B1Q2,***C2B2*	**B1T2,B1U2 B1S2,***C3B2*
	(ECD-153)	No further action — go to RMAP 340 on page REPAIR-13.			
DC	DCP Check detected during Data Check Recovery	**B1E2,B1D2 B1F2,***C0B2*	**B1J2,B1K2 B1H2,***C1B2*	**B1P2,B1N2 B1Q2,***C2B2*	**B1T2,B1U2 B1S2,***C3B2*
	(ECD-154)	No further action — go to RMAP 340 on page REPAIR-13.			
DD	Command gate missing during Data Check Recovery	**B1F2,B1E2 C0B2,B1D2**	**B1H2,B1J2 C1B2,B1K2**	**B1Q2,B1P2 C2B2,B1N2**	**B1S2,B1T2 C3B2,B1U2**
		Controller A1/A3: *A1Q2, A1U2, A1N2* Controller A2/A4: *A1H2, A1D2, A1J2*			
	(ECD-155)	*MIM Volume R10*, page MAP-1, Entry ED			
DF	DCP timeout failure during Crash Stop Recovery	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-156)	*MIM Volume R10*, page MAP-1, Entry DN			
F1	GBOD not detected after Park during Power Off	**B1E2,C4P1 B1D2**	**B1J2,C4P2 B1K2**	**B1P2,C4P3 B1N2**	**B1T2,C4P4 B1U2**
	(ECD-172)	*MIM Volume R10*, page MAP-1, Entry DC			
F2	Drive motor slowing down during sweep	**B1E2,B1D2** *B1G2*	**B1J2,B1K2** *B1G2*	**B1P2,B1N2** *B1R2*	**B1T2,B1U2** *B1R2*
	(ECD-173)	*MIM Volume R10*, page PWR-1, Entry E			

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 12 of 13). SC=95XX (XX= Format 1 Byte 15)

Checkpoint Log: Checks F3 through FC (SC = 95F3 through 95FC)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
F3	AGC signal stuck active, motor not turning during power-on reset (POR)	**B1D2,B1E2** *C0B2,C4P1*	**B1K2,B1J2** *C1B2,C4P2*	**B1N2,B1P2** *C2B2,C4P3*	**B1U2,B1T2** *C3B2,C4P4*
	(ECD-174)	*MIM Volume R10*, page MAP-1,Entry DJ			
F4	Motor slowing, AGC active, motor relay not picked during power-on reset (POR)	**B1E2,B1D2** *B1G2*	**B1J2,B1K2** *B1G2*	**B1P2,B1N2** *B1R2*	**B1T2,B1U2** *B1R2*
	(ECD-175)	*MIM Volume R10*, page PWR-1, Entry E			
F6	No Air Pressure detected during Idle	**B1E2,B1G2** *B1F2*	**B1J2,B1G2** *B1H2*	**B1P2,B1R2** *B1Q2*	**B1T2,B1R2** *B1S2*
	(ECD-177)	*MIM Volume R10*, page PWR-1, Entry I			
F8	Sector compare not detected during Sector Search	**B1E2,B1D2** *C4P1*	**B1J2,B1K2** *C4P2*	**B1P2,B1N2** *C4P3*	**B1T2,B1U2** *C4P4*
	(ECD-178)	*MIM Volume R10*, page MAP-1, Entry DN			
F9	RPS Failed To Lock detected during Load HAR command	**B1D2,B1E2** *C0B2,C4P1*	**B1K2,B1J2** *C1B2,C4P2*	**B1N2,B1P2** *C2B2,C4P3*	**B1U2,B1T2** *C3B2,C4P4*
	(ECD-179)	*MIM Volume R10*, page MAP-1, Entry DJ			
FC	Disable switch detected active during any Search command	**B1G2,B1E2** **B1F2**	**B1G2,B1J2** **B1H2**	**B1R2,B1P2** **B1Q2**	**B1R2,B1T2** **B1S2**
	(ECD-180)	*MIM Volume R10*, page MAP-1, Entry CE			

NOTE: For details about symptom code 95XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 7 (Part 13 of 13). SC=95XX (XX= Format 1 Byte 15)

SC=97XX (XX= Format 1 Byte 17)

Servo Control Check (SC = 9700 through 9754)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
00	There is no DCP error code in byte 17 (ECD-122)	B1E2,B1D2 B1F2,B1G2	B1J2,B1K2 B1H2,B1G2	B1P2,B1N2 B1Q2,B1R2	B1T2,B1U2 B1S2,B1R2
		No further action — go to RMAP 340 on page REPAIR-13.			
13	Motion command not accepted while busy (ECD-122)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
14	Disable Write Inhibit command received while not offset (ECD-122)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
20 *	Voice coil offset error too large (ECD-122)	B1E2,B1D2 C4P1,B1F2	B1J2,B1K2 C4P2,B1H2	B1P2,B1N2 C4P3,B1Q2	B1T2,B1U2 C4P4,B1S2
		MIM Volume R10, page MAP-1, Entry DC			
21 *	Voice coil voltage or current integrate error too large (ECD-122)	B1E2,B1D2 C4P1,B1F2	B1J2,B1K2 C4P2,B1H2	B1P2,B1N2 C4P3,B1Q2	B1T2,B1U2 C4P4,B1S2
		MIM Volume R10, page MAP-1, Entry DC			
23	Excessive average VCM current (ECD-122)	B1E2,B1D2 C4P1,B1F2	B1J2,B1K2 C4P2,B1H2	B1P2,B1N2 C4P3,B1Q2	B1T2,B1U2 C4P4,B1S2
		MIM Volume R10, page MAP-1, Entry DC			
51	Windage exceeds the allowable limit (ECD-122)	B1E2,B1D2 C4P1,B1F2	B1J2,B1K2 C4P2,B1H2	B1P2,B1N2 C4P3,B1Q2	B1T2,B1U2 C4P4,B1S2
		MIM Volume R10, page MAP-1, Entry DC			
52	PES exceeds the allowable limit during track following (ECD-122)	B1E2,B1D2 C4P1,B1F2	B1J2,B1K2 C4P2,B1H2	B1P2,B1N2 C4P3,B1Q2	B1T2,B1U2 C4P4,B1S2
		MIM Volume R10, page MAP-1, Entry DN			
53 *	AGC is not active (ECD-122)	B1D2,B1E2 B1G2,C0B2	B1K2,B1J2 B1G2,C1B2	B1N2,B1P2 B1R2,C2B2	B1U2,B1T2 B1R2,C3B2
		MIM Volume R10, page MAP-1, Entry DJ			
54	Locate command received when not track following or offset (ECD-122)	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 97XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 8 (Part 1 of 3). SC=97XX (XX= Format 1 Byte 17)

Servo Control Check (SC = 9755 through 9783)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
55	Offset command received when not track following or offset *(ECD-122)*	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
56	Locate command outside the minimum or maximum cylinder *(ECD-122)*	B1E2,B1D2	B1J2,B1K2	B1P2,B1N2	B1T2,B1U2
		No further action — go to RMAP 340 on page REPAIR-13.			
57	AGC gain correction voltage reaches the limit *(ECD-122)*	B1E2,B1D2 *C4P1*	B1J2,B1K2 *C4P2*	B1P2,B1N2 *C4P3*	B1T2,B1U2 *C4P4*
		MIM Volume R10, page MAP-1, Entry DN			
58	Excessive position estimator error *(ECD-122)*	B1D2,B1E2 C4P1	B1K2,B1J2 C4P2	B1N2,B1P2 C4P3	B1U2,B1T2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
59	Timeout during Locate, Offset, Sweep or Rezero *(ECD-122)*	B1D2,B1E2 C4P1	B1K2,B1J2 C4P2	B1N2,B1P2 C4P3	B1U2,B1T2 C4P4
		MIM Volume R10, page MAP-1, Entry DN			
5A	Unable to locate guard band during Rezero *(ECD-122)*	B1D2,B1E2 *C4P1,B1F2*	B1K2,B1J2 *C4P2,B1H2*	B1N2,B1P2 *C4P3,B1Q2*	B1U2,B1T2 *C4P4,B1S2*
		MIM Volume R10, page MAP-1, Entry DN			
5B	PES P has too much offset *(ECD-122)*	B1D2,B1E2 *C0B2*	B1K2,B1J2 *C1B2*	B1N2,B1P2 *C2B2*	B1U2,B1T2 *C3B2*
		MIM Volume R10, page MAP-1, Entry DJ			
5C	PES Q has too much offset *(ECD-122)*	B1D2,B1E2 *C0B2*	B1K2,B1J2 *C1B2*	B1N2,B1P2 *C2B2*	B1U2,B1T2 *C3B2*
		MIM Volume R10, page MAP-1, Entry DJ			
5D *	Incorrect device type *(ECD-122)*	B1E2,B1F2 B1D2	B1J2,B1H2 B1K2	B1P2,B1Q2 B1N2	B1T2,B1S2 B1U2
		MIM Volume R10, page MAP-1, Entry DI			
5E *	Unable to move away from GBOD *(ECD-122)*	B1E2,C4P1 B1D2	B1J2,C4P2 B1K2	B1P2,C4P3 B1N2	B1T2,C4P4 B1U2
		MIM Volume R10, page MAP-1, Entry DC			
81	IML fails checksum *(ECD-122)*	B1E2,B1D2 *B1F2,B1G2*	B1J2,B1K2 *B1H2,B1G2*	B1P2,B1N2 *B1Q2,B1R2*	B1T2,B1U2 *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
83	Instruction storage parity error *(ECD-122)*	B1E2,B1D2 *B1F2,B1G2*	B1J2,B1K2 *B1H2,B1G2*	B1P2,B1N2 *B1Q2,B1R2*	B1T2,B1U2 *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 97XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 8 (Part 2 of 3). SC=97XX (XX= Format 1 Byte 17)

Servo Control Check (SC = 9784 through 97FF)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
84	Data storage parity error (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
85	Data bus parity error (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
86	Time interval between interrupts is too short (ECD-122)	**B1D2,B1E2** *B1F2,B1G2*	**B1K2,B1J2** *B1H2,B1G2*	**B1N2,B1P2** *B1Q2,B1R2*	**B1U2,B1T2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
87	Illegal command (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
88 *	Time interval between interrupts is too long (ECD-122)	**B1E2,B1D2** **B1G2**,*C0B2* *B1F2*	**B1J2,B1K2** **B1G2**,*C1B2* *B1H2*	**B1P2,B1N2** **B1R2**,*C2B2* *B1Q2*	**B1T2,B1U2** **B1R2**,*C3B2* *B1S2*
		MIM Volume R10, page MAP-1, Entry DJ			
FC	Multiply failure in Basic Assurance Test (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
FD	Compute failure in Basic Assurance Test (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
FE	Checksum failure in Basic Assurance Test (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			
FF	Power-on reset (POR) code hung (ECD-122)	**B1E2,B1D2** *B1F2,B1G2*	**B1J2,B1K2** *B1H2,B1G2*	**B1P2,B1N2** *B1Q2,B1R2*	**B1T2,B1U2** *B1S2,B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 97XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 8 (Part 3 of 3). SC=97XX (XX= Format 1 Byte 17)

SC=98XX (XX= Format 9 Byte 18)

Read/Write Channel Checks (SC = 98XX)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
4C *	Transition check	A1Q2,A1N2 *A1V2,A1W2*	A1H2,A1J2 *A1C2,A1B2*	C0B2,B1F2 *B1D2,C1B2*	C1B2,B1H2 *B1K2,C0B2*	C2B2,B1Q2 *B1N2,C3B2*	C3B2,B1S2 *B1U2,C2B2*
	(ECD-399)	See *MIM Volume R10*, page MAP-1, Entry EA					
4E *	Transition check	A1Q2,A1N2 *A1V2,A1W2*	A1H2,A1J2 *A1C2,A1B2*	C0B2,B1F2 *B1D2,C1B2*	C1B2,B1H2 *B1K2,C0B2*	C2B2,B1Q2 *B1N2,C3B2*	C3B2,B1S2 *B1U2,C2B2*
	(ECD-399)	See *MIM Volume R10*, page MAP-1, Entry EA					
XX *	Read/Write Channel check			C0B2,B1F2	C1B2,B1H2	C2B2,B1Q2	C3B2,B1S2
	(ECD-376)	See *MIM Volume R10*, page MAP-1, Entry EA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 98XX, see page ECD-376 in the *ECM, Volume R40*.

Figure 9. SC=98XX (XX= Format 9 Byte 18)

SC=9CXX (XX= Format 1 Bytes 11-15)

DDC Hot Bits (SC = 9CXX)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
XX *	Bits always on, Format 1 or 9 sense assembly selection	A1U2,A1V2 A1T2	A1D2,A1C2 A1E2	B1F2,B1G2	B1H2,B1G2	B1Q2,B1R2	B1S2,B1R2
	(ECD-1)	See *MIM Volume R10*, page MAP-1, Entry CD					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 9CXX, see page ECD-1 in the *ECM, Volume R40*.

Figure 10. SC=9CXX (XX= Format 1 Bytes 11-15)

SC=9DXX (XX= Format 1 Byte 15)

Checkpoint Log (SC = 9DXX)

XX=	Description	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
XX *	Seek incomplete Use FRUs for symptom code 95XX with the same value of XX. If the value XX is not listed for symptom code 95XX, use the FRUs shown here. *(ECD-11)*	**B1E2,B1D2** **B1F2**,*C4P1* *B1G2*	**B1J2,B1K2** **B1H2**,*C4P2* *B1G2*	**B1P2,B1N2** **B1Q2**,*C4P3* *B1R2*	**B1T2,B1U2** **B1S2**,*C4P4* *B1R2*
		MIM Volume R10, page MAP-1, Entry DN			

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 9DXX, see page ECD-11 in the *ECM, Volume R40*.

Figure 11. SC=9DXX (XX= Format 1 Byte 15)

SC=9E10 (Format 1)

	Description	Front Device Left	Front Device Right	Rear Device Left	Rear Device Right
9E10	False end of track detected by system program. Warning: Data loss has occurred or may occur. Replace HDA and all FRUs listed.	C0B2 A1F2 HDA	C1B2 A1H2 HDA	C2B2 A1Q2 HDA	C3B2 A1S2 HDA

Figure 12. SC=9E10 (Format 1)

SC=9FXX (XX= Format 1 or 9 Byte 07)

Format and Message (SC = 9F10 through 9F97)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
10	Intervention Required or Device End op with no device checks *(ECD-3)*			**B1F2,B1E2 B1D2**	**B1H2,B1J2 B1K2**	**B1Q2,B1P2 B1N2**	**B1S2,B1T2 B1U2**
		No further action — go to RMAP 340 on page REPAIR-13.					
11	Device Status 1 not as expected *(ECD-3)*			**B1F2,B1E2 B1D2,***B1G2*	**B1H2,B1J2 B1K2,***B1G2*	**B1Q2,B1P2 B1N2,***B1R2*	**B1S2,B1T2 B1U2,***B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.					
13	Index missing *(ECD-5)*			**B1E2,B1D2 C0B2**	**B1J2,B1K2 C1B2**	**B1P2,B1N2 C2B2**	**B1T2,B1U2 C3B2**
		See *MIM Volume R10*, page MAP-1, Entry DJ					
14 *	Interrupt cannot be reset *(ECD-6)*	*A1U2,A1T2*	*A1D2,A1E2*	**B1F2,***B1E2*	**B1H2,***B1J2*	**B1Q2,***B1P2*	**B1S2,***B1T2*
		No further action — go to RMAP 340 on page REPAIR-13.					
15 *	Device does not respond to selection *(ECD-6)*	*A1U2,A1T2 A1N2,A1V2 A1S2*	*A1D2,A1E2 A1J2,A1C2 A1F2*	**B1F2,B1G2 B1E2,B1D2**	**B1H2,B1G2 B1J2,B1K2**	**B1Q2,B1R2 B1P2,B1N2**	**B1S2,B1R2 B1T2,B1U2**
		See *MIM Volume R10*, page MAP-1, Entry CD					
16	Device Check 2 or Set Sector Incomplete *(ECD-7)*			**B1G2,B1E2 B1D2,***B1F2*	**B1G2,B1J2 B1K2,***B1H2*	**B1R2,B1P2 B1N2,***B1Q2*	**B1R2,B1T2 B1U2,***B1S2*
		No further action — go to RMAP 340 on page REPAIR-13.					
18	Device Status 1 has an invalid combination of bits *(ECD-8)*			**B1F2,B1E2 B1D2,***B1G2*	**B1H2,B1J2 B1K2,***B1G2*	**B1Q2,B1P2 B1N2,***B1R2*	**B1S2,B1T2 B1U2,***B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.					
19	Device not ready to do customer work *(ECD-9)*			**B1F2,B1E2 B1D2,***B1G2*	**B1H2,B1J2 B1K2,***B1G2*	**B1Q2,B1P2 B1N2,***B1R2*	**B1S2,B1T2 B1U2,***B1R2*
		No further action — go to RMAP 340 on page REPAIR-13.					
1B *	Missing device address bit at selection *(ECD-10)*	**A1U2,A1T2 A1V2**	**A1D2,A1E2 A1C2**	**B1F2,***B1E2 B1D2,B1G2*	**B1H2,***B1J2 B1K2,B1G2*	**B1Q2,***B1P2 B1N2,B1R2*	**B1S2,***B1T2 B1U2,B1R2*
		See *MIM Volume R10*, page MAP-1, Entry CD					
1C *	Drive Motor switch sensed off while running *(ECD-11)*			**B1E2,B1G2 B1F2**	**B1J2,B1G2 B1H2**	**B1P2,B1R2 B1Q2**	**B1T2,B1R2 B1S2**
		See *MIM Volume R10*, page PWR-1, Entry AC					
1F	Offset Active cannot be reset *(ECD-12)*			**B1D2,B1E2**	**B1K2,B1J2**	**B1N2,B1P2**	**B1U2,B1T2**
		See *MIM Volume R10*, page MAP-1, Entry DJ					
97	Head address miscompare *(ECD-362)*			**C0B2,B1F2 B1E2**	**C1B2,B1H2 B1J2**	**C2B2,B1Q2 B1P2**	**C3B2,B1S2 B1T2**
		See *MIM Volume R10*, page MAP-1, Entry EA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code 9FXX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 13 (Part 1 of 2). SC=9FXX (XX= Format 1 or 9 Byte 07)

Format and Message (SC = 9F9A through 9F9E)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
9A	Track physical address miscompare while oriented *(ECD-363)*			C0B2,B1E2 B1F2	C1B2,B1J2 B1H2	C2B2,B1P2 B1Q2	C3B2,B1T2 B1S2
		See *MIM Volume R10*, page MAP-1, Entry EA					
9E	Cylinder address miscompare *(ECD-364)*			B1D2,B1E2 C4P1	B1K2,B1J2 C4P2	B1N2,B1P2 C4P3	B1U2,B1T2 C4P4
		See *MIM Volume R10*, page MAP-1, Entry DJ					

NOTE: For details about symptom code 9FXX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 13 (Part 2 of 2). SC=9FXX (XX= Format 1 or 9 Byte 07)

SC=9FXX (Format 1 and 9)

Device Undervoltage (SC = 9FFF)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
9F	Non-repeatable runout						
		See SMAP 0058: Determining the Failing FRUs on page START-34.					
FF	Device undervoltage *(ECD-182)*			B1D2,B1F2	B1K2,B1H2	B1N2,B1Q2	B1U2,B1S2
		See *MIM Volume R10*, page PWR-1, Entry P					

NOTE: For details about symptom code 9FFF, see page ECD-182 in the *ECM, Volume R40*.

Figure 14. SC=9FXX (Format 1 and 9)

SC=D1XX (XX= Format 7 Byte 11)

Connection Check Alert and Power Status (SC = D1XX)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
41 *	Controller String 1: Connection check alert and power on	**A1W2,A1N2 A1V2,A1R2** *A1Q2,A1U2 A1S2,A1T2*	**A1B2,A1J2 A1C2,A1G2** *A1H2,A1D2 A1F2,A1E2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
51 *	Controller String 1: Connection check alert with DPS 1 unconditional reserve release and power on	**A1S2,A1F2**	**A1F2,A1S2**				
		No further action — go to RMAP 340 on page REPAIR-13.					
82 *	Controller String 0: Connection check alert and power on	**A1W2,A1N2 A1V2,A1R2** *A1Q2,A1U2 A1T2*	**A1B2,A1J2 A1C2,A1G2** *A1H2,A1D2 A1E2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
A2 *	Controller String 0: Connection check alert with DPS 0 unconditional reserve release and power on	**A1S2,A1F2**	**A1F2,A1S2**				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

Figure 15. SC=D1XX (XX= Format 7 Byte 11)

SC=D2XX (XX= Format 7 Byte 12)

Controller String 0 Check-1 Status 1 (SC = D2XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0-2 *	I/O Control 1 Checks Bits 0-2 Equal:						
	001 * IOC ROS Bit Parity Check (ECD-210)	A1R2,A1V2 *A1W2*	A1G2,A1C2 *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	010 * IOC Transfer Clock Check (ECD-211)	A1V2,*A1W2*	A1C2,*A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	011 * IOC Detected DDC Bus Out Parity Check (ECD-213)	A1W2,A1V2	A1B2,A1C2				
		See *MIM Volume R10* Page MAP-1, Entry AA					
	100 * IOC Register Data Bus Parity Check (ECD-214)	A1V2,A1R2 *A1W2*	A1C2,A1G2 *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	101 * IOC Register 1 Parity Check (ECD-215)	A1V2,*A1W2*	A1C2,*A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	110 * IOC Register 3 Parity Check (ECD-217)	A1V2,A1U2 A1T2	A1C2,A1D2 A1E2				
		No further action — go to RMAP 340 on page REPAIR-13.					
	111 * IOC Controller Selection Check (ECD-218)	A1V2,A1W2 *A1Q2*	A1C2,A1B2 *A1H2*				
		See *MIM Volume R10* Page MAP-1, Entry AA					
3 *	DDC Bus Out Parity Check (ECD-220)	A1W2	A1B2				
		See *MIM Volume R10* Page MAP-1, Entry AA					
4 *	Controller Clock Check (ECD-221)	A1N2,A1Q2 *A1W2*	A1J2,A1H2 *A1B2*				
		See *MIM Volume R10* Page MAP-1, Entry BA					
5 *	Controller Sequencer Check (ECD-222)	A1R2,A1V2 *A1N2*	A1G2,A1C2 *A1J2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
6 *	DDC Bus In parity check (ECD-223)	A1V2,A1W2	A1C2,A1B2				
		No further action — go to RMAP 340 on page REPAIR-13.					
7 *	IOC Card Check-1 check (ECD-225)	A1V2,A1R2 *A1W2*	A1C2,A1G2 *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D2XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 16. SC=D2XX (XX= Format 7 Byte 12)

SC=D3XX (XX= Format 7 Byte 13)

Controller String 0 Check-1 Status 2 (SC = D3XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	DDC Tag Out sequence check	**A1W2,A1V2** *A1N2*	**A1B2,A1C2** *A1J2*				
	(ECD-226)	See *MIM Volume R10*, page MAP-1, Entry AA					
1 *	Extended Command, Tag sequence check	**A1W2,***A1V2* *A1R2*	**A1B2,***A1C2* *A1G2*				
	(ECD-228)	See *MIM Volume R10*, page MAP-1, Entry AA					
3 *	Controller Gate DDC Drivers check	**A1W2,A1N2** *A1V2*	**A1B2,A1J2** *A1C2*				
	(ECD-230)	See *MIM Volume R10*, page MAP-1, Entry AA					
4 *	RCC Sequence check	**A1W2,***A1R2*	**A1B2,***A1G2*				
	(ECD-231)	See *MIM Volume R10*, page MAP-1, Entry AA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D3XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 17. SC=D3XX (XX= Format 7 Byte 13)

SC=D4XX (XX= Format 7 Byte 14)

Controller String 1 Check-1 Status 1 (SC = D4XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0-2 *	I/O Control 1 Checks Bits 0-2 Equal:						
	001 * IOC ROS Bit parity check (ECD-210)	A1R2,A1V2 *A1W2*	A1G2,A1C2 *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	010 * IOC Transfer Clock check (ECD-211)	A1V2,*A1W2*	A1C2,*A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	011 * IOC Detected DDC Bus Out parity check (ECD-213)	A1W2,A1V2	A1B2,A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
	100 * IOC Register Data Bus parity check (ECD-214)	A1V2,A1R2 *A1W2*	A1C2,A1G2 *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	101 * IOC Register 1 parity check (ECD-215)	A1V2,*A1W2*	A1C2,*A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
	110 * IOC Register 3 parity check (ECD-217)	A1V2,A1U2 A1T2	A1C2,A1D2 A1E2				
		No further action — go to RMAP 340 on page REPAIR-13.					
	111 * IOC Controller Selection check (ECD-218)	A1V2,A1W2 *A1Q2*	A1C2,A1B2 *A1H2*				
		See *MIM Volume R10*, page MAP-1, Entry AA					
3 *	DDC Bus Out parity check (ECD-220)	A1W2	A1B2				
		See *MIM Volume R10*, page MAP-1, Entry AA					
4 *	Controller Clock check (ECD-221)	A1N2,A1Q2 *A1W2*	A1J2,A1H2 *A1B2*				
		See *MIM Volume R10*, page MAP-1, Entry BA					
5 *	Controller Sequencer check (ECD-222)	A1R2,A1V2 *A1N2*	A1G2,A1C2 *A1J2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
6 *	DDC Bus In parity check (ECD-223)	A1V2,A1W2	A1C2,A1B2				
		No further action — go to RMAP 340 on page REPAIR-13.					
7 *	IOC Card Check-1 check (ECD-225)	A1V2,A1R2 *A1W2*	A1C2,A1G2 *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D4XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 18. SC=D4XX (XX= Format 7 Byte 14)

SC=D5XX (XX= Format 7 Byte 15)

Controller String 1 Check-1 Status 2 (SC = D5XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	DDC Tag Out sequence check	A1W2,A1V2 *A1N2*	A1B2,A1C2 *A1J2*				
	(ECD-226)	See *MIM Volume R10*, page MAP-1, Entry AA					
1 *	Extended Command, Tag sequence check	A1W2,*A1V2* *A1R2*	A1B2,*A1C2*				
	(ECD-228)	See *MIM Volume R10*, page MAP-1, Entry AA					
3 *	Controller Gate DDC Drivers check	A1W2,A1N2 *A1V2*	A1B2,A1J2 *A1C2*				
	(ECD-230)	See *MIM Volume R10*, page MAP-1, Entry AA					
4 *	RCC sequence check	A1W2,*A1R2*	A1B2,*A1G2*				
	(ECD-231)	See *MIM Volume R10*, page MAP-1, Entry AA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D5XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 19. SC=D5XX (XX= Format 7 Byte 15)

SC=D6XX (XX= Format 7 Byte 16)

Controller Sequencer Detected Check-1 Errors—String 0 (SC = D602 through D636)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
02 *	Sequencer and/or IOC register failure *(ECD-233)*	A1V2,A1R2	A1C2,A1G2				
		No further action — go to RMAP 340 on page REPAIR-13.					
04 *	Sequencer counter failed *(ECD-234)*	A1R2	A1G2				
		No further action — go to RMAP 340 on page REPAIR-13.					
10 *	Controller command active With a DPS command on DDC Bus Out *(ECD-235)*	A1V2,A1W2 *A1U2,A1T2*	A1C2,A1B2 *A1D2,A1E2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
12 *	Controller command, DPS command, or Selected stuck active *(ECD-237)*	A1V2,A1S2 *A1F2,A1W2*	A1C2,A1F2 *A1S2,A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
18 *	Timeout routine: Allow Selection off and Device Selected on *(ECD-240)*	A1V2	A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
1A *	Controller timeout: DDC Tag Out = 01, CDP/DPS Tag In = 01 *(ECD-242)*	A1U2,A1T2 A1V2,*A1W2*	A1D2,A1E2 A1C2,*A1B2*	B1F2,B1G2	B1H2,B1G2	B1Q2,B1R2	B1S2,B1R2
		See *MIM Volume R10*, page MAP-1, Entry CD					
20 *	Controller command active without DDC Tag Out being in a command gate state *(ECD-243)*	A1V2	A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
22 *	DPS command active with a non-DPS command on the DDC Bus Out lines *(ECD-244)*	A1V2,A1S2 *A1F2,A1W2*	A1C2,A1F2 *A1S2,A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
32 *	Reset allegiance, Start conditions not correct *(ECD-246)*	A1V2,A1U2 A1T2	A1C2,A1D2 A1E2				
		No further action — go to RMAP 340 on page REPAIR-13.					
34 *	Reset allegiance, invalid device address received from storage control *(ECD-247)*	A1V2,A1W2	A1C2,A1B2				
		No further action — go to RMAP 340 on page REPAIR-13.					
36 *	Timeout or Sense Fault log, DDC Tag Out lines in invalid state *(ECD-249)*	A1W2,A1V2	A1B2,A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D6XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 20 (Part 1 of 2). SC=D6XX (XX= Format 7 Byte 16)

Controller Sequencer Detected Check-1 Errors—String 0 (SC = D670 through D6CE)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
70	Invalid Tag State on the DDC Tag Out lines *(ECD-250)*	A1W2,A1V2	A1B2,A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
72 *	Internal '1D' register failure	A1W2,A1R2 *A1V2*	A1B2,A1G2 *A1C2*				
	(ECD-251)	No further action — go to RMAP 340 on page REPAIR-13.					
74 *	Invalid command on the DDC Bus Out lines	A1W2,A1R2 *A1V2*	A1B2,A1G2 *A1C2*				
	(ECD-252)	No further action — go to RMAP 340 on page REPAIR-13.					
CE *	During device power on, controller failed to take control *(ECD-256)*	A1V2,A1R2	A1C2,A1G2				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D6XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 20 (Part 2 of 2). SC=D6XX (XX= Format 7 Byte 16)

SC=D8XX (XX= Format 7 Byte 18)

Controller Sequencer Detected Check-1 Errors—String 1 (SC = D802 through D870)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
02 *	Sequencer and/or IOC register failed *(ECD-233)*	A1V2,A1R2	A1C2,A1G2				
		No further action — go to RMAP 340 on page REPAIR-13.					
04 *	Sequencer counter failed *(ECD-234)*	A1R2	A1G2				
		No further action — go to RMAP 340 on page REPAIR-13.					
10 *	Controller command active with a DPS command on DDC Bus Out *(ECD-235)*	A1V2,A1W2 *A1U2,A1T2*	A1C2,A1B2 *A1D2,A1E2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
12 *	Controller command, DPS command, or selected stuck active *(ECD-237)*	A1V2,A1S2 *A1F2,A1W2*	A1C2,A1F2 *A1S2,A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
18 *	Timeout routine, Allow Selection off Device Selected on *(ECD-240)*	A1V2	A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
1A *	Controller timeout: DDC Tag Out = 011 CDP/DPS Tag In = 01 *(ECD-242)*	A1U2,A1T2 A1V2,*A1W2*	A1D2,A1E2 A1C2,*A1B2*	B1F2,B1G2	B1H2,B1G2	B1Q2,B1R2	B1S2,B1R2
		See *MIM Volume R10*, page MAP-1, Entry CD					
20 *	Controller command active without DDC Tag Out in a command gate state *(ECD-243)*	A1V2	A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
22 *	DPS command active with a non-DPS command on the DDC Bus Out lines *(ECD-244)*	A1V2,A1S2 *A1F2,A1W2*	A1C2,A1F2 *A1S2,A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
32 *	Reset allegiance, Start conditions not correct *(ECD-246)*	A1V2,A1U2 A1T2	A1C2,A1D2 A1E2				
		No further action — go to RMAP 340 on page REPAIR-13.					
34 *	Reset allegiance, invalid device address received from storage control *(ECD-247)*	A1V2,A1W2	A1C2,A1B2				
		No further action — go to RMAP 340 on page REPAIR-13.					
36 *	Timeout or Sense Fault log, DDC Tag Out lines in invalid state *(ECD-249)*	A1W2,A1V2	A1B2,A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D8XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 21 (Part 1 of 2). SC=D8XX (XX= Format 7 Byte 18)

Controller Sequencer Detected Check-1 Errors—String 1 (SC = D872 through D8CE)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
70	Invalid Tag State on the DDC Tag Out lines *(ECD-250)*	A1W2,A1V2	A1B2,A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
72 *	Internal '1D' register failure *(ECD-251)*	A1W2,A1R2 *A1V2*	A1B2,A1G2 *A1C2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
74 *	Invalid command on the DDC Bus Out lines *(ECD-252)*	A1W2,A1R2 *A1V2*	A1B2,A1G2 *A1C2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
CE	During device power on, controller failed to take control *(ECD-256)*	A1V2,A1R2	A1C2,A1G2				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code D8XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 21 (Part 2 of 2). SC=D8XX (XX= Format 7 Byte 18)

SC=DEXX (XX = Format 7 Byte 11)

Controller Check Alert and Power Status (SC = DE2X)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
2X	Storage director detected that both RCC sequences were not successful *(ECD-189)*	A1W2,A1R2	A1B2,A1G2				
		See *MIM Volume R10*, page MAP-1, Entry AA					

NOTE: For details about symptom code DE2X, see page ECD-189 in the *ECM, Volume R40*.

Figure 22. SC=DEXX (X= Format 7 Byte 11 Bits 4 & 5)

SC=DFXY (X= Format 7 Byte 10 Bits 0-3, Y= Byte 7 Bits 4-7)

Format 7 Message (SC = DF10 through DFX4)

XY=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
10 *	Storage control detected DDC Bus In parity check	A1W2,A1V2 *A1N2,A1U2 A1T2*	A1B2,A1C2 *A1J2,A1D2 A1E2*	*B1F2*	*B1H2*	*B1Q2*	*B1S2*
	(ECD-205)	See *MIM Volume R10*, page MAP-1, Entry AB					
20 *	Storage control detected DDC Sync In check	A1W2,A1V2 A1N2	A1B2,A1C2 A1J2				
	(ECD-204)	See *MIM Volume R10*, page MAP-1, Entry AB					
40 *	DDC Tag In check	A1W2,A1V2 A1S2,*A1U2 A1T2,A1N2 A1F2,A1R2*	A1B2,A1C2 A1F2,*A1D2 A1E2,A1J2 A1S2,A1G2*	*B1F2*	*B1H2*	*B1Q2*	*B1S2*
	(ECD-203)	See *MIM Volume R10*, page MAP-1, Entry AB					
80	Connection check alert is on solid *(ECD-202)*	A1W2	A1B2				
		See *MIM Volume R10*, page MAP-1, Entry AB					
X1	RCC 1 sequence not successful *(ECD-188)*	A1W2	A1B2				
		See *MIM Volume R10*, page MAP-1, Entry AA					
X2	RCC 1 And RCC 2 sequences not successful *(ECD-189)*	A1W2,A1R2	A1B2,A1G2				
		See *MIM Volume R10*, page MAP-1, Entry AA					
43 *	Storage control detected DDC Tag-In check	A1W2,A1V2 A1S2,*A1U2 A1T2,A1F2 A1N2,A1J2 A1R2*	A1B2,A1C2 A1F2,*A1D2 A1E2,A1S2 A1J2,A1N2 A1G2*	*B1F2*	*B1H2*	*B1Q2*	*B1S2*
		See *MIM Volume R10*, page MAP-1, Entry AB					
X3 *	Invalid Tag In during selection sequence	A1V2,A1W2 A1S2,*A1U2 A1T2,A1N2 A1F2*	A1C2,A1B2 A1F2,*A1D2 A1E2,A1J2 A1S2*				
	(ECD-190)	See *MIM Volume R10*, page MAP-1, Entry AA					
X4	Storage control detected a Check-1 check during an RCC sequence *(ECD-191)*	A1W2	A1B2				
		See *MIM Volume R10*, page MAP-1, Entry AA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code DFXY, see page ECD-nnn in the *ECM, Volume R40*.

Figure 23 (Part 1 of 2). SC=DFXY (X= Format 7 Byte 10 Bits 0-3, Y= Byte 7 Bits 4-7)

Format 7 Message (SC = DFX5 through DFXD)

XY=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
X5 *	Invalid DDC selection response, timeout waiting for a response, or controller power missing *(ECD-192)*	**A1N2,A1V2 A1W2,A1R2** *A1Q2,A1U2 A1T2,A1S2*	**A1J2,A1C2 A1B2,A1G2** *A1H2,A1D2 A1E2,A1F2*				
		See *MIM Volume R10*, page PWR-1, Entry AA					
X6 *	Missing End Op, transfer was complete *(ECD-193)*	**A1W2,A1U2 A1T2,**_A1N2_ *A1S2*	**A1B2,A1D2 A1E2,**_A1J2_ **A1F2**				
		No further action — go to RMAP 340 on page REPAIR-13.					
X7 *	Missing End Op, transfer Was incomplete *(ECD-195)*	**A1U2,A1T2 A1W2,**_A1N2_ *A1S2*	**A1D2,A1E2 A1B2,**_A1J2_ *A1F2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
X8 *	Invalid Tag In for an immediate command sequence *(ECD-196)*	**A1S2,A1V2 A1U2,A1T2** *A1W2,A1N2 A1S2,A1Q2*	**A1F2,A1C2 A1D2,A1E2** *A1B2,A1J2 A1F2,A1H2*				
		See *MIM Volume R10*, page MAP-1, Entry AA					
X9 *	Invalid Tag In for an extended command sequence *(ECD-197)*	**A1U2,A1T2** *A1V2*	**A1D2,A1E2** *A1C2*	**B1F2**	**B1H2**	**B1Q2**	**B1S2**
		No further action — go to RMAP 340 on page REPAIR-13.					
XA *	Storage control microcode timed out on deselection *(ECD-198)*	**A1S2,A1V2** *A1W2*	**A1F2,A1C2** *A1B2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
XB *	No selection response after poll interrupt *(ECD-199)*	**A1W2,A1U2 A1S2,**_A1N2_ *A1Q2*	**A1B2,A1D2 A1F2,**_A1J2_ *A1H2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
XC *	Permanent path error *(ECD-200)*	**A1W2**	**A1B2**				
		See *MIM Volume R10*, page MAP-1, Entry AA					
XD *	Controller not available on disconnected command chain *(ECD-201)*	This is a status code. No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code DFXY, see page ECD-nnn in the *ECM, Volume R40*.

Figure 23 (Part 2 of 2). SC=DFXY (X= Format 7 Byte 10 Bits 0-3, Y= Byte 7 Bits 4-7)

SC=DFXX (Format 7)

Format 7 Message (SC = DFFF)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
FF	Controller undervoltage *(ECD-323)*	A1Q2,A1R2	A1H2,A1G2				
		See *MIM Volume R10*, page PWR-1, Entry 0					

NOTE: For details about symptom code DFFF, see page ECD-323 in the *ECM, Volume R40*.

Figure 24. SC=9FXX (Format 7)

SC=E0XX (XX= Format 8 Byte 10)

DTI/XES Register (SC = E0XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
1 *	Tag In check	A1W2,A1V2 A1S2,*A1U2* *A1T2,A1F2* *A1N2,A1R2* *A1J2*	A1B2,A1C2 A1D2,*A1D2* *A1E2,A1S2* *A1J2,A1G2* *A1N2*	*B1F2*	*B1H2*	*B1Q2*	*B1S2*
	(ECD-203)	See *MIM Volume R10*, page MAP-1, Entry AB					
2 *	Sync In check	A1W2,A1V2 *A1N2*	A1B2,A1C2 *A1J2*				
	(ECD-204)	See *MIM Volume R10*, page MAP-1, Entry AB					
3 *	DDC Bus In parity check	A1W2,A1V2 *A1N2,A1U2* *A1T2*	A1B2,A1C2 *A1J2,A1D2* *A1E2*	*B1F2*	*B1H2*	*B1Q2*	*B1S2*
	(ECD-205)	See *MIM Volume R10*, page MAP-1, Entry AB					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

Figure 25. SC=E0XX (XX= Format 8 Byte 10)

SC=E1XX (XX= Format 8 Byte 11)

Controller Fault Log A (SC= E1XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	DHPLO Delta Frequency check	A1Q2,*A1W2* *A1V2,A1N2*	A1H2,*A1B2* *A1C2,A1J2*	C0B2,B1D2 B1F2,*B1K2*	C1B2,B1K2 B1H2,*B1D2*	C2B2,B1N2 B1Q2,*B1U2*	C3B2,B1U2 B1S2,*B1N2*
	(ECD-315)	See *MIM Volume R10*, page MAP-1, Entry DF					
1 *	DHPLO Non-Drive check	A1Q2,A1N2 A1V2	A1H2,A1J2 A1C2	B1D2,*B1F2* *B1K2*	B1K2,*B1H2* *B1D2*	B1N2,*B1Q2* *B1U2*	B1U2,*B1S2* *B1N2*
	(ECD-316)	See *MIM Volume R10*, page MAP-1, Entry DF					
2 *	Read/Write Data Cable check	A1Q2,*A1N2*	A1H2,*A1J2*	C0B2,C1B2 *B1F2*	C1B2,C0B2 *B1H2*	C2B2,C3B2 *B1Q2*	C3B2,C2B2 *B1S2*
	(ECD-318)	See *MIM Volume R10*, page MAP-1, Entry EC					
3	Data Valid check	A1Q2,*A1V2* *A1N2*	A1H2,*A1C2* *A1J2*	C0B2,B1F2	C1B2,B1H2	C2B2,B1Q2	C3B2,B1S2
	(ECD-319)	See *MIM Volume R10*, page MAP-1, Entry DF					
4 *	DHPLO Failed to Lock check	A1Q2,A1N2 A1V2	A1H2,A1J2 A1C2	B1D2,*B1F2* *B1K2*	B1K2,*B1H2* *B1D2*	B1N2,*B1Q2* *B1U2*	B1U2,*B1S2* *B1N2*
	(ECD-320)	See *MIM Volume R10*, page MAP-1, Entry DF					
5	DHPLO Multiple Select check	A1Q2,A1V2 A1N2	A1H2,A1C2 A1J2				
	(ECD-321)	No further action — go to RMAP 340 on page REPAIR-13.					
6	No Read Data check	A1Q2,*A1W2* *A1V2,A1N2*	A1H2,*A1B2* *A1C2,A1J2*	C0B2,B1F2	C1B2,B1H2	C2B2,B1Q2	C3B2,B1S2
	(ECD-322)	See *MIM Volume R10*, page MAP-1, Entry DF					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E1XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 26. SC=E1XX (XX= Format 8 Byte 11)

SC=E2XX (XX= Format 8 Byte 12)

Controller Fault Log B (SC= E2XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	SERDES Control check	A1V2,A1N2 *A1W2*	A1C2,A1J2 *A1B2*				
	(ECD-325)	No further action — go to RMAP 340 on page REPAIR-13.					
1 *	CLOCK/SERDES/ECC card check	A1N2,A1W2	A1J2,A1B2				
	(ECD-326)	No further action — go to RMAP 340 on page REPAIR-13.					
2 *	SERDES Path check	A1W2,A1N2	A1B2,A1J2				
	(ECD-328)	See *MIM Volume R10*, page MAP-1, Entry AA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E2XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 27. SC=E2XX (XX= Format 8 Byte 12)

SC=E3XX (XX= Format 8 Byte 13)

Controller Fault Log C (SC= E3XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
1	Controller Sequencer Check-2 check	A1R2,A1V2	A1G2,A1C2				
	(ECD-329)	No further action — go to RMAP 340 on page REPAIR-13.					
3 *	Multiplexer Input parity check	A1U2,A1T2 A1V2	A1D2,A1E2 A1C2				
	(ECD-330)	No further action — go to RMAP 340 on page REPAIR-13.					
4 *	CDP Register 3 parity check	A1V2,*A1U2* *A1T2*	A1C2,*A1D2* *A1E2*				
	(ECD-331)	No further action — go to RMAP 340 on page REPAIR-13.					
5	IOC Card Check-2 check	A1V2,*A1N2*	A1C2,*A1J2*				
	(ECD-332)	No further action — go to RMAP 340 on page REPAIR-13.					
6	Precompensation check	A1N2,A1V2	A1J2,A1C2				
	(ECD-333)	No further action — go to RMAP 340 on page REPAIR-13.					
7	Write Gap 3 Control check	A1V2,A1W2	A1C2,A1B2				
	(ECD-334)	No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E3XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 28. SC=E3XX (XX= Format 8 Byte 13)

SC=E5XX (XX= Format 8 Byte 15)

Controller Fault Log E (SC= E5XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0	DPS Array check	**A1S2,A1F2** *A1W2,A1R2*	**A1F2,A1S2** *A1B2,A1G2*				
	(ECD-338)	No further action — go to RMAP 340 on page REPAIR-13.					
1	DPS Internal check	**A1S2,***A1R2*	**A1F2,***A1G2*				
	(ECD-340)	No further action — go to RMAP 340 on page REPAIR-13.					
2	DPS Compare check	**A1S2,A1F2** *A1W2,A1R2*	**A1F2,A1S2** *A1B2,A1G2*				
	(ECD-341)	No further action — go to RMAP 340 on page REPAIR-13.					
3	DPS Controller To Controller connection check	**A1F2,A1S2**	**A1S2,A1F2**				
	(ECD-342)	No further action — go to RMAP 340 on page REPAIR-13.					
4	DPS Storage Address Register check (SAR check)	**A1S2,***A1R2*	**A1F2,***A1G2*				
	(ECD-343)	No further action — go to RMAP 340 on page REPAIR-13.					
5	DPS Internal Register check	**A1S2,A1F2** *A1W2,A1R2*	**A1F2,A1S2** *A1B2,A1G2*				
	(ECD-344)	No further action — go to RMAP 340 on page REPAIR-13.					
6	DPS Alternate check (Wait/Lock Check)	**A1S2,A1F2** *A1W2,A1R2*	**A1F2,A1S2** *A1B2,A1G2*				
	(ECD-346)	No further action — go to RMAP 340 on page REPAIR-13.					

NOTE: For details about symptom code E5XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 29. SC=E5XX (XX= Format 8 Byte 15)

SC=E6XX (XX= Format 8 Byte 16)

Controller Fault Log F (SC= E6XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	DTB Bus Out parity check	A1W2,*A1V2*	A1B2,*A1C2*				
	(ECD-347)	See *MIM Volume R10*, page MAP-1, Entry AA					
1 *	DTB Bus In parity check	A1N2,A1W2 A1U2,A1T2 *A1V2*	A1J2,A1B2 A1D2,A1E2 *A1C2*				
	(ECD-348)	See *MIM Volume R10*, page MAP-1, Entry AA					
2	DTB Control check	A1W2	A1B2				
	(ECD-349)	See *MIM Volume R10*, page MAP-1, Entry AA					
3	Read/Write Gate DDC Drivers check	A1W2,A1N2 *A1V2*	A1B2,A1J2 *A1C2*				
	(ECD-350)	See *MIM Volume R10*, page MAP-1, Entry AA					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E6XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 30. SC=E6XX (XX= Format 8 Byte 16)

SC=E7XX (XX= Format 8 Byte 17)

Controller Fault Log G (SC= E7XX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
0 *	Controller to CDP Card check	A1U2,A1T2 A1V2	A1D2,A1E2 A1C2				
	(ECD-353)	No further action — go to RMAP 340 on page REPAIR-13.					
2 *	Port Response check	A1U2,A1T2	A1D2,A1E2				
	(ECD-357)	See *MIM Volume R10*, page MAP-1, Entry CG					
7 *	Port Degate check	A1U2,A1T2	A1D2,A1E2				
	(ECD-361)	No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E7XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 31. SC=E7XX (XX= Format 8 Byte 17)

SC=E8XX (XX= Format 8 Byte 18)

Register '0F' Error Codes (SC= E801 through E813)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
01 *	Index not active when expected	A1N2,A1V2 A1U2,A1T2 *A1Q2*	A1J2,A1C2 A1D2,A1E2 *A1H2*	B1E2,B1F2 B1D2	B1J2,B1H2 B1K2	B1P2,B1Q2 B1N2	B1T2,B1S2 B1U2
	(ECD-278)	No further action — go to RMAP 340 on page REPAIR-13.					
02 *	Index active when not expected	A1N2,A1V2 A1U2,A1T2 *A1Q2*	A1J2,A1C2 A1D2,A1E2 *A1H2*	B1E2,B1F2 B1D2	B1J2,B1H2 B1K2	B1P2,B1Q2 B1N2	B1T2,B1S2 B1U2
	(ECD-279)	No further action — go to RMAP 340 on page REPAIR-13.					
03 *	Segment Boundary not active when expected	A1N2,A1V2 A1U2,A1T2 *A1Q2*	A1J2,A1C2 A1D2,A1E2 *A1H2*	B1E2,B1D2 B1F2,*B1K2*	B1J2,B1K2 B1H2,*B1D2*	B1P2,B1N2 B1Q2,*B1U2*	B1T2,B1U2 B1S2,*B1N2*
	(ECD-281)	No further action — go to RMAP 340 on page REPAIR-13.					
04 *	Segment Boundary active when not expected	A1N2,A1V2 A1U2,A1T2 *A1Q2*	A1J2,A1C2 A1D2,A1E2 *A1H2*	B1E2,B1D2 B1F2,*B1K2*	B1J2,B1K2 B1H2,*B1D2*	B1P2,B1N2 B1Q2,*B1U2*	B1T2,B1U2 B1S2,*B1N2*
	(ECD-282)	No further action — go to RMAP 340 on page REPAIR-13.					
05 *	Segment boundary was not active after clock started	A1N2,A1V2 A1U2,A1T2 *A1Q2*	A1J2,A1C2 A1D2,A1E2 *A1H2*	B1E2,B1D2 B1F2	B1J2,B1K2 B1H2	B1P2,B1N2 B1Q2	B1T2,B1U2 B1S2
	(ECD-284)	No further action — go to RMAP 340 on page REPAIR-13.					
06 *	Address Mark or Index Not Active when expected	A1N2,A1V2 A1U2,A1T2 *A1Q2*	A1J2,A1C2 A1D2,A1E2 *A1H2*	B1E2,B1D2 B1F2	B1J2,B1K2 B1H2	B1P2,B1N2 B1Q2	B1T2,B1U2 B1S2
	(ECD-285)	No further action — go to RMAP 340 on page REPAIR-13.					
07	Oriented not active when expected	A1V2,*A1W2*	A1C2,*A1B2*				
	(ECD-287)	No further action — go to RMAP 340 on page REPAIR-13.					
10	First Byte Ready active when not expected	A1N2,A1V2	A1J2,A1C2				
	(ECD-288)	No further action — go to RMAP 340 on page REPAIR-13.					
13	Special after Index command	A1V2,A1W2	A1C2,A1B2				
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E8XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 32 (Part 1 of 3). SC=E8XX (XX= Format 8 Byte 18)

Register '0F' Error Codes (SC= E814 through E853)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
14	Address Mark active when not expected *(ECD-289)*	A1Q2,A1N2 A1V2	A1H2,A1J2 A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
15	Lock PLO To Servo not active when expected *(ECD-290)*	A1V2,*A1Q2*	A1C2,*A1H2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
17	Write Address Mark active when not expected *(ECD-292)*	A1N2,A1V2	A1J2,A1C2				
		No further action — go to RMAP 340 on page REPAIR-13.					
18	Lock PLO To Data not active when expected *(ECD-293)*	A1V2,*A1Q2* *A1N2*	A1C2,*A1H2* *A1J2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
19	'Any Check' and 'Any Check Duplicated' mismatch *(ECD-294)*	A1W2,A1N2 *A1V2*	A1B2,A1J2 *A1C2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
20 *	CDP Tag In At valid when not expected *(ECD-295)*	A1U2,A1T2 *A1N2,A1V2*	A1D2,A1E2 *A1J2,A1C2*	B1F2,B1G2 B1E2	B1H2,B1G2 B1J2	B1Q2,B1R2 B1P2	B1S2,B1R2 B1T2
		See *MIM Volume R10*, page MAP-1, Entry CD					
21 *	In Reset Allegiance command, the device returned incorrect address *(ECD-296)*	A1U2,A1T2 *A1N2,A1V2*	A1D2,A1E2 *A1J2,A1C2*	B1F2,B1G2 B1E2	B1H2,B1G2 B1J2	B1Q2,B1R2 B1P2	B1S2,B1R2 B1T2
		See *MIM Volume R10*, page MAP-1, Entry CD					
22 *	CDP Tag In was not at Selected Null, is now at Selected Null *(ECD-298)*	A1U2,A1T2 *A1N2,A1V2*	A1D2,A1E2 *A1J2,A1C2*	B1F2,B1G2 B1E2	B1H2,B1G2 B1J2	B1Q2,B1R2 B1P2	B1S2,B1R2 B1T2
		See *MIM Volume R10*, page MAP-1, Entry CD					
51	Expected Device Checkpoint Log value did not occur *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					
52	Expected Device Checkpoint Log value did not occur *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					
53	Expected Device Checkpoint Log value did not occur *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code E8XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 32 (Part 2 of 3). SC=E8XX (XX= Format 8 Byte 18)

Register '0F' Error Codes (SC= E855 through E8FF)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
55	Expected Device Checkpoint Log value did not occur *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					
56	Pad in Progress active when not expected *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					
57	Expected Device Checkpoint Log value did not occur *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					
58	Expected Device Checkpoint Log value did not occur *(ECD-299)*			B1E2,B1F2	B1J2,B1H2	B1P2,B1Q2	B1T2,B1S2
		No further action — go to RMAP 340 on page REPAIR-13.					
80-FF	Undervoltage Active ORed with code 00-7F	See corresponding entry for Symptom Code E800 — E87F. Also see entry for Symptom Codes EFFF and DFFF.					

NOTE: For details about symptom code E8XX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 32 (Part 3 of 3). SC=E8XX (XX= Format 8 Byte 18)

SC=EBXX

XX Bits 0-3 = Byte 16 Bits 4-7
XX Bits 4,5 = Byte 17 Bits 5,6
XX Bits 6,7 = Byte 14 Bits 6,7

CDP Card Detected Error (SC= EBXX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
*	String Configuration Bits 0-3: Number of units that are cabled into the string. Set by IOC card switches 1-4.	A1U2,*A1S2* *A1V2*	A1D2,*A1F2* *A1C2*	B1F2** B1G2,B1E2 B1D2	B1H2** B1G2,B1J2 B1K2	B1Q2** B1R2,B1P2 B1N2	B1S2** B1R2,B1T2 B1U2
		See *MIM Volume R10*, page MAP-1, Entry CD					
0,1	Configuration bits Device Range 00-0F: 00 = A unit only 01 = A and 1 B unit 10 = A and 2 B units 11 = A and 3 B units						
2,3	Configuration bits Device Range 10-1F: 00 = A unit only 01 = A and 1 B unit 10 = A and 2 B units 11 = A and 3 B units						
4,5	Substring Select (bits 4 and 5) 10 = Substring 0 01 = Substring 1 00 = Invalid 11 = Invalid						
6,7	CDP Port Select (bits 6 and 7) 4 5 6 7 1 0 0 0 = Port 0 1 0 0 1 = Port 1 1 0 1 0 = Port 2 1 0 1 1 = Port 3 0 1 0 0 = Port 4 0 1 0 1 = Port 5 0 1 1 0 = Port 6 0 1 1 1 = Port 7						

Note: String ID can be determined by Sense Byte 3.

** A defective card in one device can cause failures in other devices on the same port. See *MIM Volume R10*, page MAP-1, Entry CD, before replacing cards.

The CDP port in error (port 0 through 7) is indicated by the combination of bits 4 and 5 (Substring Select) and bits 6 and 7 (CDP Port Select).

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code EBXX, see page ECD-351 in the *ECM, Volume R40*.

Figure 33. SC=EBXX

SC=ECXX (XX= Format 8 Bytes 11, 12, 13, 18)

DDC Hot Bits (SC= ECXX)

Bit	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
XX= *	Bits always active on, Format 8 sense assembly	A1V2,A1S2 A1U2,A1T2 A1N2,*A1W2* *A1M4,A1Q2*	A1C2,A1F2 A1D2,A1E2 A1J2,*A1B2* *A1L4,A1H2*				
	(ECD-257)	No further action — go to RMAP 340 on page REPAIR-13.					

NOTE: For details about symptom code ECXX, see page ECD-257 in the *ECM, Volume R40*.

Figure 34. SC=ECXX (XX= Format 8 Bytes 11, 12, 13, 18)

SC=EDXX (XX= Format 8 Byte 09)

DDC Bus In (SC= ED01 through ED10)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
00	An unexpected end-op response received	A1W2,A1V2 A1N2,A1Q2	A1B2,A1C2 A1J2,A1H2				
	(ECD-260)	No further action — go to RMAP 340 on page REPAIR-13.					
01	DDC command overrun	A1W2	A1B2				
	(ECD-268)	No further action — go to RMAP 340 on page REPAIR-13.					
06	Invalid command code	A1S2,A1V2 *A1W2*	A1F2,A1C2 *A1B2*				
	(ECD-270)	See *MIM Volume R10*, page MAP-1, Entry AA					
07	DDC data overrun	A1W2,A1N2 *A1V2*	A1B2,A1J2 *A1C2*				
	(ECD-271)	See *MIM Volume R10*, page MAP-1, Entry AA					
08	HAR modifier overrun on set HAR oriented	A1W2	A1B2				
	(ECD-273)	No further action — go to RMAP 340 on page REPAIR-13.					
0D	Data missing in a count area	For further analysis, go to the MIM page MAP-1, Entry EN.					
10 *	Check 2 detected in controller	A1N2,A1W2 A1S2,*A1V2* *A1U2,A1T2* *A1Q2,A1R2*	A1J2,A1B2 A1F2,*A1C2* *A1D2,A1E2* *A1H2,A1G2*				
	(ECD-274)	No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code EDXX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 35 (Part 1 of 2). SC=EDXX (XX= Format 8 Byte 09)

DDC Bus In (SC= ED11 through ED1B)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
11 *	Device Check 1 on deselection	*A1U2,A1T2 A1N2,A1V2 A1S2*	*A1D2,A1E2 A1J2,A1C2 A1F2*	**B1F2,B1G2 B1E2,B1D2**	**B1H2,B1G2 B1J2,B1K2**	**B1Q2,B1R2 B1P2,B1N2**	**B1S2,B1R2 B1T2,B1U2**
	(ECD-275)	See *MIM Volume R10*, page MAP-1, Entry CD					
13 *	CDP Hang condition caused by late or missing response	**A1U2,A1T2 A1N2,A1V2 A1S2**	**A1D2,A1E2 A1J2,A1C2 A1F2**	**B1F2,B1G2 B1E2,B1D2**	**B1H2,B1G2 B1J2,B1K2**	**B1Q2,B1R2 B1P2,B1N2**	**B1S2,B1R2 B1T2,B1U2**
	(ECD-305)	See *MIM Volume R10*, page MAP-1, Entry CD					
16	Data check on start read/write	**A1N2,A1V2**	**A1J2,A1C2**				
	(ECD-307)	No further action — go to RMAP 340 on page REPAIR-13.					
17	Any check, but controller collected no status	**A1V2,A1N2 A1Q2**,*A1W2*	**A1C2,A1J2 A1H2**,*A1B2*				
	(ECD-308)	No further action — go to RMAP 340 on page REPAIR-13.					
18	Sync Out/In Tag counts not equal	**A1W2,A1N2** *A1V2,A1R2*	**A1B2,A1J2** *A1C2,A1G2*				
	(ECD-310)	No further action — go to RMAP 340 on page REPAIR-13.					
19 *	Device dropped to null	*A1U2,A1T2 A1N2,A1V2 A1S2*	*A1D2,A1E2 A1J2,A1C2 A1F2*	**B1F2,B1G2 B1E2,B1D2**	**B1H2,B1G2 B1J2,B1K2**	**B1Q2,B1R2 B1P2,B1N2**	**B1S2,B1R2 B1T2,B1U2**
	(ECD-311)	See *MIM Volume R10*, page MAP-1, Entry CD					
1B *	Index found during defect skip in HA	**A1U2,A1T2** *A1N2,A1Q2*	**A1D2,A1E2** *A1J2,A1H2*	**B1E2,B1F2** *B1D2*	**B1J2,B1H2** *B1K2*	**B1P2,B1Q2** *B1N2*	**B1T2,B1S2** *B1U2*
	(ECD-312)	No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code EDXX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 35 (Part 2 of 2). SC=EDXX (XX= Format 8 Byte 09)

SC=EEXX (XX= Format 8 Byte 14)

Controller Fault Log D (SC= EEXX)

<table>
<tr><th rowspan="2">Bit</th><th rowspan="2">Description</th><th colspan="2">Controller</th><th colspan="2">Front Devices</th><th colspan="2">Rear Devices</th></tr>
<tr><th>A1
(A3)</th><th>A2
(A4)</th><th>Left
0,4,8,C</th><th>Right
1,5,9,D</th><th>Left
2,6,A,E</th><th>Right
3,7,B,F</th></tr>
<tr><td>*</td><td>Device Check 1:
(bits 0, 1, 2, 3)
indicates the device
on the port in error</td><td colspan="6" rowspan="2">Note: Device ID can be determined by
sense byte 4, bits 3 through 7.</td></tr>
<tr><td>0
1
2
3</td><td>Device 0,4,8,C Check
Device 1,5,9,D Check
Device 2,6,A,E Check
Device 3,7,B,F Check</td></tr>
<tr><td rowspan="2">4,5</td><td rowspan="2">Isolation 0,1:
(bits 4 and 5)
00=DPS Tie Break Chk
01=Clock Check
10=Port Card Check
11=CDP Interface Chk</td><td>A1U2,A1T2
A1V2,A1S2</td><td>A1D2,A1E2
A1C2,A1F2</td><td>B1F2,B1H2
B1G2</td><td>B1H2,B1F2
B1G2</td><td>B1Q2,B1S2
B1R2</td><td>B1S2,B1Q2
B1R2</td></tr>
<tr><td colspan="6">See MIM Volume R10, page MAP-1, Entry CD</td></tr>
<tr><td rowspan="2">6,7</td><td>CDP Port Select:
(bits 6 and 7)
Substring 0:
Byte 17, Bit 5 = 1
Devices 00 — 0F</td><td colspan="6" rowspan="4">Note: String ID can be determined by sense byte 3.

The CDP port in error (port 0 through 7) is indicated by the combination of sense byte 17, bits 5 and 6, and the XX portion of symptom code EEXX, bits 6 and 7.</td></tr>
<tr><td>00 = Port 0
01 = Port 1
10 = Port 2
11 = Port 3</td></tr>
<tr><td rowspan="2">6,7</td><td>CDP Port Select:
(bits 6 and 7)
Substring 1:
Byte 17, Bit 6 = 1
Devices 10 — 1F</td></tr>
<tr><td>00 = Port 4
01 = Port 5
10 = Port 6
11 = Port 7</td></tr>
</table>

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code EEXX, see page ECD-335 in the *ECM, Volume R40*.

Figure 36. SC=EEXX (XX= Format 8 Byte 14)

SC=EFXX (XX= Format 8 Byte 07)

Format/Message (SC= EF81 through 8A)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
81	Error Correction Code hardware check *(ECD-259)*	A1N2,A1W2	A1J2,A1B2				
		No further action — go to RMAP 340 on page REPAIR-13.					
86	DPS Cleanup checks on channel reset or system reset *(ECD-262)*	A1S2,A1F2 A1W2,A1V2 A1N2,A1M4	A1F2,A1S2 A1B2,A1C2 A1J2,A1L4				
		No further action — go to RMAP 340 on page REPAIR-13.					
87	DPS array can not be initialized *(ECD-263)*	A1S2,*A1F2* *A1V2*	A1F2,*A1S2* *A1C2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
88	Short busy timeout during selection *(ECD-264)*	A1S2,*A1F2*	A1F2,*A1S2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
89	Controller failed to set or reset a long busy *(ECD-266)*	A1S2,*A1F2*	A1F2,*A1S2*				
		No further action — go to RMAP 340 on page REPAIR-13.					
8A *	Storage control has detected a missing Device Interrupt *(ECD-267)*	*A1U2,A1T2* *A1V2*	*A1D2,A1E2* *A1C2*	B1F2,B1E2	B1H2,B1J2	B1Q2,B1P2	B1S2,B1T2
		No further action — go to RMAP 340 on page REPAIR-13.					

* A more detailed analysis can be obtained by using the MD to analyze the SC.

NOTE: For details about symptom code EFXX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 37. SC=EFXX (XX= Format 8 Byte 07)

SC=EFXX (Format 8)

Undervoltage (SC= EFF0 and EFFF)

XX=	Description	Controller A1 (A3)	Controller A2 (A4)	Front Devices Left 0,4,8,C	Front Devices Right 1,5,9,D	Rear Devices Left 2,6,A,E	Rear Devices Right 3,7,B,F
F0	Device undervoltage *(ECD-182)*			B1D2,B1F2	B1K2,B1H2	B1N2,B1Q2	B1U2,B1S2
				MIM Volume R10, page PWR-1, Entry P			
FF	Controller undervoltage *(ECD-323)*	A1Q2,A1R2	A1H2,A1G2				
				MIM Volume R10, page PWR-1, Entry 0			

NOTE: For details about symptom code EFFX, see page ECD-nnn in the *ECM, Volume R40*.

Figure 38. SC=EFXX (Format 8)

EC History of SC-FRU Section

EC HISTORY OF P/N 4519909			
EC Number	Date Of EC	EC Number	Date Of EC
475245	14Nov86	475248	25Apr88
475246	21Jul87	476573	30Nov88
475247	11Sep87	476581	01Aug89

Notes:

How to Use the Master Index

The master index is created by combining the indexes from the *PSG*, *MIM, Volume R10*, and *MSM, Volume R60* manuals, and index entries of the INST section (from the *MDM* index) of the Maintenance Library Manual set (MLM). Index entries from the *PCM, Volume R20*, the *MDM, Volume R30* (except for the INST section), and the *ECM, Volume R40* are not included in the master index. The master index contains an alphabetized list of entries, with abbreviations representing the manual or section-page where they are found.

The following examples are typical Master Index entries identifying specific pages in the *PSG*:

```
DASD
  data transfer summary  PROG-13
  event history report  PROG-21
  informational messages  PROG-12
  symptom code summary  PROG-17
```

The next examples show references to the other manuals incorporated into the master index. The specific page references for these entries are located in the index of the referenced manual.

```
data and fill characters
  reading    'See MSM index'
  writing    'See MSM index'
```

P/N 4519911 39 Sides EC 476581 01Aug89

Special Characters

+1.7 Vdc power supply 'See Index of INST
+24 Vdc distribution 'See MIM index
+24 Vdc panel 'See MIM index
+24 Vdc, +5 Vdc distribution 'See MIM index
+5 Vdc (from +24 Vdc) distribution 'See MIM index
+5 Vsp power supply 'See Index of INST
'0F' errors SC-FRU-42

A

A board voltage and clock LEDs INTRO-30
A board, (controller) 'See MIM index
A gate (controller) - A board 'See MIM index
A unit 'See MSM index
A unit (60 hertz, 50 hertz Japan), primary power box 'See MIM index
A unit, covers 'See MIM index
A unit, 50 hertz, primary power box 'See MIM index
A units, joined 'See Index of INST
A-board pin side label
  pin side label 'See Index of INST
A-board to A-board cable 'See Index of INST
A-unit locate first 'See Index of INST
A-unit locate only 'See Index of INST
A-unit transformer connections 'See Index of INST
abbreviations 'See Index of INST
abnormal termination of data check recovery 'See ECM index
absolute filter assembly 'See MIM index
absolute filter check 'See MIM index
ac convenience outlet distribution, 'See MIM index
AC distribution 'See Index of INST
ac drive, 60 hertz and 50 hertz Japan 'See MIM index
ac line cord 'See Index of INST
ac line phases, 'See Index of INST
ac phasing and primary power 'See MIM index
  ac power-on 'See MIM index
  convenience outlet power 'See MIM index
  K420 circuit 'See MIM index
  missing phase protection 'See MIM index
  phase sense bypass 'See MIM index
  phase sensing 'See MIM index
ac power cable disconnect procedure 'See MIM index
ac power-on LED INTRO-8, INTRO-22, 'See MIM index, 'See Index of INST
ac primary power 'See MIM index
access mechanism positioning 'See MSM index
  clean process 'See MSM index
  compress process 'See MSM index
  offset process 'See MSM index
  park process 'See MSM index
  rezero process 'See MSM index
access mechanisms INTRO-26
active check-1 bits
  fault log D
    bits 0 through 3 'See MIM index
    bits 4 and 5 'See MIM index
active check-1 bits in fault log D 'See MIM index
actuator circuit protectors INTRO-35
actuator lock, HDA 'See Index of INST
actuator locking lever, lock/unlock 'See MIM index
actuator mechanism power-on/off (rear) 'See MIM index
actuator power supply 'See MIM index
actuator power supply, drive 'See MIM index
actuator swapped label 'See Index of INST
actuator unlock, HDA 'See Index of INST
actuator, power on/off procedure - single 'See MIM index
  front left/right 'See MIM index
  rear left/right 'See MIM index
actuator, single maintenance control 'See MIM index
additional read/write procedures MAP 'See MIM index
address mark active when not expected 'See ECM index
address mark or index not active when expected 'See ECM index
address marks
  reading and recognizing 'See MSM index
  writing 'See MSM index
address, string INTRO-9
AGC lost during rezero 'See ECM index
AGC not active with motor turning at more than 3150 rpm 'See ECM index
AGC not active 18 seconds after the motor was started 'See ECM index
AGC signal detected inactive during search 'See ECM index
AGC signal inactive during offset 'See ECM index

AGC signal inactive during seek 'See ECM index
AGC signal stuck active, motor not turning during POR 'See ECM index
AGC still active with motor off 'See ECM index
aids, diagnostic MD-82
air flow detector 'See MIM index
  switch adjustment 'See MIM index
air plenum and hose replacement, procedure 2 'See MIM index
  air plenum replacement 'See MIM index
  power-off procedure 'See MIM index
  power-on procedure 'See MIM index
  tools and supplies 'See MIM index
air plenum and hose, procedure 1 'See MIM index
  air plenum installation 'See MIM index
  air plenum removal 'See MIM index
  cable and belt installation 'See MIM index
  drive power-off and actuator lock 'See MIM index
  pivot rear HDA base casting 'See MIM index
  rear HDA drive belt removal 'See MIM index
  rear HDA power-on procedure 'See MIM index
  tools and supplies 'See MIM index
air pressure check, HDA 'See MIM index
air pressure checks 'See MIM index
  absolute filter check 'See MIM index
  air pressure table 'See MIM index
  HDA air pressure check 'See MIM index
  HDA manifold, differential pressure check 'See MIM index
  intermediate filter check 'See MIM index
air pressure table 'See MIM index
airflow error conditions 'See MIM index
amplifier card, servo 'See MIM index
amplifier card, voltage checks - servo power 'See MIM index
analysis procedures INTRO-38
analysis with multiple ECDs 'See MSM index
analysis, CB or CP tripped failure 'See MIM index
analysis, power supply ripple problem 'See MIM index
analysis, power supply voltage problem 'See MIM index
analysis, symptom code ISOLATE-23
analysis, tripped CB or CP failure 'See MIM index
analysis, voltage problem - power supply 'See MIM index
analyze
  or display next error MD-81
analyze format of sense data 'See MSM index
analyze symptom code MD-79
any check and any check duplicated mismatched 'See ECM index
any check, but controller collected no status 'See ECM index
area 'See MSM index
areas of the machine - major, location 'See MIM index
arm electronics selected 'See ECM index
arm electronics status 1 'See ECM index
arm electronics status 2 'See ECM index
arm layout INTRO-29
assignments, circuit card connector 'See MIM index
attachment features, storage control 'See Index of INST
attachment to a 3880 'See Index of INST
attachment to a 3990, 2-path 'See Index of INST
attachment to a 3990, 4-path 'See Index of INST
attachment, 3880 INTRO-3
attachment, 3990 INTRO-12
A1 board - controller, voltage checks 'See MIM index
A1 board cards REPAIR-4
A1 board cards, repair affects START-35
A1 controller power supply 'See MIM index
A2 controller power supply 'See MIM index

B

B board, (drive) 'See MIM index
B gate (drive) - B board 'See MIM index
B unit 'See MSM index
B unit locate first 'See Index of INST
B unit, covers 'See MIM index
B unit, primary power box 'See MIM index
B-unit power cable installation 'See Index of INST
B-unit transformer connections 'See Index of INST
B_switch
  cable labeling 'See Index of INST
back panel 'See Index of INST
bands
  data bands 'See MSM index
    inner 'See MSM index
    outer 'See MSM index
  guard bands 'See MSM index
    inner 'See MSM index
    outer 'See MSM index
baseplate ground
  check 'See Index of INST

isolation 'See Index of INST
baseplate ground isolation 'See Index of INST
baseplate shipping locks 'See Index of INST
belt guard
installation 'See Index of INST
removal 'See Index of INST
belt resistance check 'See MIM index
belt tracking 'See MIM index
belt, drive 'See MIM index
bits always active on, format 1 or 9 sense assembly 'See ECM index
blower and HDA drive motors 'See MIM index
blower motor 'See MIM index
blower motor assembly 'See MIM index
board cards, replacement procedures REPAIR-2
board LEDs, logic INTRO-30
board pin ID 'See MIM index
board, read/write channel 'See MIM index
bootstrap power supply, 5/24 Vdc 'See MIM index
both DCP track follow and offset inactive at beginning of offset 'See ECM index
both DCP track following and DCP offset bits inactive at beginning of seek routine 'See ECM index
both guard bands detected, actuator appears to be oscillating 'See ECM index
brake test failed at the beginning of power on 'See ECM index
brake, drive motor 'See MIM index, 'See MSM index
buffer cylinders INTRO-27, INTRO-28, 'See MSM index
bus in, DDC SC-FRU-46
Busy timeout on DCP Inhibit Power Amp command 'See ECM index
byte text headings 'See MSM index
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