IBM TotalStorage Enterprise Tape Drive 3590

Maintenance Information

Model B11/B1A, E11/E1A, and H11/H1A

SA37-0301-05

IBM TotalStorage Enterprise Tape Drive 3590

Maintenance Information

Model B11/B1A, E11/E1A, and H11/H1A

SA37-0301-05

Note!
Before using this information and the product it supports, be sure to read the general information under “Notices” on page C-1.

The revision character **|** found in this document identifies the information that has been added or changed since the previous release of this document. This release includes information to support the following enhancements:

- Addition of information that supports Model H11/H1A
- Rebranding or name change of Magstar to TotalStorage
- Inclusion of Linux operating system information

Nineteenth Edition (July 2002)

This publication obsoletes and replaces P/N 19P1595 at EC H28177.

Order publications through your IBM® representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

IBM Storage Subsystems Division home page:

`http://www.ibm.com/storage`

A readers’ comments form is provided at the back of this publication. Either mail the form or fax it to (520) 799-2230. If the form has been removed, address your comments about this document to:

IBM Corporation
RAS Package Development
Department 4WUA
9000 South Rita Road
Tucson, AZ 85747-9108
U.S.A.

When you send information to IBM, you grant IBM a nonexclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

Contents

Tables

Figures

Preface

This manual is intended for use by service personnel who install, remove, diagnose, repair, or test the IBM 3590 Models B11, B1A, E11, E1A, H11, H1A, Deskside, and to support the Ultra drives, FC 9790/5790.

Related Information

Additional information related to the subsystem is available in the following publications:

- *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*, GA32-0329
- *IBM TotalStorage Enterprise Tape System 3590 Operator Guide*, GA32-0330
- *IBM 3590 Operator's Quick Reference Guide*, GA32-0354
- *IBM TotalStorage Enterprise Tape System 3590 Hardware Reference Guide*, GA32-0331
- *IBM TotalStorage Silo Compatible Tape Drive Frame 3590 Introduction, Planning, and User's Guide*, GA32-0366
- *IBM 3494 Tape Library Dataserver Maintenance Information*, SA37-0270
- *IBM Care and Handling of the IBM Magnetic Tape Cartridge*, GA32-0047
- *IBM TotalStorage Silo Compatible Tape Drive Frame 3590 Maintenance Information*, SA37-0405
- *IBM TotalStorage Enterprise Tape System 3590 Model A00 and A50 Controller Models Maintenance Information*, SA37-0420
- *IBM TotalStorage Enterprise Tape Controller 3590 Model A60 Maintenance Information*, SA37-0421

iSeries/AS400 (OS/400) System® Information

For additional information about the iSeries/AS400 (OS/400) System subsystems and software, see:

- *IBM 3494 Tape Library Dataserver User's Guide: Media Library Device Driver for Application System/400®*, GC35-0153
-
- *Application System/400 Service Functions*, SY44-3902
- *Application System/400 System Operation*, SC41-3203
- *Application System/400 Physical Planning Reference*, SA41-3109
- *Application System/400 Physical Planning Summary*, SA41-3108
- *Application System/400 Control Language Reference*, SC41-0030
- *Application System/400 Security Concepts and Planning*, SC41-8083
- *IBM 9309 Rack Enclosure Setup and Operation Guide (Models 1 and 2)*, GA24-4039

RISC pSeries/RS6000 (AIX) System Information

For additional information about the RISC System/6000 subsystems and software, see:

- *RISC System/6000®Getting Started: Using RISC System/6000*, GC23-2377
- *RISC System/6000 Getting Started: Managing RISC System/6000*, GC23-2378
- *RISC System/6000 Problem Solving Guide*, SC23-2204
- *RISC System/6000 System Overview and Planning*, GC23-2406
- *RISC System/6000 Planning for System Installation*, GC23-2407
- *7202 Install and Service Guide*, SA23-2670
- *7015 Install and Service Guide*, SA23-2628
- *pSeries/RS6000 (AIX) System Enterprise Servers S70 and S7A Installation and Service Guide*, SA38-0548

9076 SP2® Information

- *Scalable POWERparallel Systems®: System Planning,* SC233864 PACKAGE on MKTTOOLS
- *Scalable POWERparallel® Systems: Installation Guide,* SH23-3865
- *Scalable POWERparallel Systems: High-Performance Technical Computing Solutions,* GH23-2485
- *Scalable POWERparallel Systems: Business Solutions,* GA23-2475
- *IBM 9076 Scalable POWERparallel Systems: SP2 Administration Guide,* SH26-2486
- *IBM 9076 Scalable POWERparallel Systems: SP2 Diagnosis and Messages,* SC23-3866
- *IBM 9076 Scalable POWERparallel Systems: SP2 Command and Technical Reference,* SC23-3867
- *IBM 9076 Scalable POWERparallel Systems: Maintenance Information, Volume 1,* SY66-0294
- *IBM 9076 Scalable POWERparallel Systems: Maintenance Information, Volume 2,* SY66-0295

Device Driver Information

- *IBM 3494 Tape Library Dataserver User's Guide: Media Library Device Driver for Application System/400*, GC35-0153
- *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, GC35-0154

Fibre Channel Attachment Information

- *IBM Fibre-Optic Channel Link Planning and Installation*, GA32-0367
- *Fibre Channel Storage Hub IBM 2103 Model H07 Installation, Service, and User's Guide*, SC26-7289
- *IBM 2109 S08 Switch User's Guide*, SC26-7349
- *IBM 2109 S08 Switch Service Guide*, SC26-7350
- *IBM 2109 S16 Switch User's Guide*, SC26-7351
- *IBM 2109 S16 Switch Service Guide*, SC26-7352

Web Site Information

Table 1. Information Web Site URLs

IBM RMSS Products Manuals	http://www.storage.ibm.com/hardsoft/tape/pubs/pubs3590.html
Fibre Support Information	http://www.storage.ibm.com/hardsoft/tape/3590/3590opn.html
Open System Support Information	http://www.storage.ibm.com/hardsoft/tape/3590/3590opn.html
Statistical Analysis and Reporting System User Guide (SARS)	http://www.storage.ibm.com/hardsoft/tape/pubs/pubs3590.html
IBM Storage Area Network (SAN) Guide	http://www.storage.ibm.com/ibmsan/director.htm
Minimum microcode requirements	http://www.storage.ibm.com/hardsoft/tape/3590/3590attach.html
Device Driver Information	ftp://ftp.software.ibm.com/storage/devdrvr/

Chapter 1. Start

Contents

Maintenance Starting Point

Begin all maintenance action here. Most drive failures result in a FID (FRU identifier) error code on the drive operator/CE panel. Some load or unload problems may also result in ATTN DRV or ATTN ACF messages. All of these error codes and messages are recorded in the drive CE Error Log for your convenience. See “CE Logs Menu” on page 5-60 for details.

Table 1-1 lists possible reasons for service and the associated service action. Find the reason you are here in the left column and perform the stated action in the right column. After determining the failing hardware, remove and replace the FRU as directed. After any hardware replacement or other maintenance action is performed, go to “End of Call” on page 9-8.

Note: If the service call is on a status 3 machine, see “General Instructions” on page 7-2, then return here to continue the service call.

If you are unable to determine the cause of the problem (No Defect Found), or the problem is intermittent, or the symptoms change and you need further assistance, go to “Problem Determination” on page 9-4.

If the next level of support is needed, it is important that the full details of the error are understood prior to calling support. Information related to the position and condition of the cartridge, media and mechanical assemblies is important. Consider the condition or status of items, such as:

- Location of cartridge and transport assembly
- Position of loader assembly (up or down), and is the cartridge fully seated?
- Position of the pantocam pin and tape leader block
- Is the tape leader block attached to the pantocam pin and/or the tape?

Table 1-1. Start Here

If You Are Here For This Reason	Perform This Action
3590 Model Axx Control Unit Problem	Go to START section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information.*
3590 Model B11/B1A attached to a Model Axx Control Unit	Go to START section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information.*
3590 E11/E1A and H11/H1A attached to either a A50 Controller or a A60 Controller	Go to START section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information.*
3590 Model C12/C14 Problem	Go to START section of *IBM TotalStorage Enterprise Tape System 3590 Models C12/C14 Maintenance Information.*
Problem with Model B11/B1A, E11/E1A, or H11/H1A in **Desk Side** Sleeve, RPQ 8B3191 or 8B3190	“Prepare Model B11/B1A, E11/E1A, or H11/H1A in Desk Side Sleeve for Service” on page 9-14
Install the 3590 Model B11/B1A, E11/E1A, or H11/H1A or Deskside	“Before Installation” on page 8-3
FID message from the operator/CE panel, the CE Error Log in the device, or from the host	“FID Entry Point” on page 1-8
Attention (ATTN) message on the operator/CE panel or from the CE Error Log	“Attention Drive Messages” on page 1-32 or “Attention ACF Messages” on page 1-37.
Analyze 3590 CE Error Log	“Error Log Analysis Procedure” on page 9-126

Table 1-1. Start Here (continued)

If You Are Here For This Reason	Perform This Action
SIM Message	Use MSG section to get Message Code and FID. See "Message Codes" on page 4-8 which contains SIM and MIM messages. See Figure 4-1 on page 4-3 for the location of the FID in the SIM record. Perform the stated action in the Message Code or from the displayed FID.
SIM Service Message	See "SIM Service Messages" on page 4-9. Read and understand the meaning of the service message. Use the MSG section to get message code and FID. See also "Message Codes" on page 4-8. SIM format is shown on Figure 4-1 on page 4-3. Perform the stated action in the Message Code or from the displayed FID.
MIM Message	See "Message Codes" on page 4-8. For MIM format, see Figure 4-2 on page 4-5. Use this information to obtain the message code. Perform the stated action in the Message Code.
MIM Exception Message	See "MIM Exception Messages" on page 4-9. Read and understand the meaning of the exception message, then use the MSG section to get the message code from the MIM record. See also Figure 4-2 on page 4-5 and "Message Codes" on page 4-8, and perform the action stated by the message code.
Fibre channel Messages displayed on the operator/CE panel	"Fibre Channel Problem Determination Procedure" on page 9-113
Operator/CE Panel problems such as a blank display or partial characters are indicated	"Operator/CE Panel Problems" on page 2-2
Drive operator panel is hung/frozen	"No Response from Operator/CE Panel and No Message" on page 9-133
Drive does not power ON	"Operator/CE Panel Problems" on page 2-2
Stuck tape or cartridge	1. If tape is loaded in the tape path, go to "Manual Cartridge Removal" on page 9-37. 2. If the cartridge is stuck in the loader or transport (Model B11/E11/H11), go to "Manual Unloading Loader or Transport (Model B11/E11/H11)" on page 9-49. 3. If the cartridge is stuck in the loader (Library models), check the tension of the Cartridge Present Loader spring. See Figure 10-63 on page 10-92, and refer to step 1 on page 10-92 for the loader spring replacement procedure. Ensure that the correct spring is installed. See the Parts Catalog, "Assembly 3: Deck Enclosure" on page 11-10.
Remove a cartridge by hand	"Manual Cartridge Removal" on page 9-37
Replace a leader block	"Leader Block Separated From Magnetic Tape" on page 9-45
Broken or damaged tape	"Manual Cartridge Removal" on page 9-37
Broken or damaged cartridge	"Manual Cartridge Removal" on page 9-37

Table 1-1. Start Here (continued)

If You Are Here For This Reason	Perform This Action
Clean messages on operator/CE panel, or reported to the host	Insert the cleaning cartridge in the drive. Cleaning is performed automatically **Notes:** 1. If there was an excessive number of Clean messages, go to "Excessive Clean Messages" on page 9-5. 2. If there has been a recent part replacement in the tape path or head guide assembly, go to "FRU Replaced Menu" on page 5-41 and select one of the menu functions to reset the drive statistical data.
Excessive temporary errors reported to the host	1. Go to "Error Log Analysis Procedure" on page 9-126. If the drive has code level D0IE_2C3, use the Temporary error log. Otherwise, use the Error Log, FID FE error log and FID FF error log. See "CE Logs Menu" on page 5-60 for a description of the error logs. 2. Go to "Error Log Analysis – pSeries/RS6000 (AIX) System" on page 4-15. a. Review "Message Codes" on page 4-8. b. Review "Sense Key – ASC and ASCQ Information" on page 4-10. 3. Ensure that the **Force Error Log** option is **OFF**. Go to "CE Config/Install Menu" on page 5-51.
Media surface errors reported by pSeries/RS6000 (AIX) System	1. Go to "Error Log Analysis – pSeries/RS6000 (AIX) System" on page 4-15. Analyze the error log for media surface errors. 2. Contact your next level of support if further assistance is needed.
Media surface errors reported by Linux system	1. Go to "Error Log Analysis – pSeries/RS6000 (AIX) System" on page 4-15. Analyze the error log for media surface errors. 2. Contact your next level of support if further assistance is needed.
Tape write protected errors	If the operator/CE panel shows the file protect icon, the tape is either physically write protected, or the customer has used a SCSI command to logically write protect the tape. 1. Inform the customer that this is normal operation. If the operator/CE panel does not show the file protect icon, the drive had a problem reading the tape at the load point. 1. The wrong format tape may be loaded. These 3590 Models have the following limitations: • Model Exx drives cannot write on 128- or 384-track tapes. • Model Bxx drives cannot write on 256- or 384-track tapes. • Model Hxx drives cannot write on 128 or 256. 2. There may be something wrong with the cartridge. Try writing on a different cartridge. If the failure occurs on multiple cartridges, go to FID entry point on page 1-30 F0 or F1.
No Defect Found (NDF), intermittent, or symptoms changing	"Problem Determination" on page 9-4

Table 1-1. Start Here (continued)

If You Are Here For This Reason	Perform This Action
Processor Check light remains ON after power-on reset	"Operator/CE Panel Problems" on page 2-2
Operator panel displays the CE menu rather than the Operator menu after a power-on sequence	1. Remove the wrap tool from a SCSI port or the library manager port. See "SCSI Ports Wrap Test" on page 9-106 and "Setup Library Manager Port Wrap Test" on page 9-111. 2. If step 1 does not fix the problem, go to "FID E4: Card Pack" on page 10-67.
The *Diags Failed* message appears on the operator/CE panel without a FID displayed	1. Select **Unload drive.** 2. Select **Cancel.** 3. Select **Verify Fix.** 4. When the request for scratch tape appears, try another tape cartridge. If the drive still fails, go to **Reported FID F0 F1 F2 F3** in 1-30 and follow the FRU procedure there. The Logs can be analyzed using the "FID FE – Isolate Fault Between Media and Hardware" on page 9-123 procedure.
Use diagnostic tape	This message appears when the tape that contains data is loaded. Use a scratch tape, an unlabeled tape, or a diagnostic tape that does not contain data.
Media Test Mode (MTM) message on the operator/CE panel	Call your next level of support.
Host-reported SCSI problems (selection time-outs, command time-outs, parity errors, and similar errors)	"SCSI Bus Problem Determination" on page 9-108
Host-reported fibre channel interface problems (errors processing requests/responses, loop up/down/parity errors, LIP condition, time-outs, and similar errors)	"Fibre Channel Problem Determination Procedure" on page 9-113
Host-reported problem during Install. Can not get the drive online to the Host in a non-Control Unit, non-Virtual Tape Server (VTS) environment	Ensure the Control Unit Mode option is Disabled. See the "CE Drive Options Menu" on page 5-52 for details.
Host-reported FID FE (media/drive problems)	"FID FE – Isolate Fault Between Media and Hardware" on page 9-123
Host-reported FID FF (Operator Action or Host Programming Error)	"FID FF – Operator Action or Host Program Error" on page 9-125
Interface problem between the 3494 or 3495 library manager and the 3590	You were sent here from the 3494 or 3495 MI. Perform "Library Manager Port Wrap Test" on page 9-111. If no error occurs, the problem could be the cable between the 3590 and the library manager. Also see "Checking 3494 Control Path by Using MTLIB Command from pSeries/RS6000 (AIX) System" on page 9-116.
ACF indicator lights problem	ACF indicator or indicators will not light. Replace the following FRUs: 1. "FID A6: LED Cards and Random Lock Sensor" on page 10-48 2. "FID A4: LED Cable" on page 10-45 3. "FID 97: Motor Control Card" on page 10-25
Microcode problem suspected	"Suspected Microcode Problem" on page 9-125
Set Error Match Trap	"Set Error Match Trap (To Get Dump)" on page 9-130
Remove Error Match Trap	"Remove Error Match Trap" on page 9-131

Table 1-1. Start Here (continued)

If You Are Here For This Reason	Perform This Action
Microcode dump to SCSI or fibre channel	Go to one of the following: • "Off-loading Dumps to pSeries/RS6000 (AIX) System by Using TAPEUTIL" on page 9-67 • "Off-loading Dumps to Sun System by Using TAPEUTIL" on page 9-69 • "Off-loading Dumps to HP-UX System by Using TAPEUTIL" on page 9-70 • "Off-loading Dumps to SP2 by Using TAPEUTIL" on page 9-71 OR • "Off-loading Dumps to Windows NT or Windows 2000 System by Using NTUTIL" on page 9-73
Microcode dump to 3591	Go to the Procedures section of the 3591 Maintenance Information
Microcode dump to cartridge	"Off-loading Dumps to Tape Cartridge" on page 9-67
Microcode update via SCSI or fibre channel	Go to one of the following: • "Updating Microcode from pSeries/RS6000 (AIX) System by Using TAPEUTIL" on page 9-76 • "Updating Microcode from Sun System by Using TAPEUTIL" on page 9-81 • "Updating Microcode from HP-UX System by Using TAPEUTIL" on page 9-82 • "Updating Microcode From SP2 by Using TAPEUTIL" on page 9-83 • "Updating Microcode from Windows NT or Windows 2000 System by Using NTUTIL" on page 9-83 OR • "Updating Microcode from LINUX by Using TAPEUTIL" on page 9-79
Microcode update via 3591	Go to the Procedure section of the 3591 Maintenance Information
Microcode update via cartridge	"Updating Microcode from FMR Cartridge" on page 9-58
Update microcode cartridge with drive microcode	"Updating FMR Tape from Drive" on page 9-58
Convert microcode cartridge to scratch cartridge	"Converting FMR Tape to Scratch Tape" on page 9-58
Create microcode cartridge from a scratch cartridge	"Making FMR Tape from Scratch Tape" on page 9-58
Obtain and analyze error log and sense information data from pSeries/RS6000 (AIX) System®.	"Error Log Analysis – pSeries/RS6000 (AIX) System" on page 4-15
Obtain and analyze error log and sense information data from iSeries/AS400 (OS/400) System	"Error Log Analysis – iSeries/AS400 (OS/400) System" on page 4-26
Obtain and analyze error information from Sun System	"Obtaining Error Information from Sun (Solaris) System" on page 4-35
Obtain and analyze error information from HP/UX System	"Obtaining Error Information from HP/UX System" on page 4-35
Obtain and analyze error information from Windows® System	"Obtaining Error Information from Windows NT or Windows 2000 System" on page 4-36
EREP information for 3590s attached to 3591	Go to the Message Section of the 3591 Maintenance Information
Locate FRUs or replace defective FRUs	Chapter 10, "Locations, Checks, Adjustments, Removals, and Replacements" on page 10-1

Table 1-1. Start Here (continued)

If You Are Here For This Reason	Perform This Action
Run verification tests	Select Verify Fix on “CE Options Menu” on page 5-38
Vary (take) the device offline	Have the customer vary (take) the device offline
Power OFF the 3590	“Powering Device ON and OFF” on page 9-6
Relocate or remove the 3590	“Removing 3590” on page 8-79
Inspection for maintenance agreement qualification	See “General Instructions” on page 7-2, for the safety inspection procedures

FID Entry Point

Table 1-2 on page 1-9 lists the FRU identifiers (FIDs) and the field replaceable units (FRUs) that you can change. The reported FID is displayed on the operator/CE panel in a FID message, in the CE Error Log, and reported to the host. For example, if the message is FID1 90, **1** is the severity and **90** is the FID. “Intervention Messages” on page 5-10 describes the different types of messages and their impact on 3590 availability. The service information message (SIM) record, which the 3590 sends to the host, also has the reported FID information. See “Service and Media Information Messages (SIMs and MIMs)” on page 4-2.

Table 1-2 on page 1-9 also contains the FRU name and a page reference to the removal and replacement procedure for the FRU. Each FRU is identified by a one-byte identifier (FID). The FID relates to the FRUs that have the highest probability of causing the problem. Always replace the FRU with the highest probability of failure first. Use the technical area code (TAC), provided here and in Chapter 10, “Locations, Checks, Adjustments, Removals, and Replacements” on page 10-1, to assist you with call reporting.

Provided with the Reported FID is a display of twelve hex characters of support data. This support data will be needed when contacting your next level of support, and should also be included in your call reporting data.

At the start of your service call, write down the reported FID and the twelve hex characters of support data for use in your call reporting when the service call is complete.

- If the FID is displayed in the operator/CE panel, see Figure 5-4 on page 5-11. The twelve characters of support data are shown below the “CALL FOR SERVICE” message.
- If the FID was reported in one of the Error Logs, see Table 5-59 on page 5-61. The twelve characters of support data are shown below the reported FID.

At the end of the service call, record the FID in the *COMMENT* field of the call record, and record the twelve hex characters of support data in the *FAULT SYMPTOM CODE (FSC)* field.

This detailed call reporting will help Engineering and Field Support to quickly identify, understand, and resolve field problems.

See Table 1-2 on page 1-9 for the complete list of FIDs and associated FRUs.

If the FID has cable FRUs in the FRU list, reseat the cable FRUs before replacing any FRU in the list.

Table 1-2. FIDs, FRUs, and TACs

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
00	Drive serial number is the default value				
	—	Invalid drive serial number	—	—	Enter valid drive serial number (go to “Drive Serial Number” on page 9-51)
01	Card pack serial number is the default value				
	E4	Invalid card pack serial number	100%	T21	“FID E4: Card Pack” on page 10-67
03	Invalid setup detected				
	—	Configuration problem	—	—	Ensure config/install options are correct (see “Set Customer Options” on page 8-35)
04	Incorrect pneumatic pressure detected				
	—	Pneumatic pressure is adjusted automatically by the microcode after each cleaning cartridge cycle and when requested by the CE via the **Adjust Pressure** option of the CE panel CE Config/Install menu. At the time of the error, the pneumatic pressure was not correct.	—	—	Perform “Measurement and Adjustment of Pneumatic System” on page 10-4
07	Incorrect Card Pack or HGA installed				
	—	The Card Pack and HGA FRUs are not interchangeable between the E11/E1A and H11/H1A drives and the Model B11/B1A drives.	—	—	See the Parts Catalog, “Assembly 3: Deck Enclosure” on page 11-10 to ensure the correct FRU is installed. The E11/E1A and H11/H1A HGA serial number on the bar code label starts with a “T”, and the Model B11/B1A serial number starts with a “B”.
08	Incorrect switch setting on Card Pack				
	—	The Card Pack for the Model B11/B1A with Common Card Pack or Model E11/E1A drives has a rotary switch on one of the logic cards. See Figure 10-50 on page 10-71 The switch setting is not correct for the Model of the 3590.	—	—	See “FID E4: Card Pack” on page 10-67 for the correct switch setting. For the E11/E1A and H11/H1A card pack or the Model B11/B1A with Common Card Pack, the switch should be set to “F.”
09	World Wide ID on fibre card pack could not be read				
	E4	Replace Card Pack	100%	T21	“FID E4: Card Pack” on page 10-67
90	Electronic fault (see also “Operator/CE Panel Problems” on page 2-2)				
	90	Operator/CE panel	88%	V08	“FID 90: Operator/CE Panel” on page 10-12
	DC	ACF and operator/CE panel cable	5%	C09	“FID DC: ACF and Operator/CE Panel Cable” on page 10-121
	91	Operator/CE panel cable (Model B11/E11/H11)	5%	C09	“FID 91: Operator/CE Panel Cable” on page 10-14
	94	Operator/CE panel cable (Model B1A/E1A/H1A)	5%	C09	“FID 94: Operator Panel Cable (Model B1A/E1A/H1A Only)” on page 10-126
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
93	Gripper-present sensor did not change state 1. This error applies only to drives in a library subsystem. It does not apply to Model B11/E11/H11. If this drive is **not** in a library, then change the config/install options to indicate that the drive is not in a library. See "Set Drive Options" on page 8-36. 2. Before replacing FRUs below, ensure that the gripper-present sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	93	Library Interface Cover	80%	T03	"FID 93: Library Interface Cover (Model B1A/E1A/H1A Only)" on page 10-124
	E4	Card pack	15%	T21	"FID E4: Card Pack" on page 10-67
	DC	ACF and operator/CE panel cable	5%	C09	"FID DC: ACF and Operator/CE Panel Cable" on page 10-121
95	Did not detect elevator movement 1. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. 2. Before replacing FRUs below, ensure that the transport-position sensors A & B (FID 98) are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. **Note:** When the power is cycled, the elevator should move. If it **does** move, suspect one of the transport position sensors (A or B). If the elevator **does not** move, suspect the hardware that is used to move the elevator.				
	92	Leadscrew assembly	30%	T03	"FID 92: Leadscrew Assembly" on page 10-15
	95	Elevator motor assembly	30%	T03	"FID 95: Elevator Motor Assembly" on page 10-20
	AB	Leadscrew drive belt	15%	T03	"FID AB: Leadscrew Drive Belt" on page 10-54
	99	Transport cable	8%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	9A	Transport	6%	T03	"FID 9A: Transport" on page 10-35
	98	Transport-position sensor	5%	T01	"FID 98: Transport Position Sensor" on page 10-26
	A1	Motor cable assembly	2%	T04	"FID A1: Motor Cable Assembly" on page 10-42
	97	Motor control card	2%	T02	"FID 97: Motor Control Card" on page 10-25
	A2	Drive/ACF cable	2%	T04	"FID A2: Drive/ACF Cable" on page 10-44

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
96	Did not detect pinch motor movement 1. Check that the pinch arms are not bent. If the arms are bent, replace the transport FID 9A. 2. Before replacing FRUs below, ensure that the pinch 1 and 2 sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	99	Transport cable	40%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	96	Pinch motor assembly	35%	T03	"FID 96: Pinch Motor Assembly" on page 10-23
	9A	Transport	10%	T03	"FID 9A: Transport" on page 10-35
	A1	Motor cable assembly	5%	T04	"FID A1: Motor Cable Assembly" on page 10-42
	97	Motor control card	5%	T02	"FID 97: Motor Control Card" on page 10-25
	A2	Drive/ACF cable	5%	T04	"FID A2: Drive/ACF Cable" on page 10-44
	E4	Card pack	5%	T21	"FID E4: Card Pack" on page 10-67
97	Electronic-detected fault 1. Error applies only to drives with an ACF. If this drive **does not** have an ACF, then change the config/install options to indicate that the drive is not a Model B11/E11/H11. See "Set Drive Options" on page 8-36. 2. Before replacing FRUs below, ensure that the priority cell sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	A2	Drive/ACF cable	80%	T04	"FID A2: Drive/ACF Cable" on page 10-44
	97	Motor control card	12%	T02	"FID 97: Motor Control Card" on page 10-25
	9E	Priority cell sensor (pair)	6%	T01	"FID 9E: Priority Cell Sensor" on page 10-39
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
98	Transport-position sensor did not change state 1. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. 2. Before replacing FRUs below, ensure that the transport-position sensors A & B (FID 98) are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	98	Transport-position sensor	35%	T01	"FID 98: Transport Position Sensor" on page 10-26
	99	Transport cable	25%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	95	Elevator motor assembly	15%	T03	"FID 95: Elevator Motor Assembly" on page 10-20
	AB	Leadscrew drive belt	10%	T03	"FID AB: Leadscrew Drive Belt" on page 10-54
	97	Motor control card	10%	T02	"FID 97: Motor Control Card" on page 10-25
	9A	Transport	5%	T03	"FID 9A: Transport" on page 10-35

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
9A	One of the sensors in the transport did not change state. 1. Ensure customer is using correct cartridge. **(3590 Only)**. 2. This failure may be caused by a dirty cartridge. Look for any contamination on the sides of the cartridge that could cause the pinch rollers to slip. Have the customer clean or replace the cartridge or magazine, if necessary. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. **Note:** Ensure that the customer does not ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots resulting in contamination on the sides of the cartridges that may cause this failure. 3. Check that the pinch rollers are not binding, and that the arms are not bent. If the rollers are binding or the arms are bent, replace the transport FID 9A. Check the pinch rollers for contamination. If they are dirty, clean or replace the rollers. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. 4. This failure may be caused by a sensor failure (transport-position A & B, Limit 1 & 2, Pinch 1 & 2, Import, or Export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. 5. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. **Note:** If the failure only occurs when accessing a cartridge from the bottom slot of the magazine, try another magazine in the ACF.				
	99	Transport cable	40%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	9A	Transport	30%	T03	"FID 9A: Transport" on page 10-35
	AA	Transport pinch rollers	20%	T03	"FID AA: Transport Pinch Rollers" on page 10-51
	FD	Magazine	5%	Q05	Customer-purchased
	97	Motor control card	5%	T02	"FID 97: Motor Control Card" on page 10-25
9B	The global/interference sensor did not change state. 1. Check the position of all cartridges to ensure they are properly positioned in the magazine and in the priority cell. A cartridge that extends too far into the magazine in the import position or a damaged cartridge can cause this error. 2. Remove the magazine and look for any obvious obstructions. 3. Try another magazine in the ACF. 4. Before replacing FRUs below, ensure that the Global Interference sensor (FID 9B) is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	9B	Global/interference sensor	84%	T01	"FID 9B: Global/Interference Sensor Assembly (Upper and Lower)" on page 10-38
	97	Motor control card	8%	T02	"FID 97: Motor Control Card" on page 10-25
	A5	Sensor cable	8%	T01	"FID A5: Sensor Cable" on page 10-46

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
9C	3590 Model C12/C14 Electronic-detected fault 1. This error applies only to drives in a Model C12/C14 (library) subsystem. If this drive is **not** in a Model C12/C14 subsystem, then change the config/install options to indicate that the drive is not in a Model C12/C14 subsystem. See “Set Drive Options” on page 8-36.				
	9C	STL0 library interface card	90%	T02	See the CARR section of *IBM TotalStorage Enterprise Tape System 3590 Models C12/C14 Maintenance Information.*
	A3	STL0 card to ACF port ribbon cable	10%	T04	See the CARR section of *IBM TotalStorage Enterprise Tape System 3590 Models C12/C14 Maintenance Information.*
9E	Sensor failed to change state **Note:** Before replacing FRUs below, ensure that the priority cell sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	9E	Priority cell sensor (pair)	92%	T01	“FID 9E: Priority Cell Sensor” on page 10-39
	97	Motor control card	5%	T02	“FID 97: Motor Control Card” on page 10-25
	A5	Sensor cable	3%	T01	“FID A5: Sensor Cable” on page 10-46

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
9F	Load or unload error when moving tape between the deck loader and the ACF transport. 1. Ensure customer is using the correct cartridge (**3590 Only**). 2. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 3. This failure may be caused by a dirty cartridge. Look for any contamination on the sides of the cartridge that could cause the pinch rollers to slip. Have the customer clean or replace the cartridge or magazine, if necessary. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. **Note:** Ensure that the customer does not ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots resulting in contamination on the sides of the cartridges that may cause this failure. 4. Check that the pinch rollers are not binding, and that the arms are not bent. If the rollers are binding or the arms are bent, replace the transport FID 9A. Check pinch rollers for contamination. If they are dirty, clean or replace the rollers. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. 5. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. 6. This failure may be caused by a sensor failure (door-open, tray up, cartridge present, limit 1 & 2, transport-position A & B). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	AA	Transport pinch rollers	23%	T03	"FID AA: Transport Pinch Rollers" on page 10-51
	BC	Loader assembly	23%	T42	"FID BC: Loader Assembly" on page 10-89
	9A	Transport	23%	T03	"FID 9A: Transport" on page 10-35
	99	Transport cable	5%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	C9	Door-open sensor	5%	T33	"FID C9: Door-Open Sensor" on page 10-97
	CA	Tray up sensor	5%	T33	"FID CA: Tray-Up Sensor" on page 10-98
	CD	Cartridge-present sensor (in the loader)	3%	T33	"FID CD: Cartridge-Present Sensor" on page 10-101
	A9	Feed motor assembly	3%	T03	"FID A9: Feed Motor Assembly" on page 10-49
	A1	Motor cable assembly	3%	T04	"FID A1: Motor Cable Assembly" on page 10-42
	97	Motor control card	3%	T02	"FID 97: Motor Control Card" on page 10-25
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
A0	Sensor did not change state **Note:** Before replacing FRUs below, ensure that the magazine-present sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	A0	Magazine-present sensor asm	94%	T01	"FID A0: Magazine-Present Sensor Assembly" on page 10-41
	A5	Sensor cable	4%	T01	"FID A5: Sensor Cable" on page 10-46
	97	Motor control card	2%	T02	"FID 97: Motor Control Card" on page 10-25
A6	Microcode did not detect current flow through ACF LED				
	A6	LED cards	80%	T02	"FID A6: LED Cards and Random Lock Sensor" on page 10-48
	A4	LED cable	10%	T01	"FID A4: LED Cable" on page 10-45
	97	Motor control card	4%	T02	"FID 97: Motor Control Card" on page 10-25
	A5	Sensor cable	2%	T01	"FID A5: Sensor Cable" on page 10-46
	A2	Drive/ACF cable	2%	T04	"FID A2: Drive/ACF Cable" on page 10-44
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
A7	Load or unload error to priority slot 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. Ensure that the customer is using the correct cartridge (**3590 Only**). 3. This failure may be caused by a dirty cartridge. Look for any contamination on the sides of the cartridge that could cause the pinch rollers to slip. Have the customer clean or replace the cartridge or magazine, if necessary. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. **Note:** Ensure that the customer does not ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots resulting in contamination on the sides of the cartridges, which may cause this failure. 4. Check that the pinch rollers are not binding, and that the arms are not bent. If the rollers are binding or the arms are bent, replace the transport FID 9A. Check the pinch rollers for contamination. If they are dirty, clean or replace the rollers. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. 5. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. 6. This failure may be caused by a sensor failure (priority cell, limit 1 & 2, import, or export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	AA	Transport pinch rollers	40%	T03	"FID AA: Transport Pinch Rollers" on page 10-51
	9A	Transport	40%	T03	"FID 9A: Transport" on page 10-35
	99	Transport cable	10%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	A9	Feed motor asm	6%	T03	"FID A9: Feed Motor Assembly" on page 10-49
	97	Motor control card	2%	T02	"FID 97: Motor Control Card" on page 10-25
	A1	ACF motor cable	2%	T04	"FID A1: Motor Cable Assembly" on page 10-42

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
A8	Load or unload error to magazine 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. Ensure that the customer is using the correct cartridge (**3590 Only**). 3. This failure may be caused by a dirty cartridge. Look for any contamination on the sides of the cartridge which could cause the pinch rollers to slip. Have the customer clean or replace the cartridge or magazine, if necessary. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. **Note:** Ensure that the customer does not ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots resulting in contamination on the sides of the cartridges that may cause this failure. 4. Check that the pinch rollers are not binding, and that the arms are not bent. If the rollers are binding or the arms are bent, replace the transport FID 9A. Check the pinch rollers for contamination. If they are dirty, clean or replace the rollers. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. 5. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. 6. This failure may be caused by a sensor failure (magazine present, magazine lock, limit 1 & 2, import, or export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	AA	Transport pinch rollers	40%	T03	"FID AA: Transport Pinch Rollers" on page 10-51
	9A	Transport	40%	T03	"FID 9A: Transport" on page 10-35
	A9	Feed motor assembly	10%	T03	"FID A9: Feed Motor Assembly" on page 10-49
	FD	Magazine	6%	Q05	Customer-purchased
	99	Transport cable	2%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	97	Motor control card	1%	T02	"FID 97: Motor Control Card" on page 10-25
	A1	Motor cable assembly	1%	T04	"FID A1: Motor Cable Assembly" on page 10-42

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
A9	Failure when loading or unloading tape to or from the magazine or the priority cell. 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. Ensure that the customer is using the correct Cartridge (**3590 Only**). 3. This failure may be caused by a dirty cartridge. Look for any contamination on the sides of the cartridge that could cause the pinch rollers to slip. Have the customer clean or replace the cartridge or magazine, if necessary. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. **Note:** Ensure that the customer does not ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots resulting in contamination on the sides of the cartridges, which may cause this failure. 4. Check that the pinch rollers are not binding, and that the arms are not bent. If the rollers are binding or the arms are bent, replace the transport FID 9A. Check the pinch rollers for contamination. If they are dirty, clean or replace the rollers. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. 5. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs. 6. This failure may be caused by a sensor failure (loader tray up, door open, cartridge present, priority cell, magazine present, magazine lock, limit 1 & 2, import, or export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see "FID CD: Cartridge-Present Sensor" on page 10-101 **6**). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	AA	Transport pinch rollers	23%	T03	"FID AA: Transport Pinch Rollers" on page 10-51
	9A	Transport	23%	T03	"FID 9A: Transport" on page 10-35
	BC	Loader assembly	23%	T42	"FID BC: Loader Assembly" on page 10-89
	99	Transport cable	10%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	A9	Feed motor assembly	9%	T03	"FID A9: Feed Motor Assembly" on page 10-49
	FD	Magazine	5%	Q05	Customer-purchased
	A1	Motor cable assembly	5%	T04	"FID A1: Motor Cable Assembly" on page 10-42
	97	Motor control card	2%	T02	"FID 97: Motor Control Card" on page 10-25
B0	Did not detect pressure				
	B0	Pneumatic system	—	T63	"Pneumatic Problems" on page 2-3
B1	Excessive current or speed is not correct				
	B1	Pneumatic supply	98%	T63	"Pneumatic Problems" on page 2-3
	E4	Card Pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
B3	Thread or unthread failure at machine reel (no current detected in pantocam motor or a sensor did not change state) 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. This failure may also be caused by the plastic shield over the tension transducer assembly interfering with the travel of the pin on the pantocam arm. Before replacing any FRUs below, ensure that the plastic shield is adjusted correctly. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83. 3. Ensure that the Machine Reel hub is assembled so that it is flat against the bottom flange, with no gaps between the two parts. Also, use the gap set tool, P/N 05H4671, to check the adjustment of the gap in the Machine Reel hub. See “Replace Pantocam” on page 10-86 for details. 4. Before replacing FRUs below, ensure that the tape path B sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	BB	Pantocam	85%	T45	“FID BB: Pantocam” on page 10-84
	CF	Tape path B sensor	10%	T33	“FID CF: Tape Path B Sensor” on page 10-104
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
B4	Thread or unthread failure at loader (no current detected in pantocam motor or a sensor did not change state) 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. Before replacing FRUs below, ensure that the tape path A sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	BB	Pantocam	83%	T45	“FID BB: Pantocam” on page 10-84
	CE	Tape path A sensor	10%	T33	“FID CE: Tape Path A Sensor” on page 10-103
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	B6	Decoupler assembly	2%	T41	“FID B6: Decoupler” on page 10-79
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
B7	Air pressure loss in transducer 1. This failure may be caused by a loose screw in the tension transducer assembly. Before replacing any FRUs below, ensure that the hex screw in the center of the tension transducer is tight. **Note:** If the plastic shield over the tension transducer is moved for any reason, it must be readjusted. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83. 2. If this error occurs after replacing an Ultra Card Pack with a Common Card Pack, replace the tension transducer also.				
	B7	Tension transducer assembly	89%	T41	“FID B7: Tension Transducer Assembly” on page 10-81
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	B1	Pneumatic supply	3%	T63	“FID B1: Pneumatic Assembly” on page 10-57
	B2	Pneumatic hose kit	3%	T64	“FID B2: Pneumatic Hose Kit” on page 10-58
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
B9	Cartridge is not fully seated in the loader, or Cartridge present not detected 1. On Model B1A/E1A/H1A loaders, this problem may be caused by the picker failing to insert the cartridge all the way into the loader. Ensure that the loader spring engages with the lip of the cartridge and that the correct spring is installed. See "FID BC: Loader Assembly" on page 10-89 and see the Parts Catalog, "Assembly 3: Deck Enclosure" on page 11-10. 2. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 3. This failure also may be caused by a sensor failure (cartridge present, door open, tray up, or gripper present). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89. 4. On Model B1A/E1A/H1A loaders, this problem may be caused by an alignment problem between the fiducial and the loader. If the loader has been replaced or the fiducial moved, it will be necessary to run the **Teach Selected Drive** routine from the **Teach** pull-down on the library controller. **Note: Fiducials** are called targets in the silo. They are the white target used to electronically align the accessor to the drives and cartridge storage units. To get the silo to "reteach", the CE can open the silo door. The next time the robot tries to mount a tape, it will automatically readjust. 5. On Models B11/E11, the problem may be caused by the ACF transport. Ensure that the gears in the transport are not broken or missing teeth. Attempt to perform "Check and Adjustment of Transport Position Sensor" on page 10-28 before replacing any FRUs.				
	BC	Loader assembly	50%	T42	"FID BC: Loader Assembly" on page 10-89
	—	Either FID 9A, the ACF transport (Model B11/E11/H11), or the library cartridge accessor (Model B1A/E1A/H1A)	35%	—	"FID 9A: Transport" on page 10-35 or if in a library, see the library maintenance documents (i.e., 3494).
	BB	Pantocam (intermittent failures)	10%	T45	"FID BB: Pantocam" on page 10-84
	93	Library interface cover (if present)	5%	T03	"FID 93: Library Interface Cover (Model B1A/E1A/H1A Only)" on page 10-124
BA	Cannot pick leader block from tape 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. This failure may also be caused by a sensor failure (cartridge present, door open, tray up, or tape path A sensor). Before replacing FRUs below, ensure that these four sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	BC	Loader assembly	40%	T42	"FID BC: Loader Assembly" on page 10-89
	C7	File reel motor	25%	T54	"FID C7: File Reel Motor" on page 10-94
	BB	Pantocam	20%	T45	"FID BB: Pantocam" on page 10-84
	CE	Tape path A sensor	10%	T33	"FID CE: Tape Path A Sensor" on page 10-103
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
BB	Pantocam thread or unthread failure. 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. This failure may also be caused by the plastic shield over the tension transducer assembly interfering with the travel of the pin on the pantocam arm. Before replacing any FRUs below, ensure that the plastic shield is adjusted correctly. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83. 3. This failure may be caused by the pantocam arm hitting the deck enclosure back cover. If the top cover is loose or missing, the sides of the back cover can bend in toward the center of the drive and interfere with the pantocam arm. Ensure that the top cover is in place and that the screws are tight. See Figure 9-13 on page 9-28. 4. Ensure that the Machine Reel hub is assembled so that it is flat against the bottom flange, with no gaps between the two parts. Also, use the gap set tool, P/N 05H4671, to check the adjustment of the gap in the Machine Reel hub. See “Replace Pantocam” on page 10-86 for details.				
	—	—	—	—	Perform “Measurement and Adjustment of Pneumatic System” on page 10-4 before replacing any FRUs.
	BB	Pantocam	70%	T45	“FID BB: Pantocam” on page 10-84
	C7	File reel motor (binding)	10%	T54	“FID C7: File Reel Motor” on page 10-94
	C6	Machine reel motor	10%	T54	“FID C6: Machine Reel Motor” on page 10-93
	B0	Pneumatic assembly	3%	T63	“FID B1: Pneumatic Assembly” on page 10-57
	B2	Pneumatic hose kit	3%	T64	“FID B2: Pneumatic Hose Kit” on page 10-58
	DA	Motor, loader, and sensor cable	2%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
BC	Load or unload failure or loader motor failed to turn 1. This failure may be caused by a damaged cartridge. Before replacing any FRUs below, inspect the cartridge that was being used when the error occurred for physical defects. Have the customer replace the cartridge if it is damaged. 2. This failure may be caused by the metal plate on the bottom of the cartridge sticking to the magnet in the file reel motor clutch. Examine the metal plate on the bottom of the cartridge to ensure that it is not loose. Try the cartridge in another drive. Have the customer replace the cartridge if the metal plate is loose or if it fails in another drive.				
	BC	Loader assembly	84%	T42	“FID BC: Loader Assembly” on page 10-89
	C7	File reel motor	10%	T54	“FID C7: File Reel Motor” on page 10-94
	DA	Motor, loader, and sensor cable	4%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
BD	Failure to detect fan motion electronically				
	C1	Power supply	90%	P04	“FID C1: Power Supply” on page 10-62 (2 levels available)
	DB	Power supply cable (new level)	8%	P04	“FID DB: Power Supply Cable (New Level)” on page 10-120
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
BE	Failure to detect fan motion electronically				
	C1	Power supply	90%	P04	“FID C1: Power Supply” on page 10-62 (2 levels available)
	DB	Power supply cable (new level)	8%	P04	“FID DB: Power Supply Cable (New Level)” on page 10-120
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
BF	Failure to detect fan motion electronically				
	BF	Card pack fan	94%	A03	“FID BF: Fan (Card Pack)” on page 10-61
	DA	Motor, loader, and sensor cable	4%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
C0	Sensors are in an invalid combination (usually tape path A and B sensors ON together) **Note:** Before replacing FRUs below, ensure that the appropriate sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	CE	Tape path A sensor	47%	T33	“FID CE: Tape Path A Sensor” on page 10-103
	CF	Tape path B sensor	47%	T33	“FID CF: Tape Path B Sensor” on page 10-104
	DA	Motor, loader, and sensor cable	4%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
C1	12- or 36-volts not within specification.				
	—	This FID is also reported when the drive detects a power outage.	—	—	Power OFF and power back ON.
	C1	Power supply	80%	P04	“FID C1: Power Supply” on page 10-62 (2 levels available)
	DB	Power supply cable (new level)	12%	P04	“FID DB: Power Supply Cable (New Level)” on page 10-120
	E4	Card pack	8%	T21	“FID E4: Card Pack” on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
C2	Sensors are in an invalid combination **Notes:** 1. This failure may be caused by a sensor failure (File protect, Door open, Tray up, Cartridge present, or Cartridge type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. 2. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	CA	Tray up sensor	45%	T33	"FID CA: Tray-Up Sensor" on page 10-98
	CD	Cartridge-present sensor (in the loader)	44%	T33	"FID CD: Cartridge-Present Sensor" on page 10-101
	BC	Loader assembly	6%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
C3	Sensors are in an invalid combination **Notes:** 1. This failure may be caused by a sensor failure (file protect, door open, tray up, cartridge-present, or cartridge-type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. 2. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	CC	Cartridge-type sensor card assembly	45%	T33	"FID CC: Cartridge-Type Sensor Card Assembly" on page 10-99
	CD	Cartridge-present sensor (in the loader)	44%	T33	"FID CD: Cartridge-Present Sensor" on page 10-101
	BC	Loader assembly	6%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
C4	Sensors are in an invalid combination **Note:** Before replacing FRUs below, ensure that the cartridge-type sensor card and the tray-up sensor are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	CA	Tray up sensor	45%	T33	"FID CA: Tray-Up Sensor" on page 10-98
	CC	Cartridge-type sensor card asm	44%	T33	"FID CC: Cartridge-Type Sensor Card Assembly" on page 10-99
	BC	Loader assembly	6%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
C5	Cartridge type sensed as invalid **Note:** Before replacing FRUs below, ensure that the cartridge-type sensor card is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	FE	Cartridge	84%	D07	“FID FE – Isolate Fault Between Media and Hardware” on page 9-123
	CC	Cartridge-type sensor card asm	7%	T33	“FID CC: Cartridge-Type Sensor Card Assembly” on page 10-99
	BC	Loader assembly	4%	T42	“FID BC: Loader Assembly” on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
C6	Machine reel motor failed to move or its speed is not correct **Notes:** 1. Before replacing FRUs below, ensure that the motor connectors are seated properly. 2. If the machine reel motor hub has been replaced recently, ensure all shims were removed from under the hub during the procedure.				
	C6	Machine reel motor	92%	T54	“FID C6: Machine Reel Motor” on page 10-93
	D6	Motor power cable	3%	C09	“FID D6: Motor Power Cables” on page 10-117
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
C7	File reel motor failed to move or its speed is not correct **Note:** Before replacing FRUs below, ensure that the motor connectors are seated properly.				
	C7	File reel motor	90%	T54	“FID C7: File Reel Motor” on page 10-94
	D6	Motor power cable	3%	C09	“FID D6: Motor Power Cables” on page 10-117
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	FE	Cartridge	2%	D07	“FID FE – Isolate Fault Between Media and Hardware” on page 9-123
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67
C8	File protect sensor failed to change state **Note:** Before replacing FRUs below, ensure that the File protect sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	C8	File protect sensor	90%	T32	“FID C8: File-Protect Sensor” on page 10-96
	BC	Loader assembly	5%	T42	“FID BC: Loader Assembly” on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	2%	T21	“FID E4: Card Pack” on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
C9	Door-open sensor failed to change state **Note:** Before replacing FRUs below, ensure that the door open sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	C9	Door-open sensor	92%	T33	"FID C9: Door-Open Sensor" on page 10-97
	BC	Loader assembly	3%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
CA	Tray-up sensor failed to change state **Note:** Before replacing FRUs below, ensure that the tray up sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	CA	Tray up sensor	92%	T33	"FID CA: Tray-Up Sensor" on page 10-98
	BC	Loader assembly	3%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
CB	Sensor failed to change state **Note:** This failure may be caused by a sensor failure (file protect, door open, tray up). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	C8	File protect sensor	30%	T32	"FID C8: File-Protect Sensor" on page 10-96
	C9	Door-open sensor	30%	T33	"FID C9: Door-Open Sensor" on page 10-97
	CA	Tray-up sensor	30%	T33	"FID CA: Tray-Up Sensor" on page 10-98
	BC	Loader assembly	5%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
CC	Cartridge-type sensor failed to change state or sensors are in an invalid combination **Note:** Before replacing FRUs below, ensure that the cartridge type sensor is operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	CC	Cartridge-type sensor card assembly	90%	T33	"FID CC: Cartridge-Type Sensor Card Assembly" on page 10-99
	BC	Loader assembly	3%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
	FE	Cartridge	2%	D07	"FID FE – Isolate Fault Between Media and Hardware" on page 9-123

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
CD	Cartridge-present sensor failed to change state **Notes:** 1. Before replacing FRUs below, ensure that the tray up and cartridge-present sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu. 2. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item 6 in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	CD	Cartridge-present sensor (in the loader)	92%	T33	"FID CD: Cartridge-Present Sensor" on page 10-101
	BC	Loader assembly	3%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
CE	Tape path A sensor failed to change state **Note:** Before replacing FRUs below, ensure that the tape path A sensor is operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	CE	Tape path A sensor	93%	T33	"FID CE: Tape Path A Sensor" on page 10-103
	DA	Motor, pantocam, loader, and sensor cable	5%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
CF	Tape path B sensor failed to change state **Note:** Before replacing FRUs below, ensure that the tape path B sensor is operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	CF	Tape path B sensor	93%	T33	"FID CF: Tape Path B Sensor" on page 10-104
	DA	Motor, loader, and sensor cable	5%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
D0 D1 D2	**D0** Read failure, write failure, track following error, or initial position sensor (IPS) calibration failure **D1** Calibration error; possible interface problem between the head guide and the card pack. **D2** The head did not move 1. Before replacing FRU 'D0' below, inspect the cleaning brush for full head coverage or any noticeable debris. If either condition appears unsatisfactory, go to "FID D4: Head Cleaning Brush Assembly" on page 10-114 first. 2. Before replacing FRU 'D0' below, ensure that the HGA cable connectors are seated and locked into the receptacles in the card pack. See "FID D0: Head Guide and Brush Assembly" on page 10-105 3. If this is a new install or the card pack has been recently replaced, unplug and reseat all of the connectors on the card pack before replacing any FRUs below. See "FID E4: Card Pack" on page 10-67. Ensure that the metal tab on top of the card pack is not bent forward and preventing the connectors from seating correctly. 4. Intermittent read and write data errors may be caused by electrical noise from the pneumatic motor-control cable in the rear of the card pack, if the cable is not routed correctly. Inspect the cable routing to ensure that it is always **outside** of the card pack metal enclosure. 5. Before replacing FRU 'D0' below, perform the following diagnostic procedure to determine if the problem is being caused by the head guide and brush assembly or the card pack/cable FRUs. a. Power OFF the drive and disconnect the IPS connector (**2** in "FID DC: ACF and Operator/CE Panel Cable" on page 10-121). b. Power ON and measure voltages on the IPS connector (cable end) as follows: **Note:** Pin 2 is empty. 1) Pin 1 (-) to Pin 3 (+) 2.24 V dc ±10% 2) Pin 1 (-) to Pin 4 (+) 5.10 V dc ±10% 3) Pin 1 (-) to Pin 5 (+) 2.24 V dc ±10% c. If any of the voltages **are not** correct, the problem is being caused by the Card Pack (FRU E4) or the ACF and operator/CE panel cable (FRU DC). If all of the voltages **are** correct, the problem is being caused by the HGA (FRU D0) or the head cleaning brush assembly. (FRU D4). d. **Attention: DO NOT** connect the IPS connector with power ON. Damage to the HGA can occur. Power OFF the drive and connect the IPS connector.				
	D0	Head guide and brush asm (D08 = clean only, T22 = replace)	77%	D08/ T22	"FID D0: Head Guide and Brush Assembly" on page 10-105
	D4	Head cleaning brush asm	8%	T49	"FID D4: Head Cleaning Brush Assembly" on page 10-114
	B5	Tape lifter solenoid	5%	T41	"FID B5: Tape-Lifter Solenoid" on page 10-77
	DA	Motor, loader, and sensor cable (FID D0 only)	4%	C09	"FID DC: ACF and Operator/CE Panel Cable" on page 10-121
	DC	ACF and operator/CE panel cable	4%	C09	"FID DC: ACF and Operator/CE Panel Cable" on page 10-121
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
D3	Track following error while moving tape 1. Before replacing FRU 'D0' below, ensure that the HGA cable connectors are seated and locked into the receptacles in the card pack. See "FID D0: Head Guide and Brush Assembly" on page 10-105 2. If this drive is using the Extended High Performance tape cartridge, ensure the correct HGA is installed. The Extended High Performance tape cartridge HGAs have a '**2X**' label on the top of the 'D' bearings.				
	FE	Cartridge	70%	D07	"FID FE – Isolate Fault Between Media and Hardware" on page 9-123
	D0	Head guide and brush asm (D08 = clean only, T22 = replace)	20%	D08/ T22	"FID D0: Head Guide and Brush Assembly" on page 10-105
	DC	ACF and operator/CE panel cable	5%	C09	"FID DC: ACF and Operator/CE Panel Cable" on page 10-121
	E4	Card pack	5%	T21	"FID E4: Card Pack" on page 10-67
D8	Read/write error. 1. Before replacing FRU 'D0' below, ensure that the HGA cable connectors are seated and locked into the receptacles in the card pack. See "FID D0: Head Guide and Brush Assembly" on page 10-105 2. If this error occurs after replacing an Ultra Card Pack with a Common Card Pack, ensure that the HGA cable connections are seated correctly on the card pack. If that is not the problem, replace 'D0' (head, guide and brush assembly) also.				
	E4	Card pack	54%	T21	"FID E4: Card Pack" on page 10-67
	D0	Head guide and brush assembly (D08 = clean only, T22 = replace)	45%	D08/ T22	"FID D0: Head Guide and Brush Assembly" on page 10-105
	DC	ACF and operator/CE panel cable	1%	C09	"FID DC: ACF and Operator/CE Panel Cable" on page 10-121
DD	Fault detected in loader sensors or the sensors are in an invalid combination **Notes:** 1. This failure may be caused by a sensor failure (file protect, door open, tray up, cartridge present, or cartridge type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. 2. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	C8	File protect sensor	19%	T32	"FID C8: File-Protect Sensor" on page 10-96
	C9	Door-open sensor	19%	T33	"FID C9: Door-Open Sensor" on page 10-97
	CA	Tray-up sensor	18%	T33	"FID CA: Tray-Up Sensor" on page 10-98
	CD	Cartridge-present sensor (in the loader)	18%	T33	"FID CD: Cartridge-Present Sensor" on page 10-101
	CC	Cartridge-type sensor card asm	18%	T33	"FID CC: Cartridge-Type Sensor Card Assembly" on page 10-99
	BC	Loader assembly	3%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
DE	Sensors are in an invalid combination **Note:** This failure may be caused by a sensor failure (door open sensor, or cartridge type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	C9	Door-open sensor	44%	T33	"FID C9: Door-Open Sensor" on page 10-97
	CC	Cartridge-type sensor card asm	43%	T33	"FID CC: Cartridge-Type Sensor Card Assembly" on page 10-99
	BC	Loader assembly	3%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67
DF	Sensors are in an invalid combination **Notes:** 1. This failure may be caused by a sensor failure (file protect, door open, tray up, cartridge present, or cartridge-type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu. 2. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the loader assembly. See "FID BC: Loader Assembly" on page 10-89.				
	C8	File protect sensor	30%	T32	"FID C8: File-Protect Sensor" on page 10-96
	CD	Cartridge-present sensor (in the loader)	30%	T33	"FID CD: Cartridge-Present Sensor" on page 10-101
	CC	Cartridge-type sensor card asm	30%	T33	"FID CC: Cartridge-Type Sensor Card Assembly" on page 10-99
	BC	Loader assembly	5%	T42	"FID BC: Loader Assembly" on page 10-89
	DA	Motor, loader, and sensor cable	3%	C09	"FID DA: Motor, Loader, and Sensor Cable" on page 10-118
	E4	Card pack	2%	T21	"FID E4: Card Pack" on page 10-67

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
E0	Tape motion error (velocity or tape slipping error).				
	—	—	—	—	Perform “Measurement and Adjustment of Pneumatic System” on page 10-4
	FE	Tape cartridge	30%	D07	“FID FE – Isolate Fault Between Media and Hardware” on page 9-123
	—	Pneumatic problem	30%	T63	“Pneumatic Problems” on page 2-3
	C7	File reel motor	15%	T54	“FID C7: File Reel Motor” on page 10-94
	C6	Machine reel motor	15%	T54	“FID C6: Machine Reel Motor” on page 10-93
	CF	Tape path B sensor	6%	T33	“FID CF: Tape Path B Sensor” on page 10-104
	DA	Motor, loader, and sensor cable	1%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	D6	Motor power cable	1%	C09	“FID D6: Motor Power Cables” on page 10-117
	B7	Tension transducer assembly	1%	T54	“FID B7: Tension Transducer Assembly” on page 10-81
	E4	Card pack	1%	T21	“FID E4: Card Pack” on page 10-67
E3	Pressure sensor failed to actuate				
	E3	Pressure sensor assembly	100%	T62	“FID E3: Pressure Sensor” on page 10-65
E4	Electronic-detected fault • If this is a new install or the card pack has been recently replaced, unplug and re-seat all of the connectors on the card pack before replacing any FRUs below. See “FID E4: Card Pack” on page 10-67. Ensure that the metal tab on top of the card pack is not bent forward and preventing the connectors from seating correctly. • If you were running SCSI or fibre wrap test, check the following before you replace the card pack: 1. If you were running the Wrap Test at the drive itself, make sure wrap plug is making a good connection or try a different Wrap Plug. Rerun the test to make sure the card pack is at fault. 2. If you were running the wrap test through the cable when you received this error, try wrap test at drive. If the test runs without error at the drive, then replace the cable. If test still provides FID E4 then replace the card pack.				
	E4	Card pack	85%	T21	“FID E4: Card Pack” on page 10-67
	C1	Power supply	10%	P04	“FID C1: Power Supply” on page 10-62 (2 levels available)
	BB	Pantocam (binding) (Microcode D0IA and D0IB only)	3%	T45	“FID BB: Pantocam” on page 10-84 See “Microcode EC Level History Log” on page 9-61 to determine what level of code you are at.
	B7	Tension transducer asm	1%	T54	“FID B7: Tension Transducer Assembly” on page 10-81
	DB	Power supply cable (new level)	1%	P04	“FID DB: Power Supply Cable (New Level)” on page 10-120
E5	Microcode detected a fault with the microcode • If this is a new install or the card pack has been recently replaced, unplug and reseat all of the connectors on the card pack before replacing any FRUs below. See “FID E4: Card Pack” on page 10-67				
	E5	Microcode (known or new) (M01 = known, M02 = new)	100%	M01/ M02	“FID E5 – Microcode Problem” on page 9-118

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
E6	Timing problem in the microcode or the electronics, or multiple check-1 errors occurred • If this is a new install or the card pack has been recently replaced, unplug and reseat all of the connectors on the card pack before replacing any FRUs below. See “FID E4: Card Pack” on page 10-67				
	E5	Microcode (known or new) (M01 = known, M02 = new)	49%	M01/ M02	“FID E6 or E7– Isolate Fault Between Microcode and Hardware” on page 9-120
	E4	Card pack	40%	T21	“FID E4: Card Pack” on page 10-67
	C1	Power supply	8%	P04	“FID C1: Power Supply” on page 10-62 (2 levels available)
	DB	Power supply cable (New Level)	2%	P04	“FID DB: Power Supply Cable (New Level)” on page 10-120
	97	Motor Control Card	1%	T02	“FID 97: Motor Control Card” on page 10-25
E7	Timing problem in the microcode or the electronics				
	E5	Microcode (known or new) (M01 = known, M02 = new)	60%	M01/ M02	“FID E6 or E7– Isolate Fault Between Microcode and Hardware” on page 9-120
	E4	Card pack	40%	T21	“FID E4: Card Pack” on page 10-67
E8	Timing problem in the hardware or microcode				
	—	Timing problem in drive occurs while writing and/or reading tape.	—	—	See “CE Utilities Menu” on page 5-66 to set a microcode trap based on support data, get a dump and contact your next level of support.
EF	Fault in pantocam or electronics while threading or unthreading				
	BB	Pantocam	80%	T45	“FID BB: Pantocam” on page 10-84
	E4	Card pack	15%	T21	“FID E4: Card Pack” on page 10-67
	DA	Motor, loader, and sensor cable	5%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
F0 F1 F2 F3	**F0 or F1** Read error **F2** Read error while writing **Note:** Reported FID F2 with FSC 3541 may be caused by an intermittent file protect switch or a faulty cable in the loader. Install a new loader assembly, FID BC, before replacing any of the FRUs listed below. **F3** Track-following error **—** **Note:** If this drive is using the Extended High Performance tape cartridge, ensure the correct HGA is installed. The Extended High Performance tape cartridge HGAs have a '**2X**' label on the top of the 'D' bearings.				
	FE	Cartridge	60%	D07	“FID FE – Isolate Fault Between Media and Hardware” on page 9-123
	D0	Head guide and brush asm (D08 = clean only, T22 = replace)	30%	D08/ T22	“FID D0: Head Guide and Brush Assembly” on page 10-105
	E4	Card pack	10%	T21	“FID E4: Card Pack” on page 10-67
F4	RS-422 bus error				
	F4	RS-422 interface problem	—	—	Run the RS-422 wrap test (see “Library Manager Port Wrap Test” on page 9-111). If problem re-occurs, get a microcode dump and contact your next level of support.

Table 1-2. FIDs, FRUs, and TACs (continued)

Reported FID	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
F5	SCSI bus or Fibre Channel error				
	F5	SCSI interface, operator procedural, or host problem	—	—	"SCSI Bus Problem Determination" on page 9-108 or "Fibre Channel Problem Determination Procedure" on page 9-113
F6	Informational message—Cleaning required due to performance. **Notes:** 1. Informational FID F6 or FF with FSCs 7036, 7037, 7038 or C559 are normal. These FSCs are generated when a drive requires cleaning or has been cleaned. 2. If this FID continues to be posted, check to see if the head guide and brush assembly cleaner blade has been removed. Refer to Figure 10-78 on page 10-113 for the location of the cleaner blade. If the cleaner blade is present, remove it using the procedure at "Cleaner Blade Removal (Model B11/B1A)" on page 10-112. Refer to "Excessive Clean Messages" on page 9-5.				
	F6	Operator, procedural, or host problem	100%	—	—
F7	SCSI or Fibre Wrap Test Failure • If this is a new install or the card pack has been recently replaced, unplug and re-seat all of the connectors on the card pack before replacing any FRUs below. See "FID E4: Card Pack" on page 10-67. Ensure that the metal tab on top of the card pack is not bent forward and preventing the connectors from seating correctly. • If you were running SCSI or fibre wrap test, check the following before you replace the card pack: 1. If you were running the wrap test at the drive itself, make sure wrap plug is making a good connection or try a different wrap plug. Rerun the test to make sure the card pack is at fault. 2. If you were running the wrap test through the fibre cable when you received this error, try wrap test at drive. If the test runs without error at the drive, then replace the cable. If test still provides FID F7 then replace the card pack.				
	E4	Card Pack	100%	T21	"FID E4: Card Pack" on page 10-67
FE	Cartridge problem				
	FE	Cartridge	—	D07	"FID FE – Isolate Fault Between Media and Hardware" on page 9-123
FF	Informational or non-hardware related status or error **Note:** Informational FID FF with FSCs 7036, 7037, 7038 or C559 are normal. These FSCs are generated when a drive requires cleaning or has been cleaned.				
	—	Operator procedural or host problem	—	—	"FID FF – Operator Action or Host Program Error" on page 9-125

Attention Drive Messages

If the ATTN DRV message **is displayed on operator/CE panel (not from CE Error Log)**.
1. If ATTN is displayed, press the Enter pushbutton. If a FID appears, go to Table 1-2 on page 1-9.
2. If no FID is presented, use the ATTN DRV message and follow the error log procedure below.

If the ATTN DRV message **is from the CE Error Log**, (Figure 5-18 on page 5-50):
1. Go to “Error Log Analysis Procedure” on page 9-126 and analyze the error log for any FIDs with a time stamp close to the time of the ATTN DRV message. If a FID appears to be associated with the ATTN DRV message, go to Table 1-2 on page 1-9.
2. If the error log does not help identify a FID, run CE DIAGS, (“CE Verify Fix Menu” on page 5-39, Test Drive function).
3. If the CE DIAGS do not identify a FID, use the ATTN DRV message and Table 1-3 on page 1-33 to find the fault.

At the start of your service call, write down the supplemental message associated with the **Attention** message. (For example: **Load Error** or **Tension Dropped**.)

At the end of the service call, record the first 12 characters of the Attention message data in the *FAULT SYMPTOM CODE (FSC)* field of the call report.

This detailed call reporting will help Engineering and Field Support to quickly identify, understand, and resolve field problems.

Table 1-3. ATTN DRV Messages

ATTN DRV	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Load Error	1. Ensure that the cartridge is not broken and the leader block is intact. See “Damaged Cartridges” in *3590 High Performance Tape Subsystem User’s Guide*. 2. Ensure that the cartridge is a 3590 compatible-type cartridge. Also, check the location of the tape and the leader block. 3. This failure also may be caused by the plastic shield over the tension transducer assembly interfering with the travel of the pin on the pantocam arm. Before replacing any FRUs below, ensure that the plastic shield is adjusted correctly. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83. 4. Before replacing FRUs below, ensure that the motor connectors are seated properly. 5. If the machine reel motor hub has been replaced recently, ensure all shims were removed from under the hub during the procedure. 6. Check Machine Reel Hub Gap, see “Replace Pantocam” on page 10-86. 7. This failure may be caused by a sensor failure (tape path A & B, loader tray up, door open, file protect, cartridge present, or cartridge type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu. **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp, see item **6** in Figure 10-70 on page 10-102. Verify the sensor operation by flexing the cable while running “Display Sensors Procedure” on page 9-35. If the cable is bad, replace the loader assembly. See “FID BC: Loader Assembly” on page 10-89. 8. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4 before replacing any FRUs.			
	BB	Pantocam	44%	T45	“FID BB: Pantocam” on page 10-84
	BC	Loader assembly	30%	T42	“FID BC: Loader Assembly” on page 10-89
	C7	File reel motor	20%	T54	“FID C7: File Reel Motor” on page 10-94
	D6	Motor power cable	1%	C09	“FID D6: Motor Power Cables” on page 10-117
	DA	Motor, loader, and sensor cable	1%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	B7	Tension transducer asm	1%	T54	“FID B7: Tension Transducer Assembly” on page 10-81
	C6	Machine reel motor	1%	T54	“FID C6: Machine Reel Motor” on page 10-93
	D0	Head guide and brush asm (D08 = clean only, T22 = replace)	1%	D08/ T22	“FID D0: Head Guide and Brush Assembly” on page 10-105
	E4	Card pack	1%	T21	“FID E4: Card Pack” on page 10-67

Table 1-3. ATTN DRV Messages (continued)

ATTN DRV	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Unload Error	1. Ensure that the cartridge is not broken and the leader block is intact. See “Damaged Cartridges” in *IBM TotalStorage Enterprise Tape System 3590 User’s Guide*. 2. Ensure that the cartridge is a 3590 compatible-type cartridge. Also, check the location of the tape and the leader block. 3. This failure also may be caused by the plastic shield over the tension transducer assembly interfering with the travel of the pin on the pantocam arm. Before replacing any FRUs below, ensure that the plastic shield is adjusted correctly. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83. 4. Check Machine Reel Hub Gap, see “Replace Pantocam” on page 10-86. 5. This failure may be caused by a sensor failure (tape path A & B, loader tray up, door open, file protect, cartridge present, or cartridge type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu. **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp, see item **6** in Figure 10-70 on page 10-102. Verify the sensor operation by flexing the cable while running “Display Sensors Procedure” on page 9-35. If the cable is bad, replace the loader assembly. See “FID BC: Loader Assembly” on page 10-89. 6. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4 before replacing any FRUs.			
	BB	Pantocam	45%	T45	“FID BB: Pantocam” on page 10-84
	BC	Loader assembly	30%	T42	“FID BC: Loader Assembly” on page 10-89
	C7	File reel motor	20%	T54	“FID C7: File Reel Motor” on page 10-94
	D6	Motor power cable	1%	C09	“FID D6: Motor Power Cables” on page 10-117
	DA	Motor, loader, and sensor cable	1%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	C6	Machine reel motor	1%	T54	“FID C6: Machine Reel Motor” on page 10-93
	D0	Head guide and brush asm (D08 = clean only, T22 = replace)	1%	D08/ T22	“FID D0: Head Guide and Brush Assembly” on page 10-105
	E4	Card pack	1%	T21	“FID E4: Card Pack” on page 10-67
FSC Trap Taken	The microcode encountered the trap address set from a CE panel menu.				
	—	Not a fault	—	—	—
Tension Dropped	Tape motion error (velocity or tape slipping error). **Note:** If the machine reel motor hub has been replaced recently, ensure all shims were removed from under the hub during the procedure.				
	—	Pneumatic system or tape cartridge fault	—	—	See FID E0 on page 1-29.

Table 1-3. ATTN DRV Messages (continued)

ATTN DRV	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Invalid Cartridge	1. Ensure that the cartridge is not damaged or broken and that the cartridge is a 3590 cartridge. 2. If this failure is being caused by an Extended High Performance Cartridge (green label), determine if the Extended High Performance Cartridge hardware and microcode are installed. If the hardware is installed there will be a **2X** label on the back cover and on the Head Guide Assembly. If the microcode is at or above level EC F23256 (D0IA_4D9), EC F23091 (D0IB_8A4), or EC F23207 (D0IC_A9A), the Extended High Performance Cartridge microcode is installed. If this drive has the Extended High Performance Cartridge tape hardware and microcode installed, ensure the CE Drive Options Menu is set for **Hdwr *Present* for double length tape**. See “CE Drive Options Menu” on page 5-52. 3. Before replacing FRUs below, ensure that the cartridge type sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	FE	Cartridge	96%	D07	See “Damaged Cartridges” in *IBM TotalStorage Enterprise Tape System 3590 User’s Guide*.
	CC	Cartridge type sensor card asm	2%	T33	“FID CC: Cartridge-Type Sensor Card Assembly” on page 10-99
	DA	Motor, loader, and sensor cable	1%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	E4	Card pack	1%	T21	“FID E4: Card Pack” on page 10-67
Temp AC Power Dip	The microcode encountered a Temp AC Power dip condition or power surge.				
	—	Customer Power	90%	—	If this condition continues, have the customer verify that his power source is adequate for the load. **Note:** Electrical weather conditions may be the cause of this problem.
	C1	Power supply	8%	P04	“FID C1: Power Supply” on page 10-62 (2 levels available)
	DB	Power supply cable (New Level)	1%	P04	“FID DB: Power Supply Cable (New Level)” on page 10-120
	E4	Card pack	1%	T21	“FID E4: Card Pack” on page 10-67
Head Calib Failed	Head failed to position correctly.				
	D0	Head guide and brush assembly	90%	T22	“FID D0: Head Guide and Brush Assembly” on page 10-105
	DC	ACF and operator/CE panel cable	6%	C09	“FID DC: ACF and Operator/CE Panel Cable” on page 10-121
	E4	Card Pack	4%	T21	“FID E4: Card Pack” on page 10-67

Table 1-3. ATTN DRV Messages (continued)

ATTN DRV	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
ERP Reload Failure	1. Ensure that the cartridge is not broken and the leader block is intact. See “Damaged Cartridges” in *IBM TotalStorage Enterprise Tape System User’s Guide*. 2. This failure also may be caused by the plastic shield over the tension transducer assembly interfering with the travel of the pin on the pantocam arm. Before replacing any FRUs below, ensure that the plastic shield is adjusted correctly. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83. 3. Check Machine Reel Hub Gap, see “Replace Pantocam” on page 10-86. 4. This failure may be caused by a sensor failure (tape path A and B, loader tray up, door open, file protect, cartridge present, or cartridge type sensor card). **Notes:** a. Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu. b. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running “Display Sensors Procedure” on page 9-35. If the cable is bad, replace the loader assembly. See “FID BC: Loader Assembly” on page 10-89. 5. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4 before replacing any FRUs.				
	BB	Pantocam	64%	T45	“FID BB: Pantocam” on page 10-84
	C7	File reel motor	35%	T54	“FID C7: File Reel Motor” on page 10-94
	D6	Motor power cable	2%	C09	“FID D6: Motor Power Cables” on page 10-117
	DA	Motor, loader, and sensor cable	2%	C09	“FID DA: Motor, Loader, and Sensor Cable” on page 10-118
	B7	Tension transducer asm	2%	T54	“FID B7: Tension Transducer Assembly” on page 10-81
	C6	Machine reel motor	2%	T54	“FID C6: Machine Reel Motor” on page 10-93
	D0	Head guide and brush asm (D08 = clean only, T22 = replace)	2%	D08/ T22	“FID D0: Head Guide and Brush Assembly” on page 10-105
	E4	Card pack	1%	T21	“FID E4: Card Pack” on page 10-67
Clean Required	The drive is fenced and cannot be used until the drive is cleaned. This usually occurs when the customer ignores requests for a cleaning cycle.				
	—	Load cleaner cartridge.	—	—	“Cleaning Cartridge” on page 3-41
Wipe Failed	The drive attempted to recover by unloading and reloading the tape and failed during the process.				
	—	Reformat of the tape failed	—	—	FID entry point 1-30 F0 or F1.

Attention ACF Messages

If the ATTN ACF message **is displayed on operator/CE panel (not from CE Error Log)**.
1. If ATTN is displayed, press the Enter pushbutton. If a FID appears, go to Table 1-2 on page 1-9.
2. If no FID is presented, use the ATTN ACF message and follow the error log procedure below.

If the ATTN ACF message **is from the CE Error Log**, (Figure 5-18 on page 5-50):
1. Go to “Error Log Analysis Procedure” on page 9-126 and analyze the error log for any FIDs with a time stamp close to the time of the ATTN ACF message. If a FID appears to be associated with the ATTN ACF message, go to Table 1-2 on page 1-9.
2. If the error log does not help identify a FID, run CE DIAGS, (“CE Verify Fix Menu” on page 5-39, Test ACF function).
3. If the CE DIAGS do not identify a FID, use the ATTN ACF message and Table 1-4 on page 1-38 to find the fault.

Special note about cartridges. If a 3480 or a 3490 cartridge is inserted in the ACF, unpredictable results can occur because the cartridges are transparent, making it difficult for the sensors to detect the position of the cartridge.

At the start of your service call, write down the supplemental message associated with the **Attention ACF** message. (For example: **Move Error** or **Transport Full**.)

At the end of the service call, record the first 12 characters of the Attention ACF message data in the *FAULT SYMPTOM CODE (FSC)* field of the call report.

This detailed call reporting will help Engineering and Field Support to quickly identify, understand, and resolve field problems.

Table 1-4. ATTN ACF Messages

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Move Error	Ensure that the cartridge is not damaged or broken and that the cartridge is a 3590 cartridge. **Notes:** 1. This failure may be caused by a sensor failure (file protect, door open, tray up, cartridge present, or cartridge type sensor card). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu. 2. Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp (see item **6** in Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running “Display Sensors Procedure” on page 9-35. If the cable is bad, replace the loader assembly. See “FID BC: Loader Assembly” on page 10-89.				
	—	—	—	—	Attempt to perform “Check and Adjustment of Transport Position Sensor” on page 10-28 before replacing any FRUs.
	9A	Transport	40%	T03	“FID 9A: Transport” on page 10-35
	BC	Loader assembly	15%	T42	“FID BC: Loader Assembly” on page 10-89
	92	Leadscrew assembly	10%	T03	“FID 92: Leadscrew Assembly” on page 10-15
	AB	Leadscrew drive belt	10%	T03	“FID AB: Leadscrew Drive Belt” on page 10-54
	99	Transport cable	5%	T04	“FID 99: Transport Cable (Former Style)” on page 10-31 or “FID 99: Transport Cable (Current Style)” on page 10-33
	95	Elevator motor assembly	4%	T03	“FID 95: Elevator Motor Assembly” on page 10-20
	A9	Feed motor assembly	3%	T03	“FID A9: Feed Motor Assembly” on page 10-49
	96	Pinch motor assembly	3%	T03	“FID 96: Pinch Motor Assembly” on page 10-23
	FD	Magazine	3%	Q05	Customer-purchased
	97	Motor control card	2%	T02	“FID 97: Motor Control Card” on page 10-25
	A1	Motor cable assembly	2%	T04	“FID A1: Motor Cable Assembly” on page 10-42
	98	Transport-position sensor	1%	T01	“FID 98: Transport Position Sensor” on page 10-26
	A2	Drive/ACF cable	1%	T04	“FID A2: Drive/ACF Cable” on page 10-44
	C9	Door-open sensor	1%	T33	“FID C9: Door-Open Sensor” on page 10-97

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Clear Picker Path	The device detected the presence of a possible blockage in the cartridge path, such as in the magazine or in the priority cell. 1. Check the position of all cartridges to ensure they are properly positioned in the magazine and in the priority cell. A cartridge that extends too far into the magazine in the import position or a damaged cartridge can cause this error. 2. Remove the magazine and look for any obvious obstructions. 3. Try another magazine in the ACF. 4. Before replacing FRUs below, ensure that the interference sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	9B	Global/ interference sensor	85%	T01	See Clear Picker Path Note, then go to “FID 9B: Global/Interference Sensor Assembly (Upper and Lower)” on page 10-38
	97	Motor control card	6%	T02	“FID 97: Motor Control Card” on page 10-25
	A5	Sensor cable	5%	T01	“FID A5: Sensor Cable” on page 10-46
	A2	Drive/ACF cable	4%	T04	“FID A2: Drive/ACF Cable” on page 10-44
Lock Magazine	Lock the magazine by pressing the lock button on the front of the ACF. **Note:** Before replacing FRUs below, ensure that the magazine lock sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	A6	LED cards	84%	T02	“FID A6: LED Cards and Random Lock Sensor” on page 10-48
	A4	LED cable	10%	T01	“FID A4: LED Cable” on page 10-45
	97	Motor control card	4%	T02	“FID 97: Motor Control Card” on page 10-25
	A2	Drive/ACF cable	2%	T04	“FID A2: Drive/ACF Cable” on page 10-44
Lock Error	Try locking and unlocking the magazine. Try another magazine. **Note:** Before replacing FRUs below, ensure that the magazine lock sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	A6	LED cards	84%	T02	“FID A6: LED Cards and Random Lock Sensor” on page 10-48
	A4	LED cable	10%	T01	“FID A4: LED Cable” on page 10-45
	97	Motor control card	4%	T02	“FID 97: Motor Control Card” on page 10-25
	A2	Drive/ACF cable	2%	T04	“FID A2: Drive/ACF Cable” on page 10-44

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Magazine Locked	If this is a problem, try unlocking the magazine. Try another magazine. **Note:** Before replacing FRUs below, ensure that the magazine lock sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	A6	LED cards	84%	T02	“FID A6: LED Cards and Random Lock Sensor” on page 10-48
	A4	LED cable	10%	T01	“FID A4: LED Cable” on page 10-45
	97	Motor control card	4%	T02	“FID 97: Motor Control Card” on page 10-25
	A2	Drive/ACF cable	2%	T04	“FID A2: Drive/ACF Cable” on page 10-44
Unlock Magazine	Ensure that the magazine is unlocked. Try another magazine. **Note:** Before replacing FRUs below, ensure that the magazine lock sensor is operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	A6	LED cards	84%	T02	“FID A6: LED Cards and Random Lock Sensor” on page 10-48
	A4	LED cable	10%	T01	“FID A4: LED Cable” on page 10-45
	97	Motor control card	4%	T02	“FID 97: Motor Control Card” on page 10-25
	A2	Drive/ACF cable	2%	T04	“FID A2: Drive/ACF Cable” on page 10-44
Extra Cartridge	The device loaded a cartridge from the magazine and detected that another cartridge was placed in its home position. The device attempts to place the cartridge in the priority cell to await operator action. If the priority cell is full, it ejects the cartridge when the priority slot is unloaded or when the Enter pushbutton is pressed. 1. Ensure that no cartridge has been inserted into an ‘in use’ cell (green LED on). 2. Visually check the transport ribbon cable for damage at the folds. **Note:** This failure may be caused by a sensor failure (priority cell, limit 1 & 2, import, export) Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	99	Transport cable	80%	T04	“FID 99: Transport Cable (Former Style)” on page 10-31 or “FID 99: Transport Cable (Current Style)” on page 10-33
	9A	Transport	9%	T03	“FID 9A: Transport” on page 10-35
	9E	Priority cell sensor (pair)	4%	T01	“FID 9E: Priority Cell Sensor” on page 10-39
	97	Motor control card	3%	T02	“FID 97: Motor Control Card” on page 10-25
	A5	Sensor cable	2%	T01	“FID A5: Sensor Cable” on page 10-46
	A2	Drive/ACF cable	2%	T04	“FID A2: Drive/ACF Cable” on page 10-44

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
No Magazine	Ensure that the magazine is properly installed and latched in place. Try a different magazine. **Note:** Before replacing FRUs below, ensure that the magazine present sensor is operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	A0	Magazine-present sensor asm	88%	T01	"FID A0: Magazine-Present Sensor Assembly" on page 10-41
	97	Motor control card	6%	T02	"FID 97: Motor Control Card" on page 10-25
	A5	Sensor cable	4%	T01	"FID A5: Sensor Cable" on page 10-46
	A2	Drive/ACF cable	2%	T04	"FID A2: Drive/ACF Cable" on page 10-44
No Cartridge	The device cannot find a cartridge in the **import** position in the magazine or the priority cell. 1. Check the position of all the cartridges to ensure they are properly positioned in the import position of the magazine and the priority cell. If this condition is not cleared, remove and replace the magazine. 2. Press Start. **Note:** This failure may be caused by a sensor failure (priority cell, global interference, limit 1 & 2, import, export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	9E	Priority cell sensor (pair)	48%	T01	"FID 9E: Priority Cell Sensor" on page 10-39
	9B	Global/Interference sensor	16%	T01	See Clear Picker Path Note, then go to "FID 9B: Global/Interference Sensor Assembly (Upper and Lower)" on page 10-38
	9A	Transport	14%	T03	"FID 9A: Transport" on page 10-35
	99	Transport cable	12%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	A5	Sensor cable	10%	T01	"FID A5: Sensor Cable" on page 10-46
	97	Motor control card	5%	T02	"FID 97: Motor Control Card" on page 10-25
	A2	Drive/ACF cable	3%	T04	"FID A2: Drive/ACF Cable" on page 10-44

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Priority Export ER	The cartridge is not positioned in the correct export position (either too far in or not far enough in the cell). 1. The sensor detected that the cartridge was not delivered far enough into the cell or too far into the cell. 2. Remove the tape cartridge. **Note:** This failure may be caused by a sensor failure (priority cell, limit 1 & 2, import, export) Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	—	—	—	—	Attempt to perform “Check and Adjustment of Transport Position Sensor” on page 10-28 before replacing any FRUs.
	FD	Magazine	55%	Q05	Customer-purchased
	9A	Transport	26%	T03	“FID 9A: Transport” on page 10-35
	99	Transport cable	10%	T04	“FID 99: Transport Cable (Former Style)” on page 10-31 or “FID 99: Transport Cable (Current Style)” on page 10-33
	9E	Priority cell sensor (pair)	5%	T01	“FID 9E: Priority Cell Sensor” on page 10-39
	97	Motor control card	4%	T02	“FID 97: Motor Control Card” on page 10-25
Magazine Export ER	The cartridge is not positioned in the correct export position (either too far in or not far enough in the cell). 1. The sensor detected that the cartridge was not delivered far enough into the magazine or too far into the magazine. 2. Remove the magazine and check that the cartridges are in the correct export position. **Note:** This failure may be caused by a sensor failure (limit 1 & 2, import, export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	—	—	—	—	Attempt to perform “Check and Adjustment of Transport Position Sensor” on page 10-28 before replacing any FRUs.
	FD	Magazine	56%	Q05	Customer-purchased
	9A	Transport	35%	T03	“FID 9A: Transport” on page 10-35
	97	Motor control card	5%	T02	“FID 97: Motor Control Card” on page 10-25
	99	Transport cable	4%	T04	“FID 99: Transport Cable (Former Style)” on page 10-31 or “FID 99: Transport Cable (Current Style)” on page 10-33

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Magazine Full	The magazine is full of cartridges. 1. The sensor detected that the magazine cannot hold any more cartridges. 2. Remove the magazine and replace the cartridges or insert another full magazine. **Note:** This failure may be caused by a sensor failure (limit 1 & 2, import, export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	FD	Magazine	56%	Q05	Customer-purchased
	9A	Transport	35%	T03	“FID 9A: Transport” on page 10-35
	97	Motor control card	5%	T02	“FID 97: Motor Control Card” on page 10-25
	99	Transport cable	4%	T04	“FID 99: Transport Cable (Former Style)” on page 10-31 or “FID 99: Transport Cable (Current Style)” on page 10-33
ACF Not Enabled	Ensure there are cartridges in the ACF and that they are seated in the import position. **Note:** This failure may be caused by a sensor failure (priority cell, global interference, cartridge present, import). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	9E	Priority cell sensor (pair)	33%	T01	“FID 9E: Priority Cell Sensor” on page 10-39
	9B	Global/Interference sensor	25%	T01	See Clear Picker Path Note, then go to “FID 9B: Global/Interference Sensor Assembly (Upper and Lower)” on page 10-38
	9A	Transport	20%	T03	“FID 9A: Transport” on page 10-35
	A5	Sensor cable	10%	T01	“FID A5: Sensor Cable” on page 10-46
	97	Motor control card	5%	T02	“FID 97: Motor Control Card” on page 10-25
	99	Transport cable	4%	T04	“FID 99: Transport Cable (Former Style)” on page 10-31 or “FID 99: Transport Cable (Current Style)” on page 10-33
	A2	Drive/ACF cable	3%	T04	“FID A2: Drive/ACF Cable” on page 10-44
Feed Over-current	An over-current condition was detected in the ACF feed motor circuitry.				
	97	Motor control card	60%	T02	“FID 97: Motor Control Card” on page 10-25
	A9	Feed motor assembly	20%	T03	“FID A9: Feed Motor Assembly” on page 10-49
	A2	Drive/ACF cable	15%	T04	“FID A2: Drive/ACF Cable” on page 10-44
	E4	Card pack	5%	T21	“FID E4: Card Pack” on page 10-67

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Pinch Over-current	An over-current condition was detected in the ACF pinch motor circuitry.				
	97	Motor control card	60%	T02	“FID 97: Motor Control Card” on page 10-25
	96	Pinch motor assembly	20%	T03	“FID 96: Pinch Motor Assembly” on page 10-23
	A2	Drive/ACF cable	15%	T04	“FID A2: Drive/ACF Cable” on page 10-44
	E4	Card pack	5%	T21	“FID E4: Card Pack” on page 10-67
Picker Over-current	An over-current condition was detected in the ACF elevator motor circuitry.				
	97	Motor control card	60%	T02	“FID 97: Motor Control Card” on page 10-25
	95	Elevator motor assembly	20%	T03	“FID 95: Elevator Motor Assembly” on page 10-20
	A2	Drive/ACF cable	15%	T04	“FID A2: Drive/ACF Cable” on page 10-44
	E4	Card pack	5%	T21	“FID E4: Card Pack” on page 10-67
Transport Full	The drive attempted to unload a cartridge, but had no place to put it. **Note:** Also follow instructions for any other messages that are presented, such as extra cartridge, magazine full, no magazine.				
	—	The magazine handle was moved while the drive was unloading a cartridge, or, a tape was present in the slot where ACF transport tried to unload, so tape cartridge is still left in transport.	—	—	Do not remove the magazine while the status area on the operator/CE panel is displaying **Transferring**.
Wrong Mode	The ACF is operating in the wrong mode for the requested command.				
	—	The ACF is operating in the incorrect ACF mode. One of five ACF modes can be selected from the **Set ACF Mode Menu** on the operator/CE panel.	—	—	Determine the correct ACF mode and set it by going to the **operator Options Menu** on the operator/CE panel and selecting option **Set ACF Mode**

Table 1-4. ATTN ACF Messages (continued)

ATTN ACF	FRUs	FRU Name or Description	Prob-ability	TAC	Page Reference or Instruction
Pinch1 or Pinch2 Error	ACF detected an error when grasping (pinching) the cartridge 1. This failure may be caused by a dirty cartridge. Look for any contamination on the sides of the cartridge that could cause the pinch rollers to slip. Have the customer clean or replace the cartridge or magazine, if necessary. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. **Note:** Ensure that the customer does not ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots resulting in contamination on the sides of the cartridges that may cause this failure. 2. Check that the pinch rollers are not binding, and that the arms are not bent. If the rollers are binding or the arms are bent, replace the transport FID 9A. Check the pinch rollers for contamination. If they are dirty, clean or replace the rollers. Use ONLY Tape Unit Cleaner, IBM P/N 05H3929 and a lint-free cloth. See "Tape Unit Cleaner" on page 3-46 for details. 3. Before replacing FRUs below, ensure that the pinch 1 and pinch 2 sensors are operating correctly. See Figure 5-8 on page 5-17 and select **UTILITIES** from the CE OPTIONS Menu, and **DISP SENSORS** from the CE UTILITIES Menu.				
	FE	Cartridge	50%	D07	"FID FE – Isolate Fault Between Media and Hardware" on page 9-123
	AA	Transport pinch rollers	20%	T03	"FID AA: Transport Pinch Rollers" on page 10-51
	9A	Transport	20%	T03	"FID 9A: Transport" on page 10-35
	97	Motor control card	6%	T02	"FID 97: Motor Control Card" on page 10-25
	99	Transport cable	4%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
ACF IRQ Fault	Continuous ACF electronic interrupt signals are being detected. **Note:** This failure may be caused by a sensor failure (priority cell, magazine present, magazine lock, global interference, cartridge present, pinch 1 & 2, limit 1 & 2, transport position A & B, import, export). Before replacing FRUs below, ensure that these sensors are operating correctly. See Figure 5-8 on page 5-17, and select **UTILITIES** from the CE OPTIONS Menu and **DISP SENSORS** from the CE UTILITIES Menu.				
	99	Transport cable	80%	T04	"FID 99: Transport Cable (Former Style)" on page 10-31 or "FID 99: Transport Cable (Current Style)" on page 10-33
	97	Motor control card	10%	T02	"FID 97: Motor Control Card" on page 10-25
	A2	Drive/ACF cable	6%	T04	"FID A2: Drive/ACF Cable" on page 10-44
	9E	Priority cell sensor (pair)	4%	T01	"FID 9E: Priority Cell Sensor" on page 10-39
ACF Msg Missing	Microcode not able to provide correct ACF message.				
	E5	Microcode (known or new) (M01 = known, M02 = new)	100%	M01/ M02	"FID E5 – Microcode Problem" on page 9-118

Chapter 2. MAPs

Contents

Operator/CE Panel Problems

This procedure helps you isolate Operator/CE panel failures.

1. See 10-1 for procedures.
2. See Chapter 5, “Operator Panel” on page 5-1 for a description of the Operator/CE panel.
3. Unless otherwise directed, run **Verify Fix**, “End of Call” on page 9-8 and **Test Panel** from the CE Options Menu to test the drive after a FRU replacement.
4. If the recommended repair actions do not fix the problem, call your next level of support.

Panel Maps

Note: Have the customer vary the drive offline, if it was not already done.

View the LEDs on the rear of the device (on the power supply).

Step Pnl01

Are the ac and dc LEDs *ON* and is the TH LED *OFF*?

Yes The 3590 power supply is OK.

Power the drive OFF and check that all operator/CE panel cable connectors from the operator/CE panel to the card pack assembly are seated. Power the drive ON.

After the power ON diagnostics have completed, select **Verify Fix** from the CE Options menu. Select **Test Panel** and visually check the panel display during the test.

If all of the cable connectors are seated correctly, and you still have a problem with the operator/CE panel, replace the following FRUs, as necessary:

1. “FID 90: Operator/CE Panel” on page 10-12
2. “FID 91: Operator/CE Panel Cable” on page 10-14 or “FID 94: Operator Panel Cable (Model B1A/E1A/H1A Only)” on page 10-126
3. “FID DC: ACF and Operator/CE Panel Cable” on page 10-121
4. “FID E4: Card Pack” on page 10-67

No Go to “Power Problems” on page 2-7.

Pneumatic Problems

Pneumatic Maps

- This procedure helps you isolate pneumatic system failures.
- See Chapter 10, “Locations, Checks, Adjustments, Removals, and Replacements” on page 10-1 for procedures. Replacement of pneumatic system FRUs requires you to perform “Measurement and Adjustment of Pneumatic System” on page 10-4.
- See “Pneumatic System” on page 3-25 for a description of the pneumatic system.
- Unless otherwise directed, run **Verify Fix** from the CE Options Menu to test the drive after a FRU replacement, “End of Call” on page 9-8.
- If the recommended repair actions do not fix the problem, call your next level of support.

Step Pnu01

If you have not already done so, perform the following procedures and return here:

- Perform “Prepare Tape Drive for Service” on page 9-6.
- Remove the power cord from its source and then from the power supply at the back of the 3590.
- Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
- Connect the power cord to the back of the 3590 and to the source outlet. Then, power ON the 3590.

A broken tape may result in a loss of pressure, which may cause a FID that points to a pneumatic system failure.

Check the tape path for a broken tape.

Was the pneumatic system error caused by a broken tape?

Yes If the edge of the tape gets nicked or damaged, it may not break right away. The damage may occur in the tape path of one drive, while the tape-break failure may occur later in a different drive.

The most likely place for tape damage to occur is at the tension transducer during a load operation.

1. Check the teeth on the lower flange of the tension transducer. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83 for details.
2. Check the adjustment of the gap in the machine reel hub to ensure that it is not too tight. See the procedure in “Replace Pantocam” on page 10-86.
3. Ensure that the latest level of microcode is installed. Call your next level of support, if necessary.

No Continue at “Step Pnu02”.

Step Pnu02

Load a scratch tape into the drive. This should cause the pneumatic compressor motor to run.

Is the compressor motor running?

Yes Go to “Step Pnu07” on page 2-5.

No Go to “Step Pnu03” on page 2-4.

Step Pnu03

Perform the following:

1. Power OFF the 3590.
2. Remove the deck enclosure back plate. See “Removing Deck Enclosure Back Plate” on page 9-27.
3. Check that the connector of the pneumatic assembly motor cable, CD1, is seated and latched into the rear of the card pack assembly.

Is the pneumatic assembly compressor motor cable connector, CD1, seated and latched into the rear of the card pack assembly?

Yes Continue to “Step Pnu04”.

No Reseat the connector, switch power ON, and test. Run verify fix “End of Call” on page 9-8.

Step Pnu04

Perform the following:

1. Ensure that power is OFF.
2. Unplug the pneumatic motor cable connector, CD1, from the card pack.
3. On the card pack connector, measure the resistance from ground (pin 4) to pins 5, 9, and 10. The resistance should be **greater than** 9K ohms at all three pins. See Figure 2-1 on page 2-4.

Is the resistance *greater than* 9K ohms at all three pins?

Yes The card pack resistance measurements are OK and the connector CD1 was seated and latched properly. If the compressor motor still does not run when a tape is loaded:

Replace the “FID B1: Pneumatic Assembly” on page 10-57.

No The card pack is defective and will have to be replaced, but the problem may have been caused by a short circuit or bind in the pneumatic compressor or motor.

Continue to “Step Pnu05”.

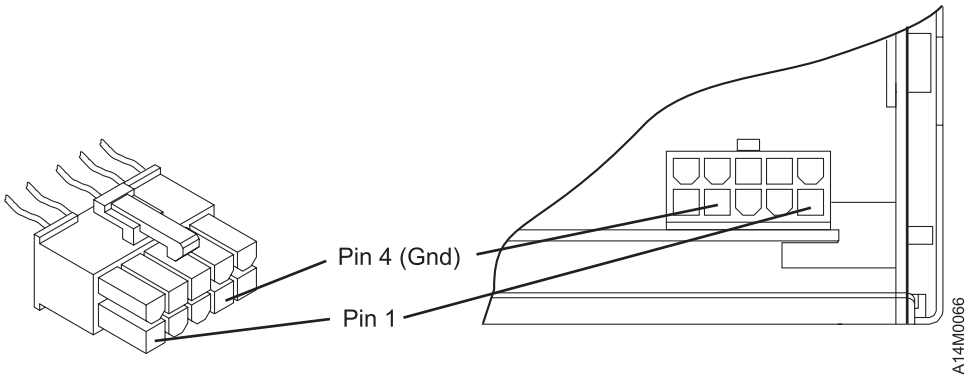


Figure 2-1. Pneumatic Motor Cable to Card Pack Cabling

Step Pnu05

Perform the following steps to determine if the pneumatic assembly needs to be replaced also:

On the pneumatic motor cable plug, CD1, measure the resistance from ground (pin 4) to pins 5, 9, and 10. The resistance should be **infinity** at all three pins. If the resistance is less than infinity, the pneumatic assembly is defective also. See Figure 2-1 on page 2-4.

Is the resistance *infinity* at all three pins?

Yes Continue to “Step Pnu06”.

No The compressor is shorted, causing the card pack to fail also.

Replace **both** of the following FRUs:
1. “FID B1: Pneumatic Assembly” on page 10-57.
2. “FID E4: Card Pack” on page 10-67.

Step Pnu06

Check the compressor for mechanical binds. With power OFF, you should be able to rotate the compressor with finger pressure on the end of the shaft.

Is the compressor binding?

Yes The compressor is binding, causing the card pack to fail also.

Replace both of the following FRUs:
1. “FID B1: Pneumatic Assembly” on page 10-57
2. “FID E4: Card Pack” on page 10-67

No The compressor is okay.

Replace the “FID E4: Card Pack” on page 10-67.

Step Pnu07

The compressor motor is running. Perform the following:
1. Check that the pneumatic pressure sensor (FID E3) cable is connected correctly.
2. Check for loose or broken hoses. If the cleaner blade has been removed, the cleaner blade vacuum hose must be either removed or plugged to prevent vacuum system leaks. See “Cleaner Blade Removal (Model B11/B1A)” on page 10-112 for details.
3. Clean the decoupler assembly.
4. Measure the pneumatic system vacuum and make adjustments if needed. See “Measurement and Adjustment of Pneumatic System” on page 10-4. This procedure also adjusts the pneumatic system pressure and displays error messages on the operator/CE panel if the pressure set point cannot be maintained.
5. Then return to this MAP.

Was the pneumatic system vacuum in adjustment?

Yes Go to “Step Pnu09” on page 2-6.

No Go to “Step Pnu08”.

Step Pnu08

Were you able to bring the pneumatic system vacuum into adjustment?

Yes The vacuum and pressure adjustments to the pneumatic system may have fixed the problem.

Run **Verify Fix** from the CE Options Menu, “End of Call” on page 9-8.

No Check that all pneumatic system hoses are seated on their connectors or fittings and that there are no leaks. See “FID B2: Pneumatic Hose Kit” on page 10-58 for hose routing and replacement. If the cleaner blade has been removed, the cleaner blade vacuum hose must be either removed or plugged to prevent vacuum system leaks. See “Cleaner Blade Removal (Model B11/B1A)” on page 10-112 for details.

If the hoses are OK, replace the following FRUs, as necessary:
1. “FID E3: Pressure Sensor” on page 10-65
2. “FID B1: Pneumatic Assembly” on page 10-57

Step Pnu09

The pneumatic system vacuum and pressure were in adjustment. The problem must be related to tape tension.

With a tape cartridge loaded in the tape drive, check that the tape is drawn into the curvature of the decoupler. See “FID B6: Decoupler” on page 10-79.

Is the tape drawn into the curvature of the decoupler?

Yes Check that the tape tension transducer cable is seated in its connector.

Check that all of the pneumatic system pressure hoses are seated on their connectors or fittings and that there are no leaks.

If the hex screw in the center of the tension transducer is loose it will cause a pressure leak in the transducer assembly. Check that the plastic shield is seated correctly on top of the tension transducer and that the hex screw is tight.

Note: If the plastic shield is moved for any reason, it must be adjusted. See “Adjustment of Tension Transducer Plastic Shield” on page 10-83.

If all of the above items are OK, and you still have a tape tension problem, replace the “FID B7: Tension Transducer Assembly” on page 10-81.

No Check that the pneumatic system hoses going to the decoupler are seated on their connectors or fittings and that there are no leaks.

If the hoses are OK, replace the “FID B6: Decoupler” on page 10-79.

Power Problems

Power Maps

- This procedure helps you isolate power failures.
- See Chapter 10, “Locations, Checks, Adjustments, Removals, and Replacements” on page 10-1 for procedures.
- See “Power Supplies” on page 3-28 for a description of 3590 power.

  Note: There are two levels of power supplies used on the 3590. See Figure 3-14 on page 3-29. The **New Level** is used on all E11/E1A and H11/H1A drives and also on the new built Model B11/B1A drives with Common Card Pack. The **Old Level** is used on all Base Model B11/B1A drives and on the Model B11/B1A drives with the Ultra Card Pack (P/N 35L0818) or older.
- Unless otherwise directed, run **Verify Fix** from the CE Options Menu to test the drive after a FRU replacement.
- If the recommended repair actions do not fix the problem, call your next level of support.

Have the customer vary the drive offline, if it was not already done.

Step Pwr01

Is the ac LED at the rear of the 3590 power supply ON?

Yes Go to “Step Pwr04” on page 2-8

No Perform the following:
1. Unplug the 3590 power cord from the source outlet.
2. Measure the ac voltage at the source outlet.
3. Go to “Step Pwr02”

Step Pwr02

Is ac voltage at the source outlet correct?

Yes Disconnect the power cord from the 3590.

Go to “Step Pwr03”

No If the source outlet is in a rack or library, see the rack or library documentation for power problems.

Otherwise, inform the customer that ac power is unavailable at the customer-provided outlet.

Step Pwr03

Check the power cord for continuity.

Is the power cord OK?

Yes Replace the following FRUs, as necessary:
1. “FID C1: Power Supply” on page 10-62
2. “FID DB: Power Supply Cable (New Level)” on page 10-120

No Replace the 3590 power cord (no FID).

Step Pwr04
Is the TH LED at the rear of the 3590 power supply ON?

Yes The TH LED can be caused by one of the following:
- A thermal sensor in the power supply or card pack assembly is indicating a thermal condition.
- FA fan motor fault has caused the dc voltages to be turned OFF and the TH LED to be turned ON.

Perform the following:
1. Power OFF the 3590 power supply, and check the LEDs, as described below:
   a. The ac LED should remain ON.
   b. The TH LED should remain OFF.

      Note: On the **Old Level** power supplies the TH LED comes ON for about 10 seconds and then remains OFF.
2. Perform “Prepare Tape Drive for Service” on page 9-6.
3. Remove the power cord from its source and then from the power supply at the back of the 3590.
4. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
5. Disconnect the 3590 power supply cable to isolate the power supply from the card pack.
   a. On **Old Level** disconnect the cable from the card pack.
   b. On **New Level** disconnect the cable from the back of the power supply.
6. Connect the power cord to the back of the 3590 and then to the source outlet.
7. Power ON the 3590 power supply, wait 20 seconds, then check the LEDs as described below:
   a. The ac LED should remain ON.
   b. The TH LED should remain OFF.
   c. About 1 or 2 seconds after the power switch is set to the ON position the dc LED should come ON and remain ON.
   d. Go to “Step Pwr06”.

No Go to “Step Pwr05”

Step Pwr05
Is the dc LED at the rear of the 3590 power supply ON?

Yes The power supply LED indicators do not indicate an error condition. The power supply appears to be OK, but there may be an intermittent failure or a failure in the cable from the power supply to the card pack assembly. Repair or replace, as necessary.

No Go to “Step Pwr09” on page 2-9.

Step Pwr06
Did the TH LED remain OFF after 20 seconds?

Yes This is correct machine operation with the card pack disconnected. The card pack may be causing the thermal condition or the machine may have cooled enough to reset the thermal sensor.

Go to “Step Pwr07” on page 2-9.

No The TH LED indicator is still ON indicating an error condition.

Replace the “FID C1: Power Supply” on page 10-62.

Step Pwr07
Check the power supply cooling fans to ensure they are operating correctly.

Are the fan(s) operating correctly?

Yes Leave the power ON long enough for the power supply to warm up to determine if the thermal failure will happen again.

Go to “Step Pwr08”.

No Replace the “FID C1: Power Supply” on page 10-62.

Step Pwr08
Did the TH LED come ON after the power supply warmed up?

Yes Replace the “FID C1: Power Supply” on page 10-62.

No The card pack may be causing the failure.
1. Switch the power OFF.
2. Reconnect the power cable to the card pack.
3. Switch the power ON.

If the TH LED comes ON and stays ON, replace the “FID E4: Card Pack” on page 10-67.

Step Pwr09
The power supply dc LED indicator is OFF, indicating an error condition.

Perform the following:
1. Power OFF the 3590 power supply, and check the LEDs as described below:
   a. The ac LED should remain ON.
   b. The TH LED should remain OFF.

   Note: On **Old Level** power supplies, the TH LED comes ON for about 10 seconds and then remains OFF.
2. Perform “Prepare Tape Drive for Service” on page 9-6.
3. Remove the power cord from its source and then from the power supply at the back of the 3590.
4. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
5. Disconnect the 3590 power supply cable to isolate the power supply from the card pack.
   a. On **Old Level** disconnect the cable from the card pack.
   b. On **New Level** disconnect the cable from the back of the power supply.
6. Connect the power cord to the back of the 3590 and then to the source outlet.
7. Power ON the 3590 power supply and check the LEDs as described below:
   a. The ac LED should remain ON.
   b. The TH LED should remain OFF.
   c. About 1 or 2 seconds after the power switch is set to the ON position, the dc LED should come ON and remain ON.

Did the dc LED come ON and stay ON?

Yes The failure is being caused by something in the power distribution circuit through the card pack to the rest of the 3590.

Go to “Step Pwr10” on page 2-10

No The power supply dc LED indicator is still OFF, indicating an error condition.

Replace the “FID C1: Power Supply” on page 10-62.

Step Pwr10

Perform the following:

1. Power OFF the 3590 power supply.
2. Reconnect the power cable from the power supply to the card pack.
3. Refer to “Cable Diagram” on page 2-13 and “FID E4: Card Pack” on page 10-67 for cable locations. Disconnect the following power cables:
   - Pneumatic supply cable (CD1)
   - Machine Reel Motor and File Reel Motor cable (CD121) at the card pack
   - Loader cable (CLC).
4. Power ON the 3590 power supply and check the LEDs again.

Did the dc LED come ON and stay ON?

Yes One of the components disconnected is causing the failure.

Go to “Step Pwr11”.

No The power supply dc LED indicator is still OFF, indicating an error condition.

Go to “Step Pwr12”.

Step Pwr11

Perform the following to determine which of the disconnected components is causing the failure:

1. Power OFF the 3590 power.
2. Reconnect the components that were disconnected in “Step Pwr10”, one at a time.
3. Switch ON the power to test each of the components.
4. Repeat this procedure until the failure returns.

When the failure returns (dc LED stays OFF), the last component that was reconnected is causing the failure.

1. If the failure returns when the pneumatic cable (CD1) is reconnected:

   Replace “FID B1: Pneumatic Assembly” on page 10-57.
2. If the failure returns when the machine reel motor or file reel motor cable (CD121) is reconnected:

   Replace “FID C6: Machine Reel Motor” on page 10-93 or “FID C7: File Reel Motor” on page 10-94, as necessary.
3. If the failure returns when the loader cable (CLC) is reconnected, use the following list and the “Cable Diagram” on page 2-13 to isolate the failure. Remove cables to isolate each component until you can identify the failing FRU.
   a. “FID C8: File-Protect Sensor” on page 10-96
   b. “FID CD: Cartridge-Present Sensor” on page 10-101
   c. Loader Motor “FID BC: Loader Assembly” on page 10-89
   d. “FID CA: Tray-Up Sensor” on page 10-98
   e. “FID C9: Door-Open Sensor” on page 10-97
   f. “FID CC: Cartridge-Type Sensor Card Assembly” on page 10-99

Step Pwr12

Perform the following:

1. Power OFF the 3590 power supply.
2. Reconnect all of the power cables that were disconnected in “Step Pwr10”.
3. Remove the card pack retaining screw and carefully pull the card pack out far enough to disconnect the two docking connectors (CD115 and CD124) on the front of the card pack.

   Note: Be careful not to pull it out too far. The Head cables may be damaged.
4. Power ON the 3590 power supply.

Did the dc LED come ON and stay ON?

Yes The failure is caused by one of components connected through the Docking Cables.

Go to “Step Pwr13”.

No The power supply dc LED indicator is still OFF, indicating an error condition.

Go to “Step Pwr14”.

Step Pwr13

Perform the following to determine which of the docking cables has the failing component:

1. Power OFF the 3590 power supply.
2. Reconnect the Card Pack Docking Cables CD115 and CD124.
3. Disconnect the following cables. This will isolate the ACF from the rest of the device.
   a. Operator Panel cable connector on front of the device.
   b. ACF cable connector on front of the device (if installed).
   c. IPS cable connector.
4. Power ON the device.

Did the dc LED come ON and stay ON?

Yes One of the components disconnected above is causing the problem.

Go to “Step Pwr15”.

No The power supply dc LED indicator is still OFF, indicating an error condition.

Go to “Step Pwr16” on page 2-12.

Step Pwr14

Perform the following to determine if the failure is being caused by the Card Pack or the Read Write Head:

1. Power OFF the 3590 power supply.
2. Reconnect the Card Pack Docking Cables CD115 and CD124.
3. Disconnect the R/W cables (J1 and J2) from the card pack.
4. Power ON the device.
   a. If the dc LED indicator is still OFF, replace the “FID E4: Card Pack” on page 10-67.
   b. If the dc LED indicator stays ON, replace the “FID D0: Head Guide and Brush Assembly” on page 10-105.

Step Pwr15

Perform the following to determine if the problem is being caused by the Operator Panel, ACF or Head IPS:

1. Power OFF the 3590, and reconnect the components disconnected in “Step Pwr13”, one at a time.
2. Switch ON the power to test each of the components.
3. Repeat this procedure until the failure returns.

When the failure returns (dc LED stays OFF), the last component that was reconnected is causing the failure.

1. If the failure returns when the Operator Panel is reconnected:

   Replace “FID 90: Operator/CE Panel” on page 10-12.
2. If the failure returns when the Head IPS is reconnected:

   “FID D0: Head Guide and Brush Assembly” on page 10-105.
3. If the failure returns when the ACF is reconnected, use the following list and Figure 2-2 on page 2-13 to isolate:
   a. “FID 97: Motor Control Card” on page 10-25
   b. “FID 96: Pinch Motor Assembly” on page 10-23
   c. “FID A9: Feed Motor Assembly” on page 10-49
   d. “FID 95: Elevator Motor Assembly” on page 10-20
   e. “FID A6: LED Cards and Random Lock Sensor” on page 10-48
   f. “FID 9E: Priority Cell Sensor” on page 10-39
   g. “FID A0: Magazine-Present Sensor Assembly” on page 10-41
   h. Magazine Locked Sensor. “FID A6: LED Cards and Random Lock Sensor” on page 10-48

i. “FID 9B: Global/Interference Sensor Assembly (Upper and Lower)” on page 10-38
j. “FID 98: Transport Position Sensor” on page 10-26
k. Elevator Card and Assembly. “FID 9A: Transport” on page 10-35

Step Pwr16

The failure is being caused by one of the components connected through the Card Pack Docking Cable CD124.

Perform the following to determine which component is causing the failure:
1. Power OFF the 3590 power supply.
2. Reconnect the Card Pack Docking Cables CD115 and CD124, if necessary.
3. Disconnect the components in the following list, one at a time, and power ON the power supply to test.

When the dc LED comes ON, with one of the components disconnected, the disconnected component is causing the failure.

Repair or replace the failing component, as necessary.
1. Card pack cooling fan (bottom) (see “FID BF: Fan (Card Pack)” on page 10-61)
2. Pressure transducer — “FID E3: Pressure Sensor” on page 10-65
3. Tension transducer — “FID B7: Tension Transducer Assembly” on page 10-81
4. Head solenoid (puffer) — “FID B5: Tape-Lifter Solenoid” on page 10-77
5. Tape A sensor — “FID CE: Tape Path A Sensor” on page 10-103
6. Tape B sensor — “FID CF: Tape Path B Sensor” on page 10-104
7. Pantocam cable — “FID BB: Pantocam” on page 10-84
8. Head VPD cable — “FID B5: Tape-Lifter Solenoid” on page 10-77
9. Machine reel motor — “FID C6: Machine Reel Motor” on page 10-93
10. File reel motor — “FID C7: File Reel Motor” on page 10-94

Cable Diagram

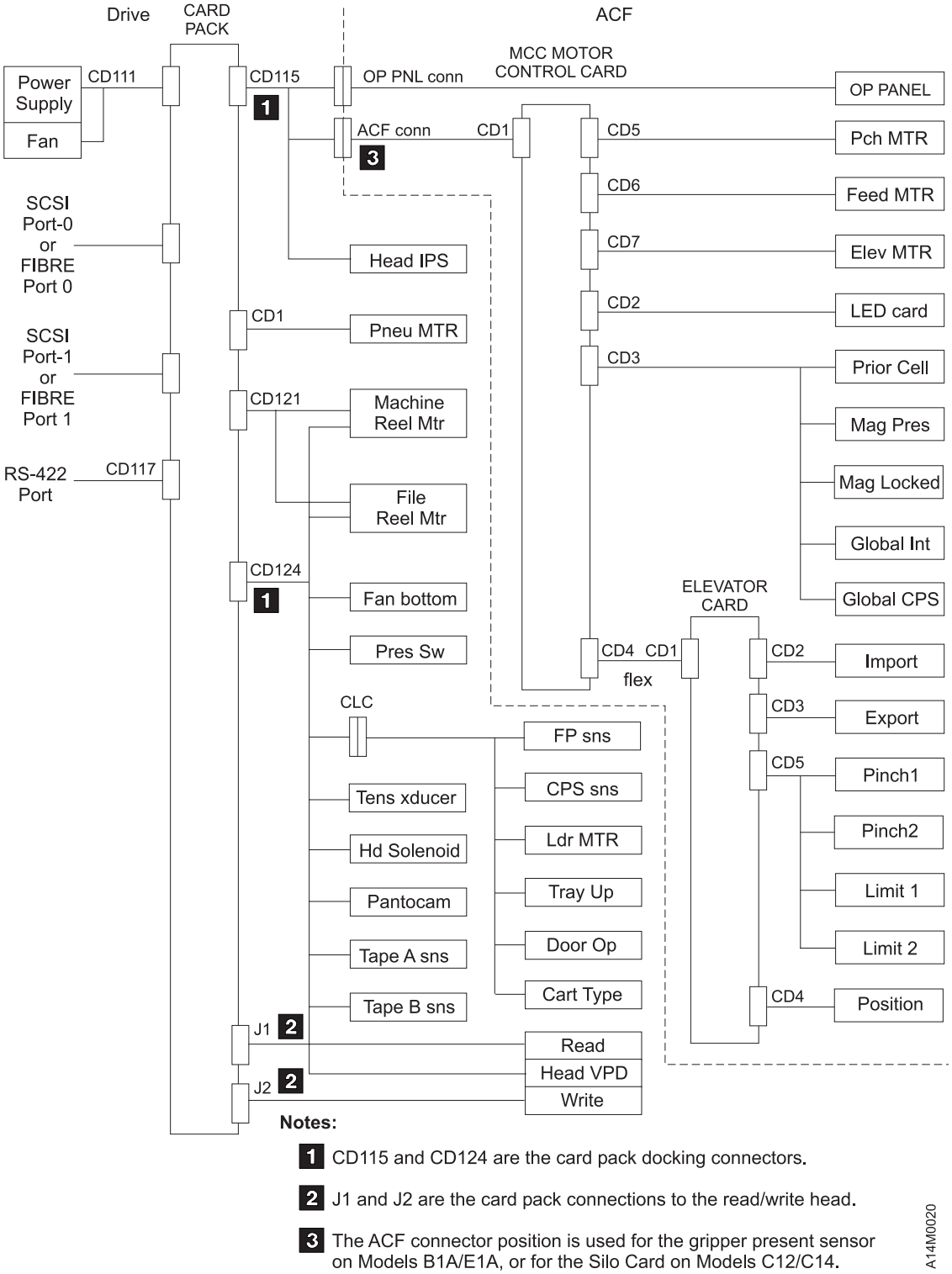


Figure 2-2. Model B11/B1A, E11/E1A, or H11/H1A Cable Diagram

Chapter 3. Introduction

Contents

3590 Introduction

The IBM 3590 High Performance Tape Subsystem provides high capacity, performance, reliability, and a wide range of host connectivity. The IBM 3590 High Performance Tape Subsystem, which features the 3590 tape drive, introduces a new technology for longitudinal recording. The new technology can significantly increase the performance of longitudinal recording while considerably improving reliability.

These 3590 models tape drives read and write in the following formats:

Model B11/B1A	128-track format
Model E11/E1A	256-track format
Model H11/H1A	384-track format

While reading or writing 16 tracks at a time, the 3590 tape drive uses serpentine interleaved, longitudinal recording technology to make a total of four (Model B11/B1A), eight (Model E11/E1A), or twelve (Model H11/H1A) round trips from the physical beginning of the tape to the physical end and back again. The tape read/write head will index, or move vertically, when it completes each round trip so that the recorded tracks will be interleaved across the width of the tape. The IBM 3590 High Performance Tape Cartridges are the same physical size as the enhanced capacity cartridge system tape (ECCST) of the IBM 3480 and the cartridge system tape (CST) of the IBM 3490, and can be placed in the IBM 3494 and 3495 Automated Tape Library Dataservers. The 3590 cartridges are **not** compatible with, and can **not** interchange with the 3480 or 3490 cartridges.

The IBM 3494 Tape Library can use either Model B1A, Model E1A, or Model H1A drives.

The IBM 3495 Tape Library can use only the Model B1A drive.

See Figure 3-1 on page 3-4.

In the 3590, data is written in blocks of 384 KB of user data using a 16-track format. The first set of 16 tracks is written to the physical end of the tape and then, using the electronic head switch, 16 interleaved tracks are written while the tape moves back to the beginning. The head is then indexed (physically moved a fraction of a millimeter) to the next set of 16 tracks. In this way eight (Model B11/B1A), sixteen (Model E11/E1A), or twenty four (Model H11/H1A) sets of interleaved tracks are written for a total of 128 tracks (Model B11/B1A), or 256 tracks (Model E11/E1A), or 384 tracks (Model H11/H1A).

The IBM 3590 High Performance Tape Subsystem uses a metal particle tape in the IBM 3590 High Performance Tape cartridge that can store 10 GB (Model B11/B1A), 20 GB (Model E11/E1A), or 30 GB (Model H11/H1A) of non-compacted data. The 3590 tape drive uses a 3-to-1 compaction algorithm which can increase the storage capacity of these cartridges to 30 GB (Model B11/B1A), 60 GB (Model E11/E1A), or 90 GB (Model H11/H1A).

With the IBM Extended High Performance Cartridge, the above capacities are all doubled. The Model B11/B1A drives can store 20 GB of non-compacted data, or 60 GB of compacted data. The Model E11/E1A drives can store 40 GB of non-compacted data, or 120 GB of compacted data. And the Model H11/H1A drives can store 60 GB of non-compacted data, or 180 GB of compacted data.

The IBM Extended High Performance Cartridge is the same physical size as the IBM High Performance Tape and can be used in both the IBM 3494 and 3495 Automated Tape Library Dataservers.

The 3590 improved compression algorithm (IBMLZ1) provides highly-efficient compression. The IBMLZ1 algorithm furnishes hardware execution efficiency by using as few machine cycles as possible to compress or decompress a byte, achieving good coding efficiency for broad applications, and performing compression without performance loss.

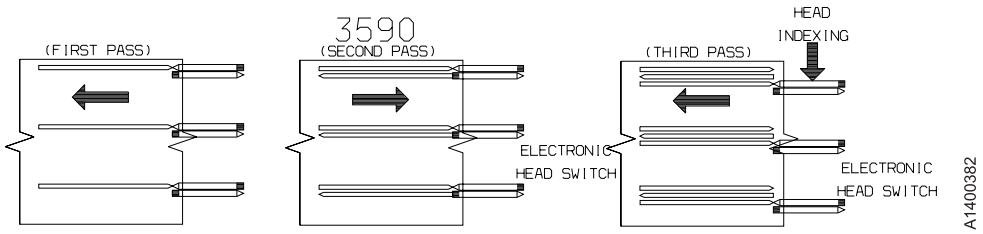


Figure 3-1. Serpentine Interleaved Track Sets

Overview

There are four models of the 3590.

- Model B11/E11/H11 is a frame-mounted or rack-mounted unit with an Automatic Cartridge Facility (ACF).
- Model B11/E11 (RPQ 8B3191) and Models B11/E11/H11 (FC 2200) can be mounted in the Deskside cover.
- Model B1A/E1A/H1A, SCSI attached drive, is a 3494 library-mounted unit in a D12/L12 or D14/L14 frame.
- Model B1A/E1A/H1A also can be mounted in a 3590 Model C12/C14 frame for library attachment.
- Model B1A/E1A also can be mounted in the Deskside cover, RPQ 8B3190 or FC 2200.
- Model E1A/H1A (fibre channel) is a 3494 Library mounted unit in D12/L12 only.
- Model Axx is an ESCON® controller, upper interface to the host.

| **Note:** The interface between the controller and the drive is SCSI or Fibre, but A60 also offers a FICON | interface.

See *IBM TotalStorage 3590 Tape Subsystem Axx Controller Models Maintenance Information* and *IBM TotalStorage 3590 Tape Subsystem Models C12/C14 Maintenance Information* for further information | about these specific models.

| **Notes:**

| 1. 3590 Model A00 controllers support Models B11/B1A drives, only.
| 2. 3590 Model A50 controllers support Models B11/B1A, E11/E1A drives.
| 3. 3590 Model A60 controllers support Models B11/B1A, E11/E1A, and H11/H1A drives.

There are several levels of the 3590 Model B11/B1A, E11/E1A, and H11/H1A in the field.

- Base 3590 Model B11/B1A drives
- Ultra 3590 Model B11/B1A drives
- 3590 Model E11/E1A drives
- 3590 Model H11/H1A drives

See “3590 Drive Model and Feature Levels” on page 3-34 for more information.

| Table 3-1 shows the twelve model conversions available.

Table 3-1. 3590 Model Conversion Available

From	To					
	B11	**E11**	**H11**	**B1A**	**E1A**	**H1A**
B11	N/A	Yes	Yes	Yes	No	No
E11	No	N/A	Yes	No	Yes	No

Table 3-1. 3590 Model Conversion Available (continued)

From	To					
	B11	**E11**	**H11**	**B1A**	**E1A**	**H1A**
H11	No	No	N/A	No	No	Yes
B1A	Yes	No	No	N/A	Yes	Yes
E1A	No	Yes	No	No	N/A	Yes
H1A	No	No	Yes	No	No	N/A
Note: Model B11/E11 can be converted incrementally to Model H1A, as follows: Model **B11 to B1A , then B1A to H1A** , or Model **E11 to E1A, then E1A to H1A.**						

Two-ported SCSI-2, SCSI-2+, or SCSI-3 attachment

- The 3590 can be integrated with any host system that supports a SCSI-2 (or SCSI-2+) attachment and has the proper software drivers installed. They can attach to separate SCSI initiators and can access the same 3590 drive.
- All earlier production 3590 Model B11/B1A drives may be updated to the Ultra SCSI feature by installation of Field FC 5790.
- 3590 drives can attach to various SCSI adapters:
  - Fast/wide SCSI-2 channel adapter for all 3590 drives
  - Ultra/wide SCSI-2+ adapter for Ultra Models B11/B1A drives or all Models of E11/E1A/H11/H1A drives
  - Ultra/wide SCSI-3 adapter for Model E11/E1A and H11/H1A drives

  For details, see “SCSI Adapter/Port Compatibility” on page 3-36.

Dual port, fibre channel attachment

The dual port fibre channel attachment is available only on Model E11/E1A and H11/H1A drives. (Two or more open system servers can access the same 3590 Model E11/E1A or H11/H1A drive.)

The 3590 Model E11/E1A and H11/H1A drive can be attached directly to any of the open systems servers that support fibre channel connection. All earlier production 3590 Model E11/E1A and H11/H1A drives can be upgraded to fibre channel by installation of FC 3510.

Note: Models E11/E1A and H11/H1A drives with fibre channel attachment are supported by the Model A60 Controller.

Consider these additional facts about the 3590:

- The drive ac power, pneumatic system, and dc power are contained in the drive frame.
- The Model B11/E11/H11 is rack or frame mounted for the iSeries/AS400 (OS/400)®, pSeries/RS6000 (AIX), and Linux systems. These models have front service capabilities for the rack-mounted devices and rear service capabilities for the frame-mounted devices.
- The Model B1A is mounted in 3494 and 3495 library systems with rear service capability.
- The Model E1A/H1A is mounted in the 3494 library systems, but is not supported in the 3495 library systems.
- The Model B1A/E1A/H1A is mounted in a 3590 Model C12/C14 drive frame (for library attachment), with rear service capability.
- The Model B11/E11/H11 has an Automatic Cartridge Facility (ACF) that contains a 10-cartridge magazine that can be pre-mounted with cartridges by an operator. The ACF can be controlled as a sequential loader or as a random access cartridge loader.
- The operator/CE panel on all drive models is a liquid crystal display (LCD) used by the operator or service representative for certain operations.
- The Deskside RPQ provides a 3590 drive in a deskside configuration.

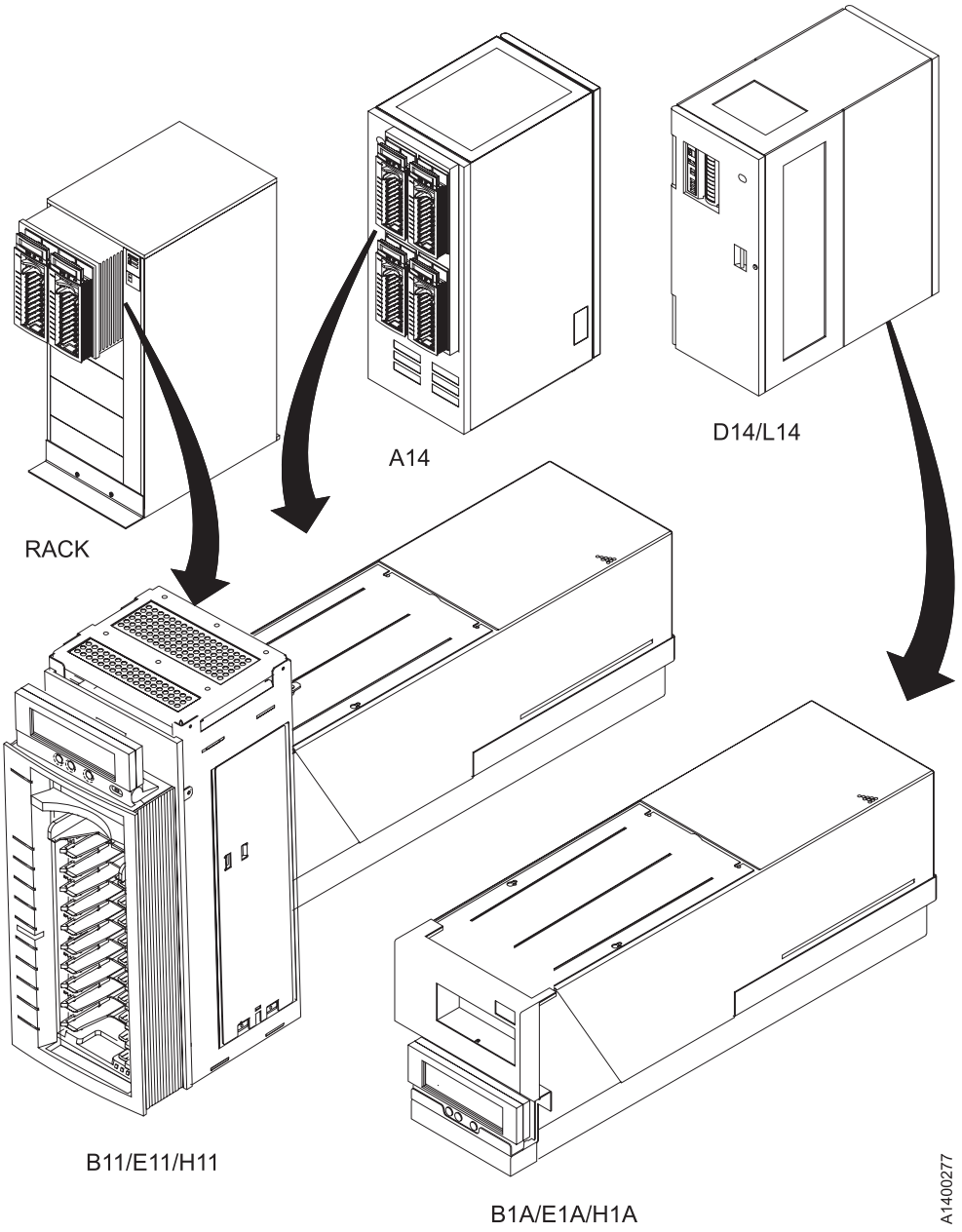


Figure 3-2. 3590 Models

RAS Characteristics

maintenance strategy

RAS is an abbreviated term for the product design characteristics of Reliability, Availability, and Serviceability.

Reliability

- Data reliability improved by 100 times over 3490
- Longer life R/W head
- New metal particle (MP) media is less abrasive
- New binder formulation to improve shelf life.

- Enhanced cartridge construction with more robust shell design to improve shelf life
- Drive/cartridge designed to minimize operator errors
- Magazine with indicators on processed/unprocessed cartridge
- Magazine priority slot makes manual mode easier to use
- Fewer cables
- Fewer parts in ACF
- Menu-driven operator functions in some native languages with action-specific messages
- Model E11/E1A and Model H11/H1A drives use digital read/write channel and second-generation electronics

Availability

- Designed for first-time fix
- Built-in hardware/microcode error detection and isolation
- Captured error recorded in expanded nonvolatile vital product data
- Reduced number of FRUs (approximately 1/2 of 3490)
- Service information message/Media information message (SIM/MIM) clearly indicate impact of failures and FRUs affected, impact of service
- No planned down time for preventive maintenance
- Designed for quick FRU replacement
- High level of integration, fewer subassemblies
- Minimum number of cables
- Predictive maintenance (catches hardware and media problems before they are evident) via SIM/MIM
- Sophisticated algorithm to keep track of error statistics to isolate between drive and media problems. This is the SARS (Statistical Analysis Reporting System) algorithm
- Possible warning message for degraded hardware or media
- Pneumatic and power are dedicated to each drive
- Allow only failing drive to be taken down for service
- When in a library, a drive is designed for rear service (maintenance concurrent with library operations)

Serviceability

- No host resources or support is required for service
- All service actions are initiated from the drive panel
- Wrap tools are provided to test all external interfaces (SCSI, fibre channel, RS-422)
- Supported by microcode levels listed in “Drive Microcode Compatibility” on page 3-37
- Non-disruptive microcode update via SCSI for all 3590 models, or via fibre channel on E11/E1A and H11/H1A
- New level of drive microcode can be written into the flash memory without affecting the current microcode in DRAM. The new level of code is written to DRAM when the drive is IMLed.
- No error recreation
- Error is captured and recorded in vital product data
- Error information (SIM/MIM) is sent to the host
- Error indicators for microcode type problems
- Error records are retained in drive error log.
- Predictive failure analysis through SARS (Statistical Analysis and Reporting System)
- Electronic isolation
- All drive electronic cards in one pack (one FRU)
- ACF designed for quick disconnect from drive
- Number of drive FRUs are significantly less than 3490
- Special utilities for IBM support service built into drive
- Tools to help development engineers provide on-site support

3590 Maintenance Strategy

The 3590 maintenance strategy does not use diagnostics for problem recreation. The hardware and microcode are designed to capture and isolate failures when they occur. The fault symptom code (FSC) generated either by the functional microcode or diagnostic microcode is converted into a FRU identifier (FID) and displayed to the operator and/or the CE by sending service information messages (SIMs) or media information messages (MIMs) in systems where these functions are supported. If the host system does not support SIMs and MIMs, sense data is available if the subsystem is able to present it. In addition, the FID is displayed on the 3590 display panel and placed into the drive error log. The FID and component identifiers are stored in the vital product data (VPD) at the plant of manufacture.

Each level of microcode has an FSC to FID conversion table. This table is unique for each microcode load and contains every FSC that is in this specific EC level. When a permanent error occurs or an error is detected by the diagnostics, a SIM is generated and a flag is set in the SCSI sense data. This flag informs the host system that additional information about the error should be read from the drive and displayed to the operator. Only a permanent error causes a FID to be displayed on the operator/CE panel.

The maintenance strategy described is for all drive models of the 3590.

- Concurrent maintenance is possible even when the 3590 is part of a string on the SCSI bus. As the CE can remove both cables without breaking the connection of the bus. fibre channel attached drives do not have this concurrent maintenance capability.
- Each 3590 drive can have power removed without powering OFF any other 3590 drives.
- The 3590 is installed by the CE. The drive is not designed for customer set up (CSU).
- No remote support via a direct connection to the 3590.
- The maintenance package for the 3590 uses the operator/CE panel for maintenance. Also, many of the maintenance functions for the drive can be accessed via the SCSI or fibre channel port from the host or controller.
- The maintenance information (MI) is contained in one volume.
- Selecting Verify Fix from the CE Options menu on the drive operator/CE panel causes all of the drive diagnostics to be executed including the motion and read/write diagnostics.
- The error log contains up to thirty error entries for a record of machine errors.
- The FID FE and FID FF logs contain up to ten entries for a record of sense data sent to the host with a FID of FE or FF.
- The Temp Error log contains up to ten entries for a record of sense data sent to the host with a sense key of 1.

3590 FID Strategy

The 3590 FID strategy was developed to prevent down-level maintenance documentation. Previously, when a new EC level of microcode was released, maintenance documentation would become down level because of additions and deletions of FSC codes.

With the newer *FID code* concept, the maintenance documentation no longer lists FSC codes, only FID codes. Each microcode EC level has a conversion table that reflects any additions or deletions in the FSC codes. The FSC-to-FID conversion table is always correct for that specific code level, thus eliminating the need to update documentation.

Host Messages

Service information messages (SIM) and media information messages (MIM) are incorporated into the 3590. These messages provide the customer and the CE with diagnostic and repair information before the call, which eliminates unnecessary service calls.

The MIM makes the 3590 media self-diagnosing. The customer's media maintenance activity is specifically directed to reduce the time required to separate hardware from media problems. The operator's media maintenance and CE's service activity is based on failure events occurring in the customer's functional environment. This eliminates the need to use time-consuming machine checkout procedure to recreate the failure.

The SIM and MIM functions are a primary factor in the 3590 maintenance plan for improved product availability. See "Service and Media Information Messages (SIMs and MIMs)" on page 4-2 and "Statistical Analysis and Reporting System" on page 4-6 for details.

Device Characteristics

See *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*, for program support and the physical characteristics.

SCSI Connectivity

Note: The 3590 is an HVD device and does not support LVD.

3590 drives have two SCSI ports. The type of ports in the drive is determined by the level and model of the drive, as follows:

- Base Model B11/B1A drives have Fast/Wide Differential SCSI ports with a speed of 20 MB/s.
- Ultra Model B11/B1A drives with FC 9790/5790, all E11/E1A and H11/H1A drives have Ultra/Wide Differential SCSI ports with a speed of 40 MB/s.

  For more information on important changes in 3590 models with FC 9790/5790, see "3590 Drive Model and Feature Levels" on page 3-34.

All SCSI cable features are compatible with all drive levels. Connectivity is supported for iSeries/AS400 (OS/400), pSeries/RS6000 (AIX), Linux, IBM POWERparallel SP2, Sun (Solaris), HP-UX and Windows NT® or Windows 2000 attached systems.

Cable Feature Codes – SCSI

Table 3-2 shows the cable feature codes for the cable of the appropriate length.

Table 3-2. 3590 Cable Feature Codes. For pSeries/RS6000 (AIX), iSeries/AS400 (OS/400), Sun (Solaris), HP-UX, Windows NT, Windows 2000, 3494, 3591, and Linux System Attachment

Feature Code (FC)	Cable Length	Part Number	System Application
5106	0.6 m (2 ft)	05H4644	A, E
5112	12 m (39 ft)	05H4649	A, B, C, E
5118	18 m (59 ft)	05H4650	A, B, C, E
5125	25 m (82 ft)	05H4651	A, B, C
5128	2.8 m (9 ft)	05H4647	A, B, C, E
5129	2.8 m (9 ft)	05H3221	B
5134	3.4 m (11 ft) (notes 4 & 6)	05H4645	D, E
5138	4 m (13 ft) (notes 4 & 6)	05H4646	D, E
5145	4.5 m (15 ft)	05H4648	A, B, C, E

Table 3-2. 3590 Cable Feature Codes (continued). For pSeries/RS6000 (AIX), iSeries/AS400 (OS/400), Sun (Solaris), HP-UX, Windows NT, Windows 2000, 3494, 3591, and Linux System Attachment

Feature Code (FC)	Cable Length	Part Number	System Application

Notes:

1. The 0.6 m (2 ft) SCSI cable (FC 5106) can be used when two 3590s are immediately adjacent to each other and are attached to the same SCSI I/O controller on a pSeries/RS6000 (AIX) System.
2. Conversions from meters to feet are approximate and rounded to the nearest foot.
3. A cable that is used with FC 2420 cannot exceed 18 m (59 ft) in length.
4. FC 5134 is for horizontal use, FC 5138 is for vertical use.
5. The 3590 Model B11/B1A, E11/E1A, and H11/H1A can be attached to all iSeries/AS400 Systems capable of running OS/400 Version 4, Release 1 and later software.
6. Cable feature codes 5134 and 5138 can be used to connect multiple 3590 Model B1A/E1A/H1A drives on the same SCSI bus in a 3494 Model D12, D14, L12, and L14.
7. The characters in the last column identify the system with which these cables can be used. The alphabetic characters apply, as shown:

pSeries/RS6000 (AIX)	**A**
iSeries/AS400 (OS/400) and Sun	**B**
HP/UX, Windows, and Linux	**C**
3494	**D**
3591	**E**

Addressing

The SCSI unit address or fibre channel port addresses are set during installation by selecting the address menus on the operator/CE panel.

Fibre Channel Connectivity

Fibre Addressing

The 3590 Exx and Hxx must have a fibre address to communicate over the fibre channel interface. The 3590 allows both hard and soft addressing. Most fibre hosts (initiators) support hard addressing and do not support soft addressing. Have the customer reference their device driver documentation for more information.

Selecting the hard addressing option allows drive selection of the Arbitrated Loop Physical Address (AL_PA). The higher the number, the lower the priority. Most hosts will try to have the lowest AL_PA number (highest priority). The drives should have a higher AL_PA (lower priority). When multiple drives are connected in an arbitrated loop, the drive closest to the host should have a lower AL_PA number (higher priority) than the next drive. Follow this protocol through the loop.

The soft address feature allows the drive to arbitrate the AL_PA number with other fibre devices. When sharing a drive between different systems, be sure two hosts do not attempt to use the same drive at the same time. See “Fibre Channel Attachment” on page 3-13.

Fibre Channel World Wide Identification (Names)

Each fibre channel card has three names (Node, Port 0, and Port 1) that are hard coded into the electronics of the card. These names are similar to a serial number and are unique world wide. Some customer fibre channel networks that have switches with the “zoning”function will use these names, in addition to using the Port Addresses for communications between the host and the drive.

When a 3590 drive is first powered on with a new card pack, the Node, and Port 0 and Port 1 names are stored into the VPD memory. These names can be displayed or changed using the operator/CE panel. See “CE Fibre Names Menu” on page 5-56 and “Fibre Channel World Wide Name History Log” on page 9-63.

The fibre name and the fibre address must not be confused. The fibre name is a World Wide Identification number assigned to the card at the time of build. The number is sixteen-characters long; the first ten are assigned to IBM and will usually be 5005076300. Character 11 is either a ″0″ for the node name, or ″4″ and ″8″ for Port 0 and Port 1 respectively. If the card is replaced, the name from the original card will have to be stored into VPD memory to keep the subsystem from getting confused.

See “CE Fibre Names Menu” on page 5-56 and “Fibre Channel World Wide Name History Log” on page 9-63.

3590 Feature Codes for Fibre Channel Attachment

3590 Model E11/E1A and H11/H1A drives with the fibre channel Attachment FC 9510 or FC 3510 have two fibre channel ports. A fibre optic cable is required for attaching a Model E11/E1A and H11/H1A drive to host fibre channel adapters, the Storage Area Network (SAN) fibre channel switch, or other storage area fibre channel components. The attaching fibre optic cable must be 50.0/125 micrometers for distances up to 500 meters. The connection is a duplex SC/SC or LC/SC connector type.

Table 3-3. 3590 Feature Codes for Fibre Channel Attachment with SC/SC Cables

Feature Code (FC)	Cable Length	Part Number
5805	5 m (16 ft)	03K9201
5813	13 m (43 ft)	54G3386
5825	25 m (82 ft)	03K9203
5861	61 m (201 ft)	54G3390

Table 3-4. 3590 Feature Codes for Fibre Channel Attachment with LC/SC

Feature Code (FC)	Cable Length	Part Number
5907	7 m (23 ft)	11P3895
5913	13 m (43 ft)	11P3896
5922	22 m (72 ft)	11P3897
5961	61 m (201 ft)	11P3900

A 500-m (1640-ft) cable also is available. See *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*.

System Attachment

The Subsystem provides a SCSI system attachment or a fibre channel attachment (Model E11/E1A and H11/H1A only).

SCSI Attachment

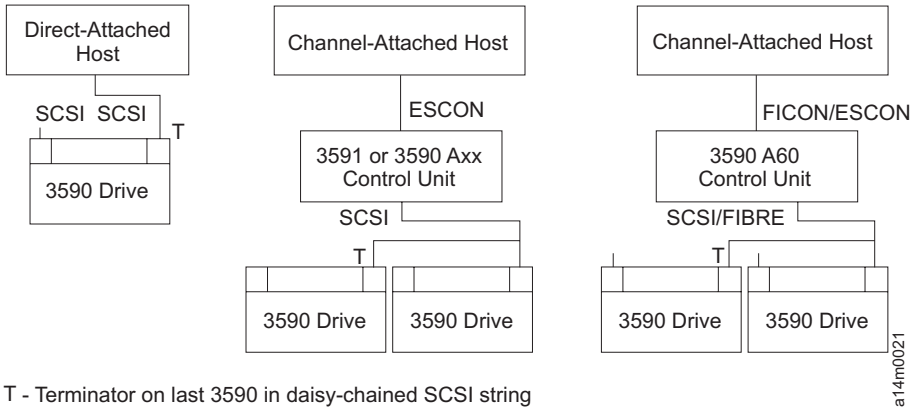
In this configuration the device attaches to a 2-byte-wide differential P-cable conforming to the SCSI-2 and SCSI-3 standard. The connectors are shielded, high density, 68-pin, D-shell connectors. This type of attachment allows cable lengths of up to 25 m (82 ft).

Asynchronous or synchronous transfers are supported. Each initiator can establish its own mode and rate of transfer independently of other initiators. In synchronous mode, the target can support transfer periods of 50, 100, 150, 200, 250, 300, 350, or 400 nanoseconds as established by the exchange of Synchronous Data Transfer Request messages.

SCSI Direct- and Control Unit-Attached 3590

Note: For ESCON, all drives must be either Extended High Performance Cartridge or Non-Extended High Performance Cartridge. ESCON can not handle mixed pools.

Figure 3-3 shows the SCSI, ESCON and FICON attachments from the host to the 3590.



T - Terminator on last 3590 in daisy-chained SCSI string

Figure 3-3. SCSI, ESCON, and FICON Attached Host Connections

Library – SCSI-Attached 3590

Figure 3-4 shows the SCSI and RS-232 or LAN connections from the host to the 3590 and the library manager when the device is direct-attached.

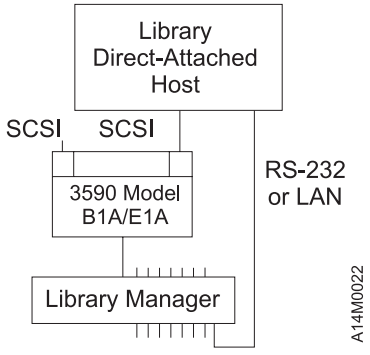


Figure 3-4. Library-Attached Host Connections

Fibre Channel Attachment

Supported Topologies: The 3590 Exx and Hxx models support switched fabric and point-to-point loop topologies.

Switched Fabric: Two or more fibre channel end points interconnect through a switch. The fibre channel architecture supports up to 256 ports through each switch. The 3590 supports a single, fabric router (switch).

Switches include a function called “zoning.” This function allows the user to partition the switch ports into port groups. It then assigns group access to other groups. This prevents group interferences. This allows or prevents drive sharing.

Switched fabrics allow all of its ports simultaneous use of the full fibre channel architecture bandwidth.

Drive sharing is not allowed when attaching 3590 fibre channel drives to an A60 Control Unit through a switch. See Figure 3-6 on page 3-14. In this configuration the switch must be connected to **Port 0**. Port 1 is not used.

Point-to-Point Loop: Point-to-Point Loop is similar to point-to-point topology. Both have two fibre channel end points connected together. The difference is in the protocol.

When only two fibre channel end points connect together, either protocol is usable. Both end points must, however, use the same protocol. The 3590 supports Point-to-Point Loop; SAN Data Gateway will utilize either protocol. Most fibre channel adapters default to the Loop Protocol when not directly connected to a fabric.

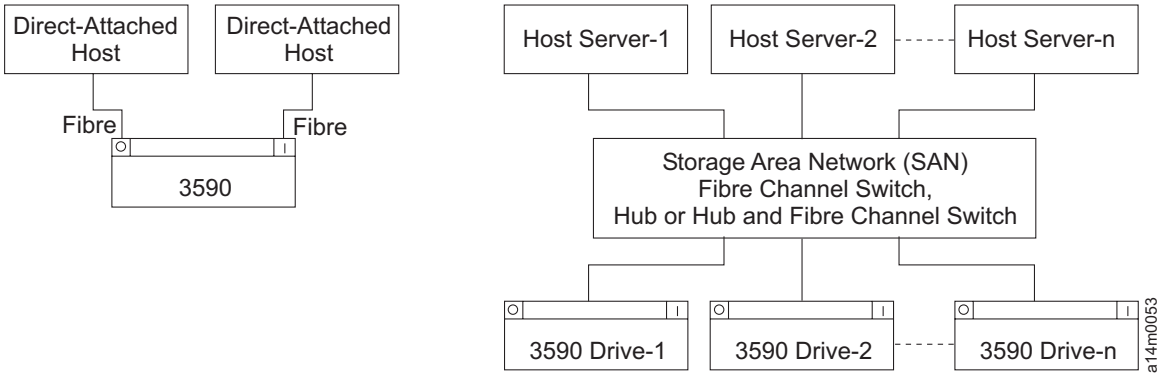


Figure 3-5. Typical Fibre Channel Host Connections

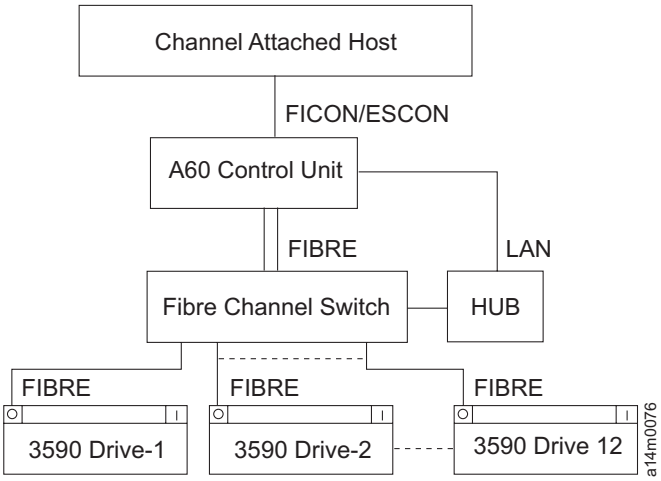


Figure 3-6. A60 Control Unit Fibre Channel Attachment

Supported Host Attachments: The 3590 Model E11/E1A and H11/H1A drives with fibre channel attachment 9510 or 3510 support attachment to the following host systems:

- IBM pSeries/RS6000 or IBM pSeries (AIX)
- IBM iSeries/AS400 or IBM iSeries (OS/400)
- IBM Linux (supported in Intel-based Linux operating environment)
- Hewlett-Packard (HP-UX)
- Windows (NT and 2000)
- Sun PCI/S-bus
- Compaq Tru64 Unix

Notes:

1. See the *IBM TotalStorage Device Driver Installation and User's Guide* for detailed information regarding the supported host attachments.
2. IBM xSeries (NUMA-Q) ONLY supports the 3590 Model E11/E1A drives with fibre channel attachment FC 9510 or FC 3510.

Note:

The drives also support attachment to the following fibre channel fabric components:

- IBM 2103 Fibre Channel Storage Hub (for distance only)
- IBM 2109 SAN Fibre Channel Switch
- IBM 2031 McData ES-1000 Fibre Channel Loop Switch
- IBM 2032 McData ED-5000 Fibre Channel Switch (connected through ES/1000 or SAN)
- IBM 2042 InRange FC/9000 Fibre Channel Director

The host system and fabric component attachments above all have unique hardware and software requirements. Also, new systems and components may be added to the lists from time to time.

Refer to a URL for the latest *Fibre Support Information*. : “Web Site Information” on page xxii.

SAN Failover Capability: The Atape device driver, (FC 9200), provides redundant path failover capability for 3590 fibre channel drives attached to a pSeries/RS6000 (AIX) and Linux systems through a SAN (Storage Area Network) connection.

The device driver can configure up to 16 alternate paths between the drive and the host systems. (See Figure 3-7 on page 3-15.) If a permanent path error occurs, the failover function provides automatic error recovery and path switching, and is transparent to the running application.

Refer to the URL information in “Web Site Information” on page xxii to acquire the latest device driver information.

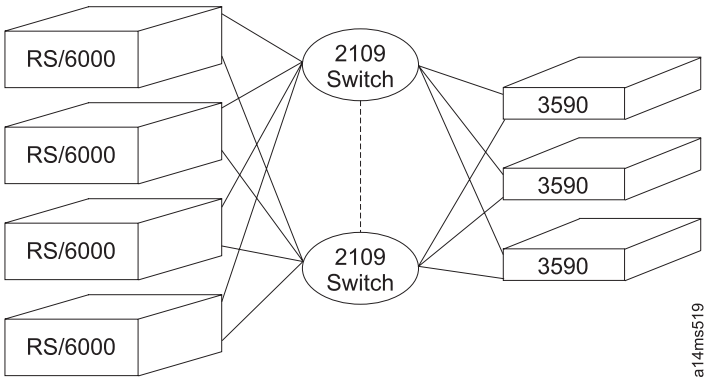


Figure 3-7. SAN Failover Capability

Tape Cartridge

The 3590 uses the IBM High Performance Tape or the Extended High Performance Cartridge. This media is not compatible with the IBM Cartridge System Tape or the IBM Enhanced Capacity Cartridge System Tape, and cannot be used on 3480, 3490, or 3490E tape products. For additional information on the cartridge, see *IBM TotalStorage Enterprise Tape System 3590 User's Guide*.

See Figure 3-8 on page 3-17.

The 3590 uses a serpentine longitudinal recording technology called interleaved-longitudinal recording. This type of recording spreads the bits of a unit of information along the tape, making data on damaged tapes more recoverable. Tape media is commonly damaged in two ways; vertical damage, which can occur if the tape is folded for some reason, and horizontal damage, such as a scratch along the length of the tape, which can occur during tape movement. The probability of being able to recover from either vertical or horizontal damage is increased, because no whole unit of information (a byte) is unrecoverable. Only a few bits within many bytes are damaged, and having only a few bit errors simplifies error recovery and considerably improves the probability of being able to read a damaged tape. IBM has chosen this technology to meet three critical factors; performance, reliability, and cost. Other characteristics include:

Mechanical simplicity:
- Few moving parts
- Proven durability
- Simple loading mechanism

Start-stop operation:
- Complete back-hitch cycle in approximately 100 milliseconds
- Hundreds of millions of cycles possible

Data integrity:
- Numerous concurrent data channels offer several advantages:
- Lower head wear
- Low degree of contact between head and tape minimizes head wear
- Lower media wear

The 3590 High Performance Tape has a capacity of 10 GB of non-compacted data on the Model B11/B1A drives, 20 GB of non-compacted data on the Model E11/E1A drives, or 30 GB of non-compacted data on the Model H11/H1A. With the 3 to 1 data compression algorithm, the capacity is increased to 30, 60 or 90 GB.

With the IBM Extended High Performance Cartridge, the above capacities are all doubled. The Model B11/B1A drives can store 20 GB of non-compacted data, or 60 GB of compacted data. The Model E11/E1A drives can store 40 GB of non-compacted data, or 120 GB of compacted data. The Model H11/H1A drives can store 60 GB of non-compacted data, or 180 GB of compacted data

An additional feature includes the implementation of an improved error correction code (ECC). A portion of the tape within each cartridge is reserved for error history; it is updated after each use (read or write) to provide statistics that can be used to identify problems with a particular tape as early as possible.

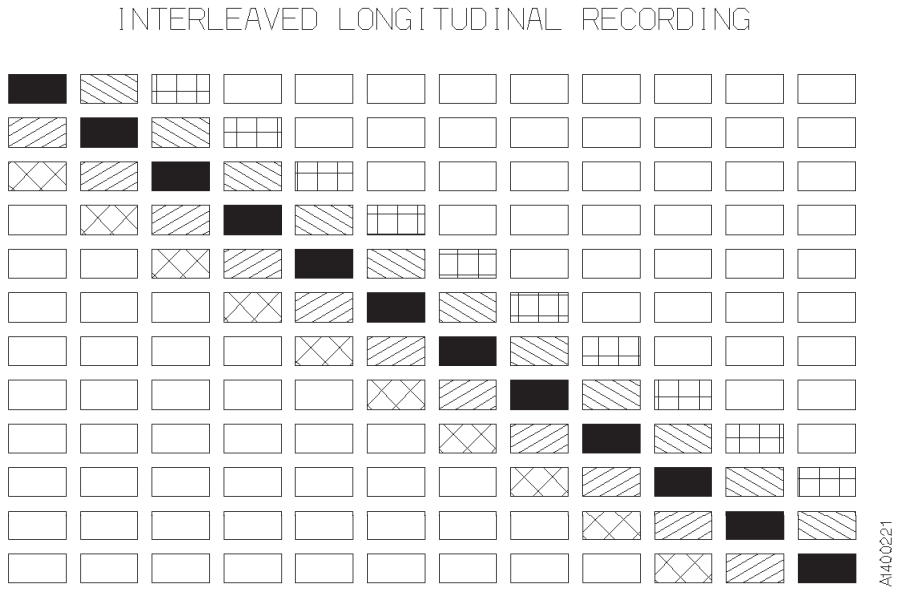


Figure 3-8. Interleaved Longitudinal Recording

Media Type Indicator

The High Performance Tape cartridges have a **blank** (Model Cxx), or a **J**, and the Extended High Performance Cartridges have a **K**, on the bar code label to identify the type of media. The library manager software uses this information to manage the different types of media in an automated library (3494 and 3495).

Servo Tracks

The media has servo tracks, which are prerecorded at the plant of manufacture. These tracks allow the 3590 to position the read/write head accurately with respect to the tape while the tape is in motion. If these servo tracks are damaged or are removed, the cartridge cannot be written to until the servo tracks are restored. Degaussing a 3590 cartridge requires use of a special metal particle degausser. After the tape is degaussed, it cannot be used again.

Erasing Data from Tape

The Erase command from the host overwrites the original data so the original data is obscured sufficiently for *data security erase* purposes.

Description of Tape Cartridge

The following is a brief description of the magnetic tape cartridge used in the 3590 High Performance Tape Subsystem. The cartridge contains:

- A single reel of magnetic tape
- A leader block
- A clutch mechanism
- A cartridge file protect mechanism

See the magnetic tape cartridge in Figure 3-9 on page 3-18.

The leader block **1** is attached to the end of the magnetic tape. During a threading operation, the leader block **3** is pulled out of the cartridge by the threader pin and moved along the tape path to the machine reel.

At the same time the leader block is engaging the threader pin, the tape clutch gear 6 on the bottom of the cartridge engages the file reel gear. This action engages the clutch surface inside the tape cartridge, allowing the file reel motor to rotate the tape reel.

The cartridge file-protect mechanism is a thumbwheel that is moved by hand to either the file-protected 2 or the 'not file-protected' 4 position. A closed-lock symbol on the face of the thumbwheel indicates that the cartridge is file-protected.

The outside of the cartridge housing has:

- Space for the volume identification 5 , which is at the front of the cartridge housing.
- The clutch mechanism 6 in the center of the cartridge housing.
- Cartridge-type sensor notches 7 .

  The cartridge-type sensor notches allow the 3590 to recognize cartridges designed for its use and to reject all other cartridges not designed for the 3590.

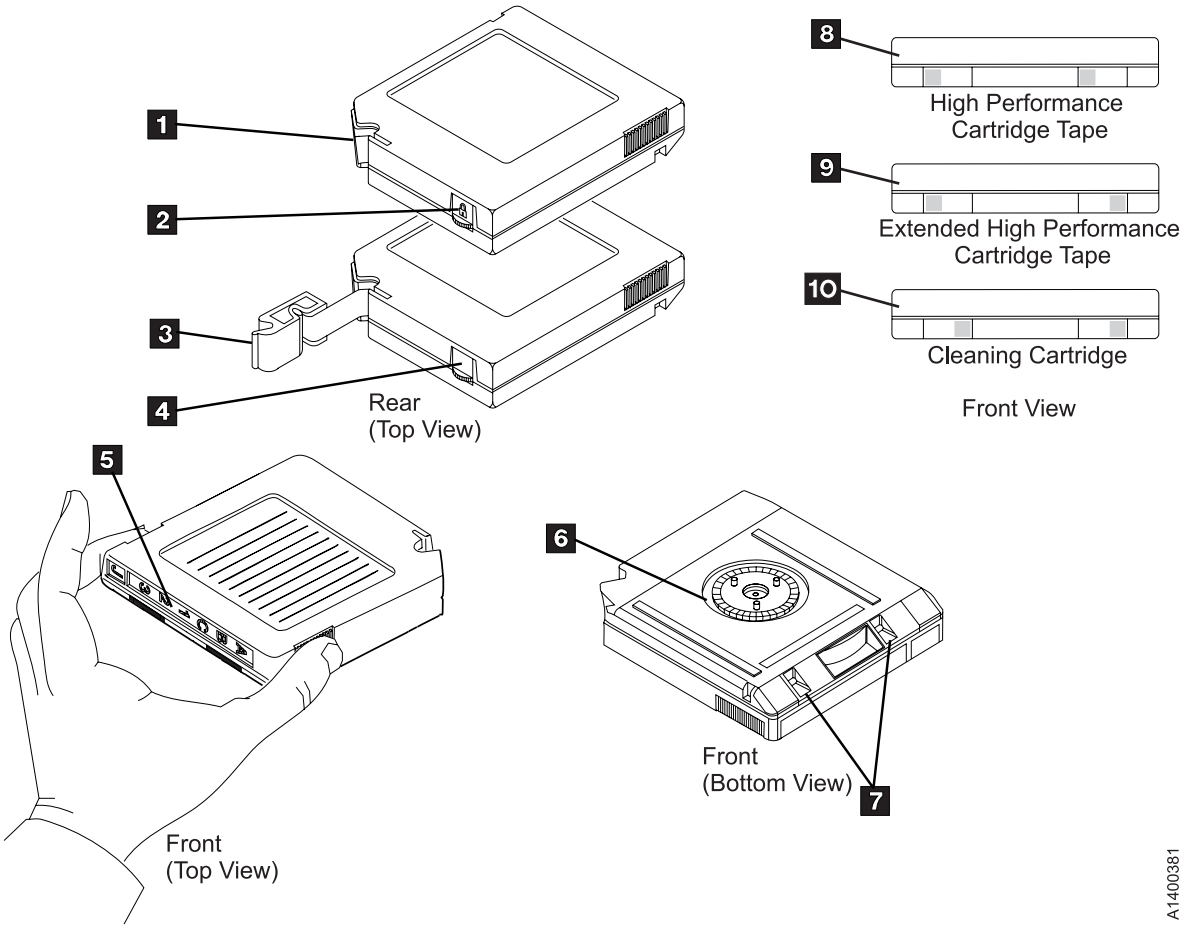


Figure 3-9. Magnetic Tape Cartridge

The 3590 uses two different data storage cartridges and a cleaning cartridge. When viewed from the front, the sensor notches for the data storage cartridges are oriented to the left 8 for the High Performance Tape and to the outside 9 for the Extended High Performance Cartridge. The sensor notches for the cleaning cartridge are oriented to the right 10 .

3590 Tape Drive

The 3590 tape drive can be configured in a rack or in an automated tape library dataserver. Either SCSI or fibre channel attachments are supported.

The 3590 tape drive is a modular drive unit that measures 221 mm (8.8 in.) wide, 750 mm (29.8 in.) deep, and 262 mm (10.5 in.) high. The 3590 tape drive contains the read/write head, the mechanical components, the sensors, the head servo system, and the motors necessary to thread and move the tape forward or backward.

Each SCSI drive has two external SCSI ports for attachment to pSeries/RS6000 (AIX), Linux , POWERparallel SP2, iSeries AS400 (OS/400), Sun (Solaris), Hewlett-Packard (HP-UX), Windows NT, or Windows 2000 attached systems. The drive can be attached to the control unit which is attached to the host Via ESCON or FICON. The 3590 can be integrated with any host system that supports the correct SCSI attachment and has the proper software drivers installed.

Each fibre channel drive has two external fibre channel ports for attachment to any iSeries AS400 (OS/400), pSeries/RS600 (AIX), xSeries (NUMA-Q) , Hewlett-Packard (HP-UX), Windows NT/2000, Sun, or other host system that supports the fibre channel attachment and has the proper software drivers installed.

Figure 3-10 on page 3-20 shows the IBM 3590 drive unit with its own integrated Data Channel control unit function with two channel interfaces, SCSI or fibre channel. The integrated control unit function includes buffering and compaction for multi-host attachment or availability, and eliminates drive contention, thus enhancing performance.

The 3590 Model B11/B1A tape drive can read and write data at a rate of 9 MB/second and the E11/E1A and H11/H1A drive can read and write data at a rate of 14 MB/second. The IBM 3590 can transfer data between the host and the tape subsystem at a rate of 17 MB/second for hosts attached through Enterprise System Connection (ESCON) channels, 20 MB/second when attached through fast/wide small computer systems interface (SCSI), and 40 MB/second if the Ultra/wide SCSI feature is installed. With the fibre channel attachment, 3590 Model E11/E1A and H11/H1A drives can transfer data at the rate of 100 MB/second burst data rate.

Microprocessors and Control Storage

The 3590 contains three microprocessors in the card pack. One processor controls all of the buffers, read/write data flow, operator/CE panel, and the ACF. This processor executes microprograms that control and monitor the 3590. The other two processors control the track-following servo system and the reel-to-reel motors.

The control storage consists of nonvolatile storage where:

- Microcode for the 3590 is stored
- DRAM where the microcode resides following a power-ON sequence or a reset

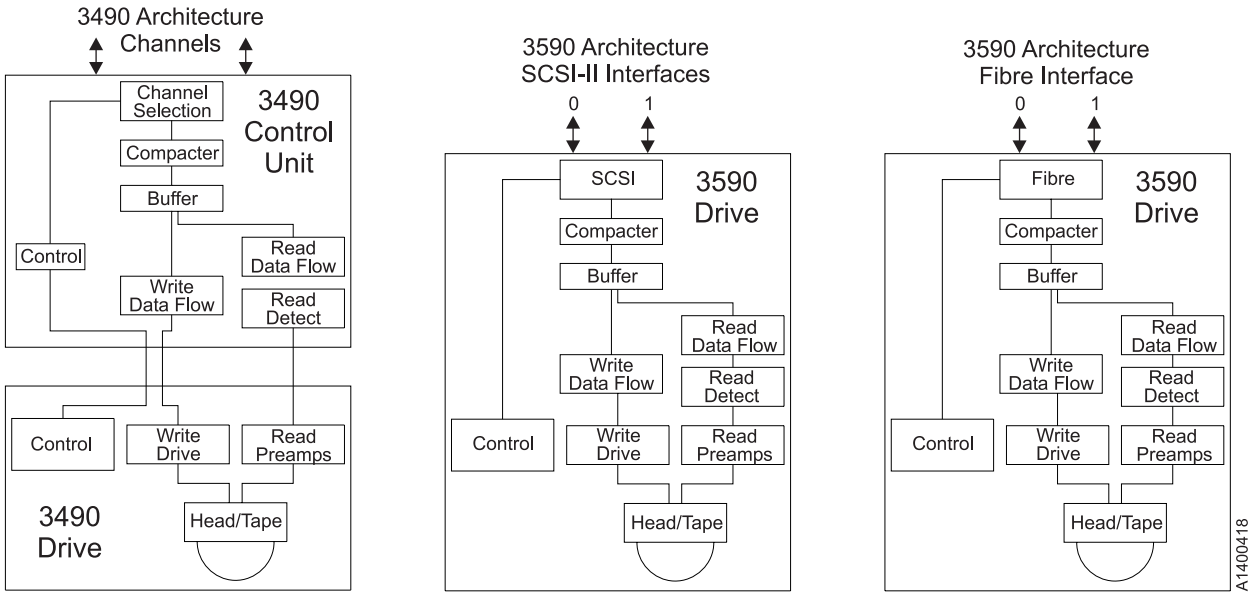


Figure 3-10. Tape Drive Schematic Comparison (3490, SCSI and Fibre)

Read/Write Functional Areas

See Figure 3-10 (SCSI) or (Fibre).

The read/write functional areas provide the data paths to transfer data between the host system and the 3590 subsystem. The data handling areas include:

- SCSI/fibre channel buffer
- LZ1 compactor
- Data buffer
- Read data flow
- Write data flow

The microprocessor on the logic card controls data movement between the tape subsystem and the host system. The data flow sends commands and receives status from the reel-to-reel digital signal processor (DSP) and the track, following DSP.

The data buffer area contains the customer data. Components of the logic process data in and out of the data buffer.

When a buffered write operation occurs, data is transferred from the SCSI/fibre channel buffer and the data buffer. The 3590 signals the host that the data has been written on tape. However, the data is still in the buffer. When the 3590 workload permits, the data is transferred to the analog card and is written on tape.

During read operations, the 3590 pre-reads data from the drive into the data buffer. When the host requests the data from the subsystem, the 3590 unit responds immediately and transfers the data.

Head Guide and Brush Assembly

The head guide assembly (HGA) is a FRU which can be removed from the 3590 deck. The HGA is a bidirectional read/write head with 16 elements and a recording format of 128 tracks (Model B11/B1A), 256 tracks (Model E11/E1A), or 384 tracks (Model H11/H1A). The bidirectional head writes 16 tracks from the

load point to the physical end of tape and then writes 16 tracks from the physical end of tape back to the load point. Therefore, fully written tapes are positioned at the load point and eliminate the rewind operation.

The only visual difference between the three HGA assemblies is the serial number on the barcode label on top of the R/W head. The Model E11/E1A serial numbers all begin with a “T”, the Model B11/B1A serial numbers all begin with a “B” and the Model H11/H1A serial numbers all begin with an “M”.

The HGA Assemblies for the Extended High Performance Cartridge have a ’**2X**’ label on top of the ’D’ bearings.

The principal purpose of the HGA assembly is to:

1. Guide the tape across the recording head with a pair of hydrodynamic bearings located on either side of the recording head. The compliant guide assembly which helps tape track on air bearing is located on top of each of the air bearing block.
2. Perform recording with the head via the flexible head cable.
3. Position the read/write head against the moving tape with the aid of the integrated actuator and optical sensor components.
4. Maintain cleanliness of the R/W head by using a head cleaner brush.
5. Provide vital product data (VPD) for the performance parameters of the HGA, such as head reference positions and actuator performance parameters.
6. Provide a location for the vital product data card (VPD). The card contains a serial nonvolatile read/write memory component, which is used to store and transmit various actuator/head position data to the drive microcode during functional operation. This erasable programmable read-only memory (EPROM) is programmed by manufacturing during HGA assembly with position data and head module current data from the high speed generic component tester (HSGCT). The card also provides connection to the actuator coil on the HGA. This connection is a direct connector pass through.

Drives with the Extended High Performance Cartridge feature require an HGA assembly with the **2X** label. The **2X** HGAs are downward compatible and will work on drives without the Extended High Performance Cartridge feature.

Attention:

HGA-Specific Notes

- Due to the delicate nature of the HGA, do not touch the head modules.
- Always unplug the head cable before removing the HGA from the drive. The head cable is extremely fragile; do not touch or pull the cable under any circumstances.
- Handle the HGA only by the HGA casting. Set the HGA on its feet with the head cable outwardly spread. Always use the HGA cover. When the HGA is not in use, put it in the packing box.
- It is important that you do not push down on the head.
- Do not use magnetized tools near the head; they can destroy the head.

Pantocam Assembly

The pantocam assembly carrier pin engages with the leader block that is attached to the end of the magnetic tape. During a threading operation, the leader block is pulled out of the cartridge by the threader pin and moved along the tape path to the machine reel. At the same time the leader block is engaging the threader pin, the tape clutch gear on the bottom of the cartridge engages the file reel gear. This action engages the clutch surface inside the tape cartridge, allowing the file reel motor to rotate the tape reel.

Loader Assembly

The loader assembly is similar to a front loading video cassette recorder (VCR). A light push causes the cartridge to go into the loader assembly where it is lowered onto the tape deck hub/clutch assembly to commence tape threading. The reverse takes place at the end of the recording or reading cycle. The tape cartridge is lifted and then ejected horizontally into the unload position.

The loader has a manually-operable compound gear that acts as a thumbwheel to assist and facilitate manual loading and unloading of a tape cartridge.

Automatic Loading and Unloading

The step-by-step cartridge loading sequence is:

1. The cartridge is inserted into the loader opening until resistance occurs.
2. During the insertion process, the loader door is tilted inward to interrupt a door-open sensor.
3. The cartridge goes into the loader in a horizontal motion for about 15 mm (0.59 in.) until the cartridge present sensor detects the cartridge. The loader motor is then turned ON.
4. With the aid of a cam follower, the cartridge is lowered a vertical distance of about 11.5 mm (0.45 in.)
5. The loader motor is turned OFF after the tray-down condition is detected by the cartridge type sensors.
6. The file-protect button in the cartridge activates the file-protect sensor, which is located in the back of the loader.
7. In the final loaded position, there are 4 cartridge media identification sensors, that distinguish 16 different types of media. These 4 sensors are interruptive (break light beams) type. The four cartridge type ID sensors also are used to detect if a cartridge is seated (tray down).

In the unloading operation, the process is reversed. The cartridge is returned to its initial position, described in step 1.

Manual Loading and Unloading

Without the aid of the loader motor, you can load the cartridge in essentially the same manner described for automatic loading. Using the protruding gear on the left side of the assembly, turn the gear towards you for loading, and turn the gear away from you for unloading.

To repeat loading and unloading cartridges, turn the gear all the way in each direction and remove the cartridge completely out of the loader before each reloading operation.

Fiducials

Fiducials are used by cartridge handling devices to locate where and what type of tape drive device is installed. Do not cover or modify the fiducials.

The 3590 Model B1A/E1A/H1A has one white fiducial **1** for 3590 devices installed in IBM Model 3494 Tape Library Dataservers.

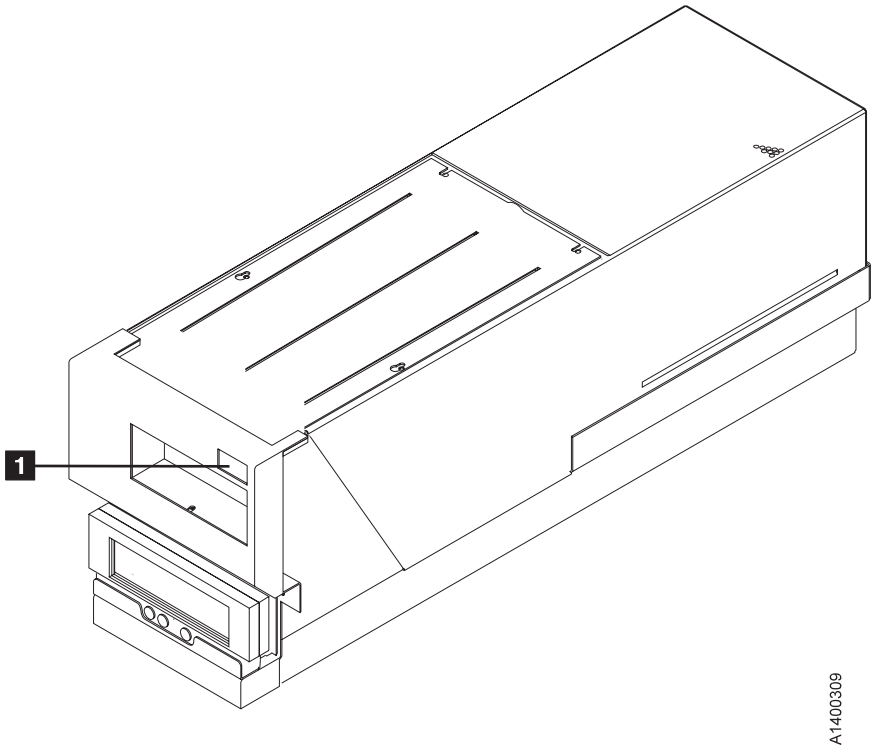


Figure 3-11. Fiducial for IBM Model 3494 Tape Library Dataservers

Operator/CE Panel

The operator/CE panel is a menu-driven display used by the CE and the operator to display and set different options such as:

- Device status
- Error conditions (FID)
- Drive setup
- Mount activities

Figure 3-12 shows the display panel. Chapter 5, “Operator Panel” on page 5-1 describes the functional description of panel operations.

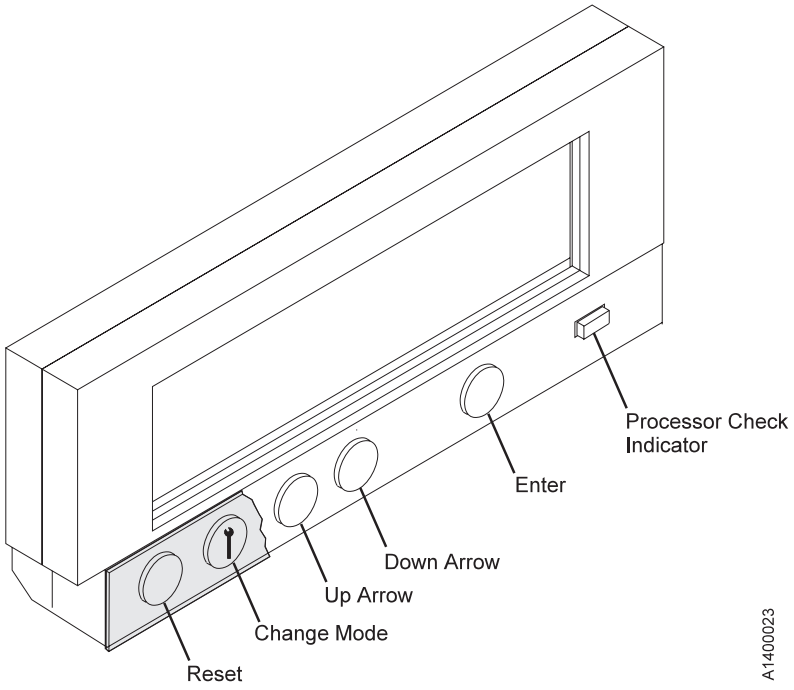


Figure 3-12. Operator/CE Panel

The operator/CE panel on a Model B11/E11/H11 can be used to set one of the following ACF modes:

- Manual
- Accumulate
- Automatic
- System
- Random or Random 2-LUN

See “Modes of Operation” on page 6-19 for a complete description of these modes.

Operator Panel Messages

The 3590 message display has 6 message types:
- FID 1 messages
- Attention messages
- Routine messages
- FID 2 messages
- FID 3 messages
- FID 4 messages

See “Intervention Messages” on page 5-10 for details.

Pneumatic System

Unlike the earlier 3480/3490 tape systems, the 3590 has a centralized pneumatic supply system to either 2 or 4 drive units. The 3490E utilizes an individual pneumatic supply system for each drive with air distribution remaining as originally designed for 3480 with improvements to the air filtration and regulation. The 3590 pneumatic supply system has a 3490E compressor with size reduction to the filters and pressure/vacuum control devices. It is a closed loop control system with pressure feedback. There is a pressure transducer for pressure feedback and a low pressure shut off. The 3590 pneumatic system has no pneumatic reservoir such as the one in the 3480/3490/3490E. The 3590 has an enhanced puffer solenoid and a complete rerouting of the air distribution system from the previous designs.

Functions

The principal function of the pneumatic supply system is to provide pressurized sources of air to the following areas:
- The hydrodynamic air bearing to guide the tape across the magnetic head.
- The tension transducer bearing to monitor the tape tension and to provide feedback to maintain reel to reel tape velocity and position control during tape acceleration and deceleration.
- The decoupler, which behaves like a mini vacuum column to buffer the dramatic changes in tape tension profile. It provides a smoothing affect on the tape tension. Both the pressure and vacuum lines go to the decoupler.
- The pressure sensor for the closed loop pneumatic control system.
- The tape lifter which is located in the magnetic head. The tape lifter prevents the tape from sticking to the head when there is no relative motion between the tape and the head. The tape lifter is normally OFF when the tape is running.

See Figure 3-13 on page 3-26 for the components of the pneumatic system.

Note: The cleaner blade is no longer used in the 3590 tape path.

Operation

The following is a description of the pneumatic system components (FRUs):

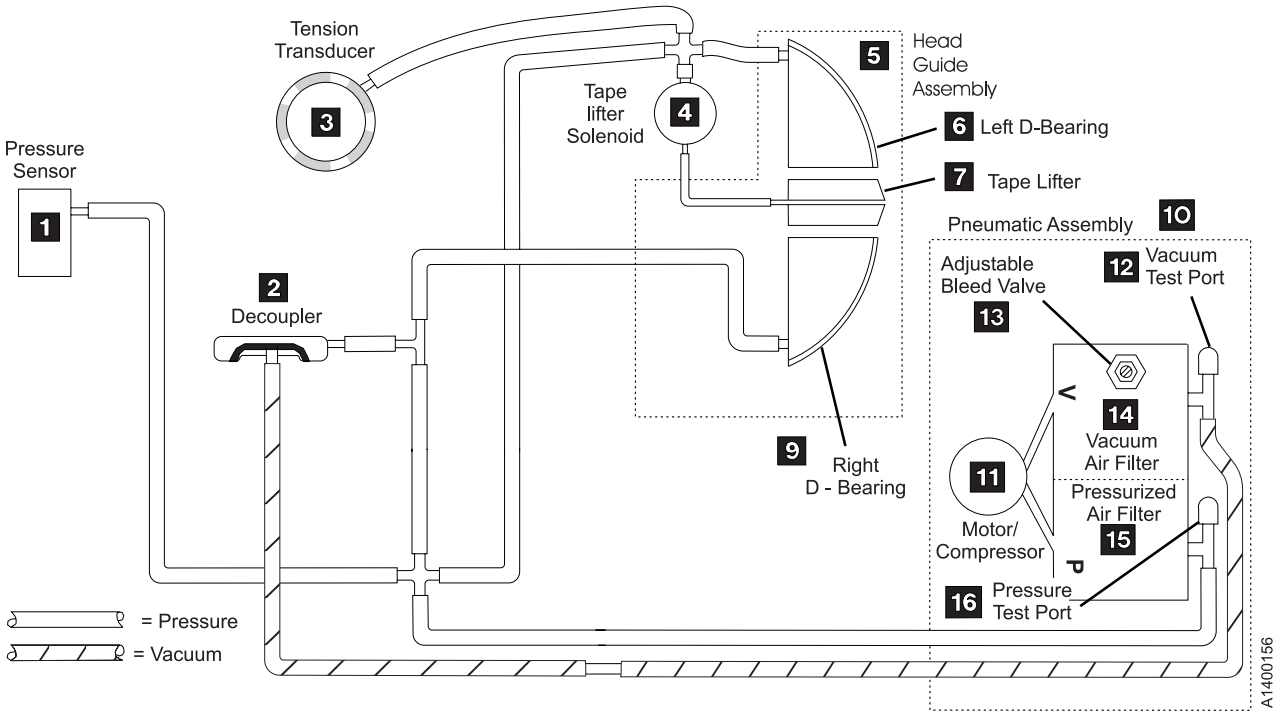


Figure 3-13. Pneumatic System Components

Pneumatic Assembly 10

The pneumatic assembly contains the pneumatic motor/compressor 11 and separate filters for pressurized air 15 and vacuum 14 in a single housing. There are test ports for the pressurized air 16 and vacuum 12 and an adjustable bleed valve 13 for adjusting the vacuum.

Pressure Sensor 1

The pressure sensor is used to measure the air pressure in the pressurized air supply from the motor/compressor. The pressure sensor and its small integrated circuit board controls pressurized air by varying the speed of the compressor motor.

Tension Transducer 3

The tension transducer assembly uses pressurized air to form an air bearing for the tape path and to measure tape tension. The tension transducer and its small integrated circuit board controls tape tension by varying the speed of the file and machine reel motors.

Head Guide Assembly 5

The head guide assembly contains three pneumatic system components:

- The right 9 and left 6 D-bearings are on either side of the read/write head. They use pressurized air to create air bearings on which tape is guided over the head.
- The tape lifter 7 is a slot in the read/write head through which pressurized air is blown when tape movement stops.

  Note: The cleaner blade is no longer used in the 3590 tape path.

Tape-Lifter Solenoid 4

The tape-lifter solenoid is a solenoid-activated air valve. When tape movement stops, the microprogram activates this solenoid, which causes pressurized air to blow through the slot 7 in the read/write head and to push the tape away from the head.

Decoupler 2

The decoupler is a pocket-shaped guide in the tape path that is a mini-vacuum column to buffer the drastic changes in tape tension. Both vacuum and pressure lines go to the decoupler.

The vacuum inside the pocket causes the tape to be pulled into the pocket. Pressurized air goes to both surfaces outside the pocket to create air bearings for the tape path.

Pneumatic Hose Kit

The pneumatic hose kit consists of tees, crosses, elbow, and hoses, to connect the components of the pneumatic system. When one hose needs to be replaced, the entire hose kit is installed.

The small hose from the tape-lifter solenoid 4 to the tape lifter 7 is part of the head guide assembly 5 and is not replaced with the hose kit. It is replaced only with the head guide assembly.

Pneumatic System Adjustments

Pressure and vacuum are adjusted when vacuum and pressure related FRUs are replaced. Pressure is adjusted by the microcode from the CE Config/Install menu or when the cleaner cartridge is run. Vacuum is adjusted manually by the CE. See “Measurement and Adjustment of Pneumatic System” on page 10-4.

Power Supplies

Power in the 3590 is supplied by a single integrated dc power supply. The ac power cord of this supply is plugged into the ac power distribution of the rack or library in which the 3590 is mounted.

The power supply is packaged in a metal housing for structural and safety purposes and to meet the mechanical requirements for mounting. Cooling air flow is provided by fan(s) attached to the power supply. The power supply assembly is an ac/dc converter that generates the dc voltages necessary for operation of the 3590. The power supply is designed to accept a single phase 50 or 60 Hz, ±5%, 100-127 or 200-240 V ac. Status indicators are located on the rear cover of the supply. When single phase ac power is supplied to the power supply the ac indicator turns ON. When the power switch is turned ON, the power supply begins operation, the dc voltages turn ON, and the dc indicator turns ON. The power supply provides over-current and over-voltage protection on all outputs.

The 3590 dc power supply is a single FRU. No serviceable components are contained within the power supply. The power supply has no adjustments.

The 3590 drive does not provide remote power control. If required, remote power control is provided by the enclosure or a higher level subassembly.

Function

There are two levels of power supplies used on the 3590. See Figure 3-14 on page 3-29. The **New Level** is used on all Model E11/E1A and H11/H1A drives and also on the new built Model B11/B1A drives with common card pack . The **Old Level** is used on all Base Model B11/B1A drives and on the Model B11/B1A drives with the Ultra card pack (P/N 35L0818) or older.

- The **Old Level** B11/B1A power supply converts ac input to +36, +12, +5.3, +5.2, +5.1 and −5.1 V dc. This power supply has two cooling fans, and provides dc power to the 3590 through an integral (non-removable) cable that connects to the card pack.
- The **New Level** E11/E1A and H11/H1A power supply converts ac input to +36, +12, +5.1 and −5.1 V dc. This power supply has only one cooling fan, and provides dc power to the 3590 through a separate (removable) cable that connects to the card pack.

Both levels of power supply have over-voltage, over-current and thermal protection circuits. The operational status of the power supply is indicated by three LEDs; AC, DC, and TH (thermal) on the rear cover of the power supply.

An over-voltage or over-current condition on the +36 V dc output will cause all of the output voltages to turn OFF. An over-voltage or over-current condition on any of the other dc outputs will turn OFF all output voltages except the +36 V dc. Either of the above conditions will cause the dc LED to turn OFF also. The power supply will resume operation when the fault is removed and the supply is cycled OFF/ON.

The thermal protection circuits are activated when a thermal condition is sensed in the power supply or in the card pack, or when a fan failure in the power supply is detected. The power supply must be cycled OFF and then back ON before the LED will go OFF.

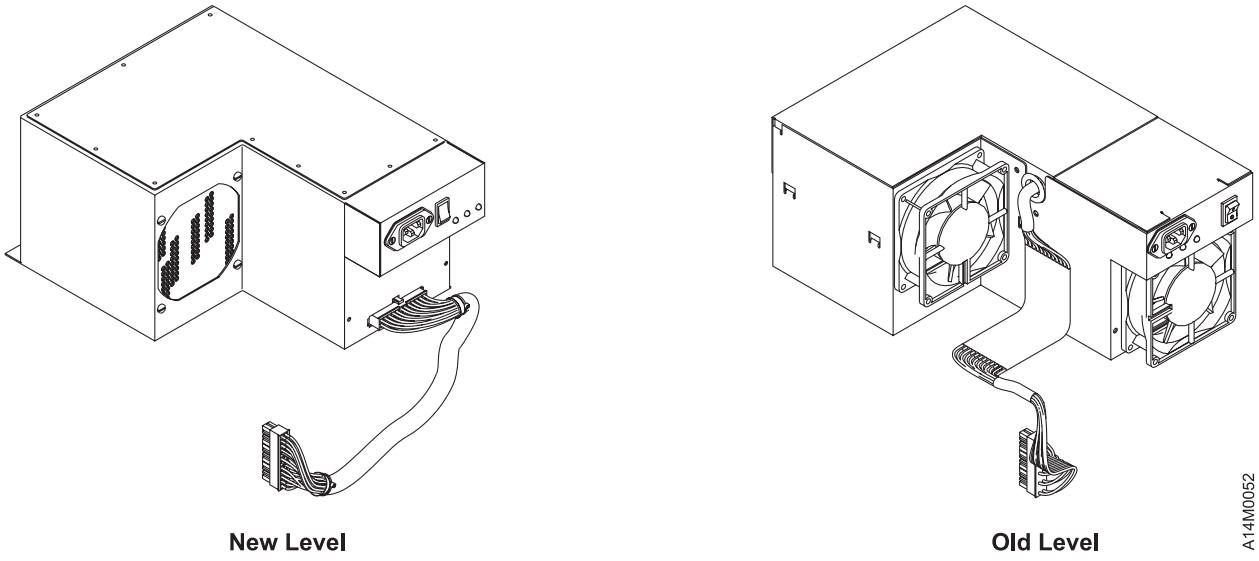


Figure 3-14. New and Old Level Power Supplies

Operation – LED Indicators

The three LEDs on the rear of the 3590 power supply indicate the power status, as follows:

LED **Indicates**

AC Presence of ac voltage at the input to the power supply regardless of the position of the power switch.

DC dc voltages are being supplied. This LED goes ON several seconds after the power switch is switched to the ON position. The LED goes OFF when:

- The switch is set to the OFF position
- An over-voltage or over-current condition is detected on one of the dc outputs
- A thermal sensor is activated in the card-pack assembly or inside the power supply

TH The thermal LED can be turned ON under any of the following conditions:

1. If a thermal error is detected in the card pack, the microcode will send a signal to the power supply that will turn ON the TH LED and also turn OFF all of the dc voltages and the dc LED.
2. If a thermal error is detected in the power supply, the power supply will turn ON the TH LED and also turn OFF all of the dc voltages and the dc LED.
3. A power supply fan failure.
   - New Level Power Supply: If the power supply detects that the power supply fan is rotating too slowly or is stopped, the power supply will turn ON the TH LED and send a signal to the card pack. When the card pack detects the fan failure signal it will send a signal back to the power supply. This causes all of the dc voltages to turn OFF, and turns OFF the dc LED.

     As an aid to failure isolation, the **New Level** power supply can be turned ON while the power supply to card pack cable is disconnected. If the circuits in the power supply detect that the fan has failed, the TH LED will be turned ON within 20 seconds. This indicates that the fault is in the power supply and not in the card pack.
   - Old Level Power Supply: The **Old Level** fan failure detection is the same as the **New Level**, except for the TH LED control. The TH LED on an **Old Level** power supply is controlled by the microcode, not by the power supply. If an **Old Level** power supply with a failing fan is turned ON while the power supply to card pack cable is disconnected, the TH LED will **not** turn ON.

Power Switch and Power Sequence

A description of the power-ON sequence follows:

1. When the 3590 power cord is plugged into the power source, the ac LED on the back of the power supply goes ON.
2. About one or two seconds after the 3590 is powered ON, the following occurs:
   - The dc LED goes ON and remains ON.
   - The cooling fans begin operating.
   - The operator/CE panel backlighting goes ON and the Processor Check LED goes ON.
3. About 15 seconds after the 3590 is powered ON, the **Panel Initialized** message displays on the operator/CE panel, and the Processor Check LED goes OFF.
4. About 20 seconds after the power switch is switched ON, the automatic cartridge facility (ACF) is initialized. The ACF elevator is moved up and down during this initialization.
5. The power-ON self-test (POST) runs for approximately 2½ minutes after the 3590 is powered ON.
6. Power-ON is successful if the operator/CE panel display is not blank and does not have an error message displayed.

Power Specifications

Table 3-5 shows the power specifications of the 3590.

AC power to the Model B11/E11/H11 is supplied from the rack power supply or the frame power supply. The Model B1A/E1A/H1A receives its ac power from the ac box in the tape library. The 3590 has an integrated ac to dc supply.

The 3590 accepts a variety of input voltages and frequencies. The 3590 automatically adjusts itself for proper operation with any combination of these voltages and frequencies.

Table 3-5. Power Specifications

Item	Old Level Power Supply	New Level Power Supply
Nominal Input Voltage	100–127 V ac 200–240 V ac	100–127 V ac 200–240 V ac
Input Frequency	47–63 Hz	47–63 Hz
Inrush Current	30 Amps	20 Amps
Typical Power Consumption	300 Watts	225 Watts

Power Cords

The ship group provides the necessary power cord for all electrical environments. All power cords are suitable for 10 amperes, 50 or 60 Hz, with one- or two-phase power plus ground.

The most common application uses a 3 m, 220 V ac, 50/60Hz cable that plugs into the Power Control Compartment (PCC).

| See *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*, for details.

Automatic Cartridge Facility and Magazine

The Automatic Cartridge Facility (ACF) magazine loads and retrieves tape cartridges to and from the tape drive. Figure 3-16 on page 3-32 shows the magazine mounted in the ACF.

See Chapter 6, “Automatic Cartridge Facility” on page 6-1 for location and functional description of the ACF.

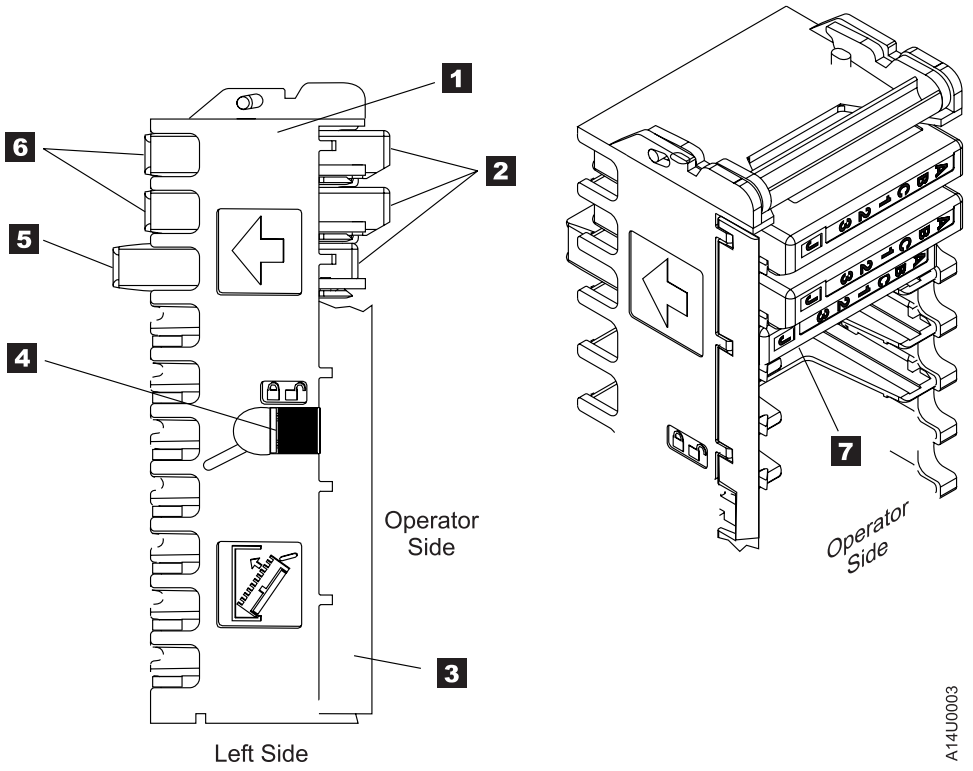


Figure 3-15. Left View of the 3590 Magazine Cartridge Positions

Figure 3-15 shows the magazine from the left side. The magazine **1** provides the following functions:

- Holds 10 tape cartridges
- Has a carrying handle
- Can be loaded and removed from the ACF
- Has two cartridge positions **2**
- Has an import position **5** or **7** where the cartridge is positioned for access by the transport
- Has an export position **6** where the cartridge is positioned by the transport for removal by the operator
- Has a locking bar **3** to hold the cartridge in the magazine
- Has a latch **4** to lock and release the locking bar
- Has 3 white fiducials that are recognized by a machine vision system when the drive is in an automated tape library

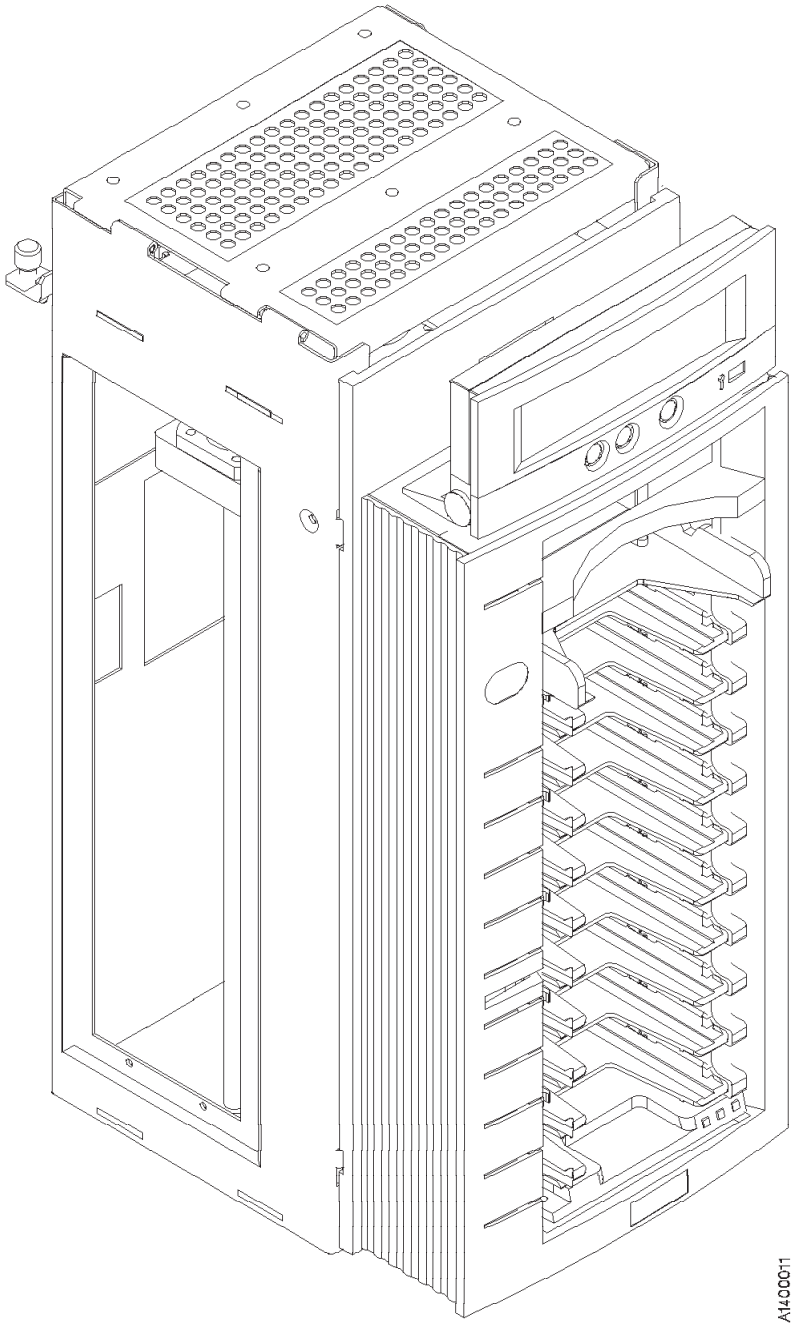


Figure 3-16. Automatic Cartridge Facility and Magazine. (Shown with Cover Removed)

Transport Mechanism

See Figure 3-16.

The transport within the ACF moves the cartridges between the drive, the magazine, and the priority cell.

When a mount is requested, the cartridge is moved (imported) from the magazine into the ACF, where it is elevated to the opening of the drive and mounted. The elevation of the cartridge from the lowest position in the magazine to the drive takes approximately 2 seconds. When the tape is unloaded and demounted, the elevator returns (exports) the cartridge to the designated (mode dependent) slot in the magazine.

Subsystem Initialization

Subsystem initialization includes initial microprogram load (IML), power sequencing, and subsystem diagnostics.

Initial Microprogram Load

During an initial microprogram load (IML), a microcode image that permits the subsystem to become functional is loaded into the RAM.

Anytime the unit is powered ON, the 3590 attempts to perform an IML from nonvolatile storage.

Power Sequencing

When power is applied, internal diagnostic tests check the voltages. After the voltages have been checked, a general reset of the logic is performed. Finally, a basic function test of the logic is performed. Errors detected during the power-ON sequence are displayed on the operator/CE panel. See “Power Switch and Power Sequence” on page 3-30 for additional details about the power supply and sequencing.

Subsystem Diagnostics

Subsystem diagnostics are divided into two sections:

- Power-ON reset (POR)
- Self-Test

POR Diagnostic

Drive power-ON reset diagnostic tests are initiated when a drive is powered up or when the “Device Reset” switch on the operator panel is activated. Any write data in the drive (buffers, compactor, and so on) that has not yet been transferred to the media is lost. Drive power-ON reset does not directly affect the initiator other than the device is offline to the initiator during the reset. The device begins executing microcode from its own nonvolatile storage providing a comprehensive test of the unit logic.

Errors detected during execution of POR are posted to a table in control store and depending on the severity of the error, errors may also be displayed in the operator/CE panel and can be cross-referenced to a FID in Table 1-2 on page 1-9. The table provides the FIDs, the FRU name, the TAC code, and the MI page for repairing the failure.

This set of diagnostics verify that the machine performs as intended. It may be invoked at any time either to verify a fix or to exercise the subsystem. See Verify Fix in “CE Verify Fix Menu” on page 5-39.

3590 Drive Model and Feature Levels

Four different levels of 3590 drives are available:
- Base Model B11/B1A 3590 Drives
- Ultra Model B11/B1A 3590 Drives
- Model E11/E1A 3590 Drives
- Model H11/H1A 3590 Drives

These drive levels have important differences which affect service, installation, and operations. The following section outlines these important differences. All three of the above models can be equipped with the Extended High Performance Cartridge tape feature.

Identifying Feature Code Level

Refer to Table 3-6 and Table 5-1 on page 5-6 to determine the 3590 drive Model and Feature level.

Table 3-6. 3590 Drive Model and Feature Level Identification

Parameter	Model H11/H1A	Model E11/E1A	Ultra Model B11/B1A	Base Model B11/B1A
Rear cover label	Model H label on rear cover near power switch, below serial number label. 2X label on rear cover because Extended High Performance Cartridge feature is installed.	Model E label on rear cover near power switch, below serial number label. 2X label on rear cover when Extended High Performance Cartridge feature is installed.	Ultra label on rear cover near power switch, below serial number label. 2X label on rear cover when Extended High Performance Cartridge feature is installed.	Serial number label only. 2X label on rear cover when Extended High Performance Cartridge feature is installed.
Op Panel display	When SCSI is installed it displays **H11–X** or **H1A–X** when Extended High Performance Cartridge feature is installed; **H11FX** or **H1AFX** with both fibre channel and Extended High Performance Cartridge features installed.	Displays the word **E11 or E1A** on top right of display when powered ON or operating; **E11–F** or **E1A–F** when fibre channel feature is installed; **E11–X** or **E1A–X** when Extended High Performance Cartridge feature is installed; **E11FX** or **E1AFX** with both fibre channel and Extended High Performance Cartridge features installed.	Displays the word **Ultra, B11–U or B1A–U** on top right of display when powered ON or operating: **B11UX** or **B1AUX** when Extended High Performance Cartridge feature is installed.	Blank or displays the word **B11** or **B1A** on top right of display when powered ON or operating: **B11–X** or **B1A–X** when Extended High Performance Cartridge feature is installed.

Table 3-6. 3590 Drive Model and Feature Level Identification (continued)

Parameter	Model H11/H1A	Model E11/E1A	Ultra Model B11/B1A	Base Model B11/B1A
Microcode level	From the operator panel, select **Services**, then **Microcode Level** to display the code level. Model Hxx drives use D0IF_xxx, microcode.	From the operator panel, select **Services**, then **Microcode Level** to display the code level. Model Exx drives use D0IC_xxx, D0ID_xxx, D0IE_xxx, or D0IF microcode.	From the operator panel, select **Services**, then **Microcode Level** to display the code level. Ultra drives with common card pack use D0ID_xxx, D0IE_xxx, or D0IF. Ultra Drives with Ultra card pack (P/N 35L0818) use D0IB_xxx.	From the operator panel, select **Services**, then **Microcode Level** to display the code level. Base drives use D0IA_xxx microcode.
Inquiry Data page '00'	Bytes 32-35 show the microcode revision level. Model Hxx drives will show Fxxx. Example: F640	Bytes 32-35 show the microcode revision level. Model Exx drives will show Cxxx, Dxxx, Exxx, or Fxxx. Example: C640	Bytes 32-35 show the microcode revision level. Ultra drives will show Bxxx with Ultra card pack (P/N 35L0818) or Dxxx, Exxx, or Fxxx with common card pack. Example: B640	Bytes 32-35 show the microcode revision level. Base drives will show Axxx. Example: A640
Inquiry Data page '03'	Bytes 8-11 show the Load ID, eight hex digits that are unique for each EC level. For Model Hxx, Load ID = A0B00E26.	Bytes 8-11 show the Load ID, eight hex digits that are unique for each EC level. For Model Exx, Load ID = A0B00E26.	Bytes 8-11 show the Load ID, eight hex digits that are unique for each EC level. For Ultra 3590, Load ID = A0B00E25 with Ultra card pack or A0B00E26 with common card pack.	Bytes 8-11 show the Load ID, eight hex digits that are unique for each EC level. For Base 3590, Load ID = A0B00E22.
Note **Note:** The 'X' in designations like 'H1A–X' indicates SCSI, and the FX in designations like 'H1A–FX' indicates Fibre.				

Drive Model and Level Differences

The four different level drives are all designed to operate in a compatible manner. However, there are some important differences which require changes in the service and maintenance procedures. Some of these differences also require the application of system prerequisites in some installations. This section describes the key differences between the drive levels.

Hardware Differences

Each of the four different level drives all has unique card-pack, electronic requirements. There are differences in the logic cards inside the packs, but the outside metal cases are all very similar. The **only** way to determine the difference is by the part number label on top of the metal case. See the Parts Catalog, "Assembly 3: Deck Enclosure" on page 11-10, for the correct part number information. Be sure to order the correct replacement card-pack when ordering a spare part.

The Model H11/H1A Read/Write Head Guide Assembly (HGA) is different from the Model E11/E1A and B11/B1A. The Model H11/H1A HGA is designed to write 384-track tape format. The Model E11/E1A Read/Write Head Guide Assembly (HGA) is different from the Model H11/H1A and B11/B1A. The Model E11/E1A HGA is designed to write 256-track tape format. The Models B11/B1A Read/Write Head Guide Assembly (HGA) is different from the Model E11/E1A and H11/H1A. The Model B11/B1A HGAs are designed to write 128 tracks. The only visual difference between the three HGA assemblies is the serial

number on the bar-code label on top of the R/W head. The Model E11/E1A serial numbers all begin with a **T**," the Model B11/B1A serial numbers all begin with a **B**, and the Model H11 and H1A serial numbers all begin with an **M**. Be sure to order the correct replacement HGA when ordering a spare part.

Note: The HGA will have a '2X' label on the 'D' Bearings if the Extended High Performance Cartridge is installed. The 2X HGAs are downward compatible and will work on drives without the Extended High Performance Cartridge feature.

The Model E11/E1A and H11/H1A Power Supply is different from the Model B11/B1A. The Model E11/E1A and H11/H1A (New Level) power supply has a separate, removable cable and only one cooling fan. The Model B11/B1A (Old Level) power supplies have a built-in, non-removable cable and two cooling fans. Be sure to order the correct replacement power supply when ordering a spare part.

SCSI Adapter/Port Compatibility

Base 3590 drives have two Fast/Wide Differential SCSI ports with a maximum data rate of 20MB/s. All Model Ultra B11/B1A, E11/E1A and H11/H1A drives have two Ultra/Wide FAST-20 differential SCSI ports with a maximum data rate of 40MB/s.

The faster 40MB/s Ultra SCSI data-rate is only achievable if the customer Host Adapter also supports the Ultra SCSI data-rates (such as the FC 6207 pSeries/RS6000 (AIX) System and Linux system adapter). If the host adapter does not support the Ultra data-rate, the 3590 drive will operate at the slower speed determined by the Host Adapter.

Ultra Model B11/B1A, Model E11/E1A and Model H11/H1A drives will operate properly with the existing adapters that are used to operate Base 3590 drives, as long as all of the required prerequisites are met. The Model E11/E1A and H11/H1A drives support attachment to SCSI-3 adapters also, or fibre channel adapters (with FC 9510 or 3510).

SCSI Cabling and Terminator Compatibility

The Model E11/E1A and H11/H1A drives are fully compatible with all IBM part number SCSI cabling and terminators that are used with the base 3590 drives. Non-IBM supplied cabling used in customer installations should be reviewed by the customer for Ultra SCSI compatibility.

Fibre Channel Cabling

The fibre channel attachment feature (FC 9510 or FC 3510) is available only on the 3590 Model E11/E1A and H11/H1A drives. This feature requires a fibre cable for attachment to the host or the fibre supported control unit. The attaching fibre cable must be 50.0/125 micrometers for distances up to 500 m (1640 ft). The connection is a duplex SC connector type.

Functional and R/W Compatibility

The Model E11/E1A and H11/H1A drives support the identical SCSI command and functions that the base 3590 drives support.

The various levels of 3590 drives are **not** fully R/W compatible. Table 3-7 depicts the capabilities:

Table 3-7. Model Read/Write or Read-Only Capabilities. These models can read/write or read-only cartridges that were created with these formats.

	Track format		
	128-Track	**256-Track**	**384-Track**
Base 3590	Read/Write		
Ultra Model B1A/B11	Read/Write		
E1A/E11	Read	Read/Write	
H1A/H11	Read	Read	Read/Write

Drive Microcode Compatibility

Each of the 3590 drive models have a unique microcode requirement as shown in Table 3-8. When a microcode update to the drive is required, it is important to determine the level of the drive and select the proper microcode image. The drives will only accept valid microcode images for the specific drive model and installed card pack type.

Table 3-8. Microcode Level Diagram

Drive Model	Microcode Level					
	D0IA_xxx	D0IB_xxx	D0IC_xxx	D0ID_xxx	D0IE_xxx	D0IF_xxx
Base Model B11/B1A	Yes	No	No	No	No	No
Model B11/B1A with Ultra card pack (P/N 35L0818)	No	Yes	No	No	No	No
Model B11/B1A with common card pack	No	No	No	Yes	Yes	Yes
Model E11/E1A with SCSI	No	No	Yes	Yes	Yes	Yes
Model E11/E1A with fibre channel	No	No	No	No	Yes	Yes
Model H11/H1A with SCSI	No	No	No	No	No	Yes
Model H11/H1A with fibre channel	No	No	No	No	No	Yes

System Prerequisites for Proper Operation of Ultra Drives

Ultra level drives require some prerequisite system microcode updates to install and operate properly in some environments. These requirements are summarized, as follows:

- **iSeries/AS400 (OS/400) System Attachment:**

  V4R1, V4R2, and V4R3 systems with adapters FC 2729 or FC 6534 require a PTF for proper operation with Ultra drives. Please refer to Informational APAR ii11472 for more information.

  This PTF may be loaded from the CUM tape.

  Also, if the Ultra drive is used as an alternate load device (boot manager), a new SLIC CD is required. See Informational APAR ii11472 for more information.

- **3494 B16 Virtual Tape Server:**

  3494 B16 system code must be at system level 2.11.20.12 (PGA4) or greater for proper operation of Ultra. Use the following procedure to determine the system microcode level of the B16 system:

  1. From the Service menu, select **3494 VTS Maintenance**.
  2. Select **Microcode Maintenance**.
  3. Select **Display Active Code Level and Status**.

     When the command completes, the system will display a message that is similar to the following:

     ```
     IBM TOTALSTORAGE 3494 VIRTUALTAPE SERVER S/N 13-0011876...
     Level 2.11.20.12 (cadd 4.9.0.0, Atape 4.2.8.0).
     ```

     If the displayed level is not 2.11.20.12 or greater (as above), a subsystem microcode update will be required using the 3494 B16 subsystem microcode CD. (This CD may be provided with the Ultra drive.) Refer to *IBM 3494 Model B16 Virtual Tape Server Maintenance Information* PROC section for procedures to copy and activate the new B16 microcode. If update is necessary, inform the customer that additional install time will be required and subsystem availability will be affected. Plan the install in conjunction with customer requirements.

     Attention: Never down-level the currently activated B16 system microcode level if it is greater than the level supplied on the CD.

- **3494 B18 Virtual Tape Server:**

3494 B18 system microcode must be at system level 2.13.7.00 or greater for proper operation of Ultra. Use the following procedure to determine the system microcode level of the B18 system:

1. From the Service menu, select ® **3494 VTS Maintenance**
2. Select **Microcode Maintenance.**
3. Select **Display Active Code Level and Status.**

   When the command completes, the system will display a message that is similar to the following:

   ```
   IBM TOTALSTORAGE 3494 VIRTUAL TAPE SERVER S/N 13-1007780:
   Level 2.13.7.4 (cadd 4.9.0.0, Atape 4.2.9.0).
   ```

   If the displayed level is not 2.13.7.00 or greater (as above), a subsystem microcode update will be required using the 3494 B18 subsystem microcode CD. (This CD may be provided with the Ultra drive.) Refer to *IBM 3494 Model B18 Virtual Tape Server Maintenance Information* PROC section for procedures to copy and activate the new B18 microcode. If update is necessary, inform the customer that additional install time will be required and subsystem availability will be affected. Plan the install in conjunction with customer requirements.

   Attention: Never down-level the currently activated B18 system microcode level if it is greater than the level supplied on the CD.

- **A60/A50/A00 Controllers:**

  A60/A50/A00 system microcode must be at system level 1.9.20.00 or greater for proper operation of the 3590 drive. Refer to *IBM 3590 Subsystem AXX Controller Models Maintenance Information* PROC Section for procedures to determine the current system microcode level. If update is necessary, use the A60/A50/A00 microcode diskettes. (These diskettes may be provided with the Ultra drive.)

  Attention: Never down-level the currently activated A60/A50/A00 system microcode level if it is greater than the level supplied on the floppy disks.

- **SUN (Solaris) system Attachment:**

  For SUN attach, an external terminator **MUST** be used somewhere on the bus. In some multi-host systems this may require the removal of internal terminators from one of the host adapters to allow the addition of an external terminator. If required, inform the customer that this change must be made. **DO NOT** perform this change on non-IBM equipment without customer approval.

Field Microcode Support (FMR)

The 3590 subsystem can accept microcode updates by either of two methods:
- Download from the host
- Microcode (FMR) cartridge

Download Microcode from Host

The 3590 subsystems allow the initiator to provide microcode to the device across the SCSI/fibre channel bus. This process could be required because of new microcode or engineering debug activities.

Note: When a microcode update to the drive is required, it is important to determine the level of the drive and to select the proper microcode image.

Refer to Table 3-8 on page 3-37 for microcode requirements for each of the 3590 Models.

The microcode download sequence follows:

1. The initiator should reserve the device before proceeding with the microcode download. Any interference during the download causes a check condition with a resulting discard of all the microcode downloaded to that point.
2. The device must be synchronized by either a Rewind or Unload command before beginning the download sequence.
3. Disconnect privilege should be allowed, as the final processing of the microcode data takes approximately 30 seconds.
4. The microcode is a single image. The initiator can download the microcode with a single Write Buffer command or with multiple Write Buffer commands to break the image up into convenient packets.
5. When multiple Write Buffer commands are used, the initiator must divide the microcode into packets and send each packet with Write Buffer commands. The packets may be sent in any order, but all packets must be sent. All Write Buffer commands must have the same buffer ID and mode.
6. No gaps or overlaps of the data are allowed in the buffer. If a gap or an overlap exists, when the host indicates that all data has been downloaded, the device returns a check condition. Also, if the parameter list is longer than 1 MB, the 3590 returns a check condition.
7. When the device receives the last Write Buffer command with the last of the code image data, the device begins validation of the microcode image, such as checking for correct length and the correct CRC. If this check of the microcode image reveals any problems, the device returns a check condition. If no problems exist in the image, the device begins loading the microcode into nonvolatile storage. This process takes up to 30 seconds.
8. The device responds to resets or selections during the loading of nonvolatile storage, but these events do not disrupt nonvolatile storage alteration. Because of the duration of the loading process, a command time-out may occur.
9. The completion of the check and save process is indicated by good status returned to the initiator for that last Write Buffer command. At this point the device is automatically reset and the new microcode is activated. The device creates a pending unit attention condition to the initiators that indicates the microcode has been changed.
10. If a reset has occurred while loading nonvolatile storage, the device will have a pending unit attention. This process will complete the transfer to nonvolatile storage and perform final checking. If a problem is found, a deferred error appropriate to the problem will be presented. If the error is such that the transferred microcode is bad, any reset can cause an unrecoverable error requiring a service call. The initiator should retry the entire download process immediately.
11. If the reset occurred after the process was completed but before status was returned to the initiator, the device will have activated the new microcode and will have a pending unit attention with associated sense indicating that microcode has been changed.

Field Microcode Support Using FMR Cartridge

There are three different levels of FMR cartridge available for 3590 drives:

- 128-track format FMR cartridge has microcode levels for the Base and Ultra Model B11/B1A drives.
- 256-track format FMR cartridge has microcode for the Model E11/E1A drives.
- 384-track format FMR cartridge has microcode for Model H11/H1A drives.

ATTENTION

The label on the FMR cartridge should clearly state which drive models the cartridge will support.

If an FMR tape with the wrong track format is loaded, a **Tape write prot'd** message will be displayed.

A 128-track format FMR cartridges that is ordered as a FRU, contains multiple microcode images for support of different levels of the 3590 Model B11/B1A drives, as follows:

- D0IA_xxx = Base 3590 Model B11/B1A drives
- D0IB_xxx = Ultra 3590 Model B11/B1A drives
- D0IF_xxx = Ultra 3590 Model B11/B1A drives with Common Card Pack

The 256-track format FMR cartridges ordered as a FRU now contain microcode images for support of the 3590 Model E11/E1A drives.

- D0IE_xxx or D0IF_xxx = For all 3590 Model E11/E1A drives.

The 384-track format FMR cartridges ordered as a FRU now contain microcode images for support of the 3590 Model H11/H1A drives.

- D0IF_xxx = For all 3590 Model H11/H1A drives.

Here are some sources for additional information:

- Microcode compatibility, see Table 3-8 on page 3-37
- Microcode load process, see "Updating Microcode from FMR Cartridge" on page 9-58
- 3590 feature levels, see "3590 Drive Model and Feature Levels" on page 3-34

Special Tools

Special tools are shipped, purchased, or ordered; they are used to repair or maintain the device.

Cleaning Cartridge

The 3590 cleaning cartridge P/N 05H4435 (or P/N 05H7540 for tape libraries) is for use only in a 3590. Figure 3-17 shows a cleaning cartridge, which is used to clean the head guide assembly.

To use the cartridge, load it in a drive and the cleaning procedure occurs automatically. The cartridge unloads when the cleaning procedure is done. This tool is part of the ship group.

The cleaning cartridge should be replaced after 100 uses. It should be undamaged and clean when it is inserted into a tape drive. You can keep track of the number of uses by marking the label provided with each cartridge.

Attention: Do not use a china-marking (grease) pencil on the label.

The 3590 cleaning cartridge is identified by its physical characteristics. The black case has two gray plastic inserts 1 and identifier notches 2 that are unique to the 3590 cleaning cartridge. The leader block 3 is also gray. The 3590 cleaning cartridge, like the 3590 data cartridge, has a finger notch 4 that is used to grasp the cartridge.

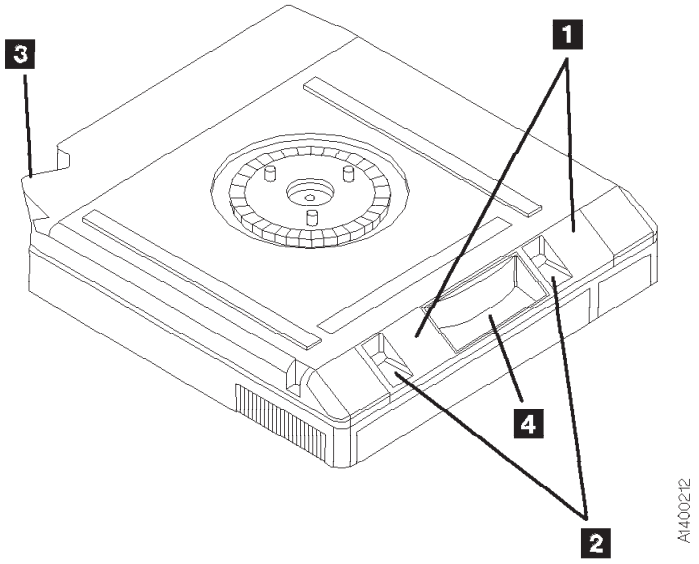


Figure 3-17. Cleaning Cartridge - Bottom View

Leader Block Replacement Kit

The leader block replacement kits are a ***customer-purchased item***. See Table 3-9 on page 3-47 for part numbers and descriptions. Replacing the leader block is the customer's responsibility.

The leader block replacement kit, P/N 05H4868, contains the necessary tools to reattach the leader block to the tape. It does not include the leader blocks. P/N 05H3869 provides 10 leader blocks (blue) for the 3590 High Performance Tape. P/N 34L2666 provides 10 leader blocks (Green) for the 3590 Extended High Performance Cartridge tape.

Note: Replacing the leader block is used only as a temporary measure to retrieve the data from the tape; it is not a permanent fix.

ESD Kit

The ESD kit (P/N is available in the *General CE Tools Reference Summary*, 5131-0075) is used to prevent damage when you work with electrostatic discharge (ESD) sensitive parts. See "Working with Electrostatic Discharge (ESD) Sensitive Parts" on page 9-23 for information on using the ESD grounding wrist strap and mat. **This tool (Figure 3-18) is not shipped with the subsystem and must be ordered.**

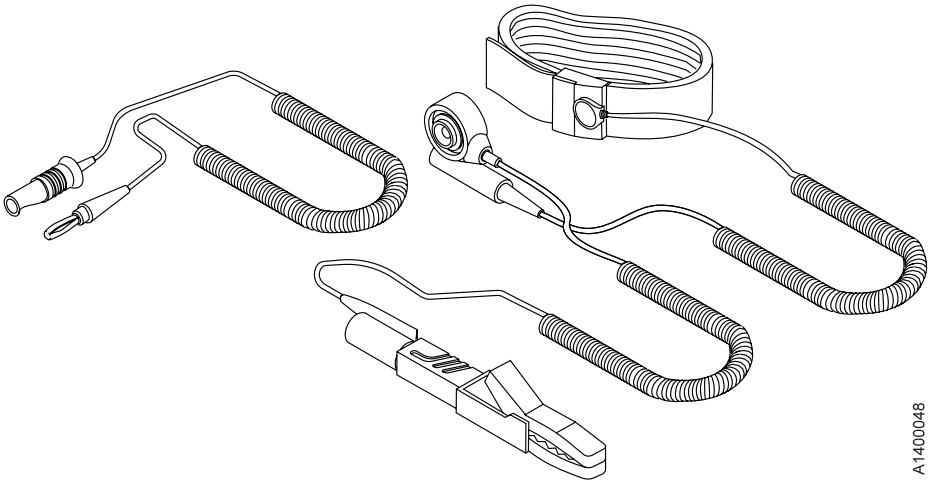


Figure 3-18. ESD Grounding Strap

Pressure/Vacuum Gauge Kit

The kit P/N 6857823 (Figure 3-19) contains hoses, fittings and a pressure/vacuum gauge to measure the pneumatic system pressure or vacuum. **This kit is not shipped with the subsystem and must be ordered separately.**

See “Measurement and Adjustment of Pneumatic System” on page 10-4 for instructions on how to use the pressure/vacuum gauge P/N 6850747.

Adapter hose **1** , P/N 05H9895 is part of the ship group. This adapter is used to adapt the existing pressure/vacuum gages currently in the field.

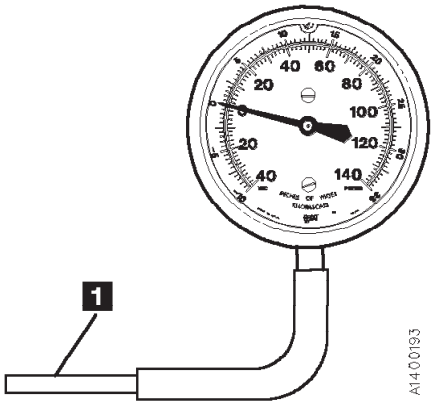


Figure 3-19. Pressure/Vacuum Gauge

SCSI Wrap Tool

The Customer Engineer uses the SCSI wrap tool P/N 62G1324 (black) or P/N 05H9163 (gray) during installation and diagnostic check out of the 3590. **These tools (Figure 3-20) are specific for this application and cannot be swapped with other wrap tools.**

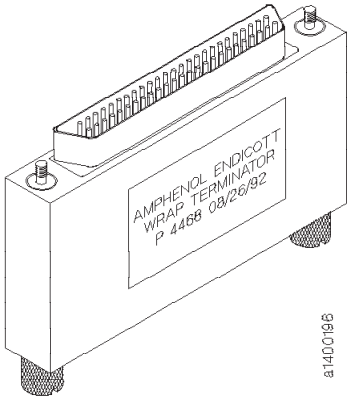


Figure 3-20. SCSI Wrap Tool

Library Attachment Wrap Tool

The library attachment wrap tool P/N 39F3884, which is one of the 3494 special tools, is used to verify the library attachment facility in the Model B1A, E1A, and H1A. **This tool (Figure 3-21) is a unique part and cannot be swapped with other wrap tools.**

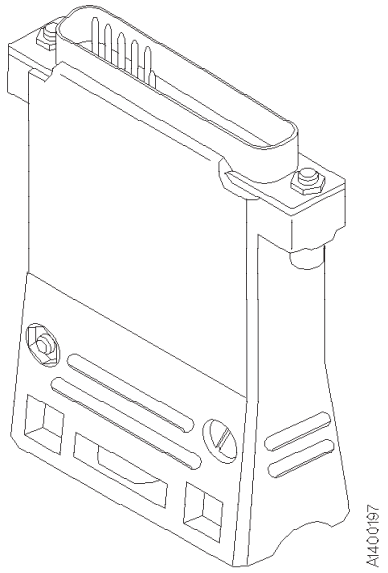


Figure 3-21. Library Attachment Wrap Tool

Library Attachment Wrap Tool Interposer

The library attachment wrap tool interposer P/N 05H3895, which is in the 3494 ship group, connects to the library manager connector on the back of the drive. The interposer (Figure 3-22) is a 9-pin male–to–25-pin female connector.

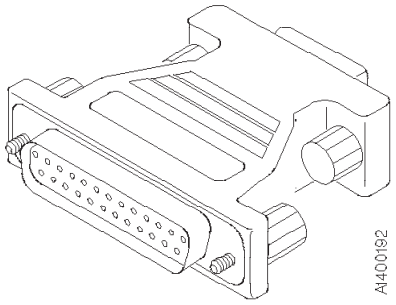


Figure 3-22. Library Attachment Wrap Tool Interposer

Gap Set Tool

The gap set tool P/N 05H4671, which is in the ship group, adjusts the gap in the hub of the machine reel motor. This tool (see Figure 3-23) must be used when the upper flange on the machine reel motor is removed.

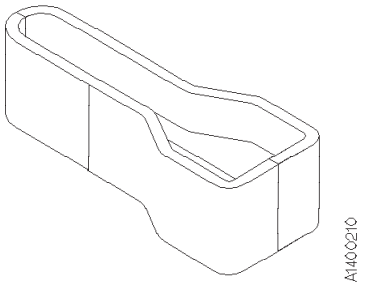


Figure 3-23. Gap Set Tool

ACF Motor Adjustment Tool

The ACF motor adjustment tool P/N 05H4724, which is in the ship group, sets the gear mesh gap between the motor gear and the intermediate gear. This tool (see Figure 3-24) is used when any of the ACF motors are replaced or reinstalled.

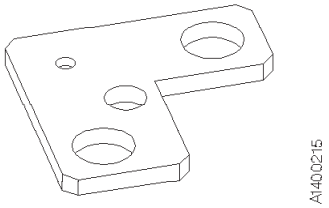


Figure 3-24. ACF Motor Adjustment Tool

ACF Transport Position Adjustment Tool

The ACF transport position adjustment tool P/N 05H3388, which is in the ship group, measures the distance between the priority cell floor and the top of the transport rails. This tool (see Figure 3-25) is used to verify and adjust the alignment of the ACF transport position sensors.

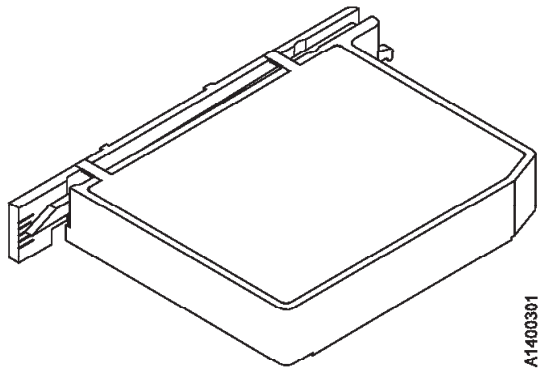


Figure 3-25. ACF Transport Position Adjustment Tool

Tape Unit Cleaner

The IBM Tape Unit Cleaner (P/N 05H3929) is the only cleaning solution that is approve to clean the 3590 tape cartridge, magazine, and tape path (excluding the head guide assembly). See Figure 3-26.

Attention: Do **NOT** wet clean the head guide assembly. The cleaning process will damage the head surfaces and actuator mechanism.

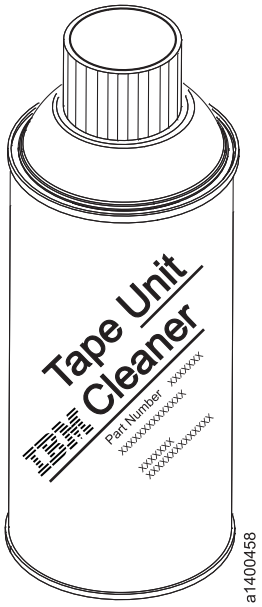


Figure 3-26. Tape Unit Cleaner

Potentiometer Adjusting Tool

The potentiometer adjusting tool P/N 1864853 (see Figure 3-27) is used to set the mode switch in the Model E11/E1A and H11/H1A card pack.

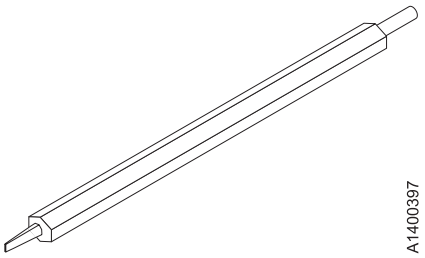


Figure 3-27. Potentiometer Adjusting Tool

Tape Supplies

The customer should possess items listed in Table 3-9 to maintain cartridges.

Table 3-9. Cartridge Maintenance

Part Number	Description
05H4868	Leader Block Replacement Kit. This kit contains the necessary tools to reattach the leader block to the tape. It does **not** include leaderblocks.
05H3869	Quantity of 10 Leader Blocks for the 3590 High Performance Tape
34L2666	Quantity of 10 Leader Blocks for the 3590 Extended High Performance Cartridge
461621	Lint-free, nylon gloves
2108930	Lint-free cloth
05H3929	IBM Tape Unit Cleaner

Hook and Loop Fastener

The hook and loop fastener P/N 19P0362 is used during installation of fibre cables on the 3590. This part is necessary to minimize damage to the fibre cables.

Figure 3-28. Hook and Loop Fastener

Fibre Wrap Tool

There are several fibre wrap tools available for 3590 drives. These tools are used only by the Customer Engineer during fibre cable installation and diagnostic checkout. They can be attached at the back of the drive or at the end of the cable.

Table 3-10. Fibre Wrap Tools and Part Numbers

Fibre Cable Connector Type	Part Number
SC fibre wrap tool	34L2629 or 08L9459
LC fibre wrap tool	11P3847

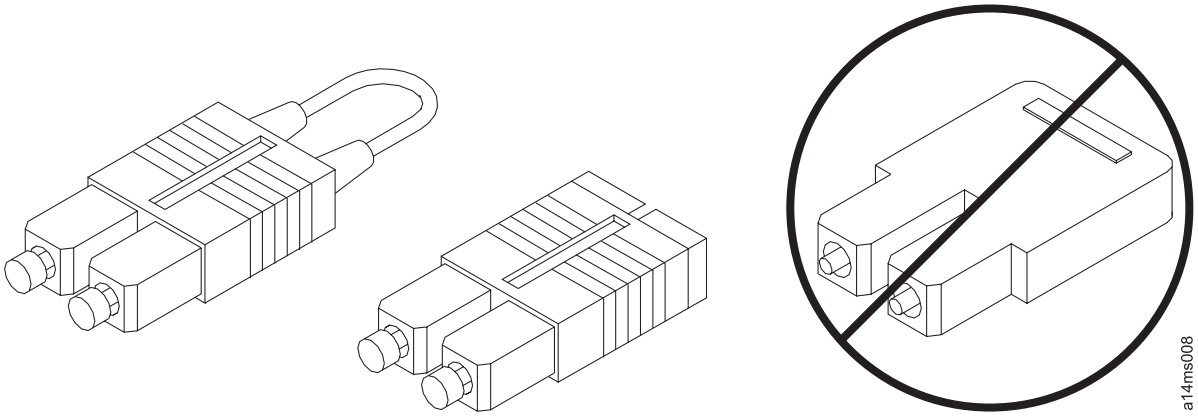


Figure 3-29. SC Fibre Wrap Tool

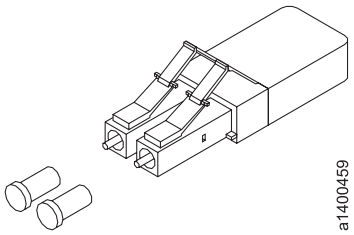


Figure 3-30. LC Fibre Wrap Tool

Fibre Wrap Duplex Adapters

There are several fibre wrap duplex adapters available for 3590 drives. These adapters are used only by the Customer Engineer to connect the cable with the wrap tool. They are attached at the end of the cable during cable installation and diagnostic checkout.

Use one of the following fibre wrap tools with a fibre wrap duplex adapter during fibre cable diagnostic checkout.

Table 3-11. Fibre Wrap Tools and Adapters

Use this fibre wrap tool P/N...	**...with this fibre wrap duplex adapter P/N...**	**...on this cable type.**
34L2629 or 08L9459	19P0913	SC/SC
11P3847	05N6766	LC/SC

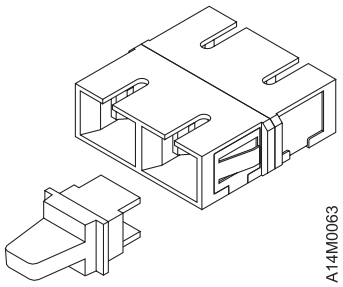


Figure 3-31. SC/SC Fibre Wrap Duplex Adapter

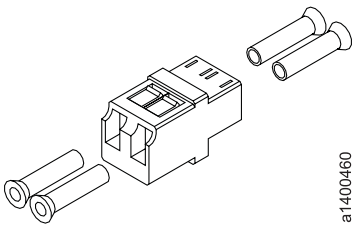


Figure 3-32. LC/SC Fibre Wrap Duplex Adapter

Inline SCSI Terminator for Open System Attachment

The Inline Terminator P/N 19P0378 (AMP 869682-1) is used for a terminator for all specified operations of the 3590. **This terminator (Figure 3-33 on page 3-49) is unique and cannot be used with other terminators.** This terminator is FC 9798 for HP9000 V-Class system attachment.

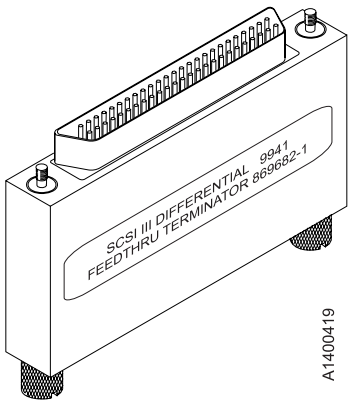


Figure 3-33. Inline SCSI Terminator for Open System Attachment

Chapter 4. Messages

Contents

Service and Media Information Messages (SIMs and MIMs)

The SIM and MIM functions are a primary factor in the 3590 maintenance plan for improved product availability.

- A SIM alerts the customer when an abnormal 3590 condition requires attention. Information in the SIM identifies the affected drive and the failing component. Information highlights the severity of the fault condition and the expected operational impact of the pending service action.

  A SIM contains the machine type, machine serial number, and FID which allows service personnel to arrive with the correct replacement parts.

  Physical location identifiers in the SIM direct the CE to the failing unit. The SIM FID code specifies the parts to be replaced and directs the CE to appropriate service procedures. This allows the machine fault to be repaired without first looking in log records and without having to try to recreate the failure by using diagnostic procedures.

Use Table 4-1 on page 4-3 with Figure 4-1 on page 4-3 to review a sample SIM.

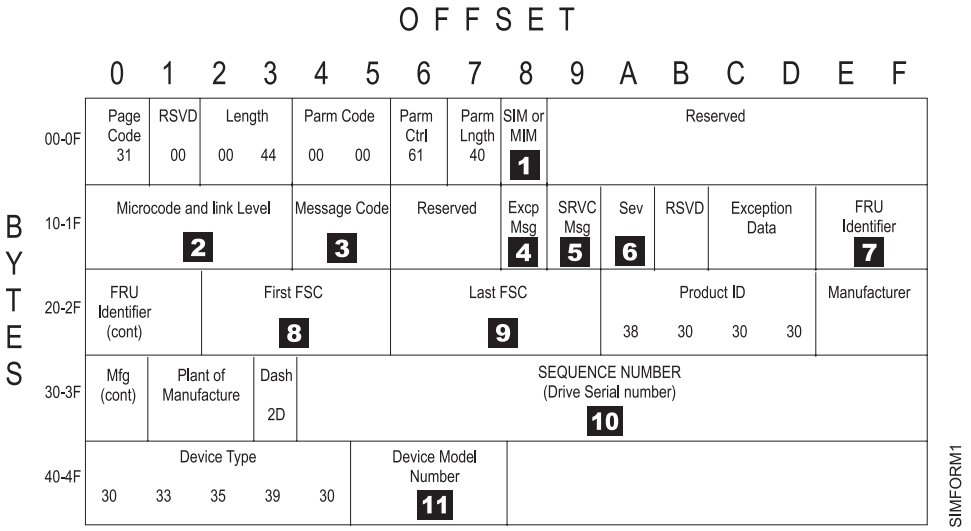


Table 4-1. SIM Format Example Data

Locator Number	Field Name	Field Selections
+1	SIM/MIM Present	**00** No SIM or MIM present **01** SIM present **02** MIM present
2	Microcode and Link Level	—
3	Message Code	See “Message Codes” on page 4-8.
4	Exception Message	“MIM Exception Messages” on page 4-9
5	Service Message	“SIM Exception Messages” on page 4-9
6	Severity	“SIM/MIM Severity” on page 4-10
7	FRU Identifier (FID)	—
8	First FSC	—
9	Last FSC	—
10	Sequence Number	—
11	Device Model Number	**423141** B1A (No ACF) **423131** B11 (ACF)
Note: 7, 8, and 9 are presented in hexadecimal format. Use Table 4-19 on page 4-18 to convert this field to ASCII values.		

Figure 4-1. SIM Format

- A MIM identifies problems with the media (tape), and provides the volume number of the *bad* cartridge. This MIM number allows the customer to identify faulty media that may prevent unnecessary service calls.
-

  If the bad cartridge cannot be identified at the time of failure, the VOLSER field of the MIM will be blank and the VOLSER Valid Flag will be **00**; VOLSER not Valid.

The detailed information within SIMs and MIMs is for use by the dispatcher or the CE in the branch office. This individual is responsible for decoding the information and scheduling for service based on data content within the SIM or MIM.

Depending on the software they possess, the customer can select the severities that they wish to see. For example, one customer may only want to see the *Acute* SIM/MIM and another customer may want to see all the SIMs and MIMs that are sent to the host. There are four severity codes:

- Severity *0* (FID4) code means that the device needs service, needs cleaning or has been cleaned.
- Severity *1* (FID3) code means that the problem is moderate.
- Severity *2* (FID2) code means that the problem is serious.
- Severity *3* (FID1) code means that the problem is acute.

A service message within the SIM also informs the customer what the service impact will be. For example, *impact unknown* disables access to the drive or requires the interface to be disconnected. A MIM specifies what is wrong with the cartridge that is indicated.

There are three MIM severity codes:

- Severity 1 indicates moderate *high temporary read/write* errors were detected.
- Severity 2 indicates serious *permanent read/write* errors were detected.
- Severity 3 indicates acute *block 0*, *cartridge type*, or *vol label* errors were detected.

Use Table 4-2 on page 4-5 with Figure 4-2 on page 4-5 to review a sample MIM.

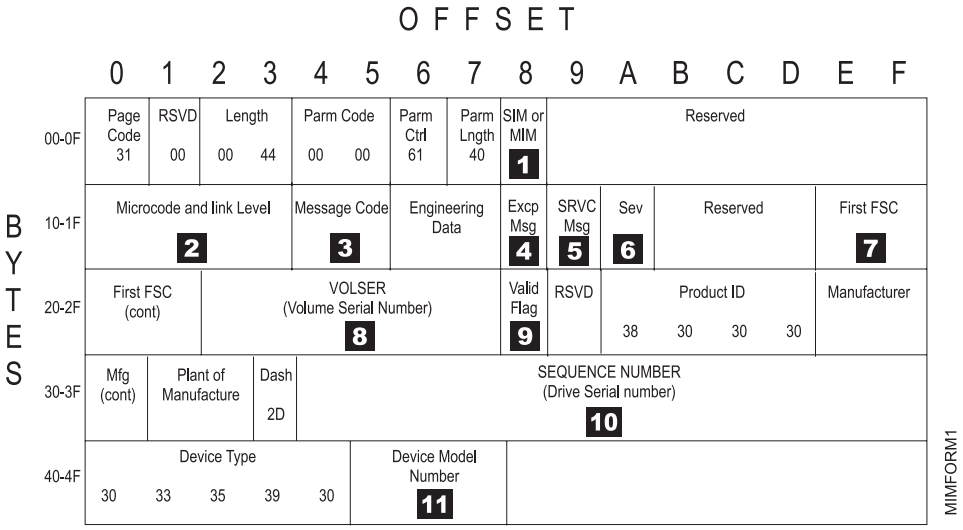


Table 4-2. MIM Format Example Data

Locator Number	Field Name	Field Selections or Data
1	SIM/MIM Present	**00** No SIM or MIM present **01** SIM present **02** MIM present
2	Microcode and Link Level	—
3	Message Code	“Message Codes” on page 4-8.
4	Exception Message	“MIM Exception Messages” on page 4-9
5	Service Message	“SIM Exception Messages” on page 4-9
6	Severity	“SIM/MIM Severity” on page 4-10
7	First FSC	—
8	VOLSER	Volume serial number
9	VOLSER Valid Flag	**00** VOLSER not valid **01** VOLSER valid
10	Sequence Number	—
11	Device Model Number	**433141** B1A (No ACF) **433131** B11 (ACF)
Note: 7 is presented in hexadecimal format. Use Table 4-19 on page 4-18 to convert the information in this field to ASCII values.		

Figure 4-2. MIM Format

Statistical Analysis and Reporting System

The statistical analysis and reporting system (SARS) assists in determining whether read and write errors are caused by the media (tape) or the hardware in the drive, and provides SIMs and MIMs. To analyze errors, the 3590 microcode contains a volume SARS (VSARS) algorithm and a hardware SARS (HSARS) algorithm.

Note: For more information on SARS reporting, visit these websites to obtain online documentation.

For general use:

`http://www.storage.ibm.com/hardsoft/tape/3590/index.html`

For internal use:

`http://snjlnt02.sanjose.ibm.com/rmss/home.nsf/3590`

The algorithms are executed in the 3590 just before a tape is unloaded. The HSARS data is stored in nonvolatile storage in the drive and the VSARS data is stored in the volume control region (VCR) on the tape.

To distinguish error patterns and trends, the SARS *volume* algorithms require the tape to be mounted on different drives while the SARS *hardware* algorithms require different volumes to be mounted on one drive. As degraded hardware passes through predefined error thresholds, cleaning and service repair messages and/or error codes are presented. Similarly, if tape volumes continue to perform poorly on different drives, rewrite or discard-media messages are presented.

The current default value for SARS options is **ON** for microcode levels D0IA and later. Previous levels of microcode had the default value as **OFF**. SARS options must be enabled to take full advantage of media error isolation via MIMs and some SIMs. You can enable or disable SARS options from “CE Drive Options Menu” on page 5-52.

Obtaining 3590 Drive Error Information at Host

IBM device drivers for the pSeries/RS6000 (AIX) System and iSeries/AS400 (OS/400) System log service and media information messages (SIMs and MIMs) when an error occurs on the 3590 drive.

Note: Linux, Sun, HP-UX and Windows NT or Windows 2000 systems do not log SIM/MIM data.

The SIM includes the following error information:

1. To which drive the SIM refers
2. The FRU identifier (FID) code and FID severity for drive errors. The FID is used to enter the START section where it specifies the failing FRU group.
3. The message code presented to the customer. See “Message Codes” on page 4-8.
4. The first FSC, second FSC or flag bytes, model and microcode link level are not required to enter the START section. This support data may be requested by your next level of support.

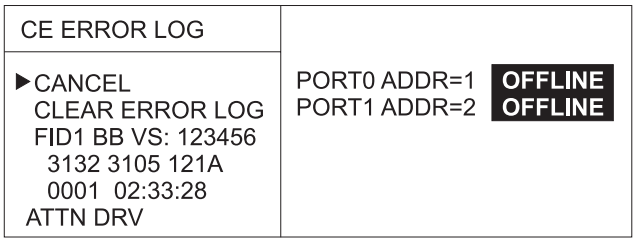
The MIM includes the following error information:

- The message code presented to the customer. See “Message Codes” on page 4-8.
- The VOLSER Number of the cartridge which is having a problem, if it can be determined from the data available at the time of failure.
- The first FSC and model and link level are not required to enter the START section. This support data may be requested by your next level of support.

This information is used to service the 3590 drive and also can be obtained directly from the drive display. 5-1 describes the 3590 display.

3590 Drive Display Panel

The following screen is an example of an error log display:



FID1 BB VS: 123456	1 = FID Severity BB = FID VS:123456 = Volume Serial 123456
3132 3105	3132 = First FSC 3105 = Last FSC
121A	1 = Model B11 21A = Microcode Level
0001 02:33:28	Time Stamp (Not real time, but relative to accumulated power-on time for the card pack installed in this machine, except that the time is saved in VPD each hour.) The time stamp is in the order dddd hh : mm : ss.
ATTN DRV	Operator Intervention (next error log)

A14M0001

Figure 4-3. Error Log Example

For more information, see “CE Error Log Menu” on page 5-61.

The following text explains how to obtain 3590 error information from the pSeries/RS6000 (AIX) System, iSeries/AS400 (OS/400) System, and Sun platforms. If the utilities described below are not used on your system, please refer to the documentation that came with your system drivers.

See “Service and Media Information Messages (SIMs and MIMs)” on page 4-2 for additional information on SIMs and MIMs.

Message Codes

The message codes are intended to explain to the customer what to do under certain conditions. Below is a table with the codes in hex and in ASCII, and a brief description of what action needs to be taken when a message code is displayed.

Table 4-3. Message Code Descriptions

Message Code: Hex	Message Code: ASCII	Description: This area tells the customer what to do.
3030	00	**No Message:** This is the default message indicating that the device does not have an error to report.
3430	40	**Operator Intervention Required:** An operator action is required at the device. For example, a magazine is full and needs to be replaced or emptied. Check the device error log for possible repair action. See “3590 Drive Display Panel” on page 4-7 and also the PANEL section describes the 3590 display.
3431	41	**Device Degraded:** The device is performing in a degraded state, but can be used. A FID is displayed with the error message. Check the device error log for possible repair action. See “3590 Drive Display Panel” on page 4-7 and also the PANEL section describes the 3590 display.
3432	42	**Device Hardware Failure:** The device can not be used. A FID is displayed with the error message. Check the device error log for possible repair action. See “3590 Drive Display Panel” on page 4-7 and also the PANEL section describes the 3590 display.
3433	43	**Service Circuits Failed, Operations not Affected:** This error does not affect the performance of the device. The failure only affects circuits used for non-operational testing. A FID is displayed with the error message. Check the device error log for possible repair action. See “3590 Drive Display Panel” on page 4-7 and also the PANEL section describes the 3590 display.
3535	55	**Clean Device:** Load a cleaning cartridge in the device. The drive returns the cleaning cartridge following the cleaning procedure. If excessive Clean messages are posted, go to “Maintenance Starting Point” on page 1-2.
3537	57	**Device has been cleaned:** The drive has been cleaned by a cleaning cartridge.
3630	60	**Bad Media, Read Only Permitted:** MIM message. Cartridge is logically write protected. Read only is allowed. A customer who wishes to write to this tape should copy data to another volume. Remove this volume from the library.
3631	61	**Rewrite Data if Possible:** MIM message. Data on the tape cartridge is degraded. Attempt to copy data to a new volume.
3632	62	**Read Data if Possible:** MIM message. The tape directory is degraded. Attempt to read tape to rebuild the tape directory.
3634	64	**Bad Media, Cannot Read or Write:** MIM message. Remove media from the tape library. Data is likely lost without special tools to recover it.
3732	72	**Replace Cleaner Cartridge:** MIM message. Have the customer order a new cleaner cartridge.

MIM Exception Messages

The following provides descriptions of Exception Messages for your information. Action information can be obtained by use of **Message Code** contained in reported Media Information Messages (MIMs).

Table 4-4. Exception Message Descriptions

Exception Message Hex	Exception Message ASCII	Description
32	2	**Data Degraded:**
34	4	**Medium Degraded:**
36	6	**Block 0 Error:**
37	7	**Medium Exception:**

SIM Exception Messages

The following provides descriptions of SIM Exception Messages for your information. Action information can be obtained by use of **Message Code** and **FID** contained in reported SIM.

Table 4-5. SIM Exception Message Descriptions

Exception Message Hex	Exception Message ASCII	Description
30	0	**Reserved**
31	1	**Affect of failure unknown**
32	2	**Dev. Exception - No performance impact**
33	3	**Dev. Exception on interface**
34	4	**Dev. Exception on ACF**
35	5	**Dev. Exception on Operator Panel**
36	6	**Dev. Exception on Tape path**
37	7	**Dev. Exception in Drive**
38	8	**Dev. Preventive Maintenance Required**
39	9	**Dev. Preventive Maintenance Completed**
41-46	A-F	**Reserved**

SIM Service Messages

The following provides descriptions of Service Information Messages (SIMs) for your information. Action information can be obtained by use of **Message Code** and **FID** contained in reported SIM.

Table 4-6. SIM Service Message Descriptions

Service Message Hex	Service Message ASCII	Description
30	0	**Reserved**
31	1	**Repair impact is unknown**
32-36	2-6	**Reserved**
37	7	**Repair will disable access to Dev.**

Table 4-6. SIM Service Message Descriptions (continued)

Service Message Hex	Service Message ASCII	Description
38	8	**Repair will disable message display ids on Dev.**
39	9	**Dev. Cleaning Required**
41	A	**Dev. Cleaning Complete**
42	B	**Dev. Cleaning For Performance Reasons is Required**
43-46	C-F	**Reserved**

SIM/MIM Severity

Table 4-7. SIM/MIM Severity Descriptions

SIM/MIM Severity HEX	SIM/MIM Severity ASCII	FID Severity Algorithm	FID Severity Displayed on Op. Panel	Description
33	3	4–3 = 1	1	**Acute:** Device requires immediate attention. Device is unusable.
32	2	4–2 = 2	2	**Serious:** Device is usable but is seriously degraded.
31	1	4–1 = 3	3	**Moderate:** Device is usable but is running degraded.
30	0	4–0 = 4	4	**Service:** Device needs scheduled maintenance but is usable.

Sense Key – ASC and ASCQ Information

The following tables list all possible combinations of Sense Keys, Additional Sense Codes (ASC), and Additional Sense Code Qualifiers (ASCQ) that are reported by the 3590. See *IBM TotalStorage Enterprise Tapes System 3590 Hardware Reference Guide* for additional information.

Sense Key 0 (No Sense)

Table 4-8. ASC and ASCQ Summary for Sense Key 0 (No Sense)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
00 00	No Additional Sense Information – EOM	X	
00 00	No Additional Sense Information – ILI	X	
00 00	No Additional Sense Information – FM	X	
00 01	Filemark Detected	X	
00 04	Beginning-of-Partition or Medium Detected	X	

Sense Key 1 (Recovered Error)

Table 4-9. ASC, and ASCQ Summary for Sense Key 1 (Recovered Error)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
00 00	No Additional Sense Information	X	X
00 17	Drive Needs Cleaning	X	
0A 00	Error Log Overflow	X	
17 01	Recovered Data with Retries	X	
18 00	Recovered Data with Error Correction Applied	X	
37 00	Rounded Parameter	X	
5B 01	Threshold Condition Met	X	
5B 02	Log Counter at Maximum	X	

Sense Key 2 (Not Ready)

Table 4-10. ASC, and ASCQ Summary for Sense Key 2 (Not Ready)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
04 00	Logical Unit Not Ready, Cause Not Reportable	X	X
04 01	Logical Unit Is in Process of Becoming Ready	X	X
04 03	Logical Unit Not Ready, Manual Intervention Required	X	X
04 04	Logical Unit Not Ready, Format in Progress	X	
15 01	Mechanical Positioning Error, Manual Intervention Required		X
30 03	Cleaning in Progress	X	
3A 00	Medium Not Present	X	
3B 12	Medium Magazine Removed		X
53 00	Media Load or Eject Failed	X	

Sense Key 3 (Medium Error)

Table 4-11. ASC, and ASCQ Summary for Sense Key 3 (Medium Error)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
03 02	Excessive Write Errors	X	
09 00	Track Following Error	X	
0C 00	Write Error	X	
11 00	Unrecovered Read Error	X	
11 01	Read Retries Exhausted	X	
11 08	Incomplete Block Read	X	
14 00	Recorded Entity Not Found	X	
14 01	Record Not Found	X	
14 02	Filemark or Setmark Not Found	X	
14 03	End-of-Data Not Found	X	

Table 4-11. ASC, and ASCQ Summary for Sense Key 3 (Medium Error) (continued)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
14 04	Block Sequence Error	X	
30 00	Incompatible Medium Installed	X	
30 01	Cannot Read Medium, Unknown Format	X	
30 02	Cannot Read Medium, Incompatible Format	X	
31 00	Medium Format Corrupted	X	
31 01	Format Command Failed	X	
33 00	Tape Length Error	X	
51 00	Erase Failure	X	
85 00	Write Protected Because of Tape or Drive Failure	X	
85 01	Write Protected Because of Tape Failure	X	
85 02	Write Protected Because of Drive Failure	X	

Sense Key 4 (Hardware Error)

Table 4-12. ASC, and ASCQ Summary for Sense Key 4 (Hardware Error)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
09 00	Track Following Error	X	
15 01	Mechanical Positioning Error	X	
3B 00	Sequential Positioning Error	X	
3B 08	Reposition Error	X	
40 00	Diagnostic Failure	X	
44 00	Internal Target Failure	X	X
4C 00	Logical Unit Failed Self-Configuration	X	
52 00	Cartridge Fault	X	
53 00	Media Load or Eject Failed	X	
53 01	Unload Tape Failure	X	

Sense Key 5 (Illegal Request)

Table 4-13. ASC, and ASCQ Summary for Sense Key 5 (Illegal Request)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
1A 00	Parameter List Length Error	X	X
20 00	Invalid Command Operation Code	X	X
21 01	Invalid Element Address		X
24 00	Invalid Field in CDB	X	X
25 00	Logical Unit Not Supported	X	X
26 00	Invalid Field in Parameter List	X	X
26 01	Parameter Not Supported	X	

Table 4-13. ASC, and ASCQ Summary for Sense Key 5 (Illegal Request) (continued)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
26 02	Parameter Value Invalid	X	
26 03	Threshold Parameters Not Supported	X	
2C 00	Command Sequence Error	X	
39 00	Saving Parameters Not Supported	X	
3B 0D	Medium Destination Element Full		X
3B 0E	Medium Source Element Empty		X
3B 11	Medium Magazine Not Accessible		X
3B 80	Medium Transport Element Full		X
3D 00	Invalid Bits in Identify Message	X	X
53 02	Medium Removal Prevented	X	
5B 03	Log List Codes Exhausted	X	
80 00	CU Mode, Vendor-Unique	X	X
85 03	Write Protected Because of Current Tape Position	X	

Sense Key 6 (Unit Attention)

Table 4-14. ASC, and ASCQ Summary for Sense Key 6 (Unit Attention)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
00 02	End-of-Partition/Medium Detected, Early Warning	X	
28 00	Not Ready to Ready Transition, Medium May Have Changed	X	X
28 01	Import or Export Element Accessed		X
28 80	Not Ready to Ready Transition, Medium Changer		X
29 00	Power On, Reset, or Bus Device Reset Occurred	X	X
2A 01	Mode Parameters Changed	X	X
2A 02	Log Parameters Changed	X	
2F 00	Commands Cleared by Another Initiator	X	
30 00	Incompatible Medium Installed	X	
3B 12	Medium Magazine Removed		X
3B 13	Medium Magazine Inserted		X
3B 14	Medium Magazine Locked		X
3B 15	Medium Magazine Unlocked		X
3F 01	Microcode Has Been Changed	X	X
3F 02	Changed Operating Definition	X	X
3F 03	Inquiry Data Has Changed	X	X
5A 01	Operator Medium Removal Request	X	
82 83	Cleaning Completed, Cleaning Cartridge Ejected	X	

Sense Key 7 (Data Protect)

Table 4-15. ASC, and ASCQ Summary for Sense Key 7 (Data Protect)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
27 00	Write Protected	X	

Sense Key 8 (Blank Check)

Table 4-16. ASC, and ASCQ Summary for Sense Key 8 (Blank Check)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
00 05	End-of-Data Detected	X	
14 01	Record Not Found, Void Tape	X	

Sense Key B (Aborted Command)

Table 4-17. ASC, and ASCQ Summary for Sense Key B (Aborted Command)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
14 00	Recorded Entity Not Found	X	
14 01	Record Not Found	X	
14 02	Filemark or Setmark Not Found	X	
1B 00	Synchronous Data Transfer Error	X	X
43 00	Message Error	X	X
44 00	Internal Target Failure	X	X
45 00	Select or Reselect Failure	X	X
47 00	SCSI Parity Error	X	X
48 00	Initiator Detected Error Message Received	X	X
49 00	Invalid Message Error	X	X
4A 00	Command Phase Error	X	X
4B 00	Data Phase Error	X	X
4E 00	Overlapped Commands Attempted	X	X

Sense Key D (Volume Overflow)

Table 4-18. ASC, and ASCQ Summary for Sense Key D (Volume Overflow)

ASC ASCQ	Description	Drive	Automatic Cartridge Facility
00 02	End-of-Partition/Medium Detected	X	

Error Log Analysis – pSeries/RS6000 (AIX) System

The AIX Tape and Medium Changer Device Driver for the pSeries/RS6000 (AIX) System provides logging to the system error log for a variety of errors. You can view the error log in various formats by using one of the following AIX commands:

- **tapeutil** command on page 4-15
- **diag** command on page 4-15
- **smit** command on page "Using SMIT/ERRPT Commands" on page 4-20
- **errpt** command on page 4-20

Use the Hex to ASCII conversion in Table 4-19 on page 4-18. Examples of the different error log formats are shown following this text.

To use the **tapeutil** command:

Note: The **tapeutil** command gives you a detailed report by device only.

1. Type **tapeutil** at the AIX command line.
2. Select **Tape Drive Service Aids** (listed under General Commands) from the menu.
3. Select **Error Log Analysis** from the Service Aid menu.
4. Select the device from the Drive Selection menu, and press PF7 to commit. The error log will be displayed.
5. You can scroll through the log by pressing the Enter key.

To use the **diag** command:

Notes:

1. You must have root authority to run the AIX **diag** command.
2. The **diag** command gives you a detailed report by device only.
   a. Type **diag** at the AIX command line.
   b. Select **Service aids** from the Diagnostic Function Selection menu.
   c. Select **IBM Tape Drive Service Aids** from the Service Aid Selection menu.
   d. Select **Error Log Analysis** from the Service Aid menu.
   e. Select the device from the Selection menu, and press PF7 to commit. The error log will be displayed.
   f. You can scroll through the log by pressing the Enter key.

Analyze the sense key and ASC/ASCQ data to determine the type of sense information reported in the error log. If a hardware failure is indicated, use the FID and go to START-1 for problem determination. For errors that indicate SCSI adapter or SCSI bus errors, see Figure 4-7 on page 4-17, go to "SCSI Bus Problem Determination" on page 9-108.

For errors indicating system problems, enter the appropriate maintenance package.

Note: The following example is valid for microcode levels D0IA or later.

```
IBM Tape Device Error Log Analysis

NAME: rmt1   LOCATION: 00-02-01-20   DEVICE TYPE: 3590

DATE: 10/31/95 07:33:21   SEQUENCE #203274   ERROR ID: HARDWARE ERROR

SCSI CDB: 0A0100001400

SCSI STATUS BYTE: CHECK CONDITION    SENSE KEY: 4    ASC/ASCQ: 4400
SCSI SENSE BYTES 0-17:
  7100 04 00000000400000000 4400 B3 08 3106

SCSI EXTENDED SENSE BYTES:
  413203010100000072410000 0A50053343000E00000000 3341 00000000000000
  FFFFFF000000000000000000000000000000000000000000 443836 2020202000

Press ENTER for additional entries...


F3=Cancel           F10=Exit            Enter
```

HEX	ASCII	Description
04		Sense key (Byte 2)
4400		ASC/ASCQ (additional sense code/ additional sense code qualifier) (Bytes 12 and 13) (See "Sense Key – ASC and ASCQ Information" on page 4-10 for error sense information.)
B3		FID (FRU identification number, Byte 14)
3106		First FSC (fault symptom code, Bytes 16 and 17)
3341		Last FSC (fault symptom code, Bytes 41 and 42)
443836	D86	Microcode level (Bytes 72-78)
(not shown)		VOLSER Number in ASCII or EBCDIC (Bytes 83-88)

Figure 4-4. AIX TAPEUTIL and DIAG Commands Error Log Example

```
IBM Tape Device Error Log Analysis

NAME: rmt1   LOCATION: 00-02-01-20   DEVICE TYPE: 3590

DATE: 10/31/95 07:33:21   SEQUENCE #203274   ERROR ID: 3590 SIM/MIM PAGE

SIM/MIM DATA:
  3100004400006140 01 30303030303030 3144383634 31 30303737 32 303030 303045383338
  303933383039 3830303049424D31332D 303030303030303033313535 303335393042 3131

Press ENTER for additional entries...




F3=Cancel           F10=Exit            Enter
```

Figure 4-5. AIX TAPEUTIL and DIAG Commands SIM Error Log Example

```
IBM Tape Device Error Log Analysis

NAME: rmt1   LOCATION: 00-02-01-20   DEVICE TYPE: 3590

DATE: 10/31/95 07:33:21   SEQUENCE #203274   ERROR ID: 3590 SIM/MIM PAGE

SIM/MIM DATA:
  31000044000061400230303030303030323538413631353536303130303033413241505 1
  5239353001303830303049424D31322D303030303030305451333135303335393042314 1

Press ENTER for additional entries...



F3=Cancel           F10=Exit            Enter
```

Figure 4-6. AIX TAPEUTIL and DIAG Commands MIM Error Log Example

```
IBM Tape Device Error Log Analysis

NAME: rmt1   LOCATION: 00-02-01-20   DEVICE TYPE: 3590

DATE: 10/31/95 07:33:21   SEQUENCE #203274   ERROR ID: SCSI ADAPTER ERROR

SCSI CDB: 170000000000

SCSI ADAPTER ERROR: COMMAND TIMEOUT

Press ENTER for additional entries...


F3=Cancel           F10=Exit            Enter
```

Figure 4-7. AIX TAPEUTIL and DIAG Commands Error Log Example

Running Tapeutil

If **tapeutil** is running and an error condition is detected, an error message is displayed. The error sense data has the format seen in Figure 4-8. The **errno**, or error number, is explained in Table 4-20 on page 4-19.

Note: The following example is valid for microcode levels D0IA and later.

```
Read/Write test terminated, total bytes written 0
Operation failed with errno 5: I/O error
Residual count: 204800

Error Sense Data,  Length 80

            0 1  2 3  4 5  6 7  8 9  A B  C D  E F
    0000 - 7100 0400 0000 0040 0000 0000 4400 E403  [q......@....D.õ.]
    0010 - AD12 0021 0201 0100 0000 0000 0000 0A00  [!..!............]
    0020 - 0000 0000 0000 0000 0000 0000 0000 0000  [................]
    0030 - 0000 0000 0000 0000 0000 0000 0000 0000  [................]
    0040 - 0000 0000 0000 0000 4438 3620 2020 2000  [........D86    .]

    HEX     ASCII    DESCRIPTION
      E4             FID (FRU identification number, Byte 14)
    AD12             FSC (fault symptom code, Bytes 16 and 17)
  443836     D86     Microcode level (Bytes 72-74
(not shown)          VOLSER Number in ASCII or EBCDIC (Bytes 83-88)
```

Figure 4-8. Tapeutil Error Sample

Table 4-19. Hex to ASCII Conversion

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
00	Null	30	0	41	A	4A	J	54	T
20	Space	31	1	42	B	4B	K	55	U
		32	2	43	C	4C	L	56	V
		33	3	44	D	4D	M	57	W
		34	4	45	E	4E	N	58	X
		35	5	46	F	4F	O	59	Y
		36	6	47	G	50	P	5A	Z
		37	7	48	H	51	Q	5F	–
		38	8	49	I	52	R		
		39	9			53	S		

Note: All codes are not shown.

Table 4-20 shows only the **errno** values pertaining to tape devices. The complete list of **errno** values can be found in the AIX **/usr/include/sys/errno.h** header file.

Table 4-20. Device Driver to AIX ERRNO Translation

AIX errno	Device Driver Error Code	Description
1	EPERM	• **General:** The process does not have adequate permission to perform the desired function.
5	EIO	• **Open:** An I/O error occurred that indicates a failure to operate the device. • **Write:** The physical end of medium was detected, or it is a general error state indicating a failure to write to device. • **IOCTL:** An I/O error occurred during the operation. • **Close:** An I/O error occurred during the operation.
6	ENXIO	• **General:** The device has not been configured and is not receiving requests. • **Write:** A write operation was attempted after the device had reached end of medium.
9	EBADF	• **General:** A bad file descriptor was passed. • **Write:** A write operation was attempted on a device that was opened for read only.
11	EAGAIN	• **Read:** The device is already opened.
12	ENOMEM	• **General:** Insufficient memory available for some internal memory operation. • **Read:** The number of bytes requested in a read of a variable block record was less than the size of the block. This is referred to as an over-length condition.
14	EFAULT	• **General:** A memory failure occurred due to an invalid pointer or address.
16	EBUSY	• **General:** An excessive busy state was encountered. • **Open:** The device is reserved by another initiator or an excessive busy state was encountered.
22	EINVAL	• **Open:** The operation requested had invalid parameters or an invalid combination of parameters. • **Write:** The operation requested had invalid parameters or an invalid combination of parameters, or the number of bytes requested in the write was not a multiple of the block size for a fixed block transfer, or the number of bytes requested in the write was greater than the maximum block size allowed by the device for variable block transfers.
28	ENOSPC	• **Write:** A write operation failed because it had reached the early warning mark while running in label processing mode. This return code is only returned once at the moment early warning is reached.
46	ENOTREADY	• **General:** The device is not ready for operation or a tape is not in the drive. • **Open:** If not opened with the O_NONBLOCK or O_NDELAY, the drive is not ready for operation or there is no tape in drive. If the non-blocking flags are used, the drive is not ready for operation.
47	EWRPROTECT	• **Open:** An open operation with the O_RDWR or O_WRONLY flag was attempted on a write-protected tape. • **Write:** A write operation was attempted on a write-protected tape. • **IOCTRL:** An operation that would modify the media was attempted on a write-protected tape or a device that was opened for O_RDONLY.
78	ETIMEDOUT	• **General:** A command has timed out.
110	EMEDIA	• **General:** An unrecoverable media error was detected.

Using SMIT/ERRPT Commands

Follow this procedure to use the **smit** command.

Note: The **smit** command has various ways to format the error log.

1. Type **smit** at the AIX command line.
2. Select **Problem Determination** from the System Management menu.
3. Select **Error Log** from the Problem Determination menu.
4. Select **Generate Error Report** from the Error Log menu.
5. Select **filename**, then select **no** from the Single Select list.
6. From the Generate Error Report menu, you can select the type of reports you want to view, then press the **Do** icon.
7. You can scroll through the log by using the up or down icons on the menu.

Follow this procedure to use the **errpt** command.

1. Select **errpt |pg** at the AIX command line. The summary report displays.
2. You can scroll through the log by pressing the Enter key for the next page.
3. You can type **q** to quit the error log at any time.

OR

1. Type **errpt -a |pg** at the AIX command line. The detailed report displays.
2. You can scroll through the log by pressing the Enter key for the next page.
3. You can type **q** to quit the error log at any time.

Analyze the sense key and ASC/ASCQ data to determine the type of sense information reported in the error log. If a hardware failure is indicated, use the FID, and go to START-1 for problem determination. For errors that indicate SCSI adapter or SCSI bus errors, see Figure 4-7 on page 4-17, go to “SCSI Bus Problem Determination” on page 9-108.

For errors indicating system problems, enter the appropriate maintenance package.

Figure 4-9 is valid for microcode levels D0IA and later.

```
---------------------------------------------------------------------------
ERROR LABEL:    Tapper
ERROR ID:       476B351D

Date/Time:       Tue Oct 31 07:33:21
Sequence Number: 203274
Machine ID:      000003243700
Node ID:         kitt
Error Class:     H
Error Type:      PERM
Resource Name:   rmt1
Resource Class:  tape
Resource Type:   3590
Location:        00-02-01-20
VPD:
        Manufacturer................IBM
        Machine Type and Model......03590B11
        Serial Number...............000000000315
        Device Specific . (FW) .....4D86

Error Description
TAPE DRIVE FAILURE

Probable Causes
TAPE DRIVE

10
TAPE
TAPE DRIVE

        Recommended Actions
        PERFORM PROBLEM DETERMINATION PROCEDURES

Detailed Data
SENSE DATA
0604 0000 1101 FFFF FE00 0000 0000 0000 0102 0000 7000 0400 0000 0048 0000 0000
4400 E503 3010 004A 1E01 0191 004A 8250 0000 1100 0036 2800 0033 4D00 0033 0600
0000 0000 0190 0000 2700 0000 0020 0000 0000 0000 0000 0000 C700 0000 4438 3620
2020 2000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
---------------------------------------------------------------------------
```

HEX	ASCII	Description
04		Sense key
4400		ASC/ASCQ (additional sense code/ additional sense code qualifier) (See "Sense Key – ASC and ASCQ Information" on page 4-10 for error sense information.)
E5		FID (FRU identification number)
3010		First FSC (fault symptom code)
3628		Second FSC (fault symptom code)
334D		Next to last FSC (fault symptom code)
3306		Last FSC (fault symptom code)
443836	D86	Microcode level
(not shown)		VOLSER Number in ASCII or EBCDIC (Bytes 83-88)

Figure 4-9. AIX SMIT and ERRPT Command Error Log Example

```
---------------------------------------------------------------------------
ERROR LABEL:    SIM_MIM_RECORD_3590
ERROR ID:       2E2EFDDE

Date/Time:       Tue Oct 31 07:33:21
Sequence Number: 203274
Machine ID:      000003243700
Node ID:         kitt
Error Class:     H
Error Type:      UNKN
Resource Name:   rmt1
Resource Class:  tape
Resource Type:   3590
Location:        00-02-01-20
VPD:
        Manufacturer................IBM
        Machine Type and Model......03590B1A
        Serial Number...............000000000315
        Device Specific . (FW) .....B58A

Error Description
UNDETERMINED ERROR

Probable Causes
TAPE DRIVE
TAPE CONTROL UNIT

Failure Causes
TAPE DRIVE

        Recommended Actions
        REFER TO PRODUCT DOCUMENTATION FOR ADDITIONAL INFORMATION

Detailed Data
DIAGNOSTIC EXPLANATION
3100 0044 0000 6140 01130 3030 3030 3030 3235 3841 3432 3030 3737 3330 3030 3030
3937 3530 3031 3530 3031 3830 3030 4942 4D31 322D 3030 3030 3030 3058 5858 5858
3033 3539 3042 3141
```

HEX	ASCII	Description
01		01=SIM 02=MIM
3235 3841	258A	Model and Microcode level
3432	42	Message code (See "Message Codes" on page 4-8)
33	3	FID severity (See "SIM/MIM Severity" on page 4-10)
3937	97	FID (FRU identification number)
3530 3031	5001	First FSC (fault symptom code)
3530 3031	5001	Last FSC (fault symptom code)
3033 3539 30	03590	Machine Type
42 3141	B1A	Model

Figure 4-10. Error Log Example of SIM Message

```
---------------------------------------------------------------------------
ERROR LABEL:    SIM_MIM_RECORD_3590
ERROR ID:       2E2EFDDE

Date/Time:       Tue Oct 31 07:33:21
Sequence Number: 203274
Machine ID:      000003243700
Node ID:         kitt
Error Class:     H
Error Type:      UNKN
Resource Name:   rmt1
Resource Class:  tape
Resource Type:   3590
Location:        00-02-01-20
VPD:
        Manufacturer................IBM
        Machine Type and Model......03590B1A
        Serial Number...............000000000315
        Device Specific . (FW) .....5B8A

Error Description
UNDETERMINED ERROR

Probable Causes
TAPE DRIVE
TAPE CONTROL UNIT

Failure Causes
TAPE DRIVE

        Recommended Actions
        REFER TO PRODUCT DOCUMENTATION FOR ADDITIONAL INFORMATION

Detailed Data
DIAGNOSTIC EXPLANATION
3100 0044 0000 6140 02**30** 3030 3030 3030 **3235 3841 3631** 3535 3630 **31**30 3030 3341
3241 **5051 5239 3530** 0130 3830 3030 4942 4D31 322D 3030 3030 3030 3058 5858 5858
**3033 3539 3042 3141**
```

HEX	ASCII	Description
02		01=SIM 02=MIM
3235 3841	258A	Model and Microcode level
3631	61	Message code (See "Message Codes" on page 4-8)
31	1	FID severity (See "SIM/MIM Severity" on page 4-10)
5051 5239 3530	PQR950	VOLSER (volume serial number)
3033 3539 30	03590	Machine Type
42 3141	B1A	Model

Figure 4-11. Error Log Example of MIM Message

```
---------------------------------------------------------------------------
ERROR LABEL:    RECOVERED_ERROR
ERROR ID:       0F78A011

Date/Time:       Mon Nov 20 07:33:21
Sequence Number: 232646
Machine ID:      000003243700
Node ID:         kitt
Error Class:     H
Error Type:      TEMP
Resource Name:   rmt1
Resource Class:  tape
Resource Type:   3590
Location:        00-02-01-0,0
VPD:
        Manufacturer................IBM
        Machine Type and Model......03590B1A
        Serial Number...............000000000315
        Device Specific . (FW) .....B58A

Error Description
Recovery logic initiated by device

Probable Causes
Undetermined

Failure Causes
TAPE DRIVE
MEDIA

        Recommended Actions
        THIS ALERT IDENTIFIES THE CAUSE OF A PREVIOUS ERROR WHICH HAS BEEN RECOVERED

Detail Data
SENSE DATA
0602 0000 0A01 0000 1400 0000 0000 0000 0102 0000 7100 0400 0000 0040 0000 0000
4400 B308 3106 4132 0301 0100 0000 7241 0000 0A50 0533 4300 0E33 4D00 0033 4100
0000 0000 0000 FFFF FF00 0000 0000 0000 0000 0000 0000 0002 2200 6000 3538 4120
2020 2000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
---------------------------------------------------------------------------
```

HEX	ASCII	Description
04		Sense Key
4400		ASC/ASCQ (additional sense code/ additional sense code qualifier) (See "Sense Key – ASC and ASCQ Information" on page 4-10 for error sense information.)
FE		FID (FRU identification number)
3106		First FSC (fault symptom code)
33 43		Second FSC (fault symptom code)
33 4D		Next to Last FSC (fault symptom code)
33 41		Last FSC (fault symptom code)
3538 41	58A	Microcode level
(not shown)		VOLSER Number in ASCII or EBCDIC (Bytes 83-88)

Figure 4-12. AIX SMIT and ERRPT Command Error Log Example

1	2	3	4	5	6
0502F666	1003075695	P	H	scsi0	ADAPTER ERROR
0502F666	1003075595	P	H	scsi0	ADAPTER ERROR
1104AA28	1003075495	T	S	SYSPROC	System reset interrupt received
9DBCFDEE	1003075795	T	O	errdemon	Error logging turned on
0F78A011	1003075195	T	H	rmt1	Recovery logic initiated by device
4865FA9B	1003074995	P	H	rmt1	TAPE OPERATION ERROR
476B351D	1003074995	P	H	rmt1	TAPE DRIVE FAILURE
2E2EFDDE	1003074995	U	H	rmt1	UNDETERMINED EFFOR
476B351D	1003074995	P	H	rmt1	TAPE DRIVE FAILURE
2E2EFDDE	1003074995	U	H	rmt1	UNDETERMINED ERROR
2E2EFDDE	1003074995	U	H	rmt1	UNDETERMINED ERROR
0502F666	1003074495	P	H	scsi0	ADAPTER ERROR
0502F666	1003074395	P	H	scsi0	ADAPTER ERROR
1104AA28	1003074395	T	S	SYSPROC	System reset interrupt received
9DBCFDEE	1003074595	T	O	errdemon	Error logging turned on
4865FA9B	1003073795	P	H	rmt1	TAPE OPERATION ERROR
476B351D	1003073795	P	H	rmt1	TAPE DRIVE FAILURE
2E2EFDDE	1003073795	U	H	rmt1	UNDETERMINED ERROR
476B351D	1003073795	P	H	rmt1	TAPE DRIVE FAILURE
2E2EFDDE	1003073595	U	H	rmt1	UNDETERMINED ERROR
AA8AB241	1003030195	T	O	OPERATOR	OPERATOR NOTIFICATION
AA8AB241	1002030195	T	O	OPERATOR	OPERATOR NOTIFICATION
AA8AB241	1001030195	T	O	OPERATOR	OPERATOR NOTIFICATION
FCA960CE	1001001395	T	S	tok0	EXCESSIVE TOKEN-RING ERRORS
20188DE1	0928091195	P	H	tok0	WIRE FAULT
476B351D	0927132795	P	H	rmt0	TAPE DRIVE FAILURE
476B351D	0927132795	P	H	rmt0	TAPE DRIVE FAILURE
476B351D	0927132695	P	H	rmt0	TAPE DRIVE FAILURE
476B351D	0927132695	P	H	rmt0	TAPE DRIVE FAILURE
5537AC5F	0927132495	P	H	rmt0	TAPE DRIVE FAILURE

A14M0008

NUMBER	DESCRIPTION
1	Error ID
2	Timestamp
3	Error Type
4	Error Class
5	Resource Name
6	Error Description

ERROR CLASS	DESCRIPTION
H	Hardware
S	Software
O	Informational

ERROR TYPE	DESCRIPTION
PEND	The availability loss of a device or component is imminent.
PERF	The performance of a device or component has degraded to an unacceptable level.
PERM	A hardware or software condition that could not be recovered from.
TEMP	A hardware condition that was recovered from after several unsuccessful attempts.
UNKN	The severity of the condition could not be determined.

A21MMS16

Figure 4-13. AIX SMIT and ERRPT Commands Error Log Example

Error Log Analysis – iSeries/AS400 (OS/400) System

To gain access to the iSeries/AS400 (OS/400) System problem logs and error logs, sign on at any available workstation using the QSRV logon and its security password (QSRV). After sign on, the proper access authorizations is granted and the iSeries/AS400 (OS/400) System MAIN MENU displays.

There are two procedures, depending on which version/release of OS/400 you are running.

iSeries/AS400 (OS/400) System with CICS Processor

1. Type STRSST (Start System Service Tools) command on the command entry line on the iSeries/AS400 (OS/400) System Main Menu, and press **Enter**.
2. Select “Start a service tool”.
3. Select “Error log utility”.
4. Select “Analyze error log”.
5. Specify the time period for searching the error log, then select “Magnetic media”.
6. On the Select Analysis Report Options menu, specify a device type of 3590, and press **Enter**. Leave all other options at their default value.
7. Use the “Display Report” option to display the desired error log entry.
8. The following figure is a sample iSeries/AS400 (OS/400) System Error Log display screen showing the 3590 error log data.

```
                      Display Detail Report for Resource

                                              Serial
Resource          Type      Model             Number            Address
TAP02             3590      B11               13-10063          0270-1700FFFF

Error log ID  . . . . . :   004602D2      Sequence . . . . . :      178324
Date  . . . . . :   10/23/95      Time . . . . . :    11:38:02
Reference code  . . . . . :   9350          Error code . . . . . :    00000000
Table ID  . . . . . :   35900B11      IPL source . . . . . :    B
Error type  . . . . . :   Permanent
Description . . . . . :
Tape unit failure
SIM/MIM message . . . . . :   00000000137E4200773000000B0311531
                              1580000B01300000000000007503590B11
Press Enter to continue.

F3=Exit                                    F6=Display hexadecimal report
F10=Display previous detail report         F12=Cancel
```

```
-------Hex-----------Description---------------------------------------
      137E           Model and Microcode Level
        42           Message Code (see "Message Codes" on page 4-8)
        B0           FID (FRU Identifier)
      3115           First FSC (fault symptom code)
      3115           Last FSC (fault symptom code)
0000000075           Sequence Number (drive serial number)
  03590B11           Device Type and Model Number
-----------------------------------------------------------------------
```

Figure 4-14. iSeries/AS400 (OS/400) System Example Error Log of SIM

To display the hexadecimal error report, press **F6**. The following figure is an example of a 3590 hexadecimal error report which shows a permanent read/write error. This figure is valid for microcode levels D0IA and later. Press **Page Up** or **Page Down** to display offset 0130 to 016C in the error log.

```
               Display Hexadecimal Report for Resource

                                    Serial                  Resource
 Name            Type      Model    Number                  Name
 TAP02           3590      B11      13-10063                DEVICE

 Offset        0 1 2 3  4 5 6 7  8 9 A B  C D E F    EBCDIC
 0000C0        00000000 00000000 00000000 00000000   ................
 0000D0        00000000 00000000 00000000 00000000   ................
 0000E0        F8807800 6501xxxx 00000270 1700FFFF   8...............
 0000F0        35900B11 9350xxxx 00631202 05D8D5E6   .....&.......QNW
 000100        F0F0F5F0 40404250 00009200 00000000   0050  .&........
 000110        00040000 0000A0B0 0E223444 32440000   ................
 000120        0000F000 03000000 00400000 00000900   ..0...... ......
 000130        FE2Axxxx 00010003 01300009 42494280   ................
 000140        10001xxx xxxxxxxx xxxxxxxx xxxxxxxx   ................
 000150        00000003 00000400 00005A90 00000003   ..........!.....
 000160        00000100 00002300 0000xxxx xxxx2020   ................
 000170        20001000 00xxxxxx xxxxxx00 00000600   ................
                                                                  More...
Press Enter to continue.

F3=Exit        F12=Cancel
```

OFFSET	*HEX*	*ASCII*	*DESCRIPTION*
00E4-00E5	6501		IOP Type
00EC-00ED	1700		1 = IOP Port Used 700 = Drive Address
00F0-00F3	35900B11		Device Type and Model
00F4-00F5	9350		SRC (system reference code)
0130	FE		FID (FRU identification number)
0132-0133	3118		First FSC (fault symptom code)
0143-0144	3542		Second FSC (fault symptom code)
0147-0148	336B		Next to Last FSC (fault symptom code)
014B-014C	3354		Last FSC (fault symptom code)
016A-016C	443836	D86	Microcode level
0175-017A	505152393530		VOLSER Number in ASCII or EBCDIC

Figure 4-15. iSeries/AS400 (OS/400) System Hexadecimal Error Log (Display)

Table 4-21. Hex to ASCII Conversion

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
00	Null	30	0	41	A	4A	J	54	T
20	Space	31	1	42	B	4B	K	55	U
		32	2	43	C	4C	L	56	V
		33	3	44	D	4D	M	57	W
		34	4	45	E	4E	N	58	X
		35	5	46	F	4F	O	59	Y
		36	6	47	G	50	P	5A	Z
		37	7	48	H	51	Q	5F	–
		38	8	49	I	52	R		
		39	9			53	S		

Note: All codes are not shown.

The following figure is an example of an iSeries/AS400 (OS/400) System hexadecimal error report printout with an Error Type of Permanent. This figure is valid for microcode levels D0IA and later.

The FID and FSC in the error log are in ASCII, while the microcode level is in hex. Use Table 4-21 on page 4-27 to convert the numbering system.

```
 Error Log Utility                                      Page . . . :        2
                                                      IBM       10/23/95  14:13:10
                          Partial Report for Resource

 From . . :   10/12/95   14:13:10       To . . :  10/23/95   14:13:10

                                  Serial
Resource       Type      Model     Number         Address          Total Count
TAP02          3590      B11       13-10063       0270-1700FFFF         286

Reference Code                Error Type                    Count

    9350                      Permanent                        3
    9355                      Permanent                       21
    FFF6                      Statistic                      262

                          Detail Report for Resource

                                           Serial
Resource           Type         Model      Number            Address
TAP02              3590          B11       13-10063          0270-1700FFFF

Error Log ID . . . . . :   004602D2      Sequence . . . . . :       178324
Date . . . . . :   10/23/95      Time . . . . . :    11:38:02
Reference code . . . . . :   9350          Error Code . . . . . :    00000000
Table ID . . . . . :   35900B11      IPL Source . . . . . :    B
Error Type . . . . . :   Permanent
Description  . . . . . :
Tape unit detected a read or write error on tape medium
          1                                                                                                    3
   00000000 0000    C5D3F0F2 000000F8  007000E0 787BB495    F50000DC 0002B894  20F6F5F0 F1027000
   00000000 0020    00000000 00000000  00000000 00000000    00000000 00000000  00000000 00000000
   00000000 0040    000000E3 C1D7F0F2  40404040 40F3F5F9    F0C2F1F1 00010063  93500046 02D20000
   00000000 0060    00000000 00001700  FFFF1100 00000000    F3F5F9F0 F0C2F1F1  40D4C4C4 C3D- - -00
   00000000 0080    0000F1F3 40404040  40404040 40404040    07000000 00000000  000000F8 0820E2C9
   00000000 00A0    F1F84040 40404040  C4C3F7F3 40404040    4040E3C1 D7F2F540  40404040 00000000
   00000000 00C0    00000000 00000000  00000000 00000000    00000000 00000000  00000000 00000000
   00000000 00E0    F8807800 6501 0001  00000270 1700FFFF    35900B11 9350 0001  00631202 05D8D5E6
      QNW*
   00000000 0100    F0F0F5F0 40404250  00009200 00000000    000- - -00 0000A0B0  0E223444 324- - -00
   00000000 0120    0000F000 03000000  00400000 00000900    FE2A3118 00010003  01300009 42494280
   00000000 0140    10001035 42000133  6B050433 54000000    00000003 00000400  00005A90 00000003
   00000000 0160    00000100 00002300  00004438 36202020    20001000 00505152  39353000 00000600
   00000000 0180    03003900 00000300  00001000 00000000    00013100 03000000  00400000 00000900
   00000000 01A0    FE2A3800 00171202  05D80000 00171202    05D81000 00050000  00171202 05D80600
   00000000 01C0    10002000 02000000  00171202 05D80600    00000000 00000000  40404040 40404040


1   Offset into the error log
2   Hexadecimal error log


 OFFSET        HEX      ASCII   DESCRIPTION
 00E4-00E5      6501            IOP Type
 00EC-00ED      1700            1 = IOP Port Used
                                700 = Drive Address
 00F0-00F3  35900B11            Device Type and Model
 00F4-00F5      9350            SRC (system reference code)
 0124             03             Sense Key
 012E-012F      0900            ASC/ASCQ (additional sense code/additional sense code qualifier)
                                        (See "Sense Key – ASC and ASCQ Information" on page 4-10
                                         for error sense information.)
 0130             FE            FID (FRU identification number)
 0132-0133      3118            First FSC (fault symptom code)
 0143-0144      3542            Second FSC (fault symptom code)
 0147-0148      336B            Next to Last FSC (fault symptom code)
 014B-014C      3354            Last FSC (fault symptom code)
 016A-016C    443836     D86    Microcode level
 0175-017A  505152393530        VOLSER Number in ASCII or EBCDIC
```

Figure 4-16. iSeries/AS400 (OS/400) System Hexadecimal Error Log (Printout)

Analyze the sense key and ASC/ASCQ data to determine the type of sense information reported in the error log. If a hardware failure is indicated, use the FID and go to START-1 for problem determination.

See *iSeries/AS400 (OS/400) System Advanced Series Service Functions* for more detailed information on displaying and printing the error logs.

iSeries/AS400 (OS/400) System with RISC Processor

1. Type STRSST (Start System Service Tools) command on the command entry line on the iSeries/AS400 (OS/400) System Main Menu, and press **Enter**.
2. Select “Start a service tool”.
3. Select “Product activity log”.
4. Select “Analyze log”.
5. Specify the time period for searching the error log, then select “Magnetic media” option.
6. On the “Select Analysis Report Options” menu, specify a device type of 3590, and press **Enter**. Leave all other options at their default value.
7. Use the “Log Analysis Report” menu to display the desired error log entry.

   Note: You may use the PF11 function key which will give you a brief description of the error log entry. This could be helpful when scanning the error logs.
8. The following figure is a sample iSeries/AS400 (OS/400) System Error Log display screen showing the 3590 error log data.

```
                        Display Detail Report for Resource

                                              Serial             Resource
Name              Type      Model             Number             Name
TAP02             3590      B11               13-10063           TAP34

Error log ID  . . . . . :   004602D2      Sequence . . . . . :      178324
Date  . . . . . :   10/23/95      Time . . . . . :    11:38:02
Reference code  . . . . . :   9350          Secondary code . . . :    00000000
Table ID  . . . . . :   35900B11      IPL source/state . . :    B/3

Class . . . . . :   Permanent
System Ref Code . . . . . :   35909300
Tape unit failure
SIM/MIM message . . . . . :   00000000137E4200773000000B0311531
                              1580000B013000000000007503590B11

Press Enter to continue.

F3=Exit                 F4=Additional Information   F6=Hexadecimal report
F9=Address Information  F10=Previous detail report  F12=Cancel
```

```
-------Hex-------Description---------------------------------------
      137E       Model and Microcode Level
        42       Message Code (see "Message Codes" on page 4-8)
        B0       FID (FRU Identifier)
      3115       First FSC (fault symptom code)
      3115       Last FSC (fault symptom code)
0000000075       Sequence Number (drive serial number)
     03590       Device Type
       B11       Device Model Number
-----------------------------------------------------------------
```

Figure 4-17. iSeries/AS400 (OS/400) System Example Error Log of SIM Message

9. Press **F4** to display additional information. See the example in Figure 4-18 on page 4-30.

```
                  Display Additional Information for Resource

                                              Serial             Resource
Name              Type      Model             Number             Name
TAP02             3590      B11               13-10063           TAP34
SIM/MIM message . . . . . :   00000000137E4200773000000B0311531
                              15800000B01300000000000007503590B11


------Hex------------Description----------------------------------------
      137E           Link and Microcode Level
        42           Message Code (see "Message Codes" on page 4-8)
        B0           FID (FRU Identifier)
      3115           First FSC (fault symptom code)
      3115           Last FSC (fault symptom code)
0000000075           Sequence Number (drive serial number)
     03590           Device Type
       B11           Device Model Number
---------------------------------------------------------------------
```

Figure 4-18. iSeries/AS400 (OS/400) System Example Error Log of SIM Message

To display the hexadecimal error report, press **F6**. The following figure is an example of a 3590 hexadecimal error report which shows a permanent read/write error. This figure is valid for microcode levels D0IA and later. Press **Page Up** or **Page Down** to display offset 01D0 to 020C in the error log.

```
              Display Hexadecimal Report for Resource

                                    Serial                  Resource
 Name            Type      Model    Number                  Name
 TAP02           3590      B11      13-10063                DEVICE

 Offset        0 1 2 3  4 5 6 7  8 9 A B  C D E F    EBCDIC
 000180        F8807800 6501 0001 00000270 1700FFFF   8.............
 000190        35900B11 9350 0001 00631202 05D8D5E6   .....&.......QNW
 0001A0        F0F0F5F0 40404250 00009200 00000000   0050  .&........
 0001B0        00040000 0000A0B0 0E223444 32440000   .............
 0001C0        0000F000 03000000 00400000 00000900   ..0..... ......
 0001D0        FE2A3118 00010003 01300009 42494280   .............
 0001E0        10001035 42000133 6B050433 54000000   .......,.......
 0001F0        00000003 00000400 00005A90 00000003   ..........!.....
 000200        00000100 00002300 00004438 36202020   .............
 000210        20001000 00505152 39353000 00000600   .............
 000220        00000000 00000000 00000000 00000000   .............
 000230        00001000 0003FFFF FFFC1200 0331D9E2   ............RS
                                                                More...
Press Enter to continue.

F3=Exit        F12=Cancel
```

Note: The above is an example of a typical iSeries/AS400 (OS/400) System report. Display contents will vary by displacement depending on the operating system release. If you do not find either F0, F1, 70, or 71 (locator byte) in Location 1C2, browse around that area and adjust the displacement accordingly. Remember the first FSC will be directly below the located byte. The typical latest iSeries/AS400 (OS/400) System report is shown on Figure 4-20 on page 4-32.

OFFSET	*HEX*	*ASCII*	*DESCRIPTION*
0184-0185	6501		IOP Type
018C-018D	1700		1 = IOP Port Used 700 = Drive Address
0190-0193	35900B11		Device Type and Model
0194-0195	9350		SRC (system reference code)
01C4	03		Sense Key
01CE-01CF	0900		ASC/ASCQ (additional sense code/ additional sense code qualifier) (See "Sense Key – ASC and ASCQ Information" on page 4-10 for error sense information.)
01D0	FE		FID (FRU identification number)
01D2-01D3	3118		First FSC (fault symptom code)
01E3-01E4	3542		Second FSC (fault symptom code)
01E7-01E8	336B		Next to Last FSC (fault symptom code)
01EB-01EC	3354		Last FSC (fault symptom code)
020A-020C	443836	D86	Microcode level
0215-021A	505152393530		VOLSER Number in ASCII or EBCDIC

Figure 4-19. iSeries/AS400 (OS/400) System Hexadecimal Error Log (Display)

```
    Here is what the sense data would look like in the  iSeries/AS400 (OS/400) System
Product Activity log for a model Exx.  The device type is
shown as 63A0 instead of 3590 since 63A0 is the reported type.

------------------------------------------------------------------------
                  Display Additional Information for Resource

                                        Serial               Resource
 Name              Type      Model      Number               Name
 TAPMLB46          63A0      001        13-10016             TAP04

 SENSE DATA FOLLOWS. . . . :
 DATA OFFSET                    0 1 2 3  4 5 6 7  8 9 A B  C D E F
 000000                         F0000300 00005058 00000000 3001FF02
 000010                         3A9F1000 02030191 00091040 00000800
 000020                         00333D00 00000000 00000000 00000000
 000030                         00000000 00000000 00000000 00000000
 000040                         00000000 49000000 36434220 20202000




 F3=Exit        F12=Cancel                              More...
Press Enter to continue.

F3=Exit        F12=Cancel
```

OFFSET	*HEX*	*ASCII*	*DESCRIPTION*
000002	03		Sense key of 3.
000007	X'0A' or X'58"		18 bytes or 96 bytes of sense data are returned.
00000C	3001		ASC and ASCQ.
00000E	FF		FID (FRU identification number)
000010	3A9F		1st error code.
000021	333D		2nd error code.
000048	36434220 20202000		Microcode EC Number (in ASCII).
	6 C B bl blblbl		ASCII EC level

Figure 4-20. iSeries/AS400 (OS/400) System Product Activity Log (Display)

If more information is necessary on the sense bytes, there is a section contained in the system operation manual “iSeries/AS400 (OS/400) System® Information” on page xxi called Request Sense X’03’.

The following figure is an example of an iSeries/AS400 (OS/400) System hexadecimal error report printout with an Error Type of Permanent. This figure is valid for microcode levels D0IA and later.

The FID and FSC in the error log are in hex, while the microcode level is in ASCII. Use Table 4-22 on page 4-34 to convert between the two systems.

```
 Error Log Utility                                          Page . . . :        2
                                                      IBM       10/23/95  14:13:10
                          Partial Report for Resource

 From . . :   10/12/95   14:13:10       To . . :  10/23/95   14:13:10

                                  Serial
Resource       Type      Model     Number         Address          Total Count
TAP02          3590      B11       13-10063       0270-1700FFFF         286

Reference Code               Error Type                    Count

    9350                     Permanent                       3
    9355                     Permanent                      21
    FFF6                     Statistic                     262

                          Detail Report for Resource

                                          Serial
Resource           Type         Model     Number            Address
TAP02              3590          B11      13-10063          0270-1700FFFF

Error Log ID . . . . . :   004602D2      Sequence . . . . . :       178324
Date . . . . . :   10/23/95      Time . . . . . :    11:38:02
Reference code . . . . . :   9350          Error Code . . . . . :    00000000
Table ID . . . . . :   35900B11      IPL Source . . . . . :    B
Error Type . . . . . :   Permanent
Description  . . . . . :
Tape unit detected a read or write error on tape medium
            1                                                    2
   00000000 0000    C5D3F0F2 000000F8  007000E0 787BB495    F50000DC 0002B894  20100103 3C000000
   00000000 0020    92100000 11000000  00000000 01720000    F3F5F9F0 C2F1F140  F1F260F0 F0F0F0F0
   00000000 0040    4040F6F5 F0F10000  00000001 00010000    00020000 00050001  0002FFFF 0000FFFF
   00000000 0060    00000000 00000000  00000000 00000000    00000000 00000000  00000000 00000000
   00000000 0080    00000000 00000000  00000000 00000000    00000000 00000000  00000000 0000E3C1
   00000000 00A0    D7F0F740 40404040  00000000 00000000    00000000 00000000  40404040 40404040
   00000000 00C0    40404040 40404040  40404040 40404040    40404040 40404040  40404040 40404040
   00000000 00E0    F3F5F9F0 F0C2F1F1  0000E2D3 C9C3C9D6    4040E5F3 D9F6D4F0  40400000 00000000
   00000000 0100    00790000 00000000  00000170 00000000    00000000 01720000  00000000 00000000
   00000000 0120    00000000 00000000  00000000 00000000    00000000 00000000  00000000 00000000
   00000000 0140    E3C1D7F0 F7404040  40400000 00000000    40404040 40404040  40404040 00070001
   00000000 0160    00000000 10200003  00000000 00000000    00000000 00000000  0005001E 00000188
   00000000 0180    F8807800 6501 0001  00000120 12F0 FFFF    35900B11 92100000  00001202 06240000
   00000000 01A0    00000000 00004250  0000920E 00000000    00040000 0000A0B0  0E213234 433800B4
   00000000 01C0    0000F000 03 000000  00400000 0000 0900    FE 2A 3118 00010003  01300009 42494280
   00000000 01E0    10001 035 42 000 133  6B 050 433 54 000000    00000003 00000400  00005A90 00000003
   00000000 0200    00000100 00002300  0000 4438 36 202020    20001000 00 505152  393530 00 00000600
   00000000 0220    03003900 00000300  00001000 00000000    00013100 03000000  00400000 00000900
   00000000 0240    FE2A3800 00171202  05D80000 00171202    05D81000 00050000  00171202 05D80600
   00000000 0260    10002000 02000000  00171202 05D80600    00000000 00000000  40404040 40404040
   00000000 0280    00000000 00000000  00000000 00000000    00000000 00000000  00000000 00000000
                       1 LINES     00000000 02A0      TO     00000000 02A0    SAME AS ABOVE
   00000000 02C0    00000000 00000000  00000000 00000000    00000000 00000000  00000000 000000D5
   00000000 02E0    00000000 00000000  00000000 00000000    00000000 00000000  00000000 0000D500
   00000000 0300    00000000 00000000  40404040 40404040    40404040 40404040  40404040 40404040

   * * * * *  E N D  O F  C O M P U T E R  P R I N T O U T  * * * * *
1    Offset into the error log
2    Hexadecimal error log

 OFFSET        HEX      ASCII   DESCRIPTION
 0184-0185      6501            IOP Type
 018C-018D      12F0            1 = IOP Port Used
                                2F0 = Drive Address
 0190-0193  35900B11            Device Type and Model
 0194-0195      9350            SRC (system reference code)
 01C4             03            Sense Key
 01CE-01CF      0900            ASC/ASCQ (additional sense code/
                                additional sense code qualifier)
                               (See "Sense Key – ASC and ASCQ Information" on page 4-10
                                for error sense information.)
 01D0             FE            FID (FRU identification number)
 01D2-01D3      3118            First FSC (fault symptom code)
 01E3-01E4      3542            Second FSC (fault symptom code)
 01E7-01E8      336B            Next to Last FSC (fault symptom code)
 01EB-01EC      3354            Last FSC (fault symptom code)
 020A-020C    443836     D86    Microcode level
 0215-021A  505152393530        VOLSER Number in ASCII or EBCDIC
```

Figure 4-21. iSeries/AS400 (OS/400) System Hexadecimal Error Log (Printout)

Note: The above is an example of a typical iSeries/AS400 (OS/400) System report. Display contents will vary by displacement depending on the operating system release. If you do not find either F0, F1, 70, or 71 (locator byte) in Location 1C2, browse around that area and adjust the displacement accordingly. Remember the first FSC will be directly below the located byte. The typical latest iSeries/AS400 (OS/400) System report is shown on Figure 4-20 on page 4-32.

Check the Message Code, see “Message Codes” on page 4-8, for all SIM/MIMs before entering the START section with the FID. Once you have located the FID, go to START-1 for problem determination.

See *iSeries/AS400 (OS/400) System Advanced Series Service Functions* for more detailed information on displaying and printing the error logs.

Table 4-22. Hex to ASCII Conversion

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
00	Null	30	0	41	A	4A	J	54	T
20	Space	31	1	42	B	4B	K	55	U
		32	2	43	C	4C	L	56	V
		33	3	44	D	4D	M	57	W
		34	4	45	E	4E	N	58	X
		35	5	46	F	4F	O	59	Y
		36	6	47	G	50	P	5A	Z
		37	7	48	H	51	Q	5F	–
		38	8	49	I	52	R		
		39	9			53	S		

Note: All codes are not shown.

Error Log Analysis – LINUX System — —

Linux does not support error logs.

Note: See the *IBM TotalStorage Device Drivers Installation and User’s Guide*for detailed information.

Obtaining Error Information from Sun (Solaris) System

The Sun system does not provide error logs for analysis; therefore, you will have to use the device diagnostics and Device Error Log for problem determination. See “CE Logs Menu” on page 5-60 and “Error Log Analysis Procedure” on page 9-126. When you have located a FID, go to START-1.

Refer to “Appendix A” on page B-1 for additional information concerning host attachment software service tools for Sun (Solaris), including *tapeutil*.

See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide* for additional information about Solaris service and diagnostic aids.

Obtaining Error Information from HP/UX System

The HP-UX system does not provide error logs for analysis. Therefore, you will have to use the device diagnostics and Device Error Log for problem determination. See “CE Logs Menu” on page 5-60 and “Error Log Analysis Procedure” on page 9-126. When you have located a FID, go to START-1.

Refer to “Appendix A” on page B-1 for additional information concerning host attachment software service tools for HP-UX systems, including *tapeutil*.

See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide* for additional information about HP/UX service and diagnostic aids.

Obtaining Error Information from Windows NT or Windows 2000 System

You may refer to “Appendix A” on page B-1 for additional information concerning host attachment software service tools for Windows NT or Windows 2000 systems, including *ntutil*.

See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User’s Guide* for additional information about Windows NT service and diagnostic aids.

Running NTUTIL

If **ntutil** is running and an error condition is detected, an error message is displayed. The error sense data has the format seen in Figure 4-22. The **err 0 ERROR_SUCCESS>**, or error number, is explained in “NTUTIL Symbolic Error and Error Number” on page 4-37.
For further information on gathering error data, see *IBM SCSI Tape Drive, Medium Changer, and Library*

```
enter selection:  39
Scsi status:  02h/Sense information Length 60h
Sense  KEY/ASC/ASCQ = 02/3a/00
       KEY   meaning is:  not ready
Sense Info - - - consult SCSI spec for details

           00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
 ------------------------------------------------------------
    0000 - 70 00 02 00 00 00 00 58 00 00 00 00 3a 00 FF 02
    0010 - C4 08 00 00 00 00 01 40 00 00 00 00 00 00 0A 00
    0020 - 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    0030 - 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    0040 - 00 00 00 00 00 00 00 00 32 46 31 20 20 20 20 00
    0050 - 00 00 00 50 51 52 39 35 30 00 00 00 00 00 00 00

analyze <> called with rc 1 err 0 <ERROR_SUCCESS> data 0
total elapsed time in seconds =   0.00
Return to continue:
```

HEX	ASCII	DESCRIPTION
FF		FID (FRU identification number) Byte 14
C408		FSC (fault symptom code) Bytes 16 and 17
324631	2F1	Microcode level, Bytes 72-74
505152393530		VOLSER# in ASCII or EBCDIC

Figure 4-22. Tapeutil Error Sample

Device Drivers: Installation and User’s Guide and the Hardware Reference Manual. For certain errors, an ntutil test_unit_ready command (39) must be issued to display the sense information. Sense information also can be retrieved with a Log_sense command (83).

NTUTIL Symbolic Error and Error Number

Symbolic Error	NT Error Number
ERROR_SUCCESS	0
ERROR_INVALID_FUNCTION	1
ERROR_FILE_NOT_FOUND	2
ERROR_PATH_NOT_FOUND	3
ERROR_TOO_MANY_OPEN_FILES	4
ERROR_ACCESS_DENIED	5
ERROR_INVALID_HANDLE	6
ERROR_NOT_ENOUGH_MEMORY	8
ERROR_BAD_FORMAT	9
ERROR_INVALID_BLOCK	10
ERROR_BAD_ENVIRONMENT	11
ERROR_INVALID_ACCESS	12
ERROR_INVALID_DATA	13
ERROR_OUTOFMEMORY	14
ERROR_INVALID_DRIVE	15
ERROR_WRITE_PROTECT	19
ERROR_BAD_UNIT	20
ERROR_NOT_READY	21
ERROR_BAD_COMMAND	22
ERROR_CRC	23
ERROR_HANDLE_EOF	38
ERROR_NOT_SUPPORTED	50
ERROR_DEV_NOT_EXIST	55
ERROR_ALREADY_ASSIGNED	85
ERROR_INVALID_PARAMETER	87
ERROR_OPEN_FAILED	110
ERROR_INSUFFICIENT_BUFFER	122
ERROR_INVALID_NAME	123
ERROR_BUSY_DRIVE	142
DD_NO_SENSE	200
DD_DEVICE_DRIVER_FAILURE	201
DD_EEPROM_FAILURE	202
DD_MANUAL_INTERVENTION	203
DD_RECOVERED_ERROR	204
DD_SCSI_ADAPTER_ERROR	205
DD_SCSI_ERROR	206
DD_SCSI_BUSY	211
DD_ILLEGAL_REQUEST	207
DD_COMMAND_ABORTED	208
DD_HARDWARE_MICROCODE	209
DD_UNIT_ATTENTION	210
ERROR_MORE_DATA	234
DD_CARTRIDGE_ENTRY_FAILURE	300

(continued on next page)

Symbolic Error	NT Error Number
DD_CARTRIDGE_LOAD_FAILURE	301
DD_CARTRIDGE_IN_FAILED_DRIVE	302
DD_CAROUSEL_NOT_LOADED	303
DD_CHANGER_FAILURE	304
DD_DRIVE_FAILURE	305
DD_DRIVE_OR_MEDIA_FAILURE	306
DD_ENTRY_EXIT_FAILURE	307
DD_ENTRY_EXIT_NOT_PRESENT	308
DD_LIBRARY_AUDIT	309
DD_LIBRARY_FULL	310
DD_MEDIA_EXPORT	311
DD_SLOT_FAILURE	312
DD_SLOT_OR_MEDIA_FAILURE	313
DD_SOURCE_EMPTY	314
DD_DESTINATION_FULL	315
DD_CLEANER_INST	316
DD_MEDIA_NOT_EJECTED	317
DD_IOPORT_NOT_CONFIG	318
DD_FIRST_DEST_EMPTY	319
DD_END_PHYSICAL_MEDIA	400
DD_MEDIA_BLANK	401
DD_MEDIA_CORRUPTED	402
DD_MEDIA_FAILURE	403
DD_MEDIA_INCOMPATIBILITY	404
DD_SECTOR_RELOCATION	405
DD_SECTOR_OUT_OF_RANGE	406
DD_WRITE_PROTECT	407
DD_CLEAN_MEDIA	408
DD_MEDIA_FAULT	409
DD_CLEANING_COMPLETE	410
DD_LOGICAL_END_OF_MEDIA	411
DD_MEDIA_NOT_PRESENT	412
DD_BEGINNING_OF_MEDIA	413
DD_ERASE_FAILURE	414
DD_WRITE_TO_WRITTEN_WORM	415
DD_WRONG_LENGTH_BLOCK	416
ERROR_IO_INCOMPLETE	996
ERROR_IO_PENDING	997
ERROR_NOACCESS	998
ERROR_CANTOPEN	1011
ERROR_CANTREAD	1012
ERROR_CANTWRITE	1013
ERROR_END_OF_MEDIA	1100
ERROR_FILEMARK_DETECTED	1101
ERROR_BEGINNING_OF_MEDIA	1102
ERROR_SETMARK_DETECTED	1103
ERROR_NO_DATA_DETECTED	1104
ERROR_PARTITION_FAILURE	1105
ERROR_INVALID_BLOCK_LENGTH	1106
ERROR_DEVICE_NOT_PARTITIONED	1107
ERROR_UNABLE_TO_LOCK_MEDIA	1108
ERROR_UNABLE_TO_UNLOAD_MEDIA	1109
ERROR_MEDIA_CHANGED	1110
ERROR_BUS_RESET	1111
ERROR_NO_MEDIA_IN_DRIVE	1112
ERROR_IO_DEVICE	1117
ERROR_TOO_MANY_LINKS	1142

Chapter 5. Operator Panel

Contents

Display

Operator/CE Panel Display

The operator/CE panel provides a menu-driven operator and service interface through a liquid crystal display assembly. Displays include operator and service menus, device status, activities, error conditions, and data.

Several languages are available on the 3590. The fonts and translations for all of these languages are included in each microcode release, regardless of country. Selection of the desired language is through the operator/CE panel. To change languages, the operator selects the desired language from the “Change Language Menu” on page 5-31. The CE menus are always in English.

Operator tasks include making selections from the operator menus. For example, Unload Drive is a selection from the “Options Menu” on page 5-22. This menu selection causes a loaded cartridge to be rewound and unloaded from the device. The device will not accept any motion commands after you select Unload Drive. If the device has data in the buffers, the device will synchronize the data (empty the buffers to tape or the host) before rewinding. If the device cannot synchronize the buffers, status appropriate to the error is presented to the initiator. The device becomes *not ready* immediately after Unload Drive is selected; the operator/CE panel displays “UNLOADED.”

Figure 5-1 on page 5-5 shows the controls and the indicator on the operator/CE panel.

The operator/CE panel for the Model B11/E11/H11 is mounted above the priority cell on the ACF. The Model B11/E11/H11 is mounted in a rack (front-serviced) or in an A14 frame (rear-serviced).

For the Model B1A/E1A/H1A, which does not have an ACF, the operator/CE panel is mounted in front of the drive. The Model B1A/E1A/H1A is mounted in the 3494 tape library as a rear-serviced device.

The operator/CE panel has five pushbuttons; three are exposed and two are hidden from view. When the display is in the normal position, the operator can use the three exposed pushbuttons (up arrow, down arrow, and Enter).

When the panel is in the service position, the service representative (usually called a CE) can use two additional pushbuttons (Reset and Change Mode). To put the panel in the service position and expose the two CE buttons, the CE releases two finger latches on the back of the panel.

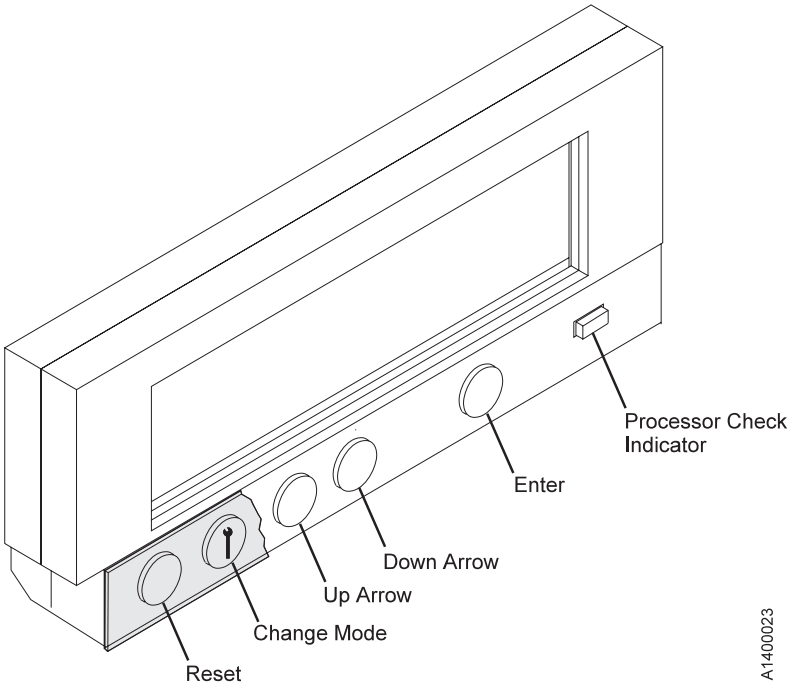


Figure 5-1. Operator/CE Panel

From left to right, the pushbuttons and indicator are:

Pushbutton/Indicator	Description
Reset	Allows the CE to perform a device power-ON reset. **Attention:** The device runs the diagnostics, which takes approximately 2.5 minutes. Do not insert your hands in the ACF during this time, even if the panel stops displaying *Diags Running* because the ACF transport may move up or down.
Change Mode	Allows the CE to toggle between CE mode and Normal mode. CE mode can be selected at any time, but the mode will not become active until the device completes all current operations. Normal mode can be selected at any time. Selecting Normal mode returns the operator/CE panel menu to the Operator menu (indicating status and conditions). CE mode enables special menus on the operator/CE panel display not available to the operator in Normal mode.
Up Arrow	Allows the operator or the CE to move the cursor arrow up through the menu options.
Down Arrow	Allows the operator or the CE to move the cursor arrow down through the menu options.
Enter	Allows the operator or the CE to select the menu option at the location of the cursor arrow.
Processor Check	During a normal power-ON or during a power-ON reset, this LED is switched ON for 10 to 20 seconds, and is switched OFF if no fault is detected. If the LED remains ON, the 3590 requires service.

See Figure 5-2 on page 5-6 and Table 5-2 for the descriptions of the areas on the panel.

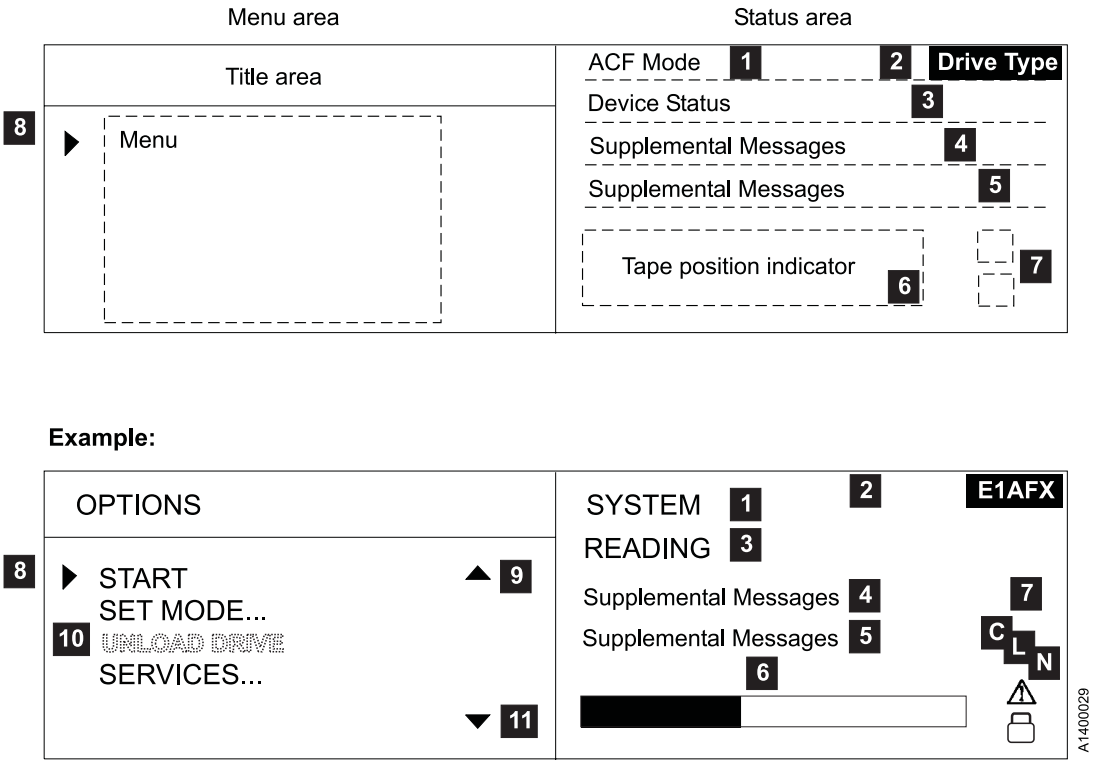


Figure 5-2. Options and Status Screen

Table 5-1. Drive Type Indicator

Drive Type	3590 Base	ULTRA	3590E SCSI	3590E Fibre	3590H SCSI	3590H Fibre
Non-Extended High Performance Cartridge/older microcode		ULTRA	3590E	N/A	N/A	N/A
Non-Extended High Performance Cartridge/ newer microcode ACF	B11	B11-U	E11	E11–F	N/A	N/A
Non-Extended High Performance Cartridge/ newer microcode Non-ACF	B1A	B1A-U	E1A	E1A-F	N/A	N/A
Extended High Performance Cartridge ACF	B11-X	B11UX	E11-X	E11FX	H11–X	H11FX
Extended High Performance Cartridge Non-ACF	B1A-X	B1AUX	E1A-X	E1AFX	H1A-X	H1AFX

Table 5-2. Options and Status

Area	Description
1 ACF Mode	Displays manual, automatic, system, accumulate, random, or when the ACF is installed. When the operator changes modes, any current ACF operation (cartridges in transit) are completed before the request is granted.
2 Drive Type	• See Table 5-1 on page 5-6 for the drive type indicators.
3 Drive and ACF Status	• Cleaning: A cleaning cartridge is in the device. • Ready: A ready message is generated by the device when it is ready and other higher-priority messages do not apply. The *ready* indicator is displayed only when the transport is not moving tape. When *ready* or *not ready*, the state of the device is the same to both SCSI busses. • Ready at load point: The media is at the beginning of tape and the device is ready. • Accessing: The empty ACF transport is moving to a magazine position to either check for an unused volume or to get a volume to load. • Transferring: The device is moving a cartridge from the magazine or the priority cell to the drive, or from the drive to the magazine or the priority cell. • Loading: The cartridge is being loaded into the drive. • Locating: The device is moving the tape to a specific location. • Reading: The device is reading data from the tape to the device buffer. • Writing: The device is writing data to the tape from the device buffer. • Erasing: The device is logically erasing data from the tape. • Rewinding: The device is rewinding the tape to the beginning of the logical volume. • Unloading: The cartridge is being removed from the drive. • Automatic Cartridge Facility Disabled: The ACF cannot perform an operation; for example, the magazine is not installed or the magazine was filled and the last imported cartridge was returned to the priority cell. • Blank Field: The ACF is inactive and the drive is not loaded.
4 Messages and **5** Supplemental Messages **(SCSI only attached)**	*Messages* include: **PORT 0 ADDR=n ONLINE** or **OFFLINE** **PORT 1 ADDR=n ONLINE** or **OFFLINE** (‘**n**’ can be in the range 0–F.) For SCSI port 0 or 1 (**PORT 0** or **PORT 1**), the last assigned SCSI address (**ADDR=n**) is listed with each port’s online or offline status (**ONLINE** or **OFFLINE**). This area is a dual-use area that can be used for prompts and messages. *Supplemental messages* appear in the two-line message area of the screens. These messages include general information, user feedback for control actions, and attention messages. For example, **DIAGS** **RUNNING** appears under **5** when the drive is running the internal diagnostics, and if the drive is loading the microcode, **LOADING** **CODE** appears in this area. If **MTM** (media test mode) appears, call your next level of support.

Table 5-2. Options and Status (continued)

Area	Description

4 Messages and **5** Supplemental Message **(Fibre Channel only)**	*Messages* include:
	PORT0 ID=02 14 26 (for example)
	PORT1 ID:aa bb cd ('**a, b, c and d**' can be in the range 0–f.)
	= Indicates a Hard Address is being used.
	: Indicates a Soft Address is being used.
	• Portn ID=/:aa bb cd
	`Port0 ID:aa bb cd`
	`Port1 ID=aa bb cd`
	`- where -`
	`aa = Fibre Domain Address or Switch ID (on some switches)`
	`bb = Fibre Area Address or Switch Port (on some switches)`
	`cd = Arbitrated Loop Physical Address or AL_PA`
	• No connection (No light seen by drive).
	`Port0 ID:-- -- -- (Soft)`
	`Port1 ID=-- -- cd (Hard)`
	• Not communicating or did not establish a connection — but does indicate the drive is seeing light.
	`Port0 ID:?? ?? ?? (Soft)`
	`Port1 ID=?? ?? cd (Hard)`
	• AL_PA is being used by another device on the fibre loop.
	`Port 0 ID=cd CONFLICT.`
	Note: This condition can be initiated by another device on the loop or via offline menu. The panel can be used to return the device online if it was bypassed by another device on the loop.
	• Drive AL_PA is bypassed on the loop.
	`Port 0 ID=cd OFFLINE.`
	Supplemental messages appear in the two-line message area of the screens. These messages include general information, user feedback for control actions, and attention messages. For example, **DIAGS** **RUNNING** appears under **5** when the drive is running the internal diagnostics, and if the drive is loading the microcode, **LOADING** **CODE** appears in this area.

6 Tape Position Indicator	A graphic representation of the position of the tape for processing a cartridge or rewinding a cartridge. See "Tape Position Indicator" on page 5-9.
7 Status Icons	Displays different icons that represent the status of the device. See "File Protected Icons" on page 5-9 and "Dump Icon" on page 5-9.
8 Cursor (►)	A symbol that moves when the operator presses the up or down arrow. The item that is beside the cursor is chosen when the operator presses **ENTER**.
9 Up Arrow (▲)	A symbol displayed when the operator has menu choices above the viewing area.
10 Option	When the operator presses **ENTER**, the item by the ► (cursor) is chosen. If an item is dotted, such as UNLOAD DRIVE in a lighter font, the drive is not available for use. If the operator presses **ENTER**, the item is highlighted temporarily and is not activated.
11 Down Arrow (▼)	A symbol displayed when the operator has menu choices below the viewing area.

Indicators and Icons

This section describes the indicators on the 3590.

Processor Check Indicator

This LED indicator is set if the microcode is not following its normal sequence. All activity is stopped; all data not yet committed to media is lost. The Processor Check indicator is located on the operator/CE panel and is labeled by a symbol that looks like a wrench.

File Protected Icons

The file-protected icons are displayed in the status icons area of the operator/CE panel (see Figure 5-2 on page 5-6).

The file-protected icon (physical) is a *read only* symbol that is displayed when the thumbwheel on the cartridge is set to the file-protected position.

The file-protected icon (logical) is a *read only* symbol that is displayed when the 3590 receives the Mode Select command from a host program that sets the volume to a logically write-protected state. Both **W**rite **O**nce **R**ead **M**any (WORM) and Persistent Write Protect status leaves a volume logically write-protected on subsequent loads. Persistent Write Protection can be turned OFF with a subsequent Mode Select while write-once, read many (WORM) cannot be turned OFF. Associated Write Protection persists only while a logical volume is loaded or until a Mode Select changes the protection status. Associated Write Protection status is lost when a volume is unloaded or the device is powered OFF. File protection is temporarily inactive (and the icon reverts to file-unprotected) during volume loading and unloading when the device updates the volume control region (VCR) on the tape.

The file-unprotected icon is a *read/write* symbol that is displayed when the thumb wheel on the cartridge is set to the not file-protected position.

Tape Position Indicator

The tape-position indicator provides the operator with a graphical representation of the position of the device relative to the beginning and end-of-volume (if processing) or the beginning and end-of-tape (if rewinding).

Dump Icon

The dump icon is located in the status area of the operator/CE panel (see Figure 5-2 on page 5-6).

The *dump* icon appears when the dump is available, and remains on the screen to indicate that trace data is stored in the 3590. The icon remains on the screen until the 3590 power is turned OFF, a dump is taken over a SCSI port, or the dump is written to a tape.

Attention: The dump is lost if you press the Reset pushbutton or switch OFF power to the drive.

Clean Icon

A *clean* icon is located in the status area of the operator/CE panel (see Figure 5-2 on page 5-6).

The clean icon appears when cartridge cleaning is required. It displays in the same position as the dump icon and is overlaid by the dump icon until the **CLEAN** *message* displays.

This icon alerts the operator that a cleaning operation is requested.

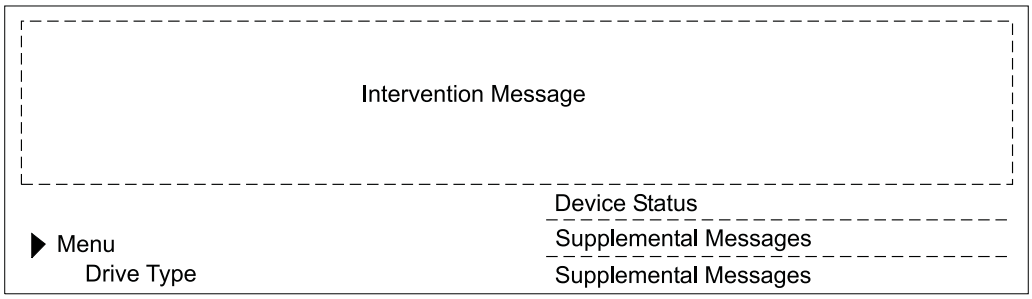
Drive Type Icon

The Drive Type Icon appears in the upper right or lower left part of the display.

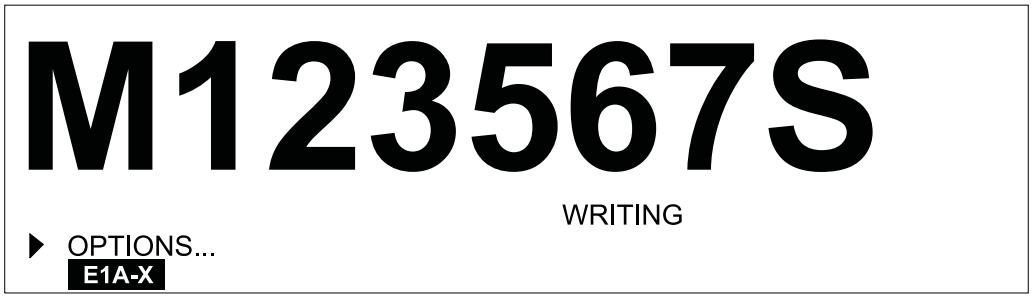
See Table 5-1 on page 5-6 for the drive type indicators.

Intervention Messages

Intervention messages are presented on the operator/CE panel in the intervention screen. The intervention screen consists of an eight-character intervention message displayed in a large font, a prompt indicating that the Options menu can be accessed by pressing Enter, device status information, and a two-line message area in the standard font. Figure 5-3 shows the intervention screen followed by an example of a **Mount** command that prompts the operator to mount a tape with the volume serial (volser) **123567**. In this example, M means *mount* and S means *scratch* The _*_____ message indicates an operator mounted a tape and the job was either cancelled or abended. The Host Software wrote the message as space, asterisk, space, space, space, space, space, space to the panel.



Example:



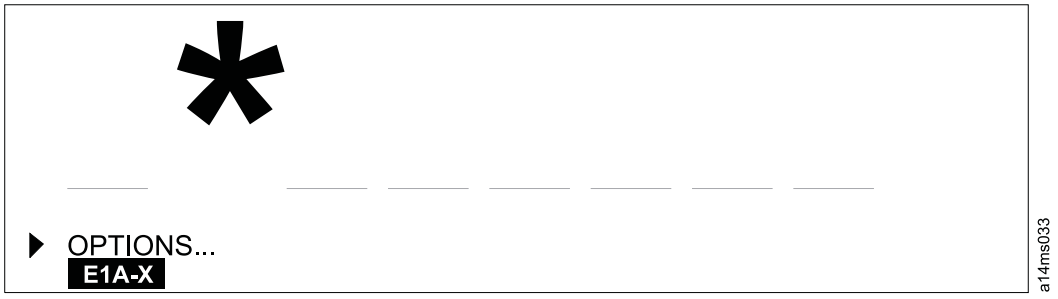


Figure 5-3. Intervention Screen, Mount Screen, and Abend Screen

Notes:

1. If the Enter key is pressed, the messages are removed from the screen. When a FID message is displayed and the Enter key is pressed, the FID message will be removed from the screen and deleted.

2. Intervention messages are one-part or two-part messages. Two-part messages consist of two 8-character message parts that alternate. The message types are FID1 messages, attention messages, routine messages, FID2 messages, FID3 messages, and FID4 messages.

A brief description of each message follows:

- FID1 Messages

  A FID1 message is generated by the device when a hardware failure occurs within the device. This message has priority over all other types of messages, and persists until the error condition is corrected. The FID code is used by maintenance personnel to identify the failing units within the device. (FID messages may be temporarily overwritten by menu selections.) Messages are in a bold font.

  The format of these messages is 'FID1 xy', where 'FID1' indicates to the operator that a failure occurred, and 'xy' is the portion of the device to replace. Figure 5-4 shows an example of FID1 C6, which indicates the machine reel motor has a fault.

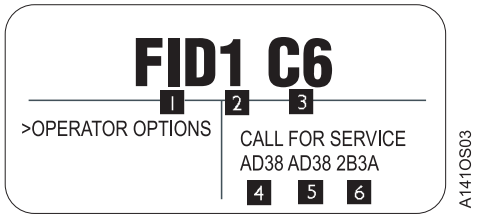


Figure 5-4. Error Message Example

  When the FRU identifier (FID) **1** and the severity code **2** is presented, the CE uses the FID number **3** to enter the START section. See "Service and Media Information Messages (SIMs and MIMs)" on page 4-2 for a description of the severity codes. The message area **4**, **5**, and **6** hex data is support information to help determine if the fault is caused by microcode. **4** represents the first FSC that caused the FID. **5** represents either the last FSC or the flag data. The first character in **6** represents part of the model number (1 = ACF present, 2 = no ACF); the last three characters represent the microcode link. A corresponding SIM is transmitted to the initiator.

- Attention Messages

  Attention (ATTN) messages indicate error conditions that customer personnel may be able to resolve. For example, the ATTN ACF message with a supplemental message of **Lock Magazine** can be corrected by the operator.

- Routine Messages

  Routine Messages consist of messages received from the host through the SCSI Display Message command (for example, **Mount**), and messages from the device (for example, ***CLEAN**).

  To generate the Clean message, the device monitors the number of megabytes processed and the number of nonpermanent errors for each drive. When either of these factors reaches a threshold, the device displays a Clean message. The clean message is maintained across device power-on reset conditions.

  The routine messages that are received through the Display Message command consist of mount messages, demount messages, and general (custom) messages.

  The routine messages usually refer to the priority cell. Actions that are automatically handled by the ACF usually occur without the display of an operator message. These messages can be generated by the initiator; however, if the device microcode detects that the ACF will automatically perform the action requested, any corresponding message is suppressed.

- FID2 Messages **2**

  A FID2 message indicates that the drive is in a degraded state. For example, FID2 E4 could indicate that one SCSI port has a fault. The drive can still be used, but is in a less available state.

- FID3 Messages **2**

  A FID3 message indicates that the drive is in a degraded state. The drive can still be used, but is in a more available state than for a FID2 type of fault.

- FID4 Messages **2**

  A FID4 message indicates that some service circuitry failed. For example, FID4 E4 could indicate that a parity-check circuit failed.

3590 Intervention Messages

Table 5-3 describes messages that may be displayed for the 3590.

Table 5-3. Intervention Messages

Message	Message Meaning
	FID 1 Messages
FID 1	These messages indicate device errors that require CE action. The device cannot perform any tasks. Go to the START section with the FID number.
	ATTN Messages
Attention	These messages indicate error conditions that operators can resolve, such as *Lock magazine*.
	Routine Messages
M*volser*	The **M** prompts the operator to mount **volser** in the priority cell.
***CLEAN**	This message prefixed with an asterisk (*) prompts the operator to put a cleaning cartridge in the priority cell. If the text **CLEAN_REQUIRED** is also present, a cleaning cartridge must be loaded before any other drive operations can be performed.
D*volser*	The **D** prompts the operator to remove **volser** from the priority cell.
	FID 2 Messages
FID 2	These messages report a degraded device condition. Go to the START section with the FID number.
	FID 3 Messages
FID 3	These messages report a degraded device condition. Go to the START section with the FID number.
	FID 4 Messages
FID 4	These messages report a service circuitry failure. Go to the START section with the FID number.
Note: The following are informational messages, not intervention conditions.	
	Device activity or status messages
Device activity	These messages are displayed in the supplemental message area. These messages include *reading, writing,* and *locating*.

Operator/CE Panel Menus

The operator/CE panel allows information to be passed from the device to the operator and back to the device. The operator and CE can be presented menu-driven options for device operation. Examples include the display of SCSI port addresses and operator panel languages.

The remainder of this chapter is divided in the following manner:

1. “Operator and CE Panel Flow Charts” on page 5-15
2. “Operator Menus” on page 5-22 (available to operator and CE)
3. “CE Online Mode Panel Menus” on page 5-34 (available only to CE)
4. “CE Offline Mode Menu” on page 5-38 (available only to CE)

Note: The CE-only menus are accessed by pressing the hidden pushbutton Change Mode . Press the Change Mode pushbutton while in CE mode to return the operator/CE panel to operator menus.

Options that are unavailable are displayed in a lighter, dotted font and cannot be selected. The first example in Figure 5-5 shows the Unload Drive option **1** when there is no cartridge in the device. The option is displayed in a lighter, dotted font, which indicates it cannot be selected. The second example in Figure 5-5 shows the Unload Drive option **2** when there **is** a cartridge in the device. The option is displayed in a darker font, which indicates it can be selected.

```
► START

  UNLOAD DRIVE 1
```

```
► START

  UNLOAD DRIVE 2
```

Figure 5-5. Example of Selection Options

If you move the cursor (►) to **1** and press Enter, the selection responds with the normal font **2** momentarily and then returns to the lighter font. The 3590 will not perform any action.

The following are common terms. They will be used throughout the panel section.

Table Caption	Indicates the Menu Name on the operator panel.
...	Indicates the menu is linked to another menu.

Operator and CE Panel Flow Charts

Figure 5-6 shows the operator panel functions and Figure 5-8 on page 5-17 shows the CE panel functions. Bold text in the figures shows the names of the menus.

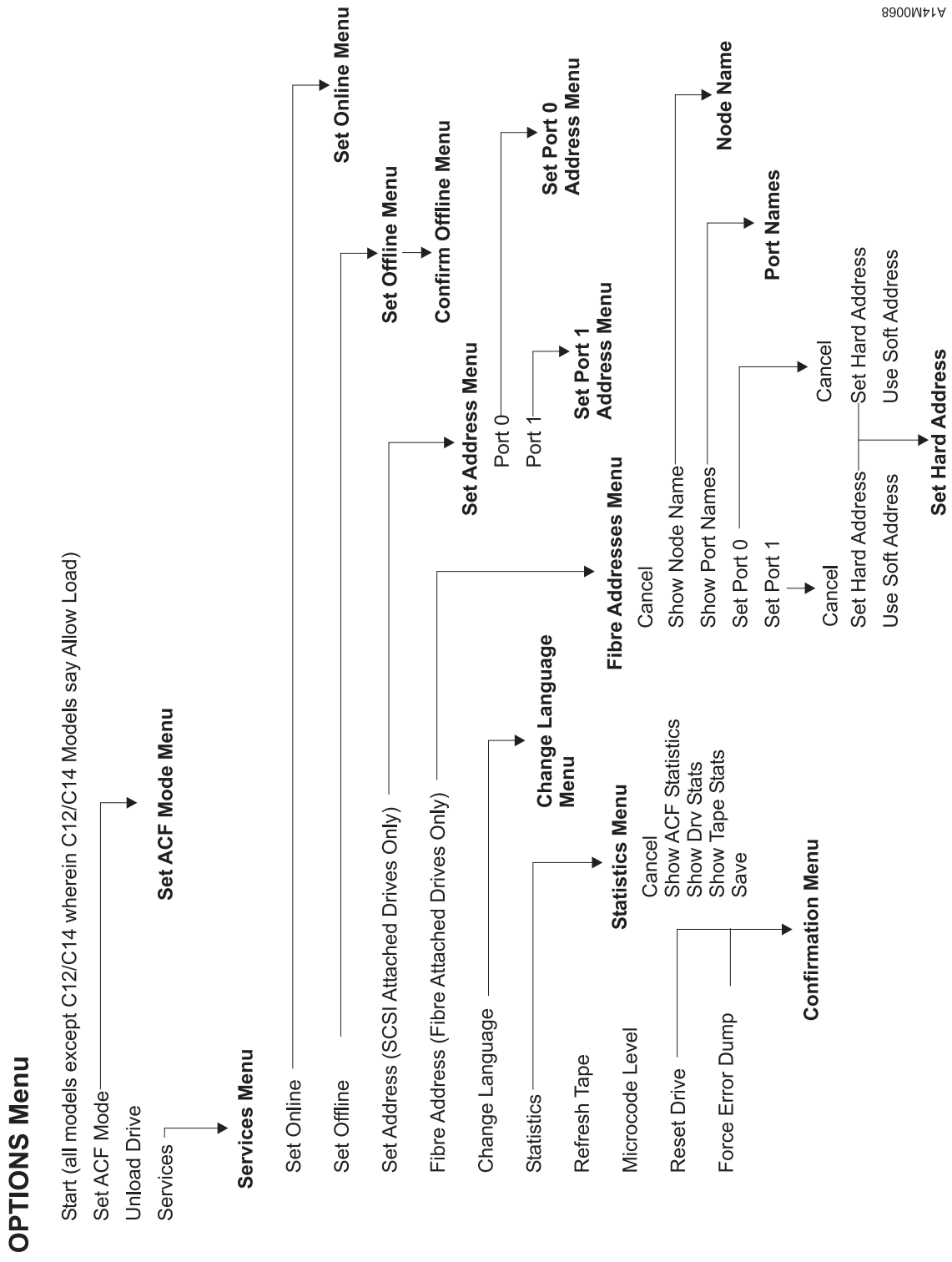


Figure 5-6. Operator Menus

Figure 5-7. Verify Mode Menu

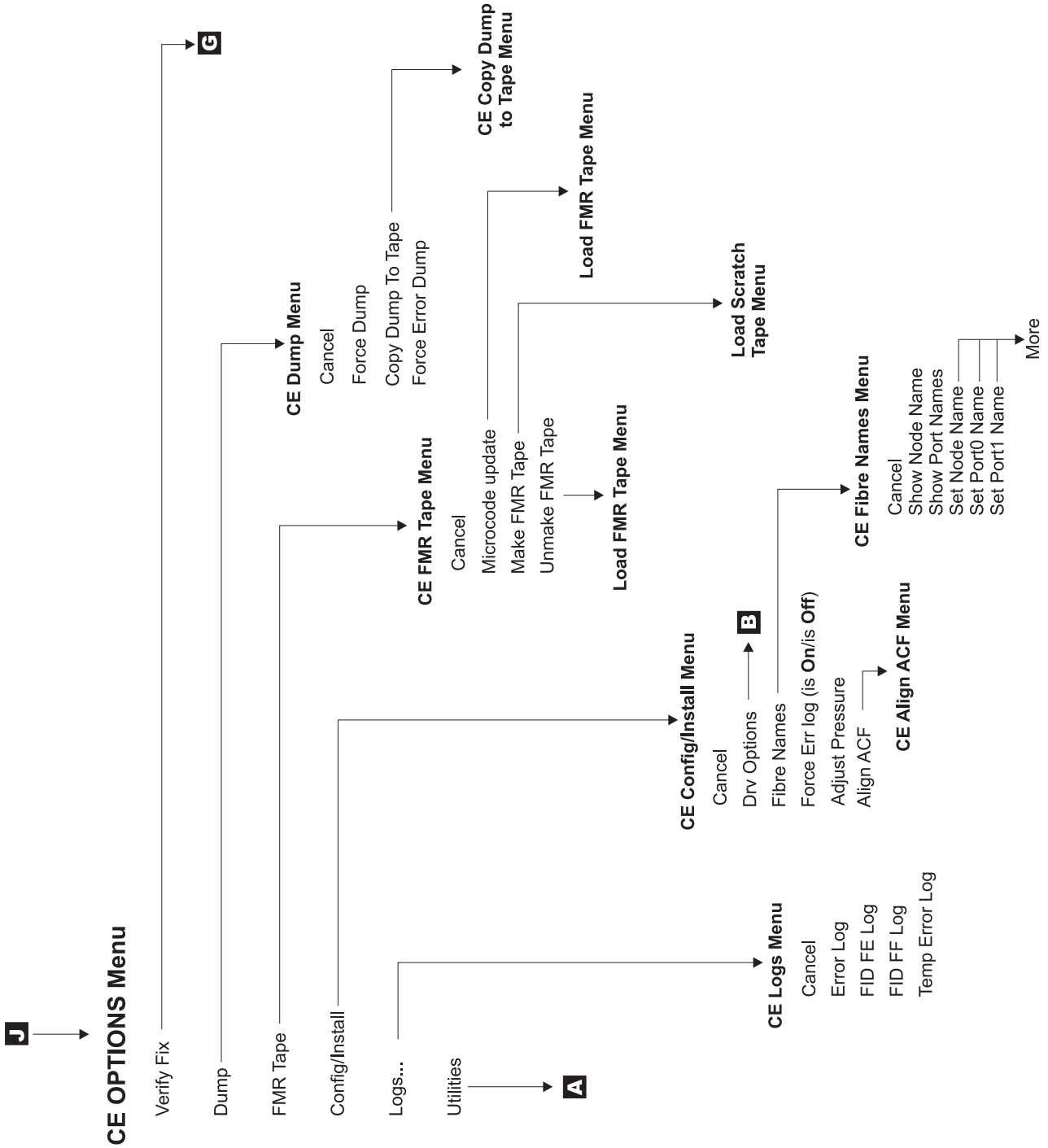
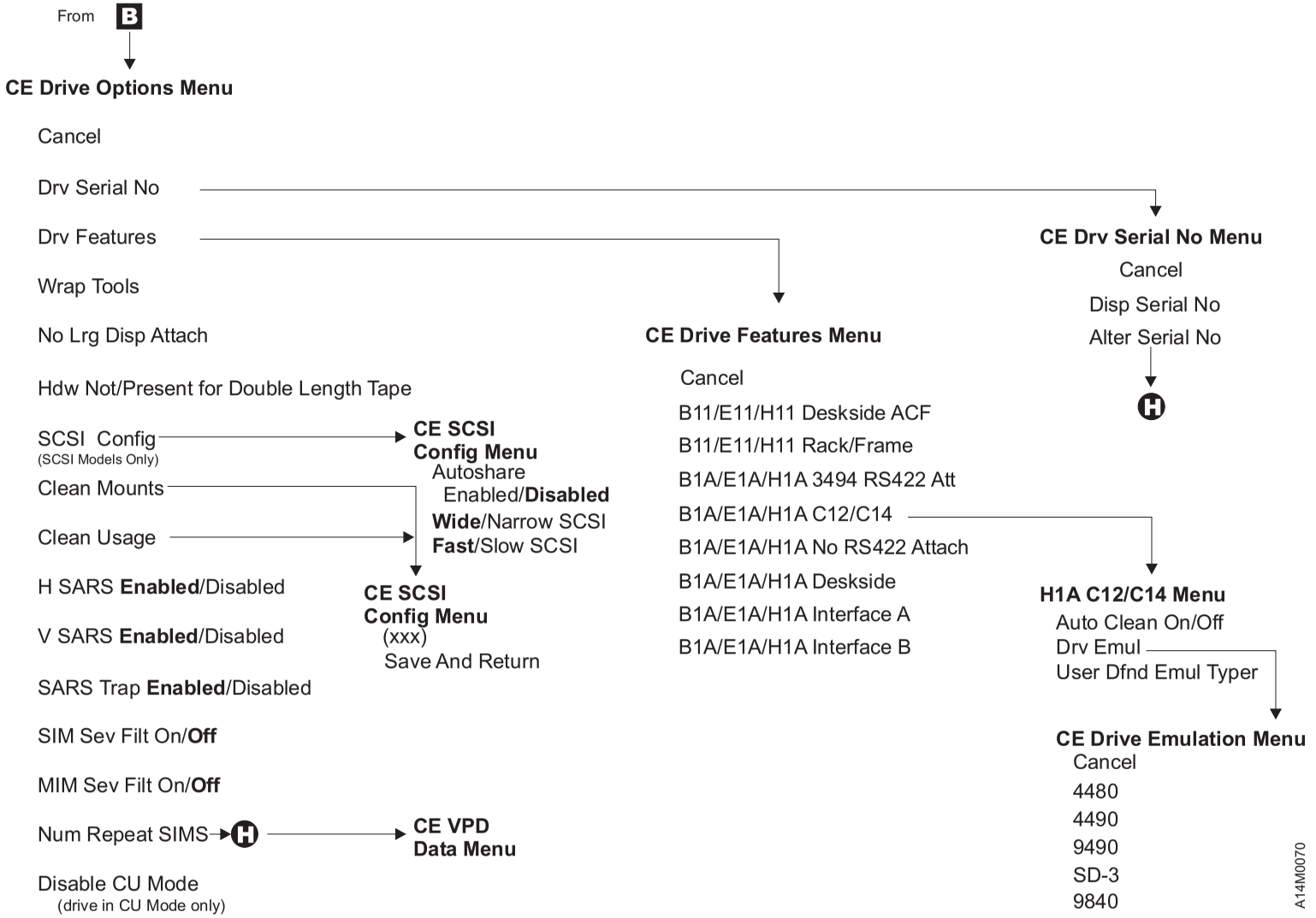


Figure 5-8. CE Panel Menu (Part 1 of 5)

Figure 5-8. CE Panel Menu (Part 2 of 5)

CE OPTIONS Menu (continued)



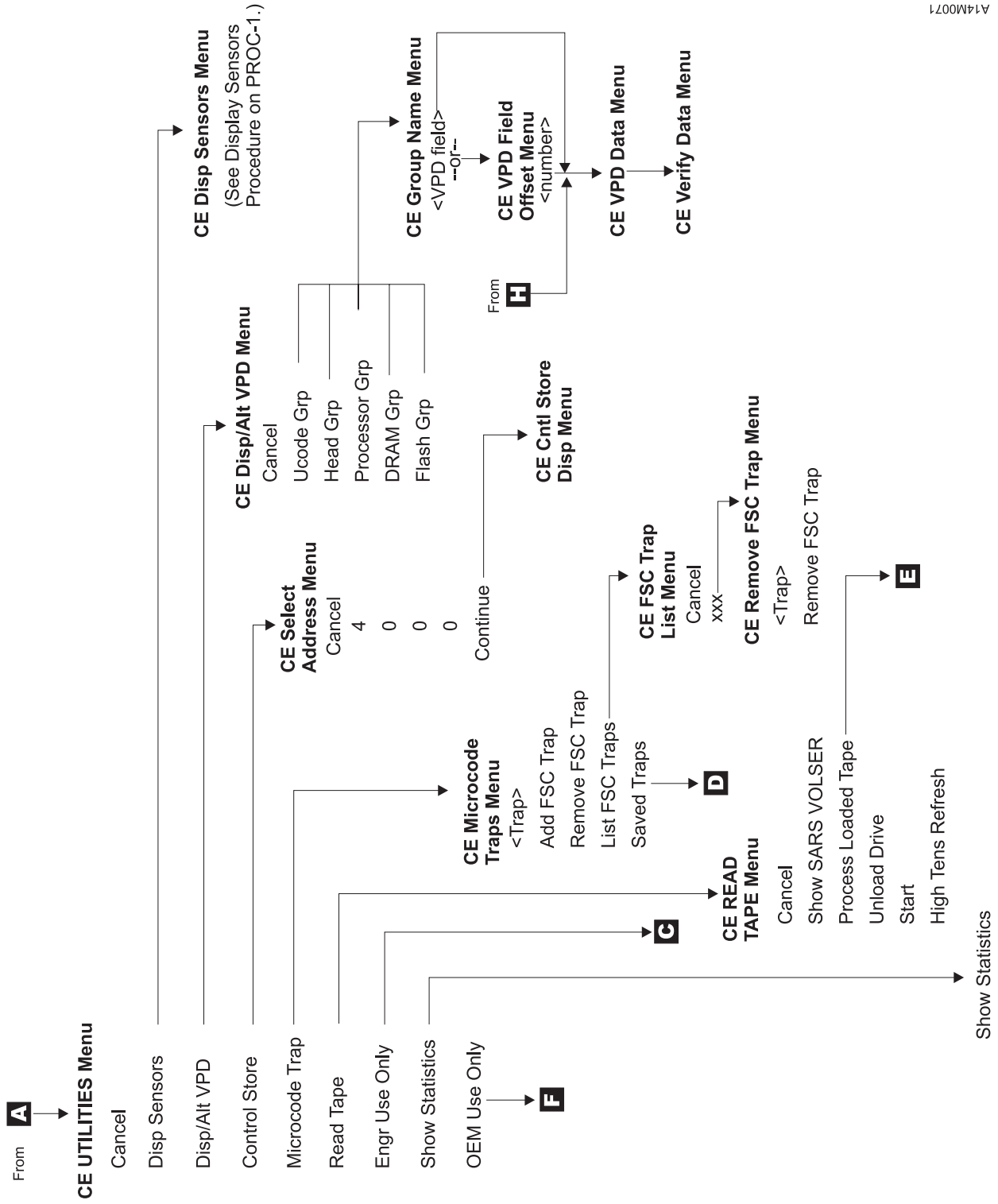


Figure 5-8. CE Panel Menu (Part 3 of 5)

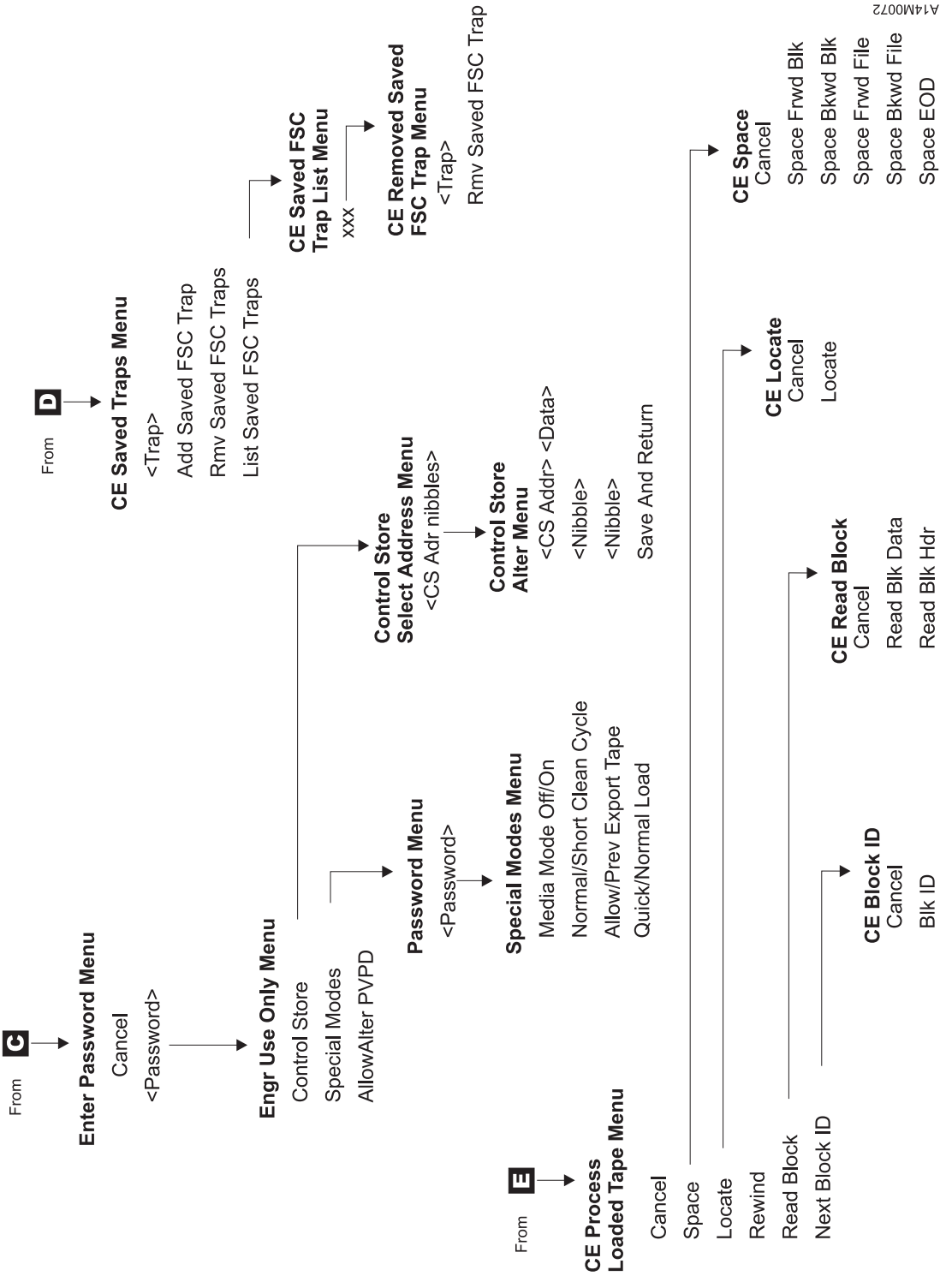


Figure 5-8. CE Panel Menu (Part 4 of 5)

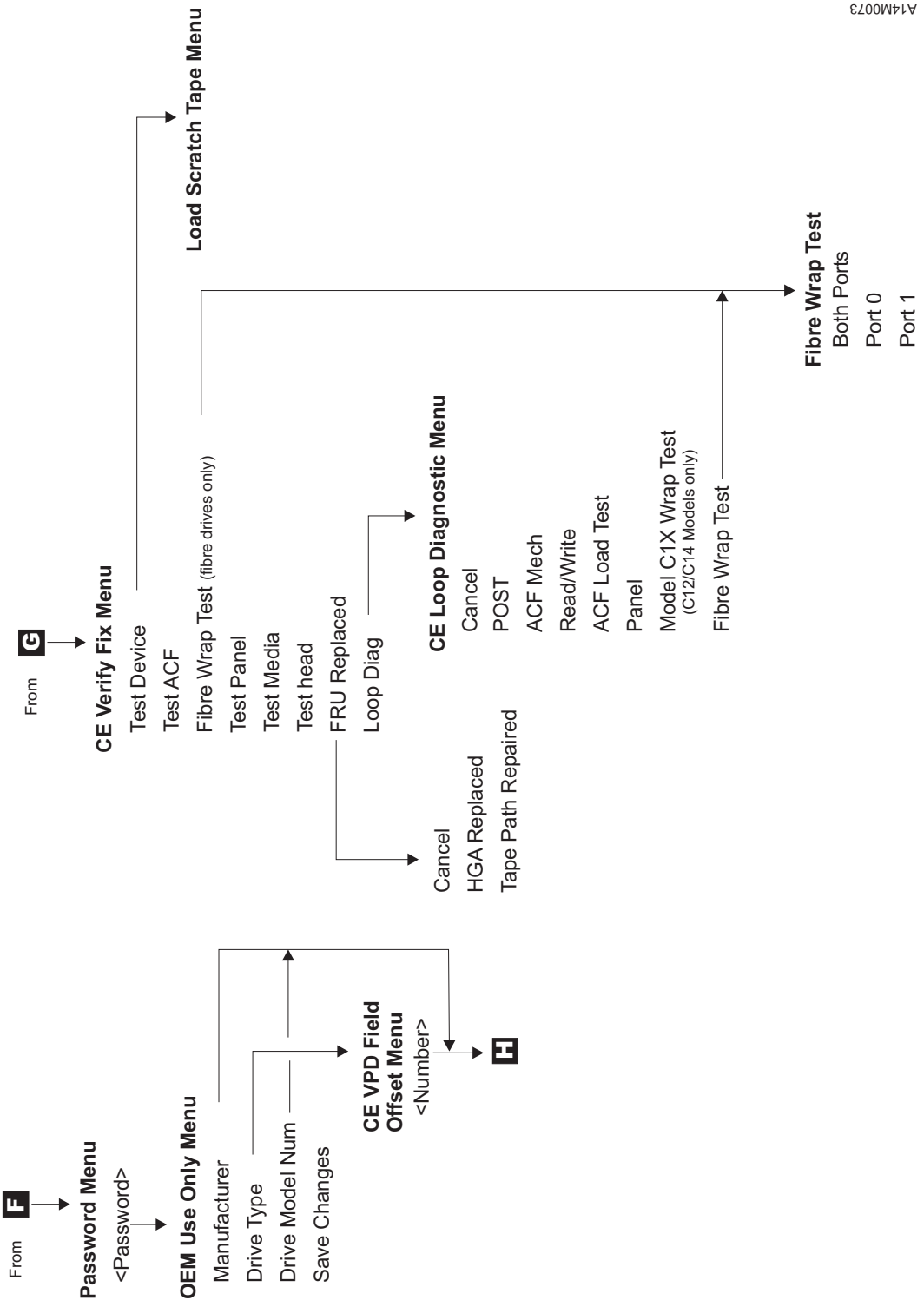


Figure 5-8. CE Panel Menu (Part 5 of 5)

Operator Menus

These menus are available at the successful completion of the power-on self-test (POST).

Options Menu

Table 5-4 shows the Options menu.

Table 5-4. Options Menu

Function	Next Menu
Start/Allow Load (Model C12/C14 only)	—
Set ACF Mode...	“Set ACF Mode Menu” on page 5-23
Unload Drive	—
Services...	“Services Menu” on page 5-23
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Note: If the STL0 card is detected the **Allow Load** is displayed.

Start Start enables the ACF on a Model B11/E11/H11. This function cannot be selected on a Model B1A/E1A/H1A

Allow Load Allow Load allows loading cartridges when the 3590 Model C12/C14 is in manual mode.

Set ACF Mode Sets the ACF mode for Model B11/E11/H11.

Unload Drive Causes the device to rewind and to unload the cartridge in the device.

Services Allows the operator to perform configuration tasks, such as setting the SCSI online and offline.

Set ACF Mode Menu

Table 5-5 shows the Set ACF Mode menu.

Table 5-5. Set ACF Mode Menu

Function	Next Menu
Cancel	“Options Menu” on page 5-22
System	“Options Menu” on page 5-22
Automatic	“Options Menu” on page 5-22
Manual	“Options Menu” on page 5-22
Accumulate	“Options Menu” on page 5-22
Random (Model B11 only)	“Options Menu” on page 5-22
Random 2-LUN	“Options Menu” on page 5-22
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the “Options Menu” on page 5-22 to appear.

System Places cartridge feeding under system control.

Automatic Takes the cartridges that are loaded in the import position of the magazine and automatically feeds one cartridge after another until the entire magazine is processed.

Manual Feeds a cartridge into the drive.

Accumulate Takes the cartridge from the priority cell and places it in the drive. It unloads cartridges from the drive to the magazine.

Random Places all the cartridges in the *import* position. The magazine must be locked. This option is available on the Model B11 only.

Random 2-LUN Places the ACF in Random mode, as described above, and adds an extra SCSI Logical Unit (LUN) to control the ACF. See the host software instructions for attaching to 3590 or a SCSI Medium Changer. This option is available on the Model B11/E11/H11.

See Chapter 6, “Automatic Cartridge Facility” on page 6-1 for a description of the modes and positions.

Services Menu

Table 5-6 shows the Services menu.

Table 5-6. Services Menu

Function	Next Menu
Cancel	“Options Menu” on page 5-22
Set Online...	“Set Online Menu” on page 5-25
Set Offline...	“Set Offline Menu” on page 5-25
Set Address...	(SCSI) “Set Address Menu (SCSI)” on page 5-26
Fibre Address...	(Fibre) “Fibre Addresses Menu” on page 5-28
Change Language...	“Change Language Menu” on page 5-31
Statistics...	“Statistics Menu” on page 5-31
Refresh Tape...	
Microcode Level	Figure 5-9 on page 5-24 then after selection, to “Services Menu”
Reset Drive	Figure 5-10 on page 5-24 then after selection, to “Services Menu”
Force Error Dump	Figure 5-10 on page 5-24 then after selection, to “Services Menu”
Note: Supplemental Message Lines: <none>	

Cancel Causes the “Options Menu” on page 5-22 to appear.

Set Online Logically enables the device to communicate on the SCSI bus. Activate Set Online at the device first, then have the host place the device online (vary online).

Set Offline Logically disables the device from the SCSI bus. Select Set Offline only after the host has taken the device offline (vary offline) first.

Set Address **SCSI** Provides the two SCSI addresses to be selected; one address associated with each device interface. Each address consists of one hexadecimal digit that specifies the SCSI address for that interface. After the address is set, modify the host information to include the correct addresses.

Fibre Address **Fibre** Provides the two Fibre addresses to be selected; one address associated with each device port. Each address consists of two hexadecimal digits that specifies the Fibre Port address for that interface. After the address is set, modify the host information to include the correct addresses. See “Fibre Channel World Wide Name History Log” on page 9-63.

Change Language Allows the operator to select the operator panel language.

Statistics Displays the number of times certain events occurred.

Microcode Level Displays the microcode EC level that is in DRAM. Figure 5-9 shows an example.

```
MICROCODE LEVEL
►CANCEL
 EC      aaaaaaa
 LINK   bbcd_ddd
```

Figure 5-9. Microcode Level Menu

Legend
```
aaaaaaa = Engineering change level
bb      = Productg identifier
c       = Link identifier
d_ddd   = Link number
```

Reset Drive Aborts the operation and causes the drive code to restart. If dump data is in the drive, it is not lost.

Note: Current operation (for example Locate) will be completed before **Reset Drive** executes. This may cause a delay before **Reset Drive** is executed.

Force Error Dump Aborts the operation, causes a recovery of the functional code, and forces a microcode dump. After getting the dump, select **Reset Drive**. This selection is normally used because of specific requests from support personnel.

Choosing **Reset Drive** or **Force Error Dump** causes the menu shown in Figure 5-10 to appear.

```
ARE YOU SURE?          |
►CANCEL                |
 PROCEED               |  Will abort jobs
```

Figure 5-10. Confirmation Menu

Cancel Causes the microcode to ignore the selection and causes the Services menu to appear.

Proceed Causes the microcode to perform the operation chosen (Reset Drive or Force Error Dump) from the Services menu.

Set Online Menu

Table 5-7 shows the Set Online menu.

Table 5-7. Set Online Menu

Function	Next Menu
Cancel	“Services Menu” on page 5-23
Port 0	“Options Menu” on page 5-22
Port 1	“Options Menu” on page 5-22
Both	“Options Menu” on page 5-22
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the “Services Menu” on page 5-23 to appear.
Port 0 Causes SCSI port 0 to be set online.
Port 1 Causes SCSI port 1 to be set online.
Both Causes both SCSI port 0 and port 1 to be set online.

Note: The host must also vary the device online.

Set Offline Menu

Table 5-8 shows the Set Offline menu.

Table 5-8. Set Offline Menu

Function	Next Menu
Cancel	“Services Menu” on page 5-23
Port 0	“Confirm Offline Menu” on page 5-26 or “Options Menu” on page 5-22
Port 1	“Confirm Offline Menu” on page 5-26 or “Options Menu” on page 5-22
Both	“Confirm Offline Menu” on page 5-26
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the “Services Menu” on page 5-23 to appear.
Port 0 Causes SCSI port 0 to be set offline.
Port 1 Causes SCSI port 1 to be set offline.
Both Causes both SCSI port 0 and port 1 to be set offline.

Notes:

1. The device should be acquiesced by the host (vary the device offline) before taking the device offline or before powering OFF the device.
2. If the device interface successfully goes offline, the “Options Menu” on page 5-22 appears, otherwise the operator can proceed to “Confirm Offline Menu” on page 5-26 for further options.
3. The device must complete all activity currently on the interface before it can go offline. If the device or the initiator cannot complete activity before going offline, “Confirm Offline Menu” on page 5-26 is displayed to allow the operator an override and force the ports offline.

Confirm Offline Menu

Table 5-9 shows the Confirm Offline menu.

Table 5-9. Confirm Offline Menu

Function	Next Menu
Cancel	“Set Offline Menu” on page 5-25
Proceed	“Options Menu” on page 5-22
Notes: 1. Supplemental Message Line 1: **Caution: Data loss** 2. Supplemental Message Line 2: **risk**	

Cancel Cancels the offline request and causes the “Set Offline Menu” on page 5-25 to appear.

Proceed Forces the ports offline. If write activity exists, any write data in the device is lost. The Proceed option causes the job to terminate.

Notes:

1. The device should be acquiesced by the host (vary the device offline) before taking the device offline or before powering OFF the device.
2. If the device interface successfully goes offline, the “Options Menu” on page 5-22 appears, otherwise the operator can proceed to “Confirm Offline Menu” for further options.
3. The device must complete all activity currently on the interface before it can go offline. If the device or the initiator cannot complete activity before going offline, “Confirm Offline Menu” is displayed to allow the operator an override and force the ports offline.

Set Address Menu (SCSI)

Table 5-10 shows the Set Address menu.

Table 5-10. Set Address Menu

Function	Next Menu
Cancel	“Services Menu” on page 5-23
Port 0...	“Set Port 0 Address Menu (SCSI)” on page 5-27
Port 1...	“Set Port 1 Address Menu (SCSI)” on page 5-27
Notes: 1. Supplemental Message Line 1: **Change made after** 2. Supplemental Message Line 2: **unload and reset**	

Cancel Causes the “Services Menu” on page 5-23 to appear.

Port 0 Causes the “Set Port 0 Address Menu (SCSI)” on page 5-27 to appear.

Port 1 Causes the “Set Port 1 Address Menu (SCSI)” on page 5-27 to appear.

Note: The address must be defined at the host also.

Set Port 0 Address Menu (SCSI)

Table 5-11 shows the Set Port 0 Address menu.

Table 5-11. Set Port 0 Address Menu

Function	Next Menu
Cancel	“Set Address Menu (SCSI)” on page 5-26
0	“Options Menu” on page 5-22
1	“Options Menu” on page 5-22
...	“Options Menu” on page 5-22
F	“Options Menu” on page 5-22

Notes:
1. Supplemental Message Line 1: **Change made after**
2. Supplemental Message Line 2: **next power on**

Cancel Causes the “Set Address Menu (SCSI)” on page 5-26 to appear.

<value> Allows the operator to set the address of SCSI port 0. The value can be from 0–15 (16 addresses). See “Set Customer Options” on page 8-35 for SCSI Address restrictions.

Note: You must select Reset Drive from the Services menu, press the Reset pushbutton, or power cycle the device to activate the new address.

Set Port 1 Address Menu (SCSI)

Table 5-12 shows the Set Port 1 Address menu.

Table 5-12. Set Port 1 Address Menu

Function	Next Menu
Cancel	“Set Address Menu (SCSI)” on page 5-26
0	“Options Menu” on page 5-22
1	“Options Menu” on page 5-22
...	“Options Menu” on page 5-22
F	“Options Menu” on page 5-22

Notes:
1. Supplemental Message Line 1: **Change made after**
2. Supplemental Message Line 2: **next power on**

Cancel Causes the “Set Address Menu (SCSI)” on page 5-26 to appear.

<value> Allows the operator to set the address of SCSI port 1. The value can be from 0–15 (16 addresses). See “Set Customer Options” on page 8-35 for SCSI Address restrictions.

Note: You must select Reset Drive from the Services menu, press the Reset pushbutton, or power cycle the device to activate the new address.

Fibre Addresses Menu

Table 5-13 shows the Fibre Addresses menu.

Table 5-13. Fibre Addresses Menu

Function	Next Menu
Cancel	“Services Menu” on page 5-23
Show Node Name...	“Show Node Name Menu”
Show Port Names...	“Show Port Names Menu” on page 5-29
Set Port 0...	“Set Port 0 Address Menu (Fibre)” on page 5-29
Set Port 1...	“Set Port 1 Address Menu (Fibre)” on page 5-30
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Cancel Causes the “Services Menu” on page 5-23 to appear.
Show Node Name Displays the Node Name assigned to the drive.
Show Port Names Displays the Port Names for both Port 0 and Port 1
Set Port 0 Causes the “Set Port 0 Address Menu (Fibre)” on page 5-29 to appear.
Set Port 1 Causes the “Set Port 1 Address Menu (Fibre)” on page 5-30 to appear.

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Show Node Name Menu

Table 5-14 shows the Node Name menu.

Table 5-14. Show Node Name Menu

Function	Next Menu
Cancel	“Fibre Addresses Menu”
Node Name 0123456789abcdef	“Fibre Addresses Menu”
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Cancel Causes the “Fibre Addresses Menu” to appear.
Node Name Displays the 16 byte Node Name assigned to the drive.

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Show Port Names Menu

Table 5-15 shows the Port Names menu.

Table 5-15. Show Port Names Menu

Function	Next Menu
Cancel	“Fibre Addresses Menu” on page 5-28
Port 0 Name 0123456789abcdef	“Fibre Addresses Menu” on page 5-28
Port 1 Name 0123456789abcdef	“Fibre Addresses Menu” on page 5-28
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Cancel Causes the “Fibre Addresses Menu” on page 5-28 to appear.
Port 0 Name Displays the 16 byte Port Name assigned to the Port.
Port 1 Name Displays the 16 byte Port Name assigned to the Port.

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Set Port 0 Address Menu (Fibre)

Table 5-16 shows the Set Port 0 Address menu.

Table 5-16. Set Port 0 Address Menu

Function	Next Menu
Cancel	“Fibre Addresses Menu” on page 5-28
Set Hard Addr...	“Set Hard Address Menu” on page 5-30
Use Soft Address	“Use Soft Address Menu” on page 5-31
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Cancel Causes the “Fibre Addresses Menu” on page 5-28 to appear.
Set Hard Addr... Takes you to the Set Hard Address menu. Selecting the hard address option allows selection of the Arbitrated Loop Physical Address (AL_PA). The higher the number, the lower the priority.
Use Soft Addr... Allows the port to use the system default value. The soft address feature allows the drive to arbitrate the AL_PA number with other fibre devices.

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Set Port 1 Address Menu (Fibre)

Table 5-17 shows the Set Port 1 Address menu.

Table 5-17. Set Port 1 Address Menu

Function	Next Menu
Cancel	“Fibre Addresses Menu” on page 5-28
Set Hard Addr...	“Set Hard Address Menu”
Use Soft Address	“CE Fibre Names Menu” on page 5-56

Notes:
1. Supplemental Message Line 1: **Port0 ID=aa bb cd**
2. Supplemental Message Line 2: **Port1 ID=aa bb cd**

Cancel Causes the “Fibre Addresses Menu” on page 5-28 to appear.

Set Hard Addr... Takes you to the Set Hard Address menu. Selecting the hard address option allows selection of the Arbitrated Loop Physical Address (AL_PA). The higher the number, the lower the priority.

Use Soft Addr... Allows the port to use the system default value. The soft address feature allows the drive to arbitrate the AL_PA number with other fibre devices.

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Set Hard Address Menu

Table 5-18 shows the Set Hard Address menu

Table 5-18. Set Hard Address Menu

Function	Next Menu
CANCEL	“Fibre Addresses Menu” on page 5-28
c	—
d	—
SAVE DATA	“Fibre Addresses Menu” on page 5-28

Notes:
1. Supplemental Message Line 1: <PORT n:cd>
   - n = the port number. (0 or 1)
   - cd = the last AL_PA value saved.
2. Supplemental Message Line 2: <ll — Valid Addr/Invalid — hh >
   - ll = the next lower valid address.
   - Valid Addr/Invalid = indicates the **cd** address is valid or invalid.
   - hh = the next higher valid AL_PA.

Cancel Causes the “Fibre Addresses Menu” on page 5-28 to appear.

c Causes the high order number (c) to increment. This hexadecimal number wraps from F to 0.

d Causes the low order number (d) to increment. This hexadecimal number wraps from F to 0.

Save Data Causes the port addresses to be saved and then return to “Fibre Addresses Menu” on page 5-28.

This menu allows selection of the AL_PA for the port. As the ″c″ and ″d″ options are incremented, the supplemental message lines indicate whether the new value is valid or not. The lines also indicate the next higher and lower valid addresses. Select only a valid address for the AL_PA. If the drive can not configure (LIP) with this AL_PA try a different one.

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Use Soft Address Menu

Table 5-19 shows the Save Data menu

Table 5-19. Use Soft Address Menu

Function	Next Menu
Continue...	"Fibre Addresses Menu" on page 5-28
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Continue The action was successful and operation complete. The "Fibre Addresses Menu" on page 5-28 will appear.

Note: Refer to "Messages and Supplemental Messages (Fibre Channel Only)" in Table 5-2 on page 5-7 for additional fibre addressing information.

Change Language Menu

Table 5-20 shows the Change Language menu.

Table 5-20. Change Language Menu

Function	Next Menu
Cancel	"Services Menu" on page 5-23
English	"Options Menu" on page 5-22
Spanish	"Options Menu" on page 5-22
German	"Options Menu" on page 5-22
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "Services Menu" on page 5-23 to appear.
<language> Allows the operator to select the operator panel language.

Note: The languages supported are **English**, **German**, and **Spanish**.

The **CE menus** only display in **English**.

Statistics Menu

Table 5-21 shows the Statistics menu.

Table 5-21. Statistics Menu

Function	Next Menu
Cancel	"Services Menu" on page 5-23
Show Statistics...	"Show Statistics Menu" on page 5-32
Save	"Statistics Menu"
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "Services Menu" on page 5-23 to appear.
Show Statistics Causes "Show Statistics Menu" on page 5-32 to appear.
Save Causes the statistics to be saved in nonvolatile storage.

Note: In later levels of microcode the statistics are displayed in decimal instead of hexadecimal.

Show Statistics Menu

Table 5-22 is an example of the Show Statistics menu.

Table 5-22. Show Statistics Menu

Function	Next Menu
Cancel	“Statistics Menu” on page 5-31
Mounts to Drv	“Show Statistics Menu”
Priority Mnts	“Show Statistics Menu”
Magazine Mnts	“Show Statistics Menu”
Clean Mounts	“Show Statistics Menu”
Pwr On Hrs	“Show Statistics Menu”

Notes:

1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

Cancel Causes the “Statistics Menu” on page 5-31 to appear.

Mounts to Drv Displays the total number of times a cartridge was mounted in the drive.

Priority Mnts Displays the total number of times a cartridge was loaded in the priority cell.

Magazine Mnts Displays the total number of times a cartridge was loaded in any of the cells of the magazine.

Clean Mounts Displays the total number of times a cleaning cartridge was loaded in the device.

Pwr On Hrs Displays the total number of hours the device was powered ON.

Notes:

1. When the card pack is replaced, the Power On Hrs (time stamp) is reset to day = 0000.
2. In later levels of microcode the statistics are displayed in decimal instead of hexadecimal.

Confirm Mode Change Menu

The following menus are accessed by pressing the Change Mode pushbutton.

Table 5-23 shows the Confirm Mode Change menu.

Table 5-23. Confirm Mode Change Menu

Function	Next Menu
Cancel	Previous menu
Operator Mode	"Options Menu" on page 5-22 if no job, or Figure 5-11 if job is in progress.
CE Offline Options	"CE Options Menu" on page 5-38
CE Online Options	"CE Online Mode Options Menu" on page 5-34
Notes: 1. Supplemental Message Line 1: **DATA LOSS RISK** 2. Supplemental Message Line 2: **none**	

When the Change Mode pushbutton is pressed, this menu may be displayed when switching from operator to CE mode or CE to operator mode (dependent on job activity).

Cancel Displays the previous menu that was active before the Change Mode pushbutton is pressed

Operator Mode
Restores the online status of the ports when changing from CE mode to operator mode

CE Offline Options
Forces the ports offline if going to CE mode and no job was in progress. If a job was active at the time, a new menu shown below is displayed:

CE Online Options
Forces the ports to CE Online Mode

```
RESET DRIVE...
 ►CANCEL
  RESET DRIVE...
  FORCE ERROR DUMP...
```

Figure 5-11. Confirm Mode Change-Proceed Menu

The RESET DRIVE option results in job termination.

Attention: The device should be quiesced by the host (vary device offline) before taking the device offline, powering OFF the device, or entering CE mode.

The online status of the ports is restored when changing from CE mode to operator mode.

CE Online Mode Panel Menus

CE Online Mode allows the CE and customer to use the drive concurrently. Only limited operations are allowed. Some panels have partial displays, such as display sensors. The CE operations may interfere with customer operation.

Attention: Any accidental operation of the reset pushbutton will severely impact customer operation.

CE Online Mode Options Menu

The following menus are accessed by pressing the Change Mode pushbutton.

Table 5-24 shows the CE Online Mode Options menu.

Table 5-24. CE Online Options Menu

Function	Next Menu
Logs...	"CE Logs Menu (CE Modes)"
Display Serial No...	"CE DRV Serial No Menu (CE Modes)" on page 5-35
Display Sensors...	"CE Disp Sensors Menu (CE Online Mode)" on page 5-36
Show Statistics...	"Show Statistics Menu (CE Modes)" on page 5-37

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

Logs Allows the CE to view the error logs
Display Serial No Allows the CE to display the serial number in decimal
Display Sensors Allows the CE to display the state of some of the sensors
Show Statistics Allows the CE to display tape and drive statistics and store the status of the device in nonvolatile storage

CE Logs Menu (CE Modes)

Table 5-25 shows data from the CE Logs menu.

Table 5-25. CE Logs Menu Items

Function	Next Menu
Cancel	"CE Options Menu" on page 5-38
Error Log...	"CE Error Log Menu" on page 5-61
FID FE Log...	"CE FID FE Log Menu" on page 5-63
FID FF Log...	"CE FID FF Log Menu" on page 5-64
Temp Error Log...	"CE Temp Error Log Menu" on page 5-65

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE Options Menu" on page 5-38 to appear
Error Log Allows the CE to view the Error Log
FID FE Log Allows the CE to view the FID FE log
FID FF Log Allows the CE to view the FID FF log
Temp Error Log Allows the CE to view the Temp Error log

CE DRV Serial No Menu (CE Modes)

This menu appears in both CE Modes.

Table 5-26. CE DRV Serial No Menu

Function	Next Menu
Cancel	“CE Online Mode Options Menu” on page 5-34
Disp Serial No...	“Display Serial No Menu (CE Modes)”
Alter Serial No...	“Alter Serial No Menu”

Cancel

Cancels the operation and returns to the previous menu

Disp Serial

Causes “Display Serial No Menu (CE Modes)” to appear

Alter Serial

Causes “Alter Serial No Menu” to appear

Display Serial No Menu (CE Modes)

Table 5-27 depicts the Drive Serial Number menu information.

Table 5-27. CE DRV Ser No Menu

Display	Next Menu
Cancel	Table 5-24 on page 5-34
000000010011 (for example)	

Notes:
1. Supplemental Message Line 1: **<none>**
2. Supplemental Message Line 2: **<none>**

Cancel — Causes the CE Online Options menu to return. Menu has the 12 position decimal Drive Serial Number displayed

Alter Serial No Menu

Table 5-28 depicts some CE VPD data.

Table 5-28. CE VPD Data Menu

CE VPD Data	E11FX
► 1 ▲ 0 0 1 1 SAVE AND CONTINUE	Sequence Number

Cancel — Causes the “CE DRV Serial No Menu (CE Modes)” to appear

0123456789ABCDEF — Selecting this option increments the hexadecimal character next to the cursor with the enter key. The number wraps from ‘F’ to 0’.

Save and Continue — Causes “CE Save Data (Serial)” on page 5-36 to appear to confirm the storing of data

CE Save Data (Serial)

Table 5-29 shows the CE Save Data menu.

This menu allows the CE to save or abort the saving of the data previously entered.

Table 5-29. CE Save Data Menu

Function	Next Menu
Cancel	"CE DRV Serial No Menu (CE Modes)" on page 5-35
Yes	"CE DRV Serial No Menu (CE Modes)" on page 5-35
No	"CE DRV Serial No Menu (CE Modes)" on page 5-35

Notes:
1. Supplemental Message Line 1: Sequence Number
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE DRV Serial No Menu (CE Modes)" on page 5-35 to appear. The address is not saved.

Yes Saves the address and returns to "CE DRV Serial No Menu (CE Modes)" on page 5-35.

No Does not save address and returns to "CE DRV Serial No Menu (CE Modes)" on page 5-35.

CE Disp Sensors Menu (CE Online Mode)

Table 5-30 shows the Disp Sensors menu. This menu allows the CE to view the state of the ACF and drive sensors, and to change the states dynamically. A delay of approximately one second is required between sensor state changes.

Table 5-30. CE Disp Sensors Menu

Function	Next Menu
CANCEL	"CE Online Mode Options Menu" on page 5-34
A:1 B:1	Display pantocam A and B sensor states
TU:1 DO:1	Display loader tray up and door open states
CP:1	Display loader cartridge present sensor states **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp, see "FID E4: Card Pack" on page 10-67, item 6 . Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the Drive FRU assembly. See "FID E4: Card Pack" on page 10-67.
FP:0 CT:0000	Display loader file protect sensor; cartridge type sensor states
PS:1 MP:0 ML:0	Model B11/E11/H11 only. Display priority slot, magazine present, and magazine loaded sensor states
GI:0 GCP:1	Model B11/E11/H11 only. Display global interference sensor and global cartridge present sensor states
P1:1 P2:0 IM:0	Model B11/E11/H11 only. Display ACF pinch 1 & 2, import sensor states
L1:1 L2:0 EX:0	Model B11/E11/H11 only. Display ACF limit 1 & 2, export sensor states
A1:1 B:1	Model B11/E11/H11 only. Display ACF elevator servo A & B sensor states
<blank>	The above five lines are replaced with one blank line for Model B1A/E1A/H1A.
SN:0	Model B1A/E1A/H1A with library interface card (LIC) only. Model B1A/E1A/H1A without the library interface card or those with STL0 cards. **do not** display this sensor.

Note: The values shown for each sensor will vary on your machine depending upon whether a cartridge is loaded and other conditions. For more information, see "Display Sensors Procedure" on page 9-35.

Show Statistics Menu (CE Modes)

Table 5-31 shows data from the CE Show Statistics menu.

Table 5-31. CE Show Statistics Menu

Function	Next Menu
Cancel	“CE Online Mode Options Menu” on page 5-34
Show Drive Statistics...	“Show Drive Statistics Menu (CE Modes)”
Show Tape Statistics...	“Show Tape Statistics Menu (CE Modes)” on page 5-38
Save and Return	Causes the statistics to be saved in nonvolatile storage and returns to “Show Statistics Menu (CE Modes)”

Cancel Cancels the operation and returns to the CE Online Mode menu
Show Drive Statistics Causes “Show Drive Statistics Menu (CE Modes)” to appear
Show Tape Statistics Causes “Show Tape Statistics Menu (CE Modes)” on page 5-38 to appear
Save and Return Causes the statistics to be saved in nonvolatile storage

Show Drive Statistics Menu (CE Modes)

Table 5-32 is an example of the Show Statistics menu.

Table 5-32. Show Drive Statistics Menu

Function	Next Menu
Cancel	
DRV Mounts...	“Show Statistics Menu” on page 5-32
CE DRV Mb Writtn...	“Show Statistics Menu” on page 5-32
CE DRV Mb Read...	“Show Statistics Menu” on page 5-32
Magazine Mnts	“Show Statistics Menu” on page 5-32
Clean Mounts	“Show Statistics Menu” on page 5-32
Power On Hours	“Show Statistics Menu” on page 5-32
Notes: 1. Supplemental Message Line 1: <Drive status — (READY and at LOAD POINT)> 2. Supplemental Message Line 2: <none>	

Cancel Causes the to appear
CE DRV Mb Writtn Displays the total number of megabytes written by the drive
CE DRV Mb Read Displays the total number of megabytes read by the drive
Mounts to Drv Displays the total number of times a cartridge was mounted in the drive
Priority Mnts Displays the total number of times a cartridge was loaded in the priority cell
Magazine Mnts Displays the total number of times a cartridge was loaded in any of the cells of the magazine
Clean Mounts Displays the total number of times a cleaning cartridge was loaded in the device
Power On Hours Displays the total number of hours the device was powered ON.

Notes:
1. When the card pack is replaced, the Power On Hrs (time stamp) is reset to day = 0000.
2. In later levels of microcode the statistics are displayed in decimal instead of hexadecimal.

Show Tape Statistics Menu (CE Modes)

Table 5-33 is an example of the Show Tape Statistics menu.

Table 5-33. Show Tape Statistics menu

Function	Next Menu
Cancel	
Tape Mounts	“Show Statistics Menu” on page 5-32
Tape Mb Writtn	“Show Statistics Menu” on page 5-32
Tape Mb Read	“Show Statistics Menu” on page 5-32
Clean Mounts	“Show Statistics Menu” on page 5-32
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the “Statistics Menu” on page 5-31 to appear
Tape Mounts Displays the total number of times a tape volume was mounted in a drive
Tape Mb Writen Displays the total number of megabytes writen on the cartridge
Tape Mb Read Displays the total number of megabytes read on the cartridge

CE Offline Mode Menu

Attention: Entering CE mode causes the device to immediately go offline to all initiators on both interfaces; therefore, any current read/write activity results in job termination. In general, the device should be quiesced by the host (vary device offline) before taking the device offline, powering OFF the device, or entering CE mode.

The following menus are accessed by pressing the Change Mode pushbutton.

CE Options Menu

Table 5-34 shows the CE Options menu.

Table 5-34. CE Options Menu

Function	Next Menu
Verify Fix...	“CE Verify Fix Menu” on page 5-39
Dump...	“CE Main Dump Menu” on page 5-44
FMR Tape...	“CE FMR Tape Menu” on page 5-47
Config/Install...	“CE Config/Install Menu” on page 5-51
Logs...	“CE Logs Menu” on page 5-60
Utilities...	“CE Utilities Menu” on page 5-66
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Verify Fix Allows the CE to check good machine operation
Dump Allows the CE to move dump data
FMR Tape Allows the CE to perform microcode updates
Config/Install Allows the CE to customize the device to meet the customer’s requirements at installation
Logs Allows the CE to view the Error logs
Utilities Allows the CE to display control store and register data from any valid address. Use this option with assistance from support personnel.

CE Verify Fix Menu

Table 5-35 shows the CE Verify Fix menu. This menu allows the CE to select tests to run.

Table 5-35. CE Verify Fix Menu

Function	Next Menu
Cancel	“CE Options Menu” on page 5-38
Test Device	Figure 5-12 on page 5-40 or “CE Load Scratch Tape Menu” on page 5-49
Test ACF	“CE Options Menu” on page 5-38
Fibre Wrap Test...	“CE Fibre Wrap Menu” on page 5-60
Test Panel	“CE Options Menu” on page 5-38
Test Media	“CE Options Menu” on page 5-38
Test Head	“CE Options Menu” on page 5-38
C1x Wrap Test	“CE Options Menu” on page 5-38
FRU Replaced...	“FRU Replaced Menu” on page 5-41
Loop Diag...	“CE Loop Diag Menu” on page 5-42
Notes: 1. Supplemental Message Line 1: **Load scratch** (conditional) 2. Supplemental Message Line 2: **magazine** (conditional)	

Cancel Causes the CE Options menu to appear

Test Device Runs most of the tests that normally occur when power is switched ON to the drive. Also, the CE is requested to load a tape to run the tape motion and read/write tests. The test checks motors, sensors, memory, head, and the card pack.

Notes:

1. For **Test Media** and **Test Head**: If the message “Use diagnostic tape” appears, the customer tape contains data. Instead, use a scratch tape, an unlabeled tape, or a diagnostic tape to run this test.
2. At the completion of Test Device microprogram, Test ACF will automatically run if the drive can sense the ACF is installed.
3. If “Test Device” runs without error, then you should view, analyze and fix any errors in the error logs. See “CE Logs Menu” on page 5-60.

Test ACF Runs tests on the automatic cartridge facility

Fibre Wrap Test Runs tests on the fibre channel through the wrap plug

Test Panel Runs tests on the operator/CE panel. Allows the CE to visually check all pixels on the operator/CE panel display.

Test Media This test is normally run only at the request of support personnel. Runs Read/Write tests on the outer tracks of the tape to verify the media tracking and performance.

Test Head This test is normally run only at the request of support personnel. Runs Read/Write tests on the inner tracks of the tape to verify the head performance.

C1x Wrap Test Runs the STL0 wrap test (this test only appears on Models C12/C14)

FRU Replaced Allows the CE to reset some of the drive statistical data after replacing the HGA or a FRU in the tape path

Loop Diag Allows the CE to loop the diagnostic tests from “CE Loop Diag Menu” on page 5-42

When a test starts to run, the Status menu shown in Figure 5-12 on page 5-40 appears.

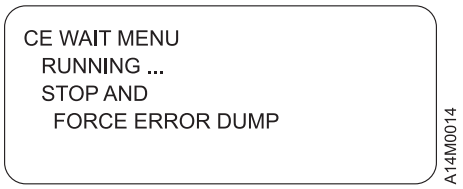


Figure 5-12. Status Menu

When a Loop Diag test starts to run, the Status menu shown in Figure 5-13 appears.

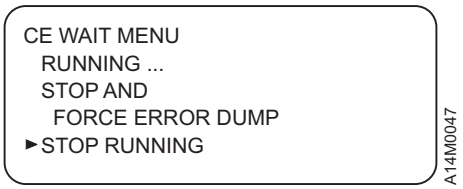


Figure 5-13. Loop Status Menu

The difference in Figure 5-12 and Figure 5-13 is that the later menu is present when Loop Diag tests are being run. If single pass diagnostics are being run, Figure 5-12 will display.

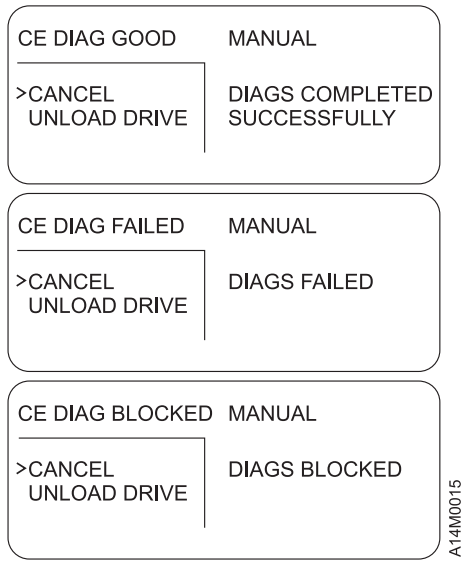


Figure 5-14. Final Status Display

When the test needs a tape, “CE Load Scratch Tape Menu” on page 5-49 is displayed.

Attention: It is recommended that when an Extended High Performance Cartridge drive needs a scratch tape an Extended High Performance Cartridge tape is used. The tests will take more time, but the entire capability will be tested.

When you load a tape and select **Process Loaded Tape**, Figure 5-12 is again displayed until the test is completed or until an error is detected. If the operator/CE panel shows the file protected icon, the tape is either physically write protected, or the wrong format scratch tape has been loaded.

Allow the tests to run to completion. When a test ends, the results are displayed on Figure 5-14 (the second screen shows an example of a failure).

Attention: Do not select **Force Error Dump** from the menu when the tests are running unless you are sure the 3590 is in a hung condition. Also, when the tests are running, do not change to operator mode by pressing the Change Mode pushbutton. Aborting a test can cause unexpected results.

The CE DIAG BLOCKED menu, the third screen in Figure 5-14 on page 5-40, can occur if the drive goes through microcode recovery. To recover from this condition, press Reset or power the drive OFF and then back ON.

The CE DIAG BLOCKED status may also occur when diagnostics are called after a tape is already loaded or the ACF is unplugged. To recover from this condition, unload the tape or ensure that the ACF is connected properly, then press Reset or power the drive OFF and then back ON. Use the FID that was displayed and go to the START section.

FRU Replaced Menu

Attention: DO NOT select any of the functions in this menu unless you have actually replaced the HGA or repaired the tape path.

This menu resets the statistical data in the drive. The statistical data is used to monitor the drive performance and call for service when appropriate.

Table 5-36. FRU Replaced Menu

Function	Next Menu
Cancel	"CE Verify Fix Menu" on page 5-39
HGA Replaced	—
Tape Path Repaired	—
Notes: 1. Supplemental Message Line 1: **<none>** 2. Supplemental Message Line 2: **<none>**	

Cancel
Causes the CE Verify Fix menu to appear

HGA Replaced
Selecting this function will cause the drive statistical data to be reset. Statistical data is reset automatically when the drive detects a new head.

Tape Path Repaired
Selecting this function will cause the drive statistical data to be reset

CE Loop Diag Menu

Table 5-37 shows the CE Loop Diag menu. This menu allows the CE to select tests to run in loop mode.

Table 5-37. CE Loop Diag Menu

Function	Next Menu
Cancel	“CE Verify Fix Menu” on page 5-39
POST	“CE Loop Diag Menu”
ACF Mech	“CE Loop Diag Menu”
Read/Write	“CE Loop Diag Menu”
ACF Load Test	“CE Loop Diag Menu”
Panel	“CE Loop Diag Menu”
Model C1x Wrap Test	“CE Loop Diag Menu”
Fibre Wrap Test	“CE Fibre Wrap Menu” on page 5-60

Notes:
1. Supplemental Message Line 1: **Please be patient**
2. Supplemental Message Line 2: **when stopping diag.**

Cancel Causes the CE Verify Fix menu to appear

POST (Power On Self Test) Runs most of the tests that normally occur when the drive is powered ON. The test checks motors, sensors, memory, and the card pack. This test also includes the ACF Mech test.

ACF Mech Test Runs tests on the Automatic Cartridge Facility mechanism. The test checks motors, sensors, and the ACF card.

Read/Write Test Runs a Read/Write test. This test takes approximately 10 minutes for each cycle. A scratch tape must be loaded before selecting this test.

Note: If the message “Use diagnostic tape” appears, the customer tape contains data. Instead, use a scratch tape, an unlabeled tape, or a diagnostic tape to run this test.

ACF Load Test Runs tests on the Automatic Cartridge Facility load mechanism. The ACF should be in **random** mode, with a cartridge loaded into the **import** position of the priority cell.

The test will move the cartridge from the priority cell into every available empty magazine cell, then back to the priority cell in the **export** position. To restart the test, it will be necessary to manually move the cartridge into the **import** position.

Panel Test Runs tests on the operator/CE panel. Allows the CE to visually check all pixels on the operator/CE panel display.

To stop the Panel test, select **STOP RUNNING** between test cycles.

C1x Wrap Test Runs the STL0 wrap test (this test only appears on Models C12/C14)

Fibre Wrap Test Runs tests on the fibre channel through the wrap plug

Attention: If the operator/CE panel shows the file-protected icon, the tape is either physically write protected or the customer has used a command to logically write protect the tape. If the operator/CE panel does not show the file-protected icon, either the wrong format scratch tape has been loaded or the drive had a problem reading the tape at the load point. The Base and Ultra Model B11/B1A require a 128-track format tape, the Model E11/E1A require a 256-track tape and the Model H11/H1A require a 384-track tape. Try writing on a different cartridge. If the failure occurs on multiple cartridges, go to FID F0 or F1 entry point on page 1-30.

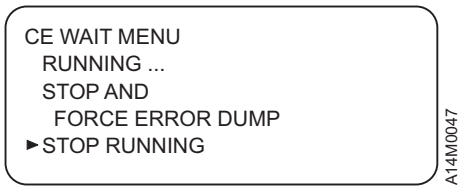


Figure 5-15. Loop Status Menu

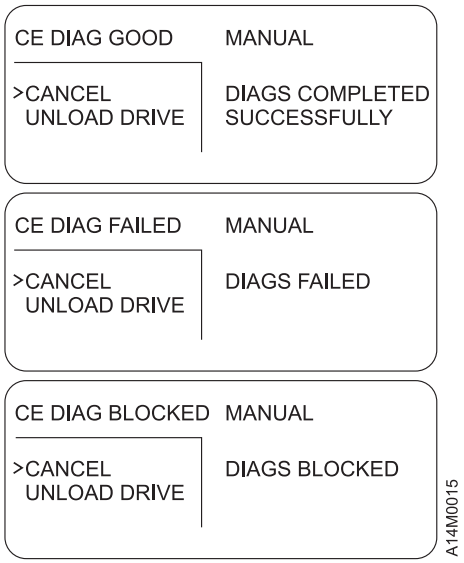


Figure 5-16. Final Status

When a test starts to run, the Status menu shown in Figure 5-15 appears.

The tests will run continuously. To stop a test, select **STOP RUNNING**, and allow the test to finish the test cycle in process.

When a test ends, the results are displayed on Figure 5-16 (the second screen shows an example of a failure).

Attention: Do not select **Force Error Dump** from the menu when the tests are running unless you are sure the 3590 is in a hung condition. Also, when the tests are running, do not change to operator mode by pressing the Change Mode pushbutton. Aborting a test can cause unexpected results.

The CE DIAG BLOCKED menu, the third screen in Figure 5-16, can occur if the drive goes through microcode recovery. To recover from this condition, press Reset or power the drive OFF and then back ON.

The CE DIAG BLOCKED status may also occur when diagnostics are called after a tape is already loaded or the ACF is unplugged. To recover from this condition, unload the tape or ensure that the ACF is connected properly, then press Reset or power the drive OFF and then back ON. Use the FID that was displayed and go to the START section.

CE Main Dump Menu

Table 5-38 shows the CE Main Dump menu. This menu allows the CE to force a dump or to copy a dump from dynamic random access memory (DRAM) to a cartridge.

Table 5-38. CE Main Dump Menu

Function	Next Menu
Cancel	"CE Options Menu" on page 5-38
Force Dump	—
Copy Dump to Tape	"CE Load Scratch Tape Menu" on page 5-49
Force Error Dump	—
Dump Options	"CE Dump Options Menu" on page 5-45

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

The *Tape Position* indicator (see Figure 5-2 on page 5-6) is displayed when the device is writing data on the tape. The indicator provides a graphical representation of the position of the device relative to the tape.

The *dump* icon ⚠ appears when the dump is available, and remains on the screen to indicate that trace data is stored in the device. The icon is not displayed after the host takes a dump or the dump is written to tape.

Attention: Trace data is volatile and is lost if you press the Reset pushbutton or power OFF the device.

Cancel Causes the CE Options menu to appear

Force Dump Causes a dump to control store DRAM to occur. The initiator can retrieve the data via a Read Buffer command to the control store DRAM.

Attention: Do not use this option if a FID1 condition has already caused a dump to be created. For this case, the dump data of interest is lost if you execute the Force Dump function. The dump caused by using this option will write over an existing dump.

Do not use Force Dump if the bus is in a hung state; instead, use Force Error Dump.

Copy Dump to Tape Copies the dump data to a cartridge. A menu prompts the CE to load a scratch tape.

Attention: Data on the tape may be overwritten. The Final Status menu indicates the status of the copy to tape (successful copy or unsuccessful copy). See Figure 5-17 on page 5-48 for an unsuccessful copy and see Figure 5-17 on page 5-48 for a successful copy. This option is invalid if no dump data exists.

Force Error Dump Causes a recovery procedure in which the microcode is reloaded. This option is used if a microcode-hang condition exists (that is, the host cannot communicate with the drive and no hardware fault is detected).

When a hang condition exists, the host can attempt to request a microcode dump through a port, but does not receive it from the drive.

This option is also used if a microcode dump is needed and the Force Dump option on this menu cannot provide a dump. The host is then able to successfully request the dump information via the port, or the CE can use the Copy Dump to Tape option on this menu.

Attention: Using this option will cause an existing dump to be overwritten.

Dump Options Allows the CE to customize the dump based on Engineering or Support request

CE Dump Options Menu

Table 5-39 shows the Dump Options menu (see Figure 5-8 on page 5-17.

Table 5-39. CE Dump Options Menu

Function	Next Menu
Cancel	"CE Main Dump Menu" on page 5-44
Object Alias...	"CE Object Alias Menu"
Address...	"CE Address Menu" on page 5-46

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE Main Dump Menu" on page 5-44 to appear
Object Alias Allows the CE to enter Object Alias data for dump options
Address Allows the CE to enter Control Store addresses for dump options

CE Object Alias Menu

Table 5-40 shows the Object Alias menu.

Table 5-40. CE Object Alias Menu

Function	Next Menu
Cancel	"CE Dump Options Menu"
Object Alias (4 characters displayed vertically)	—
Add Object Alias	—
Remove Object Alias	—
List Object Alias...	"List Object Alias menu"

Notes:
1. Supplemental Message Line 1: Obj Alias set, Obj Alias removed, or Select Obj Alias
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE Dump Options Menu" to appear
Object Alias Allows the CE to select a specific hex value. To change the value of the nibble, select the nibble, which causes a new menu to appear where you can select 0–F.
Add Object Alias Allows the CE to add Object Alias data to the dump options
Remove Object Alias Allows the CE to remove Object Alias data from dump options
List Object Alias Allows the CE to list Object Alias data from the dump options

CE Address Menu

Table 5-41 shows the Address menu.

Table 5-41. CE Address Menu

Function	Next Menu
Cancel	“CE Dump Options Menu” on page 5-45
Address (4 characters displayed vertically)	—
Add Address	—
Remove Address	—
List Address	“List Address” menu

Notes:
1. Supplemental Message Line 1: Address set, Address removed, or Select Address
2. Supplemental Message Line 2: <none>

Cancel Causes the “CE Dump Options Menu” on page 5-45 to appear

Address Allows the CE to select a specific hex value. To change the value of the nibble, select the nibble, which causes a new menu to appear where you can select 0–F.

Add Address Allows the CE to add Address data to the dump options

Remove Address Allows the CE to remove Address data from dump options

List Address Allows the CE to list Address data from the dump options

CE FMR Tape Menu

Table 5-42 shows the FMR Tape menu.

Table 5-42. CE FMR Tape Menu

Function	Next Menu
Cancel	“CE Options Menu” on page 5-38
Microcode Update...	“CE Load FMR Tape Menu” on page 5-50
Make FMR Tape...	“CE Load Scratch Tape Menu” on page 5-49
Unmake FMR Tape...	“CE Load FMR Tape Menu” on page 5-50
Notes: 1. Supplemental Message Line 1: <status> 2. Supplemental Message Line 2: <status>	

Cancel Allows the CE to abort an FMR and return to the CE Options menu

Microcode Update Allows the CE to replace the microcode in the device from a field microcode replacement (FMR) tape and to update the FMR cartridge with the microcode. A menu prompts the CE to load the FMR tape in the device. (The FMR tape is in the ship group). When the 3590 reads the FMR tape, it checks the EC levels on the tape. If the tape does not contain the EC level of the drive, it automatically writes the microcode to the FMR tape. It then displays the EC level via the “CE Select EC Level Menu” on page 5-48.

Make FMR Tape Allows the CE to create a field microcode replacement (FMR) tape from a scratch tape. The FMR tape contains the current level of microcode that is active in the device. A menu prompts the CE to load a scratch tape in the device. After the tape is written, the final status menu indicates whether the operation was successful.

Unmake FMR Tape Allows the CE to convert an FMR tape to a scratch tape. A menu prompts the CE to load an FMR tape in the device. After the tape has the header information changed, the final status menu indicates whether the operation was successful.

Attention: If the operator/CE panel shows the file-protected icon, the tape is either physically write protected or the customer has used a command to logically write protect the tape. If the operator/CE panel does not show the file-protected icon, either the wrong format scratch tape has been loaded or the drive had a problem reading the tape at the load point. The Base and Ultra Model B11/B1A require a 128-track format tape, the Model E11/E1A require a 256-track tape and the Model H11/H1A require a 384-track tap. Try writing on a different cartridge. If the failure occurs on multiple cartridges, go to FID entry point on page 1-30 F0 or F1.

CE Select EC Level Menu

Table 5-43 shows the Select EC menu. This menu is displayed when the device loads an FMR tape. The device reads all the EC levels and displays them on this menu. The invalid EC levels are displayed in a lighter font. The message lines display the EC level running in the device. The ECs are displayed in the same order as they appear on tape. The CE picks which EC level to load into the device.

After the FMR tape is read, a power-on reset or CE reset is needed to activate the microcode that was just loaded.

Operational Note:

If you insert the FMR cartridge and the EC level of the code is not on the cartridge, the microcode is automatically copied from the drive to the cartridge.

Table 5-43. CE Select EC Level Menu

Function	Next Menu
Cancel	"CE Options Menu" on page 5-38
EC=aaaaaaa LL=bbbb	—
EC=ccccccc LL=dddd	—
EC=eeeeeee LL=ffff	—

Notes:
1. Supplemental Message Line 1: **Current EC Level:**
2. Supplemental Message Line 2: **<EC Level q>**

Cancel Allows the CE to abort an FMR and return to the CE Options menu
EC Level Allows the CE to pick which EC level to load into the device

The latest EC level is determined by the link level (LL), as the EC level may not always increment to a higher number. The following example shows that the second entry is the latest level microcode.

```
EC=6C56789 LL=4D0D
EC=3C56789 LL=5B02  (highest EC level)
```

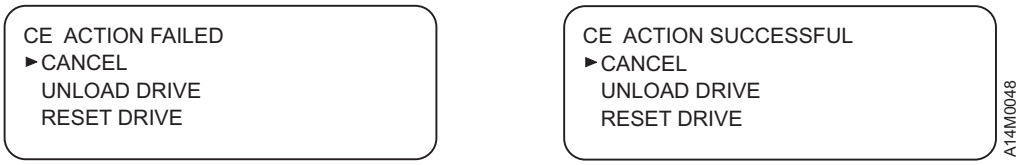


Figure 5-17. Final Status Menu

EC DISPLAY NOTES:

1. If a failure occurs, the final status menu indicates CE ACTION FAILED. This failure can occur if the drive cannot read the tape.
2. If the process was successful, the final status menu indicates CE ACTION SUCCESSFUL.
3. The Base and Ultra Model B11/B1A require a 128-track format FMR tape, the Model E11/E1A require a 256-track format FMR tape and the Model H11/H1A require a 384-track format FMR tape.

CE Load Scratch Tape Menu

Table 5-44 shows the menu that prompts the CE to load a scratch tape.

If the scratch cartridge in the drive has a volser written on the tape, it is **overwritten**.

Attention: Use an Extended High Performance Cartridge when an Extended High Performance Cartridge needs a scratch tape. The tests will take more time, but the entire range of capabilities will be tested.

Table 5-44. CE Load Scratch Tape Menu

Function	Next Menu
Cancel	Previous menu
Process Loaded Tape	Next menu
Unload Drive	"CE Load Scratch Tape Menu"
Start	—
Set Pressure to Default	See Figure 5-17 on page 5-48

Notes:
1. Supplemental Message Line 1: **Use unlabeled tape**
2. Supplemental Message Line 2: **Expected scratch tape**
   - **Tape not at load pt**
   - **Tape write prot'd**
   - **Pump not set**

Cancel Allows the CE to return to the CE Options menu

Process Loaded Tape If scratch tape is loaded and at ready point, a **new** menu will be displayed, depending on the previous menu. See Figure 5-8 on page 5-17 for details.

Unload Drive Allows the CE to unload the cartridge from the drive

Start Enables the ACF on a Model B11/E11/H11. This function cannot be selected on a Model B1A/E1A/H1A.

Set Pressure to Default Sets the pressure of the drive to the default value

See messages appearing on *Supplemental Message Line 2***:**

1. **Expected scratch tape** - FMR tape was loaded
2. **Tape not at load pt** - Not at ready point, wait for tape to finish loading. If the Status message says **Rdy at Ld Pt.** but the Supplemental message says **Tape not at load pt.** If the 3590 is attached to a 3494, you may have to wait up to 2 minutes for the 3494 to either acknowledge the Load Point message or time out. This may indicate a problem with the interface to the 3494.
3. **Tape write prot'd** - If the operator/CE panel shows the file-protected icon, the tape is either physically write protected or the customer has used a command to logically write protect the tape. If the operator/CE panel does not show the file-protected icon, either the wrong format scratch tape has been loaded or the drive had a problem reading the tape at the load point. The Base and Ultra Models B11/B1A require a 128-track format tape, the Models E11/E1A require a 256-track tape and the Models H11/H1A require a 384-track tap. Try writing on a different cartridge. If the failure occurs on multiple cartridges, go to FID entry point on page 1-30 (F0 or F1).
4. **Pump not set** - Go into "CE Config/Install Menu" on page 5-51 and set/adjust pressure.

CE Load FMR Tape Menu

Table 5-45 shows the menu that prompts the CE to load the FMR tape.

Table 5-45. CE Load FMR Tape Menu

Function	Next Menu
Cancel	Previous menu
Process Loaded Tape	Next menu
Unload Drive	"CE Load FMR Tape Menu"
Start	—
Set Pressure to Default	See Figure 5-17 on page 5-48

Notes:
1. Supplemental Message Line 1: **Use FMR tape**
2. Supplemental Message Line 2: **Expected FMR tape**
   - **Tape not at load pt**
   - **Pump not set**

Cancel Allows the CE to return to the CE Options menu

Process Loaded Tape If FMR tape is loaded and at ready point, then a **new** menu will be displayed, depending on the previous menu. See Figure 5-8 on page 5-17 for detail.

Unload Drive Allows the CE to unload the cartridge from the drive

Start Enables the ACF on a Model B11/E11/H11. This function cannot be selected on a Model B1A/E1A/H1A.

Set Pressure to Default Sets the pressure of the drive to the default value

Note: See messages appearing on *Supplemental Message Line 2:*

- **Expected FMR tape** - Scratch tape was loaded
- **Tape not at load pt** - Not at ready point, wait for tape to finish loading. If the Status message says **Rdy at Ld Pt.** but the Supplemental message says **Tape not at load pt.** and the 3590 is attached to a 3494, you may have to wait up to 2 minutes for the 3494 to either acknowledge the Load Point message or time out. This may indicate a problem with the interface to the 3494.
- **Tape write prot'd** - If the operator/CE panel shows the file-protected icon, the tape is either physically write protected or the customer has used a command to logically write protect the tape. If the operator/CE panel does not show the file-protected icon, either the wrong format scratch tape has been loaded or the drive had a problem reading the tape at the load point. The Base and Ultra Model B11/B1A require a 128-track format tape, the Model E11/E1A require a 256-track tape and the Model H11/H1A require a 384-track tape. Try writing on a different cartridge. If the failure occurs on multiple cartridges, go to FID entry point on page 1-30 F0 or F1.
- **Pump not set** - Go to "CE Config/Install Menu" on page 5-51 and set/adjust pressure.

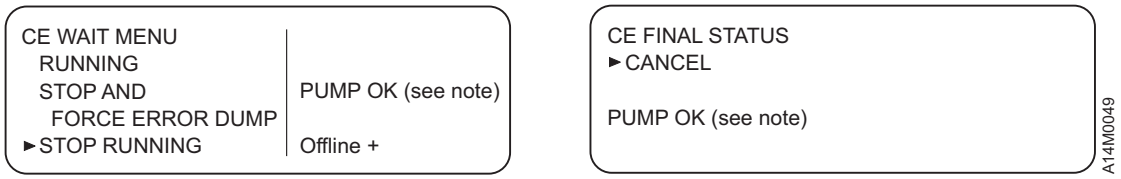


Figure 5-18. Final Status Menu

CE Config/Install Menu

Table 5-46 shows the Config/Install menu. The default values are in a bold font.

Note: The *Force Error Log On/Off* option displays the current status. For example, if the option says 'Forced Error Log Off', that means that forced error logging is OFF. To turn it ON, select the option. The option will change to show the new current status, 'Forced Error Log On'.

Table 5-46. CE Config/Install Menu

Function	Next Menu
Cancel	"CE Options Menu" on page 5-38
Drv Options...	"CE Drive Options Menu" on page 5-52
Fibre Addresses...	"CE Fibre Names Menu" on page 5-56
Force Error Log On/Off	—
Adjust Pressure	Figure 5-18 on page 5-50
Align ACF	"CE Align ACF Menu" on page 5-55
Notes: 1. Supplemental Message Line 1: **Drive fenced!** -or- **Loading code** 2. Supplemental Message Line 2: **Fix previous error Try again**	

Cancel Causes the CE Options menu to appear. If any of the VPD options have been updated, the **CE WAIT** message may be displayed momentarily while the Flash memory is being rewritten.

Drv Options Allows the CE to set items from "CE Drive Options Menu" on page 5-52

Fibre Addresses Allows the CE to view the drive node name and port names. See "Fibre Channel World Wide Name History Log" on page 9-63.

Force Error Log On/Off Allows the CE to turn error logging ON. When set to On, deferred-check conditions are reported to the host. Therefore, temporary errors are reported in the sense data. The default is *Off*. This selection is normally used because of specific requests from support personnel.

Adjust Pressure Causes the microcode to set and record the compressor motor speed by sensing the output from the compressor pressure sensor. In addition to the time of drive install, this option should be done after replacement of any drive part that affects the pressure.

When the test is running, the menu in Figure 5-18 on page 5-50 appears. Choosing **Stop Running** causes the menu in "CE Logs Menu" on page 5-60 to appear. Choosing **Cancel** from "CE Logs Menu" on page 5-60 causes the "CE Config/Install Menu" to appear. Select **Cancel** twice to save the value in nonvolatile storage (once from the CE Final Status menu and once from the Config/Install menu).

Align ACF Allows the CE to view the state of the transport-position sensors in the ACF from "CE Align ACF Menu" on page 5-55

CE Drive Options Menu

Table 5-47 shows the Drive Options menu.

This menu allows the CE to set specific drive information needed at installation of the drive. The **default** values are appear in Table 5-47 in a **bold** font.

Note: The CE Drive Options menu displays the current status. For example, if the H SARS Enabled/Disabled option says 'H SARS Disabled', that means that H SARS is disabled. To enable H SARS, select the option. The option will change to show the new current status, 'H SARS Enabled'.

Table 5-47. CE Drive Options Menu

Function	Next Menu
Cancel	"CE Config/Install Menu" on page 5-51
Drv Serial No...	See "Drive Serial Number" on page 9-51
Drv Features...	"CE Drive Features Menu" on page 5-81
Wrap Tools...	—
(**No Lrg**/Lrg) Disp Attach	—
Hdwr Present/Not present for Double Length Tape	—
Autoshare Enabled/**Disabled** (Base Model B11, B1A only)	—
SCSI Config (Ultra Model B11/B1A, Model E11/E1A and Model H11/H1A SCSI drives only)	"CE SCSI Config Menu" on page 5-55
Clean Mounts	Clean Mounts menu
Clean Usage	Clean Usage menu
H SARS **Enabled**/Disabled	—
V SARS **Enabled**/Disabled	—
SARS Traps Enabled/**Disabled**	—
SIM Sev Filt On/**Off**	—
MIM Sev Filt On/**Off**	—
Num Repeat SIMs	—
Disable CU Mode	—

Notes:
1. Supplemental Message Line 1: **When done, select**
2. Supplemental Message Line 2: **CANCEL option**
3. Highlighted Functions, such as **No Lrg**, are the default values.

Cancel — Causes the "CE Config/Install Menu" on page 5-51 to appear. If any of the VPD options have been updated, the **CE WAIT** message may be displayed momentarily while the Flash memory is being rewritten.

Drv Serial No — Allows the CE to enter the drive's serial number (maximum of 12 bytes). See "Drive Serial Number" on page 9-51.

Drv Features — Allows the CE to set items from "CE Drive Features Menu" on page 5-81

Wrap Tools — Allows the CE to see what (attached) wrap tools are detected by the drive during a power-on test. The drive checks for the following wrap tools before running the respective wrap tests: SCSI Port 0 and SCSI Port 1 wrap tools, RS-422 port wrap tool, and the STL0 silo interface card wrap tool (the latter for B1A drives in Model C12/C14 only).

The status of the wrap tools will be displayed on the operator/CE panel, as follows:

```
SCSI 0:   PRESENT/NOT PRESENT  (SCSI Models only)
SCSI 1:   PRESENT/NOT PRESENT  (SCSI Models only)
RS-422:   PRESENT/NOT PRESENT
STL   :   PRESENT/NOT PRESENT  (Model C12/C14 only)
```

Note: This menu does not check for the fibre wrap plug.

A status of “PRESENT” indicates that the particular wrap plug has been detected.

(No Lrg/Lrg) Disp Attach Allows the CE to specify that a large operator display is attached to the drive. (The large display is a customer-supplied option.) This option will not become active until you either select **Reset Drive** from the operator Services menu, press the Reset pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the CE Options menu. The default is *No Lrg*.

Hdwr present/Not present for Dbl Lngth Tape
Allows the CE to indicate if the hardware required for double-length tape is present. The default is *Hdwr present*

Autoshr Enabled/Disabled Allows the CE to enable the Autoshare option for host application (Base Model B11/B1A only) The default is *Disabled.*

SCSI Config (SCSI drives only) Allows the CE to set items from “CE SCSI Config Menu” on page 5-55

Clean Mounts Allows the CE to change the quantity specifying the number of mounts required for the drive before a **clean** message is posted on the operator/CE panel

Note: The default value is 0708 (1800 mounts). It is recommended that this default value **not** be changed without engineering involvement.

Clean Usage Allows the CE to change the quantity specifying the number of bytes processed by the drive before a **clean** message is posted on the operator/CE panel

Note: The default value is 0002BF20 (150 Gb). It is recommended that this default value **not** be changed without Engineering involvement.

H SARS Enabled/Disabled Allows the CE to enable the **hardware** statistical analysis and reporting (H SARS) system. Hardware SARS can be enabled or disabled while the drive is operating. Enabling this option allows the drive to indicate potential hardware problems. See “Statistical Analysis and Reporting System” on page 4-6 for details. The default is *Enabled*.

V SARS Enabled/Disabled Allows the CE to enable the **volume** statistical analysis and reporting (V SARS) system. Volume SARS can be enabled or disabled while the drive is operating. Enabling this option will allow the drive to flag bad tape media. See “Statistical Analysis and Reporting System” on page 4-6 for details. The default is *Enabled*.

SARS Traps Enabled/Disabled
Allows the CE to enable **traps** used by the statistical analysis and reporting (SARS) system. A change in SARS Traps to enabled or disabled status will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE**

Options menu. Enabling this option will force an automatic dump in the drive if a SARS trap is hit. See “Statistical Analysis and Reporting System” on page 4-6 for details. The default is *Disabled*.

SIM Sev Filt On/Off

Allows the CE to filter the messages sent to the host. When this option is set to **On**, only *acute* and *serious* severity service information messages (SIMs) are sent. *Moderate* and *service-related* severity SIMs are not sent. When this option is set to Off, all SIMs are displayed. The default is *Off*.

MIM Sev Filt On/Off

Allows the CE to filter the messages sent to the host. When this option is set to **On**, only *acute* severity media information messages (MIMs) are sent. *Serious, moderate,* and *service-related* severity MIMs are not sent. When this option is set to Off, all MIMs are displayed. The default is *Off*.

Num Repeat SIMs

Allows the CE to determine how many times to repeat sending the same SIMs to the host. For example, if you set the value to 3, the SIM is sent to the host when a SIM is generated eight hours later, then again eight hours later. You cannot change the time between the presentation of SIMs, which is eight hours. The default value is *zero* (do not repeat SIMs). The maximum value allowed is 255.

Disable CU Mode

Allows the CE to disable the Control Unit mode (option displayed in dotted font) if the drive is **not** attached to a 3590 Axx Control Unit or Virtual Tape Server (VTS). If the drive **is** attached to a 3590 Axx control unit or Virtual Tape Server (VTS), the control unit will automatically enable the Control Unit mode and this option will be displayed in the **bold** font.

CE SCSI Config Menu

Table 5-48 shows the SCSI Config menu. This menu allows the CE to set the SCSI configuration options.

Table 5-48. CE SCSI Config Menu

Function	Next Menu
Cancel	"CE Options Menu" on page 5-38
Autoshare Enabled/**Disabled**	—
Wide/Narrow SCSI	—
Fast/Slow SCSI	"CE FID FF Log Menu" on page 5-64

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>
3. Highlighted Functions, such as **Disabled**, are the default values.

Cancel Causes the "CE Options Menu" on page 5-38 to appear

Autoshr Enabled/Disabled Allows the CE to enable the Autoshare option for host applications. (Ultra Model B11/B1A only) The default is *Disabled.*

Wide/Narrow SCSI Allows the CE to set the Wide/Narrow SCSI option. Wide is 2 bytes per clock cycle. Narrow is 1 byte per clock cycle. The default is *Wide*.

Fast/Slow SCSI Allows the CE to set the Fast/Slow SCSI option. Fast is Ultra Speed 20 MHz clock. Slow is the normal 10 MHz clock. The default is *Fast*.

Note: Some SCSI configurations must be set to Slow and Narrow to prevent SCSI timeout errors. Ask the customer how these options should be set.

CE Align ACF Menu

Table 5-49 shows the Align ACF menu. This menu allows the CE to align the transport-position sensors in the ACF.

Table 5-49. CE Align ACF Menu

Function	Next Menu
Done	"CE Config/Install Menu" on page 5-51
Align High	—
Align Low	—

Notes:
1. The message lines indicate the last adjustment performed.
2. Supplemental Message Line 1: **Aligned high** or **Aligned low** <depends on last adjustment>
3. Supplemental Message Line 2: **Blank**

Done Causes the "CE Config/Install Menu" on page 5-51 to appear

Align High Causes the transport to align to the bottom transport-position sensor

Align Low Causes the transport to align to the top transport-position sensor

When you select Align High or Align Low, the transport moves down three-fourths of the way, moves up to the priority slot, moves to the bottom slot, then moves up to the priority slot. See "Check and Adjustment of Transport Position Sensor" on page 10-28 for details.

CE Fibre Names Menu

Table 5-50 shows the Fibre Names menu.

Note: This menu will be named Fibre Names is the next release of code.

Table 5-50. CE Fibre Names Menu

Function	Next Menu
Cancel	“CE Config/Install Menu” on page 5-51
Show Node Name...	“Show Node Name Menu”
Show Port Names...	“Show Port Names Menu” on page 5-57
Set Node Name...	“Set Node Name Menu” on page 5-57
Set Port 0 Name...	“Set Port 0 Name Menu” on page 5-58
Set Port 1 Name...	“Set Port 1 Name Menu” on page 5-58

Notes:
1. Supplemental Message Line 1: **Port0 ID=aa bb cd**
2. Supplemental Message Line 2: **Port1 ID=aa bb cd**

Cancel Causes the “CE Config/Install Menu” on page 5-51 to appear
Show Node Name Causes the “Show Node Name Menu” to appear
Show Port Names Causes the “Show Port Names Menu” on page 5-57 to appear
Set Node Name Causes the “Set Node Name Menu” on page 5-57 to appear
Set Port 0 Name Causes the “Set Port 0 Name Menu” on page 5-58 to appear
Set Port 1 Name Causes the “Set Port 1 Name Menu” on page 5-58 to appear

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Show Node Name Menu

Table 5-51 shows the Show Node Name CE menu.

Table 5-51. Show Node Name Menu

Function	Next Menu
Cancel	“CE Fibre Names Menu”
Node Name 0123456789abcdef	“CE Fibre Names Menu”

Notes:
1. Supplemental Message Line 1: **Port0 ID=aa bb cd**
2. Supplemental Message Line 2: **Port1 ID=aa bb cd**

Cancel Causes the “CE Fibre Names Menu” to appear
Node Name Causes Fibre Node Name to be displayed

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

Show Port Names Menu

Table 5-52 shows the Port Names menu.

Table 5-52. Show Port Names Menu

Function	Next Menu
Cancel	"CE Fibre Names Menu" on page 5-56
Port 0 Name 0123456789abcdefPort 1 Name 0123456789abcdef	"CE Fibre Names Menu" on page 5-56
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Cancel Causes the "Fibre Addresses Menu" on page 5-28 to appear
Port 0 / Port 1 Name Both Fibre port 0 and Fibre port 1 names are displayed.

Note: Refer to "Messages and Supplemental Messages (Fibre Channel Only)" in Table 5-2 on page 5-7 for additional fibre addressing information.

Set Node Name Menu

Table 5-53 shows the Set Node Name menu.

This menu allows the drive **Node** name to be set.

Table 5-53. Set Node Name Menu

Function	Next Menu
Cancel	"Fibre Addresses Menu" on page 5-28
0	—
1	—
. . .	—
Save and Continue	"CE Save Data Menu (Node/Port)" on page 5-59
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Note: If you alter **any** name you must save or alter all the names. For example, if you alter the Node Name only, at minimum, you must save Port 0 and Port 1.

Cancel Causes the "Fibre Addresses Menu" on page 5-28 to appear
0123456789ABCDEF Selecting this option increments the hexadecimal character. The number wraps from 'F' to 0'.
Save and Continue Causes "CE Save Data Menu (Node/Port)" on page 5-59 menu to appear to allow/disallow saving data in DRAM

Note: Refer to "Fibre Channel World Wide Identification (Names)" on page 3-10 for more fibre names information.

Set Port 0 Name Menu

Table 5-54 shows the Set Port 0 Name menu.

This menu allows the drive **Port 0 Name** to be set.

Table 5-54. Set Port 0 Name Menu

Function	Next Menu
Cancel	"CE Fibre Names Menu" on page 5-56
0	—
1	—
. . .	—
Save and Continue	"CE Save Data Menu (Node/Port)" on page 5-59
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Note: If you alter **any** name you must save or alter all the names. For example, if you alter the Node Name only, you have to at least save Port 0 and Port 1.

Cancel Causes the "CE Fibre Names Menu" on page 5-56 to appear

0123456789ABCDEF Selecting this option increments the hexadecimal character. The number wraps from 'F' to 0'.

Save and Continue Causes "CE Save Data Menu (Node/Port)" on page 5-59 menu to appear to allow/disallow saving data in DRAM

Note: Refer to "Fibre Channel World Wide Identification (Names)" on page 3-10 for more fibre names information.

Set Port 1 Name Menu

Table 5-55 shows the Set Port 1 Name menu.

This menu allows the drive **Port 1 Name** to be set.

Table 5-55. Set Port 1 Name Menu

Function	Next Menu
Cancel	"CE Fibre Names Menu" on page 5-56
0	—
1	—
. . .	—
Save and Continue	"CE Save Data Menu (Node/Port)" on page 5-59
Notes: 1. Supplemental Message Line 1: **Port0 ID=aa bb cd** 2. Supplemental Message Line 2: **Port1 ID=aa bb cd**	

Cancel Causes the "CE Fibre Names Menu" on page 5-56 to appear

0123456789ABCDEF Selecting this option increments the hexadecimal character. The number wraps from 'F' to 0'.

Save and Continue Causes "CE Save Data Menu (Node/Port)" on page 5-59 menu to appear to allow/disallow saving data in DRAM

Note: Refer to "Fibre Channel World Wide Identification (Names)" on page 3-10 for more fibre names information.

CE Save Data Menu (Node/Port)

Table 5-56 shows the CE Save Data.

This menu allows the CE to save or abort saving the data entered at the previous menu.

Table 5-56. CE Save Data Menu

Function	Next Menu
Cancel	“CE Fibre Names Menu” on page 5-56
Yes	“CE Fibre Names Menu” on page 5-56
No	“CE Fibre Names Menu” on page 5-56
Notes: 1. Supplemental Message Line 1: FC NODE/PORT NAME 2. Supplemental Message Line 2: <none>	

Cancel Causes the “CE Fibre Names Menu” on page 5-56 to appear. The name is not saved.

Yes Saves the node or port name and returns to “CE Fibre Names Menu” on page 5-56

No Does not save name and returns to “CE Fibre Names Menu” on page 5-56

CE Fibre Wrap Menu

Table 5-57 shows the Fibre Wrap menu. This menu allows the CE to wrap both fibre ports or each individually.

Note: Fibre Wrap Plugs must be attached to the drive or the end of the cables (with the duplex adapter) prior to running these tests. Running tests without the wrap plug may cause performance or I/O problems on the fibre loop.

Table 5-57. CE Fibre Wrap Menu

Function	Next Menu
Cancel	"CE Verify Fix Menu" on page 5-39 or "CE Loop Diag Menu" on page 5-42
Both Ports	—
Port 0	—
Port 1	—
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Options Menu" on page 5-38 or "CE Loop Diag Menu" on page 5-42 to appear

Both Ports Runs Port 0 and Port 1 Wrap test. See "Fibre Channel Ports Wrap Test" on page 9-112.

Port 0 Runs Port 0 Wrap test. See "Fibre Channel Ports Wrap Test" on page 9-112.

Port 1 Runs Port 1 Wrap test. See "Fibre Channel Ports Wrap Test" on page 9-112.

CE Logs Menu

Table 5-58 shows the Logs menu. This menu allows the CE to access the CE error logs.

Table 5-58. CE Logs Menu

Function	Next Menu
Cancel	"CE Options Menu" on page 5-38
Error Log...	"CE Error Log Menu" on page 5-61
FID FE Log...	"CE FID FE Log Menu" on page 5-63
FID FF Log...	"CE FID FF Log Menu" on page 5-64
Temp Error Log...	"CE Temp Error Log Menu" on page 5-65
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Options Menu" on page 5-38 to appear.

Error Log Allows the CE to view the Error Log

FID FE Log Allows the CE to view the FID FE log

FID FF Log Allows the CE to view the FID FF log

Temp Error Log Allows the CE to view the Temp Error log

Notes:

1. The CE Error Log logs every FID or ATTN message posted to the operator/CE panel.
2. The FID FE Log logs a filtered subset of all sense data sent to the host with a FID of **FE**.
3. The FID FF Log logs a filtered subset of all sense data sent to the host with a FID of **FF**.
4. The Temp Error Log logs a filtered subset of all sense data sent to the host with a sense key of **1**.

CE Error Log Menu

The **CE Error Log** logs every FID or ATTN message posted to the operator/CE panel.

Table 5-59. CE Error Log Menu

Function	Next Menu
Cancel or No Entries	“CE Logs Menu” on page 5-60
CLEAR LOG	“CE Logs Menu” on page 5-60
CURRENT TIMESTAMP dddd hh:mm:ss	“CE Logs Menu” on page 5-60
FID1 DD VS:142M95 3130 0030 283A 0001 04:33:32	“CE Logs Menu” on page 5-60
FID1 CD VS:UNKNOWN 311A 311A 283A 0001 05:37:04	“CE Logs Menu” on page 5-60
ATTN DRV LOAD/UNLOAD ERROR 0001 06:02:10	“CE Logs Menu” on page 5-60
ATTN ACF 005 CLEAR PICKER PATH 0001 06:34:17	“CE Logs Menu” on page 5-60

Cancel Causes the “CE Logs Menu” on page 5-60 to appear

No Entries Indicates that no entries are in the error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear

CLEAR LOG Allows the CE to erase the error log. This option will only be displayed when there is at least one entry in error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CURRENT TIMESTAMP Provides a current time stamp in the form **dddd hh:mm:ss**. For a full description of this field, see “Time Stamp for CE Error Log” on page 5-62

FID1 DD Indicates a possible fault with one of the sensors. The Volume Serial number is 142M95. The fault symptom codes are 3130 and 0030. The next character (2 in 283A) represents the model number followed by the microcode link (83A). Choosing this option causes “CE Options Menu” on page 5-38 to appear.

FID1 CD Indicates a possible fault with the cartridge present sensor. The Volume Serial number is Unknown. The fault symptom codes are 311A. The next character (2 in 283A) represents the model number followed by the microcode link (83A). Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

ATTN DRV Indicates an error condition with the drive that customer personnel may be able to resolve. The condition indicated by supplemental message of **LOAD/UNLOAD ERROR** could be corrected by the operator. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

ATTN ACF Indicates an error condition with the ACF that customer personnel may be able to resolve. The condition indicated by supplemental message of **CLEAR PICKER PATH** could be corrected by the operator. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

Only the last 30 entries in the log are displayed. If a fault is detected and the log contains 30 entries, the oldest entry is scrolled off the end and the newest error is put in position 1 (the first position in the list).

Table 5-59 shows an example of the menu when the log contains entries. The format is:

FIDx yy VS:nnnnnn		ATTN DRV/ACF ttt
aaaa bbbb cccc	-or-	(detailed message)
dddd hh : mm : ss		dddd hh : mm : ss

The volume serial number (or unknown) is listed after the FID number.

Support Data: Twelve hex characters of support data (or a detailed message) are included in the error log.

aaaa	Fault Symptom Code
bbbb	Fault Symptom Code (FSC)
cccc	Model number (c) and microcode link (ccc)

Time Stamp for CE Error Log: A time stamp accompanies each error log entry. It is **not real time** but is **relative time**, and is associated with the approximate number of power-on hours for the card pack that is installed in the machine. When the card pack is replaced, the time stamp is reset to dddd=0000. A clock counter is started with power-on, but is saved each hour in VPD. The times may vary from real “relative time” depending on the number of power cycles taken, and timing between them.

```
dddd  hh  :  mm :  ss
Days  hours  mins  secs
Time is relative power-on time for the card pack installed in this
machine.  It is not real time.  Newest entries are at the top.

EXAMPLE
    DRV          ccc
    LOAD/UNLOAD  ERROR
    0001  05:01:10
```

The ‘’ccc’ in the above example is the number of times, if more than once, that the ATTN message was called out during a 5-second period of time. The error in this example occurred on the 1st day, 5th hour, 1st minute and 10th second in “relative time”.

See “Error Log Analysis Procedure” on page 9-126 for a procedure to assist you in analyzing the error log.

CE FID FE Log Menu

The **FID FE Log** logs a filtered subset of all sense data sent to the host with a FID of **FE**.

Table 5-60 shows an example of the menu when the log contains entries. See “CE Error Log Menu” on page 5-61 for format information. The format is:

```
FID  F0    FID  FF
      aaaa    bbbb    cccc
      dddd  hh:mm:ss
      VOLSER:      nnnnnn
```

See “Error Log Analysis Procedure” on page 9-126 for a procedure to assist you in analyzing the error log.

Table 5-60. CE FID FE Log Menu

Function	Next Menu
Cancel or No Entries	“CE Logs Menu” on page 5-60
CLEAR LOG	“CE Logs Menu” on page 5-60
CURRENT TIMESTAMP dddd hh:mm:ss	“CE Logs Menu” on page 5-60
FID F0 FID FF 3601 3335 22B1 0010 13:05:12 VOLSER: 156M95	“CE Logs Menu” on page 5-60

Cancel Causes the “CE Logs Menu” on page 5-60 to appear

No Entries Indicates that no entries are in the error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CLEAR LOG Allows the CE to erase the error log. This option will only be displayed when there is at least one entry in the error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CURRENT TIMESTAMP Provides a current time stamp in the form **dddd hh:mm:ss**. For a full description of this field, see “Time Stamp for CE Error Log” on page 5-62.

FID yy yy This example indicates a possible fault with the device associated with a FID yy. The 12 characters of support data include the fault symptom codes (aaaa and bbbb), and the model number (c), followed by the microcode link (ccc). A time stamp follows. The last entry is the Volume Serial number. If the Volume Serial number is not known, it will show “UNKNOWN.” Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

Only the last 10 entries in the log are displayed. If a fault is detected and the log contains 10 entries, the oldest entry is dropped from the end and the newest error is put in position 1 (the first position in the list).

CE FID FF Log Menu

The **FID FF Log** logs a filtered subset of all sense data sent to the host with a FID of **FF**.

Table 5-61 shows an example of the menu when the log contains entries. See “CE Error Log Menu” on page 5-61 for format information. The format is:

```
FID  F0    FID  FF
      aaaa    bbbb    cccc
      dddd  hh:mm:ss
```

See “Error Log Analysis Procedure” on page 9-126 for a procedure to assist you in analyzing the error log.

Table 5-61. CE FID FF Log Menu

Function	Next Menu
Cancel or No Entries	“CE Logs Menu” on page 5-60
CLEAR LOG	“CE Logs Menu” on page 5-60
CURRENT TIMESTAMP dddd hh:mm:ss	—
FID A8 FID 96 0062 003D 1AAB 0244 15:34:07	“CE Logs Menu” on page 5-60

Cancel Causes the “CE Logs Menu” on page 5-60 to appear

No Entries Indicates that no entries are in the Error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CLEAR LOG Allows the CE to erase the error log. This option will only be displayed when there is at least one entry in error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CURRENT TIMESTAMP Provides a current time stamp in the form **dddd hh:mm:ss**. For a full description of this field, see “Time Stamp for CE Error Log” on page 5-62.

FID yy yy Provides the FID identifier (yy yy), 12 characters of support data, and the current timestamp. The 12 characters of support data include the fault symptom codes (aaaa, bbbb), the model number (c) and the microcode link (ccc).

Only the last 10 entries in the log are displayed. If a fault is detected and the log contains 10 entries, the oldest entry is scrolled off the end and the newest error is put in position 1 (the first position in the list).

CE Temp Error Log Menu

The **Temp Log** logs a filtered subset of all sense data sent to the host with a sense key of **1**. The Temp error log was implemented in EC F25981, code link level D0IE_2C3. Some of the PFE levels with D0IE_2C3+ do not have this change.

Table 5-62 shows an example of the menu when the log contains entries. See “CE Error Log Menu” on page 5-61 for format information. The format is:

```
FID  F0    FID  FF
      aaaa    bbbb    cccc
      dddd  hh:mm:ss
      VOLSER:      nnnnnn
```

See “Error Log Analysis Procedure” on page 9-126 for a procedure to assist you in analyzing the error log.

Table 5-62. CE Temp Error Log Menu

Function	Next Menu
Cancel or No Entries	“CE Logs Menu” on page 5-60
CLEAR LOG	“CE Logs Menu” on page 5-60
CURRENT TIMESTAMP dddd hh:mm:ss	“CE Logs Menu” on page 5-60
FID F1 FID FF 3626 3341 22C3 0021 08:00:05 VOLSER: UNKNOWN	“CE Logs Menu” on page 5-60

Cancel
Causes the “CE Logs Menu” on page 5-60 to appear

No Entries
Indicates that no entries are in the Error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CLEAR LOG
Allows the CE to erase the error log. This option will only be displayed when there is at least one entry in error log. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

CURRENT TIMESTAMP
Provides a current time stamp in the form **dddd hh:mm:ss**. For a full description of this field, see “Time Stamp for CE Error Log” on page 5-62

FID yy yy
Provides the FID identifier (yy yy), 12 characters of support data, and the current timestamp. The 12 characters of support data include the fault symptom codes (aaaa, bbbb), the model number (c) and the microcode link (ccc). A time stamp follows. The last entry is the Volume Serial number. If the Volume Serial number is not known, it will show “UNKNOWN”. Choosing this option causes “CE Logs Menu” on page 5-60 to appear.

Only the last 10 entries in the log are displayed. If a fault is detected and the log contains 10 entries, the oldest entry is scrolled off the end and the newest error is put in position 1 (the first position in the list).

CE Utilities Menu

Table 5-63 shows the Utilities menu.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-63. CE Utilities Menu

Function	Next Menu
Cancel	“CE Options Menu” on page 5-38
Disp Sensors	“CE Disp Sensors Menu” on page 5-67
Disp/Alt VPD...	“CE Disp/Alt VPD Menu” on page 5-68
Control Store...	“CE Control Store Select Address Menu” on page 5-70
Microcode Trap...	“CE Microcode Trap Menu” on page 5-71
Read Tape...	“CE Read Tape Menu” on page 5-72
Engr Use Only...	“Password Menu” on page 5-75
Show Statistics...	“Statistics Menu” on page 5-79
OEM Use Only...	“Password Menu” on page 5-75
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the “CE Options Menu” on page 5-38 to appear

Disp Sensors Causes the “CE Disp Sensors Menu” on page 5-67 to appear which allows the CE to exercise most of the sensors in the device and observe feedback as to their operation.

Disp/Alt VPD Allows the CE to display or change the vital product data (VPD). Changing the VPD should only be done with assistance from support personnel.

Control Store Allows the CE to read any address in nonvolatile storage and control store

Microcode Trap Allows the CE to set a specific FSC trap (error code match) in microcode to force a microcode dump

Read Tape Allows the CE to display a portion of the data on the tape

Engr Use Only Allows support personnel to access selected utilities

Show Statistics Allow the CE to display internal counts of activities

OEM Use Only Allows OEM support personnel to customize VPD data

CE Disp Sensors Menu

Table 5-64 shows the Disp Sensors menu. This menu allows the CE to view the state of the ACF and drive sensors, and to change the states dynamically. A delay of approximately one second is required between sensor state changes.

Table 5-64. CE Disp Sensors Menu

Function	Next Menu
CANCEL	"CE Utilities Menu" on page 5-66
A:1 B:1	Display pantocam A and B sensor states
TU:1 DO:1	Display loader tray up and door open states
CP:1	Display loader cartridge present sensor states **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp, see "FID E4: Card Pack" on page 10-67. Verify the sensor operation by flexing the cable while running "Display Sensors Procedure" on page 9-35. If the cable is bad, replace the Drive FRU. See "FID E4: Card Pack" on page 10-67.
FP:0 CT:0000	Display loader file protect sensor; cartridge type sensor states
PS:1 MP:0 ML:0	Model B11/E11/H11 only. Display priority slot, magazine present, and magazine loaded sensor states
GI:0 GCP:1	Model B11/E11/H11 only. Display global interference sensor and global cartridge present sensor states
P1:1 P2:0 IM:0	Model B11/E11/H11 only. Display ACF pinch 1 & 2, import sensor states
L1:1 L2:0 EX:0	Model B11/E11/H11 only. Display ACF limit 1 & 2, export sensor states
A1:1 B:1	Model B11/E11/H11 only. Display ACF elevator servo A & B sensor states
SN:0	Model B1A/E1A/H1A with library interface card (LIC) only. Model B1A/E1A/H1A without the library interface card or those with STL0 cards **do not** display this sensor.

Note: The values shown for each sensor will vary on your machine depending upon whether a cartridge is loaded and other conditions. For more information, see "Display Sensors Procedure" on page 9-35.

CE Disp/Alt VPD Menu

Table 5-65 shows the Disp/Alt VPD menu. This menu allows the CE to select the vital product data (VPD) group that contains the specific VPD field to be displayed or altered. You can display all the contents in each of the groups, but can alter some of the contents in only the flash group.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-65. CE Disp/Alt VPD Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Ucode Grp	"CE Group Name Menu"
Head Grp	"CE Group Name Menu"
Processor Grp	"CE Group Name Menu"
DRAM Grp	"CE Group Name Menu"
Flash Grp	"CE Group Name Menu"

Notes:
1. Supplemental Message Line 1: **Select VPD field**
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

Ucode Grp The link level and size of the microcode

Head Grp The initial position sensor (IPS) gain settings, plant of manufacture, and serial number of the read/write head

Processor Grp The type of processor in the card pack

Dram Grp The EC levels of the module. These fields are only maintained in DRAM, not in flash EPROM or in the microcode.

Flash Grp The SCSI addresses, the ACF mode, and the other setup choices you can make from the operator/CE panel (the dynamic information). This information is in flash EEPROM.

CE Group Name Menu

Table 5-66 shows the Group Name menu. This menu allows the CE to select a VPD field to display or alter.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-66. CE Group Name Menu

Function	Next Menu
Cancel	"CE Disp/Alt VPD Menu"
<VPD field i>	"CE VPD Field Offset Menu" on page 5-69 or "CE VPD Data Menu" on page 5-69
<VPD field i+1>	"CE VPD Field Offset Menu" on page 5-69 or "CE VPD Data Menu" on page 5-69
...	"CE VPD Field Offset Menu" on page 5-69 or "CE VPD Data Menu" on page 5-69
<VPD field i+n>	"CE VPD Field Offset Menu" on page 5-69 or "CE VPD Data Menu" on page 5-69

Notes:
1. Supplemental Message Line 1: **Select VPD Field**
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE Disp/Alt VPD Menu" to appear. If any of the VPD options have been updated, the **CE WAIT** message may be displayed momentarily while the Flash memory is being rewritten.

VPD field Causes the selected VPD field to appear. If the VPD field selected is large, the VPD Field Offset menu is displayed. Otherwise, the VPD data menu is displayed.

CE VPD Field Offset Menu

Table 5-67 shows the VPD Field Offset menu. This menu selects the number of bytes to skip (bytes to not display) in the VPD field chosen at “CE Group Name Menu” on page 5-68.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-67. CE VPD Field Offset Menu

Function	Next Menu
Cancel	“CE Group Name Menu” on page 5-68
0	“CE VPD Data Menu”
1	“CE VPD Data Menu”
...	“CE VPD Data Menu”
Notes: 1. Supplemental Message Line 1: <VPD Field> 2. Supplemental Message Line 2: **Field Protected** (conditional)	

Cancel Causes the “CE Group Name Menu” on page 5-68 to appear

<number> Allows the CE to select an offset in the VPD field. After you select a number, “CE VPD Data Menu” is displayed.

Note: The message **Field Protected** is informing the CE that the VPD field just selected is displayed, but cannot be modified.

CE VPD Data Menu

Table 5-68 shows the VPD Data menu. This menu allows the CE to modify any character in the selected offset for the selected VPD field.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-68. CE VPD Data Menu

Function	Next Menu
Cancel	“CE VPD Field Offset Menu” or “CE Group Name Menu” on page 5-68 or “OEM Use Only Menu” on page 5-78
<VPD offset high nibble>	—
<VPD offset next nibble>	—
<VPD offset next nibble>	—
<VPD offset low nibble>	—
Save and Continue	“CE Verify Data Menu” on page 5-70
Notes: 1. Supplemental Message Line 1: <VPD Field> <VPD Offset> 2. Supplemental Message Line 2: **Field protected** (conditional)	

Cancel Causes the “CE VPD Field Offset Menu” to appear if an offset is required. If offset is not required, “CE Group Name Menu” on page 5-68 or “OEM Use Only Menu” on page 5-78 appears. Any changes to VPD Data are **not** saved.

<VPD nibble> Shows the data (hex number) contained in the selected VPD field for the offset selected. The CE can select another value for that nibble.

Save and Continue Causes the “CE Verify Data Menu” on page 5-70 to appear. This option is invalid if the VPD field is protected.

CE Verify Data Menu

Table 5-69 shows the Verify Data menu. This menu allows the CE to check and verify the VPD entered before the data is stored in nonvolatile storage.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-69. CE Verify Data Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Yes	"CE Utilities Menu" on page 5-66
No	"CE VPD Data Menu" on page 5-69
Notes: 1. Supplemental Message Line 1: <VPD Name> <VPD Offset> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear. The VPD data is not modified.

Yes Causes the verified data to be stored in nonvolatile storage, then causes the "CE Utilities Menu" on page 5-66 to appear

No Causes the "CE VPD Data Menu" on page 5-69 to appear. The VPD data is not modified

CE Control Store Select Address Menu

Table 5-70 shows the Control Store Select Address menu. This menu allows the CE to select an address in control store. The byte is read from the selected address. The message line indicates that the control store option was selected on the previous screen.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-70. CE Control Store Select Address Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
CS Adr (8 characters displayed vertically)	—
Continue	"CE Control Store Display Menu" on page 5-71
Notes: 1. Supplemental Message Line 1: **Control store** 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

<CS Adr> Defines the address to be chosen. To change the value of the nibble, select the nibble, which causes a new menu to appear where you can select 0–F.

Continue Takes the address displayed and goes to "CE Control Store Display Menu" on page 5-71

CE Control Store Display Menu

Table 5-71 shows the Control Store Display menu. This menu allows the CE to display the byte in the specified address. The message line indicates the current control store address and value.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-71. CE Control Store Display Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Scroll Up	—
<CS Adr+0> <CS Data>	—
<CS Adr+4> <CS Data>	—
<CS Adr+8> <CS Data>	—
<CS Adr+...><CS Data>	—
Scroll Down	—
Notes: 1. Supplemental Message Line 1: **CS Adrs: <CS Adrs>** 2. Supplemental Message Line 2: **CS Value: <CS Data>**	

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear
Scroll Up Causes previous addresses to be displayed (scrolling up through memory)
<CS Adr> <data> Shows data contained in word starting at the specified address, causes the "CE Control Store Select Address Menu" on page 5-70 to appear
Scroll Down Causes next address to be displayed (scrolling down through memory)

CE Microcode Trap Menu

Table 5-72 shows the Microcode Trap menu. This menu allows the CE to set a specific trap in microcode to force a microcode dump.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-72. CE Microcode Trap Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Trap (4 characters displayed vertically)	—
Add FSC Trap	—
Remove FSC Trap	—
List FSC Traps	"CE FSC Trap List Menu" on page 5-85
Saved Traps	"CE Saved Traps Menu" on page 5-72
Notes: 1. Supplemental Message Line 1: Trap set, Trap removed, or Select FSC 2. Supplemental Message Line 2: <none>	

Cancel Causes "CE Utilities Menu" on page 5-66 to appear. Address is not saved.
Trap Allows CE to select a specific hex value. To change value of nibble, select nibble, which causes a new menu to appear where you can select 0–F.
Add FSC Trap Allows the CE to add an FSC trap
Remove FSC Trap Allows the CE to remove an FSC trap
List FSC Traps Causes all FSC traps to be displayed in "CE FSC Trap List Menu" on page 5-85
Saved Traps Causes the "CE Saved Traps Menu" on page 5-72 to appear

CE Saved Traps Menu

Table 5-73 shows the Saved Traps menu.

This menu allows the CE to add, remove or list **saved** FSC traps.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-73. CE Saved Traps Menu

Function	Next Menu
Cancel	"CE Microcode Trap Menu" on page 5-71
Trap (4 characters displayed vertically)	—
Add Saved FSC Trap	—
Rmv Saved FSC Traps	—
List Saved FSC Traps	"CE Saved FSC Trap List Menu" on page 5-84
Notes: 1. Supplemental Message Line 1: Trap set, Trap remove, or Select FSC 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Microcode Trap Menu" on page 5-71 to appear. The address is not saved.

Trap Allows the CE to select a specific hex value. To change the value of the nibble, select the nibble, which causes a pop-up menu to appear where you can select 0–F.

Add Saved FSC Trap Allows the CE to add a Saved FSC trap

Rmv Saved FSC Traps Allows the CE to remove a Saved FSC trap

List Saved FSC Traps Causes the "CE Saved FSC Trap List Menu" on page 5-84 to be displayed

CE Read Tape Menu

Table 5-74 shows the Read Tape menu. This menu allows the CE to select portions of the tape to be displayed on the operator/CE panel.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-74. CE Read Tape Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Show SARS Volser	—
Process Loaded Tape	"CE Process Tape Menu" on page 5-73
Unload Drive	—
Start	—
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

Show SARS Volser Displays SARS Volser

Process Loaded Tape Allows CE to move and read tape

Unload Drive Allows the CE to unload the cartridge from the drive

Start Enables ACF on a Model B11/E11/H11. Function cannot be selected on a Model B1A/E1A/H1A.

CE Process Tape Menu

Table 5-75 shows the Process Tape menu. This menu allows the CE to select portions of the tape to be displayed on the operator/CE panel.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-75. CE Process Tape Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Space	"Space Menu" on page 5-74
Locate	—
Read Block	"Read Block Menu" on page 5-74
Next Block ID	"Next Block ID Menu" on page 5-75

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear
Space Allows CE to move to different parts of tape
Locate Allows the CE to locate to any block on the tape
Read Block Allows the CE to read data or header info from tape
Next Block ID Displays the next block ID on tape

Space Menu

Table 5-76 shows the Space menu. This menu allows the CE to select portions of the tape to be displayed on the operator/CE panel.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-76. Space Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Space FRWD BLK	number of blocks
Space BKWD BLK	number of blocks
Space FRWD File	number of files
Space BKWD File	number of files
Space EOD	—
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear
Space FRWD BLK Allows CE to space forward on tape the number of blocks specified
Space BKWD BLK Allows CE to space backward on tape the number of blocks specified
Space FRWD File Allows CE to space forward on tape the number of files specified
Space BKWD File Allows CE to space backward on tape the number of files specified
Space EOD Allows CE to space to the end of data

Read Block Menu

Table 5-77 shows the Read Block menu. This menu allows the CE to do a read block command.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-77. Read Block Menu

Function	Next Menu
Read Blk Data	—
Read Blk HDR	—
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Read BLK Data Displays the first 80 characters of blocks data. At bottom of menu, you can go to next 80 character and up to 16K.
Read BLK HDR Displays the first 80 characters of blocks header. By scrolling down, you can display the next 16 characters.

Next Block ID Menu

Table 5-78 shows the Next Block ID menu This menu allows the CE to show the next block id.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-78. Next Block ID Menu

Function	Next Menu
Next Block ID :xxxxxxxx	—
Notes: 1. Supplemental Message Line 1: <none> 2. Supplemental Message Line 2: <none>	

Next Block ID Displays the next blocks ID

Password Menu

Table 5-79 shows the Password menu.

This menu is displayed when Engr Use Only or OEM Use Only is chosen from the “CE Utilities Menu” on page 5-66. If the correct password is entered, the “Engr Use Only Menu” on page 5-76 or the “OEM Use Only Menu” on page 5-78 appears.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-79. Password Menu

Function	Next Menu
Cancel	Previous menu
A...	—
Z...	—
0...	—
9	—
Notes: 1. Supplemental Message Line 1: **Password:** 2. Supplemental Message Line 2: <password>	

Cancel Causes the previous menu to appear (see Figure 5-8 on page 5-17)

<character> Indicates the current character to be entered into the password. When this option is chosen, the character selected is entered into the password and displayed in the message area. After the last letter is entered and the password is correct, the “Engr Use Only Menu” on page 5-76, or “Media Test Mode Menu” on page 5-77, or “OEM Use Only Menu” on page 5-78 is displayed, depending on which path was used to access this menu. See Figure 5-8 on page 5-17 for more detail. If the password is not correct, the previous menu appears. See Figure 5-8 on page 5-17 for linkage.

The message area indicates that a password is being entered. Every character entered in the password field is displayed in the message area.

Engr Use Only Menu

Table 5-80 shows the Engr Use Only menu. This menu allows Engineering to access the menu items, after entering the password.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-80. (CE) Engr Use Only Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Control Store...	"Control Store Select Address Menu" on page 5-80
Media Test Mode	"Password Menu" on page 5-75
Allow Alter PVPD	—

Notes:
1. Supplemental Message Line 1: **Caution:**
2. Supplemental Message Line 2: **data may be lost**

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

Control Store Allows Engineering to read and write any address in nonvolatile store and in control store DRAM.

Attention: The message area warns that damage can occur to the machine. The machine can be configured improperly and made inoperable with this option.

Media Test Mode Causes the password menu to appear. After you enter the password in "Password Menu" on page 5-75, "Media Test Mode Menu" on page 5-77 allows you to set media mode.

Allow Alter PVPD Conditions the microcode to allow access and altering of the privileged vital product data

H SARS Config Menu

Table 5-81 shows the H SARS Configuration menu. This menu allows service representatives and engineering staff to display the H SARS Configuration after entering the password.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-81. H SARS Config Menu

Function	Next Menu
Cancel	Table 5-80
Disable HSARS	—
Temp and Perm Chk	—
Temp, Perm, Tens Chk	—

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

Media Mode Off/On Allows Engineering to set Media Mode OFF or ON. The default is *OFF*. When this option is set to **ON**, the drive is placed in a special mode to test the media. Any media written in this mode can only be read by a device in media mode. If the device reading the media is not in media mode, the cartridge appears as a scratch.

Normal/Short Clean Cycle Allows Engineering to set the cleaning cycle to normal or short

Allow/Prev Export Tape Allows Engineering to allow or prevent the export of a tape

V SARS Config Menu

Table 5-82 on page 5-77 shows the V SARS Configuration menu. This menu allows Engineering, after entering the password, to display and configure the V SARS area.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-82. V SARS Config Menu

Function	Next Menu
Cancel	Table 5-80 on page 5-76
Disable V SARS	—
Perm Err Chk Only	—
Temp and Perm Chk	—
WRT Prot Bad Tapes	—

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

Media Mode Off/On Allows Engineering to set Media Mode OFF or ON. The default is *OFF*. When this option is set to **ON**, the drive is placed in a special mode to test the media. Any media written in this mode can only be read by a device in media mode. If the device reading the media is not in media mode, the cartridge appears as a scratch.

Normal/Short Clean Cycle Allows Engineering to set the cleaning cycle to normal or short

Allow/Prev Export Tape Allows Engineering to allow or prevent the export of a tape

Media Test Mode Menu

Table 5-83 shows the Media Test mode menu. This menu allows Engineering, after entering the password, to initiate special media test algorithms.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-83. Media Test Mode Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
Media Mode **Off**/On	—
Normal/Quick Clean Cycle	—
Allow/Prev Export Tape	—
Tape Wipe **Disabled**/Enabled	—
Normal/Quick Load Mode	—

Cancel Causes the "CE Utilities Menu" on page 5-66 to appear

Media Mode Off/On Allows Engineering to set Media Mode OFF or ON. When this option is set to **On**, the drive is placed in a special mode to test the media. Any media written in this mode can only be read by a device in media mode. If the device reading the media is not in media mode, the cartridge appears as a scratch. The default is *Off*.

Normal/Quick Clean Cycle Allows Engineering to set the cleaning cycle to normal or quick. The default is *Normal*.

Allow/Prev Export Tape Allows Engineering to allow or prevent the export of a tape. The default is *Allow*.

Tape Wipe Disabled/Enabled Allows Engineering to enable or disable the tape-wipe function.The default is *Disabled*.

Normal/Quick Load Mode Allows Engineering to choose between a normal load speed or a quick load speed. The default is *Normal*.

OEM Use Only Menu

Table 5-84 shows the OEM Use Only menu. This menu allows OEM support personnel to access the menu items, after entering the password.

Table 5-84. OEM Use Only Menu

Function	Next Menu
Cancel	“CE Utilities Menu” on page 5-66
Manufacturer	“CE VPD Data Menu” on page 5-69
Drive Type	“CE VPD Field Offset Menu” on page 5-69
Drive Model Num	“CE VPD Data Menu” on page 5-69
Save Changes	—

Notes:
1. Supplemental Message Line 1: <none>
2. Supplemental Message Line 2: <none>

Cancel Causes the “CE Utilities Menu” on page 5-66 to appear

Manufacturer Allows OEM support personnel to customize the **manufacturer** field in the VPD Data menu

Drive Type Allows OEM support personnel to customize the **drive type** field, using the VPD Field Offset menu and the VPD Data menu

Drive Model Num Allows OEM support personnel to customize the **drive model number** field in the VPD Data menu

Save Changes Stores the changes into nonvolatile storage (NVS)

Statistics Menu

Table 5-85 shows part of the Statistics menu.

Notes:

1. In later levels of microcode the statistics are shown in decimal instead of hexadecimal format.
2. Statistics are valid only if the *Save* option is selected in "Statistics Menu" on page 5-31.

Table 5-85. Statistics Menu

Function	Next Menu
Cancel	"CE Utilities Menu" on page 5-66
See below for complete list	"Statistics Menu"
Note: Supplemental Message Lines: <none>	

All functions are from the ACF *transport*. For example, **Put Mag Fail** is a failure when the cartridge is moved from the *transport* to the magazine.

Cancel Causes the "Statistics Menu" on page 5-31 to appear

Mounts to Drv The total number of times a cartridge was mounted in the drive

Priority Mnts The total number of times a cartridge was mounted from the priority cell

Magazine Mnts Total number of times a cartridge was mounted from any cell of the magazine

Clean Mounts The total number of times a cleaning cartridge was loaded in the device

Pwr On Hrs Displays the total number of hours the device was powered ON

Note: When the card pack is replaced, the Power On Hrs (time stamp) is automatically reset to dddd = 0000.

ACF Errors The total number of errors that occurred on ACF operations

Put Drive Fail The total number of errors that occurred when a cartridge was inserted in the drive

Get Drive Fail Total number of errors that occurred when a cartridge was being removed from drive

Pinch Mtr Err The total number of timeouts on the motor

Feed Mtr Error The total number of timeouts on the motor

Elevator Error The total number of timeouts on the motor

Cell to Cell The total number of times cartridges were moved to or from any cells or to or from the drive

Recalibrations The total number of times the transport had to be recalibrated

Put Mag Fail Total number of errors that occurred when a cartridge was inserted in magazine

Get Mag Fail Total number of errors that occurred when a cartridge was being taken from magazine

Put Pri Fail Total number of errors that occurred when a cartridge was being inserted in priority cell

Get Pri Fail Total number of errors that occurred when a cartridge was being retrieved from priority cell

Get Mag Retry The total number of errors that required a retry operation when a cartridge was being retrieved from a magazine or priority cell (from the front of the ACF)

Put Mag Retry The total number of errors that required a retry operation when a cartridge was being put into the magazine or priority cell (from the front of the ACF)

Get Dri Retry The total number of errors that required a retry operation when a cartridge was being retrieved from the drive

Put Dri Retry The total number of errors that required a retry operation when a cartridge was being put into the drive

Control Store Select Address Menu

Table 5-86 shows the Control Store Select Address menu. This menu allows the CE to select an address in control store. Data is written into the selected address. The message line indicates that the Control Store option was chosen on the previous screen.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-86. Control Store Select Address Menu

	Next Menu
Cancel	"Engr Use Only Menu" on page 5-76
CS Adr (8 characters displayed vertically)	—
Continue	"Control Store Alter Menu"
Notes: 1. Supplemental Message Line 1: **Utilities** 2. Supplemental Message Line 2: **Control Store**	

Cancel Causes the "Engr Use Only Menu" on page 5-76 to appear

CS Adr Defines the hex address to be chosen. To change the value of the nibble, select the nibble, which causes a pop-up menu to appear where you can select 0–F.

Continue Takes the address displayed and goes to "Control Store Alter Menu"

Control Store Alter Menu

Table 5-87 shows the Control Store Alter menu. This menu allows a PE to display the byte in the specified address and to update the data in that address. The message lines indicate the control store address selected and indicates the value at that address.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-87. Control Store Alter Menu

Function	**Next Menu**
Cancel	"Control Store Select Address Menu"
<CS Addrss><CS Data>	—
<CS hi nibble>	—
<CS low nibble>	—
Save and Return	"Control Store Select Address Menu"
Notes: 1. Supplemental Message Line 1: **CS Addr:** <CS Addr> 2. Supplemental Message Line 2: **CS Val:** <CS Data>	

Cancel Causes the "Control Store Select Address Menu" to appear. Any modifications to the byte are canceled.

<address> <data>

Shows the data contained in the word (4 bytes) selected. This display cannot be selected and is for information purposes only.

<CS nibble> Shows the current nibble (hex number) in the byte selected. To change the value of the nibble, select the nibble, which causes a pop-up menu to appear where you can select 0–F.

Save and Return Saves the updated byte in the address and returns to the "Control Store Select Address Menu"

CE Drive Features Menu

Table 5-88 shows the Drive Features menu.

This menu allows the CE to specify the configuration into which the drive is being installed.

Table 5-88. CE Drive Features Menu

Function	Next Menu
Cancel	"CE Drive Options Menu" on page 5-52
Model B11/E11/H11 Rack/Frame	—
Model B1A/E1A/H1A 3494 RS422 Att	—
Model B1A/E1A/H1A C12/C14	"CE Model B1A/E1A/H1A C12/C14 Menu" on page 5-82
Model B1A/E1A/H1A no RS422 Attach	—
Model B11/E11/H11 Deskside ACF	—
Model B1A/E1A/H1A Deskside	—
Model B1A/E1A/H1A Interface A	—
Model B1A/E1A/H1A Interface B	—

Notes:
1. Supplemental Message Line 1: **When done, select**
2. Supplemental Message Line 2: **CANCEL option**

Cancel Causes the "CE Drive Options Menu" on page 5-52 to appear

Model B11/E11/H11 Rack/Frame

CE must select this option if the drive is a Model B11/E11/H11 being installed in a rack or frame. Selecting this option also tells the drive what model number it is. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

Model B1A/E1A/H1A 3494 RS422 Att

CE must select this option if the drive is a Model B1A/E1A/H1A being installed in a 3494 tape library. Specifying this option also tells the drive what model number it is. The drive is attached to the library manager via the RS422 port. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

Model B1A/E1A/H1A C12/C14

Go to "CE Model B1A/E1A/H1A C12/C14 Menu" on page 5-82.

Model B1A/E1A/H1A No RS422 Attach

CE must select this option if the drive is a Model B1A/E1A/H1A without the RS422 hooked up. This could be the case in a 3494 tape library that contains a ESCON controller in a Model A14 frame. Specifying this option also tells the drive what model number it is. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

Model B11/E11/H11 Deskside ACF

Select this option if the drive is a Model B11/E11/H11 with a deskside model which has an ACF. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

Model B1A/E1A/H1A Deskside

Select this option if the drive is a Model B1A/E1A/H1A and is a deskside

model. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

Model B1A/E1A/H1A Interface A

CE must select this option if the drive is a Model B1A/E1A/H1A being installed in a non-IBM tape library which uses a 3494-like protocol. Specifying this option will also tell the drive what model number it is. The drive is attached to the library via the RS422 port. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

Model B1A/E1A/H1A Interface B

CE must select this option if the drive is a Model B1A/E1A/H1A being installed in a non-IBM tape library which uses the OEM protocol for the RS422 port. Selecting this option will also tell the drive what model number it is. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

CE Model B1A/E1A/H1A C12/C14 Menu

Table 5-89 shows the Model B1A/E1A/H1A C12/C14 menu.

This menu allows the CE to specify that the drive is being installed into a C12/C14 environment.

Table 5-89. CE B1A/E1A/H1A C12/C14 Menu

Function	Next Menu
Cancel	“CE Drive Features Menu” on page 5-81
Auto Clean On/Off	—
DRV Emulation	Go to “CE DRV Emulation Menu” on page 5-83

Cancel
Causes the “CE Drive Features Menu” on page 5-81 to appear

Auto Clean On/Off
CE must set this option to ON if the drive is to be automatically cleaned. If set to Off, the drive will not be automatically cleaned. For more information, see *IBM TotalStorage Silo—Compatible Tape Frame Model C12 Introduction, Planning, and User’s Guide*, Document Number GA32-0366, or the Install section of this manual. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

DRV Emulation
CE must set this option to set the condition to emulate a 4480, 4490, SD-3 or 9490, or to reset emulation mode. If this option is selected, the “CE DRV Emulation Menu” on page 5-83 will appear.

CE DRV Emulation Menu

Table 5-90 shows the CE DRV Emulation menu.

This menu allows the CE to specify that the drive is to emulate a 4480, 4490, SD-3 or 9490, or no emulation at all.

Table 5-90. CE DRV Emulation Menu

Function	Next Menu
Cancel	"CE Model B1A/E1A/H1A C12/C14 Menu" on page 5-82
No Emulation	—
4480	—
4490	—
SD-3	—
9490	—

Cancel Causes the "CE Model B1A/E1A/H1A C12/C14 Menu" on page 5-82 to appear

No Emulation **Do not select this option.** The C12/C14 Host microcode does not interface with the 3590 drive type. All 3590 drives installed in a C12/C14 library must emulate one of the STK drive types.

4480 CE must set this option if the B1A is to emulate a 4480 drive. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

4490 CE must set this option if the B1A is to emulate a 4490 drive. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

SD-3 CE must set this option if the B1A is to emulate a SD-3 drive. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

9490 CE must set this option if the B1A is to emulate a 9490 drive. This option will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

CE Saved FSC Trap List Menu

Table 5-91 shows the Saved FSC Trap List menu.

This menu allows the CE to select a saved FSC to be removed from a list of **saved** FSC traps.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-91. Saved FSC Trap List Menu

Function	Next Menu
Cancel	"CE Saved Traps Menu" on page 5-72
Saved FSC1	"CE Remove Saved FSC Trap Menu" on page 5-85
Saved FSC2	"CE Remove Saved FSC Trap Menu" on page 5-85
Saved FSC3	"CE Remove Saved FSC Trap Menu" on page 5-85
Notes: 1. Supplemental Message Line 1: Trap set, Trap remove, or Select FSC 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Saved Traps Menu" on page 5-72 to appear

Saved FSC1 Selecting this FSC will cause "CE Remove Saved FSC Trap Menu" on page 5-85 to be displayed. If no saved trap exists, then "SLOT EMPTY" will be displayed.

Saved FSC2 Selecting this FSC will cause "CE Remove Saved FSC Trap Menu" on page 5-85 to be displayed. If no saved trap exists, then "SLOT EMPTY" will be displayed.

Saved FSC3 Selecting this FSC will cause "CE Remove Saved FSC Trap Menu" on page 5-85 to be displayed. If no saved trap exists, then "SLOT EMPTY" will be displayed.

Note: Only **three saved** traps can be active at a time.

CE Remove Saved FSC Trap Menu

Table 5-92 shows the Remove Saved FSC Trap menu.

This menu allows the CE to remove a **saved** FSC trap which was selected in "CE Saved FSC Trap List Menu" on page 5-84.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-92. Remove Saved FSC Trap Menu

Function	Next Menu
Cancel	"CE Saved Traps Menu" on page 5-72
Trap (4 characters displayed vertically)	—
Rmv Saved FSC Trap	—
Notes: 1. Supplemental Message Line 1: Trap set, Trap remove, or Select FSC 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Saved Traps Menu" on page 5-72 to appear

Trap Allows the CE to select a specific hex value. To change the value of the nibble, select the nibble, which causes a pop-up menu to appear where you can select 0–F.

Rmv Saved FSC Trap Allows the CE to remove the Saved FSC trap which was selected in the previous menu "CE Saved FSC Trap List Menu" on page 5-84

CE FSC Trap List Menu

Table 5-93 shows the FSC Trap List menu.

This menu allows the CE to select a (normal) FSC to be removed from a list of (normal) FSC traps.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-93. FSC Trap List Menu

Function	Next Menu
Cancel	"CE Microcode Trap Menu" on page 5-71
FSC1 (normal trap)	"CE Remove FSC Trap Menu" on page 5-86
FSC2 (normal trap)	"CE Remove FSC Trap Menu" on page 5-86
.... (normal trap)	"CE Remove FSC Trap Menu" on page 5-86
Notes: 1. Supplemental Message Line 1: Trap set, Trap remove, or Select FSC 2. Supplemental Message Line 2: <none>	

Cancel Causes the "CE Microcode Trap Menu" on page 5-71 to appear

FSC1 Selecting this FSC will cause "CE Remove FSC Trap Menu" on page 5-86 to be displayed

FSC2 Selecting this FSC will cause "CE Remove FSC Trap Menu" on page 5-86 to be displayed

.... Selecting this FSC will cause "CE Remove FSC Trap Menu" on page 5-86 to be displayed

Notes:

1. If no traps exist, then "NO TRAPS SET" is displayed.
2. More than three FSCs may be displayed on this menu.

CE Remove FSC Trap Menu

Table 5-94 shows the Remove FSC Trap menu.

This menu allows the CE to remove a (normal) FSC trap which was selected in “CE FSC Trap List Menu” on page 5-85.

Note: This menu is normally used because of specific requests from support personnel.

Table 5-94. CE Remove FSC Trap Menu

Function	Next Menu
Cancel	“CE Microcode Trap Menu” on page 5-71
Trap (4 characters displayed vertically)	—
Remove FSC Trap	—
Notes: 1. Supplemental Message Line 1: Trap set, Trap remove, or Select FSC 2. Supplemental Message Line 2: <none>	

Cancel Causes the “CE Microcode Trap Menu” on page 5-71 to appear

Trap Allows the CE to select a specific hex value. To change the value of the nibble, select the nibble, which causes a pop-up menu to appear where you can select 0–F.

Remove FSC Trap Allows the CE to remove the (normal) FSC trap which was selected in the previous menu “CE FSC Trap List Menu” on page 5-85

Chapter 6. Automatic Cartridge Facility

Contents

ACF Description

The ACF magazine, P/N 39F4762, weighs 0.68 kg (1.5 lb) and each cartridge weighs 0.23 kg (0.5 lb). Figure 6-1 on page 6-3 shows the automatic cartridge facility with a magazine installed. The ACF is attached to the tape drive mechanism.

ACF Functions

The mechanical functions of the ACF (shown in Figure 6-1) are:

- The operator/CE panel **1** is a located on top of the front bezel above the ACF. The operator/CE panel is movable for easier viewing by the operator.

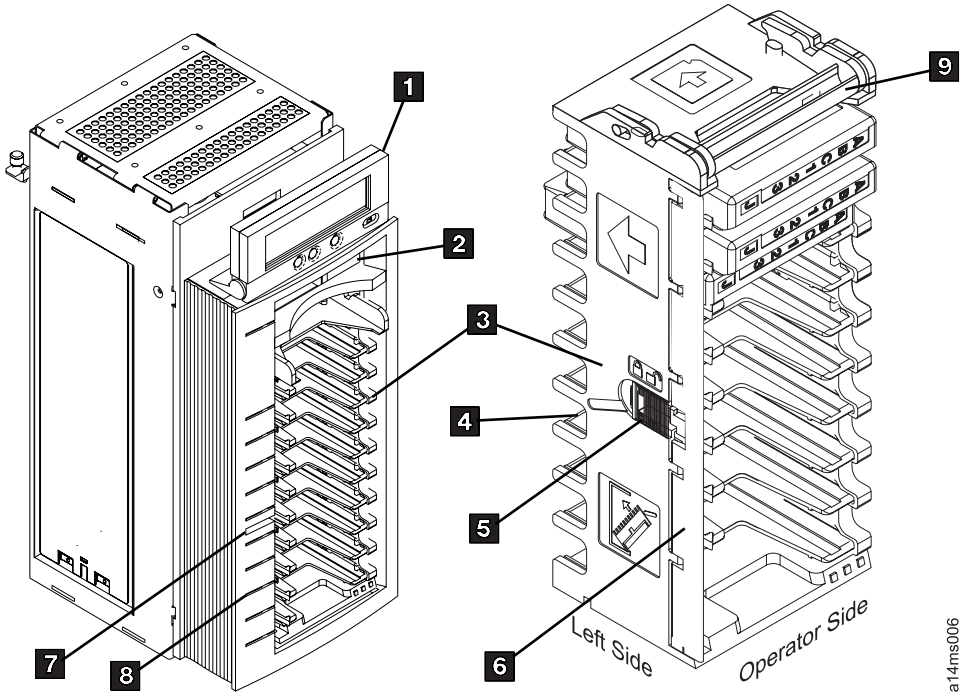


Figure 6-1. 3590 ACF and Magazine

- The magazine **3** has a capacity of ten cartridges that can be inserted and removed by hand.

  There is also a priority cell **2** in the ACF. A single cartridge may be inserted into the priority cell import position allowing the ACF to process eleven cartridges.
- The magazine handle **9** is used to insert and to remove the magazine in the ACF. See “Inserting and Removing Magazine” on page 6-7. The magazine handle also is used for transporting the magazine.

  Note: Do not touch the handle during operations. Doing so may cause job interruptions.
- A magazine cartridge lock **5** that the operator can use to open or lock the door **6** . The magazine cartridge lock should be locked (door locked) for random mode and for transportation of the magazine. The magazine cartridge lock should be in the locked position when cartridges are present and should be unlocked (door unlocked) when loading cartridges. When the magazine is inserted into the ACF the cartridges are automatically unlocked and ready to be accessed depending on the operational mode selected. By pushing in the lock button **7** , to the detent/lock position the operator can lock cartridges in the magazine when the magazine is in the ACF.
- A magazine LED **8** indicates that a cartridge occupies a slot.

ACF Components

See Figure 6-2.

The ACF 3 attaches to the deck enclosure 2 with two alignment pins, two hooks, and one captive screw.

The main components of the ACF are the:

- Transport assembly 7 . It delivers cartridges from the magazine or priority cell to the loader 1 , which is located in the deck enclosure. After the cartridge is processed, it is returned to the magazine or priority cell by the transport assembly.
- Magazine assembly 6 . Contains ten cells for storing cartridges to be processed.
- Priority cell 5 . An additional storage cell for inputting a single cartridge.
- Operator/CE display 4 , which is mounted in a holder on top of the ACF.

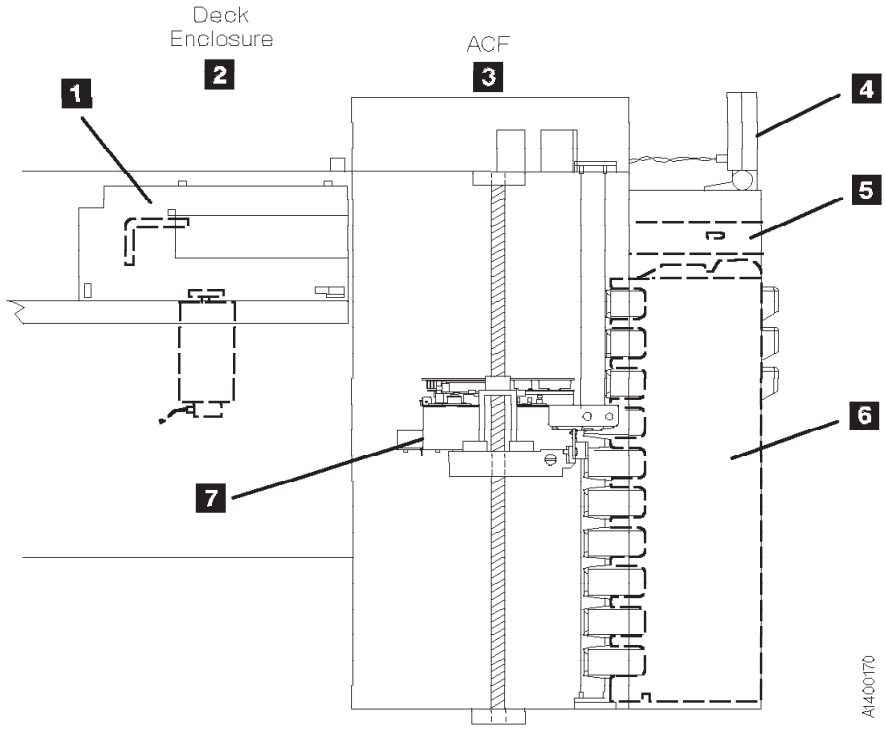


Figure 6-2. ACF and Deck Enclosure

Cartridge Magazine Positions

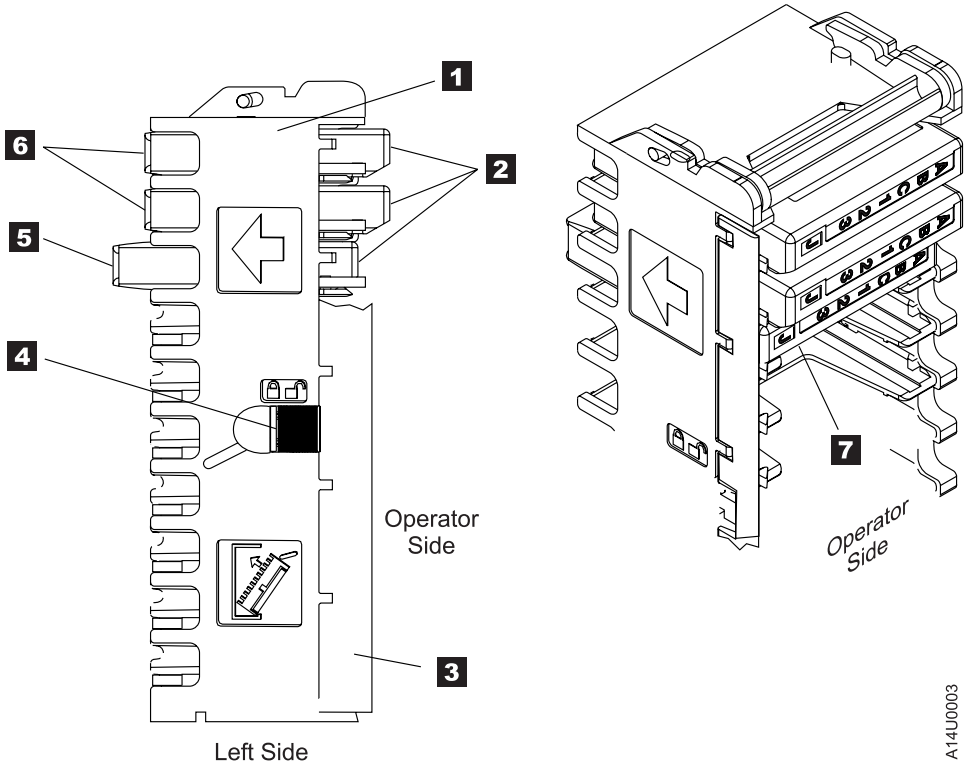


Figure 6-3. 3590 Magazine Cartridge Positions – Left View

Figure 6-3 shows a partially loaded magazine. The magazine **1** has two positions for the cartridges **2** to be positioned.

Notes:

1. The magazine lock **4** must be in the unlocked position, as indicated by the icon, to remove or insert cartridges into the magazine.
2. Always insert the cartridges into the magazine so that the labels are orientated, as shown in **7** .
3. A sensing device detects any cartridge position beyond the import position, and prevents operation of the cartridge transport.

Import position 5 — When the operator inserts a cartridge into the magazine, the cartridge is said to be in the import position. In this detent position, the cartridge extends out the back of the magazine so it can be grasped by the transport and moved into the transport carriage.

Export position 6 — When the device returns the cartridge to the magazine, the cartridge is said to be in the export position. In this detent position, the cartridge extends out the front of the magazine, so it can be grasped and removed by the operator.

Inserting and Removing Cartridges from Magazine

Note: The magazine cartridge lock **4** in Figure 6-3 on page 6-5 must be in the unlocked position before you insert or remove cartridges from the magazine. The door **3** of the magazine **1** will be damaged if cartridges are moved with the magazine lock in the locked position.

Cartridges are inserted and removed manually.

Figure 6-4 shows two areas that can be used to grasp the 3590 cartridge. Operators with smaller hands may elect to grasp the cartridges on the top and finger notch **2** on the bottom cartridge surface with their thumb and index finger. Operators with larger hands may find it more convenient to grasp the sides of the cartridge using the finger notches **1** on the side of the cartridge case.

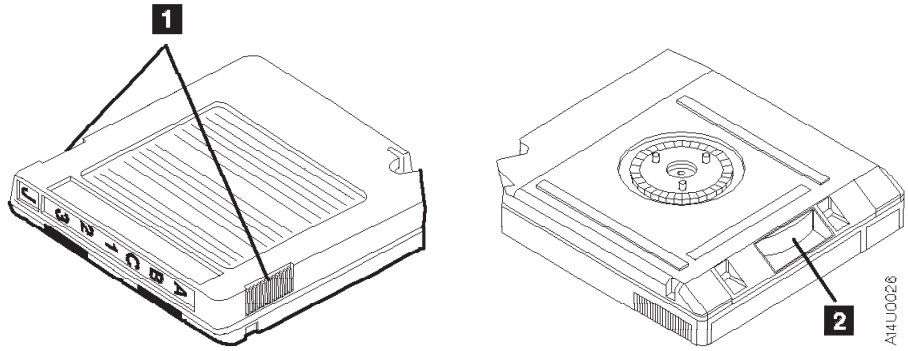


Figure 6-4. Grasping Cartridges

The cartridges are removed with the least effort by pressing the label end of the cartridge to the right (to the side of the magazine opposite the magazine lock) while pulling out.

Note: Always engage the magazine lock **4** (Figure 6-3 on page 6-5) before you transport a loaded magazine to avoid dropping the cartridges or shifting their position in the magazine.

ACF Door and Lock Function

The magazine has a door **3** in Figure 6-3 on page 6-5 that extends along the entire length of the magazine. The door is located at the front left side of the magazine when viewed from the front. A hand-operated slider is located in the middle of the magazine frame. The two positions for the magazine lock are:

Unlocked

The slider is towards the front of the magazine to enable insertion and removal of the cartridge from the magazine. The magazine door opens toward the left, permitting the insertion and removal of cartridges.

Locked The slider is towards the back of the magazine. The magazine is now locked for random mode of operation for the ACF or for transporting the magazine outside of the ACF.

Attention: When a Model A14 is installed in a 3495, the magazine cartridge lock must be left in the unlocked position.

Inserting and Removing Magazine

Figure 6-5 shows how to insert or remove the magazine from the ACF. Use two hands to load the magazine in the ACF:

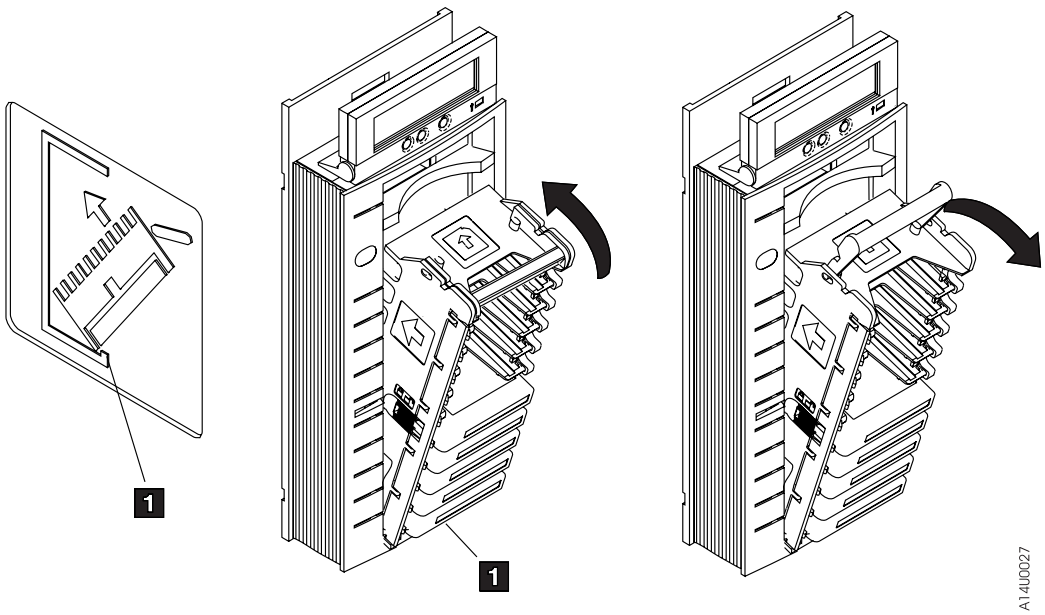


Figure 6-5. Inserting and Removing Magazine from ACF

Inserting Magazine Into 3590

1. Hold the handle with one hand while you hold the body of the magazine at a 45 degree angle with the other hand.
2. Insert the lower front of the magazine into the ACF, as shown in Figure 6-5 so that the front of the magazine is inside the ACF lip **1**.
3. Pivot the magazine top towards the ACF, until the magazine is flush with the front of the ACF.
4. Push the magazine handle into the ACF lock bar to secure the magazine in the ACF.

Note: The ACF automatically unlocks the magazine cartridge lock when the magazine is correctly inserted. You must manually push the lock button in (see **5** in Figure 6-1 on page 6-3) if the mode selected requires a locked magazine.

Removing Magazine From 3590

Use two hands to remove the magazine from the Automatic Cartridge Facility, as follows:

1. Pull the magazine handle out of the ACF lock bar to release the magazine from the ACF.
2. Hold the handle with one hand and use your other hand to hold the body of the magazine as you pivot the magazine top towards you until the magazine is at a 45 degree angle to the ACF.
3. Lift the lower front of the magazine out of the ACF until the magazine is clear of the ACF.
4. Ensure that the magazine door is locked.

Notes:

1. Do not touch the magazine handle while the 3590 is processing tape cartridges. Touching the magazine handle while the 3590 is operating may result in unexpected job interruptions.
2. Use care when moving or storing magazines. When the magazine is not in storage or loaded in the ACF, it should be set on its side to prevent it from tipping over or falling.
3. Never ship magazines with cartridges loaded. The cartridges will vibrate in the magazine slots, resulting in contamination on the sides of the cartridges. This contamination may cause transport or loader failures.

Priority Cell

See Figure 6-6 on page 6-10.

The priority cell 5 is located above the magazine. The priority cell allows the operator to load a cartridge directly into the ACF when a priority system Mount command occurs. Insert the cartridge into the second detent position.

Transport Assembly

The transport assembly 2 is mounted to an elevator 13 . An elevator motor 3 and leadscrew 12 drive the elevator and transport assembly up or down. The position of the elevator and transport assembly is controlled by the transport position sensor 8 .

Note: Do not attempt to lubricate ACF leadscrew. Lubricants will ruin the leadscrew coating.

The transport assembly can grasp a cartridge from the import position of either a magazine 6 , priority cell 5 or from the loader 1 in the drive enclosure. Two square shafts, the pinch 11 and feed 9 are mounted vertically and pass through the transport assembly. Thus, rotating the square shafts can turn gears and transfer mechanical motion to the transport assembly. Each shaft is controlled by a separate motor; the pinch 4 and feed motors 14 . Rotation of the motors will cause the following actions:

- The pinch motor 4 and its square shaft (through gears and linkage) will cause either the front roller arm 7 or rear roller arm 10 to squeeze against the side of the cartridge.
- The feed motor 14 and its square shaft (through gears) will cause the pinch rollers to rotate 7 and 10 . The direction of rotation is dependent on the operation to be performed; either pull a cartridge into the transport from a cell or the loader or push a cartridge from the transport into a cell or the loader.
- The elevator 3 , pinch 4 , and feed 14 motors are same type/model.

The position of the transport assembly and the cartridge is controlled by sensors.

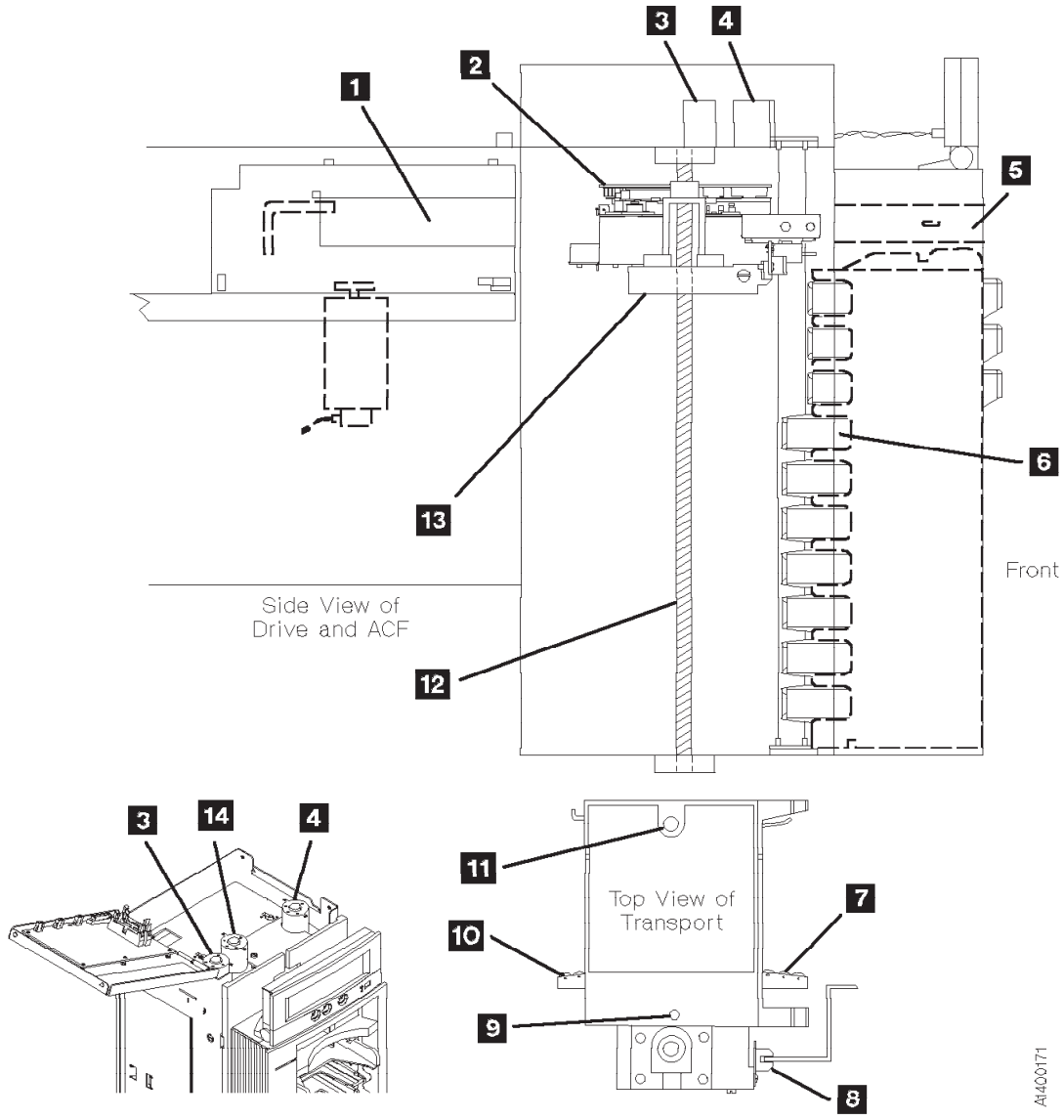


Figure 6-6. Transport Assembly

ACF and Drive Loader Sensors

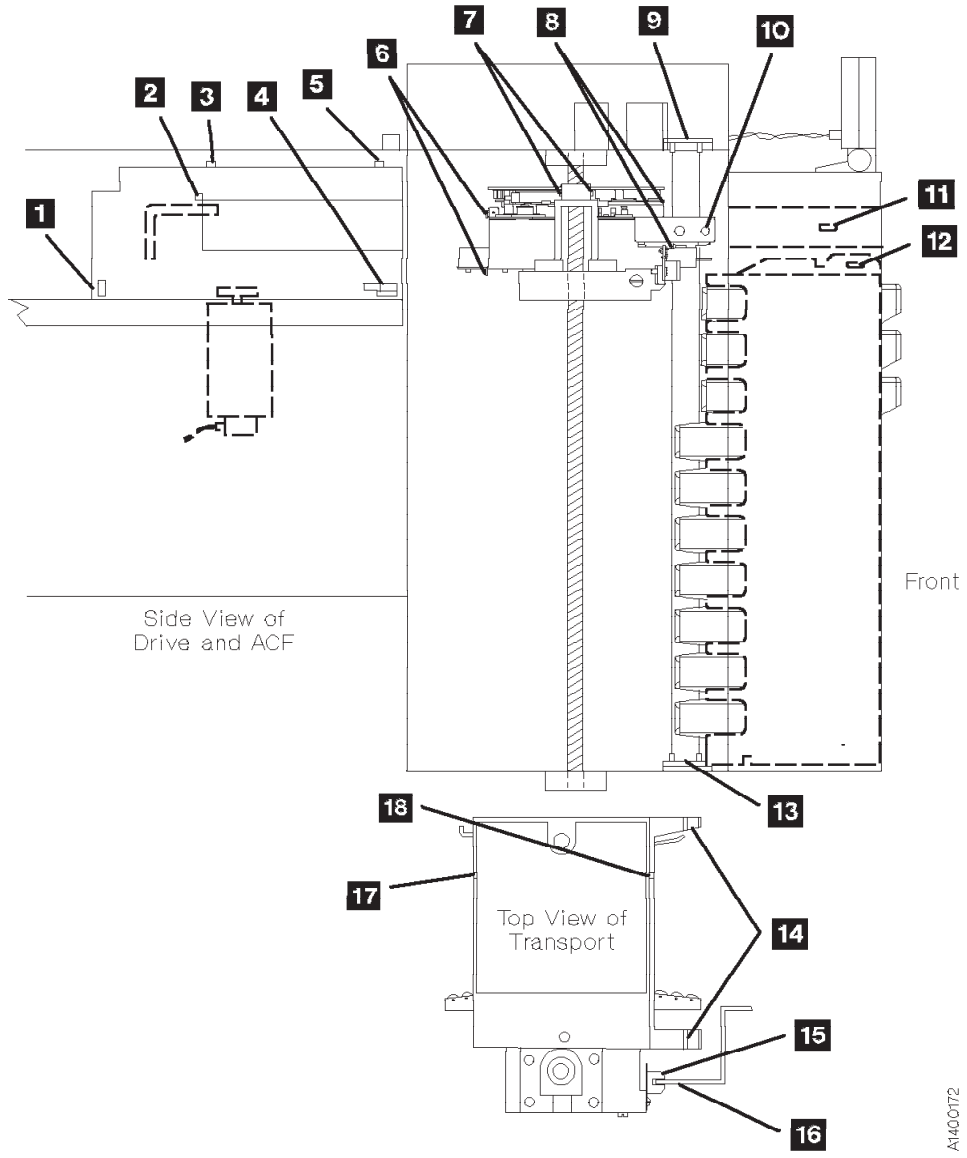


Figure 6-7. ACF and Drive Loader Sensors

The following part names refer to Figure 6-7 on page 6-11.

Table 6-1. ACF Drive and Loader Sensor Names and Key Identifiers

Key	Name	Key	Name
1	File-protect sensor (FID C8)	10	Transport-position sensor (FID 98)
2	Cartridge-present sensor (FID CD)	11	Priority-cell sensor (FID 9E)
3	Tray-up sensor (FID CA)	12	Magazine-present sensor assembly (FID A0)
4	Cartridge-type sensor card (FID CC)	13	Global/interference sensor (FID 9B)
5	Door-open sensor (FID C9)	14	Import/export sensors (not a FRU)
6	Limit-2 sensor (not a FRU)	15	Transport-position sensor (FID 98)
7	Pinch sensor (not a FRU)	16	Transport-position bar (not a FRU)
8	Limit-1 sensor (not a FRU)	17	Limit-2 sensor (not a FRU)
9	Global/interference sensor (FID 9B)	18	Limit-1 sensor (not a FRU)

ACF Sensors

Table 6-2 describes the function of the ACF sensors that are also listed in Table 6-1 and shown in Figure 6-7 on page 6-11.

Table 6-2. ACF Sensor Functions

Key	Type	Function
6 8 17 18	Limit 1/Limit 2 sensor (2)	Senses cartridge positions in transport within its limits
7	Pinch sensor	Senses if cartridge is pinched or not pinched (located in transport card)
9 13	Global/cartridge present sensor and Global/interference sensor (top and bottom)	Global/cartridge present sensor assembly senses if a cartridge is present in the import position. Global/interference sensor senses if a cartridge has moved past the import position
10 15	Transport-position sensor	Senses vertical position of transport
11	Priority cell	Senses cartridge in priority cell
12	Magazine present sensor	Senses magazine is loaded in the ACF
14	Import/export sensors	Senses cartridges in the import and export positions respectively

The following describes the sensor functions as a cartridge is moved from a magazine cell to the loaded position in the drive loader.

See Figure 6-8.

Assume the transport assembly is initially positioned at the priority cell and the next available cartridge must be loaded.

The front beam 3 of the global/interference sensors 2 and 4 is broken and the rear beam 5 is not. The front beam indicates that at least one cartridge is in the import position and the rear beam will indicate if a cartridge is beyond the import position which will cause interference with the movement of the transport 1. With cartridge in import position and not beyond import position, elevator motor will begin rotating the leadscrew 6 to lower the transport.

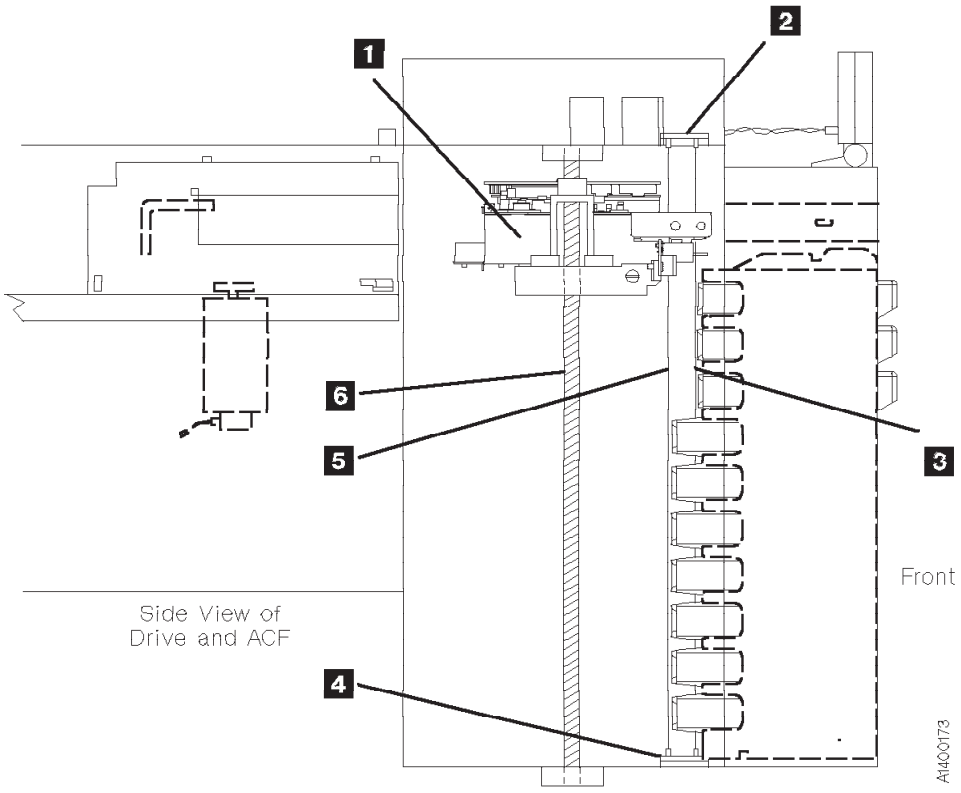


Figure 6-8. Transport Assembly at Priority Cell Position

See Figure 6-9.

The transport 1 moves to each cell position, stops, and checks if a cartridge is in the import position. If not, the transport moves to the next cell and checks, repeating this process until a cartridge is sensed.

The transport-position sensor 6 senses the cell positions. The sensor is U-shaped and fits around the edge of the transport position bar 7 . Elongated slots 3 cut into the bar provide the spacing from one cell to the next. When the two sensor beams 4 are broken by the solid area between the slots, the transport stops. The sensor is shown at a cell location.

The cartridge is sensed by the import/export sensors 2 and 9 . Again, two beams are used 5 . If both beams are broken, a cartridge 8 is detected in the import position.

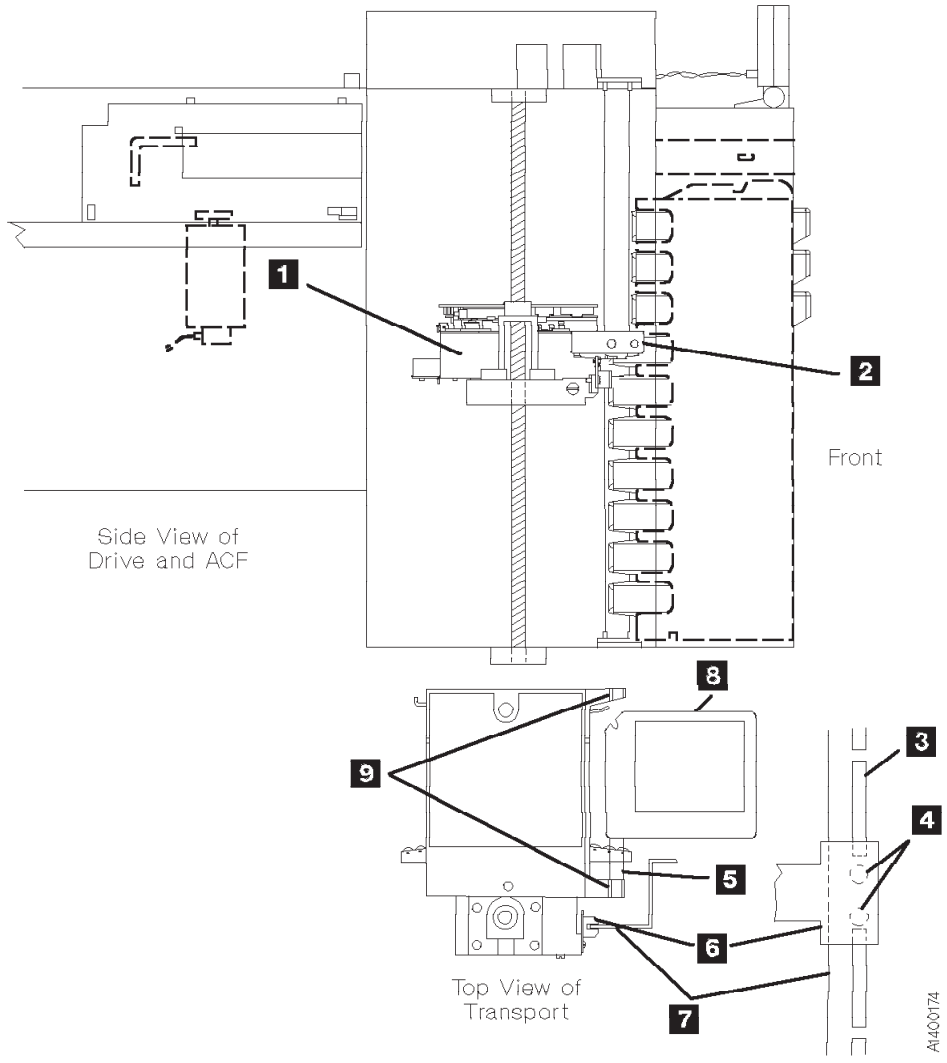


Figure 6-9. Transport Stops at First Cartridge in Import

See Figure 6-10.

After the cartridge is detected in the import position, the pinch motor rotates and causes the following action:

- Rotates the square pinch shaft **11** .
- Using gears and linkage, rotates the pinch roller arm **7** against the cartridge, squeezing the cartridge between the rollers and the guide rail bearing **4** .
- A cantilever arm **3** is rotated into the magazine detent mechanism, disengaging the detent that holds the cartridge in the magazine. Before moving the transport assembly, ensure the arm is disengaged.

The pinch motor stops and the feed motor begins rotating to cause the following:

- Rotates the square feed shaft **8** .
- Through gears, the rollers **7** on the pinch roller arm are rotated to pull the cartridge out of the magazine cell and into the transport **6** .
- The light beam of the limit-1 sensor **2** and **5** is interrupted by the leading edge of the cartridge. The cartridge continues to move into the transport until the light beam of limit-2 sensor **1** and **10** is interrupted/broken, at which time the feed motor stops. The indication that a cartridge **6** is in the transport is when both limit-1 and limit-2 sensor beams are interrupted/broken.

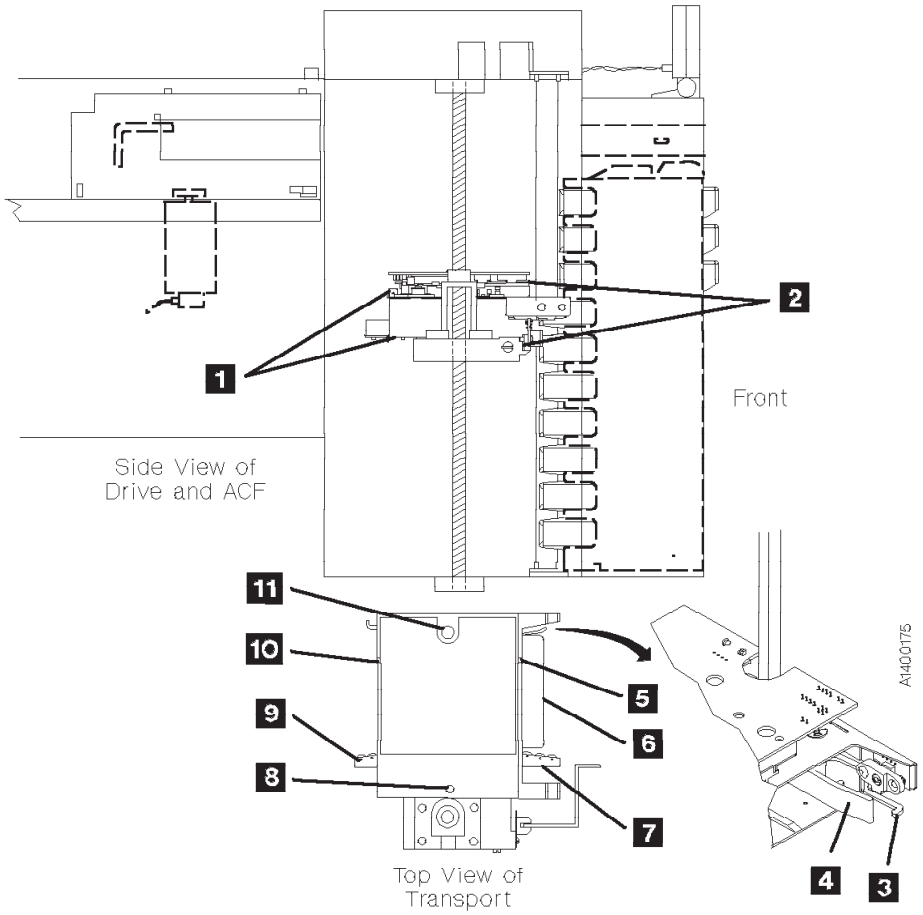


Figure 6-10. Cartridge is Pulled Into Transport

See Figure 6-11.

The elevator motor rotates, turning the leadscrew 3 to raise or lower the elevator and transport. Again the transport-position sensor 4 senses the slots in the transport position bar 5 . When the priority cell position 2 is sensed, the elevator motor stops. This is also the position for the drive loader carriage 1 .

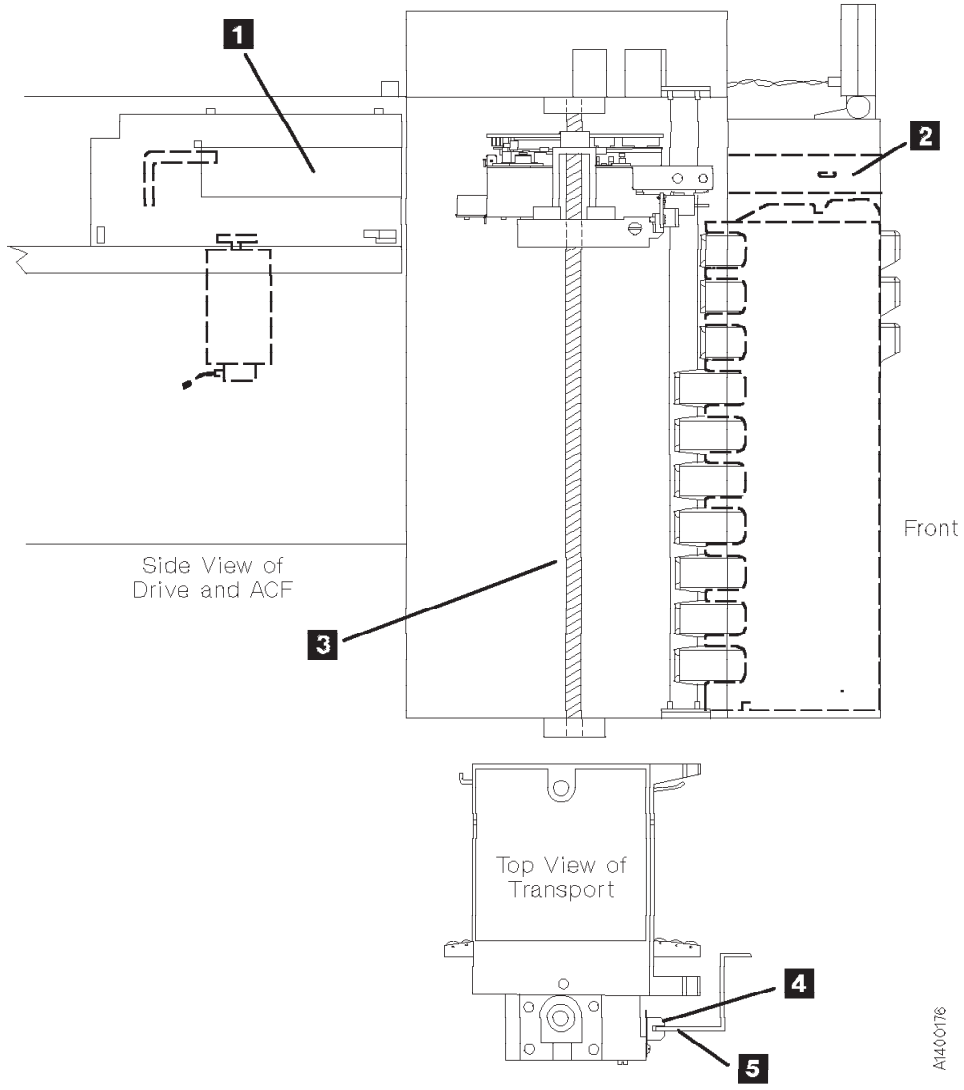


Figure 6-11. Transport Moves to Priority Cell

See Figure 6-12.

The pinch and feed motors again operate to move the cartridge, this time, into the loader carriage, as follows:

1. The feed motor rotates its square feed shaft **4** which, in turn, causes the rollers on the rear pinch roller arm **3** to rotate, pushing the cartridge into the loader carriage **2** .
2. When the cartridge is pushed to the end of the carriage, the cartridge-present sensor operates **1** and the feed motor stops.
3. The pinch motor again rotates, moving the rear pinch roller arm away from the cartridge, and then stops.

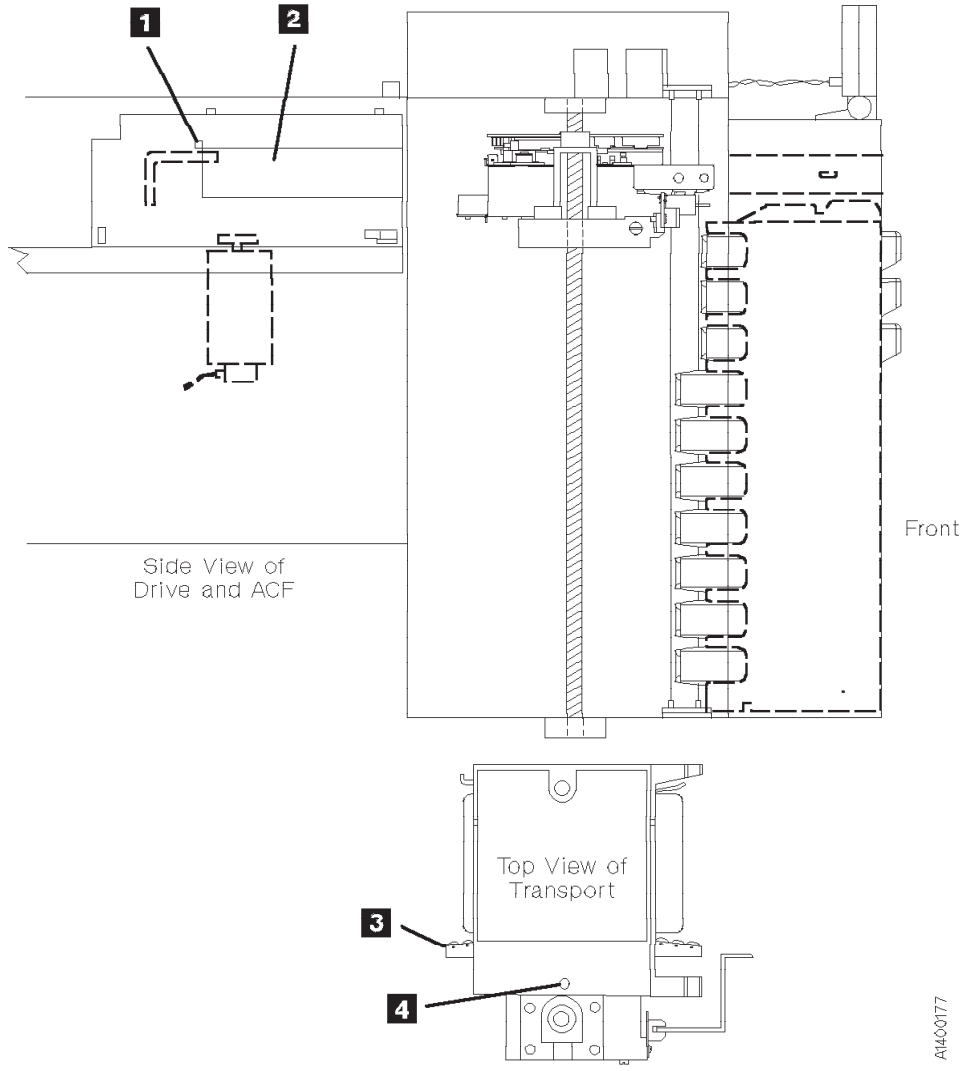


Figure 6-12. Transport Moves Cartridge Into Loader Carriage

See Figure 6-13.

Finally the loader drive motor 3 rotates to move the loader carriage forward to get the cartridge 2 and then lowers the cartridge down onto the file reel motor gear clutch 5 . The following occurs when the cartridge is lowered onto the file reel motor gear:

- The cartridge-type sensor 4 indicates if the cartridge is a valid 3590 cartridge.
- The cartridge being completely lowered onto the file reel motor gear clutch is assumed if the cartridge-type sensor indicates the correct cartridge.
- Lowering the cartridge onto the file reel motor causes the gear clutch within the cartridge to engage the drive clutch.
- The file-protect sensor 1 indicates if the cartridge is file protected or unprotected.

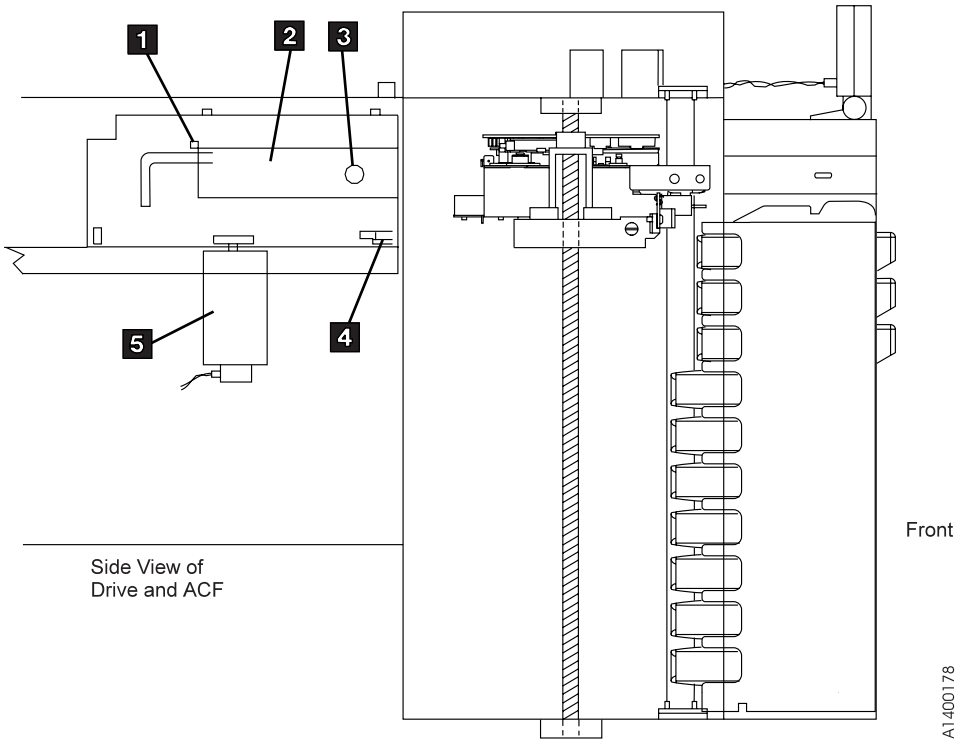


Figure 6-13. Loader Moves Cartridge In and Down Onto File Reel

Modes of Operation

The ACF has six modes of operation: manual, automatic, system, accumulate, random, and random 2-LUN. The operator can select all the modes.

Manual The device takes the cartridge from the priority cell or the ACF when **Start** is pressed and the device returns the cartridge to its original cell.

Accumulate The operator inserts the cartridge in the priority cell and the device returns the cartridge to the magazine.

Automatic The operator loads the magazine with cartridges and the device automatically feeds the drive loader until the entire magazine is processed. Cartridges are returned to their original cells.

System The host program initiates the load from the next cell. Cartridges are returned to their original cells.

Random The device loads cartridges that are in the *import* position under host program control. Cartridges are returned to the cell specified by the host program. The indicator lights are all green and the magazine must be *locked*. This mode is supported on Model B11 only.

Random 2-LUN
Same as Random mode above, but adds an extra SCSI logical unit (LUN) to control the ACF. This mode is supported on Model B11, E11, and H11.

ACF Notes

These items are general in nature and cover many or all modes. Rather than repeating these notes in each mode description, the notes are shown here and referenced from the mode descriptions.

1. When the magazine is removed from the ACF, it is automatically locked.

   When the magazine is placed in the ACF, it is automatically unlocked. If ACF random mode is to be used, the operator must press the magazine lock button into the detent position.
2. In random mode, a cartridge that is returned to the magazine is placed in the import position, to be available for reuse by the attaching host.
3. In manual, automatic, accumulate, and system mode, a cartridge returned to the magazine is placed in the export position.
4. In all modes, to reuse a cartridge exported in the priority cell, either remove and re-insert the cartridge or push the cartridge back to the import position and select Start on the Operator Panel.
5. The feed mechanism for the ACF can access cartridges only in the import position.
6. If the ACF is disabled, the operator presses Start on the operator/CE panel, and there is no magazine in the ACF or there is no cartridge in the import position in either the magazine or in the priority cell, the ACF returns to the disabled state without changing the position of any cartridge. This condition is not an error.
7. If while unloading a cartridge to the magazine, the destination cell is occupied, the ACF tries to unload the cartridge to the priority cell (also see Note 9).
8. If the ACF is instructed to unload a cartridge to the magazine and the magazine is not installed, the ACF tries to unload the cartridge to the priority cell (also see Note 9). The cell-status indicator LED is set to alert (solid yellow) for the priority cell.
9. If the ACF tries to unload the cartridge to the priority cell (in any mode other than random) and the priority cell is occupied, the ACF sets the cell status indicator LED to attention (flashing yellow) on all cells and disables the ACF (extra cartridge condition). Additionally the ATTN ACF message is displayed. In random mode a Move Medium command specifying an already occupied priority cell as a target will be failed as an illegal request.

   For any mode other than random, when the cartridge occupying the priority cell is removed by the operator, the ACF will automatically transfer the previously blocked cartridge to the priority cell in export position without further operator intervention. The associated cell status information is reset.

10. The physical implementation for most modes can be viewed as a medium changer with 11 import and export ports, no storage elements, a single data transfer element, and a single medium transport element that cannot be used to permanently store a piece of medium. For random mode, the ACF contains one import and export port, 10 storage elements, a single data-transfer element and a single medium-transport element.

Initiator Control of ACF

When the ACF operates in manual, accumulate, or automatic mode, the initiator controls only the unload of the cartridge from the device; it does not issue any command that causes the ACF to load a cartridge. A Load/Unload command that requests an unload operation causes a cartridge to be unloaded, as described in “Modes of Operation” on page 6-19.

If a Load/Unload command with the ‘load’ bit set is received while the ACF is enabled in system mode, the ACF loads a cartridge. If a Load/Unload command with the ‘load’ bit set is received in any mode other than system mode, the command is presented check-condition status with associated sense data (70, not ready, logical unit not ready, cause not reportable). Receiving two Load/Unload commands with the ‘load’ bit set, without an intervening Unload shall also cause the same check condition.

When the ACF operates in system mode, the program has indirect control over the ACF; the program specifies that a cartridge is to be loaded if possible, but cannot specify from which cell the cartridge is to be obtained. If no magazine is found and the priority cell is empty, the command check condition status is presented, and includes associated sense data (70, not ready, no medium present). If a magazine is present but contains no loadable cartridges and the priority cell also is empty, the command is presented check condition status, with associated sense data (70, not ready, medium source element empty).

When the ACF operates in random mode, the program can control the ACF through the Prevent/Allow Medium Removal, Read Element Status, and Move Medium commands. These commands allow the ACF to access cartridges from cells that are located non-sequentially; to assist the initiator in generating and maintaining an inventory of the cartridges in the magazine, and to indicate to the operator that these cartridges can be removed.

The physical implementation for most modes can be viewed as a medium changer with 11 import/export ports, no storage elements, a single data-transfer element, and a single medium-transport element that cannot be used to permanently store a piece of medium. Random mode has a different configuration. For random mode, the ACF contains 1 import/export port, 10 storage elements, a single data-transfer element and a single medium-transport element. The program should issue the Read Element Status command when changing ACF modes to assure the correct configuration. The program should assume that it can request medium to be moved from an import/export port that does not have the ‘ImpExp’ indication set (for example, an exported medium can be imported again).

Manual Mode

Manual mode allows the operator to load a cartridge by operator action. Each time the operator presses Start, the ACF selects a cartridge from the appropriate cell and mounts it in the device. Only one cartridge is loaded for each operator action.

Terminology Note: For this and all other modes, the term *initial conditions* refers to actions the operator or attaching host must take prior to attempting to initiate ACF activity. *Enabling conditions* refers to the actions that begin ACF motion. Similarly, *disabling conditions* refers to the actions that stop ACF activity.

When the ACF is operating in manual mode, the following applies (see also “ACF Notes” on page 6-19):

- Initial conditions:

  Manual mode is selected from the Set ACF Mode menu.
- Enabling conditions: To enable manual mode
  - Insert a cartridge into the import position of the priority cell.
- Disabling conditions: The ACF becomes disabled in manual mode when:
  - The magazine cartridge was processed and returned to its original cell and there is no cartridge in the import position of the priority cell.
  - The ACF is enabled from the operator choosing Start, but the ACF cannot detect a cartridge in the import position in the magazine.
  - An attention condition is detected in the ACF; for example, an extra cartridge condition.
  - The magazine is not installed; choosing Start causes the ACF to return to the disabled state.
- Operation

1. If the ACF is disabled and is in manual mode, and the operator selects Start on the operator/CE panel, the ACF becomes enabled, then verifies that at least one cartridge is in the import position of the magazine. If so, the ACF indexes down the magazine until it finds the first cell with a cartridge in the import position. The ACF sets the cell-status indicator LED for that cell to in-use (steady green) and moves the cartridge from the cell to the device.
2. If the ACF is disabled and in manual mode, and a cartridge is placed in the import position of the priority cell, the ACF loads the cartridge in the device and sets the cell-status indicator LED to in-use (steady green) for the priority cell.
3. If a cartridge is placed in the priority cell while the ACF is enabled and in manual mode, the ACF sets the cell-status indicator LED of the priority cell to in-use (steady green). When the ACF completes its current operation, the ACF automatically loads the priority cell as described in step 2.
4. When a cartridge that was loaded while in manual mode is unloaded, it is returned to its original cell if possible, and the in-use indication is turned off. If the original cell is occupied, the ACF turns off the in-use indicator LED and puts the cartridge in the priority cell, if possible, and sets the priority cell status indicator LED to alert (steady yellow). If the priority cell is occupied, the ACF is disabled and it presents check status (see step 9 on page 6-19). The cell-status indicator LEDs for all cells are set to attention (flashing yellow). An intervention message is posted on the operator/CE panel.

Accumulate Mode

Some customers organize their operations so that certain subsystems focus on specific cartridge mounts; that is, the entire device is dedicated to responding to servicing specific volumes requested by the attaching host. For this type of operation, the customer needs the ability to easily insert specific cartridges and to allow processed specific mounts to accumulate in a *hopper* until it is convenient for the operator to retrieve a group of cartridges.

In manual, automatic, and system mode, cartridges are always exported to the same ACF cell from which they were imported, if possible. This makes them conveniently available for processing scratch volumes. Accumulate mode differs in that cartridges are always imported from the priority cell, and exported to a magazine cell. This allows the operator to insert specific cartridges into the priority cell, and to accumulate processed cartridges into the magazine for pickup by the operator.

When the ACF is in accumulate mode, the following applies (see also “ACF Notes” on page 6-19):

- Initial conditions:
  - Accumulate mode is selected from the Set ACF Mode menu.
  - While not a required condition, IBM recommends that initially the magazine be empty.
  - To indicate to the operator that they should not place cartridges in the magazine (only remove cartridges), all magazine cells have the cell-status indicator LEDs set to in-use (steady green). This is to remind the operator that the entire magazine is reserved as the accumulate *hopper*.
- Enabling conditions: Two ways to enable accumulate mode follow:
  - Select Start ACF on the operator/CE panel.
  - Insert a cartridge into the import position of the priority cell.
- Disabling conditions: The ACF becomes disabled in accumulate mode, as follows:
  - The magazine is full and the last imported cartridge is returned to the priority cell.
  - An attention condition is detected in the ACF; for example, an extra cartridge condition.
- Operation:

1. If the ACF is disabled and in accumulate mode, and the operator selects Start on the operator/CE panel, the ACF becomes enabled and waits until a cartridge is inserted in the import position of the priority cell.
2. When a cartridge is inserted into the priority cell, the cartridge sets the cell-status indicator LED to in-use (steady green) for the priority cell and waits for the device to become available.
3. When the device is available, the cartridge is loaded in the device and the priority cell indicator LED is turned off.
4. When a cartridge is unloaded from the drive, it is moved to the magazine. The ACF places the cartridge in the top cell of the magazine unless that cell is occupied. If the top cell is occupied, the ACF searches down the magazine for the next available cell. Each cartridge is placed in the export position.
5. When the last available cell in the magazine is filled, the ACF warns the operator by activating all magazine cell-status indicator LEDs to alert (steady yellow). If another cartridge is unloaded, it is placed into the priority cell again, if possible, and the priority cell cell-status indicator LED is set to alert (steady yellow). See step 9 on page 6-19 if the priority cell is also full.

Automatic Mode

Automatic mode provides the operator a means to keep the drive continually fed with cartridges from the magazine. After enabling, the ACF automatically feeds cartridges to the device until all the cartridges in the magazine are processed. The operator can supply specific cartridges to an application by inserting the cartridge into the priority cell. The priority cell cartridge is automatically the next cartridge to be loaded into the device. When the specific cartridge is loaded, the ACF automatically resumes processing cartridges from the magazine.

Processed cartridges can be removed from the magazine and unprocessed cartridges can be added, without disturbing the ACF. The ACF locates each unprocessed cartridge.

When the ACF is in automatic mode, the following applies (see also “ACF Notes” on page 6-19):

- Initial conditions:
  - Automatic mode is selected from the Set ACF Mode menu.
  - The ACF is initialized so the top of the magazine is considered the current cell.
- Enabling conditions: To enable automatic mode:
  - Select Start on the operator/CE panel.
  - Insert a cartridge in the import position of the priority cell.
- Disabling conditions: The ACF is disabled in automatic mode when:
  - A magazine or a priority cartridge is processed and returned to its original cell, and there is no cartridge in the import position of the magazine or the priority cell.
  - The ACF is enabled because the operator chose Start, but the ACF cannot detect a cartridge in the import position in either the magazine or the priority cell.
  - An attention condition is detected in the ACF; for example, there is an extra cartridge in the magazine.
- Operation

1. If the ACF is disabled and in automatic mode and the operator selects Start on the operator/CE panel, the ACF becomes enabled and verifies that there is at least one cartridge in the import position of the magazine. If so, the ACF indexes down the magazine until it finds the first cell with a cartridge in the import position. The ACF sets the cell-status indicator LED for that cell to in-use (steady green) and moves the cartridge from the cell to the device.
2. If the ACF is disabled and in automatic mode and a cartridge is placed in the import position of the priority cell, the ACF is enabled, it loads the cartridge in the device, and it sets the cell-status indicator LED to in-use (steady green) for the priority cell.
3. If a cartridge is placed in the priority cell while the ACF is enabled and in automatic mode, the ACF sets the cell-status indicator LED of the priority cell to in-use (steady green). When the ACF completes its current operation, it automatically loads the priority cell as described in step 2.
4. When a cartridge that was loaded while in automatic mode is unloaded, it is returned to its original cell, if possible, and the in-use indicator LED for that cell is turned off. The ACF then searches the magazine for the next cell in the import position and loads it in the device. This process repeats until the ACF cannot find another cartridge to load.

System Mode

System mode provides the operator an additional means to keep the drive continually loaded with cartridges from the magazine. With the ACF enabled and the first cartridge loaded, subsequent load commands are under the control of the attaching host. The ACF loads one cartridge in response to each of these system commands until all the cartridges in the magazine are processed.

System mode does not preclude specific mount requests from the attaching host. The operator can supply specific cartridges to an application by inserting the cartridge in the priority cell. The priority cell cartridge is automatically the next cartridge to be loaded in the device. After the cartridge is processed, the ACF automatically resumes processing cartridges from the magazine, under system control.

Processed cartridges can be removed from the magazine and unprocessed cartridges can be added, without disturbing the ACF. The ACF locates each unprocessed cartridge.

When the ACF is in system mode, the following applies (see also “ACF Notes” on page 6-19):

- Initial conditions:
  - System mode is selected from the Set ACF Mode menu.
  - The ACF is initialized so the top cell of the magazine is considered the current cell location.
- Enabling conditions: Two ways to enable system mode follow:
  - Select Start ACF on the operator/CE panel.
  - Insert a cartridge in the import position of the priority cell.
- Disabling conditions: The ACF becomes disabled in system mode, as follows:
  - A magazine or priority cartridge is processed and returned to its original cell, and there is no cartridge in the import position of the magazine or priority cell.
  - The ACF is enabled because the operator chose Start, but the ACF cannot detect a cartridge in the import position in either the magazine or the priority cell.
  - An attention condition is detected in the ACF; for example, extra cartridge condition.
- Operation:

1. If the ACF is disabled and in system mode, and the operator selects Start on the operator/CE panel, the ACF becomes enabled and verifies that there is at least one cartridge in the import position of the magazine. If so, the ACF indexes down the magazine until it finds the first cell with a cartridge in the import position. The ACF sets the cell-status indicator LED for that cell to in-use (steady green) and moves the cartridge from the cell to the device.
2. If the ACF is disabled and in system mode, and a cartridge is placed in the import position of the priority cell, the ACF loads the cartridge in the device and sets the cell-status indicator LED to in-use (steady green) for the priority cell.
3. If a cartridge is placed in the priority cell while the ACF is enabled and in system mode, the ACF sets the cell-status indicator LED of the priority cell to in-use (steady green). When the ACF completes its current operation, it automatically loads the priority cell as described in step 2.
4. When the system completes processing a cartridge, it issues a Load command. The ACF unloads the old cartridge and returns it to its original cell, if possible, and turns off the in-use indicator LED for that cell. The ACF waits in enabled state until it receives a Load command or until a cartridge is inserted in the priority cell. In the case of the Load command, the ACF searches the magazine for the next cell in the import position and loads it to the device. This process repeats until the ACF cannot find another cartridge to load.

Random Mode

Random mode is designed to act as a small, self-contained library of up to 10 cartridges, controlled by the attaching host. The attaching host uses the SCSI Medium Mover commands to select a cartridge from a given cell and move it to its destination cell. Control of the source and destination cells are left entirely to the attaching host.

Random mode is supported on the Model B11 only, but the Random 2−LUN mode is supported on both Model B11 and E11.

Being in random mode does not preclude attaching host requests for specific mounts. Requests for specific cartridges to be mounted can be satisfied by inserting the specific cartridge in the priority cell. In random mode, the priority cell is simply another addressable cell. The ACF notifies the attaching host of the presence of a cartridge in the priority cell, but the attaching host must specifically address that cell to access the cartridge.

To ensure the integrity of the library, the magazine contains a lock which prevents the addition or removal of cartridges from the magazine after the magazine is installed in the ACF and locked. The ACF senses the state of the magazine lock and does not permit random mode to be enabled unless the magazine lock is set to the locked position. A sensor on the ACF allows the unit to determine that the magazine is not installed or was removed. This disables random mode.

Because the magazine must be locked in random mode, the priority cell is used as an I/O port to the library. This way you can add or remove cartridges from the magazine without having to violate the integrity of the locked magazine. The attaching host can move cartridges from the priority cell to any empty magazine cell (or the device), or from a magazine cell (or the device) to the priority cell. The attaching host is responsible for the library inventory and inventory control.

If a Move Medium or Read Element Status command is issued with no magazine present, or with the magazine unlocked, the command fails with a permanent error.

When the ACF is in random mode, the following applies (see also “ACF Notes” on page 6-19):

- Initial conditions:
  - Random mode is selected from the Set ACF Mode menu.
- Enabling conditions: random mode is enabled if all the following conditions are met:
  - The magazine is installed in the ACF.
  - The magazine lock is in the locked state.
  - A valid Move Medium command is received.
- Disabling conditions: The ACF is disabled in random mode if one of the following conditions are met:
  - The magazine is removed from the ACF.
  - The magazine is unlocked.
  - An attention condition is detected in the ACF; for example, extra cartridge condition.
- Operation:

1. When first enabled in random mode, the ACF waits for attaching host commands.
2. All magazine cell-status indicator LEDs are set to in-use (steady green). The in-use indicator LEDs remain on unless random mode is disabled. The priority cell cell-status indicator LED is activated as it is used.
3. All cartridge movement is under control of the attaching host using the Medium Mover commands.
4. The ACF honors the Prevent Allow Media Removal command by not allowing operator-initiated export of cartridges any time the command has specified Prevent Media Removal.

5. The priority cell has an assigned element address and can be accessed by the accessor under attaching host control. If an operator inserts a cartridge in the priority cell, the ACF notifies the attaching host. The ACF will not access the cartridge in the priority cell unless commanded by the attaching host.
6. If a cartridge that was loaded while in random mode is unloaded, it may not always be returned to the same cell where it was previously located. The attaching host controls the cartridge location. When the cartridge is placed in a magazine cell, it is placed in the import position.

Random 2-LUN Mode

Random 2-LUN mode is identical to the Random mode except that it adds an extra SCSI logical unit (LUN) to control the ACF.

Note: If this mode is selected when the extra SCSI LUN is not available, the host will not be able to control the ACF.

Random mode is supported on the Model B11 only, but the Random 2−LUN mode is supported on Model B11, E11, and H11.

Cell Status Indicator LEDs

This section describes the operation of the cell status indicator LEDs for the ACF and the priority cell, and the conditions identified by the indicator LEDs.

Cell Status: Flashing Yellow – Attention Indicator LED

The device requires operator assistance. Table 6-3 describes the Attention condition. There is a corresponding operator panel ATTN ACF message when the LEDs indicate attention.

Table 6-3. Cell Status Indicator LEDs - Flashing, Yellow Attention Indicator

Indicator LED State	Description of the Condition
All 11 LEDs, which are the magazine LEDs and the priority cell LED, are flashing yellow (accumulate, automatic, manual, and system modes) or all 10 magazine LEDs are flashing yellow (random mode).	Further activity is stopped. Requires operator attention such as installing the magazine, locking or unlocking the magazine, or clearing a cartridge jam. When the condition is cleared, the LEDs return to normal after Start is chosen on the operator panel. Typical supplemental messages to ATTN ACF include *extra cartridge, picker error,* and *export error*.

Cell Status: Steady Yellow – Alert Conditions

This condition does not immediately preclude machine operation, but may unless the condition is cleared soon. Table 6-4 describes the alert condition.

Table 6-4. Cell Status Indicator LEDs - Steady, Yellow, Alert Conditions

Indicator LED State	Description of the Condition
All 10 magazine LEDs are steady yellow	Indicates that the magazine is not installed or is locked – accumulate, automatic, manual, or system modes only. LEDs return to normal when the condition is cleared.
	The magazine is processed (no cartridges are in the import position in the magazine or the priority cell) – automatic or system modes only. LEDs return to normal when condition is cleared.
	The magazine is full (warns the operator to remove the full magazine and replace it with one that is not full) – accumulate mode only. LEDs return to normal when Start is selected.
Priority cell LED is steady yellow	Instructs the operator to remove the cartridge from the priority cell.

Cell Status: Steady Green – In-Use Indicator LED

The indicated cells are in use by the ACF or by the program. Table 6-5 describes the in-use condition.

Table 6-5. Cell Status Indicator LEDs - Steady, Green, In-Use Indicator

Indicator LED State	Description of the Condition
One magazine LED or priority cell LED is steady green.	Indicates that the designated cell is reserved for a cartridge that is presently in the drive – automatic, system, and manual modes only.
Multiple magazine LEDs are steady green	Indicates that the designated cells are reserved – random or accumulate modes only. Do not put a cartridge in a cell that shows a green LED.

Chapter 7. Inspection

Contents

General Instructions

Use this checklist to ensure that a machine not covered by an IBM Maintenance Agreement has the necessary safety items installed and no other changes were made that would make it unsafe or inoperable. Each machine, as it was designed and assembled, had needed safety items installed to protect the owners, operators, and service personnel from injury.

Note: This equipment is designed for connection to impedance-transformer power subsystems.

Materials Needed

The following items are needed or are useful during the inspection:

- Copies of safety service memorandums (SMs) and engineering change announcements (ECAs) for this machine type
- Machine history
- *Electrical Safety for IBM Customer Engineers,* S229-8124

Education

Service personnel must be trained on the new general maintenance agreement qualification (MAQ), tailored-maintenance agreement qualification, and changed machine safety inspection procedures as part of an electrical safety course.

Safety

The general caution symbol  identifies conditions where caution must be used.

The electrical caution symbol  identifies electrical hazards where extreme caution must be used.

Perform this inspection before the normal inspection for a maintenance agreement. **Suspect that the 3590 is unsafe until you verify that it is safe**. If any unsafe conditions are present, decide how serious the hazard is and whether you can continue without first correcting the problem. Examples of safety hazards are:

Electrical An electrically charged frame can cause serious or lethal electrical shock.

Mechanical Hazards, such as a safety cover missing, are potentially harmful to people.

Chemical Do not use solvents, cleaners, or other chemicals not approved for use on this product.

Any of the problems listed above must be repaired before you use the 3590.

The following notices are translated into selected languages. Each notice contains an identifier (C1 or C2) that relates to these translated languages, found later in this chapter. Use the English text to understand the model designation in a non-English notice.

C1 **CAUTION: The 3590 Model B11/E11/H11 with the Automatic Cartridge Facility(ACF) weighs 40.5 kilograms (89 pounds) so remove the ACF before lifting the 3590. The 3590 weighs 28.6 kilograms (63 pounds) without the ACF attached; it takes two persons to safely lift this unit.**

C2 **CAUTION: The 3590 Model B1A/E1A/H1A weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit.**

Laser Information

These products comply with the performance standards set by the U.S. Food and Drug Administration for a Class I Laser Product.

Figure 7-1. Laser Safety Label Class I

This means that these products belong to a class of laser products that do not emit hazardous laser radiation. This classification was accomplished by providing the necessary protective housings and scanning safeguards to ensure that laser radiation is inaccessible during operation or is within Class 1 limits. These products have been reviewed by external safety agencies and have obtained approvals to the latest standards as they apply to this product type.

Safety Inspection Procedures

Before performing the safety procedures, ensure the existing room and electrical conditions are safe.

Read all Safety information on the label before starting.

See “Device Covers” on page 7-13 and “Labels” on page 7-14 for locations.

3590 Drive AC Grounding Inspection

1. Power off the 3590.
2. Disconnect the channel cables.
3. See Figure 7-2 on page 7-4. Disconnect the power cord **1** from its source.
4. Check that no voltage exists between the housing on the power source and building ground.
5. Check that resistance is less than 0.1 ohm from the building ground to the power supply enclosure **3** .
6. Inspect the power cable **1** for visible cracks, wear, or damage.
7. Check that the resistance between the power cable ground and the 3590 frame **2** is less than 0.1 ohm.
8. Inspect the power supply enclosure covers **3** to ensure all screws are installed and tight.

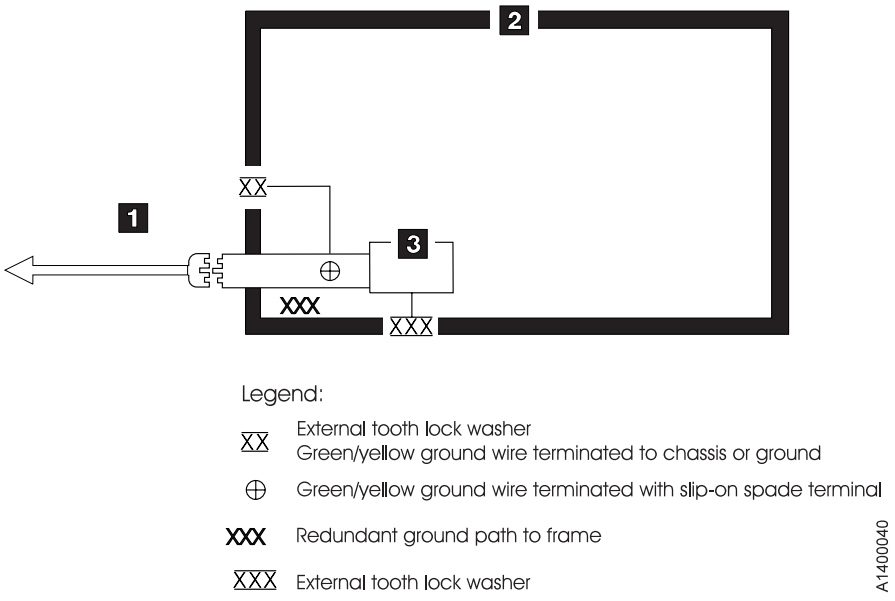


Figure 7-2. AC Grounding Diagram (50 Hz and 60 Hz)

Sécurité

Le symbole attention  indique qu'une attention particulière est nécessaire.

Le symbole risque électrique  identifie des risques liés au courant électrique ; il faut en ce cas faire preuve d'une extrême prudence.

Ces procédures doivent être effectuées avant l'inspection normale pour un contrat de maintenance. **Le sous-système de bande magnétique IBM 3590 doit être considéré comme potentiellement dangereux tant qu'il n'a pas été vérifié**. Si vous détectez la moindre condition d'insécurité, vous devez évaluer sa gravité et déterminer si vous pouvez continuer ou non sans avoir d'abord corrigé le problème. Les risques peuvent être de différentes natures :

Risques électriques
: Un châssis chargé en électricité peut provoquer un choc électrique grave ou mortel.

Risques mécaniques
: L'absence d'un carter de sécurité, par exemple, peut être à l'origine de blessures.

Risques chimiques
: Utilisez uniquement les produits de nettoyage et autres produits chimiques recommandés pour ce matériel.

Assurez-vous que toutes ces conditions de sécurité sont remplies avant d'utiliser le sous-système de bande magnétique IBM 3590.

Chaque consigne est introduite par un identificateur (Attention=Cn).

C1 **ATTENTION Le sous-système 3590 modèle B11/E11/H11 doté du dispositif ACF (chargeur automatique de cartouches) pèse 40,5 kilogrammes. Retirez le dispositif ACF avant de soulever le 3590. Sans ce dispositif, le sous-système pèse 28,6 kilogrammes. La présence de deux personnes est nécessaire pour le soulever.**

C2 **ATTENTION Le sous-système 3590 modèle B1A/E1A/H1A pèse 28,6 kilogrammes. La présence de deux personnes est nécessaire pour le soulever.**

Inspection de sécurité

Avant de procéder à l'inspection de sécurité, assurez-vous que la salle ainsi que l'installation électrique remplissent toutes les conditions de sécurité.

Pour plus de détails sur les emplacements des éléments, reportez-vous aux sections "Device Covers" et "Labels". Effectuez les opérations ci-dessous.

1. Mettez le sous-système 3590 hors tension.
2. Débranchez les cordons de transmission.
3. Reportez-vous à la Figure 7-3. Débranchez le cordon d'alimentation **1** du socle de prise de courant.
4. Assurez-vous que la tension est nulle entre le boîtier de la source d'alimentation et la terre du bâtiment.
5. Vérifiez que la résistance est inférieure à 0,1 ohm entre la terre du bâtiment et le carter du sous-système **2** .
6. Examinez le cordon d'alimentation **1** et assurez-vous qu'il n'est ni craquelé, ni troué, ni endommagé.
7. Vérifiez que la résistance entre la broche de terre du cordon d'alimentation et le sous-système 3590 est inférieure à 0,1 ohm.
8. Examinez les capots **3** et assurez-vous que les vis sont correctement placées et serrées

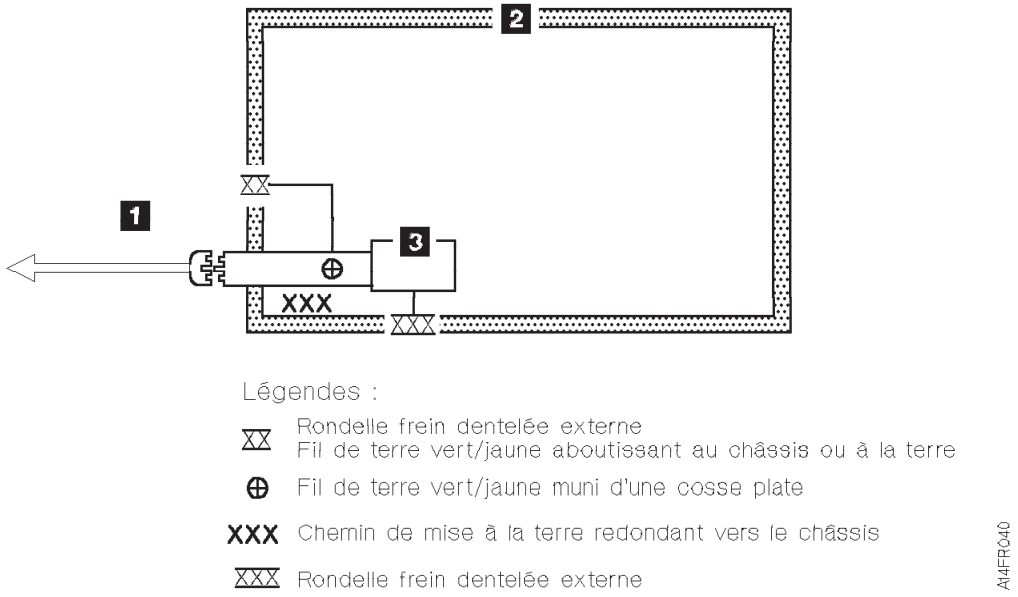


Figure 7-3. Schéma de mise à la terre c.a. (50/60 Hz)

안전

일반 주의 기호  는 주의를 요합니다.

전기 주의 기호  는 극도의 주의를 요하는 전기적 위험을 표시합니다.

유지보수 계약에 대한 일반 검사 전에 이 검사를 수행하십시오. **3590**이 안전하다고 증명되기 전에는 **3590**이 안전하지 않다고 생각하십시오. 안전하지 않은 조건이 있으면 그 위험의 심각성을 결정하고 그 문제가 먼저 정정되지 않고 계속할 수 있는지 결정하십시오. 가능성이 있는 위험요소는 다음과 같습니다.

전기적
: 충전되어 있는 프레임은 심각하거나 치명적인 전기 쇼크를 일으킬 수 있습니다.

기계적
: 안전 커버가 없다든지 하는 위험은 잠재적으로 인체에 해롭습니다.

화학적
: 이 제품에서 사용이 허용되지 않은 용해제, 클리너, 기타 화학 물질을 사용하지 마십시오.

3590을 사용하기 전에 위에 나열된 문제점 중 어떤 것이 있으면 반드시 시정하십시오.

다음 주의 사항은 선택된 언어로 번역되었습니다. 각 주의 사항은 식별명을 갖습니다 (주의 = Cx).

C1 주의
ACF를 포함하는 **3590** 모델 **B11**은 **40.5** 킬로그램입니다 **(89** 파운드**). 3590**을 들어올리기 전에 **ACF**를 제거하십시오. **ACF**가 부착되지 않은 **3590**은 **28.6** 킬로그램입니다 **(63** 파운드**).** 이 장치를 안전하게 들어 올리려면 두 사람이 들어야 합니다.

C2 주의
3590 모델 **B1A**은 **28.6** 킬로그램입니다 **(63** 파운드**).** 이 장치를 안전하게 들어올리려면 두 사람이 들어야 합니다.

안전 검사 프로시져

안전 프로시져를 수행하기 전에 설치 장소와 전기 상태가 안전한지 확인하십시오.

위치에 대해서는 "장치 커버" 와 "레이블"을 참조하십시오. 다음의 단계를 수행하십시오.

1. 3590의 전원을 끄십시오.
2. 채널 케이블을 분리하십시오.
3. 전원 코드 **1** 을 소스에서 분리하십시오. 그림1을 참조하십시오.
4. 전원 소스의 단자와 빌딩 접지선 사이에 전압이 있는지 체크하십시오.
5. 빌딩 접지선과 AC 박스 커버 **2** 사이의 저항이 0.1 옴 보다 적은지 체크하십시오.
6. 전원 케이블 **1** 이 눈에 띄는 파열이나 낡음, 혹은 파손된 곳이 있는지 점검하십시오.
7. 전원 케이블 그라운드와 3590 사이에 저항이 0.1 옴 보다 적은지 체크하십시오.
8. AC 박스 커버 **3** 을 점검하여 모든 나사못이 제대로 꽉 조여 있는지 확인하십시오.

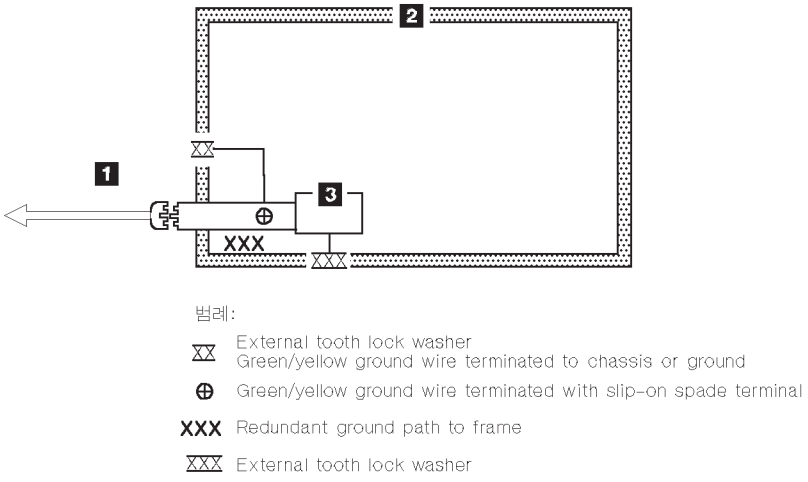


그림 1. AC 그라운딩 다이어그램 (50 Hz 와 60 Hz)

Seguridad

El símbolo general de precaución  identifica situaciones en las que debe tener precaución.

El símbolo de precaución eléctrica  identifica situaciones de riesgo eléctrico en las que debe extremar la precaución.

Realice esta inspección antes de la inspección normal para un acuerdo de mantenimiento. **Considere que la 3590 no es segura hasta verificar que lo es**. Si detecta alguna condición poco segura, decida el grado de riesgo existente y si puede continuar sin solucionar primero el problema. Posibles condiciones de riesgo para su seguridad son,

Riesgos eléctricos
Un bastidor cargado eléctricamente puede producir descargas serias o letales.

Riesgos mecánicos
Riesgos, como la falta de la cubierta de seguridad, son potencialmente perjudiciales para la gente.

Riesgos químicos
No use disolventes, artículos de limpieza u otros productos químicos que no hayan sidos aprobados para ser usados en este producto.

Cualquier problema de los listados anteriormente debe ser corregido antes de usar la 3590.

Los avisos siguientes se han traducido en varios idiomas. Cada aviso contiene un identificador (Precaución=Cx).

C1 **PRECAUCION La 3590 modelo B11/E11/H11 con el ACF (Dispositivo avanzado de comunicaciones) pesa 40.5 kilogramos (89 libras) por tanto, quite el ACF antes de levantar la 3590. La 3590 pesa 28.6 kilogramos (63 libras) sin el ACF montado; se necesitan dos personas para levantar la unidad sin peligro.**

C2 **PRECAUCION La 3590 modelo B1A/E1A/H1A pesa 28.6 kilogramos (63 libras); se necesitan dos personas para levantar esta unidad sin peligro.**

Procedimiento de inspección de seguridad

Antes de proceder con esta inspección, asegúrese de que las condiciones eléctricas y de carécter general existentes son seguras.

Consulte “Cubiertas del dispositivo” (“Device Covers”) y “Etiquetas” (“Labels”) para saber donde se encuentran. Siga los pasos siguientes:

1. Desconecte la 3590.
2. Desconecte los cables de canal.
3. Consulte la Figure 7-4. Desconecte el cable de alimentación **1** de su fuente de alimentación.
4. Compruebe que no hay voltaje entre el receptéculo de la fuente de alimentación y la toma de tierra del edificio.
5. Compruebe que la resistencia es menor de 0.1 ohmios desde la toma de tierra del edificio hasta el recinto del dispositivo **2** .
6. Inspección el cable de alimentación **1** para detectar grietas, desgaste excesivo u otros desperfectos visibles.
7. Compruebe que la resistencia entre la toma de tierra del cable de alimentación y la 3590 es menor de 0.1 ohmios.
8. Inspección las cubiertas del recinto **3** para comprobar que todos los tornillos estén instalados y firmes.

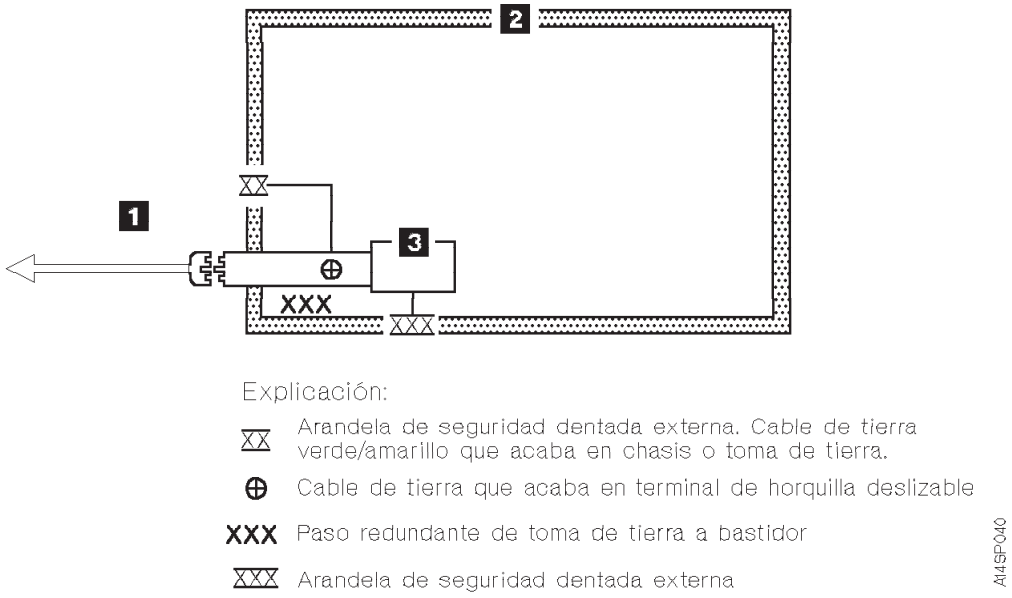


Figure 7-4. Diagrama de toma de tierra CA (50 Hz y 60 Hz)

Segurança

O símbolo geral de cuidado  identifica condições nas quais é necessário cuidado.

O símbolo de cuidado elétrico  identifica riscos elétricos onde é necessário cuidado máximo.

Execute esta inspeção antes da inspeção normal para um contrato de manutenção. **Não acredite na segurança do 3590 até certificar-se de que é seguro**. Se houver qualquer condição insegura, verifique a gravidade do risco e se você pode continuar sem antes corrigir o problema. Os riscos de segurança possíveis são:

Elétrico
Uma estrutura carregada eletricamente pode causar choque elétrico sério ou letal.

Mecânico
Riscos, tais como a falta de uma tampa de segurança, são potencialmente prejudiciais para as pessoas.

Químico
Não utilize solventes, produtos de limpeza ou outros produtos químicos não-aprovados para uso neste produto.

Qualquer um dos problemas acima relacionados deve ser resolvido antes de se iniciar a utilização do 3590.

Os seguintes avisos são traduzidos nos idiomas selecionados. Cada aviso contém um identificador (Cuidado=Cx).

C1 **CUIDADO O 3590 Modelo B11/E11H11 com o ACF pesa 40,5 quilos (89 libras), portanto remova o ACF antes de levantar o 3590. O 3590 pesa 28,6 quilos (63 libras) sem o ACF acoplado; são necessárias duas pessoas para levantar esta unidade com segurança.**

C2 **CUIDADO O 3590 Modelo B1A/E1A/H1A pesa 28,6 quilos (63 libras); são necessárias duas pessoas para levantar esta unidade com segurança.**

Procedimentos Para Inspeção de Segurança

Antes de realizar os procedimentos de segurança, certifique-se de que o local e as condições elétricas existentes são seguras.

Consulte “Device Covers” e “Labels” para obter informações sobre localizações. Execute os seguintes passos:

1. Desligue o 3590.
2. Desconecte os cabos de canal.
3. Consulte Figure 7-5. Desconecte o cabo de alimentação **1** da sua fonte.
4. Confirme se não existe voltagem entre o compartimento na fonte de alimentação e o terra do prédio.
5. Confirme se a resistência é menor do que 0,1 ohm entre o terra do prédio e o compartimento do dispositivo **2** .
6. Inspecione o cabo de alimentação **1** para verificar se existem fissuras, desgastes ou danos.
7. Confirme se a resistência entre o terra do cabo de alimentação e o 3590 é menor do que 0,1 ohm.
8. Inspecione as tampas dos compartimentos **3** para certificar-se de que todos os parafusos estão instalados e apertados.

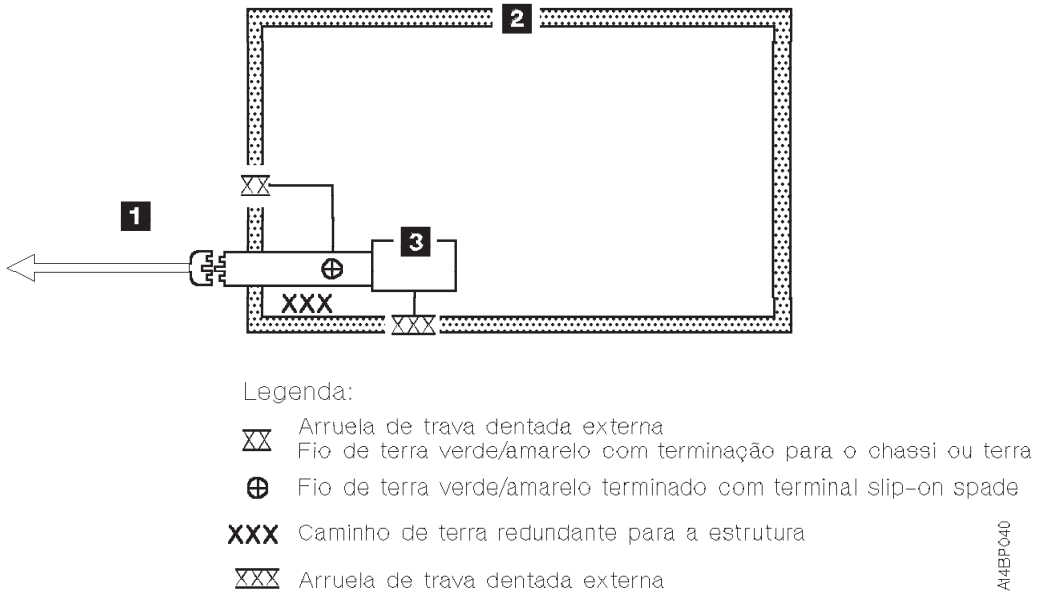


Figure 7-5. Diagrama de Aterramento AC (50 Hz e 60 Hz)

Device Covers

See Figure 7-6. Ensure that the following items are not damaged and do not have sharp edges:

- Automatic cartridge facility (ACF) **1**
- Deck enclosure **2**

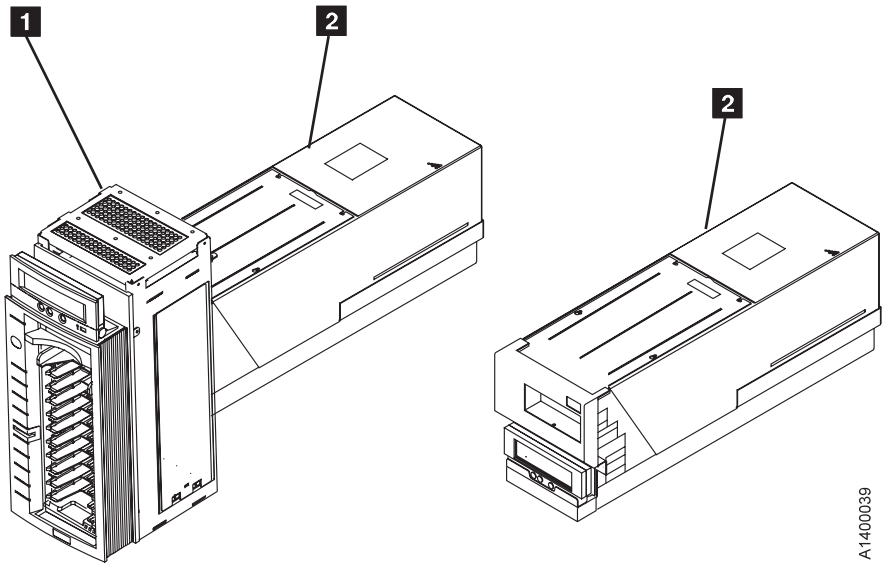


Figure 7-6. Covers for Model B11/B1A, E11/E1A, and H11/H1A

Labels

Older Drive Labels

For older drives, see Figure 7-7. Label **2** is available in multiple languages. For newer drives, see Figure 7-8 on page 7-15.

Check that the following labels are installed:

- Cleaning label **1**
- Caution **2**
- Serial plate **3**
- Canada EMC **4**
- FCC **5**
- Manufactured in U.S.A. **6**
- Bar code **7** located on both sides
- Power rating UL/CSA **8**
- Serial plate **9**
- CE **10**
- Weight **11** located on both sides

Exchange the labels if they are damaged (not readable), or order new labels if they are missing. See Chapter 11, “Parts Catalog” on page 11-1 for part numbers.

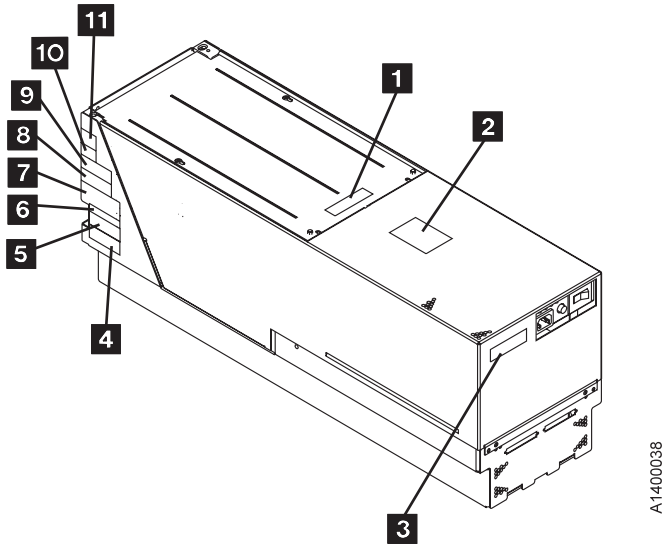


Figure 7-7. Label Locations (Older Drives)

Newer Drive Labels

See Figure 7-8. Label 2 is available in multiple languages.

Check that the following labels are installed:

- Cleaning label 1
- Caution 2
- Model number 3
- Bar code 4 (rear) and 7
- 2X cartridge label 5
- Serial plate 6 and 8
- Multi-use label 9
  - FCC and other country communication statements
  - Weight
  - Power rating
  - UL/CSA designation
  - CE designation

Exchange the labels if they are damaged (not readable) or order new labels if they are missing. See the "Parts Catalog" chapter for the part numbers.

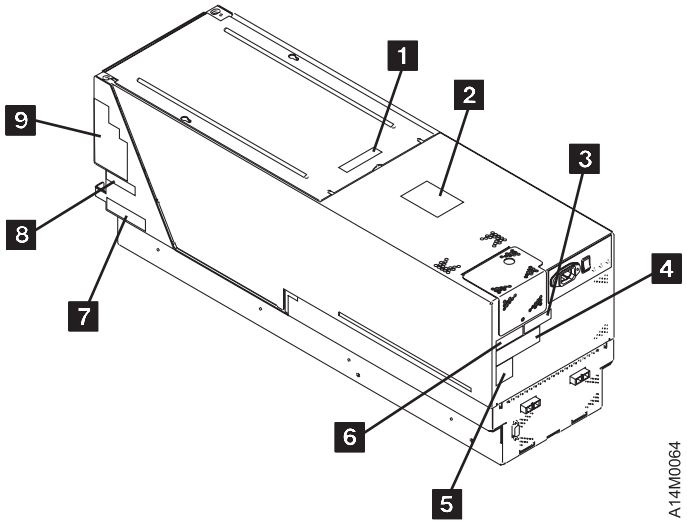


Figure 7-8. Label Locations (Newer Drives)

Rack Slides

See Figure 7-9. Ensure that the following items are not damaged and do not have sharp edges:

- Physical stops **1** located under the tray (in front)
- Position locks **2** located under the tray (push tabs inside the slide rail)

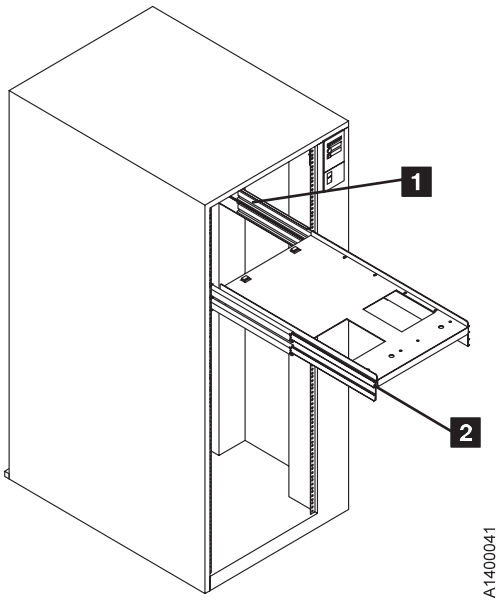


Figure 7-9. Rack Slides

Completion Report

- Safety inspection for machine type 3590
- General safety inspection
- Maintenance agreement qualification (MAQ)

After the inspection, sign, date, and store the checklist with the Maintenance Agreement inspection.

_____ _____ _____
NAME DATE SERIAL NUMBER

SAFETY HAZARDS

LIST ALL SAFETY HAZARDS. IF NONE, SAY NONE.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

This report completes the safety inspection.

1. Reconnect the 3590 power cable into the customer's power receptacle.
2. Reconnect the channel cables to the subsystem.

Chapter 8. Installation

Contents

Before Installation

Attention: The 3590 drive may require certain microcode prerequisites if attaching to a control unit or a library. Read and understand the **Read Me** instruction sheet that was shipped with the drive. Ensure that all of the prerequisite conditions are completed, as necessary.

Note: If possible, save the packaging material for future 3590 reshipment or relocation.

Perform the following steps for unpacking the subsystem:

__ 1. Open the shipping container and inventory the parts listed on the 3590 bills of material.
__ 2. Position the shipping container that contains the 3590 near the rack or frame.
__ 3. Check to make sure that you received the following items:
    __ a. Correct power cable

        Note: The most common power application is where the power cord plugs into the Power Control Compartment (PCC). This uses a 3 m (10 ft), 220 V ac, 50/60Hz cable, P/N 05H8911.

    __ b. SCSI interposer (if required) for attachment to host:

P/N	Attachment
05H3834	iSeries/AS400 (OS/400) System with FC 9410
61G8323	pSeries/RS6000 (AIX) System with FC 9701
50G0460	pSeries/RS6000 (AIX) System with FC 9702
09L0878	Sun system with FC 9799
09P0378	Sun system with FC 9798
19P0378	HP V-Class only with FC 9798

    __ c. Correct SCSI or fibre cables

This procedure describes installation activities. Read and check off each step after you complete it.

Note: Be aware that you will need assistance when lifting the drive.

Ensure that the:

- Installation planning specifications have been met by checking with the branch office or physical planning representative
- Customer has the correct host software levels and correct host PTFs for 3590 attachment.
- Correct SCSI or fibre channel cables and power cables were ordered.
- Correct length SCSI or fibre cables were ordered for connection to a host or to a control unit.
- Correct terminators and interposers are available.

Head Protector

New machines from the factory are shipped **without** the orange head protector, P/N 45G0145. You should not have to remove the deck cover to install a new machine.

Relocated machines, however, may have had the head protector installed when they were discontinued at the previous location.

If this is a relocated machine, **do not** power ON the drive until the head protector is removed during the “Installation Checkout” procedure.

Tools

The following tools are contained in the ship group. For Model B1A/E1A/H1A drives, some tools in the list are in the 3494 ship group. Not all tools are shipped with all drives.

- **Blank scratch cartridge** P/N 05H3188 for testing the 3590 when the drive is not in the library. When the drive is library-attached, P/N 05H7539 is supplied.
- **FMR cartridge** that contains the EC level of the microcode shipped with this drive. (The P/N of the cartridge changes with each EC release of the code.)
- **Cleaner cartridge** P/N 05H4435 (P/N 05H7540 when in a library) for cleaning the tape path.
- Wrap tools P/N 62G1324 or P/N 05H9163 for testing the SCSI hardware or wrap tools P/N 34L2629 or 08L9459 for testing the fibre channel hardware.
- **RS-422 wrap tool** P/N 39F3884 for testing the library manager port (always a 3494 or 3495 special tool).
- **Fibre Wrap Duplex Adapter** (P/N 19P0913 for SC/SC, or P/N 05N6766 for LC/LC used at the end of the fibre cables for testing the connection to the drive. See “Fibre Wrap Duplex Adapters” on page 3-48.
- **Fibre Wrap Tool** P/N 34L2629 or 08L9459 for SC, or P/N 11P3847 for LC used for testing the connection at the end of the drive and the end of the SC/SC and LC/SC cable. See “Fibre Wrap Tool” on page 3-47.
- **Tape removal tool** P/N 6850663 for rewinding the tape onto the cartridge. Refer to “Magnetic Tape Attachment Procedure” on page 9-46 for illustration of tool.
- **Library attachment wrap interposer tool** P/N 05H3895 (9-to-25 pin) for isolating cable problems (3494 or 3495 special tool).
- **CE vacuum gauge adapter** P/N 05H9895 for testing the pneumatic system.
- **Gap set tool** P/N 05H4671 for adjusting the machine reel motor hub.
- **ACF motor alignment tool** P/N 05H4724 for setting the gear mesh gap.
- **ACF transport position adjustment tool** P/N 05H3388 for adjusting the transport position sensor.
- **Two SCSI terminators** P/N 61G8324 for terminating the two SCSI ports (SCSI models only). On newer drives, terminator P/N 05H4793 is shipped. Uses for the new terminator are:
  - Terminating the unused SCSI port in a 3590. Use the two short screws P/N 05H4782 or the two long screws P/N 05H8983, as required. The two sets of screws are shipped with the terminator (P/N 05H4793).
  - Daisy-chaining a non-IBM drive or an IBM drive that does not have a hammerhead cable to a 3590.
  - Using a host cable that does not have a hammerhead in a 3495 to connect the library control unit frame to a drive unit frame that is at the end of the string (no drive cables are long enough). Use the short screws P/N 05H4782 that are shipped with the terminator.

The following items, not in the ship group, may be needed to complete the installation:

- Flat-blade screwdriver
- Nut-drivers (5.5 mm, 3/16 in., and 7 mm for rack installation)
- End wrench (11 mm)
- Metal scale or flat ruler at least 125 mm (5 in.) long.
- Pressure/vacuum gauge P/N 6850747.

Choosing Correct Installation Procedure

Use Table 8-1 to select the installation procedure for the 3590 Model that you are installing.

Table 8-1. Choosing Your Correct Installation Procedure.

3590 Models	**Where to Start**
3590 Model B11/E11/H11 only	“Model B11/E11/H11 Installation” on page 8-6
3590 Model B1A/E1A/H1A only	“Model B1A/E1A/H1A Installation” on page 8-25
Model B11/E11 (RPQ 8B3191) or Model B11/E11/H11 (FC 2200) is being installed in a Desk Side sleeve	“Install Model B11/E11 Within Desk Side Sleeve (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)” on page 8-21
Model B1A/E1A (RPQ 8B3190) is being installed in a Desk Side sleeve	“Install Model B1A/E1A Within Desk Side Sleeve (RPQ 8B3190)” on page 8-29
3590 Model C12/C14	INSTALL section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information*.
Model Axx Control Unit with any Model 3590 drives	INSTALL section of *IBM 3590 Tape Subsystem Axx Controller Models Maintenance Information*.

Model B11/E11/H11 Installation

Install Model B11/E11/H11 in Rack

- If you are installing a rack that has the 3590s already installed, go to “Install Rack That Contains Model B11/E11/H11 Drives” on page 8-23.
- If you are installing a 3590 Model B11/E11/H11 in a rack, continue with “Unpack 3590”.

pSeries/RS6000 (AIX) System 7017 S70 or S7A Only

If you are installing a 3590 Model B11/E11/H11 in a pSeries/RS6000 (AIX) System 7017 S70 or S7A I/O rack, use the I/O rack removal and replacement procedure to remove the I/O rack door. Refer to the *pSeries/RS6000 (AIX) System Enterprise Servers S70 and S7A Installation and Service Guide* for details.

Attention: The door and hinge **must** be left off the I/O rack to eliminate interference with the tape drive.

End of pSeries/RS6000 (AIX) System 7017 S70 or S7A Only

Note: A second person can help you align the holes and level the hardware when you install the rack shelf hardware.

Unpack 3590

Each 3590 model has its own set of unpack instructions. Follow the correct procedure for the model you are installing; do not mix procedures.

The  symbol identifies an ESD-sensitive part. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Note: The following notice is translated into selected languages. See **C2** in Chapter 7, “Inspection” on page 7-1.

CAUTION:
The 3590 Model B11/E11/H11 weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit.

__ 1. Place the 3590 near the rack, frame or cover (sleeve) that will contain the 3590 and unpack the boxes.

__ 2. Verify the 3590 shipping group parts by checking that you have received all the parts listed on the 3590 bills of material. Do not remove the parts from plastic containers so you can tell the part numbers of the parts.

Drive Numbering and EIA Units for Model B11/E11/H11

During the Model B11/E11/H11 (rack mount) installation procedure, you can locate various components by hole location and EIA rack units. All hole locations are given from the top, unless otherwise stated.

Figure 8-1 shows how drives in a rack are numbered in an empty rack and the sequence of installation. Always install the lowest-numbered drives first.

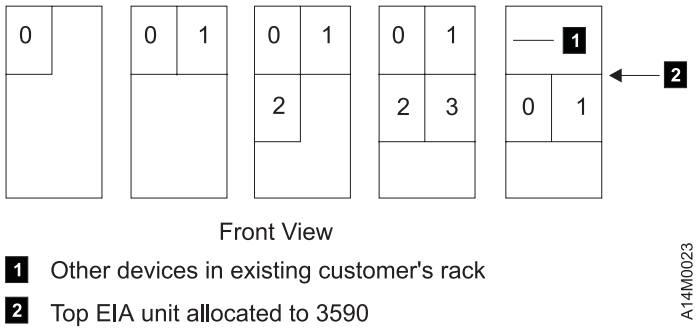


Figure 8-1. Drive Numbering in Rack

__ 1. Position the rack and identify the physical location in the rack where the 3590 is to be installed.

The 3590 Model B11/E11/H11 drive requires 12 EIA units. Each EIA unit consists of three holes in the rack. EIA unit number 32 (top of rack) only has two holes, all other units have three holes. Figure 8-2 shows an example of EIA number 20 **1** as being allocated to the 3590. When these procedures prompt you to count starting at hole 1 **2**, count from the center hole of the first allocated EIA unit.

Note: The top hole is the center hole of EIA unit 32 **3** and is therefore hole number 1.

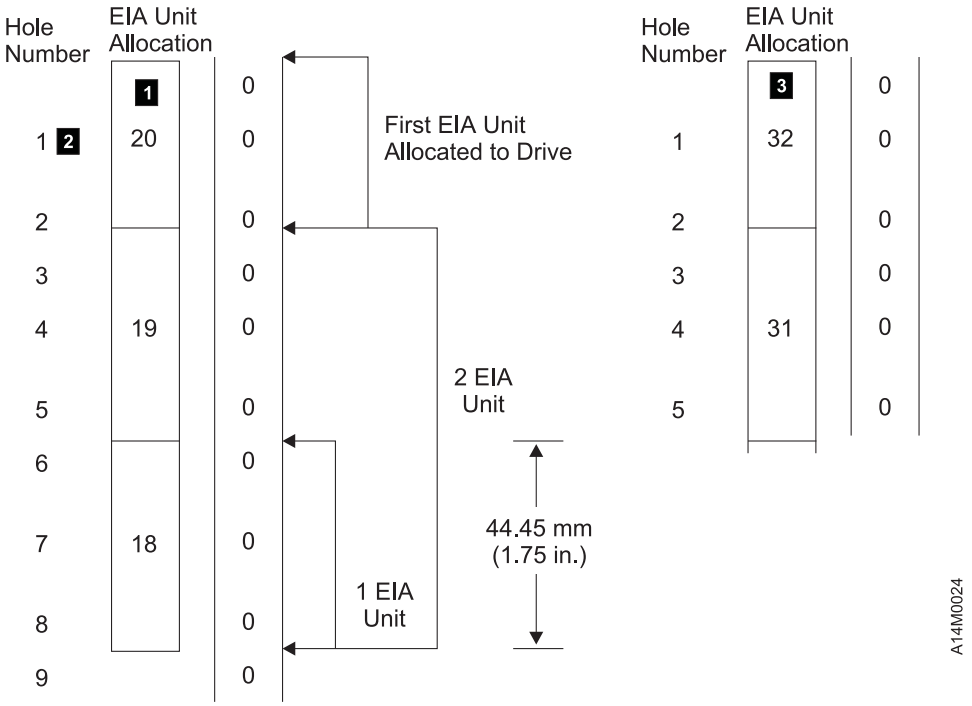


Figure 8-2. EIA Unit Allocation

Holes for EIA Units, Model B11/E11/H11: The 3590 Model B11/E11/H11 drive requires 12 EIA units. Figure 8-3 on page 8-9 shows the hole number and the location of the pins and screws for the hardware. Start counting at **A** hole number 1, which is the second hole in the first allocated EIA unit. Figure 8-2 on page 8-7 shows an example of EIA unit number 20 as being the first EIA unit allocated to the 3590.

Legend:
(from front of rack)
rr right rear
lr left rear
lf left front
rf right front

Use Figure 8-3 and Table 8-2 with the figures under “Hardware for Drives 0 and 1” on page 8-12. The figures show the hole numbers and the part numbers for the hardware.

Figure 8-3 and Figure 8-4 are identical. You can copy (if a photocopier is available) one of these figures, or use the one with the blank page on the back of it to make a template. Cut the figure from top to bottom into three sections. Tape the three pieces together (locating them by hole number) to make a long, vertical strip that will help you locate the hardware mounting locations. The EIA holes may not be in exactly the correct location, but you can determine the exact hole location by the spacing between each EIA unit.

Note: Cut only the figure with the blank page on the back Figure 8-3, and use the other, Figure 8-4, as a master to create future additional copies that you could cut out. Do not cut the master template in Figure 8-4.

Cut the figure with the blank page on the back and use the other as the spare

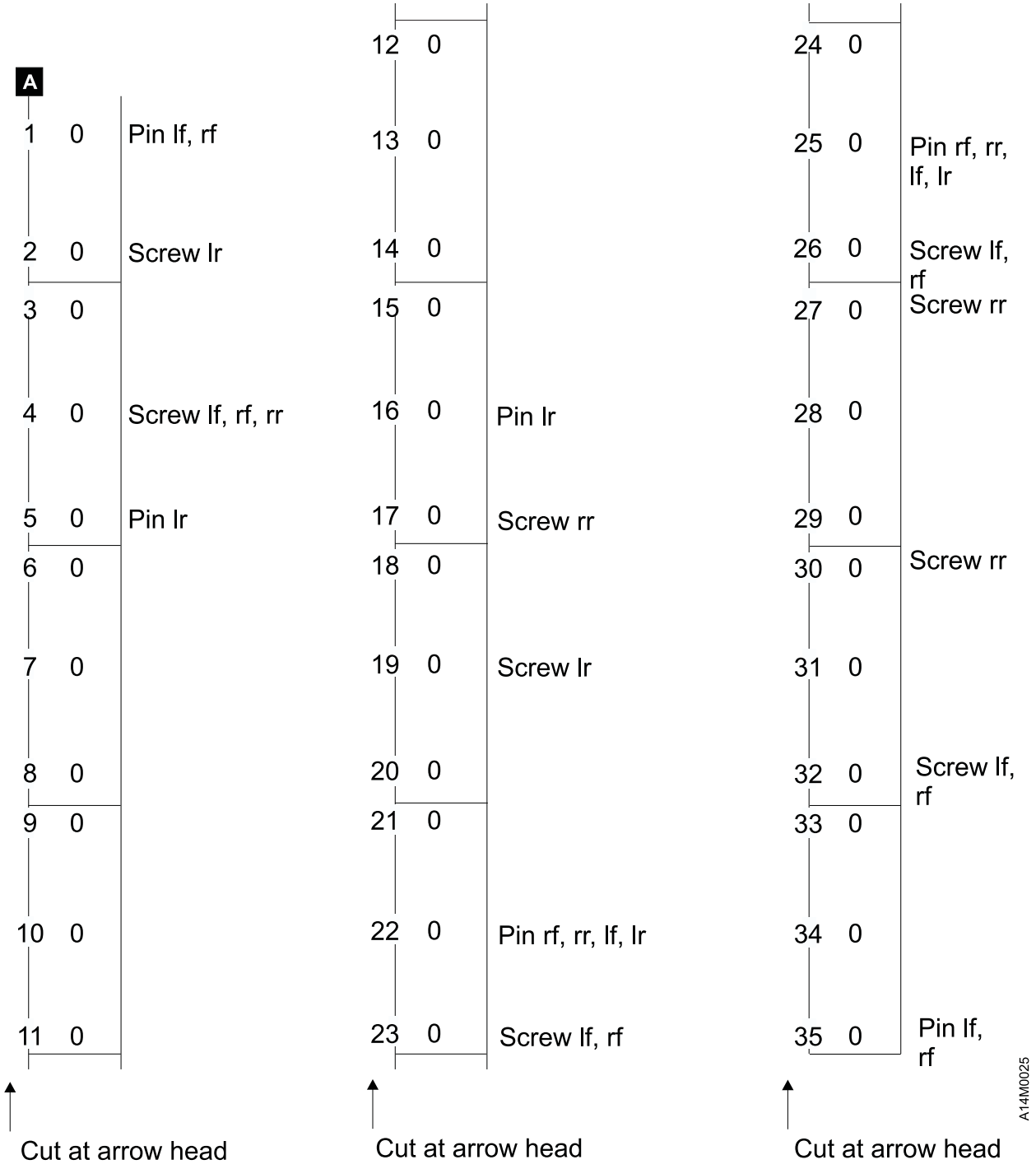


Figure 8-3. EIA Unit Holes

Cut out the figure on the other side of this page.

Do not cut out the figure on this page. Copy this template, and cut out the copy.

Cut the figure with the blank page on the back and use the other as the spare

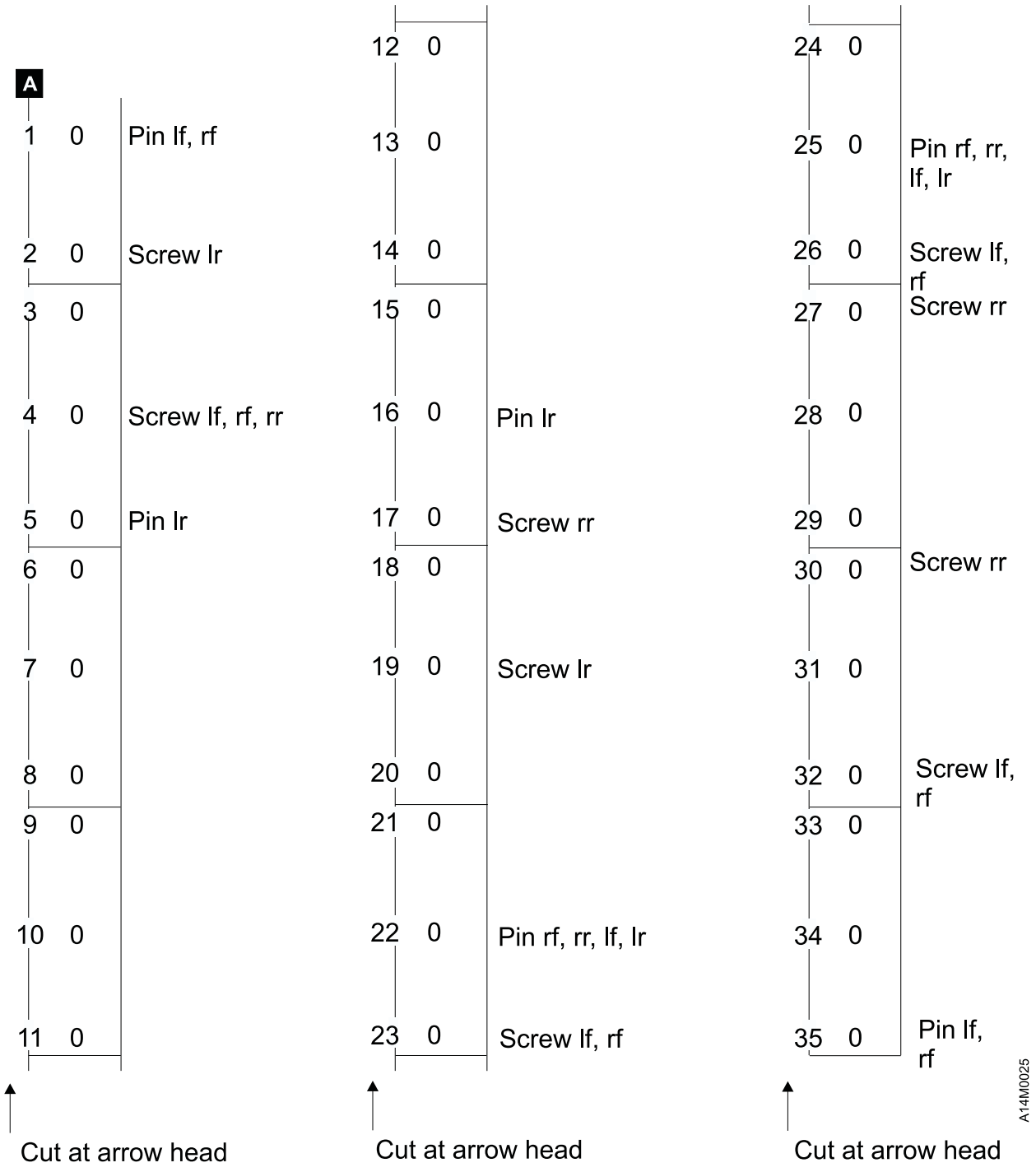


Figure 8-4. EIA Unit Holes. Do not cut out this figure. Copy this template, and cut out the copy.

Hardware for Drives 0 and 1

__ 1. Use Table 8-2 and Figure 8-5 to help you install the slides for drives 0 and 1. Install the right slide **2** and left slide **1** by using four screws **3** P/N 1624778. Install the slides so that the rail that holds the tray is up.

Note: You can cut out a template to help you locate the holes. See Figure 8-3 on page 8-9.

Table 8-2. Drives 0 and 1 Slides

Usage	Screw Mounting Hole	Pin Locator Hole	Part Name, Number
Count the holes from the top EIA unit allocated for the drive. See Figure 8-2 on page 8-7.			
2 Right slide (1)	23, 26 right front	22, 25 right front and rear	Slide, 05H2341
1 Left slide (1)	23, 26 left front	22, 25 left front and rear	Slide, 05H2340

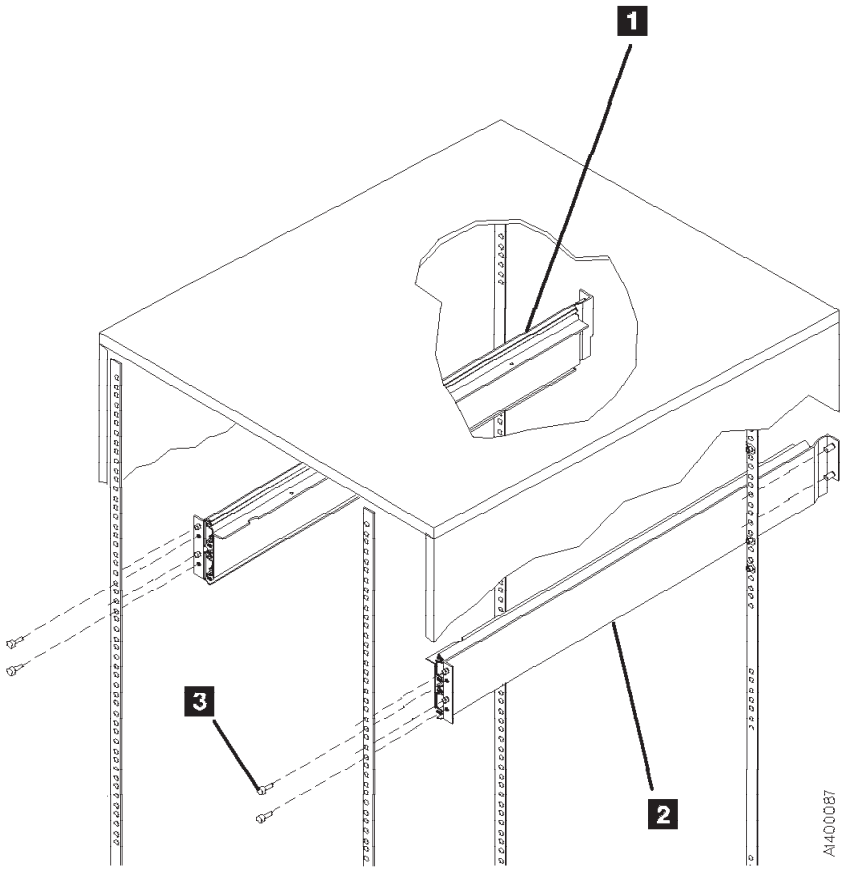


Figure 8-5. Slides (Front View)

__ 2. Use Table 8-3 and Figure 8-6 to help you install the hardware for drives 0 and 1. Use six screws P/N 1624778 **1** in the mounts.

Table 8-3. Drives 0 and 1 Hardware

Usage	Screw Mounting Hole	Pin Locator Hole	Part Name, Number
Count the holes from the top EIA unit allocated for the drive. See Figure 8-2 on page 8-7.			
2 Rack, rear panel hardware (2)	2 left rear 19 left rear	5 left rear 16 left rear	Mount, 05H2347 Mount, 05H2347
3 2-drive cover hardware (4), (Decorative cover hardware)	4 left front 4 right front 32 left front 32 right front	1 left front 1 right front 35 left front 35 right front	Mount, 05H2347 Mount, 05H2347 Mount, 05H2347 Mount, 05H2347
4 Rack, rear panel hardware (2)	4 right rear 17 right rear	See Note. —	Nut clip, 74F1823 Nut clip, 74F1823
5 Cable guide hardware (2)	27 right rear 30 right rear	See Note. —	Nut clip, 74F1823 Nut clip, 74F1823
Note: The nut must be *inside* the frame as you face the frame.			

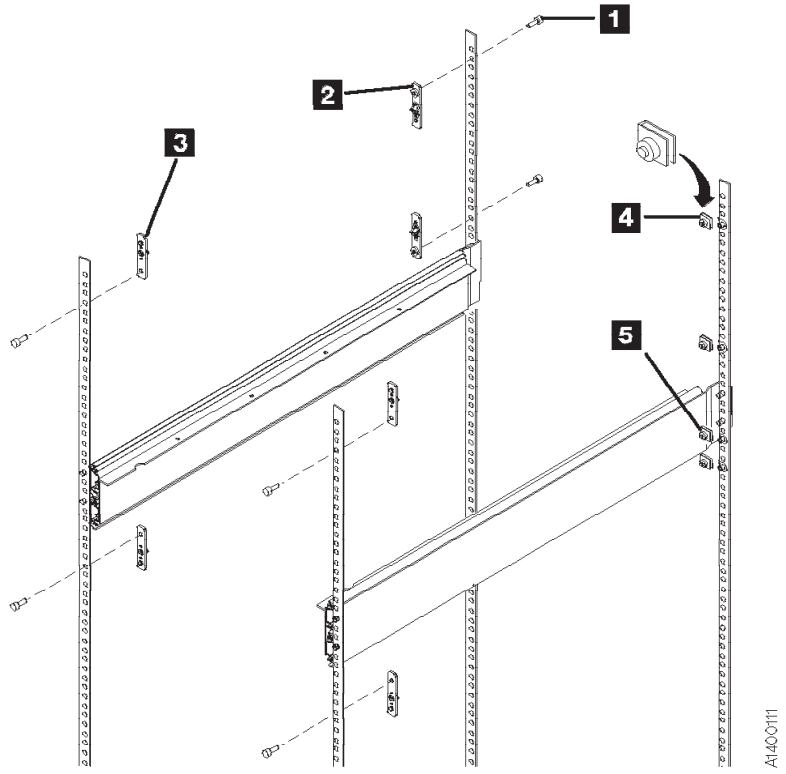


Figure 8-6. Cover Mounting Hardware (Front View)

__ 3. Ensure that the rack stabilizer is installed. See *7202 Install and Service Guide*, *7015 Install and Service Guide*, or *9309 Model 1 and 2 Setup and Operator Guide*.

__ 4. Extend the slides.

__ 5. See Figure 8-7 on page 8-14. Install the drive shelf **2** P/N 45G0236 by using eight screws **1** P/N 1621308.

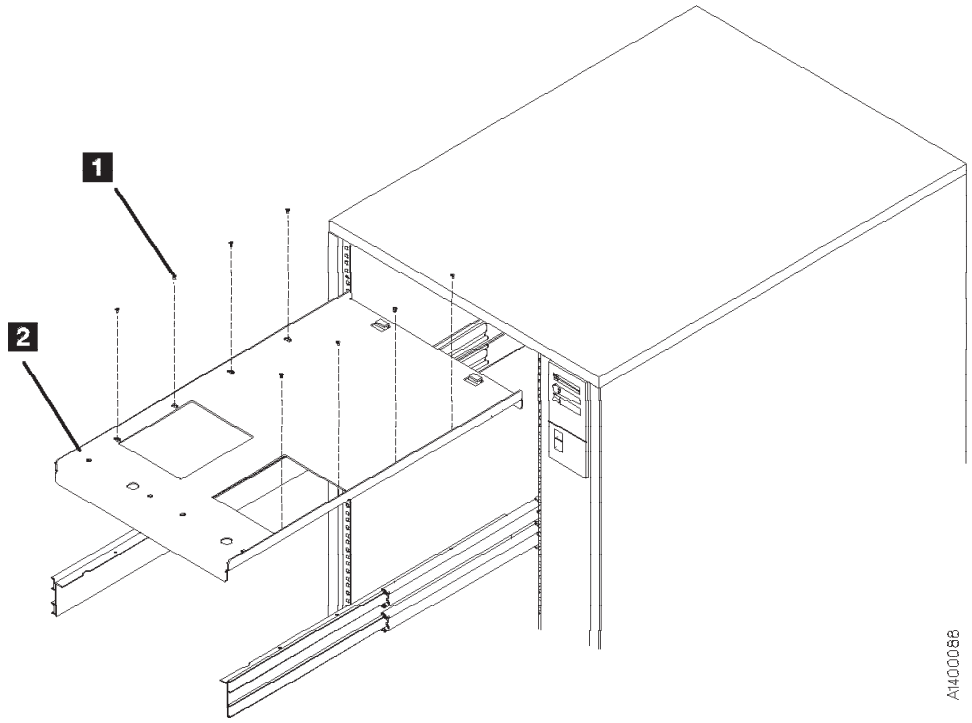


Figure 8-7. Drive Shelf (Front View)

See Figure 8-8 on page 8-15.

__ 6. Install the cable pivot arm (cable guide) **2** P/N 45G0188 in hole locations 27 and 30 by using two screws **3** P/N 1624778.

__ 7. Attach the cable pivot arm to the drive shelf by using screw **1** P/N 1621537.

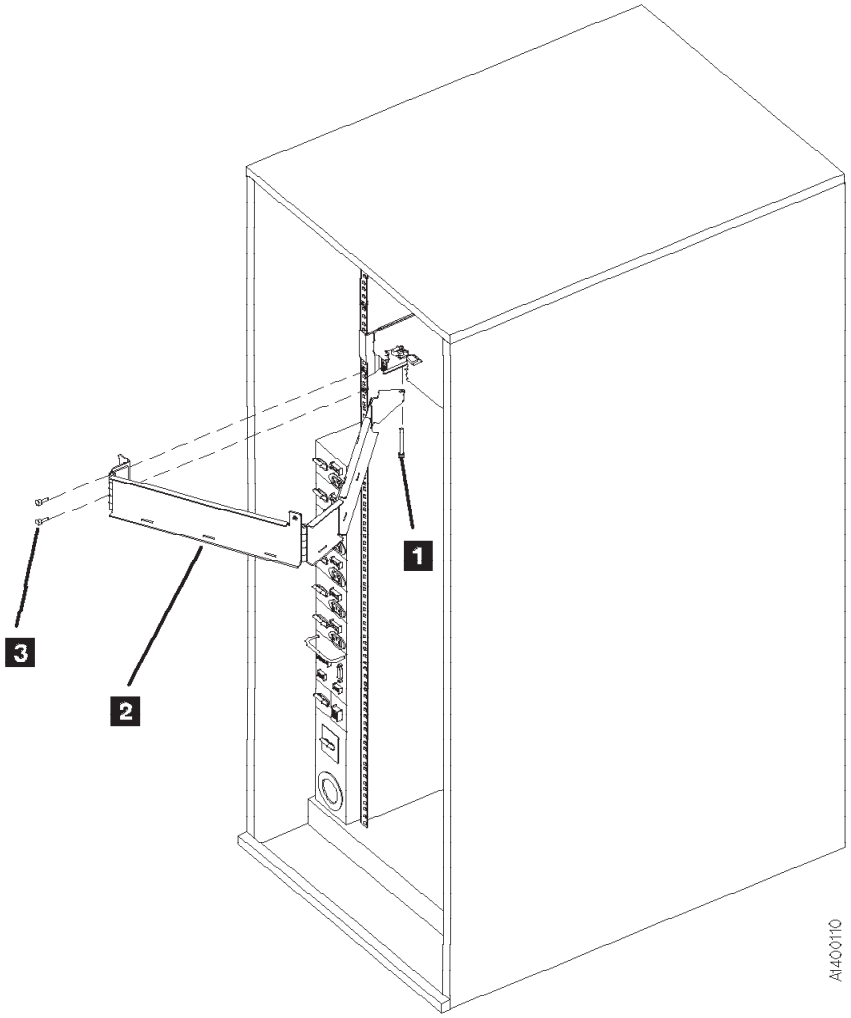


Figure 8-8. Cable Guide (Rear View)

__ 8. If you are not installing the lower shelf for drives 2 and 3, go to “Install Drives in Rack” on page 8-18.

Hardware for Drives 2 and 3

See Table 8-4 and Figure 8-9 on page 8-17. Count the holes from the top (use the hole locations in the figure only if the rack has Model B11/E11/H11 drives in the top EIA space). If other than 12 EIA units were used above the space for drives 2 and 3, count the required 12 EIA units as you did for drives 0 and 1. See Figure 8-2 on page 8-7 for how to count the holes in the EIA units.

__ 1. Install right slide **6** P/N 05H2341 and left slide **5** P/N 05H2340 by using four screws **11** P/N 1624778. Use pin holes 58 and 61 if drives 0 and 1 are installed in the top position.

Table 8-4. Drives 2 and 3 Slides

Usage	Screw Mounting Hole	Pin Locator Hole	Part Name, Number
Count the holes from the top EIA unit allocated for the drive. See Figure 8-2 on page 8-7.			
5 Left slide (1)	59, 62 left front	58, 61 left front and rear	Slide, 05H2340
6 Right slide (1)	59, 62 right front	58, 61 right front and rear	Slide, 05H2341

See Table 8-5 and Figure 8-9 on page 8-17.

__ 2. Install the four mounts **4** P/N 05H2347 by using four screws **3** P/N 1624778.

__ 3. Extend the slides.

__ 4. Attach the drive shelf **2** P/N 45G0236 to the slides by using 8 screws **1** P/N 1621308.

__ 5. Install the two nut clips **9** P/N 74F1823 in the rear mounting holes 63 and 66. Ensure that the threaded nut is *inside* the frame as you face the frame.

__ 6. Install the cable guide **7** P/N 45G0188 in the rear hole locations 63 and 66 by using two screws **8** P/N 1624778.

__ 7. Attach the cable guide to the drive shelf by using screw **10** P/N 1621537.

Table 8-5. Drives 2 and 3 Hardware

Usage	Screw Mounting Hole	Pin Locator Hole	Part Name, Number
Count the holes from the top EIA unit allocated for the drive. See Figure 8-2 on page 8-7.			
4 Decorative cover hardware (4)	40 left front 40 right front 68 left front 68 right front	37 left front 37 right front 71 left front 71 right front	Mount, 05H2347 Mount, 05H2347 Mount, 05H2347 Mount, 05H2347
9 Cable guide hardware (2)	63 right rear 66 right rear	See Note. —	Nut clip, 74F1823 Nut clip, 74F1823
Note: The threaded nut must be *inside* the frame as you face the frame.			

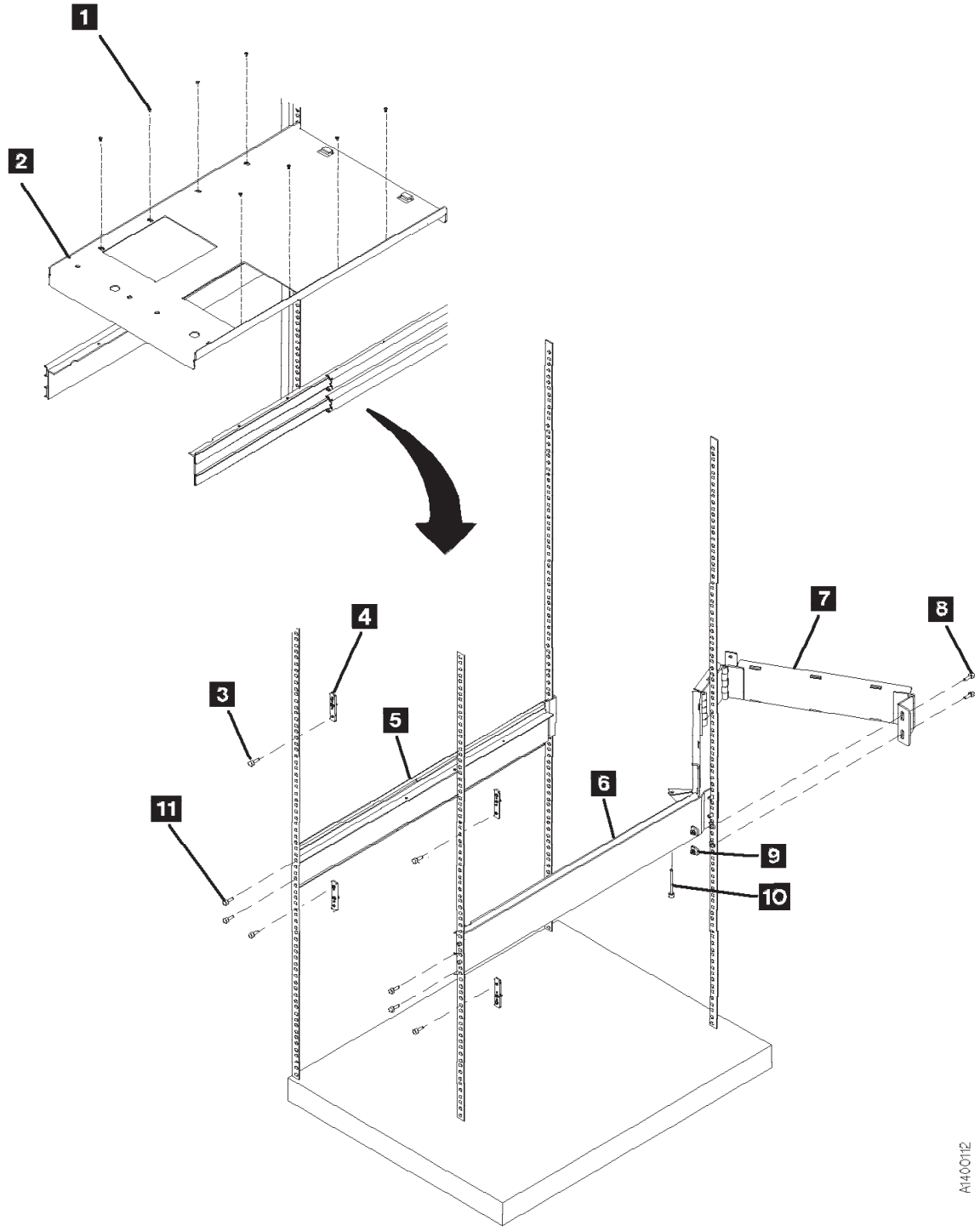


Figure 8-9. Drives 2 and 3 Hardware

Install Drives in Rack

Note: The following notice is translated into selected languages. See **C2** in Chapter 7, “Inspection” on page 7-1.

CAUTION:
The 3590 Model B11/E11/H11 (without the ACF) weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit.

Attention: When lifting drive:

- **When picking up the 3590 drive, do NOT use the cartridge feed slot as a handle to lift the 3590 drive! Damage may easily result to the loader door or loader.**
- **Use the protrusion in the drive enclosure under the cartridge feed slot or the bottom of the drive enclosure to lift the 3590 drive.**

__ 1. Carefully install each drive on a drive shelf by using two screws 4 P/N 1624778.

> **Hint**
> Keep the drives close together when securing them on the shelf to allow easy installation of the decorative cover.

__ 2. Ensure that the loader door moves freely.

__ 3. Go to “Install ACF” on page 8-19.

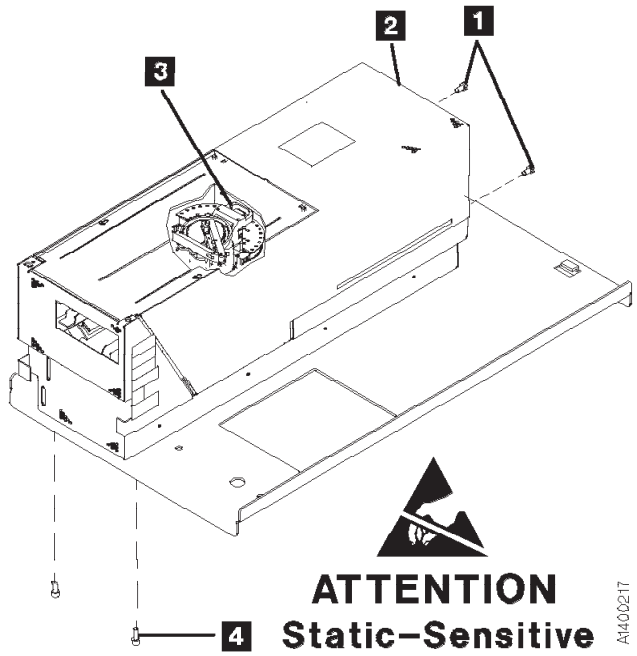


Figure 8-10. Deck Enclosure Cover

Install ACF

__ 1. Unpack the ACF.

__ 2. Pull the 3590 into the service position (see “Service Position” on page 9-11).

> **Hint**
> If you are installing two drives on a shelf, install the right-side ACF first so that you can access the cables easier.

__ 3. Read this step before proceeding with placement of the ACF.

Place the ACF over the tabs on the lower part of the deck enclosure, compress the foam pad, then slide the ACF down on the tabs. Simultaneously engage the upper alignment pins.

⚠ ACF side covers may not be permanently attached. Use other points to lift the ACF.

__ 4. Ensure that the ACF is engaged on the upper alignment pins and tabs (slots) on lower part of deck enclosure.

__ 5. See Figure 8-12 on page 8-20. Tighten the thumbscrew **1** on the upper left tab of the ACF into the deck enclosure.

__ 6. Remove the side cover, as follows:

> **Rack-Mounted Model B11/E11/H11 Only**
>
> You cannot remove the left cover if an ACF is mounted to the left of this drive. An alternate method to plug the cable connectors into the 3590 is to remove the magazine and use that access rather than removing the side cover. If you do not remove the side cover, go to step 7.
>
> **End of Rack-Mounted Model B11/E11/H11 Only**

__ a. See Figure 8-11. Remove the two screws **3** .

__ b. Insert a screwdriver into the hole **2** at the bottom of the side cover **1** .

__ c. Lift the side panel up to disengage the tabs from the frame and pull the panel out at the bottom.

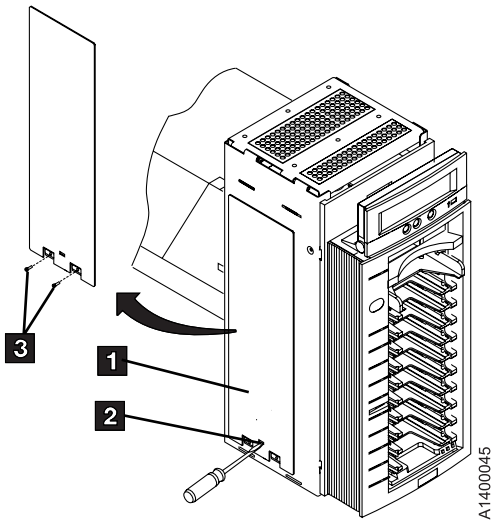


Figure 8-11. ACF Side Cover

__ 7. See Figure 8-12 on page 8-20. Connect the two cable connectors **2** from the ACF to the drive.

__ 8. Position the ACF cables to the left side of the ACF and remove any slack in them to ensure the cables do not interfere with the movement of the ACF elevator or transport. Place them into retaining clips **5** .

__ 9. If removed, reinstall the side cover you removed in 6 on page 8-19.

__ 10. If you are installing or servicing a desk side Model B11/E11 (RPQ 8B3191) or Model B11/E11/H11 (FC 2200), return to the procedure that sent you here. Otherwise, continue to the next step.

__ 11. Install the serial number label **3** P/N 44F0904. Ensure that the serial number matches the serial number of the drive, which has the label on the side panel and on the rear of the drive cover.

__ 12. Install the address label **4** P/N 05H8904.

__ 13. Go to “Installation Checkout” on page 8-32.

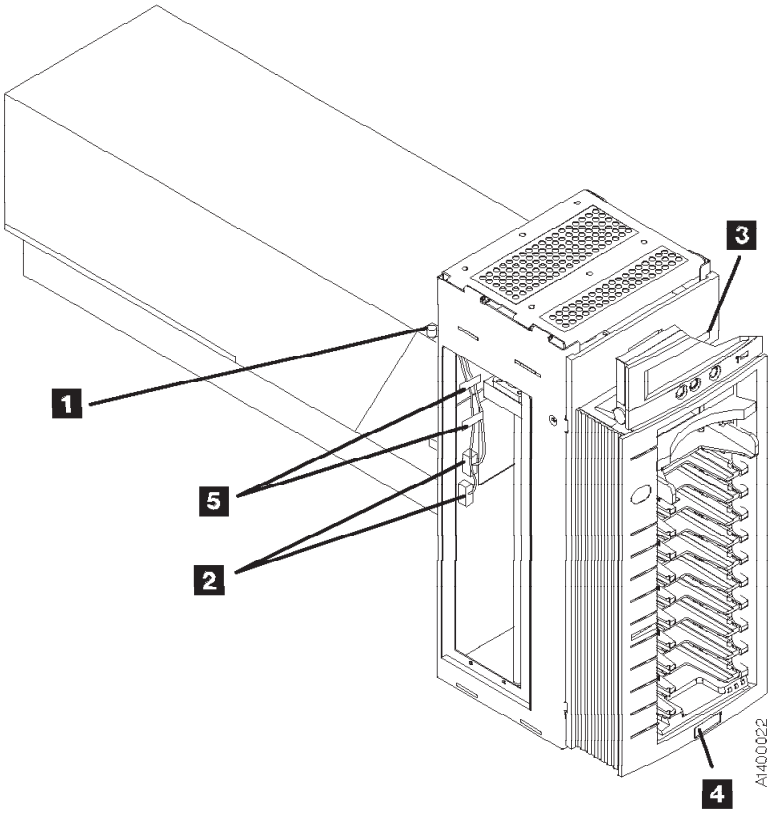


Figure 8-12. ACF Thumbscrew and Cables

Install Model B11/E11 Within Desk Side Sleeve (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)

Note: The following notice is translated into selected languages. See **C2** in Chapter 7, "Inspection" on page 7-1.

CAUTION:
The 3590 Model B11/E11/H11 (without the ACF) weighs 28.6 kilograms (63 pounds); the 3590 Model B11/E11/H11 with the ACF weighs 40.5 kilograms (89 pounds), so remove the ACF before lifting the 3590. It takes two persons to safely lift this unit (without the ACF).

__ 1. Place the 3590 near the sleeve that will contain the 3590, then unpack the boxes.

__ 2. Verify the 3590 shipping group parts by checking that you have received all the parts listed on the 3590 bills of material. Do not remove the parts from plastic containers so you can tell the part numbers of the parts.

Parts for RPQ 8B3191 or FC 2200

Ensure that you have received the following parts:

__ 1. Desk side sleeve top cover, P/N 05H8347.

__ 2. Desk side lower sleeve, P/N 05H8348.

__ 3. Desk side base support plate, P/N 05H9075.

__ 4. ACF cover, P/N 05H3263.

__ 5. Label assembly (ON/OFF) for top of desk side cover, P/N 05H3264.

__ 6. Eight washers, P/N 05H3348, for drive installation in the lower sleeve.

__ 7. Eight screws, M4X16, P/N 1621371, for drive installation in the lower sleeve.

__ 8. Eight additional screws, M4X16, P/N 1621371, to secure the desk side lower sleeve to the desk side base support (plate).

__ 9. Eight screws, M3X5, P/N 05H2734, to secure the desk side top cover to the desk side lower sleeve.

__ 10. AC power cable suitable for wall outlet; the P/N varies with the country of destination.

Parts included in 3590 drive ship group are not listed.

Continue Installation

Attention: When lifting the drive:

- **Do NOT use the cartridge feed slot as a handle to lift the 3590 drive! Damage may easily result to the loader door or loader.**
- **Use the protrusion in the drive enclosure under the cartridge feed slot or the bottom of the drive enclosure to lift the 3590 drive.**

Note: Because of "Installation Checkout" requirements for the Model B11/E11/H11 drive, the installation of the desk side sleeve top cover, **1** in Figure 8-14 on page 8-23, occurs after *"Installation Checkout".*

__ 1. See Figure 8-13 on page 8-22. Place the desk side lower sleeve **1**, P/N 05H8348, over the desk side base support plate **2**, P/N 05H9075.

__ 2. Install the eight screws **3**, P/N 1621371, four screws on each side of the lower sleeve **1**, to bolt the lower sleeve to the desk side base support **2**. Snug the screws to secure the lower sleeve to the base support plate.

__ 3. **With assistance**, lift the 3590 drive and place it on the desk side lower sleeve **1**. **Ensure** that the **front** of the drive is placed over the **enclosed** end **5** of the lower sleeve.

__ 4. Slide the front of the drive **forward** (toward the front of the lower sleeve) as far as possible to a position that still allows installation of screws **4**.

Note: Installation of the ACF to the drive will be made easier by having the front of the drive extend forward as far as possible.

__ 5. Install the eight screws **4** , P/N 1621371, and washers **4** , P/N 05H3348, four screws and washers on each side of the lower sleeve, to bolt the drive to the desk side lower sleeve. Do **not** snug the screws yet.

__ 6. Ensure that the loader door moves freely.

__ 7. Unpack the ACF.

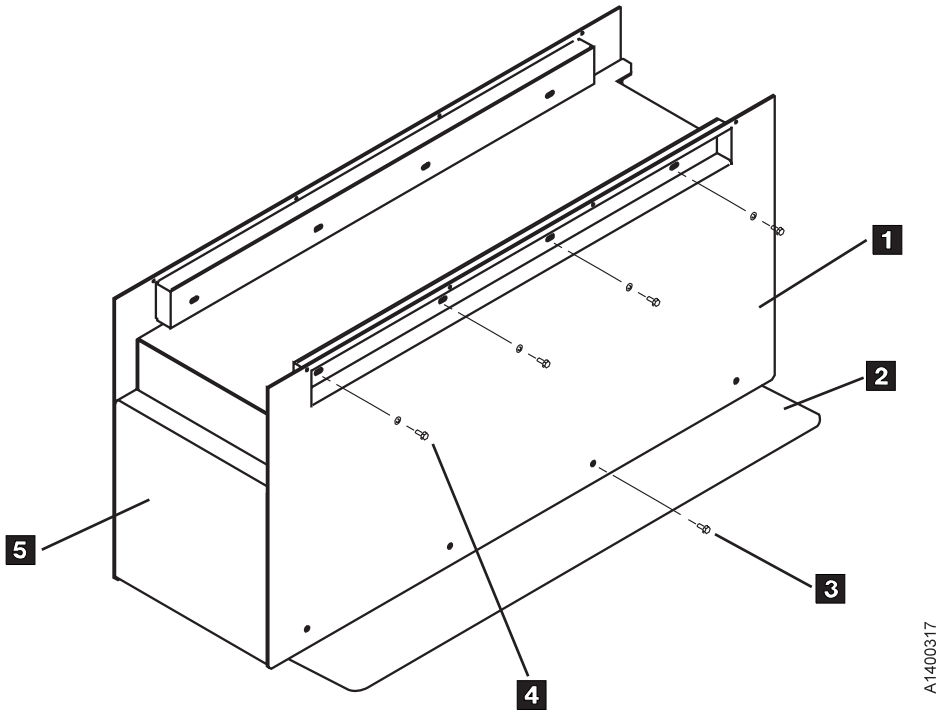


Figure 8-13. View of Desk Side Lower Sleeve Installed on Base Plate

__ 8. Go to step 3 on page 8-19 to install the ACF. Return here after completing the procedure.

__ 9. Push the drive and the mounted ACF back on the lower sleeve until the ACF is flush to the front of the sleeve, **5** in Figure 8-13.

__ 10. **Snug** the screws **4** (Figure 8-13) now to secure the drive to the lower sleeve.

__ 11. Refer to Figure 8-14 on page 8-23. Install the serial number label **10** , P/N 44F0904. Ensure that the serial number matches the serial number of the drive, which has the label on the side panel and on the rear of the drive enclosure.

__ 12. Install the address label **7** , P/N 05H8904, to the ACF.

__ 13. With the ACF install completed, go to “Installation Checkout” on page 8-32.

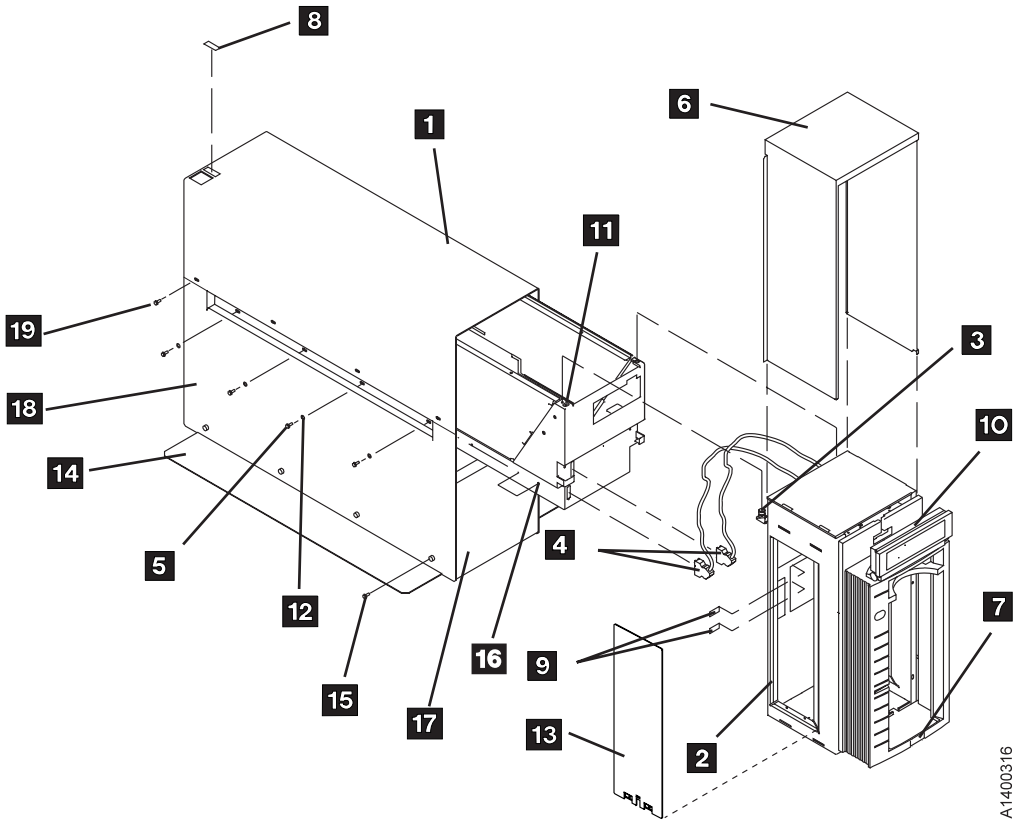


Figure 8-14. Desk Side Sleeve Installation for Model B11/E11 (RPQ 8B3191) or Model B11/E11/H11 (FC 2200)

Install Rack That Contains Model B11/E11/H11 Drives

This procedure is to be used when a Model B11/E11/H11 is shipped already installed in a rack.

See Figure 8-15 on page 8-24.

__ 1. Remove the shipping plates **2** P/N 05H8922 from the cable guide pivots **4** by removing screws **1** and **3**.

__ 2. If not installed, install the ACFs and decorative covers. See “Install ACF” on page 8-19.

__ 3. Go to “Installation Checkout” on page 8-32.

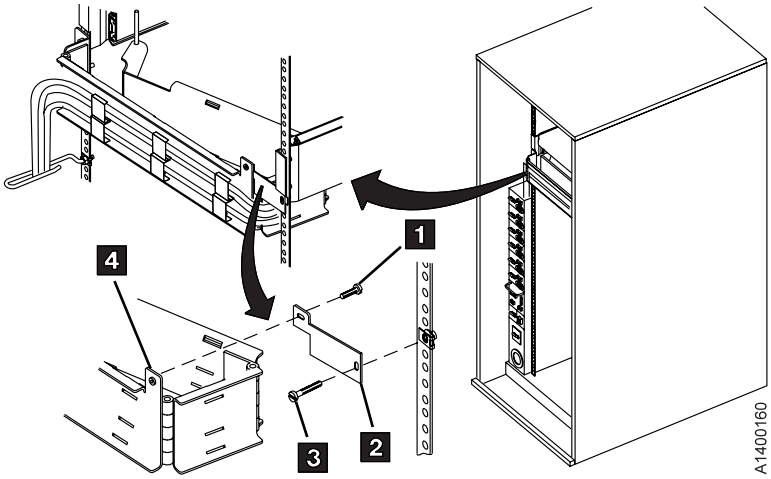


Figure 8-15. Shipping Plate

Model B1A/E1A/H1A Installation

- If the Model B1A/E1A/H1A is already installed in a 3494 frame, go to “Installation Checkout” on page 8-32.
- If the Model B1A/E1A/H1A is being installed into a non-IBM library, ensure that all prerequisite activity needed within the library is completed before you begin to install the drive. After the drive is installed, go to “Installation Checkout” on page 8-32.
- If you are installing a Model B1A/E1A/H1A in an existing 3494 frame, ensure that the appropriate 3494 feature code or conversion is installed, then continue with “Install Model B1A/E1A/H1A Into 3494 Frame”.

Install Model B1A/E1A/H1A Into 3494 Frame

Be sure to read “Before Installation” on page 8-3 before you start here.

Figure 8-16 shows examples of fully-configured 3494 Models D12, D14, L12, and L14 as viewed from the front. Install the 3590 in the lowest-numbered available position in the frame.

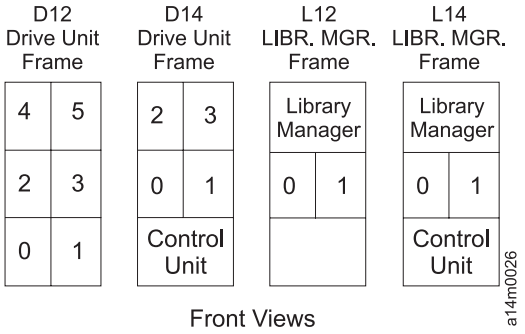


Figure 8-16. 3494 Frames

Note: The following notice is translated into selected languages. See **C2** inChapter 7, “Inspection” on page 7-1.

CAUTION:
The 3590 Model B1A/E1A/H1A weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit.

__ 1. See the START section in *IBM 3494 Tape Library Dataserver Maintenance Information*, P/N 05H7566 and switch OFF power to the 3494.

Before you start, see how the slides work. The inner slide has a locking mechanism that you press to release and the outer slides have a locking mechanism that you move to the center position to release.

See Figure 8-17 on page 8-26.

__ 2. Remove the rear door from the 3494 frame.

__ 3. Install the two slides **2** P/N 05H4256 in the 3494 frame by using eight screws **1** P/N 1621197.
   - Install the slides so the slide locks (the cables with the screws) are to the rear of the frame. You may have to extend the slides to access the mounting holes.
   - Loosely install the first screw in the front hole, the second and third screws in the rear, the fourth screw in the front slot, and then tighten the screws.

__ 4. Each slide has three sections. Pull the slides to the rear and remove the inner slide section from each slide. **Do not** reverse the inner slides. The slides must be installed in the same position as they were removed and the tapered ends must be at the front of the drive.

__ 5. Install the inner slide sections **3** on the 3590 by using 8 screws **4** P/N 1621197.

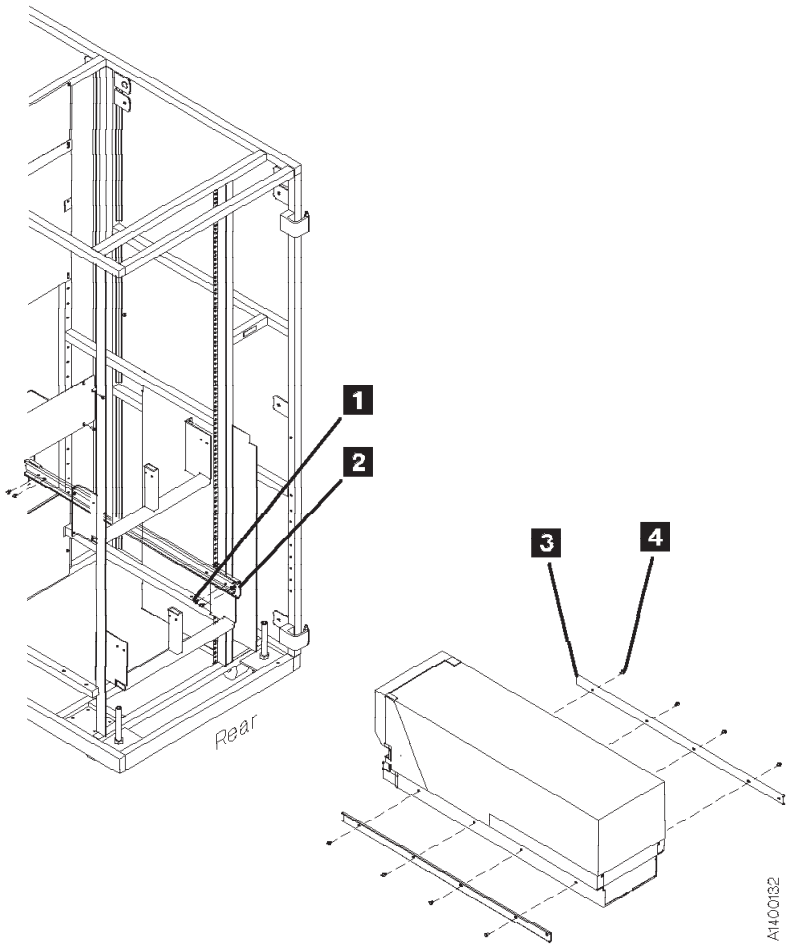


Figure 8-17. 3494 Slides (Rear View)

See Figure 8-18.

__ 6. Install the fiducial bracket **8** P/N 05H3143 by using the screw **9** P/N 1621019 and lock washer P/N 1622332.

__ 7. While holding the front cover **4** P/N 05H4255 near the drive, plug the cables into the connectors **11** . Insert the display cable **5** P/N 45G0275 into the lower connector of the 3590 and into the panel P/N 39F3450.

__ 8. Install the front cover by inserting the right screw **7** P/N 1621197 through the cover and into the drive.

__ 9. To hold the flat cable in place, fasten the cable retaining bracket **6** P/N 05H4756 to the left side of the cover by using the left screw **7** .

__ 10. Install the serial number label **10** P/N 44F0904. Ensure that the serial number matches the serial number of the drive, which has the label on the side panel and on the rear of the drive cover.

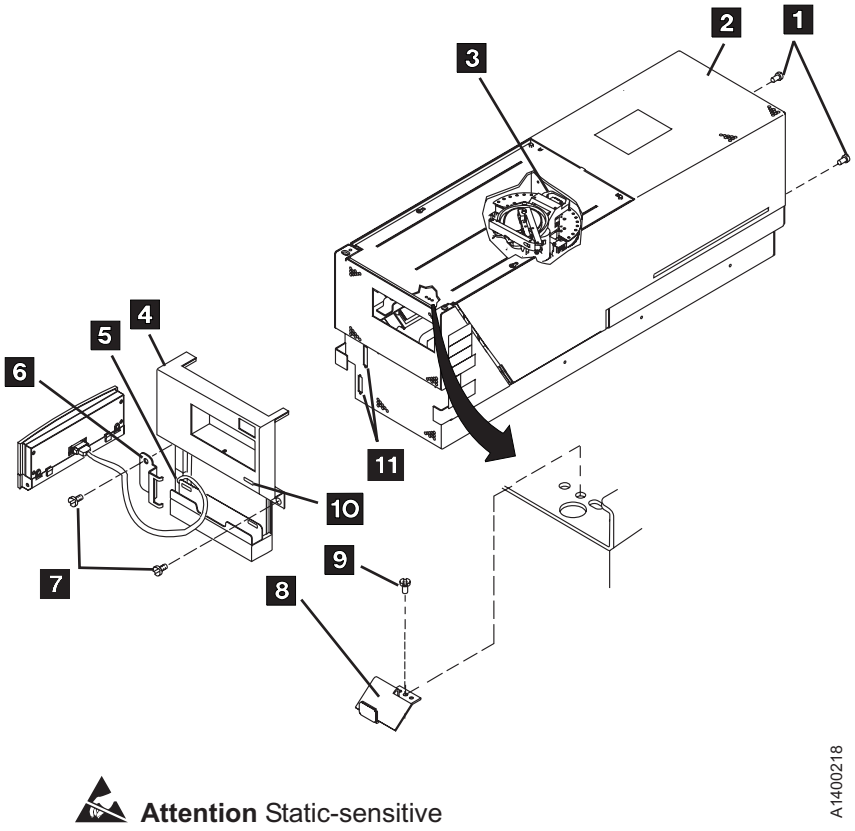


Figure 8-18. Front Cover and Deck Enclosure Cover

Notes for the Next Step:

a. Ensure that the ball-bearing retaining assemblies of the slides are located at the rear of the center slide when installing the 3590.

b. Ensure that the middle section of the slide is fully extended and locked before you push the drive in place.

Attention: When lifting the drive:

- **When picking up the 3590 drive, do NOT use the cartridge feed slot as a handle to lift the 3590 drive! Damage may easily result to the loader door or loader.**
- **Use the protrusion in the drive enclosure under the cartridge feed slot or the bottom of the drive enclosure to lift the 3590 drive.**

__ 11. Read this complete step before proceeding. With assistance, lift the 3590 and place it in the slides. Hold the ball-bearing retainers to the rear while you guide the slides into the ball-bearing retainer assemblies and then push the 3590 in place. Guide the 3590 onto four or five ball bearings before you push it forward.

Attention: If you do not have the inner slides aligned in the ball-bearing retainers, you will damage the slides and they will have to be replaced. **Do not force** the drive to the front.

__ 12. Ensure that the loader door moves freely.

__ 13. Go to “Installation Checkout” on page 8-32.

Install Model B1A/E1A Within Desk Side Sleeve (RPQ 8B3190)

Note: The following notice is translated into selected languages. See **C2** in Chapter 7, “Inspection” on page 7-1.

CAUTION:
The 3590 Model B1A/E1A/H1A weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit.

__ 1. Place the 3590 near the sleeve that will contain the 3590, then unpack the boxes.

__ 2. Verify the 3590 shipping group parts by checking that you have received all the parts listed on the 3590 bills of material. Do not remove the parts from plastic containers so you can tell the part numbers of the parts.

Parts for RPQ 8B3190

Be sure you received the following parts for RPQ 8B3190:

__ 1. 3590 B1A Logo for front cover, P/N 05H9064.

__ 2. Front cover of drive, P/N 05H3260.

__ 3. Desk side sleeve top cover, P/N 05H8347.

__ 4. Desk side lower sleeve, P/N 05H8348.

__ 5. Desk side base support plate, P/N 05H9075.

__ 6. Label assembly (ON/OFF) for top of desk side cover, P/N 05H3264.

__ 7. Two nylon washers, P/N 05H4459, to secure the swivel base to the front cover.

__ 8. Compression spring, P/N 05H4460, to secure the swivel base to the front cover.

__ 9. Screw, P/N 05H4465, to secure the swivel base to the front cover.

__ 10. Eight washers, P/N 05H3348, to install the drive in the lower sleeve.

__ 11. Eight screws, M4X16, P/N 1621371, to install the drive in the lower sleeve.

__ 12. Eight additional screws, M4X16, P/N 1621371, to secure the desk side lower sleeve to the desk side base support (plate).

__ 13. Eight screws, M3X5, P/N 05H2734, to secure the desk side top cover to the desk side lower sleeve.

__ 14. Two screws, M5X25, P/N 1621522, to secure the front cover to the front of the drive enclosure.

__ 15. Swivel base for operator/CE panel, P/N 62G2542, which is attached to the front cover.

__ 16. AC power cable suitable for wall outlet; the P/N varies with the country of destination.

Parts included in 3590 drive ship group are not listed.

Continue Installation

Attention: When lifting the drive:

- **When picking up the 3590 drive, do NOT use the cartridge feed slot as a handle to lift the 3590 drive! Damage may easily result to the loader door or loader.**
- **Use the protrusion in the drive enclosure under the cartridge feed slot or the bottom of the drive enclosure to lift the 3590 drive.**

Note: Because of “Installation Checkout” test requirements for the drive, the installation of the desk side sleeve top cover **1** , in Figure 8-20 on page 8-31, occurs after “Installation Checkout”.

__ 1. See Figure 8-19 on page 8-30.

Place the desk side lower sleeve **1** , P/N 05H8348, over the desk side base support plate **2** , P/N 05H9075.

__ 2. Install the eight screws 3 , P/N 1621371, four screws on each side of the lower sleeve 1 , to bolt the lower sleeve to the desk side base support 2 . Snug the screws to secure the lower sleeve to the base support plate.

__ 3. **With assistance**, lift the 3590 drive and place it on the desk side lower sleeve 1 . **Ensure** that the **front** of the drive is placed over the **enclosed** end 5 of the lower sleeve.

__ 4. Slide the front of the drive **forward** (toward the front of the lower sleeve) as far as possible to a position that will still allow installation of screws 4 .

Note: This position will help to prevent any problems during installation of the desk side sleeve top cover to the lower sleeve after completion of *"Installation Checkout"*.

__ 5. Install the eight screws 4 , P/N 1621371, and washers 4 , P/N 05H3348, four screws and washers on each side of the lower sleeve, to bolt the drive to the desk side lower sleeve. Do **not** snug the screws yet.

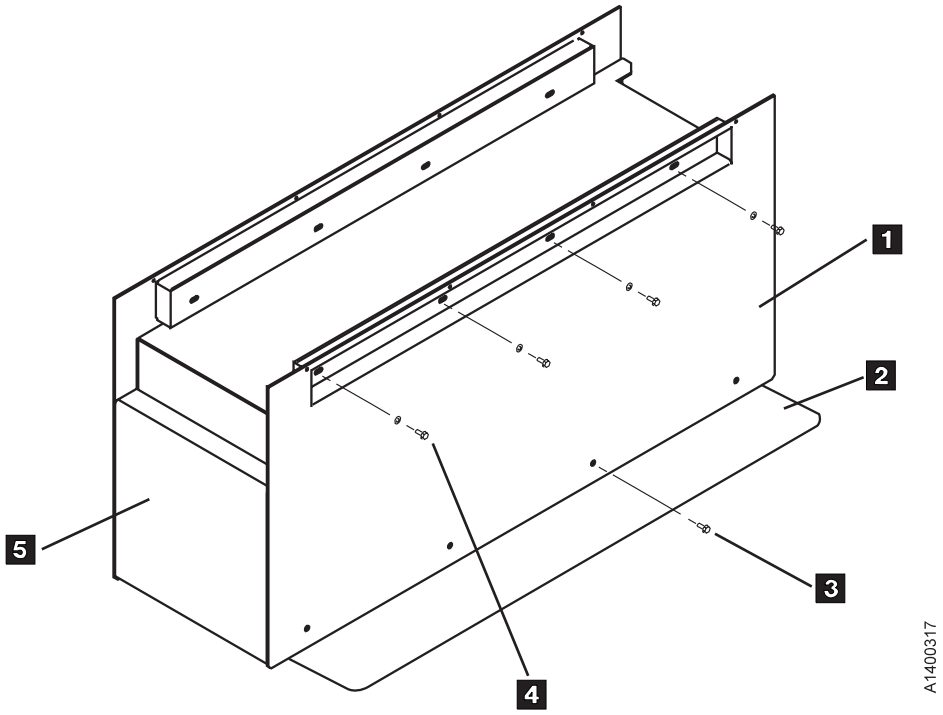


Figure 8-19. View of Desk Side Lower Sleeve Installed on Base Plate

__ 6. Refer to Figure 8-20 on page 8-31. Install the front cover 3 , P/N 05H3260, by hooking it onto the slots/holes 2 located at the top of the front drive enclosure. Secure the cover by tightening the screws 7 , P/N 1621522, to the front of the drive enclosure.

__ 7. Insert the display cable 4 , P/N 45G0275, (large plug) into the lower connector 5 of the B1A drive. Connect the other end, the smaller connector, of the display cable into the operator/CE panel 6 , P/N 39F3450.

__ 8. Using screw 11 , P/N 05H4465, two nylon washers 11 , P/N 05H4459, and one spring 11 , P/N 05H4460, connect the display swivel base 12 , P/N 62G2542, to the front cover 3 .

__ 9. Attach the operator/CE panel 6 to the display swivel base 12 .

__ 10. Install the IBM label, P/N 05H9064, on the upper left side 8 of the front cover 3 .

__ 11. Install the serial number label 13 , P/N 44F0904. Ensure that the serial number matches the serial number of the drive, which has the label on the side panel and on the rear of the drive.

__ 12. Ensure that the loader door moves freely.

__ 13. Go to"Installation Checkout" on page 8-32.

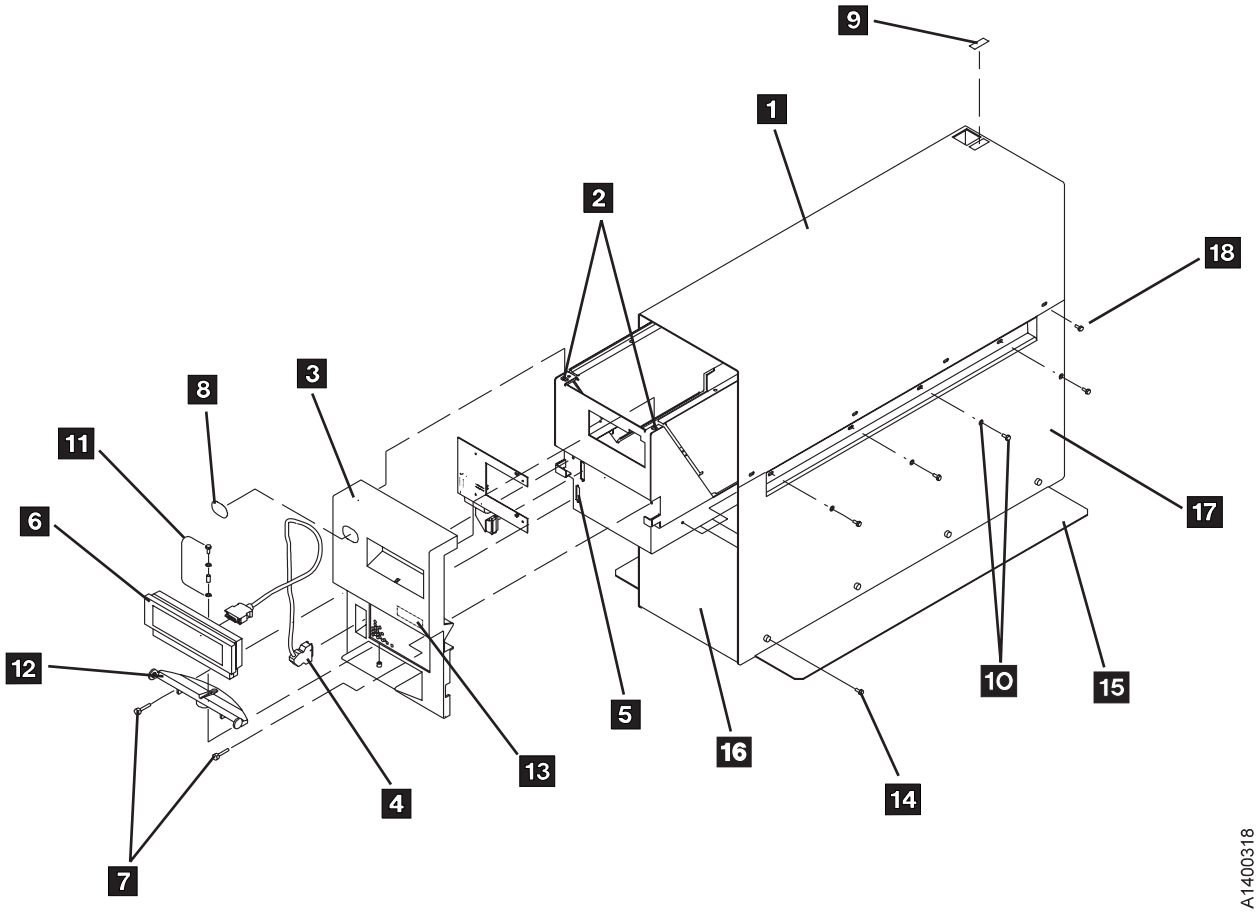


Figure 8-20. Desk Side Sleeve Installation for B1A/E1A, RPQ 8B3190

Installation Checkout

Head Protector

New machines from the factory are shipped **without** the orange head protector, P/N 45G0145. You should not have to remove the deck cover to install a new machine.

Relocated machines, however, may have had the head protector installed when they were discontinued at the previous location.

If this is a relocated machine, remove the deck cover and remove the head protector if it is installed.

__ 1. Ensure that the drive is in its operating position.

__ 2. Install the power cable in the 3590 and plug it into its power source. Proper routing of the power cable will be handled in later phases of the drive installation.

SCSI Channel Only

__ 3. Go to “Setup SCSI Ports Wrap Test” on page 9-105 to install channel port wrap tools on the drive being installed, then return here.

End of SCSI Channel Only

Fibre Channel Only

__ 4. The fibre channel ports wrap test is not a part of the Power-on Self Test (POST) diagnostics. It is part of the Verify Fix diagnostics and will be run at the end of the installation procedure.

__ 5. Continue with the next step in this procedure.

End of Fibre Channel Only

3494/3495 Only

__ 6. Go to “Setup Library Manager Port Wrap Test” on page 9-111 to install the Serial (RS-422) port wrap tool on the drive being installed, then return here.

Note: This information applies to 3494/3495 installations.

End of 3494/3495 Only

__ 7. Set the drive power switch to the **ON** position.
- When you power ON the drive, the power-on self test (POST) diagnostic will run in the drive. The SCSI communications path(s), Serial communications path and the Model C12/C14 library communications path will be tested automatically (if wrap tools have been installed) as part of the POST diagnostics. The drive will come up in CE mode (CE Options menu is displayed) if any of the wrap tools is detected.

  Note: The power-on test takes approximately 2.5 minutes to complete.
- If a failure occurs, a message can be posted in the operator/CE panel, or the operator/CE panel can be blank. If any of these conditions exist, go to the START section for further analysis of the failure.
- If the failure message has cable(s) in the FRU list (listed in the START section), check and reseat cable connections before replacing any FRUs.

__ 8. Continue with “Operator/CE Panel Setup and Tests” on page 8-33.

Operator/CE Panel Setup and Tests

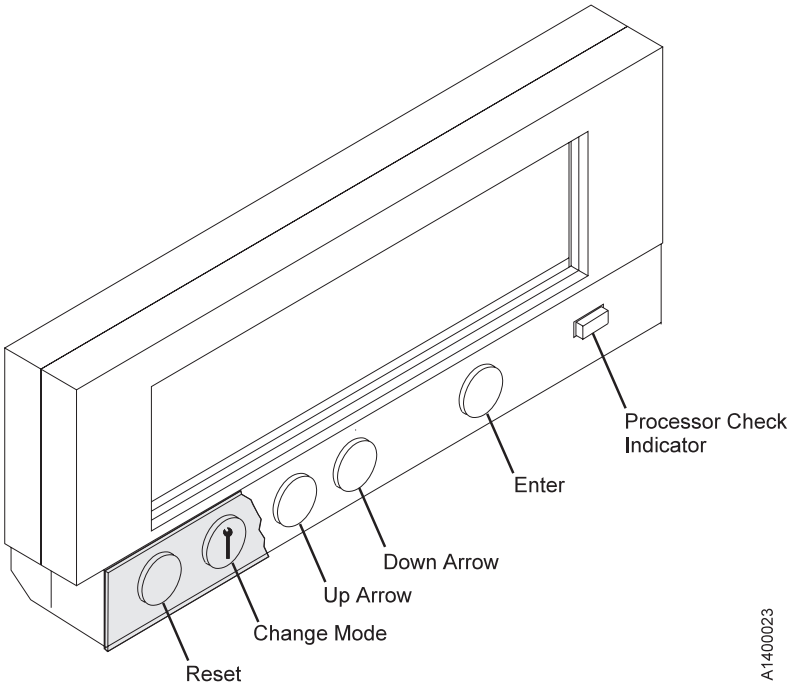


Figure 8-21. Operator/CE Panel

When the instructions for using the panel use the term *select*, use the **arrow** pushbuttons to move the cursor to the choice, then press **Enter**. Pressing **Reset** causes a power-on reset.

Pressing **Change Mode** selects either the *operator* Options menu or the *CE* Options menu.

If the power-on diagnostics detect a problem, a FRU identifier (FID) is posted in the operator/CE panel. If an error occurs, note the FID and go to the START section.

See Chapter 5, “Operator Panel” on page 5-1 for details about the operator/CE panel and the meaning of the menu options.

Continue with “Check Wrap Tools” on page 8-34.

Check Wrap Tools

This procedure will show which of the installed wrap tools were **detected**. Successful completion of all tests, including the wrap tests, is indicated if no FIDs or ATTN messages are posted on the operator/CE panel.

__ 1. Press the Change Mode pushbutton to place the subsystem in CE mode.
__ 2. Select **Config/Install** from the CE Options menu.
__ 3. Select **Drv Options** from the CE Config/Install menu.
__ 4. From the CE Drv Options menu, select **Wrap Tools**.
__ 5. The following output is displayed. The term *'PRESENT'* means that the particular wrap tool was detected by the test and the associated wrap test was performed.

```
SCSI 0: PRESENT  or  NOT PRESENT  (SCSI attached drives only)
SCSI 1: PRESENT  or  NOT PRESENT  (SCSI attached drives only)
RS-422: PRESENT  or  NOT PRESENT
STL   : PRESENT  or  NOT PRESENT
```

Note: This procedure can **NOT** check for the fibre channel port wrap tools.

__ 6. Make sure that *'PRESENT'* status is indicated for all installed wrap tools. A status of *'NOT PRESENT'* indicates that the wrap tool was not recognized and the associated wrap test was **not** run.
__ 7. Continue with "Check EC Level".

Check EC Level

__ 1. If not displaying the operator Options menu, press the Change Mode pushbutton.
__ 2. From the operator Options menu, select **Services**.
__ 3. From the Services menu, select **Microcode Level**.
__ 4. Record the EC level and link level in "Microcode EC Level History Log" on page 9-61.
__ 5. Select **Cancel** twice to return to the Options menu.
__ 6. Continue with "Set Customer Options" on page 8-35.

Set Customer Options

__ 1. If not displaying the operator Options menu, press the Change Mode pushbutton.

Model B11/E11/H11 Only

__ 2. From the operator Options menu, select the **Set ACF Mode** option. Set the ACF mode per the customer's direction. See "Modes of Operation" on page 6-19 for details.

Note: The drive tests can not be run correctly if the ACF is set to **Random** or **Random 2–LUN**. Wait until after the drive tests are completed. Temporarily set the ACF to one of the other modes now. When the drive tests are completed, the ACF mode can be reset to **Random** or **Random 2–LUN** mode.

__ 3. Ensure that the ACF magazine is in the ACF in the locked position. See "Inserting and Removing Magazine" on page 6-7.

End of Model B11/E11/H11 Only

__ 4. Set the language of the operator screens, if necessary. Select the **Change Language** option.

__ 5. From the operator Options menu, select **Services**.

__ 6. Set the SCSI or fibre channel port addresses, as follows:

SCSI Channel Only

a. Select the **Set Address** option.

Addressing Restrictions:

1) When attaching to iSeries/AS400 (OS/400) System with system FC 6501, the drive **must** be set to address '0'. The iSeries/AS400 (OS/400) System will recognize the drive as address '7' due to system design. When a 3590 drive is attached to an iSeries/AS400 (OS/400) System it is **a point to point connection only.**

2) The pSeries/RS6000 (AIX) System host will recognize the drive as address '0' if the attached drive's address is set to '0'. The pSeries/RS6000 (AIX) System allows multiple 3590s to be attached to a single port via a SCSI string. **In this case, different 3590 drives on the same SCSI string cannot have the same address. Each 3590 must have a unique address.**

3) When attaching to a RISC/SP2, the RISC adapter is assigned SCSI address **7**. Therefore, the drive can **NOT** be set to address **7**.

Model C12/C14 Only

If you are installing Model B1A/E1A/H1A in a **3590 Model C12/C14**, the addresses must be set according to the feature code:

FC 5200 or FC 5400

Consult the site planning representative or the customer for the correct SCSI addresses to be set in each of the four drives. Any address ('0' to 'F') may be set for SCSI **Port 0** and **Port 1**, as long as the addresses are **unique and non-conflicting within each SCSI string**. Refer to the INSTALL section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for a description of feature code FC 5200 or FC 5400.

FC 5201 or FC 5401

The drives' SCSI addresses must be set sequentially from '0' to '3' starting at the top drive to the bottom drive in the Model C12/C14 drive frame. Set SCSI **Port 0 addresses only**. Port 1 is

unused. Refer to the INSTALL section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for a description of FC 5201 or FC 5401.

FC 5202 or FC 5403

Set addresses to '0' to '1', and '0' to '1' sequentially from the top to the bottom drive. Set SCSI **Port 0 addresses only**. Port 1 is unused. Refer to the INSTALL section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for a description of FC 5202 or FC 5403.

FC 5402

SCSI addresses are set for **both SCSI Port 0 and Port 1**. The drives' SCSI addresses must be set sequentially from '0' to '3' starting at the top drive to the bottom drive in the Model C12/C14 drive frame for **SCSI Port 0** only. For **SCSI Port 1**, set the drives' SCSI addresses sequentially from '6' to '3' starting at the top drive to the bottom drive. Refer to the INSTALL section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for a description of FC 5402.

Feature Code FC 5404

SCSI addresses are set for **both SCSI Port 0 and Port 1**. Set addresses to '0' to '1', and '0' to '1' sequentially from the top to the bottom drive for **SCSI Port 0** only. For **SCSI Port 1**, set the drives' SCSI addresses to '6' to '5', and '6' to '5' sequentially from the top to the bottom drive. Refer to the INSTALL section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for a description of FC 5404.

Note: The SCSI address will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive.

End of Model C12/C14 Only

End of SCSI Channel Only

Fibre Channel Only

a. Select the **Fibre Address** option.
b. From the Fibre Address menu, set both Port 0 and Port 1 to either Set Hard Address or Use Soft Address.

   Note: Soft Address is not recommended and is not supported by most adapters.
c. If the **Set Hard Address** option is selected, use the **Set Hard Address** menu to set the Arbitrated Loop Physical Address (AL_PA) that the Customer has selected. Then select **SAVE DATA** to save the new address.

   Note: Refer to "Messages and Supplemental Messages (Fibre Channel only)" in Table 5–2 on 5-8 for more fibre addressing information.

End of Fibre Channel Only

__ 7. Continue with "Set Drive Options".

Set Drive Options

__ 1. Press the Change Mode pushbutton to place the subsystem in CE mode.
__ 2. Select **Config/Install** from the CE Options menu.
__ 3. Select **Drv Options** from the CE Config/Install menu.

__ 4. Check the settings of the **Disable CU Mode** option.
   - If the drive is attached to a 3590 Axx Control Unit or Virtual Tape Server (VTS), you can skip to the next step because the control unit will automatically set this option.
   - If the drive is attached in any way other than to a 3590 Axx Control Unit or VTS, continue with this step to ensure Control Unit Mode is disabled.
     a. Move the cursor to the **Disable CU Mode** option.
     b. If the **Disable CU Mode** option is displayed in the dotted font, the option is already disabled and you can skip to the next step.
     c. If the **Disable CU Mode** option is displayed in the **bold** font, press the **'Enter'** button on the operator/CE panel to select the **Disable CU Mode** option. (The panel display will switch back to the top of the CE Drive Options menu with the arrow pointing to the **Cancel** option.)

        Note: For this option, (and any of the other **CE Drv Options** selections), to take affect you must first reset the drive. To do this, select **Cancel** twice to return to the **CE Options** menu, then either press the **Reset** pushbutton on the Operator/CE panel or power OFF the drive. The drive can also be reset by selecting **Reset Drive** from the operator **Services** menu.

__ 5. From the CE Drv Options menu, select **Drv Features**, then select **one** of the following from the CE Drv Features menu:
   - For a Model B11/E11/H11, select the **Model B11/E11/H11 Rack/Frame** option or **B11/E11/H11 Deskside ACF** option.
   - For a Model B1A/E1A in a desk side cover, select **B1A/E1A Deskside** option.
   - For a Model B1A/E1A/H1A in a 3494 Tape Library, select the **B1A/E1A/H1A 3494 RS422 Att** option. **Important**: Before you skip to step 6 on page 8-38, check the next step to make sure that it **does not** apply.
   - For a Model B1A/E1A/H1A attached to a Model Axx Control Unit, select the **B1A/E1A/H1A No RS422 Attach** option.
   - For a Model B1A/E1A/H1A in a tape library other than the 3494 Tape Library, select the **B1A/E1A/H1A No RS422 Attach** option, then select either **B1A Interface A** or **B1A/E1A/H1A Interface B** depending upon the library or OEM protocol used. See “CE Drive Features Menu” on page 5-81.
   - For a Model B1A/E1A/H1A in a **3590 Model C12/C14 installation**, select the **B1A/E1A/H1A C12/C14** option. Continue after the C12/C14 selection to select **Auto Clean ON or OFF** from the B1A/E1A C12/C14 menu.

     Note: Auto Clean should only be **enabled (ON)** when the Automatic Cartridge System consisting of **all interconnected LSMs**, to which the 3590 Model C12/C14 is attached, is populated exclusively by 3590 cartridges. Ask the customer if other than 3590 type of cartridges are also stored in the silos.

     Continue by selecting **Drv Emulation** option from the B1A/E1A C12/C14 menu. Consult with the customer to determine how the emulation type should be set.

     Select the appropriate **drive emulation** option from the Drv Emulation menu.

     Do not select the **No Emulation** option.
     The C12/C14 host microcode does not interface with the 3590 drive type. All 3590 drives installed in a C12/C14 library must emulate one of the STK drive types.

     Select one of the following emulation options:
     – If 4490 drives are present in LSM, select the **9490** option.
     – If 9490 drives are present in LSM, select the **4490** option.
     – If neither type drive is present, select **either** option.

Select **Yes** to save the drive emulation type. Select **Cancel**.

__ 6. Select **Yes** to save the library type and return to the CE Drv Options menu. For a Model B11/B1A, E11/E1A, or H11 Desk Side model, select **Cancel** to return to the CE Drv Options menu.

__ 7. From the CE Drv Options menu, select **(No Lrg/Lrg) Disp Attach**. If you are attaching a large operator TDS (Texas Digital Systems, Inc.) display to the drive, select **Lrg**. The default is *No Lrg*.

Double Length Tape option

__ 8. Set the **Hdwr Present/Not Present for Dbl Lngth Tape** option. If this drive has the Extended High Performance Cartridge feature, there will be a **2X** label on the back cover and on the head guide assembly.

End of Double Length Tape option

__ 9. Set the **Autoshr Enabled/Disabled** option (Base Model B11/B1A only.) The default for this option is ***Disabled***.

__ 10. For SCSI attached drives, set the **SCSI Config** options. See “CE SCSI Config Menu” on page 5-55 for more information. For fibre channel attached drives, record the World Wide Node and Port names in the Table 9-14 on page 9-66. See “Fibre Channel World Wide Name History Log” on page 9-63 for details, then return here.

Note: It is very important that the Node and Port names be recorded if the customer’s fibre network contains any switches with the “Zoning” function. If the old Node and Port names are not available when a card pack is replaced, it will be necessary to have the customer reconfigure the entire fibre network to establish new names for the drive.

__ 11. You may select the **H SARS Enabled/Disabled** option and the **V SARS Enabled/Disabled** option from the CE Drv Options menu.

Note: The default is *Enabled* (turned **ON**) for microcode level IA or higher, and *Disabled* (turned **OFF**) for microcode levels I9 and earlier.

Selecting H SARS enables the drive to indicate potential hardware problems. Selecting V SARS enables the drive to indicate potential tape media problems. Ask for the customer’s preference. If he has none, we suggest that you **Enable** the options for better isolation of problems. Refer to “CE Drive Options Menu” on page 5-52 for more information.

__ 12. Select whether to filter the messages to be displayed on the panel and to be sent to the host via the SCSI. The default is *OFF*. Ask for the customer’s preference. See **SIM Sev Filt On/Off** and **MIM Sev Filt On/Off** in the “CE Drive Options Menu” on page 5-52.

__ 13. You may select the **Num Repeat SIMs** option from the CE Drv Options menu. Selecting this option allows you to set the number of times that the same SIM may be sent repetitively to the host. The default value is *zero*. Ask for the customer’s preference. See “CE Drive Options Menu” on page 5-52 for more information.

__ 14. Select **Cancel** to return to the Config/Install menu.

__ 15. Ensure that the “Force Error Log On/Off” option is set **OFF**.

From the CE Config/Install menu check the current status of the “Force Error Log On/Off” option. If the option says *Force Error Log On*, **select** the option to turn it **Off**. Otherwise, skip to the next step.

This option should only be used (turned on) at the request of support personnel.

__ 16. Select **Cancel** again to return to the CE Options menu.

Ensure that you have returned to the **CE Options menu** before **resetting** the drive.

Note: These options will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive, **after you have returned** to the **CE Options menu**.

__ 17. Continue with “Run Tests”.

Run Tests

__ 1. Power **ON** the drive, and run the cleaner cartridge to automatically adjust pneumatics. If necessary, refer to “Cleaning the Tape Path” in the *IBM TotalStorage Enterprise Tape System 3590 Operator Guide*.

__ 2. Select **Verify Fix** from the CE Options menu. “CE Verify Fix Menu” on page 5-39 details the operation and describes any *attention* notice.

__ 3. From the Verify Fix menu, select **Test Drive**. You are prompted to load a cartridge and to verify that the tape is loaded (select **Process Loaded Tape**).

Notes:

a. Each Base and Ultra model requires a specific tape format:

Model B11/B1A
Requires 128-track format tape

Model E11/E1A
Requires 256-track format tape

Model H11/H1A
Requires 384-track format tape

b. If the operator/CE panel shows the file protect icon, the tape is either physically write protected, or the wrong format tape has been loaded.

c. If you are installing a **Model B11/E11/H11**, put scratch tapes in the middle and bottom cells of the ACF and run the test. (If you have only one cartridge, you need to run the test every time you put a cartridge in a different cell). If the ACF does not load the tape, select the **Start** option.

__ 4. When the CE Options menu is displayed, remove the tape by choosing **Unload Drive** from the Ending Status menu or by pressing the Change Mode pushbutton to change to the operator Options menu and choosing **Unload Drive**.

__ 5. If you are installing a **E11/E1A and H11/H1A** with fibre channel attachment, go to “Fibre Channel Ports Wrap Test” on page 9-112 and run the Wrap Test on the fibre channel ports, then return here to continue the installation.

__ 6. If you are installing a **3590 Model C12/C14**, and you have completed the installation checkout procedure for each drive, return to the “Checkout of the Four Drives in 3590 Model C12/C14 Frame” procedure in the INSTALL section of *IBM TotalStorage Enterprise Tape System 3590 Models C12/C14 Maintenance Information*.

__ 7. Continue with “Set 3590 Offline”.

Set 3590 Offline

__ 1. Ensure that the drive is unloaded and the tape cartridge is removed.

__ 2. If not displaying the operator Options menu, press the Change Mode pushbutton to change to the operator Options menu.

Model B11/E11/H11 Only

__ 3. If the requested ACF mode was **not** Random or Random 2–LUN mode, skip to step 5. For Random or Random 2–LUN mode, continue with next step.

__ 4. From the operator Options menu, select the **Set ACF Mode** option. Set the ACF mode per customer’s direction to **Random or Random 2–LUN**. See “Modes of Operation” on page 6-19 for details.

End of Model B11/E11/H11 Only

__ 5. Select **Services**.

__ 6. From the Services menu, select **Set Offline**.

__ 7. From the Offline menu, select **Both**.

__ 8. If the Confirm Offline menu appears, select **Proceed**.

__ 9. Power OFF the subsystem.

__ 10. Reinstall the deck cover if it was removed during the installation.

__ 11. Remove and save any wrap tools used for diagnostic wrap tests (for example, SCSI port wrap tools, fibre channel wrap tools, and Serial RS-422 port wrap tools).

__ 12. If the Model B1A/E1A (RPQ 8B3190) is being installed in a **Desk Side** sleeve, go to "Model B1A/E1A Within Desk Side Sleeve (RPQ 8B3190)" on page 8-42.

__ 13. If the Model B11/E11 (RPQ 8B3191) or Model B11/E11/H11 (FC 2200) is being installed in a **Desk Side** sleeve, go to "Model B11/E11 Within Desk Side Sleeve (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)" on page 8-41.

__ 14. Go to "SCSI Bus Attachment" on page 8-43 or "Fibre Channel Attachment" on page 8-67.

Model B11/E11 Within Desk Side Sleeve (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)

Within Desk Side Sleeve only

See Figure 8-22 for the final install steps of the Model B11/E11/H11 drive.

__ 1. Place the desk side sleeve top cover **1**, P/N 05H8347, over the mounted drive (enclosure) and on top of the lower sleeve **18**, P/N 05H8348. A ridge in the sides of the top cover allows the top cover to rest on top of the lower sleeve with the lip of the top cover on the outside of the lower sleeve sides.

Note: The rear of the sleeve top cover is indicated by the label and opening **8** on top of the sleeve (top) cover for the drive's power On/Off switch.

__ 2. Install the eight screws **19**, P/N 05H2734, four screws on each side of the sleeve top cover **1**, to bolt the sleeve top cover to the desk side lower sleeve **18**. **Snug** the screws to secure the top cover to the lower sleeve.

__ 3. Place the ACF cover **6**, P/N 05H3263, over the ACF.

__ 4. Attach the "ON/OFF" label **8**, P/N 05H3264, to the top of the desk side sleeve (top cover).

__ 5. Reconnect the power cable to the desk side subsystem.

__ 6. Go to "SCSI Bus Attachment" on page 8-43 or "Fibre Channel Attachment" on page 8-67.

End of Within Desk Side Sleeve only

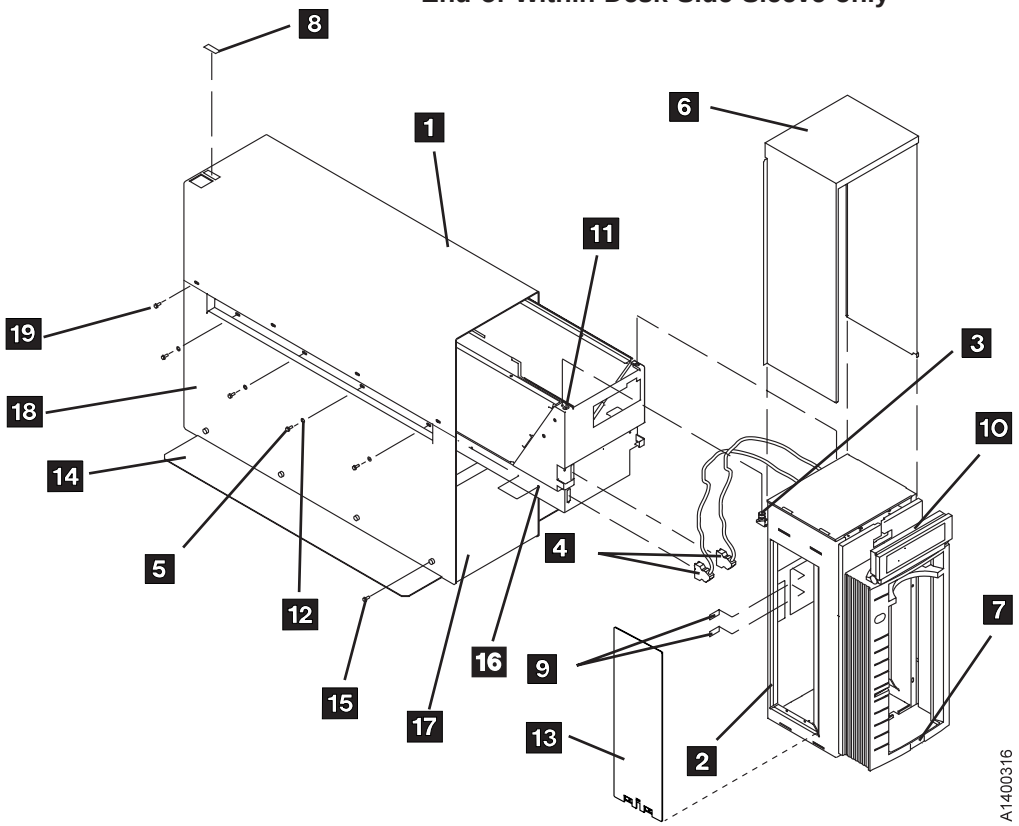


Figure 8-22. Desk Side Sleeve Installation for Model B11/E11/H11, RPQ 8B3191 (or Model B11/E11/H11, FC 2200)

Model B1A/E1A Within Desk Side Sleeve (RPQ 8B3190)

Within Desk Side Sleeve only

See Figure 8-23 for final install steps for the Model B1A/E1A drive.

__ 1. Place the desk side sleeve top cover **1**, P/N 05H8347, over the mounted drive and on top of the lower sleeve **17**, P/N 05H8348. A ridge in the sides of the top cover allows the top cover to rest on top of the lower sleeve with the lip of the top cover on the outside of the lower sleeve.

Note: The rear of the sleeve top cover is indicated by the label and opening **9** on top of the sleeve (top) cover for the drive's power On/Off switch.

__ 2. Install the eight screws **18**, P/N 05H2734, four screws on each side of the sleeve top cover **1**, to bolt the sleeve top cover to the desk side lower sleeve **17**. **Snug** the screws to secure the top cover to the lower sleeve.

__ 3. Push the drive into the sleeve until the front cover **3** is flush to the front of the sleeve top cover **1** and to the front **16** of the lower sleeve.

__ 4. Now **snug** the eight screws **10**, P/N 1621371, and washers **10**, P/N 05H3348, four screws on each side of the lower sleeve to secure the drive in the desk side sleeve.

__ 5. Attach the "ON/OFF" label **9**, P/N 05H3264, to the top of the desk side cover.

__ 6. Reconnect the power cable to the desk side subsystem.

__ 7. Go to "SCSI Bus Attachment" on page 8-43 or "Fibre Channel Attachment" on page 8-67.

End of Within Desk Side Sleeve only

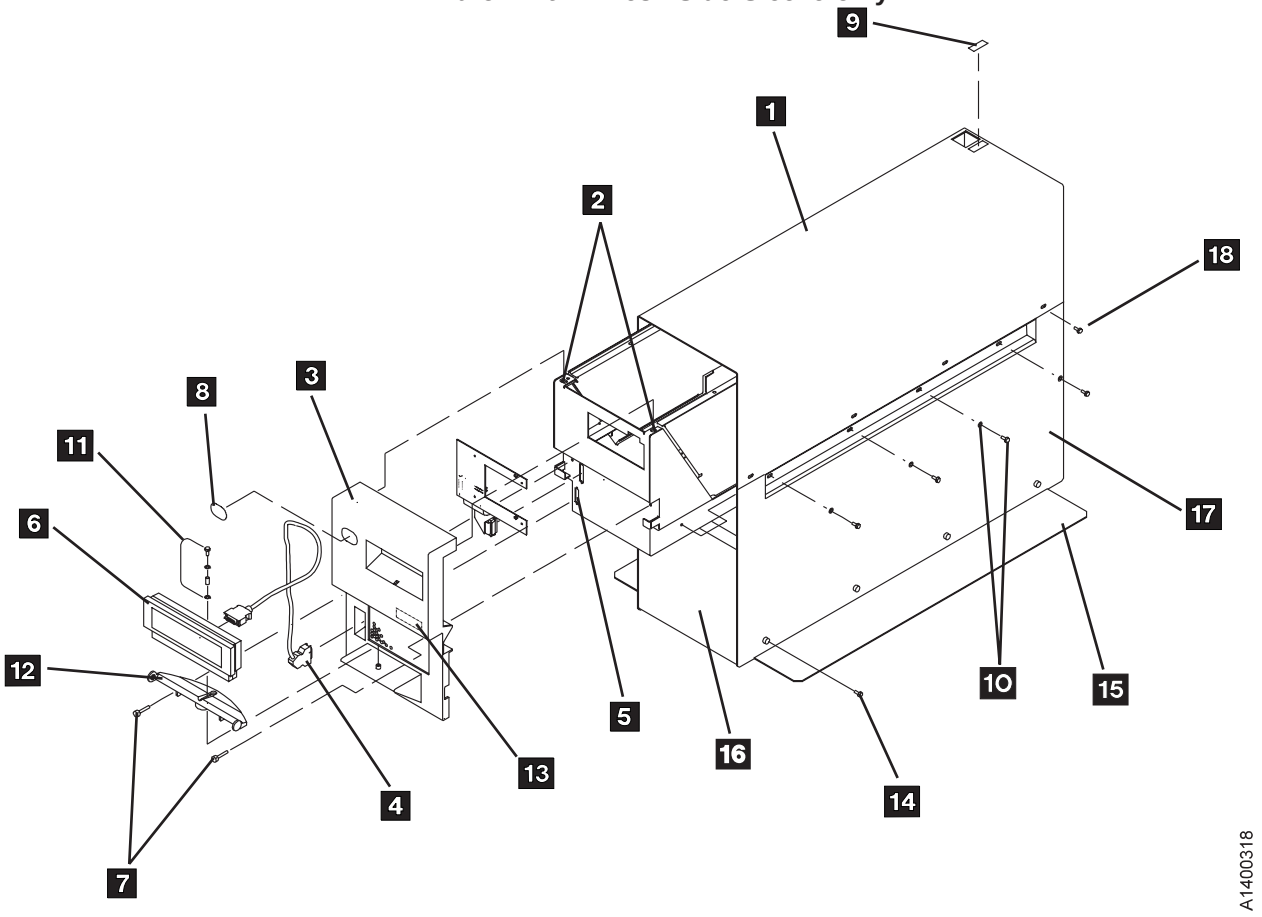


Figure 8-23. Desk Side Sleeve Installation for Model B1A/E1A (RPQ 8B3190) or Model B1A/E1A/H1A (FC 2200)

SCSI Bus Attachment

__ 1. Review the following sections for SCSI Bus information, then return here:
- "SCSI Bus Details"
- "SCSI Bus Termination" on page 8-44
- "Examples of SCSI Bus Cabling" on page 8-45

__ 2. Review one or more of the following sections, depending on your application, then return here:
- "pSeries/RS6000 (AIX) System Controller and SP2 (FC 2416 and FC 2420)" on page 8-48
- "pSeries/RS6000 (AIX) System Controller and SP2 Other Available Adapters" on page 8-49
- "iSeries (OS/400) System (FC 6501)" on page 8-50
- "iSeries (OS/400) System (FC 6534 or 2729)" on page 8-50
- "Sun System Attachment" on page 8-51
- "LINUX System Attachment" on page 8-51
- "Sun Solaris 7" on page 8-51
- "HP-UX System Attachment" on page 8-53
- "HP-UX 11.00 System Attachment" on page 8-53
- "Windows NT System" on page 8-54
- "Windows 2000 System Attachment" on page 8-54
- "Cabling Inline SCSI Terminator for Open System Attachment" on page 8-55

__ 3. Go to "SCSI Cables to Device" on page 8-55.

SCSI Bus Details

The 3590 subsystem contains two small computer system interface (SCSI) ports for system attachment. Each port supports the 2-byte wide SCSI-2, SCSI 2+, and SCSI-3. Each port also supports fast/wide and ultra/wide attachment. The 3590 also logically supports the one-byte wide protocol. When attaching to a one-byte SCSI-2 attachment, a one-byte to two-byte interposer is required. The SCSI protocol supports a maximum 2 MB block size.

The three types of SCSI busses are:
- SCSI-2 — Limited instruction set.
- SCSI 2+ — Mixed instruction set.
- SCSI-3 — Large instruction set.

See *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for details.

Note: Before proceeding, ensure that you are not trying to attach the 3590 to an LVD device. The 3590 is an HVD device and does not support LVD.

When the Ultra SCSI feature is installed on Model Bxx drives, the protocol used is SCSI 2+ (SCSI-2 and some SCSI-3 commands are supported). It will communicate over the Ultra SCSI interface.
- All current production 3590 Model B11/B1A drives are Ultra level drives with the Ultra SCSI FC 9790 as standard equipment.
- All current production 3590 E11/E1A and H11/H1A drives are Ultra level drives.
- All earlier production 3590 Model B11/B1A drives may be updated to the Ultra SCSI level by installation of Field FC 5790.
- The 3590 can be integrated with any host system that supports a SCSI-2 (or SCSI 2+) attachment and has the proper software drivers installed.

Multiple systems can be attached to a 3590 tape subsystem; however, the 3590 can be varied ON to only one system at a time. The two attachments on the 3590 drive requires a shielded, differential driven, two-byte wide, SCSI-2 P cable with a 68-pin D-connector. The total cable length must not exceed 25 m (82 ft). Figure 9-43 on page 9-109 shows an example of how to calculate the bus length.

The terminator power is **not** provided by the 3590.

SCSI Bus Termination

The 3590 has a differential SCSI adapter card installed and has facilities for supporting SCSI bus termination.

The SCSI bus terminator P/N 61G8324 or P/N 05H4793 is installed on the last drive in a string of multiple drives. On newer drives, terminator P/N 05H4793 is shipped. Uses for the new terminator are:

- Terminating the unused SCSI port in a 3590. Use the two short screws P/N 05H4782 or the two long screws P/N 05H8983, as required. The two sets of screws are shipped with the terminator.
- Daisy-chaining a non-IBM device or an IBM device that does not have a hammerhead, to a 3590. Use the short screws P/N 05H4782 that are shipped with the terminator.
- Using a host cable, which does not have a hammerhead, in a 3495 to connect the library control unit frame to a drive unit frame that is at the end of the string (no device cables are long enough).

In a single 3590 installation, the terminator is installed in the SCSI bus connector (0 or 1) of this 3590. Two bus terminators are in the ship group, one for each port. If you do not use all the terminators, keep them in a safe place for possible future use.

All drive models provide two 68-pin SCSI connectors. The SCSI bus and all of the wires in the SCSI cable must be properly terminated according to the SCSI standard.

Examples of SCSI Bus Cabling

Table 8-6 shows the SCSI cables in order by length. The Key column has references to the following two figures. Figure 8-24 on page 8-46 shows some examples of rack SCSI cabling and Figure 8-25 on page 8-47 shows some examples of SCSI cabling in a 3494.

Table 8-6. 3590 SCSI Bus Cables

Key	Meters	Feet	F/C	P/N	Usage
1	0.6	1.97	5106	05H4644	Device to device (see Note 4)
2	2.8	9.19	5128	05H4647	Device to host (see Note 1)
9	2.9	9.5	5129	05H3221	Device to device
3	3.4	11.15	5134	05H4645	Device to device
10	3.6	11.81	N/A	09L5107	Device to host
4	4.0	13.12	5138	05H4646	Device to device
11	4.0	13.12	N/A	34L2671	Device to host
5	4.5	14.76	5145	05H4648	Device to host (see Note 1)
12	6.0	19.68	N/A	19P0677	Device to host
6	12	39.37	5112	05H4649	Device to host (see Note 1)
7	18	59.06	5118	05H4650	Device to host (see Notes 1 and 2)
8	25	82.02	5125	05H4651	Device to host (see Notes 1 and 3)

SCSI Cable Notes:

1. Do not use host cables for daisy-chaining devices together because these cables do not have screws long-enough to attach two cables to the device.
2. If feature code 2420 is installed on the pSeries/RS6000 (AIX) System or the POWERparallel SP2 and a second drive is daisy-chained to the first drive, you can only use the 0.6 m- (2 ft-) cable to stay under the maximum cable length of 19 m.
3. This is the maximum distance supported for SCSI attachment to the iSeries/AS400 (OS/400) System. It also is the maximum distance when FC 2416 is installed on the pSeries/RS6000 (AIX) System or the POWERparallel SP2. Also, you cannot use this cable when FC 2420 is installed on the pSeries/RS6000 (AIX) System or the POWERparallel SP2 because it exceeds the maximum cable length of 19 m (62.3 ft).
4. When using a 0.6 m- (2 ft-) cable to connect adjacent drives, ensure that the cable is routed between the cable pivot arm and the rack door to avoid damage during drive servicing. See Figure 8-33 on page 8-57 for reference on routing the cable on the outside of the cable pivot arm.

The 0.6 m- (1.96 ft-) SCSI cable can be used when two 3590s are immediately adjacent to each other and are attached to the same SCSI I/O controller on a pSeries/RS6000 (AIX) System.

When using the pSeries/RS6000 (AIX) System SCSI controller, FC 9702, the maximum cable length is 25 m (82 ft).

If you are connecting 3490 Models C1A or C2A on the same SCSI bus as 3590 Models B1A, the 3490 models must be first-in-line from the host. Use a device-to-host cable when daisy-chaining from a 3590 to a 3490.

Figure 9-43 on page 9-109 shows an example of how to calculate the SCSI bus length.

The examples show the shortest available lengths of the cables. For example, if the racks are too far apart, cable 4 illustrated between the racks may not be long enough, so the configuration illustrated may not be possible.

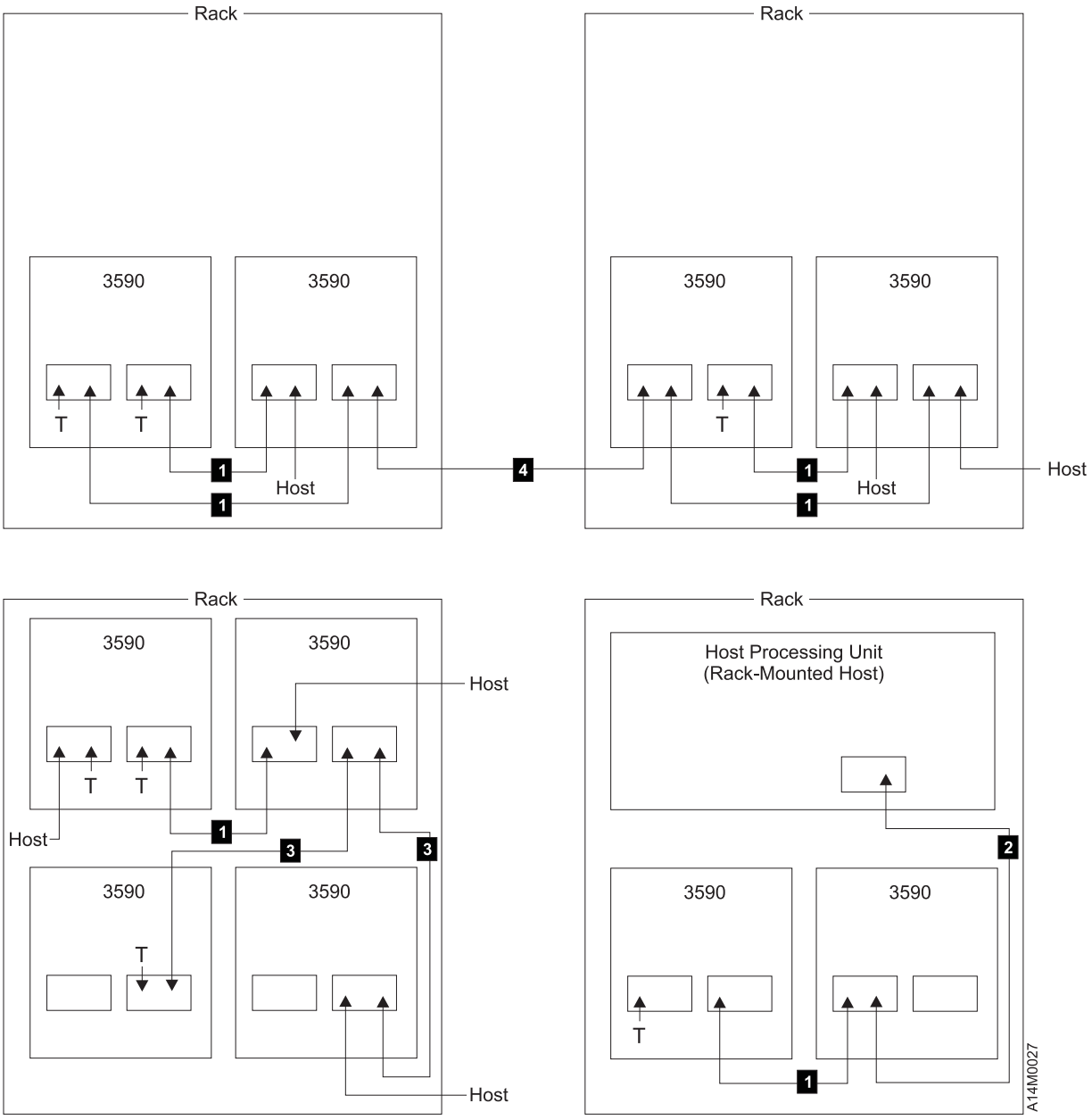
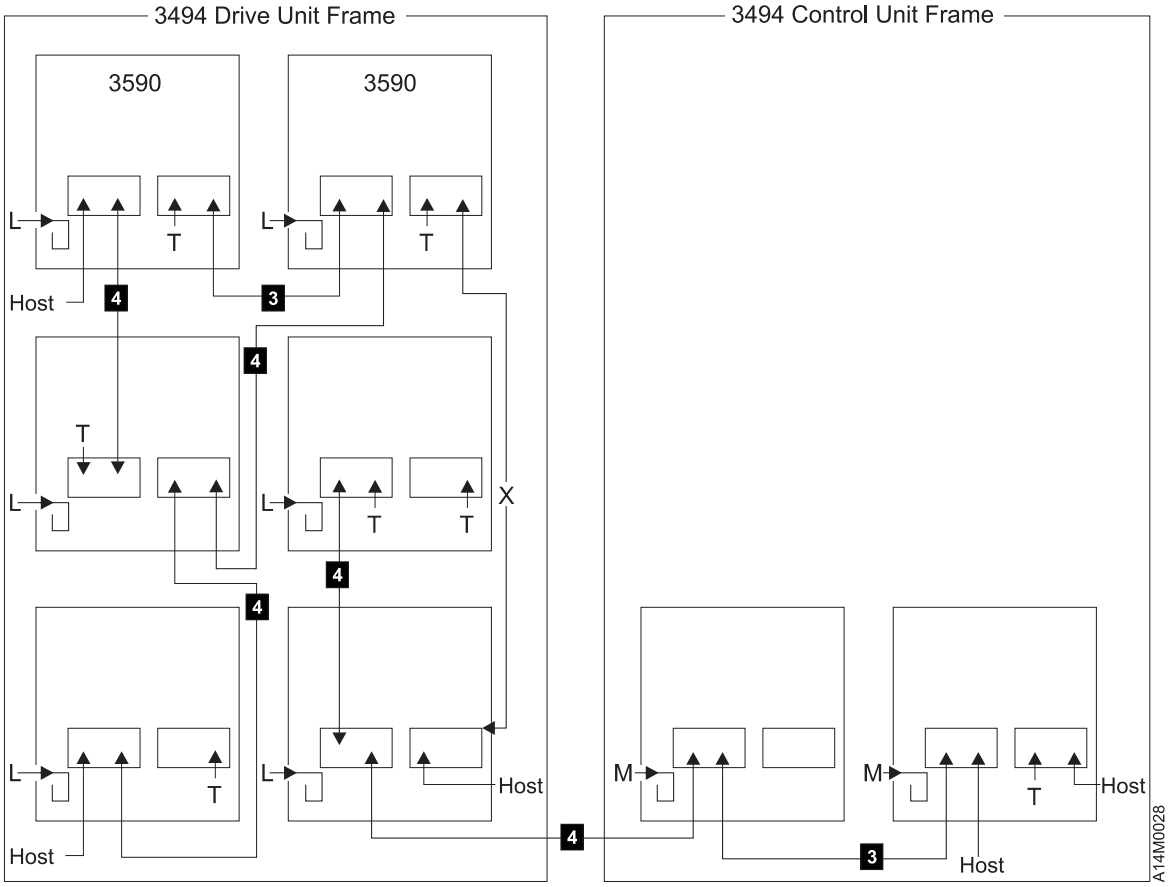


Figure 8-24. Rack Cabling Example

See “Examples of SCSI Bus Cabling” on page 8-45.

The examples show the shortest available lengths of the cables. For example, if the control unit frame is too far from the drive unit frame, cable 4 illustrated between the frames may not be long enough, so the configuration illustrated may not be possible.



Legend.

X Cable of this length not available
L Library Manager RS-422 cable P/N 05H8981
•
M Library Manager RS-422 cable P/N 05H8953
•
T Terminator

Figure 8-25. 3494 Cabling Example

See “Examples of SCSI Bus Cabling” on page 8-45.

3494 Cables

Table 8-6 on page 8-45 shows the cable feature codes for connecting multiple 3590 Model B1A/E1A/H1A drives on the same SCSI bus in a 3494 Model D12, D14, L12, and L14.

Note: Library manager RS-422 interface cable (P/N 05H8953) is for control-unit frames and cable (P/N 05H8981) is for drive-unit frames.

SCSI Host Attachment Information

pSeries/RS6000 (AIX) System Controller and SP2 (FC 2416 and FC 2420)

When attaching to the pSeries/RS6000 (AIX) System controller or POWERparallel SP2 FC 2416, use cable interposer (FC 2416). A total of 16 attachments are allowed. For example, one initiator can be attached to 15 targets.

Note: Some FC 2416 SCSI ports may have a “Y” cable installed. There should be a terminator plugged into one of the “Y” connectors, and the 3590 SCSI cable should plug directly into the other “Y” connector. Interposer P/N 50G0460 is not needed with this cable configuration.

- The SCSI bus is properly terminated at each end.
- When using the pSeries/RS6000 (AIX) System SCSI controller, FC 2416, the maximum cable length is 25 m (82 ft). Figure 9-43 on page 9-109 shows an example of how to calculate the bus length.
- Multiple pSeries/RS6000 (AIX) Systems may be linked to 3590 tape drives, but the systems cannot use the drives simultaneously.

When attaching 3590 Model B11/B1A, E11/E1A, or H11/H1A subsystems to the pSeries/RS6000 (AIX) System controller or POWERparallel Spy FC 2420, use a 1-byte to 2-byte interposer (FC 9701). If FC 2420 is used, the 3590 must be attached at the end of the SCSI bus.

Notes:

1. One initiator can be attached to seven targets if a 3590 is the last device on the SCSI bus.
2. For the pSeries/RS6000 (AIX) System SCSI controller, FC 2420, the maximum cable length is 19 m (62.3 ft). Figure 9-43 on page 9-109 shows an example of how to calculate the bus length.

Figure 8-26 shows the cabling for a pSeries/RS6000 (AIX) System.

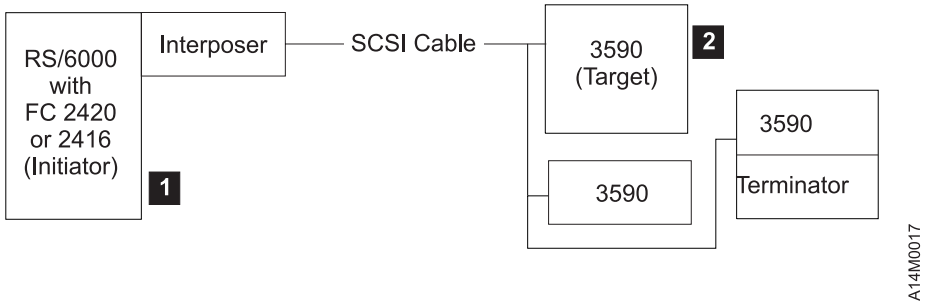


Figure 8-26. pSeries/RS6000 (AIX) System Cabling

Table 3-2 on page 3-9 shows the available cable feature codes for attachment to a pSeries/RS6000 (AIX) System.

Notes:

1. An *initiator* **1** is a SCSI device that can request an I/O process to be performed by another SCSI device (a target). A *target* **2** is a device that can perform an I/O process. An initiator can be a processor, such as a pSeries/RS6000 (AIX) System processor.
2. To ensure maximum performance, the 3590 subsystems must be the only targets on the SCSI bus.
3. The required interposer is supplied by ordering FC 9701 or 9702. The interposer is only to allow a mechanical connection; the lines do not change.
4. The 0.6 m (1.96 ft.) SCSI cable (FC 5106) can be used when two 3590s are immediately adjacent to each other and are attached to the same SCSI I/O controller on a pSeries/RS6000 (AIX) System.
5. Cable lengths of 18 meters (59 feet), or shorter lengths, can be used with FC 2420; cable lengths longer than 18 meters cannot be used with FC 2420.

pSeries/RS6000 (AIX) System Controller and SP2 Other Available Adapters

Additional feature codes are now available to attach the 3590 drive to the pSeries/RS6000 (AIX) System Controller and SP2:

FC 2412	Enhanced SCSI-2 Differential F/W Adapter/A
FC 2409	PCI SCSI-2 Differential F/W Adapter
FC 6209	PCI SCSI-2 F/W Differential Adapter
FC 6207	PCI Differential Ultra SCSI Adapter

Note: When installing a Ultra level drive, the system must be reconfigured to run at the higher Ultra data rates on Ultra-capable adapters such as FC 6207. The customer can accomplish this in one of the following ways:

1. If the customer switches OFF the pSeries/RS6000 (AIX) System power prior to the upgrade and the 3590 power is switched ON first after the upgrade, the devices will be automatically configured when pSeries/RS6000 (AIX) System power is switched ON.
2. If the upgrade is done without powering off the pSeries/RS6000 (AIX) System, the device can be unconfigured, then reconfigured from the pSeries/RS6000 (AIX) System console, as follows:

```
rmdev -l rmtx

mkdev -l rmtx

   Where x=number assigned by the system to the drive that contains
         the Ultra SCSI feature.
```

See “3590 Drive Model and Feature Levels” on page 3-34 for more information about the Ultra drives.

iSeries (OS/400) System (FC 6501)

The following feature codes apply for iSeries/AS400 (OS/400) System 9404 and 9406 SCSI bus attachment of a 3590 Model B11/B1A, E11/E1A, or H11/H1A to system FC 6501:

- Each feature code 6501 provides two ports.
- Each iSeries/AS400 (OS/400) System port can support a single 3590 Model B11/B1A, E11/E1A, or H11/H1A for a maximum of two 3590 tape drives per feature code 6501.
- No other devices can be supported on a FC 6501-equipped port with a 3590 attached (no daisy-chaining).
- iSeries/AS400 (OS/400) Systems cannot be interconnected by using the SCSI. Therefore, a Model B11/B1A, E11/E1A, or H11/H1A can only be attached to one iSeries/AS400 (OS/400) System at a time.
- You can connect a 3490 on one port and a 3590 on another port.

Figure 8-27 shows the cabling for an iSeries/AS400 (OS/400) System.

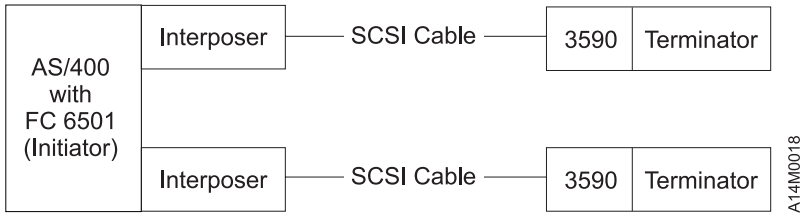


Figure 8-27. iSeries/AS400 (OS/400) System Cabling

An interposer is required when a Model B11/B1A, E11/E1A, or H11/H1A is connected to feature code 6501. The interposer is supplied with feature code 9410.

Table 3-1 on page 3-4 shows the available cable feature codes for the attachment to an iSeries/AS400 (OS/400) System.

Advise customer of the setting of the 6501 IOP options. The setting should be *DEV or *NO.

3590 Drive Address on iSeries/AS400 (OS/400) System:

1. When attaching to iSeries/AS400 (OS/400) System with feature code 6501 the 3590 drive **must** be set to address '0'. The iSeries/AS400 (OS/400) System will recognize the device as address '7' due to system design.
2. The address will not become active until you either select **Reset Drive** from the operator Services menu, press the **Reset** pushbutton on the operator/CE panel, or power OFF the drive.

iSeries (OS/400) System (FC 6534 or 2729)

Feature codes 6534 and 2729 each provide one port. Each port can support one 3590 tape subsystem. No other devices can be supported on these feature codes. An iSeries/AS400 (OS/400) System cannot be interconnected with any other system (including another iSeries/AS400 (OS/400) System) on the same SCSI bus. When the subsystem is attached to an iSeries/AS400 (OS/400) System with FC 6534 or 2729, one of the SCSI addresses on the 3590 tape subsystem **must** be set to **0** if the 3590 is to be used as an alternate IPL device. No interposers are required for these feature codes.

Table 3-1 on page 3-4 shows the cable feature codes for the cable of the appropriate length.

Note: iSeries/AS400 (OS/400) System adapter FC 6534 and FC 2729 require new PTFs for proper operation of Ultra level drives, even if replacing or adding a drive to an operational system. Review the prerequisite information in "3590 Drive Model and Feature Levels" on page 3-34 for additional details, or refer to informational APR ii11472.

Sun System Attachment

The 3590 subsystem can be installed on Sun SPARC and Ultra/Enterprise Architecture workstations and servers that support one of the following:

- Sun SBus Differential Fast/Wide intelligent SCSI-2 Host Adapter
- Sun Bus Ultra Differential Fast/Wide intelligent SCSI-2 Host Adapter
- Sun Dual-Channel Differential Ultra SCSI Host Adapter (PCI)

The SunOS 5.x (Solaris 2.4 or higher) is required to support the 3590 when used with the Sun SBus Differential Fast/Wide intelligent SCSI-2 Host Adapter. The SunOS 5.x (Solaris 2.5.1 or higher) is required to support the 3590 when used with the Sun SBus Ultra Differential Fast/Wide intelligent SCSI-2 Host Adapter or the Sun Dual-Channel Differential Ultra SCSI Host Adapter (PCI). The Open Systems Device Drivers (FC 9200 and 9211) provides specific tape drive device support. ADSM for Sun Solaris 1.2.1 with PTFs also supports the 3590.

LINUX System Attachment

The 3590 Models B11/B1A, E11/E1A, and H11/H1A are supported on Intel-based platforms running Red Hat LINUX with the appropriate adapter card and associated cable. For more information about support, see *IBM TotalStorage Enterprise Tape Device Drivers; Installation and User's Guide*.

The Adaptec AHA-2944UW PC1 Differential Ultra SCSI adapter is supported for SCSI attachment.

Note: See the *IBM TotalStorage Device Driver Installation and User's Guide* for detailed information about the supported host attachment.

The maximum SCSI cable length is 25 m (82 ft). See "Cable Feature Codes – SCSI" on page 3-9 and the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for additional SCSI cable planning information.

Sun Solaris 7

The 3590 Model B11/B1A, E11/E1A, and H11/H1A are supported on selected Sun SPARC and UltraSPARC Architecture workstations and servers, including the Ultra/Enterprise Server family, running Solaris 7 that support one of the following:

- Sun SBus Differential Fast/Wide Intelligent SCSI-2 Host Adapter (X1062A)
- Sun SBus Ultra Differential Fast/Wide Intelligent SCSI-2 Host Adapter (X1065A)
- Sun Dual-Channel Differential Ultra SCSI Host Adapter (PCI) (X6541A)

The Model B11/E11/H11 requires installation in a supported rack or space in an existing customer rack (two Model B11/E11/H11 units per 12 EIA positions). The maximum SCSI cable length is 25 m (82 ft). See "Cable Feature Codes – SCSI" on page 3-9 and the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for additional SCSI cable planning information.

No interposers are required with these attachments.

For SUN attachment, an external terminator is required for use on the SCSI bus. In some multi-host systems, this may require the removal of internal terminators from one of the host adapters. The part number for the inline terminator is P/N 19P0378.

Figure 8-28 on page 8-52 shows the cabling for a Sun Solaris 7.

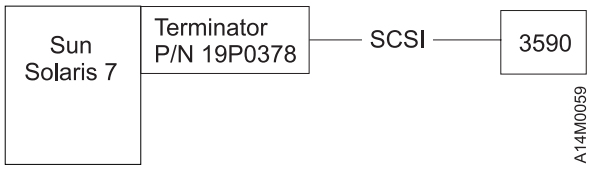


Figure 8-28. Sun Solaris 7 Open System Support Cabling

Table 3-1 on page 3-4 shows the available cable feature codes for the Sun Systems attachment.

HP-UX System Attachment

The Model B11/B1A, E11/E1A, and H11/H1A drives are supported on Hewlett-Packard (HP) 9000 Series 800 Business Servers. They are also supported in other HP-PB based servers that support a SCSI Fast/Wide Differential adapter including:

- HP9000 Series /T Class Server (T500, T520, T600)
- HP9000 Series /K Class Server (K4xx, K2xx)
- HP9000 Series /D Class Server (D3xx, D2xx)
- HP9000 Series /E Class Server (E3xx, E2xx)

The Model B11/E11/H11 requires installation in a support rack or space in an existing customer rack (two B11 units per 12 EIA positions). The maximum SCSI cable length is 25 m (82 ft). See “Cable Feature Codes – SCSI” on page 3-9 and the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for additional SCSI cable planning information.

HP-UX 10.0x through HP-US 10.3x supports the IBM 3590 subsystem. The Open Systems Device Drivers, FC 9200 and 9210 provide specific HP device support. For the 3590 Model B1A/E1A, this support is included in the 3494 FC 9200.

No interposers are required with these attachments.

“Cable Feature Codes – SCSI” on page 3-9 shows the available cable feature codes for the attachment to the HP system.

HP-UX 11.00 System Attachment

The Model B11/B1A, E11/E1A, and H11/H1A drives are supported on Hewlett-Packard (HP) 9000 Series V-Class and N-Class servers running HP-UX 11.0 with the HP F/W Differential SCSI-2 adapter (A4800A).

- HP9000 Series /V Class Server (Vxxx, Vxxx)
- HP9000 Series /N Class Server (Nxxx, Nxxx)
- HP9000 Series /E Class Server (Exxx, Exxx)

The Model B11 requires installation in a support rack or space in an existing customer rack (two B11 units per 12 EIA positions). The maximum SCSI cable length is 25 m (82 ft). See “Cable Feature Codes – SCSI” on page 3-9 and the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for additional SCSI cable planning information.

HP-UX 11.0 supports the IBM 3590 subsystem. The Open Systems Device Driver (FC 9200) provides specific HP device support. For the 3590 Model B1A/E1A, this support is included in the 3494 FC 9200.

No interposers are required with these attachments.

When attached to V-Class systems, this adapter requires the Inline SCSI terminator FC 9200 for attachment to a 3590 Tape Drive. The part number for the inline terminator is P/N 19P0378.

Figure 8-29 shows the cabling for an HP 9000.

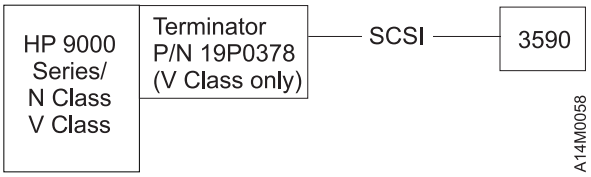


Figure 8-29. HP-UX Open System Attach Cabling

Windows NT System

The 3590 Model B11/B1A, E11/E1A, and H11/H1A are supported in Intel-based processors. These include Intel 486DX or Pentium processor with sufficient RAM and disk space for operation of Microsoft®'s Windows NT operating system. An appropriate SCSI F/W Differential adapter and associated cable also is required.

The Model B11/E11/H11 requires installation in a supported rack or space in an existing customer rack (two Model B11/E11/H11 units per 12 EIA positions). The maximum SCSI cable length is 25 m (82 ft). See "Cable Feature Codes – SCSI" on page 3-9 and the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for additional SCSI cable planning information.

Microsoft's Windows NT Server Version 4.0, and later releases, support the IBM Model B11/E11/H11. The Open Systems Device Drivers (FC 9200 and 9212) provide specific tape drive device support. For the 3590 Model B1A/E1A/H1A, this support is included on the 3494 FC 9200.

No interposers are required for these attachments.

"Cable Feature Codes – SCSI" on page 3-9 shows the available cable feature codes for the attachment to a Windows NT system.

Windows 2000 System Attachment

The 3590 Model B11/B1A, E11/E1A, and H11/H1A is supported in Intel-based processors running Microsoft Windows 2000 (build 2195 or greater) with sufficient resources to run the Adaptec AHA-2944UW PCI Differential Ultra SCSI adapter. Use the existing SCSI cables to attach to host system.

The Model B11/E11/H11 requires installation in a supported rack or space in an existing customer rack (two Model B11/E11/H11 units per 12 EIA positions). The maximum SCSI cable length is 25 meters. See "Cable Feature Codes – SCSI" on page 3-9 and the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide* for additional SCSI cable planning information.

Microsoft's Windows 2000 and later releases, support the IBM Model B11/E11/H11. The Open Systems Device Drivers (FC 9200) provide specific tape drive device support. For the 3590 Model B1A/E1A/H1A, this support is included on the 3494 FC 9200.

No interposers are required with these attachments.

Figure 8-30 shows the cabling for a Windows 2000.

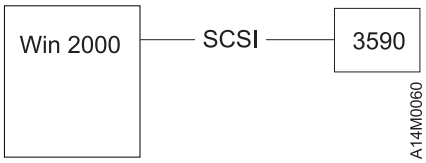


Figure 8-30. Windows 2000 Open System Support Cabling

Cabling Inline SCSI Terminator for Open System Attachment

Figure 8-31 shows the cabling for a Sun or HP with Open System Cabling feature installed.

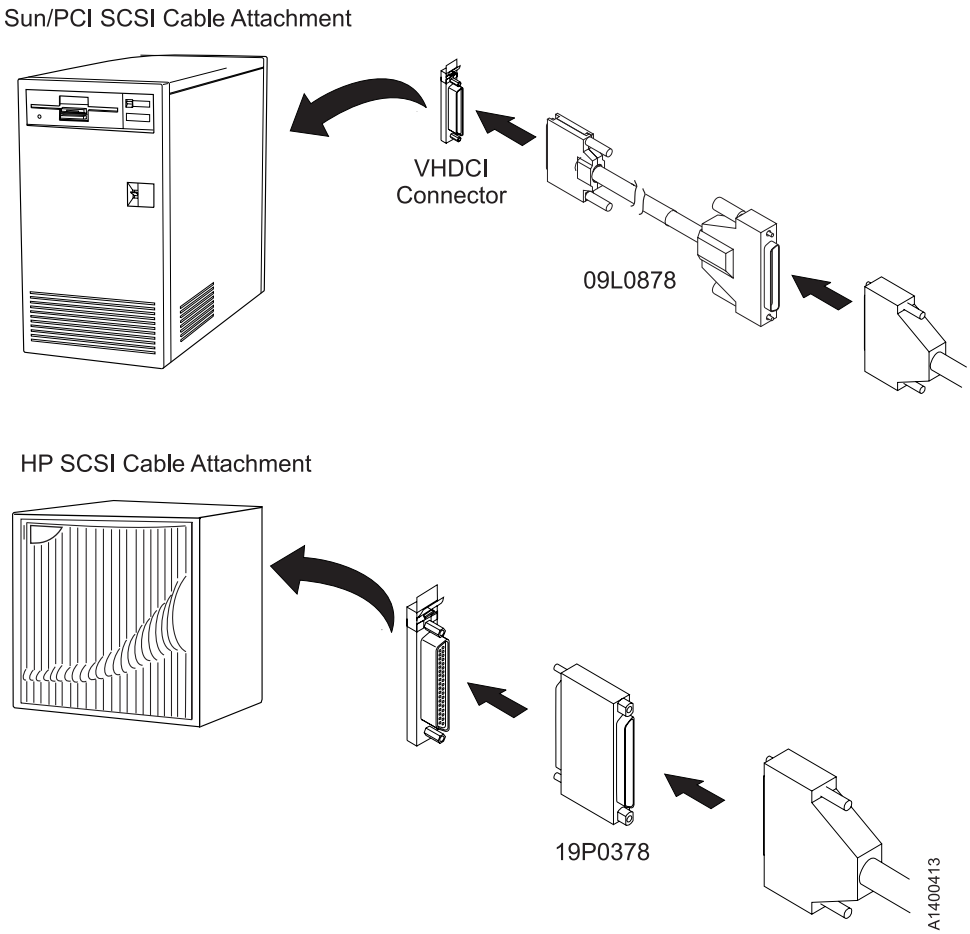


Figure 8-31. Open System Cabling

SCSI Cables to Device

Attention:

- Apply **very light** torque when tightening the system SCSI cable and terminator screws. Over-tightening these screws can cause the connector standoffs (that the cable connector screws go into) to loosen and make removing the cable difficult.
- Do not connect or disconnect any SCSI device while power is ON as this practice may corrupt data or may damage hardware.

__ 1. If not already done, insert the drive power cables into the 3590 ac connectors and insert the drive power cables into the ac power sources.

__ 2. Locate the cables from the hosts and route them to the rear of the devices.

__ 3. If you are installing Model B11/E11/H11 devices, including the **Desk Side** model, go to “SCSI Cables – Model B11/E11/H11” on page 8-56.

__ 4. If the Model B1A/E1A is being installed in a **Desk Side** cover as part of RPQ 8B3190, go to “SCSI Cables – Model B11/E11/H11” on page 8-56.

__ 5. If you are installing Model B1A/E1A/H1A devices, other than the desk side model, go to “SCSI Cables – Model B1A/E1A/H1A” on page 8-60.

SCSI Cables – Model B11/E11/H11

See Figure 8-32. Port 1 connections are the same as for port 0.

__ 1. Connect the system cable **3** (hammerhead end) straight into the card connector **4**. (SCSI port 0 is on the left when you are facing the rear of the device.)

When connecting the SCSI cables and terminators to the ports on the 3590s, use screws P/N 05H8983. One screw is in the ship group and one screw is attached to each cable.

__ 2. If this is the last device on the SCSI bus, install the terminator P/N 61G8324 or 05H4793 **1** on cable connector **3**. A set of two short screws (P/N 05H4782) and a set of two long screws (P/N 05H8983) are shipped with terminator P/N 05H4793. Use the appropriate screws, as required.

__ 3. If connecting to the next device in the chain, install the next connector **2** in the female side of cable connector **3**.

__ 4. If the Model B1A/E1A is being installed in a **Desk Side** sleeve as part of RPQ 8B3190, go to “SCSI System Cable at Host” on page 8-64.

__ 5. If the Model B11/E11/H11 is being installed in a **Desk Side** sleeve as part of RPQ 8B3191, go to “SCSI System Cable at Host” on page 8-64.

__ 6. Go to “Cable Guides – Model B11/E11/H11” on page 8-57.

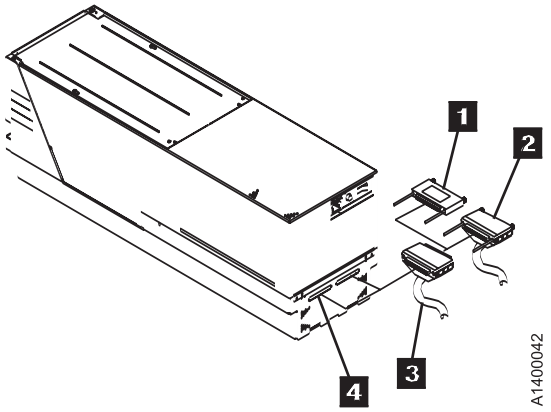


Figure 8-32. Installing SCSI System Cable into 3590

Cable Guides – Model B11/E11/H11

See Figure 8-33.

__ 1. Install the cable guides **6** P/N 45G0179, nuts **5** P/N 1622404, and nut clips **4** P/N 74F1823 in the eighth hole below each pivot arm.

__ 2. Route the signal cables **1** through the upper snap-on cable retainers **3** of the cable pivot arm. Do not twist the cables.

__ 3. Route the power cords **2** through the lower sections of the snap-on cable retainers.

__ 4. Go to “Rack, Rear Internal Panel – Model B11/E11/H11” on page 8-58.

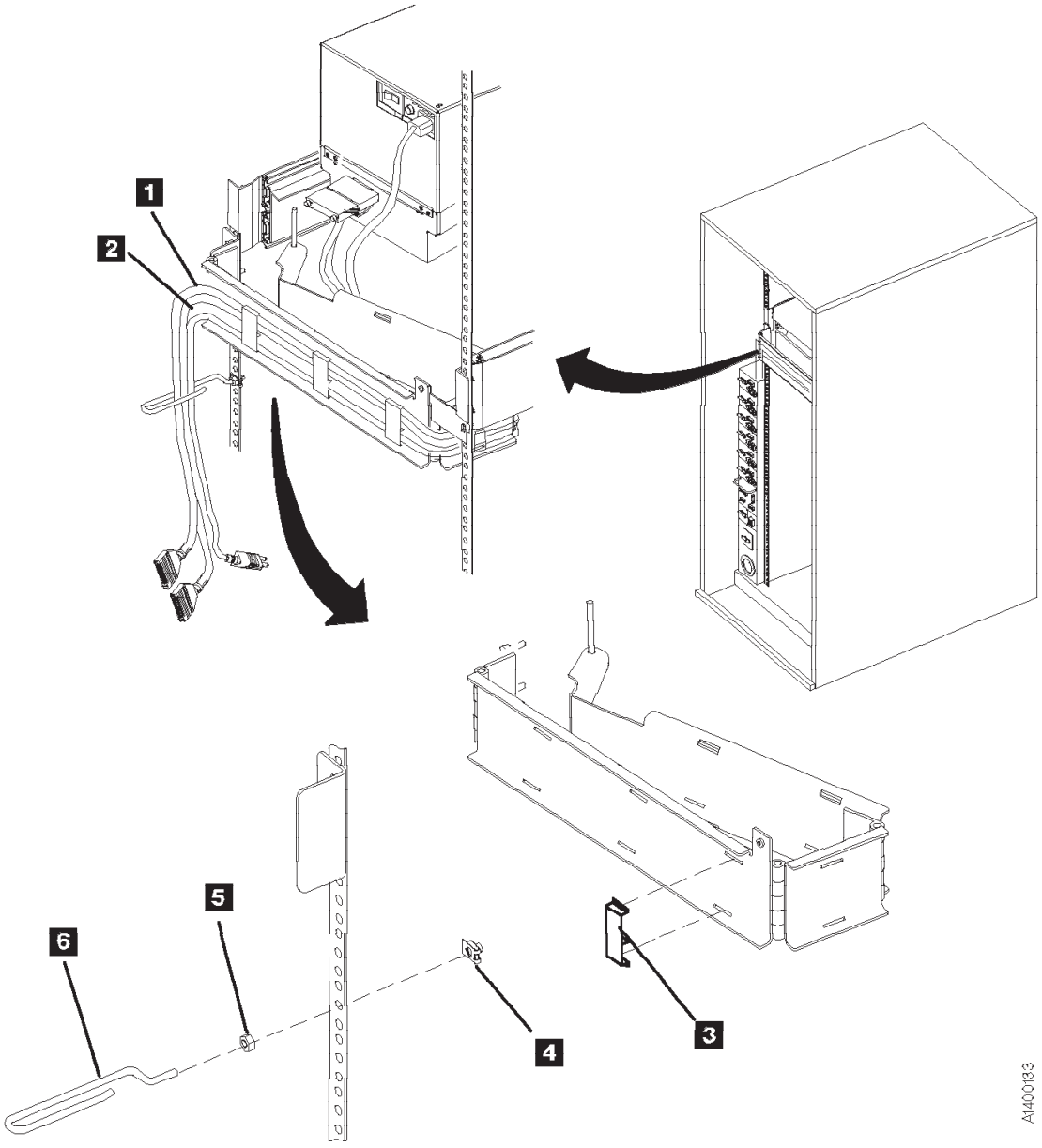


Figure 8-33. Cable Retainers for SCSI (Rear View)

Rack, Rear Internal Panel – Model B11/E11/H11

See Figure 8-34.

__ 1. Install the rear internal panel **1** P/N 05H2346 by using two screws **2** P/N 1624778. The internal panel is required only for the top drives.

__ 2. If you received the shipping plate P/N 05H9822, an additional screw P/N 1624778, and an additional nut clip P/N 74F1823, keep them in a safe place. They are used when the rack and devices are moved to another location.

__ 3. Go to “Decorative Covers (2-Drive Cover) – Rack-Mounted Model B11/E11/H11” on page 8-59.

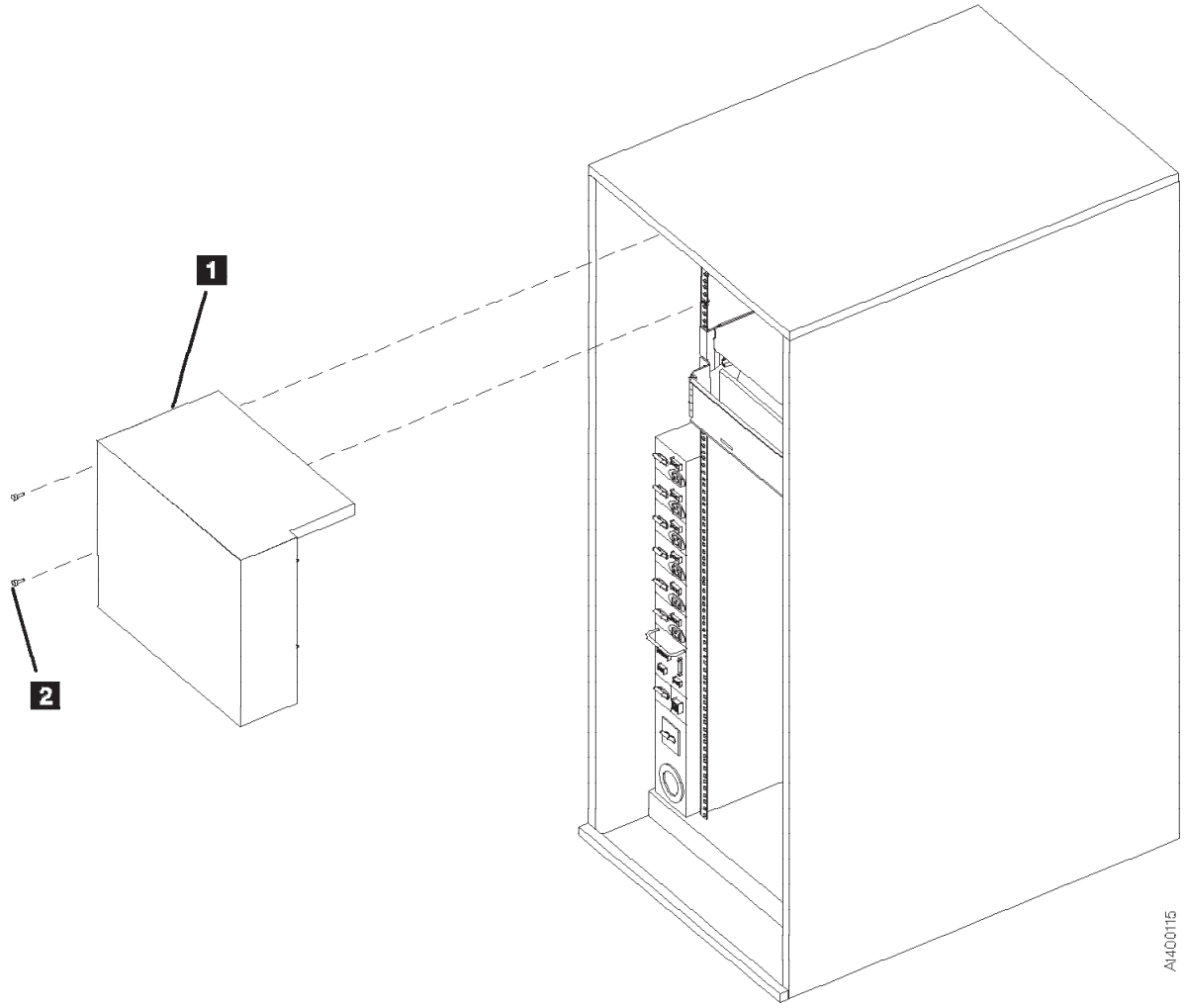


Figure 8-34. Internal Panel

Decorative Covers (2-Drive Cover) – Rack-Mounted Model B11/E11/H11

See Figure 8-35.

1. After you have installed the last 3590, install the 2-drive cover **4** over the drives:
   a. Install the blank-out cover **5** over any unused position of the decorative cover **4** (drive 1 or drive 3 position).

      Note: The wider side lip of the cover must be positioned on the left side for installation.

   b. Insert the magazine (see “Inserting and Removing Magazine” on page 6-7).

      Note: In the next step, if two drives are side-by-side, both displays must be tilted forward.

   c. Slide the display forward **2** and then rotate it down **1** to lower the overall height of the display.
   d. Align the studs **3** with the mounting holes and snap the decorative cover **4** onto the rack frame.
2. Put the display in the vertical position.
3. Go to “SCSI System Cable at Host” on page 8-64.

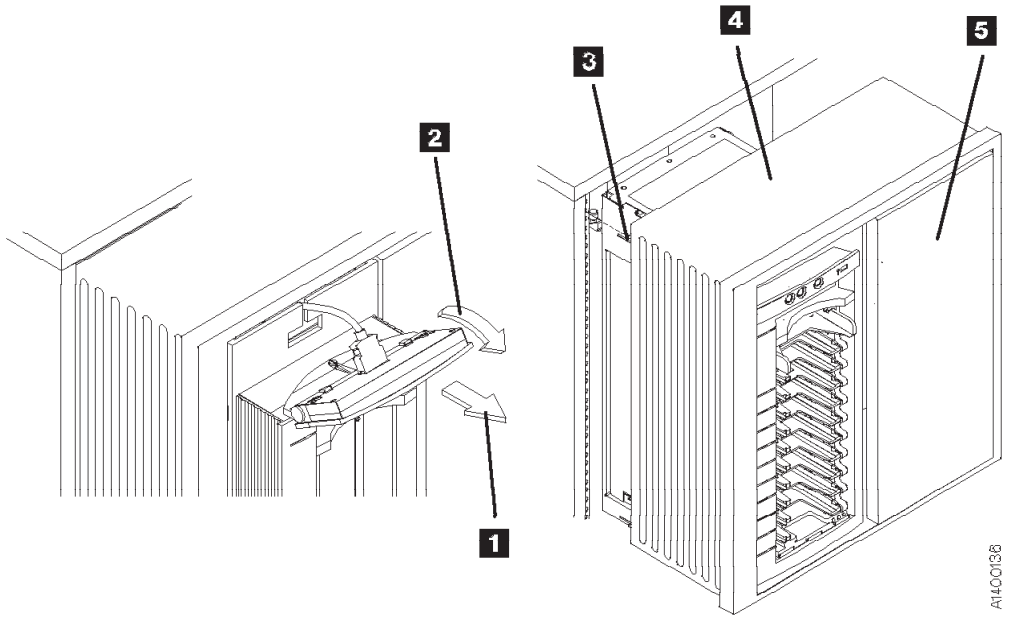


Figure 8-35. ACF Decorative (2-Drive) Cover

SCSI Cables – Model B1A/E1A/H1A

Cable Brackets – Model B1A/E1A/H1A

If the brackets are already installed, go to “Cable Routing – Model B1A/E1A/H1A with SCSI Attachment” on page 8-61.

See Figure 8-36. View the drives from the rear. In this text, *front* refers to the front of the drive and *left-hand drive* refers to the left drive as you face the rear of the drive.

__ 1. Extend the drive to its fully locked service position if it is not already in its service position.

__ 2. Loosely attach the cable clamp P/N 05H2629 **2** to the rear cable bracket P/N 45G0193 **1** with screw P/N 1624780.

__ 3. Attach the rear cable bracket **1** to the drive with two screws P/N 1624775.

__ 4. Loosely attach the cable clamp P/N 05H2629 **7** to the front cable bracket P/N 45G0178 **6** or **8** with screw P/N 1624780.

__ 5. For the **right-hand** drive, face the cable clamp to the **left** and attach the front cable bracket **6** with screw P/N 1624765. (If the bottom plate on the drive has only one threaded hole, use the center hole in the bracket.)

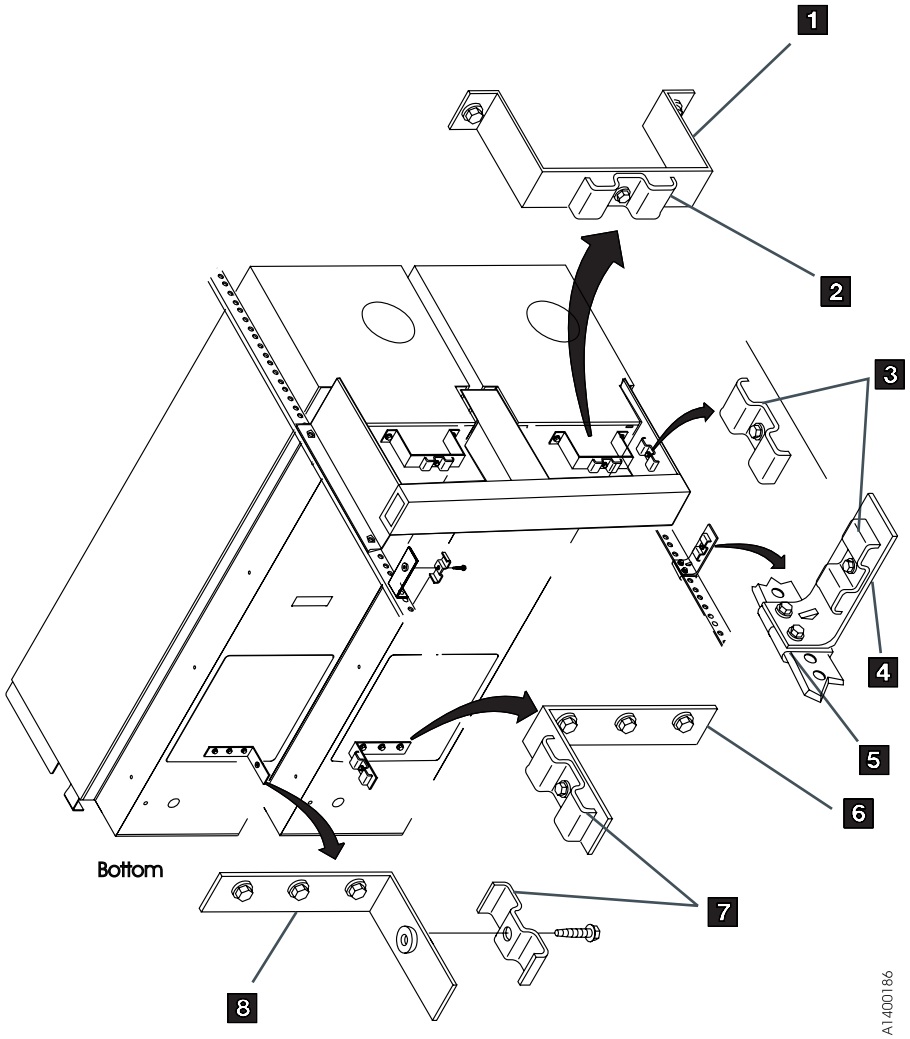


Figure 8-36. Cable Brackets (Bottom View of Drives)

__ 6. For the **left-hand** drive, face the cable clamp 8 to the **right** and attach the front cable bracket with screw P/N 1624765. (If the bottom plate on the drive has only one threaded hole, use the center hole in the bracket.)

__ 7. Loosely attach cable clamps P/N 05H2629 3 to the side frame bracket with screw P/N 1624780 and to the bracket 4 with screws P/N 1624778. For left-hand drives, attach the clamp to the left frame bracket.

__ 8. Attach the bracket P/N 45G0181 4 below the drive with nut clips 5 and screws P/N 1624778. Use the 15th and 16th mounting holes below the pin in the slide mounting bracket.

__ 9. Go to "Cable Routing – Model B1A/E1A/H1A with SCSI Attachment".

Cable Routing – Model B1A/E1A/H1A with SCSI Attachment

In this text, *front* refers to the front of the drive and *left-hand drive* refers to the left drive, as you face the rear of the drive.

Notes:

1. The power cables and the library manager cables are not routed through the cable brackets, they are attached to the SCSI cables with cable ties.
2. If you are connecting 3490 Models C1A or C2A on the same SCSI bus as 3590 Model B1A/E1A/H1A, the 3490 models must be first-in-line from the host. You must use a drive-to host cable because the hammerhead on the device-to-device cables will not fit in a 3490.

Route the SCSI cables through the cable brackets, as follows:

__ 1. Extend the drive to its fully locked service position if it is not already in its service position.

__ 2. See Figure 8-37 on page 8-63. Connect the SCSI cables and terminators to the ports on the 3590s. Use screws P/N 05H8983 15 . One screw is in the ship group and one screw is attached to each cable.

__ 3. To create the service loop, route the SCSI cables 4 and 5 through the rear bracket clamp and through the front cable clamp, then tighten these two clamps.

Route the left-hand power cable 2 in the service loop and across the rear slide mounting bracket.

For the SCSI cables that go side-by-side from drive-to-drive 3 , route them through the service loop and across the rear slide mounting bracket, then attach them and the left-hand drive power cable with cable ties 8 . If the drives in a string are above or below the drive, route the cables through the service loop and, if necessary, across the rear slide mounting bracket, through the clamp 7 , and then through the service loop in the other drive.

__ 4. Route the SCSI cables so they extend about 115 mm (4.5 in.) 10 past the front of the rear slide mounting bracket and then route them through the side frame clamp 6 and then through the rack-mount clamp 7 .

__ 5. With the drive in the fully-extended service position, clamp the SCSI cables about 25 mm (1 in.) 13 past the front of the rear slide mounting bracket 14 with clamp P/N 05H2629 11 and bracket P/N 05H2630 12 by using an M5 screw.

Note: If the drive has less than 3 SCSI cables attached, do not place the clamp as specified in the next step. Instead, connect it below clamp 7 . Then if more SCSI cables are added later, the clamp can be attached where specified.

__ 6. Route the power cable 2 and the library manager cable 1 next to the SCSI cables and attach them to the SCSI cables with cable ties 9 . Do not route them through the cable brackets. Use as many cable ties as necessary so the drive can be extended to its service position without interference.

__ 7. If the frame is a drive unit frame, route the library manager cables through the hole under the front of the lower drives and clamp them in place on the braided part of the cables. See "Frame to Frame Cables" in the INST section of *IBM 3494 Tape Library Dataserver Maintenance Information*.

__ 8. Go to “ARTIC Adapter Cables to Tape Subsystem” in the INST section of *IBM 3494 Tape Library Dataserver Maintenance Information*, complete those steps, and then return here. When the drive is configured run the wrap tests, see “SCSI Ports Wrap Test” on page 9-106.

Note: Tape subsystems must be connected sequentially by library position in the 3494.

If you are adding a drive (inserting a drive within the string) to a 3494 Model L12 or D12, you shift the existing tape subsystem cables down one position to free the correct ARTIC port for the new drive. This also applies if you are replacing a 3490E with more than one 3590 Model B1A/E1A/H1A.

__ 9. Secure the drives in their operating positions by installing the slide locking screws (see Figure 9-4 on page 9-13).

__ 10. Go to “SCSI System Cable at Host” on page 8-64.

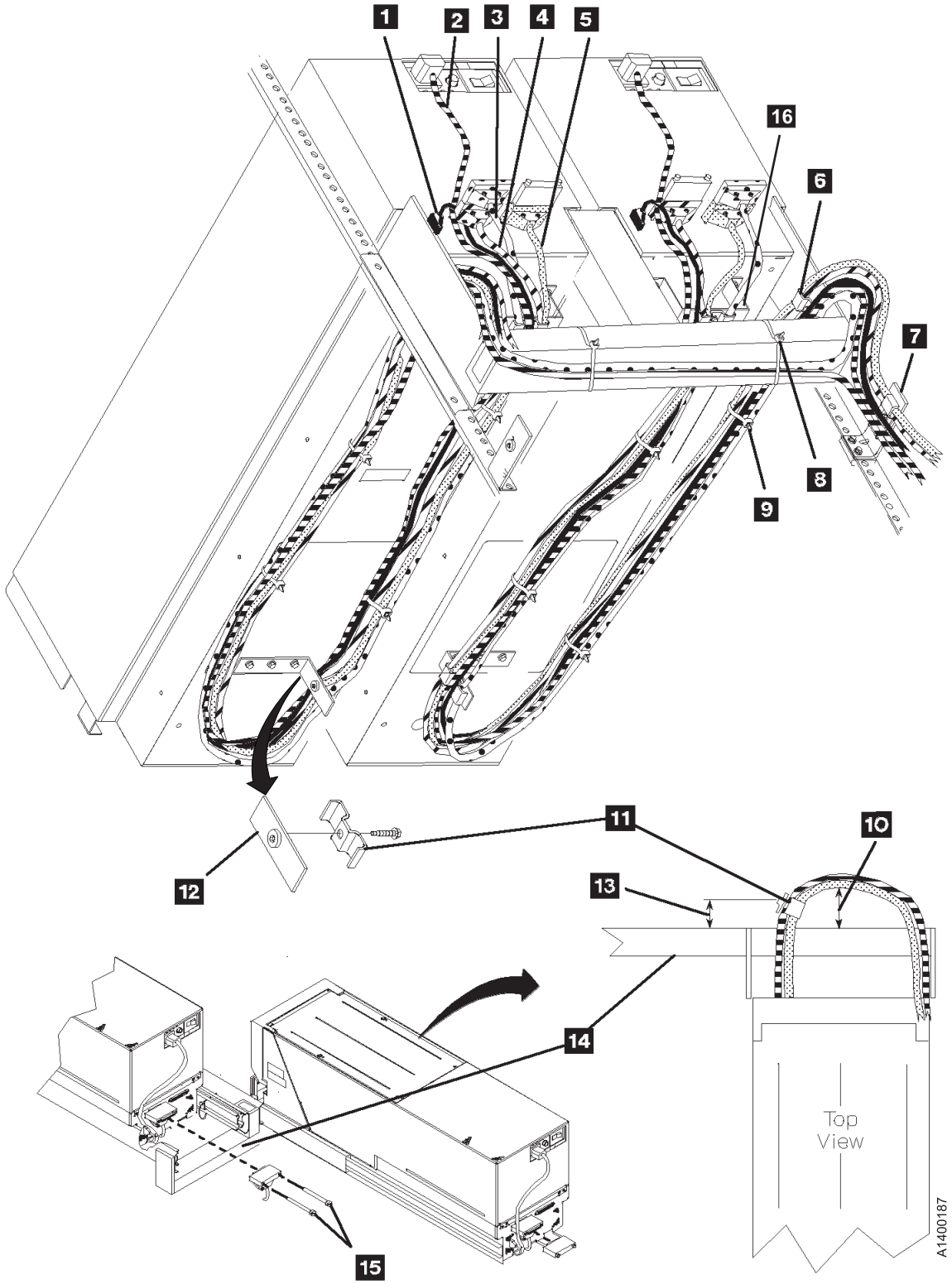


Figure 8-37. Cable Routing

SCSI System Cable at Host

Install the appropriate interposer at the attachment point of the SCSI cable to the host. Be sure to securely attach the interposer before attaching the SCSI cable.

Note: If you are connecting 3490 Models C1A or C2A on the same SCSI bus as 3590 Model B1A/E1A/H1A, the 3490 models must be first-in-line from the host.

Table 8-7. Interposers

Host	Description	Interposer/Terminator/
iSeries/AS400 (OS/400) System	Magnetic Media Subsystem Controller (FC 6501)	05H3834 (FC 9410)
pSeries/RS6000 (AIX) System	SCSI-2 Differential High Performance I/O Controller (FC 2420)	61G8323 (FC 9701)
pSeries/RS6000 (AIX) System	IBM SCSI-2 Differential Fast/Wide Adapter/A (FC 2416).	50G0460 (FC 9702)
SUN	Sun Dual-Channel Differential Ultra SCSI Host Adapter (PCI).	09L0878 (FC 9799)
SUN	Inline SCSI terminator feature.	19P0378 (FC 9798)
HP V–Class only	Inline SCSI terminator feature.	19P0378 (FC 9798)
Note: Some FC 2416 SCSI ports may have a “Y” cable installed. There should be a terminator plugged into one of the “Y” connectors, and the 3590 SCSI cable should plug directly into the other “Y” connector. Interposer P/N 50G0460 is not needed with this cable configuration.		
Note: Refer to your host documentation for the latest information.		

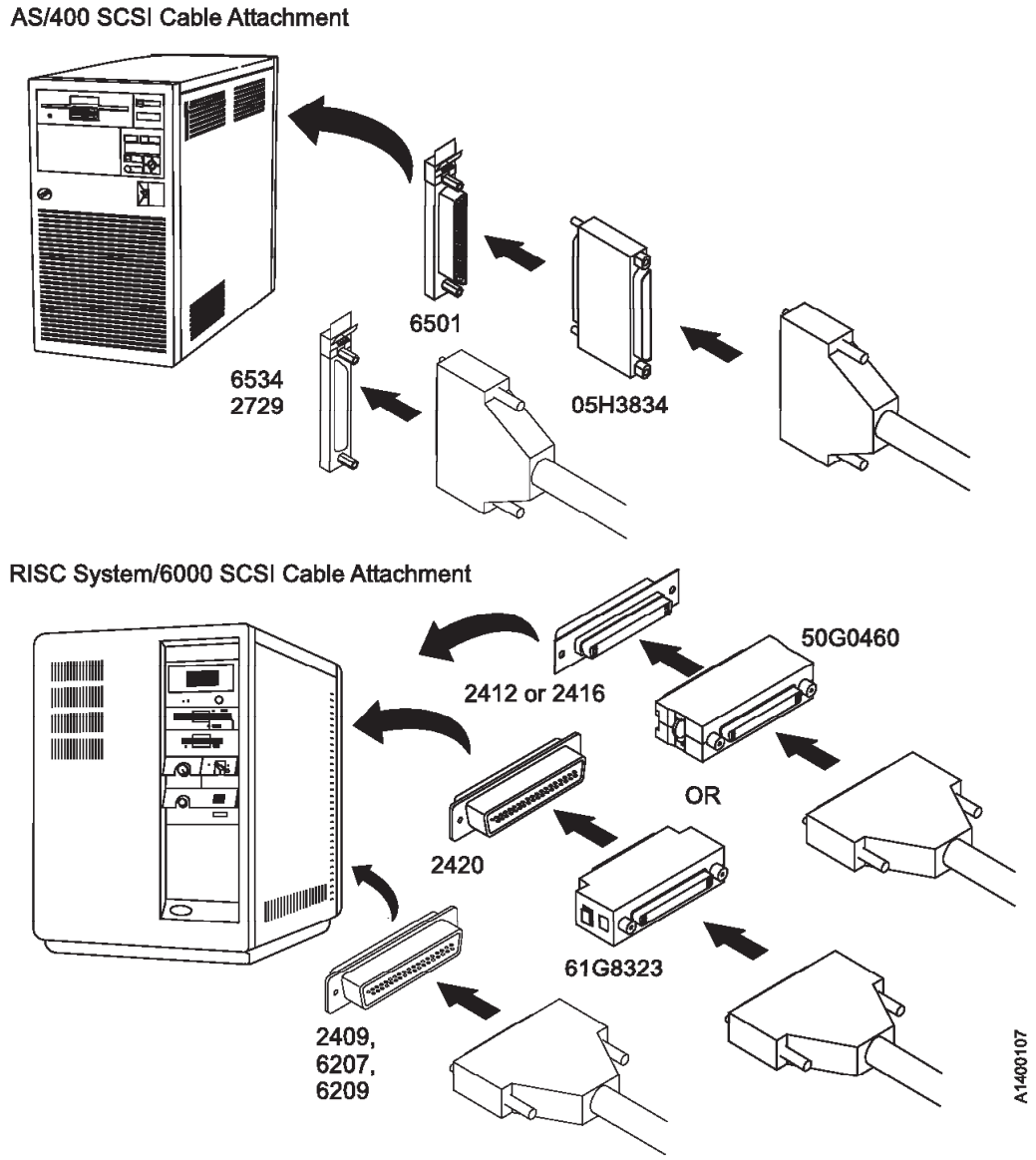


Figure 8-38. Installing SCSI System Cable at Host

An interposer may be required at the host end of the SCSI cable. See Table 8-7 on page 8-64, Figure 8-38 and Figure 8-39 on page 8-66.

Go to “Online Test” on page 8-78.

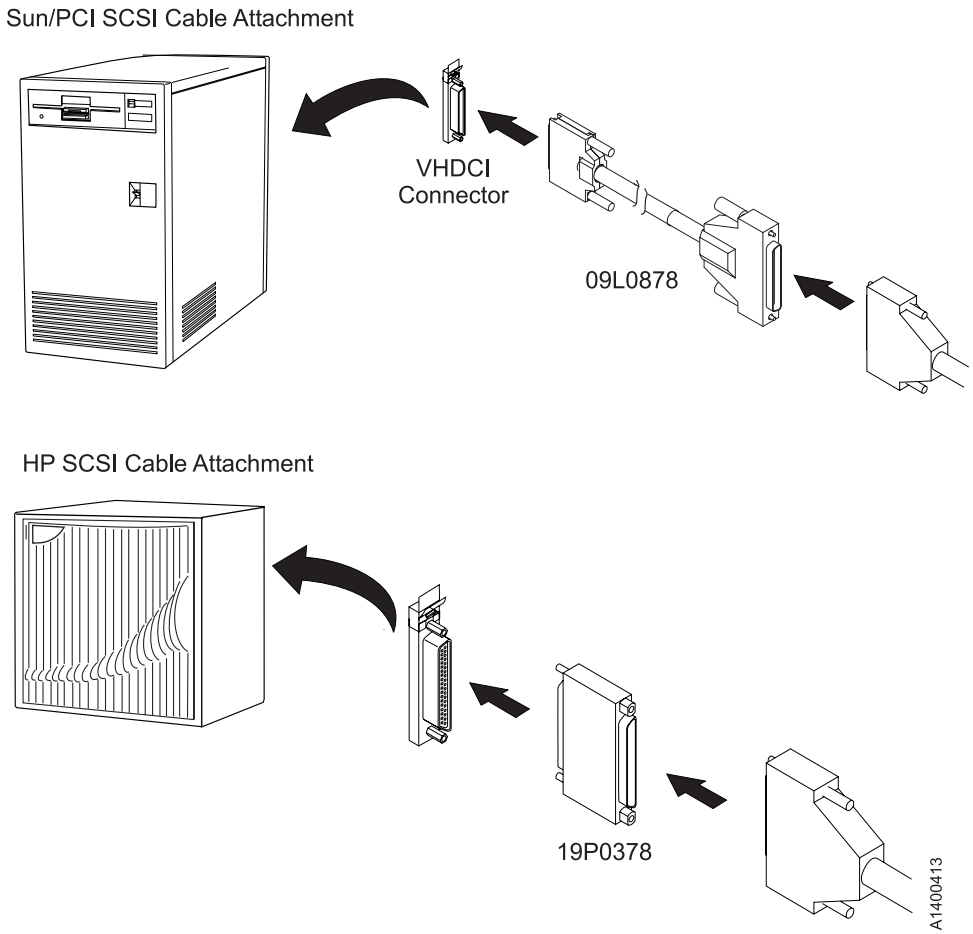


Figure 8-39. Installing Open System Cable at Host

Fibre Channel Attachment

Supported Host Attachments

The 3590 drives with fibre channel attachment FC 9510 or FC 3510 support attachment to the following host systems:

- IBM pSeries (AIX)
- IBM iSeries (OS/400)
- IBM xSeries (NUMA-Q)
- Hewlett-Packard (HP-UX)
- Windows (NT and 2000)
- LINUX
- Sun PCI/S-bus.

The drives also support attachment to the following fibre channel fabric components:

- IBM 2103 Fibre Channel Storage Hub (for distance only)
- IBM 2109 SAN Fibre Channel Switch
- IBM 2031 McData ES-1000 Fibre Channel Loop Switch
- IBM 2032 McData ED-5000 Fibre Channel Switch (connected through ES-1000 or SAN)
- IBM 2042 InRange FC/9000 Fibre Channel Director.

The host system and fabric component attachments above have unique hardware and software requirements. Also, new systems and components may be added to the lists from time to time.

See *Fibre Support Information* for the latest updates on “Web Site Information” on page xxii.

Install 'Read-Me' Sheet

The minimum code requirements for the host system fibre channel attachments are listed on the 'Read-Me' sheet that is shipped with each new fibre channel 3590 drive.

See *minimum microcode requirements* in “Web Site Information” on page xxii for latest levels.

Fibre Channel Cabling Examples

Each drive has two external fibre channel ports. The cable is a shortwave or multi-mode type (50-micron cable) for distances up to 500 m (1640 ft). The connection is a duplex SC connector type.

Table 8-8 shows the fibre cables ordered by length.

Table 8-8. 3590 Feature Codes for Fibre Channel Attachment.

Feature Code	Cable Length	Part Number
5805	5.0 meter (16 feet)	03K9201
5813	13 meters (43 feet)	54G3386
5825	25 meters (82 feet)	03K9203
5861	61 meters (200 feet)	54G3390

If the customer requires cable lengths greater than 61 meters, they can contact IBM Site and Connectivity Services (I/T Consulting and Implementation Services in the US) for custom cable system design and installation.

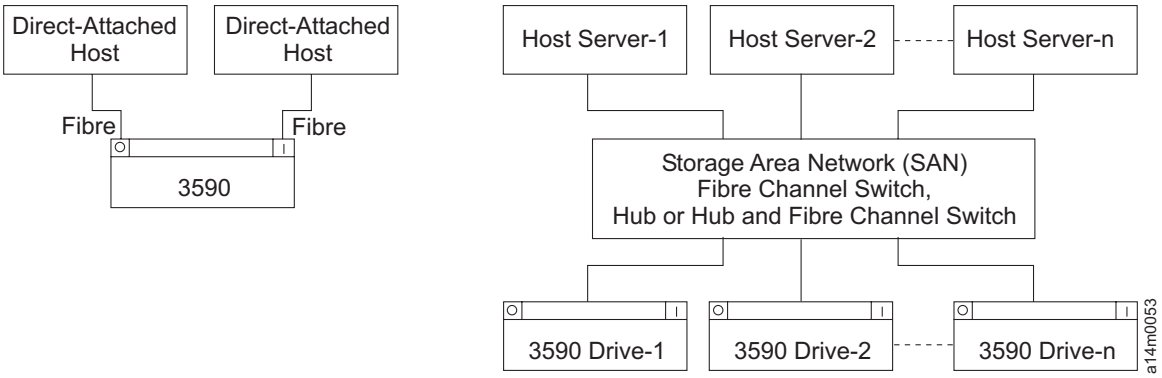


Figure 8-40. Typical Fibre to Host Cabling

When installing 3590 drives with fibre channel into a rack, a 3494, or a C12 frame, a 3-m (9-ft) cable P/N 19P0160 goes from the drive ports to an interposer connector on a bulkhead at the bottom of the frame. The customer's cable attaches to the other side of the bulkhead connector.

Fibre Cables to Device

Attention: Do not connect or disconnect any fibre channel device while power is **On** as this practice may corrupt data or may damage hardware.

__ 1. If not already done, insert the drive power cables into the 3590 ac connectors and insert the drive power cables into the ac power source.
__ 2. Locate the cables from the host/switch/hub and route them to the rear of the device.
__ 3. If you are installing Model E11/H11 devices, including the Desk Side model, go to "Fibre Cables – Model E11/H11".
__ 4. If the Model E1A/H1A is being installed in a Desk Side cover as part of RPQ 8B3190, go to "Fibre Cables – Model E11/H11".
__ 5. If you are installing Model E1A devices, other than the Desk Side model, go to "Fibre Cables – Model E1A/H1A" on page 8-74.

Fibre Cables – Model E11/H11

Note: Be sure all the drives in the rack are offline and powered down.

Refer to Figure 8-40 on page 8-68 and connect the customer supplied cables to the rear of the bulkhead. Notice how the cables are tied and supported to prevent damage.

In this text, *front* refers to the front of the drive and *left-hand drive* refers to the left drive as you face the rear of the drive.

Note: The fibre channel cables and power cables are not routed through the cable brackets, they are attached to the support cables with "hook and loop" fasteners.

Overview – Rack Installation

If drives are replacing existing SCSI drives refer to the appropriate MES installation instructions for procedures.

- The fibre channel cables are not as strong as the SCSI cables and they can be damaged very easily. It is necessary to use a dummy SCSI cable for support and routing in the rack service loop.
- The dummy cables go inside the cable clamps the same as when installing SCSI cables. The fibre channel cables are routed outside of the cable clamps so they are not damaged and they are attached to the dummy cables with "hook and loop" fasteners.
- All of the drives in the rack use the same 3-m (10-ft) length fibre cable. Any excess length should be coiled up in the bottom of the frame near the bulkhead connectors.
- All of the drive cables are connected to the back of the bulkhead connectors, and the host cables all plug into the other side of the bulkhead connectors.

Installing Fibre Cables (Model E11/H11)

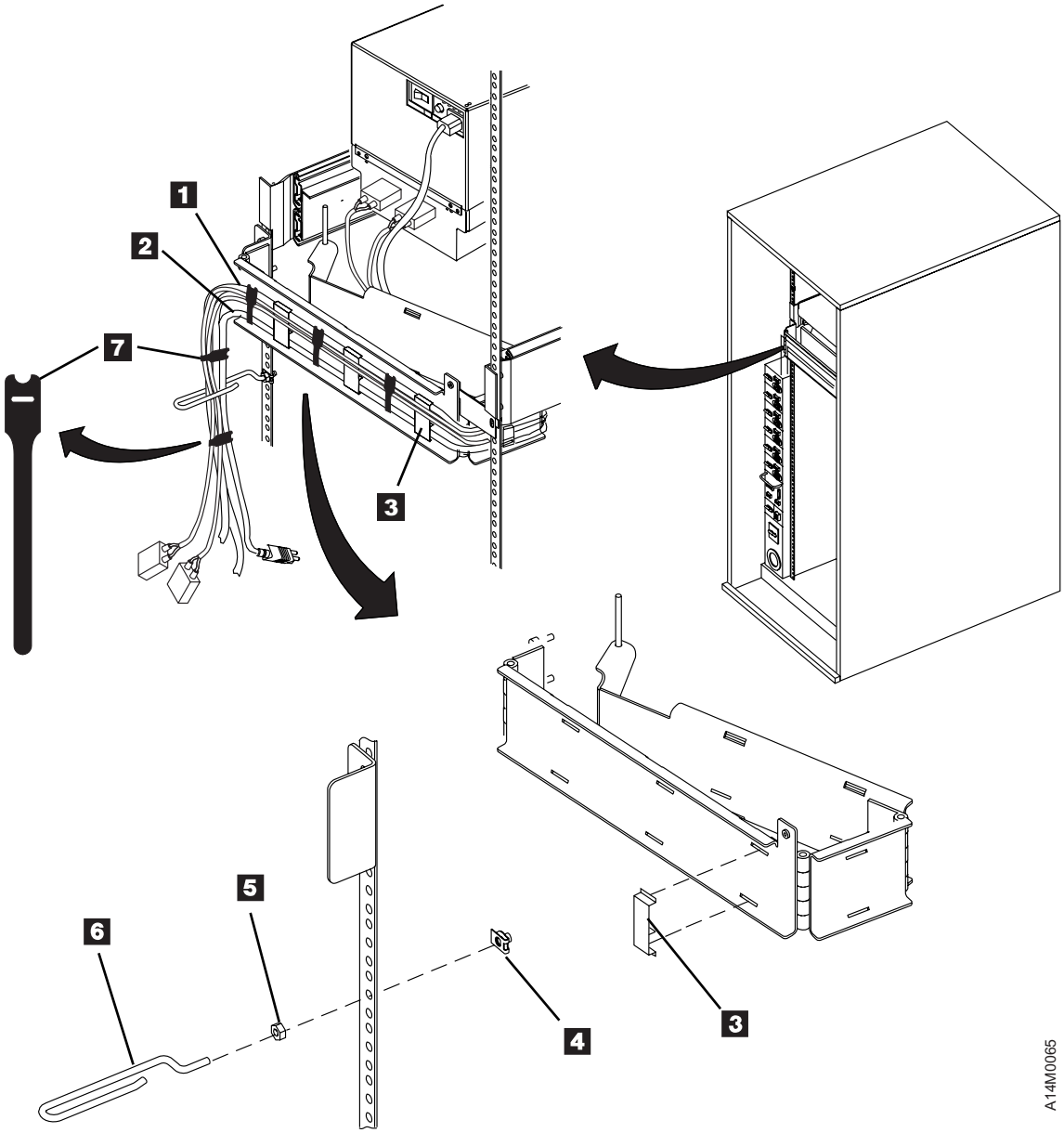
__ 1. Connect the system fibre cable straight into the card connector on the drive (Fibre Port 0 is on the left when facing the rear of the drive).
__ 2. If the model E1A is being installed in a Desk Side sleeve as part of RPQ 8B3190, go to "Fibre Cable at Host" on page 8-77.
__ 3. If the model E11/H11 (RPQ 8B3191 or FC 2200) is being installed in a Desk Side sleeve, go to "Fibre Cable at Host" on page 8-77.
__ 4. Go to "Cable Guides and Routing – Model E11/H11 (Fibre)".

Cable Guides and Routing – Model E11/H11 (Fibre)

See Figure 8-41 on page 8-70.

__ 1. Install the cable guides **6** P/N 45G0179, nuts **5** P/N 1622404, and nut clips **4** P/N 74F1823 in the eighth hole below each pivot arm.
__ 2. Route the dummy support cables **1** P/N 35L2022 through the upper snap-on cable retainers **3** of the cable pivot arm. Do not twist the cables.
__ 3. Route the power cords **2** through the lower sections of the snap-on cable retainers.

__ 4. Route the fibre channel cables along side the dummy support cables, but not through the snap-on cable retainers, with “hook and loop” fasteners **7** , as necessary. See P/N 19P0362 “Hook and Loop Fastener” on page 3-47.
__ 5. See Figure 8-44 on page 8-73. Route the cables down to the bottom of the frame, then through cable clamps **2** and **4** , as shown. Any excess cable should be coiled through clamps **4** , if necessary.
__ 6. Connect the cables to the back of the appropriate bulkhead connector **3** , as shown. The customers external cables **1** will plug into the outside of the bulkhead connectors.
__ 7. Go to “Rack, Rear Internal Panel – Model E11/H11” on page 8-71.



See “Hook and Loop Fastener” on page 3-47 for fastener illustration.

Figure 8-41. Cable Retainers for Fibre (Rear View)

Rack, Rear Internal Panel – Model E11/H11

See Figure 8-42.

__ 1. Install the rear internal panel **1** P/N 05H2346 by using two screws **2** P/N 1624778. The internal panel is required only for the top drives.

__ 2. If you received the shipping plate P/N 05H9822, an additional screw P/N 1624778, and an additional nut clip P/N 74F1823, keep them in a safe place. They are used when the rack and devices are moved to another location.

__ 3. Go to “Decorative Covers (2-Drive Cover) – Rack-Mounted Model E11/H11” on page 8-72.

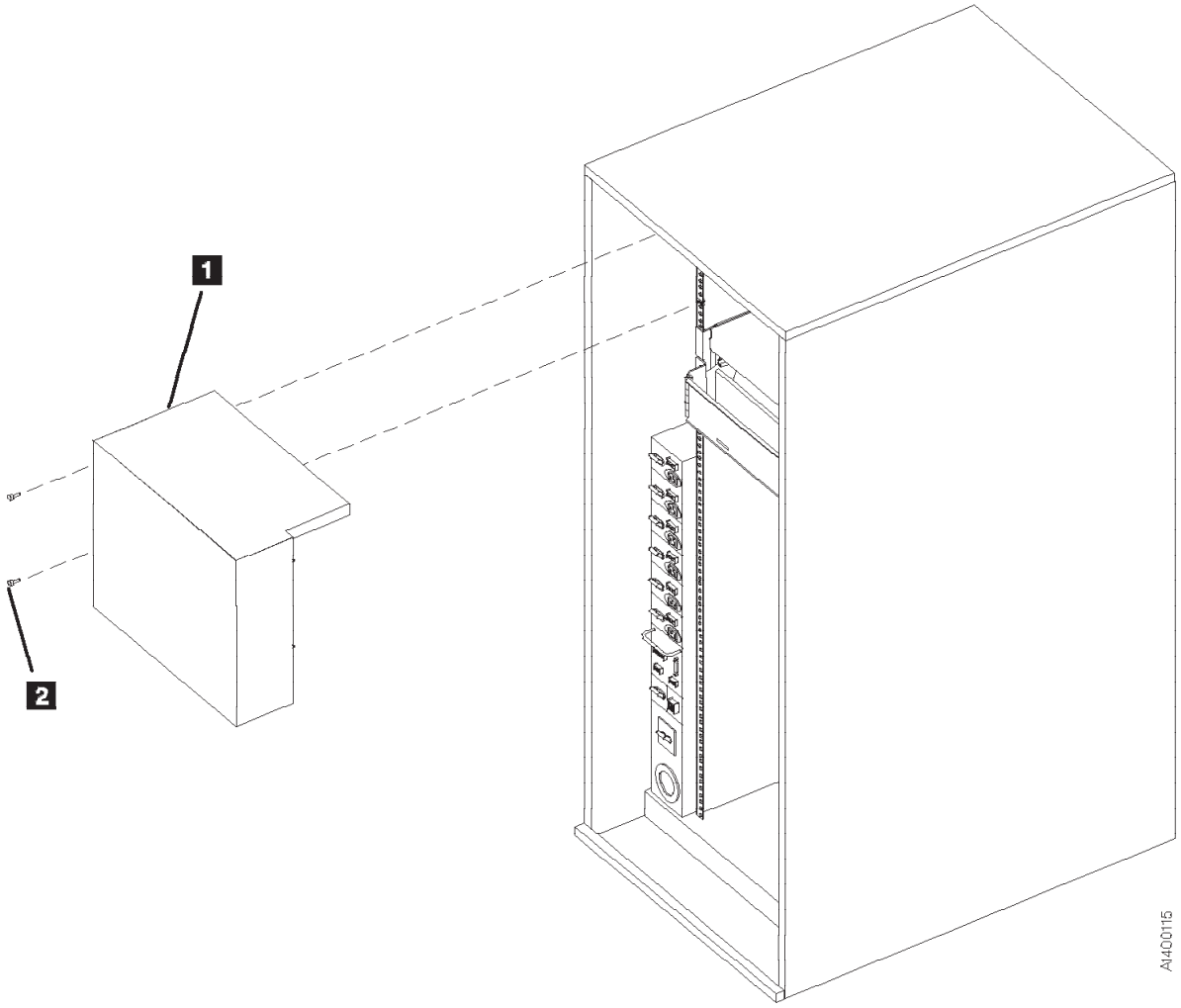


Figure 8-42. Internal Panel Model E11/H11

Decorative Covers (2-Drive Cover) – Rack-Mounted Model E11/H11

See Figure 8-43.

1. After you have installed the last 3590, install the 2-drive cover **4** over the drives:
   a. Install the blank-out cover **5** P/N 05H2343 over any unused position of the decorative cover **4** (drive 1 or drive 3 position).

      Note: The wider side lip of the cover must be positioned on the left side for installation.
   b. Insert the magazine (see “Inserting and Removing Magazine” on page 6-7).

      Note: In the next step, if two drives are side-by-side, both displays must be tilted forward.
   c. Slide the display forward **2** and then rotate it down **1** to lower the overall height of the display.
   d. Align the studs **3** with the mounting holes and snap the decorative cover **4** onto the rack frame.
2. Put the display in the vertical position.
3. Go to “Fibre Cable at Host” on page 8-77.

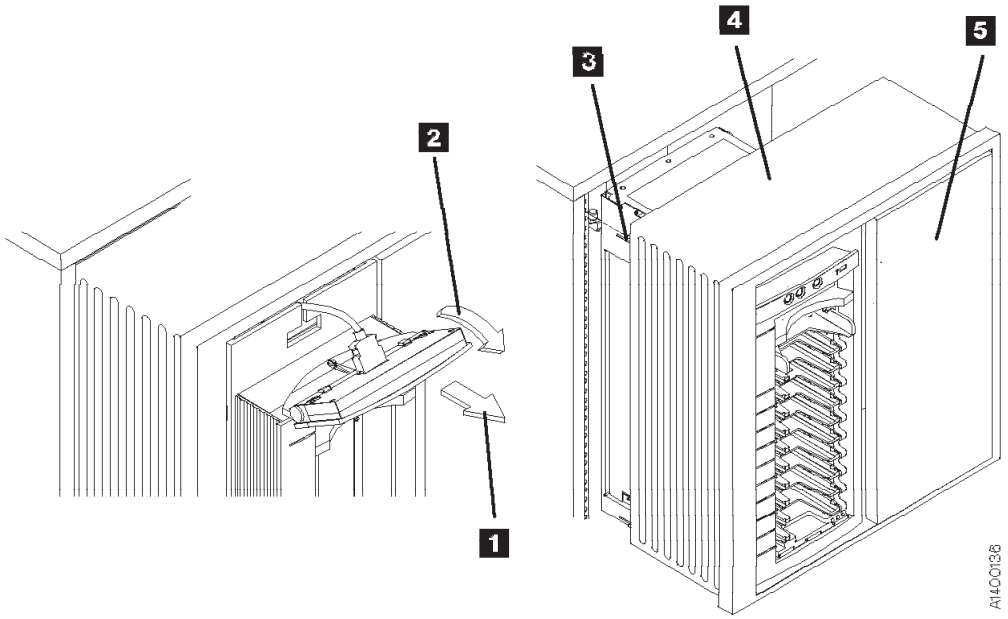


Figure 8-43. ACF Decorative (2-Drive) Cover

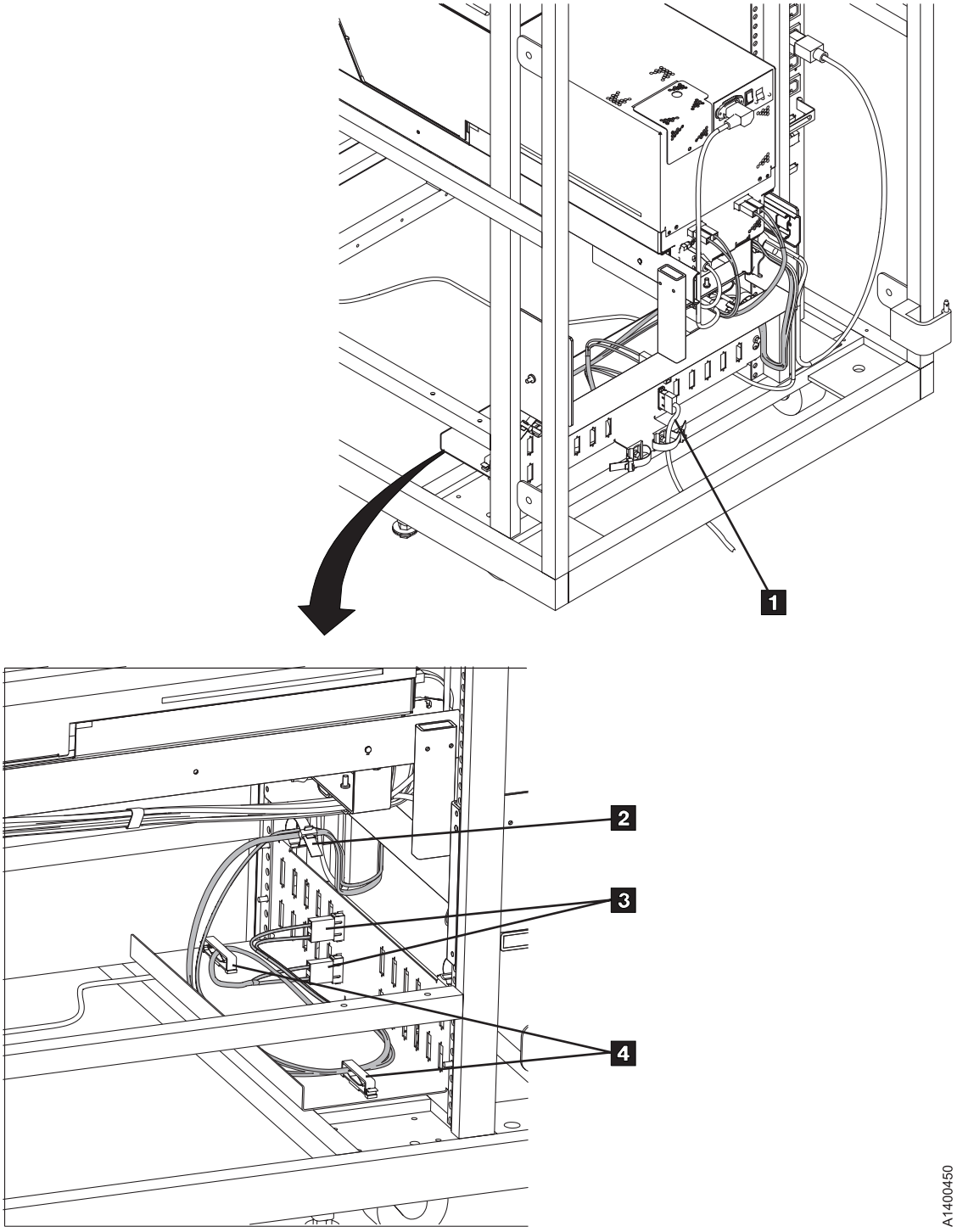


Figure 8-44. Typical Model E11/E1A/H11/H1A Fibre Channel Cable Routing

Fibre Cables – Model E1A/H1A

In this text, *front* refers to the front of the drive and *left-hand drive* refers to the left drive as you face the rear of the drive.

Note: The fibre channel cables, power cables and the library manager cables are not routed through the cable brackets, they are attached to the support cables with “hook and loop” fasteners.

Overview

- The fibre channel cables are not as strong as the SCSI cables and they can be damaged very easily. It is necessary to use a support SCSI cable for support and routing in the 3494 service loop.
- The dummy cables go inside the cable clamps the same as when installing SCSI cables. The fibre channel cables are routed outside of the cable clamps so they are not damaged and they are attached to the dummy cables with “hook and loop” fasteners.
- All of the drives in the 3494 use the same 3 meter length fibre cable. Any excess length should be coiled up in the bottom of the frame near the bulkhead connectors.
- All of the drive cables are connected to the back of the bulkhead connectors, and the host cables all plug into the other side of the bulkhead connectors.
- The service loops for the bottom drives will be slightly longer than those of the upper drives because the dummy cables can’t be attached to the vertical frame in the same way.

Fibre Channel Cable Brackets – Model E1A/H1A

If the brackets are already installed, go to “Fibre Channel Cable Routing – E1A/H1A” on page 8-76.

See Figure 8-45 on page 8-75. View the drives from the rear. In this text, *front* refers to the front of the drive and *left-hand drive* refers to the left drive as you face the rear of the drive.

__ 1. Extend the drive to its fully locked service position if it is not already in its service position.

__ 2. Loosely attach the cable clamp P/N 05H2629 **2** to the rear cable bracket P/N 45G0193 **1** with screw P/N 1624780.

__ 3. Attach the rear cable bracket **1** to the drive with two screws P/N 1624775.

__ 4. Loosely attach the cable clamp P/N 05H2629 **7** to the front cable bracket P/N 45G0178 **6** or **8** with screw P/N 1624780.

__ 5. For the **right-hand** drive, face the cable clamp to the **left** and attach the front cable bracket **6** with screw P/N 1624765. (If the bottom plate on the drive has only one threaded hole, use the center hole in the bracket.)

__ 6. For the **left-hand** drive, face the cable clamp **8** to the **right** and attach the front cable bracket with screw P/N 1624765. (If the bottom plate on the drive has only one threaded hole, use the center hole in the bracket.)

__ 7. Loosely attach cable clamps P/N 05H2629 **3** to the side frame bracket with screw P/N 1624780 and to the bracket **4** with screws P/N 1624778. For left-hand drives, attach the clamp to the left frame bracket.

__ 8. Attach the bracket P/N 45G0181 **4** below the drive with nut clips **5** and screws P/N 1624778. Use the 15th and 16th mounting holes below the pin in the slide mounting bracket.

__ 9. Go to “Fibre Channel Cable Routing – E1A/H1A” on page 8-76.

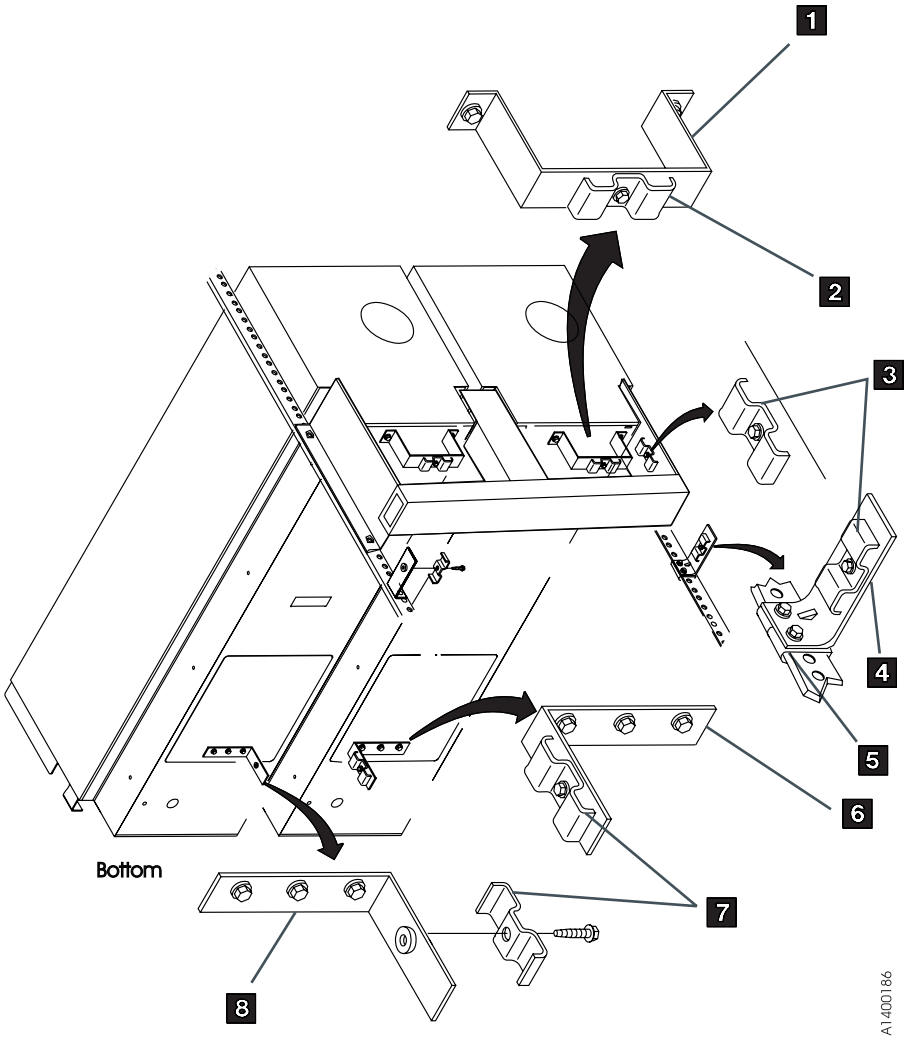
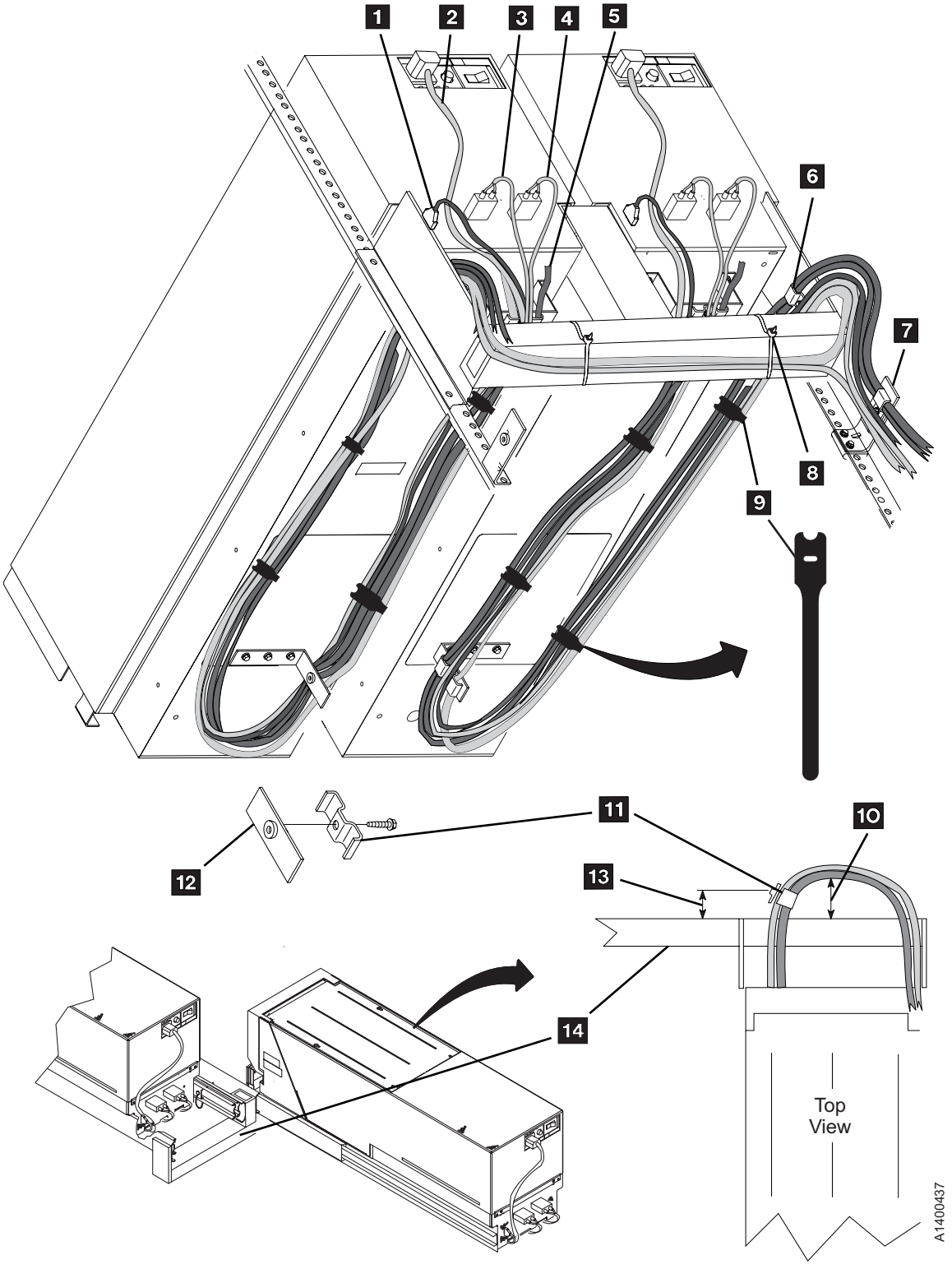


Figure 8-45. Cable Brackets (Bottom View of Drives)

Fibre Channel Cable Routing – E1A/H1A



Notice “hook and loop”, item 9 .

Figure 8-46. Fibre Channel Cable Routing for E1A/H1A

Route the support cable through the cable brackets, as follows:

__ 1. Extend the drive to its fully locked service position if it is not already in its service position.
__ 2. To create the service loop, route the support cable **5** through the rear bracket clamp and through the front cable clamp, then tighten these two clamps.

Note: When tightening the rear bracket clamp, allow approximately 24 mm (1.0 in.) of the cable to extend beyond the clamp.

__ 3. Route the left-hand power cable **2** in the service loop and across the rear slide mounting bracket, then attach the left-hand drive power cable with cable ties **8**.
__ 4. Route the support cable so it extends about 115 mm (4.5 in.) **10** past the front of the rear slide mounting bracket and then route them through the side frame clamp **6** and then through the rack-mount clamp **7**.
__ 5. Allow approximately 24 mm (1.0 in.) of the support cable to extend through the rack-mount clamp **7**, then tighten the rack-mount clamp and the side frame clamp.
__ 6. Route the power cable **2** and the library manager cable **1** next to the support cable and attach them to the support cable with cable ties (plastic cable ties **8** in approximate positions illustrated by **9**. Later “hook and loop” cable ties will be added for the fibre cables). Use as many cable ties as necessary, so the drive can be extended to its service position without interference.
__ 7. Connect the fibre channel cables **3** and **4** to the fibre channel port connectors on the back of the drive.
__ 8. Route the fibre channel cables next to the support cable and attach them to the support cable with the “hook and loop” fasteners provided, item **9**. Use as many “hook and loop” fasteners as necessary, so the drive can be extended to its service position without interference.
__ 9. See Figure 8-44 on page 8-73. Route the cables down to the bottom of the frame, then through cable clamps **2** and **4**, as shown. Any excess cable should be coiled through clamps **4**, if necessary.
__ 10. Connect the cables to the back of the appropriate bulkhead connector **3**, as shown. The customers external cables **1** will plug into the outside of the bulkhead connectors.
__ 11. If the frame is a drive unit frame, route the library manager cables through the hole under the front of the lower drives and clamp them in place on the braided part of the cables. See “Frame to Frame Cables” in the INST section of *IBM 3494 Tape Library Dataserver Maintenance Information*.
__ 12. Go to “ARTIC Adapter Cables to Tape Subsystem” in the INST section of *IBM 3494 Tape Library Dataserver Maintenance Information*, complete those steps, and then return here.

Note: Tape subsystems must be connected sequentially by library position in the 3494.

If you are adding a drive (inserting a drive within the string) to a 3494 Model L12 or D12, you shift the existing tape subsystem cables down one position to free the correct ARTIC port for the new drive. This also applies if you are replacing a 3490E with more than one 3590 Model B1A/E1A/H1A.

__ 13. Secure the drives in their operating positions by installing the slide locking screws (see Figure 9-4 on page 9-13).
__ 14. Continue with “Fibre Cable at Host”.

Fibre Cable at Host

__ 1. Refer to the customers host or switch documentation for information about attaching the fibre cables between the drive and the host.
__ 2. Install the appropriate cable from the drive to the host, hub, or switch. Refer to *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*. Use switch, hub, or other fibre product service guides, as appropriate. Verify that the levels are supported.

See *configuration and software* in “Web Site Information” on page xxii for the latest information.

__ 3. Go to “Online Test” on page 8-78.

Online Test

Note: When the 3590 is powered OFF, wait approximately five seconds before again powering ON the 3590.

__ 1. Set the Power switch to the ON position.

This power-on test takes approximately 2.5 minutes to complete and is automatically performed when the subsystem is powered ON.

If a failure occurs, a message can be posted in the operator/CE panel or the operator/CE panel can be blank. If either of these conditions exist, go to the START section for further analysis. When any faults are corrected, return here.

__ 2. From the Options menu, select **Services**.

__ 3. From the Services menu, select **Set Online**.

__ 4. From the Set Online menu, select **Port 0** and/or **Port 1** to set the interfaces online, depending on the customer's choice.

__ 5. Select **Cancel** twice to return to the Options menu.

3494 Only

If you have completed an install and/or checkout of a 3590 Model B1A/E1A/H1A in a 3494 library, locate the next task to perform in the following list:

__ a. If you have more **field-installed** 3590 Model B1A/E1A/H1A drives to checkout, return to "Install Model B1A/E1A/H1A Into 3494 Frame" on page 8-25.

__ b. If you have more **factory-installed** 3590 Model B1A/E1A/H1A drives to checkout, return to "Installation Checkout" on page 8-32 to check the next drive.

__ c. If you have checked out all of the **factory-installed** 3590 Model B1A/E1A/H1A drives in a new 3494 library (new library or new frame), return to "Checkout" in *3494 Tape Library Dataserver Maintenance Information* and complete the library teach and checkout.

__ d. If you are field-installing a 3590 Model B1A/E1A/H1A in an **existing** 3494 library frame (feature code 4630), return to the feature Installation Instructions to complete the library teach and checkout.

__ e. If you are field-installing a 3590 Model B1A/E1A/H1A in a **new** 3494 library or **new** library frame (feature code 4630), return to "Checkout" in *3494 Tape Library Dataserver Maintenance Information* and complete the library teach and checkout.

End of 3494 Only

__ 6. Perform one of the following procedures depending on your application, then return here:
- "Checking Channel Attachment – AIX" on page 9-91
- "Checking Channel Attachment – iSeries (OS/400)" on page 9-89

  Note: **Ensure** that you have the latest iSeries/AS400 (OS/400) System PTFs before performing this procedure.
- "Checking Channel Attachment – Sun" on page 9-99
- "Checking Channel Attachment – Linux" on page 9-97
- "Checking Channel Attachment – HP-UX" on page 9-102
- "Checking Channel Attachment – Windows NT or Windows 2000" on page 9-103

__ 7. Make sure that the **latest** level of microcode is installed in the drive. If you need to update the microcode, do so by using the "Microcode update via SCSI" or "Microcode update via SCSI or fibre channel" entry in the START section, see 1-6.

Post Installation Reporting

If the *IBM 3590 Operator Quick Reference Guide* and the *3590 Training Tape* are included in the ship group, give them to the customer.

Follow this procedure after the drive is installed and tested.

__ 1. Update the account management plan book.

__ 2. Record the drive serial number (from the label) into the machine history log. See “Microcode EC Level History Log” on page 9-61.

Note: Record this serial number for use when restoring nonvolatile storage. It may be required by certain repair procedures.

__ 3. Record the installed microcode level into the machine history log. See “Check EC Level” on page 8-34 and “Microcode EC Level History Log” on page 9-61.

__ 4. For fibre channel attached drives, ensure that the “Fibre Channel World Wide Name History Log” on page 9-63 is filled out.

__ 5. Save the tools and cartridges in a safe place for later use.

__ 6. Report the installation as complete, using the existing branch office procedure.

__ 7. After successfully completing installation, notify the customer that the subsystem is now available for use.

Removing 3590

Use this procedure to remove a 3590 from service or to relocate it.

Relocation Notes:

1. For World Trade countries, refer to WT General CEM 257, “General Internal Packaging Instructions for Replant Machines.”
2. Before attempting to remove a 3590, ensure that you have the relocation kit.
3. If your host system has software aids for system upgrades, installations, or relocations, execute that software and follow the instructions it provides.
4. If the drive is attached to an Axx Control Unit or Virtual Tape Server (VTS), it is recommended that you disable the Control Unit Mode option before removing the drive. This will prevent any attachment problems if the drive is relocated to a non-Control Unit application. See the “CE Drive Options Menu” on page 5-52 for details.

To remove a 3590, perform the following steps:

__ 1. Before proceeding, check the following:

  __ a. Ensure that the drive is unloaded and the tape cartridge has been removed or stored in the magazine.

  __ b. Notify the system operator that you must power OFF the 3590 and that it will not be available, then vary the drive offline at the operator panel.

__ 2. Set the Power switch to the OFF position. The power switch is at the rear of the device.

__ 3. Open the rear door.

__ 4. Set the circuit protector (CP) to the OFF position ***for this drive only***.

__ 5. Disconnect the power cable ***for this drive only*** from the outlet in the rack or the power control compartment (PCC).

__ 6. Disconnect the ac power cable from the 3590.

__ 7. Disconnect the interface cables from the 3590.

Note: The ac power cable, and any interface cables that are removed with the drive should stay with the drive.

Remove or Relocate Model B11/E11/H11 in Rack

When removing nut clips, bolts, and screws, put them into the containers provided. Mark the containers with the correct part number.

__ 1. Remove the rack covers.

__ 2. Slide the 3590 into the service position. See “Service Position” on page 9-11.

__ 3. Remove the 3590 from the drive shelf.

__ 4. If the 3590 Model B11/E11/H11 is to be relocated to a different rack or a different location in the same rack, perform the installation instructions. If the 3590 is to stay in a rack and the rack is to be moved, install the shipping plates (see “Install Rack That Contains Model B11/E11/H11 Drives” on page 8-23).

__ 5. If you are not reinstalling the drive, place the drive in the shipping box. See “Repack Instructions for 3590” on page 8-81.

Remove or Relocate Model B1A/E1A/H1A

When removing nut clips, bolts, and screws, put them into the containers provided. Mark the containers with the correct part number.

__ 1. Disconnect the interface cables.

__ 2. Disconnect the ac power cord.

__ 3. Move the 3590 to the new location.

OR

__ 4. If you are not reinstalling the drive, place it in the shipping box. See “Repack Instructions for 3590” on page 8-81.

Note: The ac power cable, and any interface cables that are removed with the drive should stay with the drive. Any slides and related hardware that are removed with Model B1A/E1A/H1A drives should stay with the drive also.

Repack Instructions for 3590

Before repacking the 3590, verify that there is no tape cartridge in the 3590. For the ACF, verify there are no tape cartridges loaded in the magazine. If there are cartridges present, remove them.

Note: The ac power cable, and any interface cables that are removed with the drive should stay with the drive. Any slides and related hardware that are removed with Model B1A/E1A/H1A drives should stay with the drive also.

Refer to the relocation kit:

Model	Part Number
B11/E11/H11	7353608
B1A/E1A/H1A	7353617

Refer to the CE packaging instructions:

Model	Part Number
B11/E11/H11	7353609
B1A/E1A/H1A	7353618

Chapter 9. Procedures

Contents

The  symbol identifies an ESD-sensitive part. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Problem Determination

Begin all maintenance action at “Maintenance Starting Point” on page 1-2.

If you have a well-defined or solid failure symptom, (such as a FID, ATTN message, operator/CE panel indication), use Table 1-1 on page 1-2 to determine the proper service action.

If the problem is intermittent or you are unable to determine the cause of the problem (No Defect Found), or the symptoms change and you need further assistance, return here and use the following problem determination procedure:

1. Discuss the problem with the customer.
   - Does the failure occur only during certain operations (load, unload, read, or write)?
   - Is the failure unique to a certain cartridge, magazine, library, or host?
   - Does the failure occur only with certain software applications, or has the microcode level been changed recently?
2. Analyze the drive error log. See “CE Error Log Menu” on page 5-61 to display the log, and “Error Log Analysis Procedure” on page 9-126 to analyze the data.
   a. Look for FIDs with a time stamp close to the time of the failure.
   b. Look for FIDs or associated FRUs in the same functional area as the failure, such as ACF, pneumatics, or read/write data path.
   c. If a FID appears to be associated with the failure, go to “FID Entry Point” on page 1-8.
3. Attempt to recreate the problem.
   a. Run diagnostics using the “CE Loop Diag Menu” on page 5-42. Exercise the functional area that was causing the problem.
   b. Have the customer run the failing job or application, if possible.
4. Analyze the host or control unit error logs.
   a. Refer to “Service and Media Information Messages (SIMs and MIMs)” on page 4-2, “Error Log Analysis – pSeries/RS6000 (AIX) System” on page 4-15, “Error Log Analysis – iSeries/AS400 (OS/400) System” on page 4-26, “Obtaining Error Information from Sun (Solaris) System” on page 4-35, “Obtaining Error Information from HP/UX System” on page 4-35, or “Obtaining Error Information from Windows NT or Windows 2000 System” on page 4-36.
   b. Look for any SIM/MIM or other error information that may be related to the problem.
5. Analyze the FID FE error log. See “CE FID FE Log Menu” on page 5-63 to display the log and “FID FE – Isolate Fault Between Media and Hardware” on page 9-123 to analyze the data.
   a. Look for FIDs with a time stamp close to the time of the failure.
   b. Look for FIDs or associated FRUs in the same functional area as the failure, such as ACF, pneumatics, or read/write data path.
   c. If a FID appears to be associated with the failure, go to “FID Entry Point” on page 1-8.
6. Analyze the Temporary Error Log (see “CE Temp Error Log Menu” on page 5-65).
7. Call your next level of support, if necessary.

Excessive Clean Messages

Normal clean messages require running a cleaning cartridge in the machine. Excessive clean messages indicate that other procedures are necessary.

If you have a clean message with the additional text **CLEAN_REQUIRED**, the drive will be unusable until a clean operation is performed. Load a cleaning cartridge to clear the condition.

If you have excessive clean messages, perform the following procedure:

1. If there has been a recent part replacement in the tape path or head guide assembly, go to “FRU Replaced Menu” on page 5-41 and select one of the functions to reset the drive statistical data.
2. Try another cleaning cartridge.
3. Replace the cleaning brush. See “FID D4: Head Cleaning Brush Assembly” on page 10-114.
4. Ensure that the new cleaning brush fully contacts the head surface and is not binding.
5. Remove the cleaning blade if one is present on the HGA. Refer to Figure 10-78 on page 10-113 for the location of the cleaning blade on the HGA. If a cleaner blade is present, use the procedure at “Cleaner Blade Removal (Model B11/B1A)” on page 10-112 to remove and discard it. When the cleaning blade has been removed, continue with the next step.
6. Check pneumatics for proper settings. See “Measurement and Adjustment of Pneumatic System” on page 10-4.
7. Run diagnostics on the drive. See “CE Verify Fix Menu” on page 5-39 for details.
8. If you are still getting excessive clean messages, replace the head guide and brush assembly. See “FID D0: Head Guide and Brush Assembly” on page 10-105.
9. If you are still getting excessive clean messages, replace the card pack. See “FID E4: Card Pack” on page 10-67.

Prepare Tape Drive for Service

1. Notify the customer the failing device must be varied offline as the power must be removed from the device.

   Proceed with the following steps after the device is offline.
2. Power OFF the failing device by using the power switch on the back of the device. See Figure 9-1 on page 9-7 for the location of power switch.

   Note: Do not use magnetized tools on this drive!
3. If the failing device is:
   - Front serviced ***with*** an ACF attached, Model B11/E11/H11 (Rack), go to step 4.
   - Rear serviced ***with*** an ACF attached, Model B11/E11/H11 (A14 Frame), go to step 9.
   - Rear serviced ***without*** an ACF attached, Model B1A/E1A/H1A (3494) go to step 14.

Front Serviced with ACF, Model B11/E11/H11 (Rack)

4. Remove the magazine from the failing device. See page 6-7.
5. Remove the ACF decorative cover. See page 9-29.
6. Pull the shelf, with the failing device, to the service position. See “Front Serviced with ACF, Model B11/E11/H11 (Rack)” on page 9-11.
7. Remove the cartridge, if present. See page 9-37.
8. Return to the removal/replacement procedure that sent you here.

Rear Serviced with ACF, Model B11/E11/H11 (A14 Frame)

9. Pull the failing device to the service position. See “Rear Serviced with ACF, Model B11/E11/H11 (A14 Frame)” on page 9-12.
10. Remove the magazine. See page 6-7.
11. Remove the cartridge, if present. See page 9-37.
12. Power OFF the failing device by using the power switch on the back of the device. See Figure 9-1 on page 9-7 for location of power switch.
13. Return to the removal/replacement procedure that sent you here.

Rear Serviced without ACF, Model B1A/E1A/H1A (3494)

14. Pull the failing device to the service position. See “Rear Serviced without ACF, Model B1A/E1A/H1A (3494 Library)” on page 9-13.
15. Remove the cartridge, if present. See page 9-37.
16. Power OFF the failing device by using the power switch on the back of the device. See Figure 9-1 on page 9-7 for location of power switch.
17. Return to the removal/replacement procedure that sent you here.

Powering Device ON and OFF

Attention: If the covers are removed, be careful of moving parts when power is turned ON.

Removing Subsystem Power During Normal Operations

To power OFF the subsystem during normal operations, perform the following steps:

1. If the device is not varied offline, have the customer vary it offline.

   Note: If 3590 drives are attached to a Model Axx Controller, you also need to vary the drive offline from Axx. Perform the procedure **Varying On/Off 3590 drives from A00, A50 or A60 Controller** in PROC section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information*.
2. If a cartridge is in tape drive, select **Unload Drive** from the operator Options menu.

3. Power OFF the subsystem by using the power switch at the back of the device.

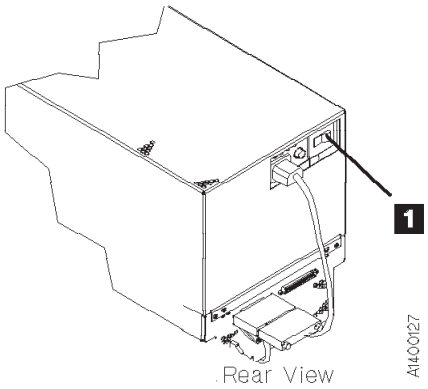


Figure 9-1. Subsystem Power Switch

Restoring Drive Power During Normal Operations

Restore power by setting the power switch to ON. Power-on self-test (POST) runs automatically.

Note: Wait approximately 5 seconds after you power OFF the 3590 before you power it ON again.

This POST takes approximately 2.5 minutes to complete. When the test is running, the panel indicates **Diags Running**. Communications with the interface are not acknowledged during the POST.

Attention: The device runs diagnostics, which takes approximately 2.5 minutes. Do not insert your hands in the ACF during this time, even if panel stops displaying *Diags Running* because the ACF transport may move up or down.

When the POST is complete, the customer can vary the device online.

If a failure occurs, a message is posted in operator/CE panel or the operator/CE panel will be blank. If either of these conditions exists, go to “Maintenance Starting Point” on page 1-2 and isolate failure.

End of Call

Note: After you power OFF the 3590, wait approximately 5 seconds before powering it ON again.

Verify Fix

1. Set the Power switch to the ON position.

   This power-on test takes approximately 2.5 minutes to complete and is automatically performed when the 3590 is powered ON.

   If a failure occurs, a message might be posted in the operator/CE panel or the operator/CE panel might be blank. If either of these conditions exist, go to “Maintenance Starting Point” on page 1-2 for further analysis.
2. Insert the cleaning cartridge in the priority cell to automatically clean the tape path.
3. If you replaced the card pack (FID E4):
   a. Ensure that the microcode was updated. See step 12 on page 10-72.
   b. Ensure that the customer options and drive options are correct. See “Set Customer Options” on page 8-35 and “Set Drive Options” on page 8-36.
4. If there has been a recent part replacement in the tape path or head guide assembly, go to “FRU Replaced Menu” on page 5-41 and select one of the menu functions to reset the drive statistical data.
5. Press the Change Mode pushbutton to place the device in CE mode.
6. Select **Verify Fix**.
7. From the Verify Fix menu, select **Test Drive** to verify the operation of the components on the deck and part of the ACF.
   - If the problem was intermittent, or if you want to test the drive more thoroughly, select **Loop Diag** from the Verify Fix menu.
   - If the problem was a RS-422 problem, perform “Library Manager Port Wrap Test” on page 9-111 and return here.
   - If the problem was a SCSI problem, perform “SCSI Ports Wrap Test” on page 9-106 or perform “Fibre Channel Ports Wrap Test” on page 9-112 and return here.

   Model B11/E11/H11 Only

   To test the ACF:
   a. Note the ACF mode, which is displayed on the operator panel the customer is using.
   b. Press the Change Mode pushbutton to place the device in CE mode.
   c. Select the Verify Fix menu, and select **Test ACF**.
   d. Lock the magazine when prompted, and press **Enter**.
   e. Insert a cartridge into the priority cell when prompted, and press **Enter**. (This test will cycle the cartridge to all empty cells in the magazine).
   f. Unlock magazine when prompted, and press **Enter**.
   g. Set the ACF mode to the customer’s preference.

   End of Model B11/E11/H11 Only
8. If you want to clear the device CE error log, perform the following:
   a. Press the Change Mode pushbutton to place the device in CE mode.
   b. Select **Error Log** option from the CE Options menu.
   c. Select **Clear Error Log** option from the CE Error Log menu to clear the error log.
   d. Select **Cancel** to return to the CE Options menu.

9. If the display indicates *Offline*, perform “Setting Device Online” on page 9-10.
10. If this was a **3590 Model C12/C14** drive problem, go to procedure “Return the Drive to the Operating Position” in the PROC section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information*.
11. If this was a **Desk Side Model B11/E11/H11** problem where the desk side sleeve is the **‘old style’** cover **without** the removable sleeve top cover, go to “Return Model B11/E11/H11 Drive to Desk Side Sleeve” on page 9-16.
    - If this was a **Desk Side Model B11/E11/H11** problem where the desk side sleeve **has** the removable sleeve top cover, go to “Reinstall Sleeve Top Cover to Desk Side Sleeve” on page 9-21.
    - If this was a **Desk Side Model B1A/E1A** problem where the desk side sleeve is the **‘old style’** cover **without** the removable sleeve top cover, go to “Return Model B1A/E1A Drive to Desk Side Sleeve” on page 9-19.
    - If this was a **Desk Side Model B1A/E1A/H1A** problem where the desk side sleeve **has** the removable sleeve top cover, go to “Reinstall Sleeve Top Cover to Desk Side Sleeve” on page 9-21.
12. If the problem involved the SCSI bus, fibre channel, or hang conditions, perform one of the following procedures, depending on your application:
    - “Checking Channel Attachment – iSeries (OS/400)” on page 9-89
    - “Checking Channel Attachment – AIX” on page 9-91
    - “Checking Channel Attachment – Sun” on page 9-99
    - “Checking Channel Attachment – HP-UX” on page 9-102
    - “Checking Channel Attachment – Linux” on page 9-97
    - “Checking Channel Attachment – Windows NT or Windows 2000” on page 9-103
13. If the 3590 drives are attached to a Model Axx Control Unit, you need to close the SIMs at the control unit. Refer to the PROC section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information*.
14. If the 3590 drives are attached to a Model Axx Control Unit, you need to vary the drive online from the Axx. Perform the procedure **Varying On/Off 3590 drives from the A00, A50 or A60 Controller** in the PROC section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information*.

Setting Device Online

__ 1. From the operator Options menu, select **Services**.
__ 2. From the Services menu, select **Set Online**.
__ 3. From the Set Online menu, select **Port 0** and/or **Port 1** to set the interfaces online, depending on the customer's choice.
__ 4. Select **Cancel** twice to return to the Options menu.

Note: If 3590 drives are attached to a Model Axx Controller, you also need to vary drive online from the Axx. Perform procedure **Varying On/Off 3590 drives from A00, A50 or A60 Controller** in PROC section of *IBM TotalStorage Enterprise Tape System 3590 Model Axx Controller Maintenance Information*.

__ 5. Notify the customer that the device can now be varied (made) online.

3494 Only

If this drive is in a 3494 library, go to the DIAG section in *IBM 3494 Tape Library Dataserver Maintenance Information* to make the drive available.

End of 3494 Only

Call Reporting

Report the FID (example: FID1−E4) in the *COMMENT* field.

Report the twelve hex characters of support data in the *FAULT SYMPTOM CODE (FSC)* field.

— or —

Report the first twelve characters of the Supplemental Message data (for example: Move Error, Load Error) in the *FAULT SYMPTOM CODE (FSC)* field.

Charge the time and parts to 3590 Drive.

Service Position

Front Serviced with ACF, Model B11/E11/H11 (Rack)

See Figure 9-2.

Pull Device to Service Position

Attention: Ensure that the rack stabilizer is installed.

1. If you have not already done so, ensure that the device is varied offline at the host. Remove the ACF decorative cover. See page 9-29.
2. Press the shelf release latch **1**, and pull the shelf far enough so the shelf is latched in the service position **2**.
3. See “Operator/CE Panel Service Position” on page 9-25 to put the operator/CE panel in the service position.
4. Return to the procedure that sent you here.

Return Device Drawer to Operating Position

1. Return the operator/CE panel to the operating position.
2. Press the shelf release latch, and push the shelf to the operating position. Ensure that the latch is engaged.
3. Return to the procedure that sent you here.

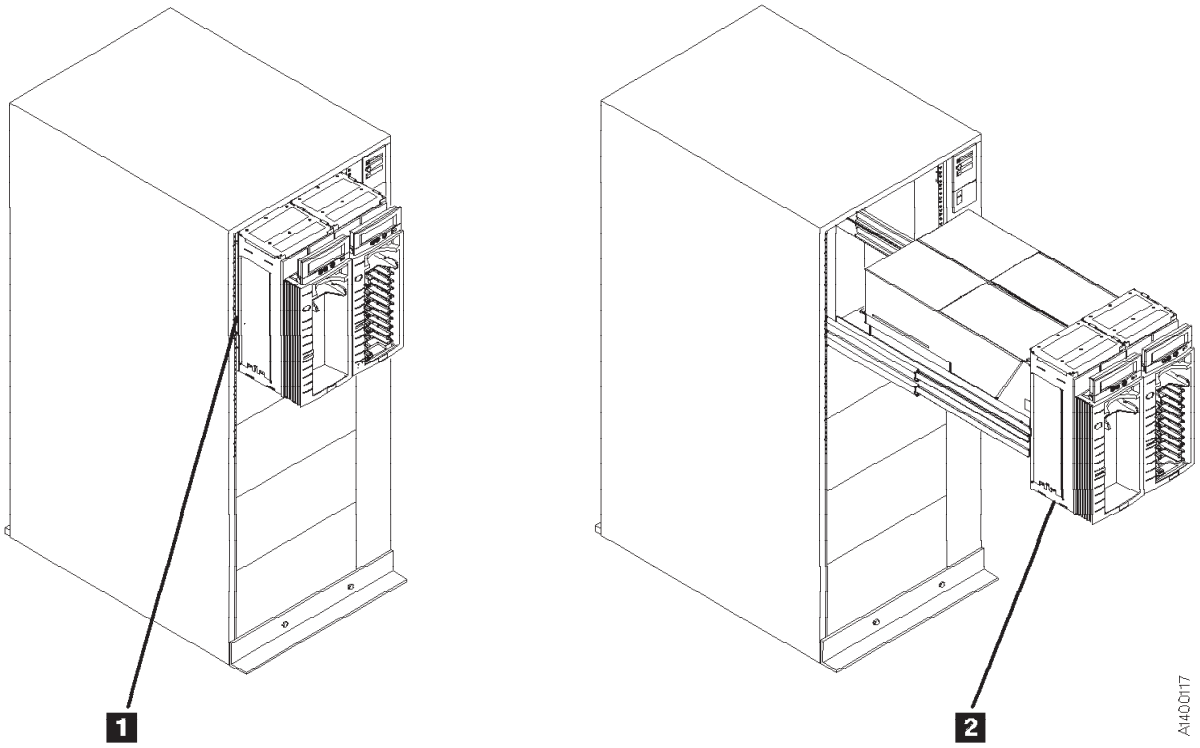


Figure 9-2. Front Serviced with ACF, Model B11/E11/H11 (Rack)

Rear Serviced with ACF, Model B11/E11/H11 (A14 Frame)

See Figure 9-3.

Pull Device to Service Position

1. If you have not already done so, ensure that the device is varied offline at the host.
2. If the device is in a library, make the device unavailable at the library manager.
3. Open the rear door of the frame with the failing device.
4. Remove the two slide locking screws **1** from the failing device slides.
5. There are two latches on the slides:
   a. Press the latches on the large slides **2**, and pull the failing device to the rear until it stops.
   b. Press the latches on the inner slides **3**, and pull the device out until it latches in the service position **4**.
   c. See “Operator/CE Panel Service Position” on page 9-25 to put the panel in the service position.
6. Return to the procedure that sent you here.

Return Device to Operating Position

1. Return the operator/CE panel to the operating position.
2. When returning the device to the operating position:
   a. Press the latches on the inner slides and push the device toward the operating position until it stops.
   b. Press the latches on the large slides and push the device to the operating position.
3. Reinstall the two slide locking screws into the slides.
4. Return to the procedure that sent you here.

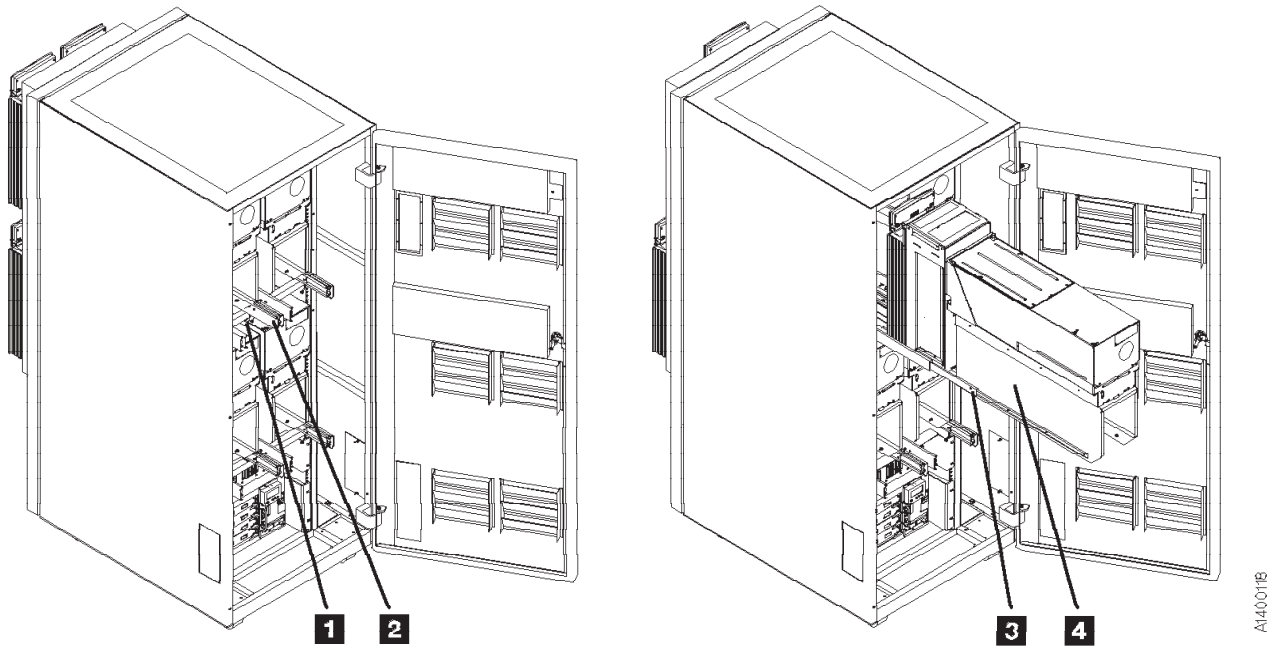


Figure 9-3. Rear Serviced with ACF, Model B11/E11/H11 (A14 Frame)

Rear Serviced without ACF, Model B1A/E1A/H1A (3494 Library)

See Figure 9-4.

Pull Device to Service Position

1. If not already done, ensure that the device is varied offline at the host.
2. If the device is in a library, make the device unavailable at the library manager.
3. Open the rear door of the frame.
4. Remove the two slide locking screws **2** .
5. Press the slide latches **1** and pull the device to the rear until it **is locked** in the service position **3** .
6. See “Operator/CE Panel Service Position” on page 9-25 to put the panel in the service position.
7. Return to the procedure that sent you here.

Return Device to Operating Position

1. Return the operator/CE panel to the operating position.
2. Press the slide latches and push the device to the operating position.
3. Reinstall the two slide locking screws **2** into the slides.
4. Return to the procedure that sent you here.

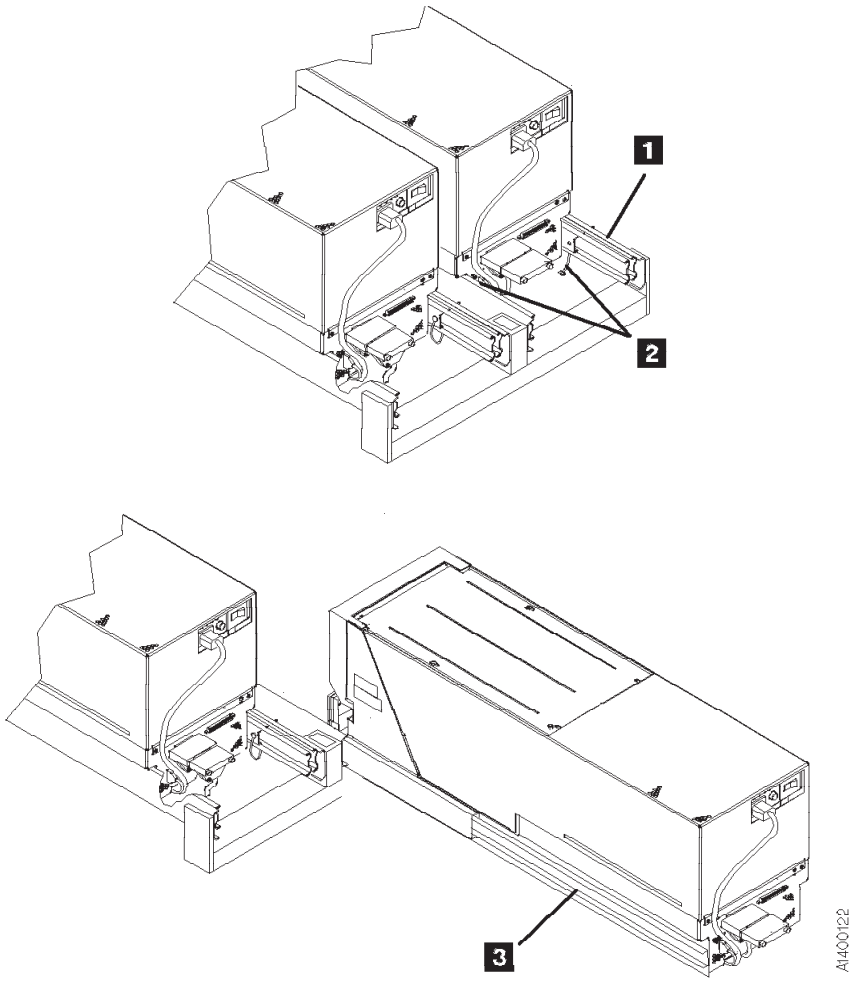


Figure 9-4. Rear Serviced without ACF - Model B1A/E1A/H1A (3494)

Prepare Model B11/B1A, E11/E1A, or H11/H1A in Desk Side Sleeve for Service

1. Notify the customer that the failing device must be **varied offline**, as the power must be removed from the device.

   After the device is offline, proceed with the following steps.
2. Power OFF the failing device by using the power switch on the back of the drive enclosure. See **8** in Figure 9-6 on page 9-16 for location of the power switch.

   Note: Do not use magnetized tools on this drive!
3. Remove the power cord from the 3590 drive.
   - For service on **Model B11/E11/H11** in the **"older style"** desk side cover **without the removable top**, go to "Prepare Model B11/E11 in Desk Side Cover for Service (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)".
   - For service on **Model B1A/E1A/H1A** in the **"older style"** desk side cover **without the removable top**, go to "Prepare Model B1A/E1A in Desk Side Cover for Service (RPQ 8B3190)" on page 9-18.
   - For service on **Model B11/E11/H11** in the **newer** desk side sleeve **with removable sleeve top cover**, go to "Prepare Model B11/E11 in Desk Side Sleeve (Removable Top Cover) for Service (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)" on page 9-20.
   - For service on **Model B1A/E1A/H1A** in the **newer** desk side sleeve **with removable sleeve top cover**, go to "Prepare Model B1A/E1A in Desk Side Sleeve (Removable Top Cover) for Service (RPQ 8B3190)" on page 9-22.

Prepare Model B11/E11 in Desk Side Cover for Service (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)

Notes:

1. This notice is translated into selected languages. See **C1** in Chapter 7, "Inspection" on page 7-1.
2. This procedure must be used if the drive is in the "old style" desk side sleeve **without the removable sleeve top cover**.

CAUTION:
The 3590 Model B11/E11/H11 with the ACF weighs 40.5 kilograms (89 pounds), so remove the ACF before lifting the 3590 drive. The 3590 Model B11/E11/H11 (without the ACF) weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit!

__ 1. Remove the SCSI cable connectors from the back of the drive. **Do not** separate the terminator or the daisy-chained cable connector from the SCSI cable connector. Remove these connectors still plugged together.
__ 2. If a FID or ATTN message is available for the failure, go to "FID Entry Point" on page 1-8 to determine if it is an ACF failure. Then decide if removal of the ACF and drive from the desk side cover is warranted. If the ACF can be serviced while attached to the sleeve, remove the ACF cover **6** in Figure 9-6 on page 9-16 from the ACF and skip to step 11 on page 9-15. **Otherwise**, continue with the next step.
__ 3. Refer to Figure 9-6 on page 9-16. Remove the eight screws **5** and eight washers **12** from the desk side cover 1, four screws and washers from each side of the sleeve to allow removal of the drive for service.
__ 4. Remove the ACF cover **6** from the ACF.
__ 5. Pull the drive forward slightly in the sleeve to allow removal of the ACF.
__ 6. Go to "Automatic Cartridge Facility (ACF)" on page 9-33 and start at step 4 to remove the ACF. After completing the procedure, return here. Place the removed ACF on a suitable work surface, where the drive also will be placed for service.

Note: You may need assistance holding the drive enclosure in place on the work surface while mounting the ACF to the front of the drive.

Note: See Figure 9-5 for safe placement of the drive and ACF, when the ACF is reattached to the drive for servicing the device. Ensure the drive **2** is placed on the work surface **1** **to avoid the risk of tipping forward or falling off the work surface** **3** due to the added weight of the ACF.

Do **not** mount the ACF on the drive if the front of the drive protrudes by **more than 38 mm (1.5 in.)** **4** over the edge of the work surface.

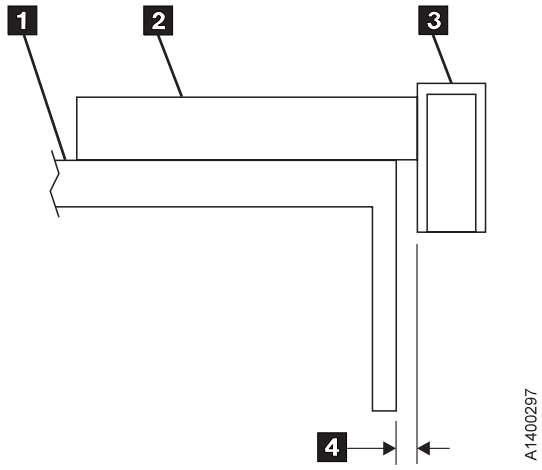


Figure 9-5. Side View of Model B11/E11/H11 Drive and ACF on Workbench

__ 7. Refer to Figure 9-6 on page 9-16.
__ 8. **With assistance**, pull the drive out of the desk side sleeve **1** and lift it up to a suitable work surface.
__ 9. Ensure that the loader door moves freely.
__ 10. Go to step 3 on page 8-19 to install the ACF. Return here after completing the procedure. Remember to **not** exceed the maximum dimension of 38 mm (1.5 in.) **4**, as shown in Figure 9-5.
__ 11. If a FID or ATTN message is available for the problem, go to “FID Entry Point” on page 1-8.
__ 12. If a FID is not available, return to Table 1-1 on page 1-2 to find the cause of the B11 failure.

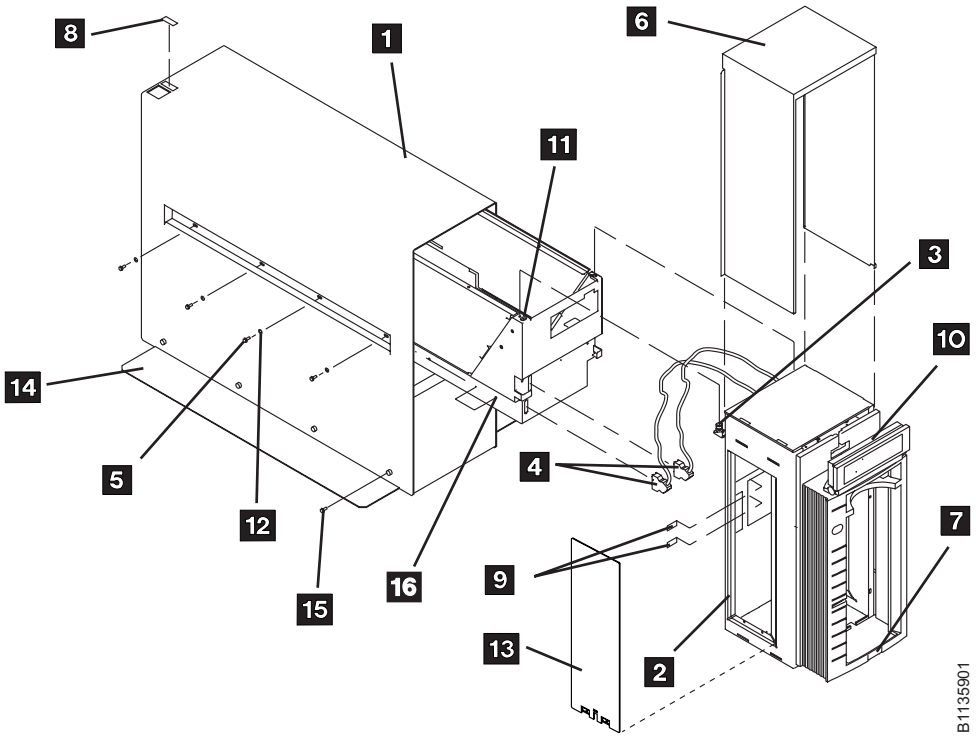


Figure 9-6. Desk Side Cover Installation for Model B11/E11 (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)

Return Model B11/E11/H11 Drive to Desk Side Sleeve

__ 1. If the drive and ACF were not removed from the desk side sleeve, skip to step 11 on page 9-17. **Otherwise**, continue to the next step.

__ 2. Go to “Automatic Cartridge Facility (ACF)” on page 9-33, and start at step 4 on page 9-33 to remove the ACF from the drive. After completing the procedure, return here.

__ 3. Refer to Figure 9-6. With assistance, lift the 3590 drive (without the ACF attached), from the work surface and slide it into the front of the sleeve **1** .

Notes:

a. The rear of the sleeve is indicated by the label and opening **8** on top of the cover for the drive’s power ON/OFF switch.

b. When sliding the 3590 drive into the desk side cover, ensure you **push the drive into the sleeve far enough to keep the desk side cover from tipping forward!**

__ 4. Leave the front of the drive protruding just enough to allow inserting a screw **16** P/N 1621371, into the right or left screw hole **on the drive enclosure** closest to the front of the drive. Only turn the screw two or three revolutions, just enough to assure the screw is seated solidly.

__ 5. Now continue to push the drive into the sleeve until the protruding screw stops further movement. The drive is now in position for installation of the ACF.

__ 6. Check the loader door moves freely.

__ 7. Go to step 3 on page 8-19 to install the ACF. Complete the procedure and return here.

__ 8. With the ACF installed, pull the drive forward **carefully** until you have access to the screw, previously inserted to stop movement of the drive within the sleeve. Remove the screw and save it with the other seven screws.

__ 9. Push the device back into sleeve until the ACF is flush to the sleeve.

__ 10. Install the eight screws **5** and eight washers **12** to bolt the drive to the desk side cover. Snug the screws to secure the drive.

__ 11. Place the ACF cover **6** over the ACF.
__ 12. Reinstall the SCSI cable connectors to the correct port.
__ 13. Reconnect the power cord to the drive power connector.
__ 14. Return to the procedure that sent you here.

Prepare Model B1A/E1A in Desk Side Cover for Service (RPQ 8B3190)

CAUTION:
The 3590 Model B1A/E1A weighs 28.6 kilograms (63 pounds); it takes two persons to safely lift this unit.

Notes:

1. This caution notice is translated into selected languages. See **C2** in Chapter 7, “Inspection” on page 7-1.
2. This procedure must be used if the B1A drive is in the “old style” desk side sleeve **without the removable sleeve top cover.**

See Figure 9-7 for removal of the B1A drive from the desk side sleeve **1** .

__ 1. Remove the SCSI cable connectors from the back of the drive. **Do not** separate the terminator or the daisy-chained cable connector from the SCSI cable connector. Remove these connectors still plugged together.

__ 2. Remove the eight screws **10** and washers **10** , four screws and washers from each side of the sleeve to allow removal of the drive for service.

Note: When sliding the 3590 drive out of the desk side cover, be sure to provide enough support to the front of the drive to keep the desk side cover from tipping forward!

__ 3. **With assistance**, lift the B1A drive (with front cover **3**) out of the desk side sleeve **1** and place it on a suitable work surface. **Ensure the drive is positioned safely on the work surface** to avoid any danger of tipping off the workbench.

__ 4. If a FID is available for the problem, go to “FID Entry Point” on page 1-8.

__ 5. If a FID is not available, return to Table 1-1 on page 1-2 to find the reason of the B1A failure.

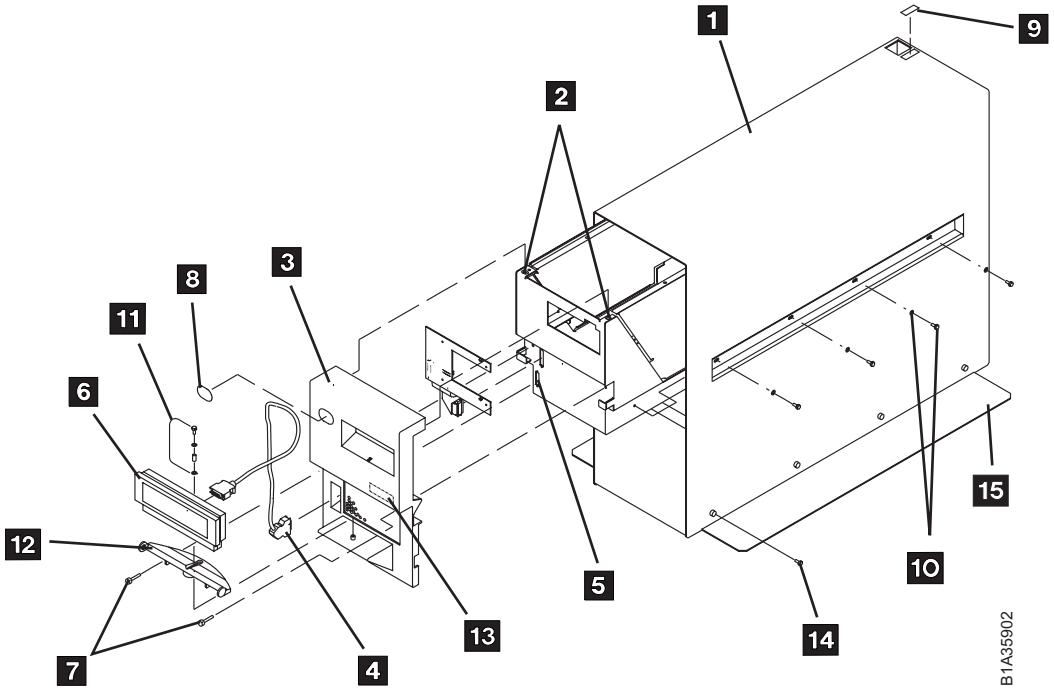


Figure 9-7. Desk Side Cover Installation for Model B1A/E1A, RPQ 8B3190

Return Model B1A/E1A Drive to Desk Side Sleeve

See Figure 9-7 on page 9-18 for this procedure to reinstall the drive in the desk side cover.

__ 1. **With assistance** pick up the drive (with attached front cover) from the test/work area and slide the drive into the sleeve **1** . Slide the rear of the device to the rear of the desk side sleeve **1** . The rear of the sleeve is indicated by the label and opening **9** for the drive's power ON/OFF switch.

Note: When sliding the 3590 drive into the desk side cover, be sure to **push the drive into the sleeve far enough to keep the desk side cover from tipping forward!**

__ 2. Push the device into the sleeve until the front cover 3 is flush to the sleeve.

__ 3. Install the eight screws **10** and washers **10** , four screws and washers on each side of the sleeve to bolt the drive to the desk side cover. Snug the screws to secure the drive in the cover.

__ 4. Reconnect the SCSI cable plugs to the correct SCSI port connectors.

__ 5. Reconnect the power cable to the drive power connector.

__ 6. Return to the procedure that sent you here.

Prepare Model B11/E11 in Desk Side Sleeve (Removable Top Cover) for Service (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)

Note: Use this procedure if the drive is in the **"new style"** desk side sleeve **with the removable sleeve top cover.**

See Figure 9-8 for removal of the sleeve top cover **1** from the desk side lower sleeve.

__ 1. Remove the eight screws **19**, P/N 05H2734, four screws from each side of the desk side sleeve top cover to allow removal of the sleeve top cover.

__ 2. Remove the sleeve top cover **1** to allow service on the Model B11/E11/H11 drive.

__ 3. **If necessary**, remove the SCSI cable connectors from the back of the drive. **Do not** separate the terminator or the daisy-chained cable connector from the SCSI cable connector. Remove these connectors still plugged together.

__ 4. If a FID is available for the problem, go to "FID Entry Point" on page 1-8.

__ 5. If a FID is not available, return to Table 1-1 on page 1-2 to find the reason for the failure.

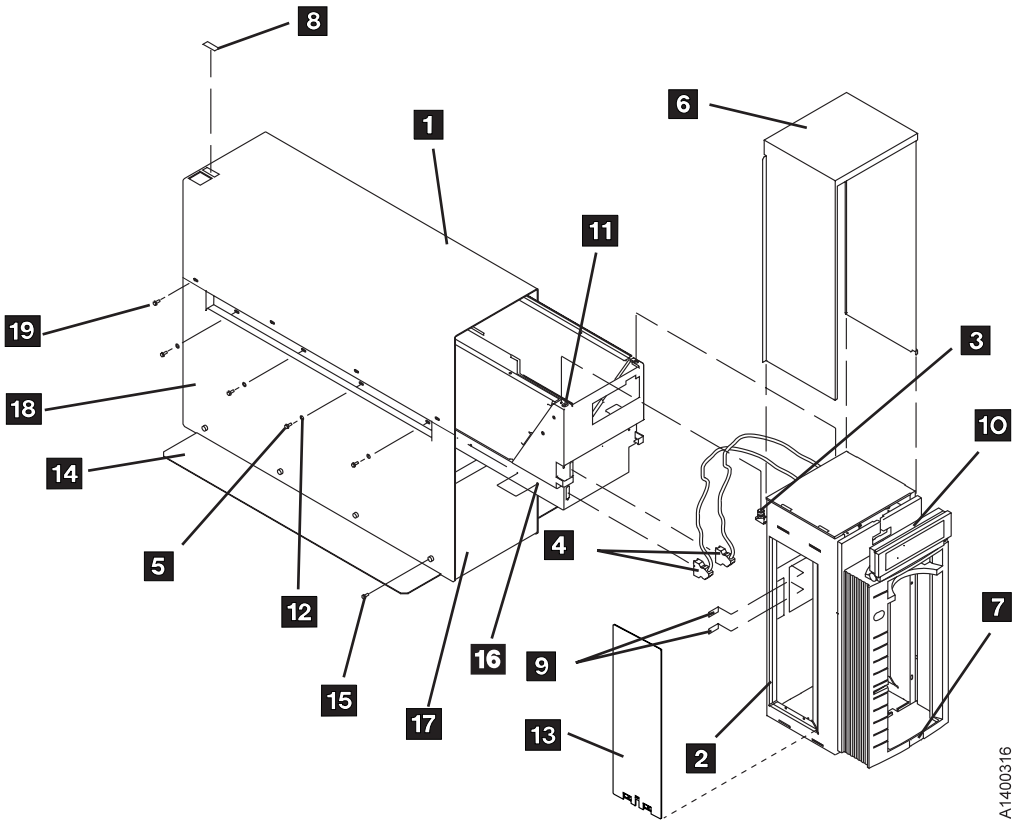


Figure 9-8. Desk Side Sleeve Configuration for Model B11/E11 (RPQ 8B3191), or Model B11/E11/H11 (FC 2200)

Reinstall Sleeve Top Cover to Desk Side Sleeve

See Figure 9-8 on page 9-20 to reinstall the sleeve top cover over the B11 drive in the desk side sleeve.

__ 1. Place the desk side sleeve top cover **1** , P/N 05H8347, over the mounted drive (enclosure) and on top of the lower sleeve **18** , P/N 05H8348. A ridge in the sides of the top cover allows the top cover to rest on top of the lower sleeve with the lip of the top cover on the outside of the lower sleeve sides.

__ 2. Reinstall the eight screws **19** , P/N 05H2734, four screws on each side of the sleeve top cover. Snug the screws to secure the sleeve top cover to the lower sleeve.

Note: The rear of the sleeve top cover is indicated by the label and opening **8** for the drive's power ON/OFF switch.

__ 3. Reconnect the SCSI cable plugs to the correct SCSI port connectors.

__ 4. Reconnect the power cable to the drive power connector.

__ 5. Return to the procedure that sent you here.

Prepare Model B1A/E1A in Desk Side Sleeve (Removable Top Cover) for Service (RPQ 8B3190)

Note: Use this procedure if the drive is in the **"new style"** desk side sleeve **with the removable sleeve top cover.**

See Figure 9-9 for removal of the sleeve top cover **1** from the desk side lower sleeve.

__ 1. Remove the eight screws **18** , P/N 05H2734, four screws from each side of the desk side sleeve top cover to allow removal of the sleeve top cover.

__ 2. Remove the sleeve top cover **1** to allow service on the Model B1A/E1A drive.

__ 3. **If necessary**, remove the SCSI cable connectors from the back of the drive. **Do not** separate the terminator or the daisy-chained cable connector from the SCSI cable connector. Remove these connectors still plugged together.

__ 4. If a FID is available for the problem, go to "FID Entry Point" on page 1-8.

__ 5. If a FID is not available, return to Table 1-1 on page 1-2 to find the reason of the B1A failure.

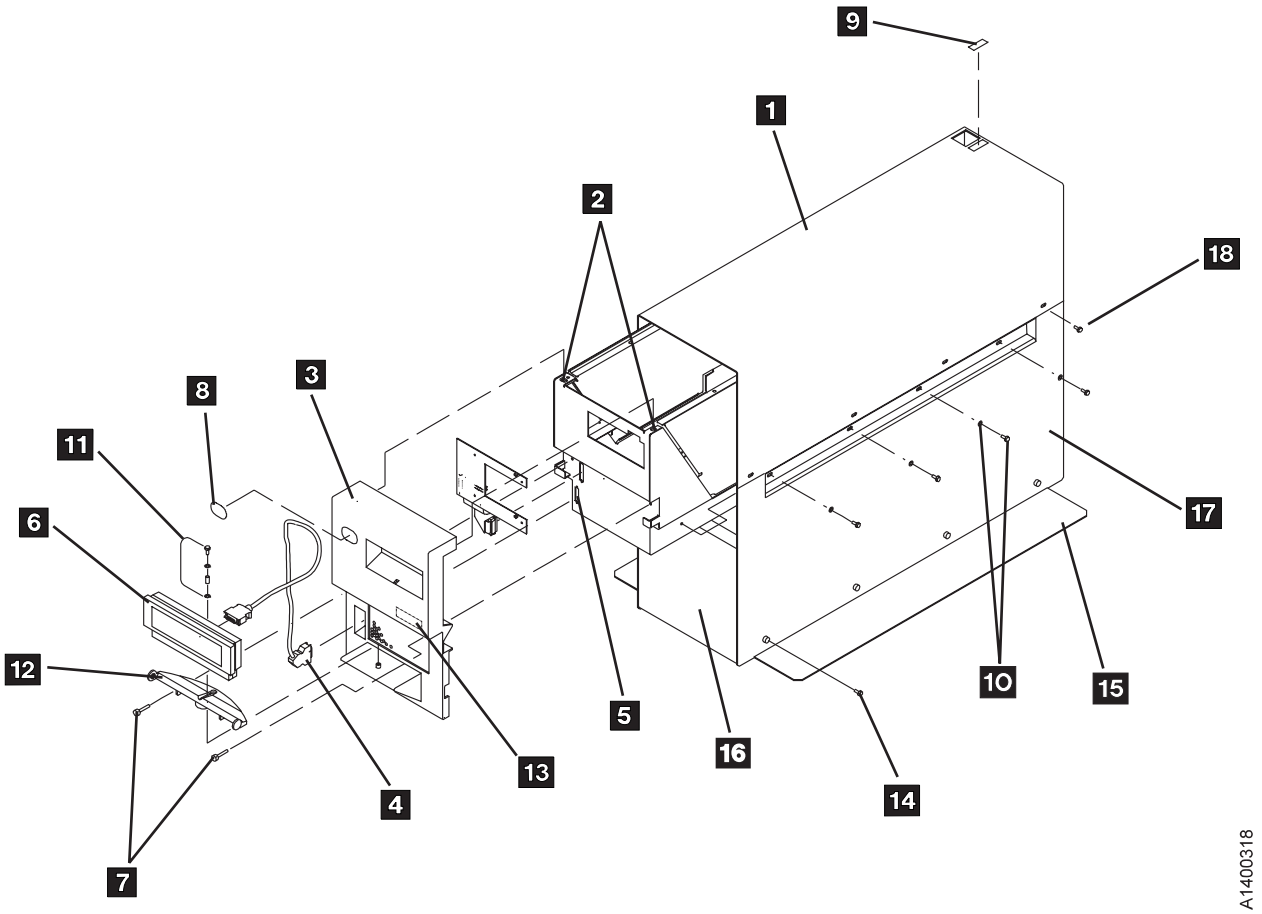


Figure 9-9. Desk Side Sleeve Configuration for Model B1A/E1A, RPQ 8B3190

Reinstall Sleeve Top Cover to Desk Side Sleeve

See Figure 9-9 on page 9-22 to reinstall the sleeve top cover over the drive in the desk side sleeve.

__ 1. Place the desk side sleeve top cover **1** , P/N 05H8347, over the mounted drive (enclosure) and on top of the lower sleeve **17** , P/N 05H8348. A ridge in the sides of the top cover allows the top cover to rest on top of the lower sleeve with the lip of the top cover on the outside of the lower sleeve sides.

__ 2. Reinstall the eight screws **18** , P/N 05H2734, four screws on each side of the sleeve top cover. Snug the screws to secure the sleeve top cover to the lower sleeve.

Note: The rear of the sleeve top cover is indicated by the label and opening **9** for the drive's power ON/OFF switch.

__ 3. Reconnect the SCSI cable plugs to the correct SCSI port connectors.

__ 4. Reconnect the power cable to the drive power connector

__ 5. Return to the procedure that sent you here.

Working with Electrostatic Discharge (ESD) Sensitive Parts

See Figure 9-10 on page 9-24. When wearing the ESD grounding wrist band **1** , ensure that the ground clip **4** remains connected. Failure to do this creates a safety exposure, the same as wearing jewelry while working on live exposed electrical circuits.

Use the most current IBM part number available when ordering a field ESD kit. In addition to the mat, the kit P/N 93F2649 contains the following components in a reclosable static-shielding bag:

- Adjustable wrist band P/N 6405959 **1**
- Wrist band cord P/N 74F9658 **2**
- Mat cord P/N 93F2652 **3**
- Large ground clip P/N 93F2654 **4**
- Cord extension P/N 93F2653 **5**

All of the logic cards and sensors in the ACF and the drive are ESD-sensitive parts in the 3590.

To prevent damage when working with ESD-sensitive parts, observe the following instructions, and the instructions printed on the ESD mat. The following instructions are in addition to all the usual precautions:

- Switch OFF power to the 3590 (see "Powering Device ON and OFF" on page 9-6).
- Put on the ESD grounding wrist strap **1** before touching the ESD-sensitive part. This strap has a high resistance (1 megohm) resistor in series with the grounding clip **4** . Use of the ESD grounding wrist strap is not dangerous to you. It discharges the static electricity from your body. Connect the clip to the flex ground strap of the gate to the frame. Keep the strap on while you are inserting or removing a logic card or handling any ESD-sensitive part.
- Keep ESD-sensitive parts in their special ESD shipping bag until ready for installation.
- Do not place ESD-sensitive parts on any machine cover or on a metal table. If you need to put down the ESD-sensitive part for any reason, place it inside its protective shipping bag or on the ESD grounded mat provided in the ESD kit. (Large metal objects can be discharge paths without being grounded.)
- Prevent ESD-sensitive parts from being touched by other personnel.
- Reinstall all covers when not working on the machine.
- Be extra careful when handling ESD-sensitive parts during a period of cold-weather, building heating. Heating of cold air lowers the relative humidity, which increases the static electricity.

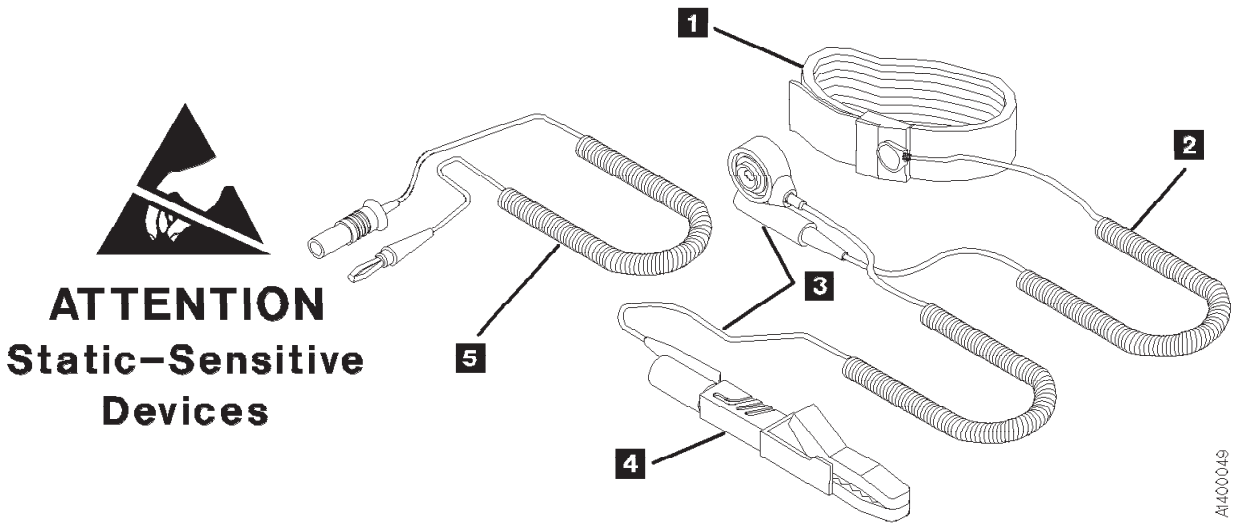


Figure 9-10. Static-Sensitive Device Attention Symbol and Grounding Wrist Strap

Operator/CE Panel Service Position

The operator/CE panel can be removed completely, tilted, or relocated for viewing from a different angle.

Model B11/E11/H11 Only

See Figure 9-11.

To Remove Completely

1. Press the two buttons **2** on the rear of the panel and lift the panel out of its holder **6**.
2. Disconnect the connector from the rear of the panel **4**.
3. Return to the procedure that sent you here.

To Relocate

1. With the ACF decorative cover removed, open the ACF top cover **1**. See “ACF Top Cover” on page 9-31.
2. Press the two buttons **2** on the rear of the panel and lift the panel out of its holder **6**.
3. Continue lifting the panel until its cable is out of the slot **5** in the back of the bezel.
4. The two hooks **3** on the back of the operator/CE panel can be used to hold the panel in a convenient location for viewing **4**.

   Note: Be careful to not pinch the cables when you lower the top cover.
5. Return to the procedure that sent you here.

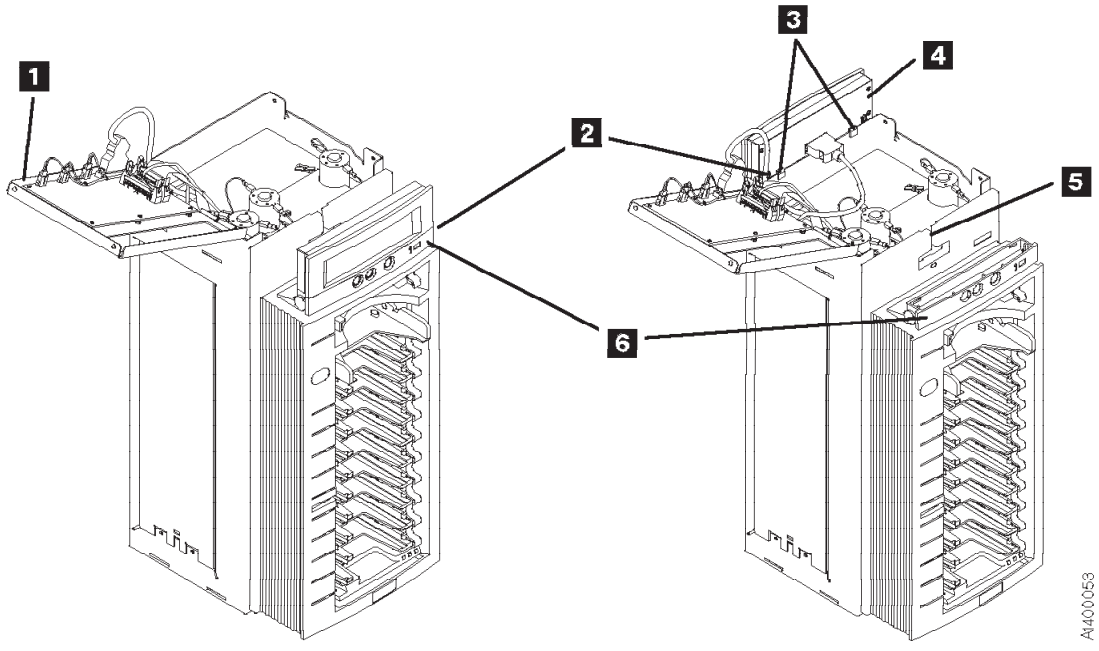


Figure 9-11. Operator/CE Panel (Model B11/E11/H11)

End of Model B11/E11/H11 Only

Model B1A/E1A/H1A Only

See Figure 9-12.

To Remove Completely

1. Press the two buttons **3** on the rear of the panel and lift the panel out of its holder **4**.
2. Disconnect the connector from the rear of the panel **2**.
3. Return to the procedure that sent you here.

To Relocate

1. Press the two buttons **3** on the rear of the panel and lift the panel out of its holder **4**.
2. Place the panel on a flat surface or use the two hooks **1** on the back of the operator/CE panel to hold the panel in a convenient location for viewing.
3. Return to the procedure that sent you here.

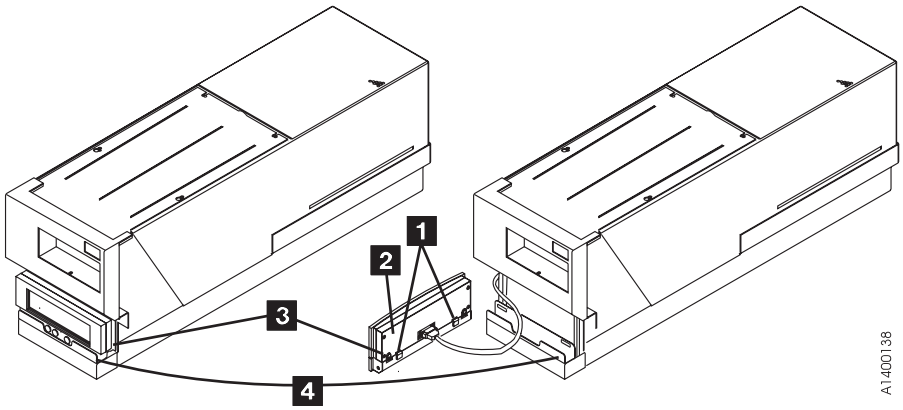


Figure 9-12. Operator/CE Panel (Model B1A/E1A/H1A)

End of Model B1A/E1A/H1A Only

Covers

Deck Enclosure Covers

See Figure 9-13 on page 9-28 and Figure 9-14 on page 9-28.

Removing Deck Enclosure Top Cover

1. Loosen and remove the four top screws **2** .
2. Lift off the top cover **1** .
3. Return to the procedure that sent you here.

Removing Deck Enclosure Back Cover

1. Disconnect the power cord at its source and then at the back of the 3590.
2. Remove the two screws **4** that secure the back cover **3** .
3. Slide the cover toward the rear of the drive to disengage the two hooks **5** and lift off the back cover.
4. Return to the procedure that sent you here.

Removing Deck Enclosure Pneumatic Access Cover

1. Remove screw **11** .
2. Remove the pneumatic access cover **10** .
3. Return to the procedure that sent you here.

Removing Deck Enclosure Back Plate

1. Remove the SCSI or fibre channel cables from the ports.
   - SCSI – Be careful that you do NOT separate the cables that are chain-connected or terminated.
   - Fibre – Use the rubber dust cover/plug to protect the connectors after the back plate has been removed.
2. If the device is in a library, remove the library manager RS-422 cable.

   Attention: If the connector mounting studs in the next step are captivated, remove the back plate retainers before you remove the mounting studs.

   Note: On newer devices, the connector mounting studs do not need to be removed from the back plate.
3. On the early level back plates, remove the connector mounting studs (two each on the SCSI connectors **7** and two on the library manager connector **8**).
4. Remove the back plate **6** by prying upward from the lip on the enclosure bottom with a screwdriver. Then lift out the back plate.

   Note: Removal of the back plate may be easier if you first loosen or remove the card pack mounting screw. (Be sure to reinstall and tighten it when you are through.)
5. Return to the procedure that sent you here.

Replacing Deck Enclosure Covers

1. Perform the removal procedure in the reverse order, then return here.

   Note: If you have removed the deck enclosure back covers from two 3590s, ensure you replace the back cover on the 3590 from which it was removed so that the serial number **9** on the right side of the device is the same as the serial number on the back cover **3** .
2. Return to the procedure that sent you here.

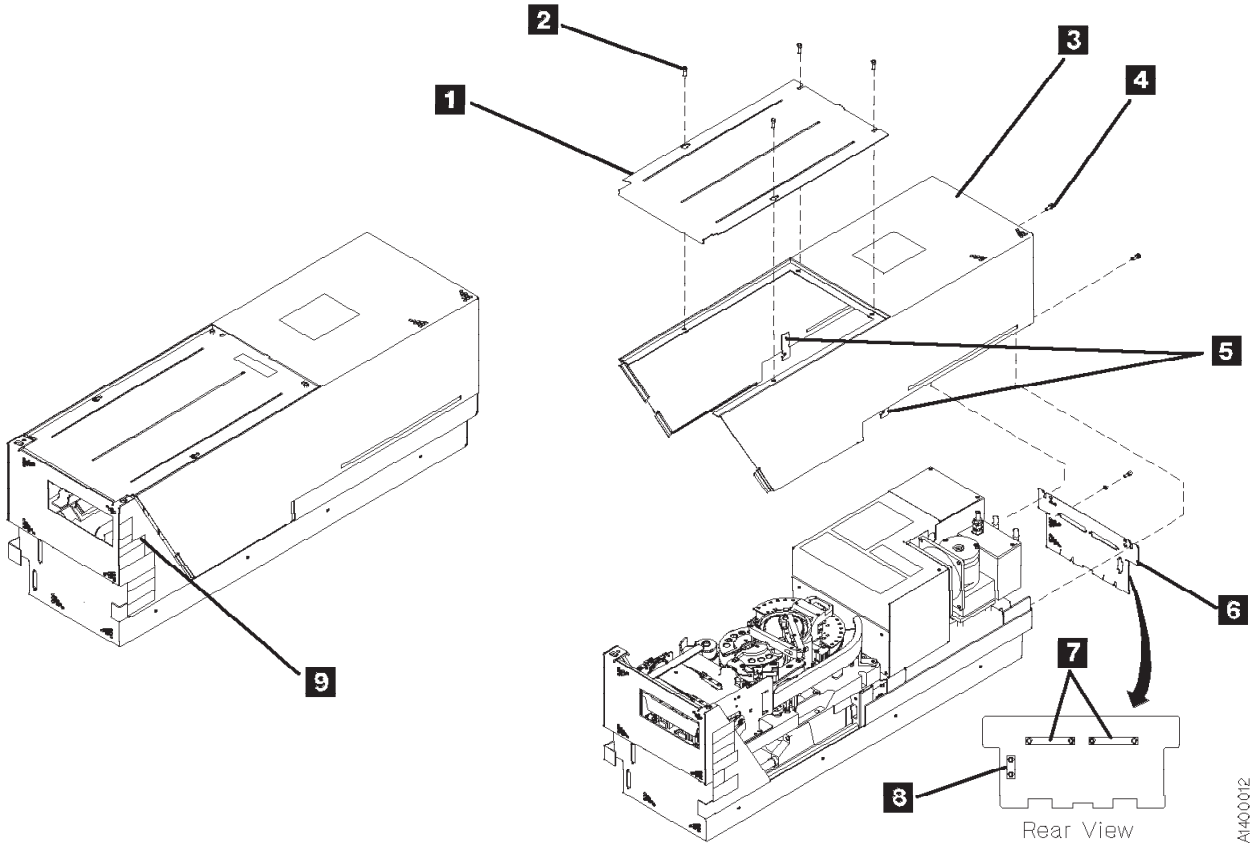


Figure 9-13. Deck Enclosure Covers

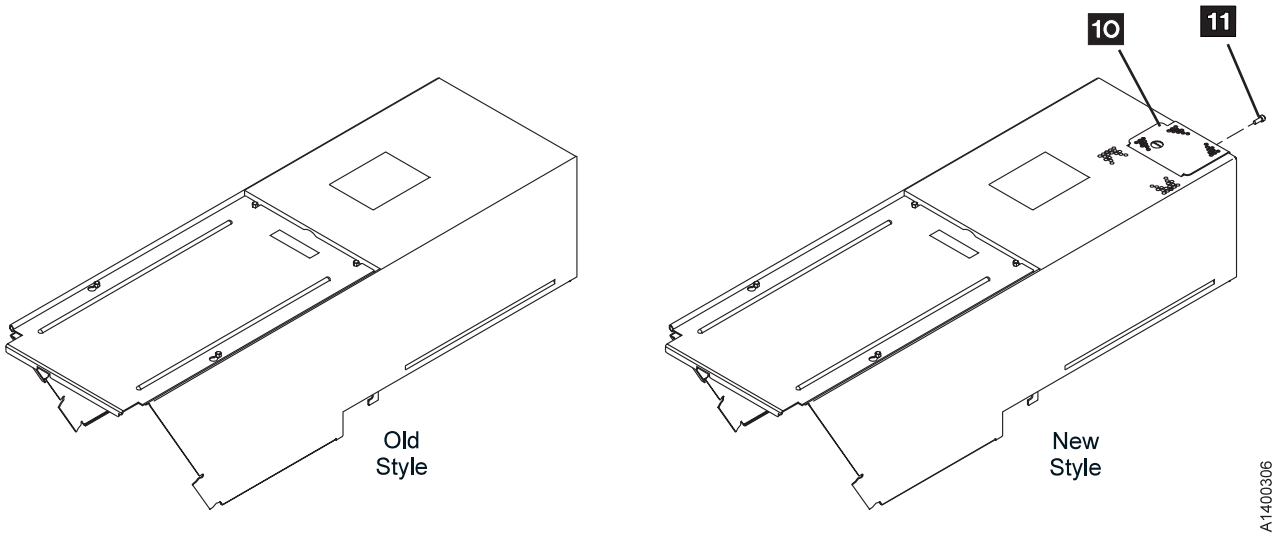


Figure 9-14. Deck Enclosure Back Covers

ACF Decorative Cover (Rack Mount Only)

See Figure 9-15.

Removal and Replacement Procedures

Removing ACF Decorative Cover:

1. To lower the height of the display, slide the operator/CE panel assembly forward as far as it will go **1**, then rotate the display down as far as it will go **2**.

   Note: If there are two drives side-by-side, both operator/CE panels must be pulled forward and rotated down.

2. The ACF decorative cover **4** is held to the rack frame with mounting studs **3**

   Grasp the ACF cover and pull it away from the frame and over the bezel. Use care not to loosen the operator/CE panel connector when removing the cover.

3. Return to the procedure that sent you here.

Replacing ACF Decorative Cover: Perform the removal procedure in the reverse order, then return to the procedure that sent you here.

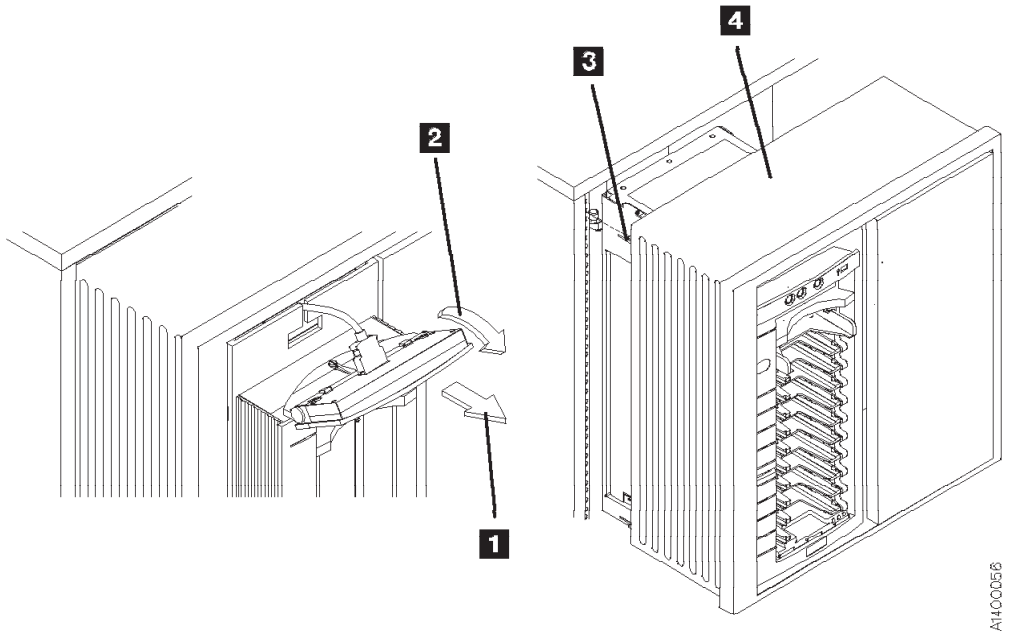


Figure 9-15. ACF Decorative Cover (Rack Mount Only)

ACF Side Covers

See Figure 9-16.

Removal and Replacement Procedures

Removing Side Covers:

Note: On machines that have the improved transport ribbon cable, the cable that **has no "Z" shape**: Use caution when removing the side covers as the transport ribbon cable will be attached to the inside of one of the side plates. See "Replace Transport Cable" on page 10-31 and "Replace Transport Cable" on page 10-33 for old and new style cables.

1. Remove the two screws **3** from the side cover **1** .
2. Insert a screwdriver in the hole **2** at the bottom of the side cover.

   Attention: In the next step, hold the cover as you disengage the tabs because the cover can fall and cause damage.
3. Lift the side panel up to disengage the tabs from the frame and pull the panel out at the bottom.

   Note: If the transport ribbon cable is attached to the inside of the side cover (newer systems), open the cable retainers to release the cables from the side cover.
4. Return to the procedure that sent you here.

Replacing Side Covers:

1. Perform the removal procedure in the reverse order, then return here.
2. Return to the procedure that sent you here.

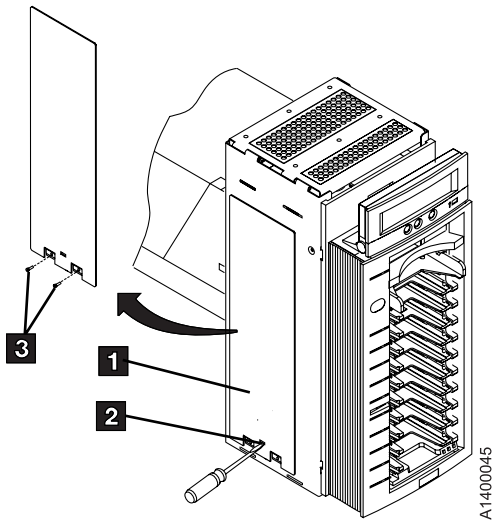


Figure 9-16. ACF Side Covers

ACF Top Cover

See Figure 9-17.

The ACF top cover is hinged.

1. Remove the ACF decorative cover. See page 9-29.
2. Insert the tip of a flat blade screwdriver at each edge of the cover **2** and pry the cover **1** open.
3. Swing the cover to its open position **3** .
4. Return to the procedure that sent you here.

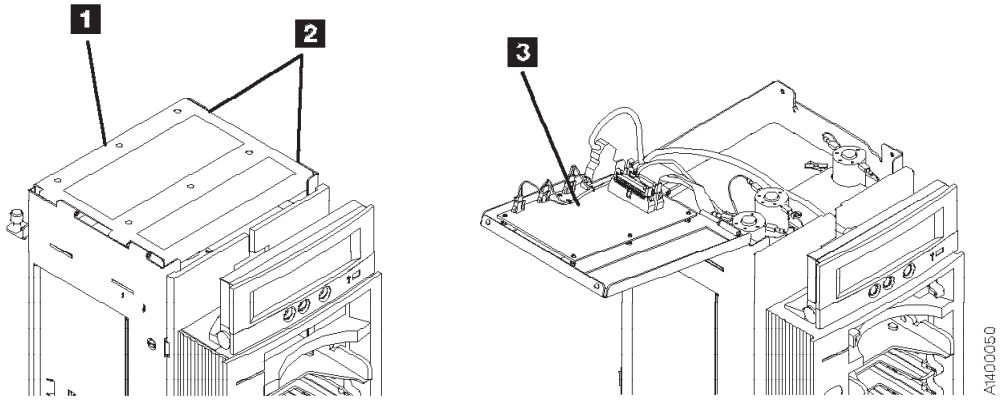


Figure 9-17. ACF Top Cover

Bezel (Model B11/E11/H11 Only)

See Figure 9-18.

Removal and Replacement Procedures

Removing Bezel:

1. Remove the magazine, if installed. See page 6-7.
2. Remove the operator/CE panel **2** by pressing the buttons **3** on the back of the operator/CE panel and lifting the panel out of the holder.
3. Disconnect the panel cable connector **4**.
4. Remove the screw **5** from the bezel. (The bezel **1** is held in place by a screw **5** at the top and two hooks on the bottom.)
5. Pull the bezel away from the ACF far enough to gain access to the LED-card cable connectors **6**.

   Attention: The hooks at the bottom of the bezel can now disengage from the ACF. Use care not to drop the bezel.
6. Carefully rotate the rear of the bezel to the left and disconnect the top, bottom, and then center LED-card cable connectors **6** from the LED cards **7** and remove the bezel.
7. Return to the procedure that sent you here.

Replacing Bezel:

1. Perform the removal procedure in the reverse order, then return here.
2. Return to the procedure that sent you here.

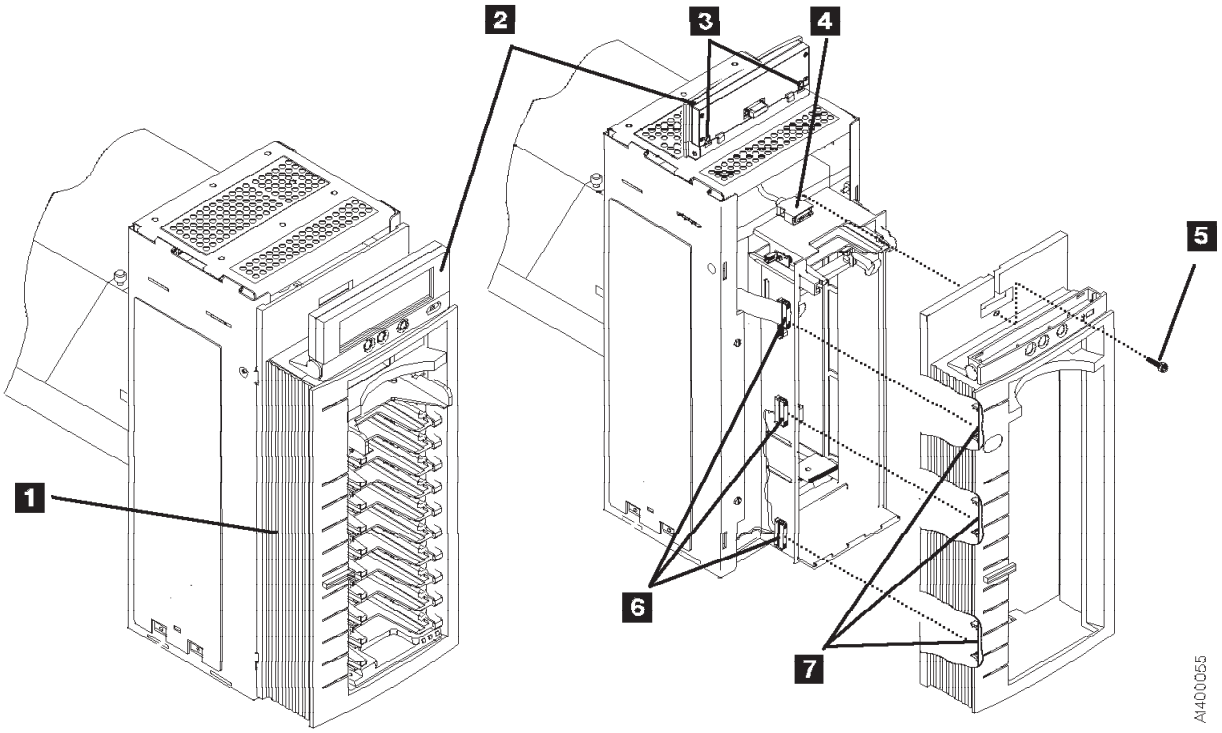


Figure 9-18. ACF Bezel

Automatic Cartridge Facility (ACF)

Removal and Replacement Procedures

Removing ACF

1. Have the customer vary the device offline, if not already done.
2. Remove the ACF decorative cover. See page 9-29.
3. Slide the device into service position. See “Front Serviced with ACF, Model B11/E11/H11 (Rack)” on page 9-11 or “Rear Serviced with ACF, Model B11/E11/H11 (A14 Frame)” on page 9-12.
4. Remove the magazine, if present. See page 6-7.
5. Remove cartridge if present. See “Manual Cartridge Removal” on page 9-37.
6. Power OFF the device. See “Powering Device ON and OFF” on page 9-6.
7. Remove the left side cover, if not obstructed by another device; otherwise, remove the right side cover. See “ACF Side Covers” on page 9-30.
8. See Figure 9-19 on page 9-34. Disconnect the two cables **2** from the ACF to the deck enclosure.
9. Loosen the thumb screw **1** on the upper-left-rear of the ACF.

   ⚠ ACF side covers are not permanently attached. Use other points to lift the ACF.

   Note: Before lifting the ACF, ensure that the side covers are secured by two screws at the bottom tabs. Side covers can slide off if the screws are not present.
10. Lift the ACF up and pull away from the deck enclosure.

Replacing ACF

1. Perform the removal procedure in the reverse order, then return here.
2. Return to the procedure that sent you here.

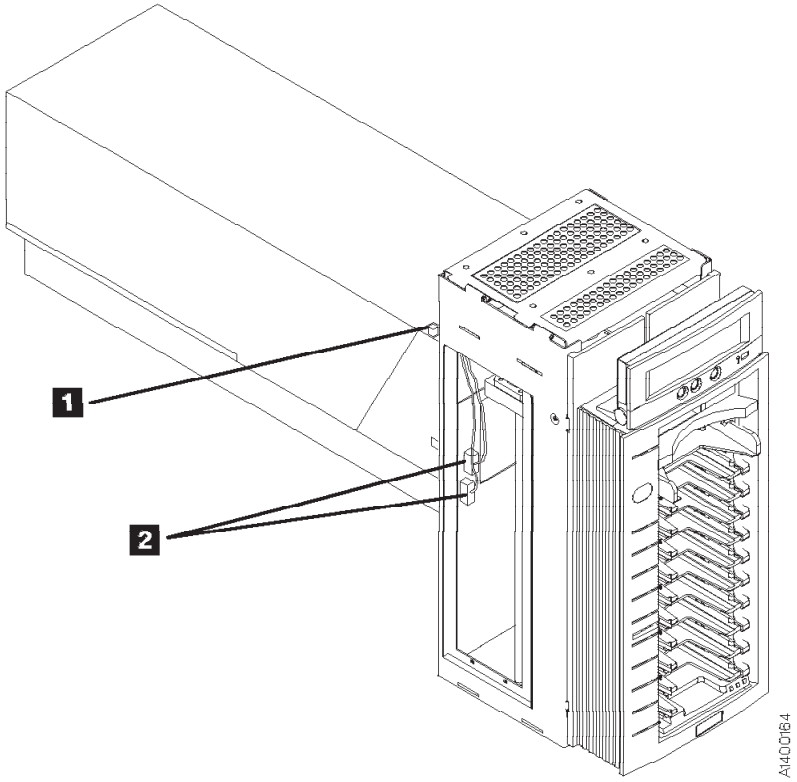


Figure 9-19. ACF and Deck Enclosure

Display Sensors Procedure

This procedure is used to display the dynamic settings of the ACF and drive sensors. A delay of approximately one second is required for the sensor to change state. The Disp Sensor menu and routine may be accessed from the Figure 5-8 on page 5-17, then select **UTILITIES** then **DISP SENSORS**. Table 9-1 summarizes the Sense routine menu, the meaning of each menu item, and one or more suggested methods to test each sensor.

Before you continue, it may be easier to remove some access covers. See “Removing Deck Enclosure Top Cover” on page 9-27 and “ACF Side Covers” on page 9-30.

Note: Static values shown are the default values that existed on a test Model B11/E11/H11, with no cartridges loaded in the drive and just after completion of POST. Your machine, if in a different environment, may show different starting static values.

Table 9-1. ACF and Drive Sensors Menu Display, Meanings, and Test Methods

Menu Display	Meaning & How to Test
►CANCEL	Select to cancel routine
A:1 B:0	**Tape path A and B sensors** (*Drive Path*). 1. For tape path A sensor, slowly move the tape threader arm CCW a short distance until the sensor changes state. Move it back slowly until it returns to the original state. 2. For tape path B sensor, slowly move the tape threader arm CCW all the way around to near the end of rotation and watch for the B sensor to change state. After it changes state, move the tape threader in the opposite direction to have it return to the original state. 3. When this sensor test is completed, return the tape thread arm to its original position. **Note:** Move the arm slowly and without forcing it to keep from damaging the drive.
TU:1 DO:0	*Loader* **tray up, door open sensors** (*Drive Loader*). 1. To exercise the loader tray up sensor, place your hand on the loader drive gear located at the top-left of the drive, and rotate the gear toward the front of the machine. This should move the loader in and down and cause the loader tray up sensor to change state. Reverse the direction of the gear rotation to move the loader back up to make the sensor return to its original state. 2. To exercise the door open sensor, use your hand to open and close the loader door while observing the door open sensor indication.
CP:1	*Loader* **cartridge-present sensor** (*Drive Loader*). **Note:** Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp, see “FID CD: Cartridge-Present Sensor” on page 10-101 **6** . Verify the sensor operation by flexing the cable while running “Display Sensors Procedure”. If the cable is bad, replace the Loader assembly. See “FID BC: Loader Assembly” on page 10-89. Manually move the loader in and down by rotating the loader drive gear located at the top left of the drive. Rotate the gear toward the front of the machine until the loader is back far enough for you to reach in and move the loader cartridge present sensor flag. Move the flag toward the back of the drive to change state, and toward the front to return to the original state. When the loader cartridge present sensor test is complete, return the loader to its original position (up and forward).
FP:0 CT:0000	*Loader* **file protect, cartridge type sensors** (*Drive Loader*). 1. To exercise the file protect sensor, rotate the loader drive gear toward the front of the machine to move the loader in and down. As you near the bottom of travel, observe the file protect sensor indication. It should change its indication. Move the loader back up and the sensor should return to its original indication. 2. To exercise the four cartridge type sensors, reach into the drive, and press each sensor flag located just below the drive door. Observe the sensors as they change state.

Table 9-1. ACF and Drive Sensors Menu Display, Meanings, and Test Methods (continued)

Menu Display	Meaning & How to Test
PS:0 MP:1 ML:0	**Priority cell, magazine present, magazine locked sensors** (*ACF Transport*). 1. Place a cartridge in and out of the priority slot while observing the sensor indication. 2. Raise and lower the magazine handle and observe the sense indication. 3. Lock and unlock the magazine by depressing and releasing the magazine lock pushbutton. **Note:** If an ATTN ACF message appears, press **Enter** to clear the message.
GI:0 GCP:0	**Global interference, global cartridge-present sensors** (*ACF Transport*). Reach through the magazine opening on the front of the ACF and block the global interference path. The sensor should change state. Use the same procedure for the global cartridge-present sensor.
P1:0 P2:0 IM:0	**ACF pinch 1 & 2, import sensors** (*ACF Transport*). 1. For pinch 1 and 2, **carefully** rotate the square pinch shaft counterclockwise until both sensors change state. Carefully rotate the shaft clockwise to return it to its original position (no pinch condition). **Note:** If the pinch cams are left in a pinch condition, the elevator may be difficult to raise and lower for later tests. 2. For import, export, limit 1 and limit 2 sensors, move the elevator to an empty slot in the magazine, insert a scratch cartridge and rotate the square feed shaft (on the left) in a CCW direction while pushing the cartridge into the drive slot. The cartridge should move slowly toward the drive slot. Next, **carefully** rotate the square pinch shaft CCW to pinch the cartridge, and continue to rotate the square feed shaft to move the cartridge into the drive. Rotating the two square shafts in the appropriate directions, move the cartridge back and forth and observe the four sensors as they change state. An alternate method is to move the cartridge into the drive slot, then move the square pinch shaft until there is no pinch condition. Then, move the cartridge back and forth with your fingers and a flat ruler reaching through the ACF slot. **Note:** Do not force the pinch or feed shafts as this may damage the ACF.
L1:0 L2:0 EX:0	**Limit 1 & 2, export sensors** (*ACF Transport*). See the import sensor procedure above.
A:1 B:1	**ACF transport-position sensors (A & B)** (*ACF Transport*). Manually move the elevator up and down and observe the two sensors. **Note:** Both sensors are molded into the same part.
SN:0	**Gripper-present sensor** (*Model B1A/E1A/H1A Drive Loader—library attached only*). This sensor is only on library versions (B1A/E1A/H1A). To exercise this sensor, block the opening for the gripper present sensor card. The sensor should change states.

Manual Cartridge Removal

Note: Find out if the cartridge contains **critical customer data**. The following removal procedures **can destroy** customer data! Use **extreme care** when handling the customer's tape to minimize tape damage and lost data.

Attention: **Do Not Touch** the magnetic tape or tape path. They are extremely sensitive to the oil and salt from your skin.

- **Use** care when handling or removing the magnetic tape. The customer may want to try to recover the data from the cartridge.
- **Use** lint-free nylon gloves P/N 461621 when working around magnetic tape or the tape path components.

Read/write errors can occur where fingerprints have contaminated the magnetic tape surface. When the tape is contaminated, in either the data or non-data area of the tape, the oil and salt will eventually migrate to and cause corrosion to the read/write head. Any contamination **may cause** replacement of the head guide assembly.

The purpose of this section is to assist you to determine the condition of the cartridge or the magnetic tape and to direct you to the procedure you must follow to remove the cartridge.

Before You Begin

If you have not already done so, attempt to remove the cartridge with power ON the device.

1. Position the device to the service position. See "Service Position" on page 9-11 and follow the procedure. Return here after the device is in the service position.
2. Display the Options menu on the operator/CE panel.
3. Select **Unload Drive** from the Options menu, and press **Enter**. The cartridge should unload and return to the priority cell or to the magazine.

   Note: It can take up to five minutes for the cartridge to rewind and unload.
4. If the cartridge unloads, inform the operator that the cartridge is unloaded and return to the procedure that sent you here.
5. If the cartridge did not unload and:
   - The failing device is in a library, continue with "Identifying Cartridge and Tape Condition".

   or
   - The failing device is not in a library, continue with the following:
     a. Remove the ACF decorative cover. See page 9-29.
     b. Press the shelf release latch for the shelf with the failing device and pull the shelf to the service position. See "Front Serviced with ACF, Model B11/E11/H11 (Rack)" on page 9-11 for the release latch location.
     c. Continue with "Identifying Cartridge and Tape Condition".

Identifying Cartridge and Tape Condition

Perform the following steps to determine the cartridge and tape condition:

1. Ensure that the device is varied offline.
2. If the failing device has an ACF, remove the magazine.
3. Switch OFF power to the failing device at the back of the device power supply. See Figure 9-1 on page 9-7 for location of power switch.
4. Remove the deck enclosure top cover. See "Deck Enclosure Covers" on page 9-27.

5. Inspect the drive for the cartridge and tape conditions shown on pages 9-38 through 9-40. Match the cartridge and the tape condition with the next examples and follow the directions in that example.

Example 1: Leader Block Separated From Magnetic Tape

See Figure 9-20.

If the leader block **1** is separated from the magnetic tape **2**, as shown in this example, perform the "Leader Block Separated From Magnetic Tape" on page 9-45.

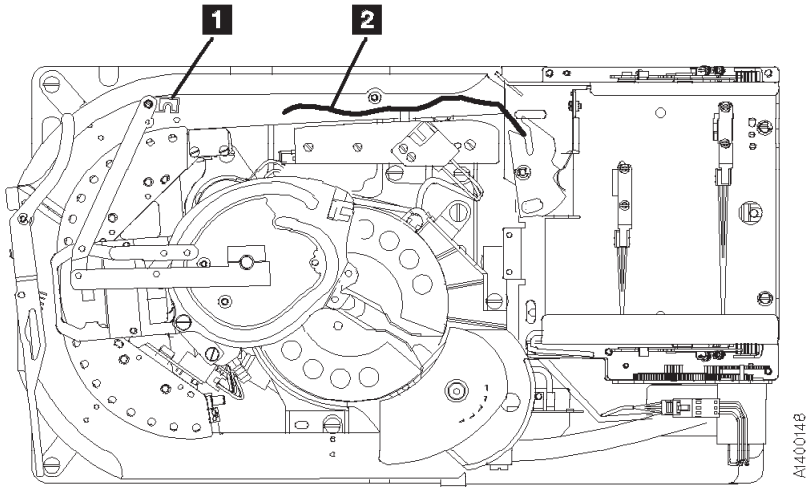


Figure 9-20. Example of Leader Block Separated From Magnetic Tape

Example 2: Magnetic Tape Pulled Out of Cartridge

See Figure 9-21.

If the magnetic tape **2** has pulled out of the cartridge and has wound onto the machine reel **1**, perform the "Magnetic Tape Attachment Procedure" on page 9-46.

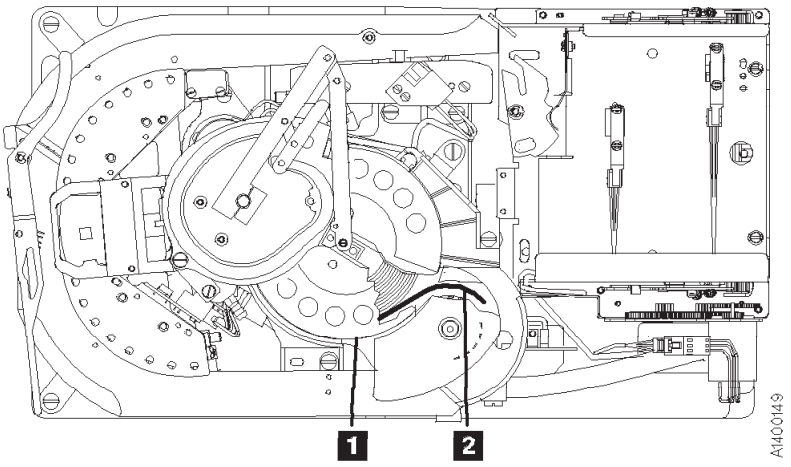


Figure 9-21. Example of Magnetic Tape Pulled Out of Cartridge

Example 3: Leader Block and Threader Pin in Machine Reel Hub

See Figure 9-22.

If the leader block **1** and threader pin **2** are in the machine reel hub **3** and will not disengage from the hub, perform the procedure “Leader Block and Threader Pin in Machine Reel Hub” on page 9-41.

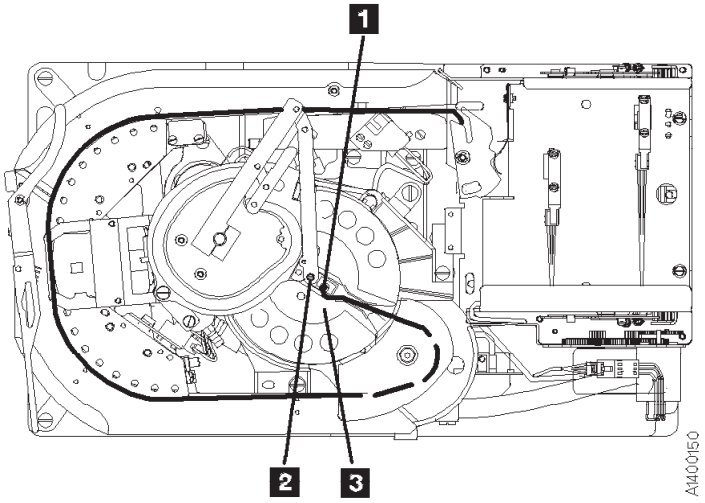


Figure 9-22. Example of Leader Block and Threader Pin in Machine Reel Hub

Example 4: Leader Block and Threader Pin Stopped in Tape Path

See Figure 9-23.

If the leader block **2** and the threader pin **1** have stopped in the tape path **3** between the machine reel hub **4** and the loader assembly **5**, perform the procedure “Leader Block and Threader Pin Stopped in Tape Path” on page 9-43.

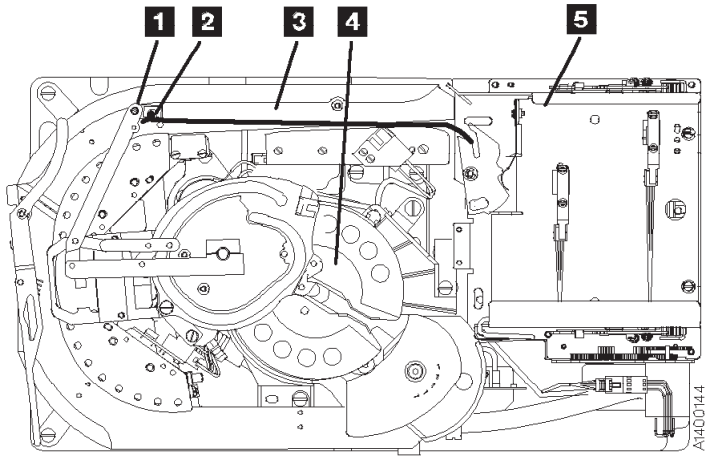


Figure 9-23. Example of Leader Block and Threader Pin Stopped in Tape Path

Example 5: Leader Block and Threader Pin at Loader

See Figure 9-24.

If the leader block and the threader pin **1** are at the loader assembly **2** (home position), and the cartridge does not unload, perform the procedure “Leader Block and Threader Pin at Loader Assembly” on page 9-44.

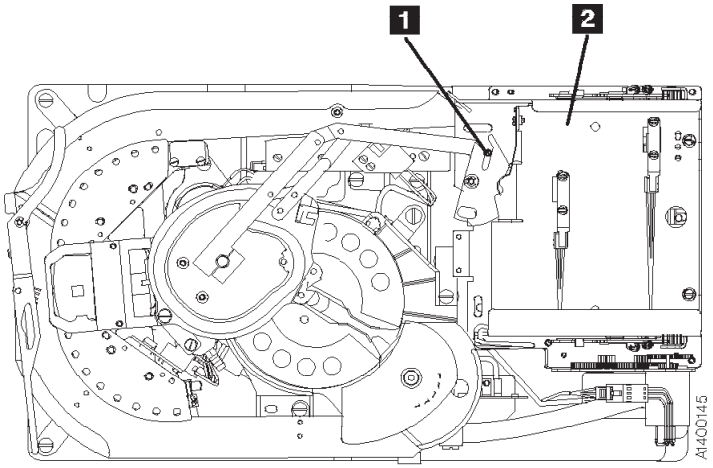


Figure 9-24. Example of Leader Block and Threader Pin at Cartridge Loader Assembly

Example 6: Operation Stopped with Tape on Machine Reel

See Figure 9-25.

If the operation has stopped with tape **2** on the machine reel **1**, perform the procedure “Leader Block and Threader Pin in Machine Reel Hub” on page 9-41.

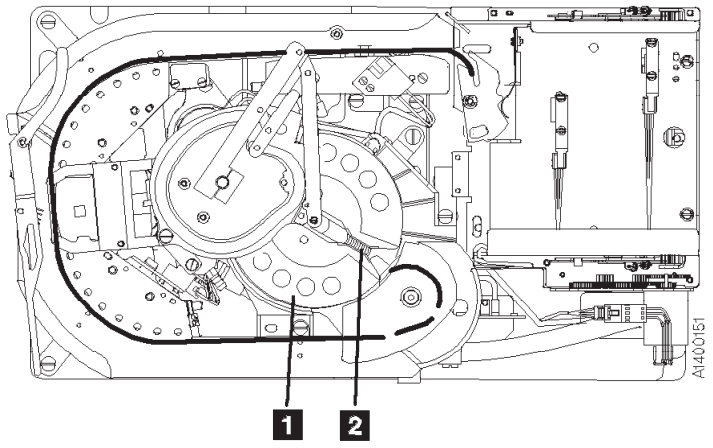


Figure 9-25. Example of Operation Stopped with Tape on Machine Reel

Example 7: Magnetic Tape Broken in Data Area
See Figure 9-26.

If the tape has broken somewhere in the data area **1**, part of the tape **3** will be on the machine reel **2** and the remainder will be attached to the tape cartridge in the loader assembly **4**. The data on the tape cannot be saved, perform the procedure “Magnetic Tape Broken in Data Area” on page 9-48.

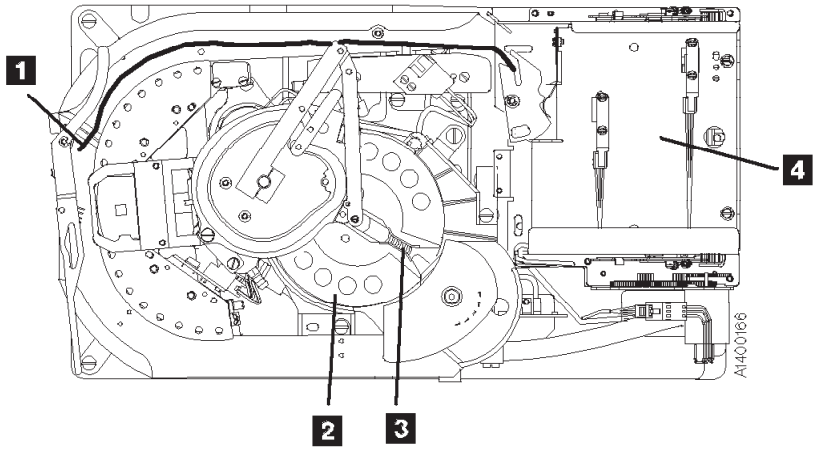


Figure 9-26. Example of Magnetic Tape Broken Somewhere in Data Area

Example 8: Cartridge Jammed in Loader or Transport
See Figure 9-27.

If the cartridge is jammed in either the drive loader assembly **1** or the ACF transport assembly **2** perform the procedure “Manual Unloading Loader or Transport (Model B11/E11/H11)” on page 9-49

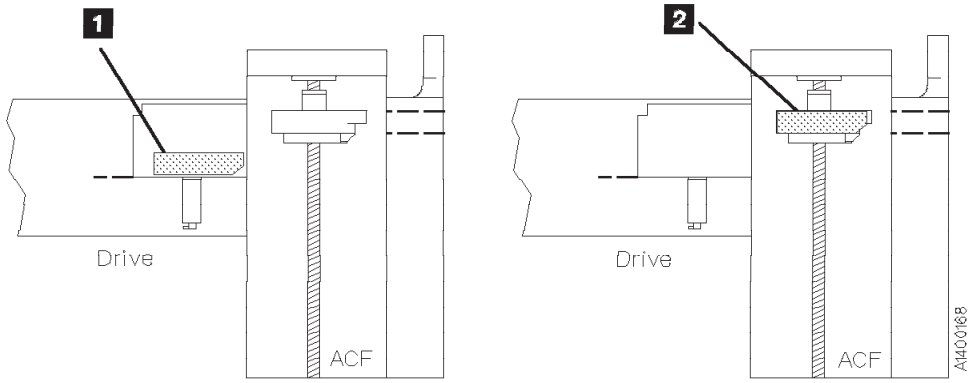


Figure 9-27. Example of Cartridge Jammed in Loader or Transport

Leader Block and Threader Pin in Machine Reel Hub
Perform the following steps to remove the cartridge when the leader block and the threader pin are in the machine reel hub.

1. See Figure 9-28 on page 9-42. Attach the tape removal tool **1** P/N 6850663 to your socket wrench handle **2**.
2. Insert the tape removal tool through the hole in the bottom of the drive enclosure, and onto the file reel motor shaft **3**.
3. Turn the tool clockwise (view from the top) to wind the tape into the cartridge.

Attention: Do not touch the magnetic tape. Finger prints contaminate the tape and can affect tape guiding. If the machine reel motor binds so that the file reel motor cannot move the tape, place your finger on the machine reel hub 6 .

4. Move the hub counterclockwise, and at the same time turn the file reel motor shaft clockwise to move the tape.
5. Turn the hub until the file reel motor is free. Continue to turn the hub until the leader block 5 can leave the machine reel hub, as shown.
6. Rotate the pantocam arm at its pivot point 4 clockwise while you rotate the file reel motor shaft clockwise until the leader block is in the cartridge. (The threader pin 7 rotates the detent lever 8 as the leader block latches into the cartridge.)
7. Check the hub alignment (see “Replace Pantocam” on page 10-86).
8. Remove the ACF from the drive. See page 9-33.
9. Rotate the loader drive gear 9 (toward the rear) until the cartridge can be removed. Give the cartridge to the customer.
10. Reattach the ACF to the drive.
11. Return to the procedure that sent you here.

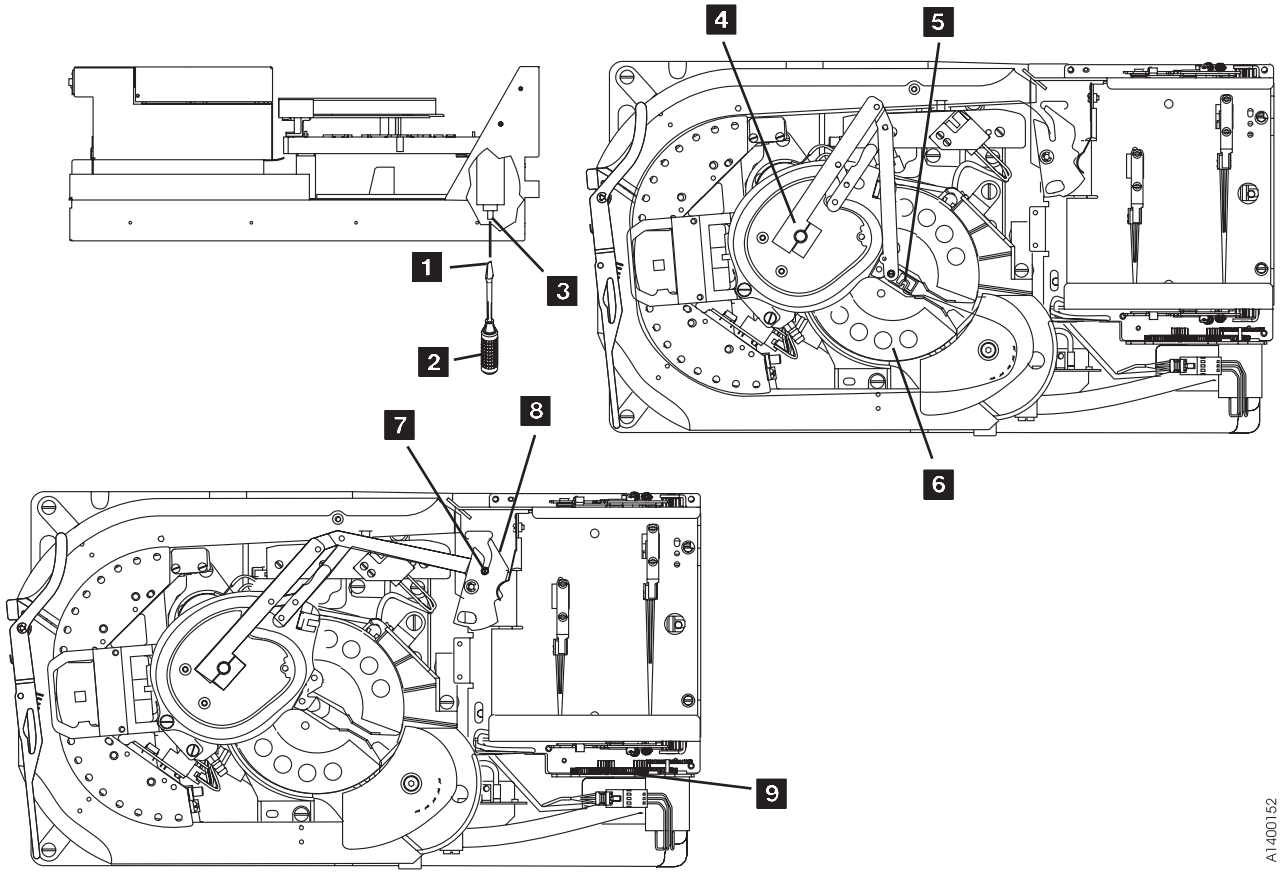


Figure 9-28. Leader Block and Threader Pin in Machine Reel Hub

Leader Block and Threader Pin Stopped in Tape Path

Perform the following steps to remove the cartridge by hand when the leader block and the threader pin have stopped in the tape path between the machine reel hub and the loader assembly.

1. See Figure 9-29. Attach the tape removal tool **1** (P/N 6850663) to your socket wrench handle **2**.
2. Insert the tape removal tool through the hole in the bottom of the drive enclosure, and onto the file reel motor shaft **3**

   Attention: Do not touch the magnetic tape. Finger prints contaminate the tape and can affect tape guiding.
3. Rotate the pantocam arm from its pivot point **4** in a clockwise direction. At the same time, rotate the file reel motor shaft clockwise (as seen from the top of the drive) to wind the tape into the cartridge.
4. Continue winding the tape into the cartridge.

   The threader pin **5** will rotate the detent lever **6** as the leader block latches into the cartridge.
5. Remove the ACF from the drive. See “Automatic Cartridge Facility (ACF)” on page 9-33 for removal procedure.
6. Rotate the loader drive gear **7** (toward the rear) until the cartridge can be removed. Give the cartridge to the customer.
7. Reattach the ACF to the drive.
8. Continue the repair action by returning to the procedure that sent your here.

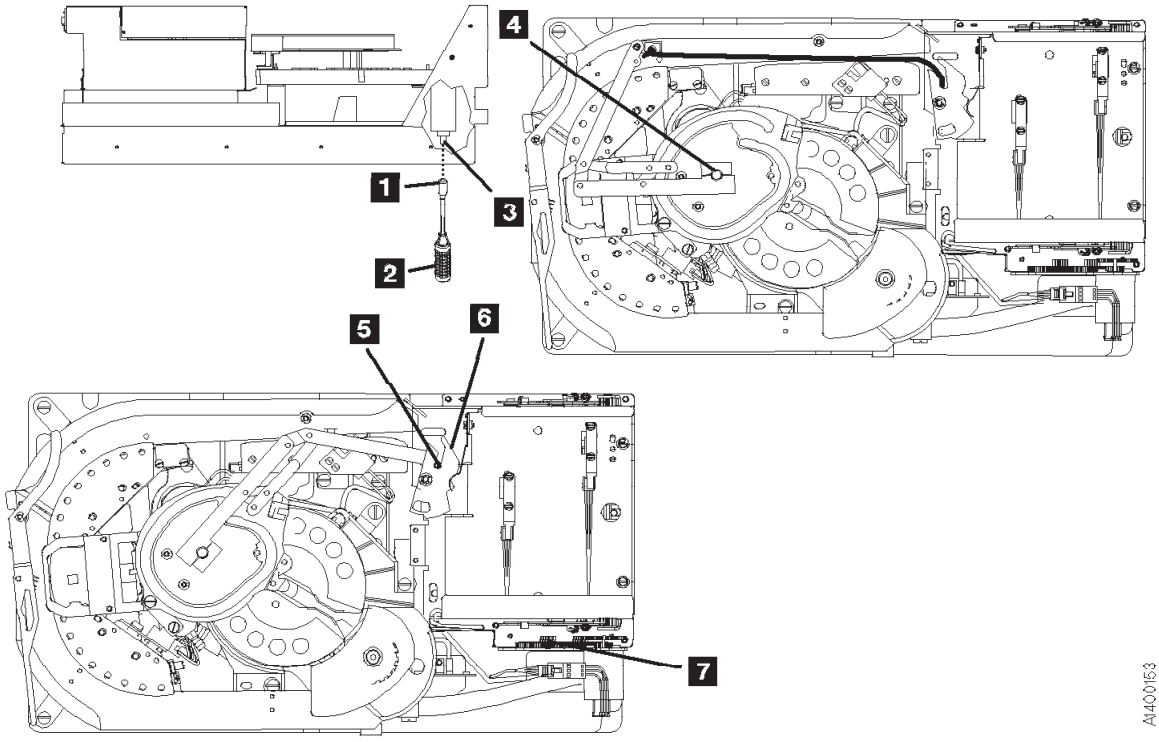


Figure 9-29. Leader Block and Threader Pin Stopped in Tape Path

Leader Block and Threader Pin at Loader Assembly

See Figure 9-30. The threader pin 2 or 6 can be at one of two positions at the loader assembly. Perform the appropriate procedure for the position in which the threader pin stopped:

- The threader pin 2 has engaged the detent lever 3, but the detent lever has not rotated clockwise to latch the leader block into the cartridge. Note the position of the lever to the stop pin 4. Go to step 1 to remove the cartridge.

  Or,

- The threader pin 6 has engaged and rotated the detent lever 7 against its stop pin 5 and the leader block is latched in the cartridge. Go to step 5 to remove the cartridge.

1. Attach the tape removal tool 11 (P/N 6850663) to your socket wrench handle 10.
2. Insert the tape removal tool through the hole in the bottom of the drive enclosure, and onto the file reel motor shaft 9.
3. Rotate the pantocam arm from its pivot point 1 clockwise just far enough to rotate the detent lever against its stop and latch the leader block into the cartridge. At the same time, rotate the file reel motor shaft clockwise (as seen from the top of the drive) to take up the slack in the tape.
4. Remove the ACF from the drive. See “Automatic Cartridge Facility (ACF)” on page 9-33 for removal procedure.
5. Rotate the loader drive gear 8 (toward the rear) until the cartridge can be removed. Give the cartridge to the customer.
6. Reattach the ACF to the drive.
7. Continue the repair action by returning to the procedure that sent you here.

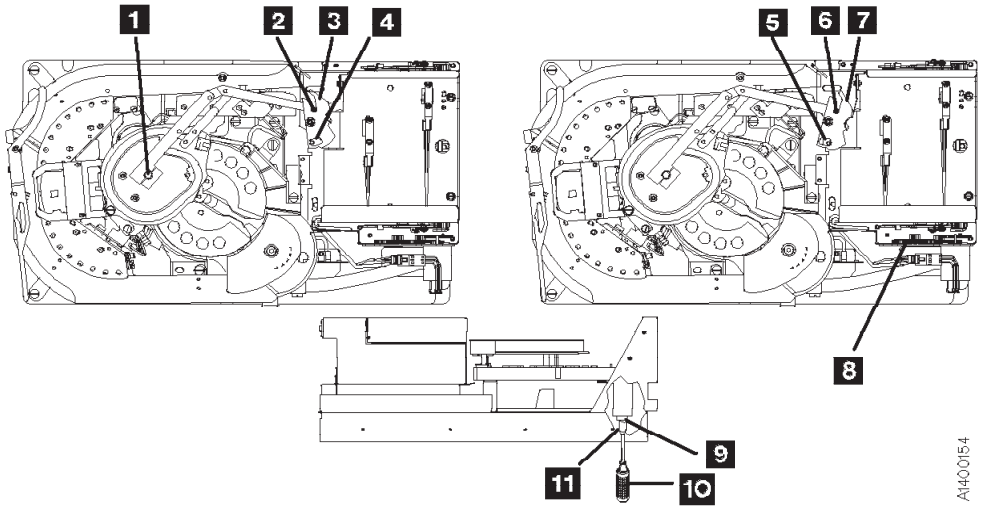


Figure 9-30. Leader Block and Threader Pin at Loader Assembly

Leader Block Separated From Magnetic Tape

Note: To save the data on the tape, the leader block must be replaced. Replacement of the leader block is the customers responsibility. Notify the customer the leader block must be replaced, if it is necessary to save the data in the cartridge.

Attention: **Do not** touch the magnetic tape while removing the cartridge. Fingerprints may cause read/write errors and the contamination may migrate, causing corrosion to the head.

Use this procedure only when data must be copied to another cartridge. The use of this procedure can affect the performance of the leader block during threading and unloading operations. Recommend that the customer destroy the cartridge after the data is copied.

The use of any tool to remove the customer's tape can cause damage to the tape.

Do not damage the edges of the tape because edge damage can affect tape guiding.

Inform the customer before you continue with this procedure. **Removing the Cartridge and Leader Block**

See Figure 9-31.

1. Remove the leader block **2** from the threader pin **1**.
2. Rotate the top of the loader gear **4** toward the back of the 3590. The loader mechanism raises the cartridge up and moves it toward the front. Continue rotating the gear until the cartridge stops moving.
3. Carefully remove the cartridge, being careful not to damage the edges of the tape **3**.
4. Give the cartridge and leader block to the customer.

   Note: Inform the customer that the tape must not be touched without the use of protective gloves.
5. Continue the repair action by returning to the procedure that sent you here.

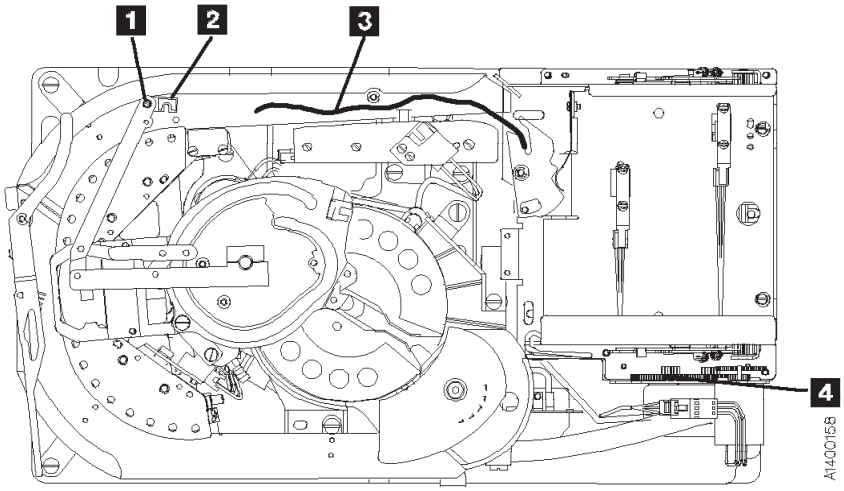


Figure 9-31. Removing Cartridge Exhibiting Separated Leader Block

Magnetic Tape Attachment Procedure

Perform the following steps when the end of the magnetic tape has pulled out of the cartridge and has wound onto the machine reel.

Attention: Use this procedure only when data must be copied to another cartridge. The use of this procedure can affect the performance of the leader block during threading and unloading operations. Recommend the customer destroy the cartridge after the data is copied.

The use of any tool to remove the customer's tape can cause damage to the tape.

Do not damage the edges of the tape because edge damage can affect tape guiding.

Touching the magnetic tape while performing this procedure is unavoidable. Use **extreme care** and do not touch the tape any further then 75 mm (3 in.) from the end of the tape. Oil from your fingers may damage the tape and can migrate to other parts of the 3590 drive.

Inform the customer before you continue with this procedure. See Figure 9-32 on page 9-47

1. Pull the tape by hand along the tape path until it is at the opening to the cartridge.

   Note: If the machine reel motor binds and does not allow the tape to move, place your finger on the machine reel hub **4** and rotate the hub counterclockwise. At the same time move the magnetic tape.
2. Attach a 50 mm (2 in.) piece of double-stick cellophane tape to the shiny side of the magnetic tape. Leave a 25 mm (1 in.) overlap of cellophane tape.

   Note: All lengths are approximate.

   Attach the protruding end of the cellophane tape to the eraser end of a pencil or similar object.

   Note: Ensure the cartridge in the loader is in the down (loaded) position.
3. Insert the pencil and the tape with the cellophane tape into the loader and the cartridge opening and attach the cellophane tape to the cartridge hub **5** . Remove the pencil without disturbing the cellophane tape attached to the hub.
4. Attach the tape removal tool **1** (P/N 6850663) to your socket wrench handle **2** .
5. Insert the tape removal tool through the hole in the bottom of the drive, and onto the file reel motor shaft **3** .
6. Turn the tool clockwise (as seen from the top of the drive) to wind the magnetic tape onto the cartridge.

   Note: If the cellophane tape pulls off the hub, attach the cellophane tape again.
7. Rotate the machine reel hub counterclockwise and at the same time rotate the file reel motor shaft clockwise for several revolutions. Ensure that the tape is secured to the cartridge hub.
8. Switch ON the device power at the back of the device power supply.
9. The tape should automatically unload when power comes ON.

   If the tape does not fully wind into the cartridge, request aid from your next level of support.
10. Remove the cartridge from the drive and give it to the customer.
11. Continue the repair action by returning to the procedure that sent you here.

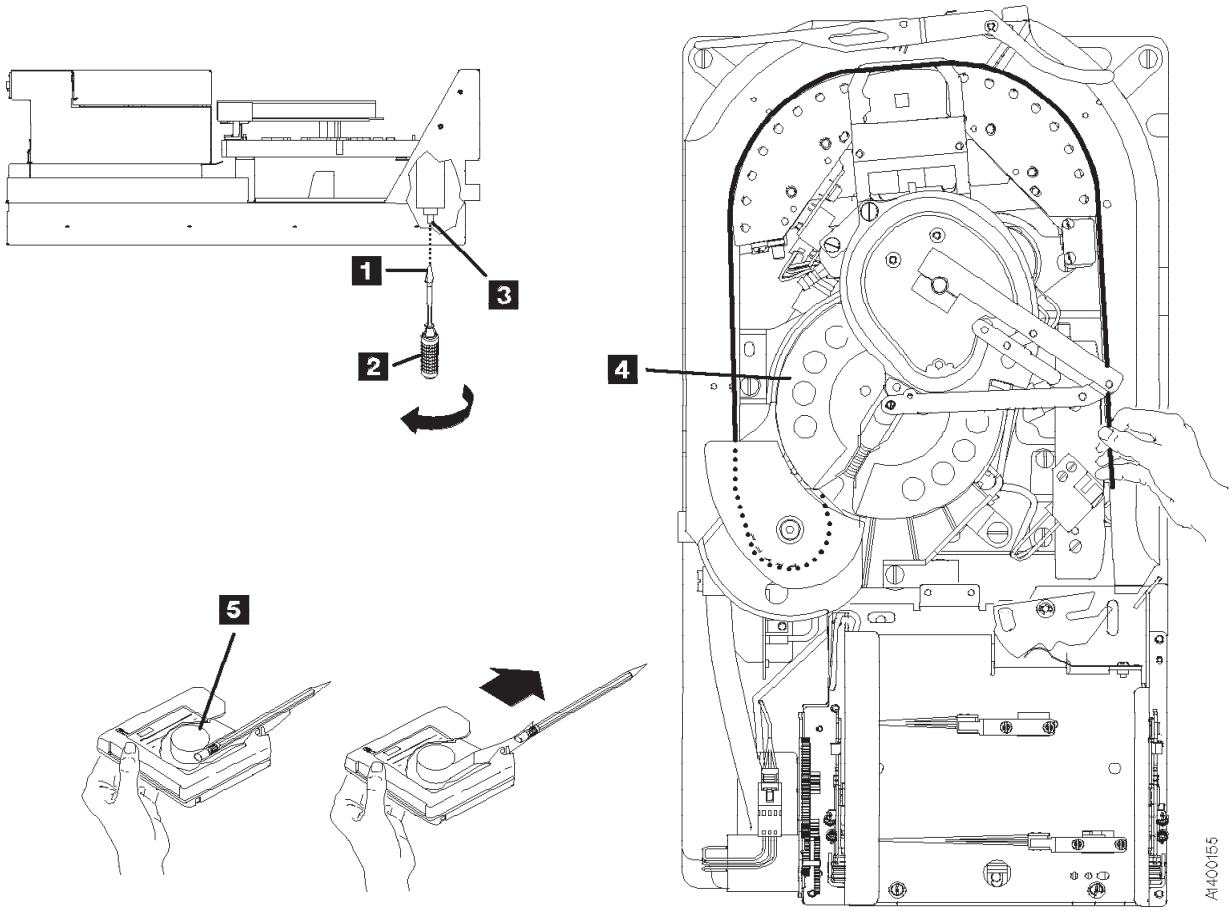


Figure 9-32. Attaching Magnetic Tape

Magnetic Tape Broken in Data Area

Note: Find out if the cartridge contains **critical customer data**. If there is critical customer data on the tape, contact your next level of support to minimize data-loss risk. **Extreme care** must be used to minimize tape damage and loss of customer data. The following removal procedure **will destroy** customer data!

Attention: **Do Not Touch** the magnetic tape or tape path. They are extremely sensitive to the oil and salt from your skin.

- **Use** care when handling or removing the magnetic tape. The customer may want to try to recover the data from the cartridge. Splicing the tape before removal of the cartridge may be necessary. Contact the support center for the procedure.
- **Use** lint-free nylon gloves P/N 461621 when working around magnetic tape or the tape path components.

The tape cannot be saved and must be removed from the tape path. Inform the customer the tape cannot be spliced without contaminating the tape and drive. This will result in loss of data if they care to try to recover the data. Read/write errors may occur where fingerprints have contaminated the magnetic tape surface and the contamination can eventually migrate to and cause corrosion to the head. Any contamination **will cause** replacement of the head guide assembly.

Inform the customer before you continue with this procedure.

Removing Destroyed Tape From Tape Path

See Figure 9-33.

1. Pull the tape **3** out of the machine reel **2** and into a suitable container.
2. When the tape is out of the machine reel, assist rotating the pantocam arm at its pivot point **1** in a clockwise direction to move the leader block out of the machine reel.
3. Remove the leader block from the threader pin when the leader block is out of the reel and accessible.
4. Rotate the loader gear **4** toward the rear of the drive far enough to remove the cartridge. Give the cartridge to the customer.
5. Give the cartridge and container of tape to the customer to be disposed of.
6. Return to the procedure that sent you here.

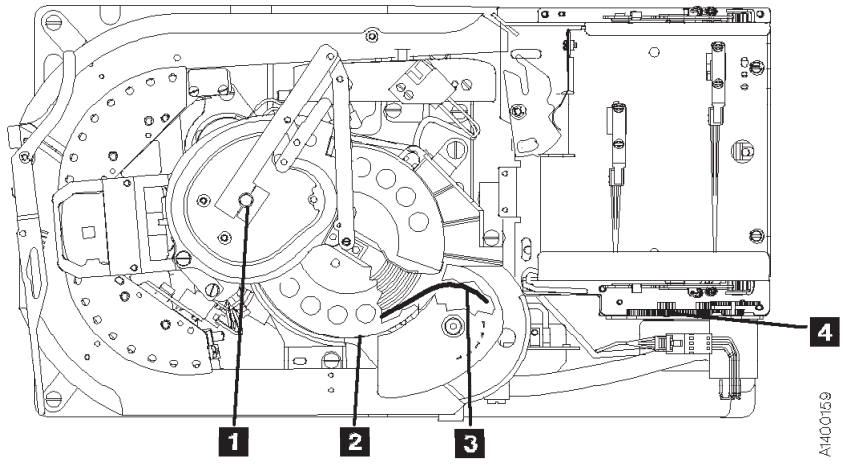


Figure 9-33. Removing Tape from Tape Path

Manual Unloading Loader or Transport (Model B11/E11/H11)

Perform the following steps to remove a jammed cartridge in either the drive loader or ACF transport.

If cartridge is in the loader, perform steps 1 through 5.

OR

If cartridge is in the transport assembly, perform steps 6 through 7.

See Figure 9-34.

1. If the tape cartridge is not completely in the loader, reach in through the priority cell and push the cartridge all the way into the drive loader assembly.
2. Remove the ACF **3** from the drive. See “Automatic Cartridge Facility (ACF)” on page 9-33.
3. Rotate the loader drive gear **2** (toward the rear) until the cartridge **1** is unloaded from the loader **4**.
4. Manually remove the tape cartridge from the drive and give the cartridge to the customer.
5. Replace the ACF on the drive, then go to step 8.

   See Figure 9-35 on page 9-50.
6. Reach up and behind the cartridge **1** in the transport assembly and push the cartridge forward **2** far enough to be removed from the priority cell **3**.
7. Manually remove the tape cartridge from the ACF and give the cartridge to the customer.

   Note: After retrieval of a cartridge check transport Limit-1 and Limit-2 sensors are not knocked loose and still firmly seated. Refer to Figure 6-7 on page 6-11.
8. Continue the repair action by returning to the procedure that sent you here.

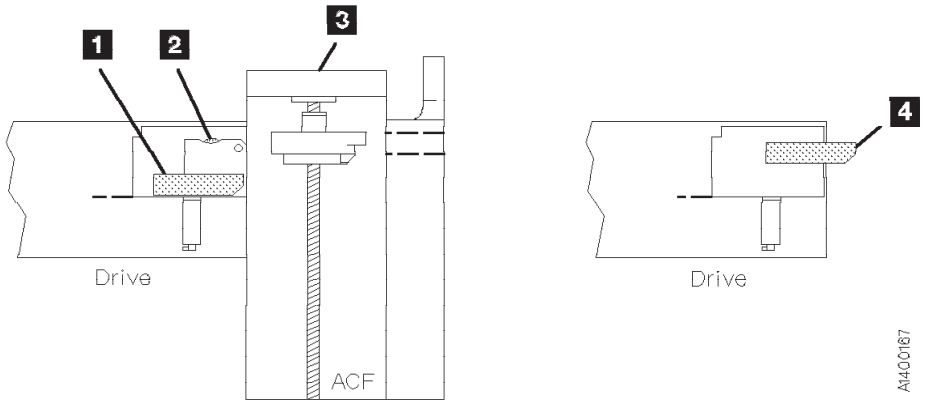


Figure 9-34. Removing Jammed Cartridge from Drive Loader

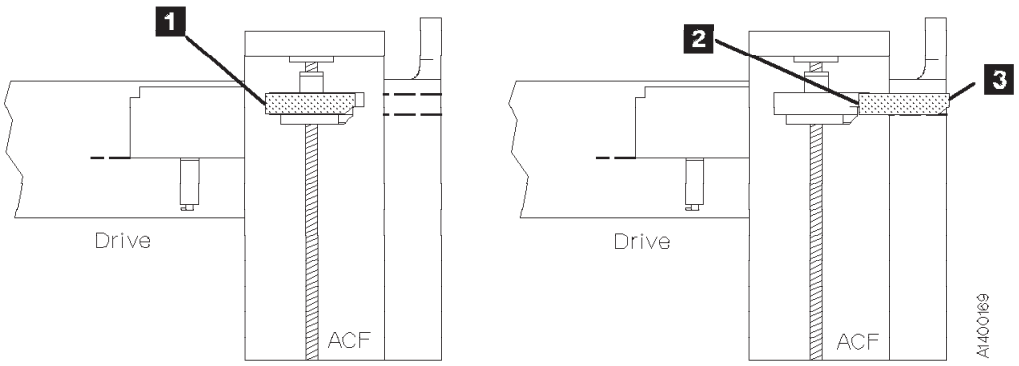


Figure 9-35. Removing Jammed Cartridge from ACF Transport

Drive Serial Number

All 3590 microcode levels above D0IA_558, D0IB_910, D0ID_22A, or D0IE_32E will use the new ASCII serial number procedure. Earlier level drives and microcode will use the old hexadecimal serial number procedure. Perform the following steps to determine which procedure is correct for your drive.

Serial Number Change Procedure Determination

Use this information to choose between the two serial number change procedures.

1. At the OPTIONS display screen, switch to CE mode by pressing the Mode Change pushbutton.
2. Use the ↓ to select PROCEED, and press **Enter**.
3. At the CE Options screen, use the ↓ to select CONFIG/INSTALL, and press **Enter**.
4. At the CE CONFIG/INSTALL screen, use the ↓ to select DRV OPTIONS, and press **Enter**.
5. At the CE DRV OPTIONS screen, use the ↓ to select DRV SERIAL NO, and press **Enter**.
6. At the CE DRV SER NO screen, use the ↓ to select ALTER SERIAL NO, and press **Enter**.
   - If the **current level** serial number procedure is installed the display will show:

CE	VPD	DATA
CANCEL		
0		
0		
0		
X		
X		

where “X” represents the Hexadecimal 0 – F number field.
(The factory default for a new card pack is set to XXXXX.)

Continue with “Serial Number Change (Current Procedure)” on page 9-52.

   - If the **former level** serial number procedure is installed the display will show:

VPD	FIELD	OFFSET
CANCEL		
OFFSET	VALUE	
000	XX	
001	XX	
002	XX	
003	XX	

where 000 is the Offset and XX is the Value.
See Figure 9-36 on page 9-53 for example.
(The factory default for a new card pack is set to XXXXX.)

Continue with “Serial Number Change (Former Procedure)” on page 9-53.

Serial Number Change (Current Procedure)

__ 1. If the displayed serial number needs to be changed, from the CE DRV SER NO screen select ALTER SERIAL NO, and press **Enter**. The CE VPD DATA menu will be displayed, as follows:

CANCEL
0
0
0
X
X
X
X
X
SAVE AND CONTINUE

This menu displays the ASCII value for the last eight digits in the VPD serial number field.

__ 2. Use the ↑ or ↓ buttons to select the digit to be changed.
__ 3. Press the **Enter** button to change the number. Continue to press the ENTER button to increment from 0 to 1, 1 to 2, and so on. Eventually the number will wrap from F back to 0.
__ 4. Repeat steps 2 and 3 until all of the digits are correct.
__ 5. Select SAVE AND CONTINUE, then press **Enter**. The CE SAVE DATA menu will appear.
__ 6. Select YES, then press **Enter** to save the changes. The CE DRV SER NO menu will appear.
__ 7. To confirm the changes, select DISP SERIAL NO, and press **Enter**.
__ 8. When the displayed serial number is correct, select CANCEL, and press **Enter** as many times as necessary to return to the CE OPTIONS menu.
__ 9. To return to the OPTIONS screen, press the  pushbutton, select PROCEED, and press **Enter**.

Note: The CE WAIT menu may appear momentarily while the new serial number data is written into memory.

Note: You must have root authority to perform the following step.

pSeries/RS6000 (AIX) System Only

__ 10. Update the VPD data in the host pSeries/RS6000 (AIX) System by unconfiguring the device **(Example: rmdev -l rmt3)** and reconfiguring the device **(Example: mkdev -l rmt3).**

End of pSeries/RS6000 (AIX) System Only

__ 11. Return to the procedure that sent you here.

Serial Number Change (Former Procedure)

The VPD FIELD OFFSET menu appears, and the display shows the hex values for offsets 000 through 00B. Scroll the cursor up or down to see all of the offset locations. *All of the VPD offset field data is displayed and entered in hex*.

The Serial Number Entry procedure varies depending upon the microcode level that is installed on the 3590 drive. If your drive has Link Level D0I9_6F9 or earlier, you should see data similar to that shown in the example on the left hand side of Figure 9-36. The default ASCII value for that level of microcode is **SequenceNum**. The hexadecimal value is **X'53455155454E43454E554D00'**. If your drive has Link Level D0I9_7E6 or higher, such as D0IA or D0IB, you should see data similar to the example on the right hand side of Figure 9-36. The default ASCII value for that level of microcode is **0000000XXXXX**. The hexadecimal value is **X'303030303030305858585858'**.

Both levels of defaults (in ASCII, **3** , and hexadecimal, **2** , are shown in Figure 9-36. Also shown are the VPD Offset positions, **1** , where the hexadecimal values are entered (after conversion by the CE from ASCII to hexadecimal).

Note: The newer default value requires no entries by the CE for the first 7 positions of the VPD offset. The CE only needs to enter data in the last 5 positions. This should save time when the serial number must be re-entered.

Microcode Level D0I9_6F9 & Earlier

1 Offset	2 Hex	3 ASCII
000	53	S
001	45	e
002	51	q
003	55	u
004	45	e
005	4E	n
006	43	c
007	45	e
008	4E	N
009	55	u
00A	4D	m
00B	00	Nul

Microcode Level D0I9_7E6 & Later

1 Offset	2 Hex	3 ASCII
000	30	0
001	30	0
002	30	0
003	30	0
004	30	0
005	30	0
006	30	0
007	58	x
008	58	x
009	58	x
00A	58	x
00B	58	x

SN359005

Figure 9-36. Card Pack Drive Serial Number Factory Defaults

Use the following procedure to enter the drive serial number. The following example shows what entries would be made if the serial number of the device were **12345**. The CE should substitute the real S/N value for the example shown.

Note: The 7 leading ASCII digits should always be zero in the new defaults, and when all data has been overwritten on the old defaults.

The example below shows how a typical five-digit (ASCII) serial number, SN 12345, is recorded in hexadecimal. Note the first seven offsets, fields 000 through 006 should be set to hex 30 (ASCII 0), and the serial number, once converted into hex, is entered in offsets 007 through 00B. (The first two letters of the serial number, **SN**, are not entered.)

```
CANCEL                                    CANCEL
                ASCII Equivalent                          ASCII Equivalent
OFFSET VALUE    (Old)      (New)          OFFSET VALUE    (Final Value)
000     53        S          0            000     30            0
001     45        e          0            001     30            0
002     51        q          0            002     30            0
003     55        u          0            003     30            0
004     45        e          0            004     30            0
005     4E        n          0            005     30            0
006     43        c          0            006     30            0
007     45        e          x            007     31            1
008     4E        N          x            008     32            2
009     55        u          x            009     33            3
00A     4D        m          x            00A     34            4
00B     00        Nul        x            00B     35            5
```

1. Starting at offset 007, write down the drive serial number below or on paper. Using the conversion chart in Table 9-3 on page 9-56, calculate the corresponding hexadecimal values.

Table 9-2. Serial Number Work Sheet

Serial Number	VPD Offset	Hex Value
0	000	30
0	001	30
0	002	30
0	003	30
0	004	30
0	005	30
0	006	30
	007	
	008	
	009	
	00A	
	00B	

2. You will be entering the serial number in three sections of four bytes (eight hex digits) each. Each data byte contains two hex digits. For example, data byte 0 is equal to hex '30'.
3. If your drive has the new default values (the first seven ASCII characters are all zero), you can review the procedure, but you need not enter any data until you reach VPD offset 007.
4. If your drive has the old default values (the first seven ASCII characters are **not** all zeros), select offset 000, and press **Enter**. The CE VPD DATA menu appears and the display shows, vertically, the four bytes (eight hex digits) for offsets 000 through 003. Scroll the cursor up or down to see all eight of the hex digits for these four offset locations. The actual screen image will look something like the following:

Note: The screen will show only one column of hexadecimal characters. Our examples will show both old and new default versions for your convenience.

```
CANCEL
     (OLD)          (NEW)
       5              3
       3              0
       4              3
       5              0
       5              3
       1              0
       5              3
       5              0
```

If your drive has the older microcode installed, refer to the column on the left. If your drive has the newer microcode installed, refer to the column on the right. If your drive has the old defaults, begin entering at offset 000. If your drive has the new defaults, skip over offsets 000 through 006 (they should already be set to '30' which equals ASCII 0,) and begin entering the serial number at offset 007.

5. The menu displays the first four bytes (eight digits) of the serial number vertically, as follows:

```
CANCEL
                (OLD Defaults)    (NEW Defaults)
  Offset         Hex   ASCII       Hex   ASCII
    000           5                 3
                  3  =   S          0  =   0
    001           4                 3
                  5  =   e          0  =   0
    002           5                 3
                  1  =   q          0  =   0
    003           5                 3
                  5  =   u          0  =   0
```

6. These eight digits represent ASCII Sequ, the first four characters of the old default value (**Sequ**enceNum0) or ASCII 0000, the first four characters of the new default value (**0000**000XXXXX).
7. Move the cursor to the first digit you want to change (if any), and press **Enter**.
8. The CE CHOOSE VALUE menu appears. This screen allows you to select the desired hex digit. Select 3, and press **Enter**. The data is updated and the previous menu (CE VPD DATA) appears.
9. Move the cursor to the next digit to change, and press **Enter**.
10. The CE CHOOSE VALUE menu appears. Select 0, and press **Enter**. The data is updated and the previous menu (CE VPD DATA) appears.
11. Repeat steps 7 through 10 until all eight digits are correct. It should look like this when completed:

```
CANCEL
   3
   0
   3
   0
   3
   0
   3
   0
```

12. When you have finished changing (or reviewing) the data in these four offset fields, select SAVE AND CONTINUE. Select YES on the CE SAVE DATA? menu. This returns you to the CE DRV SER NO menu.
13. At the CE DRV SER NO screen, use the ↓ to select ALTER SERIAL NO, and press **Enter**.
14. To enter the next eight hex digits, select DRV SERIAL NO, and press **Enter**. At the VPD FIELD OFFSET menu, select 004. A screen much like the following will appear:

```
CANCEL
                (OLD Defaults)    (NEW Defaults)
  Offset         Hex   ASCII       Hex   ASCII
    004           4                 3
```

```
                5  =   e          0  =   0
  005           4                  3
                E  =   n          0  =   0
  006           4                  3
                3  =   c          0  =   0
  007           4                  5
                5  =   e          8  =   x
```

15. Repeat steps 7 on page 9-55 through 10 on page 9-55, alternating 3 and 0 for the next six digits.

    Note: The last two digits that you enter in this section (offset 007) are the first two hex digits of the serial number. In our example, ASCII “1” will be entered as Hex ‘31’.

16. When you have finished changing (or viewing) the data in these four offset fields, select SAVE AND CONTINUE. Select YES on the CE SAVE DATA? menu.
17. At the CE DRV SER NO screen, use the ↓ to select ALTER SERIAL NO, and press **Enter**.
18. At the VPD FIELD OFFSET menu select 008. A screen much like the following will appear:

```
CANCEL
                (OLD Defaults)    (NEW Defaults)
  Offset         Hex   ASCII       Hex   ASCII
    008          4                 5
                 E  =   N          8  =   x
    009          5                 5
                 5  =   u          8  =   x
    00A          4                 5
                 D  =   m          8  =   x
    00B          0                 5
                 0  =   Null       8  =   x
```

19. Repeat steps 7 on page 9-55 through 10 on page 9-55, beginning with offset 008 to enter the last eight digits, but instead of entering 3s and 0s, enter the last four digits (eight hex digits) of the serial number. In our example, ASCII “2345:” is entered as Hex ‘32333435’.
20. When you have finished changing the data in these four offset fields, select SAVE AND CONTINUE. Select YES on the CE SAVE DATA? menu. This takes you back to the CE DRV SER NO menu.
21. To verify the serial number you entered is correct, select ALTER SERIAL NO, and press **Enter**. Scroll through the VPD FIELD OFFSET menu to ensure the hex values you entered are accurate and match the ones you wrote down. If you make any corrections, be sure to save the changes. Select CANCEL, as necessary to return to CE OPTIONS menu.
22. To return to the OPTIONS screen, press the pushbutton, select PROCEED, and press **Enter**.

    Note: The CE WAIT menu may appear momentarily while the new serial number data is written into memory.

Note: You must have root authority to perform the following step.

pSeries/RS6000 (AIX) System Only

23. Update the VPD data in the host pSeries/RS6000 (AIX) System by un-configuring the device **(Example: rmdev -l rmt3)** and reconfiguring the device **(Example: mkdev -l rmt3).**

End of pSeries/RS6000 (AIX) System Only

24. Return to the procedure that sent you here.

Table 9-3. Hex to ASCII Conversion

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
00	Null	30	0	41	A	4A	J	54	T
20	Space	31	1	42	B	4B	K	55	U
		32	2	43	C	4C	L	56	V

Table 9-3. Hex to ASCII Conversion (continued)

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
		33	3	44	D	4D	M	57	W
		34	4	45	E	4E	N	58	X
		35	5	46	F	4F	O	59	Y
		36	6	47	G	50	P	5A	Z
		37	7	48	H	51	Q	5F	–
		38	8	49	I	52	R		
		39	9			53	S		

Note: Not all codes are shown.

FMR Tape Maintenance

The following notes apply to to the following procedures for converting an FMR tape to a scratch tape, updating an FMR tape from the drive, and making an FMR tape from a scratch tape:

Notes:

- 3590 Model B11/B1A drives require 128-track format tapes.
- 3590 Model E11/E1A drives require 256-track format tapes.
- 3590 Model H11/H1A drives require 384-track format tapes.

  If a tape with the wrong track format is loaded, a **Tape write prot'd** message will be displayed.

Converting FMR Tape to Scratch Tape

This procedure converts an FMR tape to a scratch tape.

1. From the CE Options menu, select **FMR Tape**.
2. From the CE FMR Tape menu, select **Unmake FMR Tape**.
3. When prompted, load the FMR tape. When the tape is loaded and at ready point, select **Process Loaded Tape**.
4. After the tape has the header information changed, the final status menu indicates whether the operation was successful.
5. Select **Unload Drive**.

Updating FMR Tape from Drive

This procedure updates an FMR tape with drive microcode.

1. From the CE Options menu, select **FMR Tape**.
2. From the FMR Tape menu, select **Microcode Update** menu.
3. When prompted, load the FMR tape. When the tape is loaded and at ready point, select **Process Loaded Tape**.
4. If the EC level of the code is not on the cartridge, the microcode is copied from the drive to the cartridge.
5. The EC level of the code is displayed via the "Select EC Level" screen.
6. Press Cancel.
7. Select **Unload Drive**.

Making FMR Tape from Scratch Tape

This procedure creates an FMR tape from a scratch tape that will contain the microcode that is active in the device.

Note: If you want to replace the microcode in the device from a field microcode replacement (FMR) tape or want to update the FMR cartridge with the microcode in the drive, go to "Updating Microcode from FMR Cartridge".

1. From the CE Options menu, select **FMR Tape**.
2. From the CE FMR Tape menu, select **Make FMR Tape**. When you are prompted, load a scratch tape. When the tape is loaded and at ready point, select **Process Loaded Tape**.
3. When the EC Levels menu is displayed, select **Cancel**.
4. Select **Unload Drive**.
5. If not labeled, label the cartridge as the FMR tape and save the cartridge in a secure place.

Updating Microcode from FMR Cartridge

There are several levels of FMR cartridge available for 3590 drives:

- An FMR cartridge with 128-track format that has microcode levels for Base Model and Ultra Model B11/B1A drives
- An FMR cartridge with 256-track format that has microcode for the E11/E1A drives
- An FMR cartridge with 384-track format that has microcode levels for the H11/H1A drives

Attention:

The label on the FMR cartridge should clearly state which drive models the cartridge will support.

If a FMR tape with the wrong track format is loaded, a **Tape write prot'd** message will be displayed.

The 128-track format FMR cartridges ordered as a FRU now contain multiple microcode images for support of different levels of the Model B11/B1A 3590 drives, as follows:

- D0IA_xxx = Base Model B11/B1A 3590 drives
- D0IB_xxx = Ultra Model B11/B1A 3590 drives
- D0IF_xxx = Ultra Model B11/B1A 3590 drives with Common Card Pack

A 256-track format FMR cartridges ordered as a FRU now contains microcode images for support of 3590 Model E drives.

- D0IE_xxx = For all Model E11/E1A 3590 drives.

The 384-track format FMR cartridges ordered as a FRU now contain microcode images for support of the 3590 Model H11/H1A drives, as follows:

- D0IF_xxx = For all 3590 Model H11/H1A drives

For more information on 3590 levels, see "3590 Drive Model and Feature Levels" on page 3-34.

Updating Microcode Process

1. Set the 3590 to CE mode.
2. From the CE Options menu, select **FMR Tape**.
3. From the CE FMR Tape menu, select **Microcode Update**.
4. At the Load FMR Tape menu, load the FMR cartridge.
5. When the tape is loaded and at ready point, select **Process Loaded Tape**.
   - The device verifies that FMR tape is correct format for the drive model. Base or Ultra Model B11/B1A drives require 128-track format FMR tapes and E11/E1A drives require 256-track format FMR tapes, and H11/H1A drives require 384-track format FMR tapes.
   - If the current EC level of microcode is **not** already on the FMR cartridge, the 3590 writes the current level of microcode onto the FMR cartridge. This provides the CE with the option to go back to the current level, if necessary.
6. When the Select EC Level menu is displayed, select the desired EC level. (The drive will only display EC levels of microcode that are valid for the EC level of the drive.)

   Note: Do not touch the Reset pushbutton while microcode update is in process.
   - The microcode in the drive is then automatically updated with the latest level of microcode from the FMR tape.
   - When the update is complete, drive status will be displayed.
7. If the update was not successful, **retry** with another cartridge.
8. When the update is successful, select **Unload drive**.

9. Press the Reset pushbutton to activate the microcode.

pSeries/RS6000 (AIX) System Only

Note: You must have root authority to perform the following step.

10. Update the VPD data in the host pSeries/RS6000 (AIX) System by un-configuring the device **(Example: rmdev -l rmt3)** and reconfiguring the device **(Example: mkdev -l rmt3).**

End of pSeries/RS6000 (AIX) System Only

11. Record the EC level and link level of the microcode in “Microcode EC Level History Log” on page 9-61.
12. Save the FMR cartridge in a secure place.

History Log Examples

Microcode EC Level History Log

Figure 9-37 shows how to determine the EC level and link level of the microcode from the operator Services menu. Use the link level **1** to determine the latest EC level. Reference “Identifying Feature Code Level” on page 3-34.

If you read the EC level and link level from the FMR tape (“Updating Microcode from FMR Cartridge” on page 9-58), the link level (LL) is displayed as dddd instead of d_ddd. The following example shows that the second entry is the latest level microcode:

```
EC=6C56789 LL=4D0D
EC=3C56789 LL=5B02  (highest EC level)
```

Table 9-4 shows the EC history of the microcode where you write the EC and link levels of the microcode, the date, and the device serial number. You write the values here when you install the device, replace the card pack, or update the device to a new microcode level.

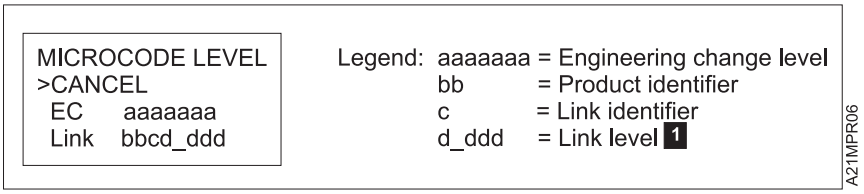


Figure 9-37. Microcode Level Menu

Table 9-4. Microcode EC Level History Log

EC Level	Link Level **1**	Date	Drive Serial Number

Table 9-4. Microcode EC Level History Log (continued)

EC Level	Link Level 1	Date	Drive Serial Number

Fibre Channel World Wide Name History Log

Copy Table 9-5 on page 9-63, and use it as a template to keep a record of the address history of each device. If a replacement of the card pack is necessary, the service representative will have a permanent record of the Port and Node names.

Notes:

1. Be sure the drive is offline. See “Set Offline Menu” on page 5-25.
2. If you alter **any** name you must save or alter all the names. For example, if you alter the Node Name only, you have to at least save Port 0 and Port 1.
3. For 3590, fibre node names and port names are in the range 5005076300XXXXXX.

Every time a card pack is replaced, record the complete row **5** of entries.

1 The customer serial number of the device
2 World Wide Node name
3 World Wide Port 0 name
4 World Wide Port 1 name
5 Next available entry row

Table 9-5. WWID Log Form Example

This table is only necessary if you use zoning and drive is attached to a fibre channel switch that is using zoning function.			
Drive Serial Number	Node Name	0 Port Names 1	
1	**2**	**3**	**4**
00010011	5005076300002047	5005076300402047	5005076300802047
5	**5**	**5**	**5**

Display WW Names Procedure

Note: Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

__ Step 1. Switch to CE mode by pressing the Mode Change pushbutton.
__ Step 2. At the “Confirm Mode Change” menu select “CE Offline Mode”.
__ Step 3. At the“CE Options” menu, select “Config/Install”.
__ Step 4. Next select “Drv Options” then “Drv Serial No”.

Note: For the following steps, enter the data in the WW Name Log Form, as necessary.
__ Step 5. Next, select “Disp Serial No” and record it in the World Wide Names History Log Table.

Table 9-6. DRV Serial No

CE DRV SERIAL NO	RANDOM 2 — LUN **E11FX**
►CANCEL DRV SERIAL 000000010011	**PORT0 ID:—23 OFFLINE** **PORT1 ID:—23 OFFLINE**

__ Step 6. Select Cancel, as necessary, to return to “CE Config/Install” menu.

__ Step 7. Select the “Fibre Addresses” menu.
__ Step 8. Select “Show Node Name”. Record the Node Name in the World Wide Names History Log Table.

Table 9-7. Node Name

NODE NAME	RANDOM 2 — LUN E11FX
►CANCEL NODE NAME 5005076300002077	PORT0 ID:—23 OFFLINE PORT1 ID:—23 OFFLINE

__ Step 9. Select Cancel to return to the “Fibre Addresses” menu.
__ Step 10. Select “Show Port Names”. Record Port 0 and Port 1 Names in the World Wide Names History Log Table.

Table 9-8. Port Names

PORT NAMES	RANDOM 2 — LUN E11FX
►CANCEL PORT 0 NAME 5005076300402077 PORT 1 NAME 5005076300802077	PORT0 ID:—23 OFFLINE PORT1 ID:—23 OFFLINE

__ Step 11. Place the drive online.
__ Step 12. Perform “End of Call” on page 9-8.

Set WW Names Procedure

Notes:
1. If you alter any name you must save or alter all the names. For example, if you alter the Node Name only, you have to at least save Port 0 and Port 1.
2. Refer to “Messages and Supplemental Messages (Fibre Channel Only)” in Table 5-2 on page 5-7 for additional fibre addressing information.

__ Step 1. Be sure the drive is offline.
__ Step 2. At the OPTIONS display screen, switch to CE mode by pressing the Mode Change pushbutton.

Note: The Drive Serial, the Node Name, Port 0 Name and Port 1 Name should have been recorded. If not, see “Display WW Names Procedure” on page 9-63. For the following steps, enter the data in the WW Name Log Form, as necessary.
__ Step 3. At the “Confirm Mode Change” menu select “CE Offline Mode”.
__ Step 4. Select “Config/Install”, then select “Drv Options”.
__ Step 5. At the “CE Drv Options” menu, select “Drv Serial No”.

Note: For the following steps, enter the data in the WW Name Log Form, as necessary.
__ Step 6. Select “Alter Serial No”. Increment each serial number digit, as necessary, to reflect the recorded serial number.

Table 9-9. Alter Serial No

CE VPD Menu	RANDOM 2 — LUN E11FX
►0 ▲ 1 0 0 1 1 SAVE AND CONTINUE	PORT0 ID:--26 OFFLINE PORT1 ID:—23 OFFLINE

__ Step 7. Select SAVE AND CONTINUE, then press **Enter**. This will cause the “CE Save Data?” menu to appear.

Table 9-10. Alter Serial No

CE SAVE DATA	RANDOM 2 — LUN E11FX
►CANCEL ▲ YES NO	Supplemental Message section contents depend of the Data being stored. **Serial** Sequence Number **Node** FC Node Name **Port 0/1** FC Port Name

__ Step 8. Select YES, then press **Enter** to store the data into VPD memory.
__ Step 9. Select Cancel to return to the “CE Config/Install” menu.
__ Step 10. Select “Fibre Addresses”, then select “Set Node Name”.
__ Step 11. Get the Node Name from the World Wide Names History Log Table, and enter the last 6 digits into VPD memory, as shown in the example above. Increment the Node Name digit positions to reflect the recorded Node name.

Table 9-11. CE Set Node Name

SET NODE NAME	RANDOM 2 — LUN E11FX
►0 ▲ 2 0 7 7 SAVE AND CONTINUE	5005076300002077

__ Step 12. Select SAVE AND CONTINUE, then press **Enter**. This will cause the “CE Save Data?” menu to appear.
__ Step 13. At the “Fibre Addresses” menu, select “Set Port 0 Name”.

Table 9-12. Set Port 0 Name

SET PORT 0 NAME	RANDOM 2 — LUN E11FX
►0 ▲ 2 0 7 7 SAVE AND CONTINUE	5005076300402077

__ Step 14. Get the Port 0 Name from the World Wide Names History Log Table, and enter the last 6 digits into VPD memory, as shown in the example above. Increment the Port Name digit positions to reflect the recorded Port Name.
__ Step 15. Select SAVE AND CONTINUE, then press **Enter**. This will cause the “CE Save Data?” menu to appear.
__ Step 16. . Select YES, then press **Enter**, to store the data into VPD memory and return you to the “Fibre Addresses” menu.
__ Step 17. At the “Fibre Addresses” menu, select “Set Port 1 Name”.

Table 9-13. CE Set Port 1 Name

SET PORT 1 NAME	RANDOM 2 — LUN **E11FX**
►0 ▲ 2 0 7 7 SAVE AND CONTINUE	5005076300802077

__ Step 18. Get the Port 0 (1) Name from the World Wide Names History Log Table, and enter the last 6 digits into VPD memory, as shown in the example above. Increment the Port Name digit positions to reflect the recorded Port Name.
__ Step 19. Select SAVE AND CONTINUE, then press **Enter**. This will cause the “CE Save Data?” menu to appear.
__ Step 20. Select YES, then press **Enter**, to store the data into VPD memory and return you to the “Fibre Addresses” menu.
__ Step 21. Now the Serial, Node, Port 0 and Port 1 Names have been set you can return the machine to the customer. You may want to check the names with the “Display WW Names Procedure” on page 9-63 to verify their validity.
__ Step 22. Perform “End of Call” on page 9-8.

Every time a card pack is replaced, record the complete row of entries.

Table 9-14. WWID Log Form Example

Drive Serial Number	Node Name	Port Names 0	Port Names 1

Dump Maintenance Utilities

Off-loading Dumps to Tape Cartridge

The dump icon ⚠ appears when the dump is available and remains on the screen to indicate that trace data is stored in the device.

Attention: Trace data is volatile and is lost if you press the Reset pushbutton or switch OFF power to the device.

1. Press the Change Mode pushbutton to place the drive in CE mode.
2. Select **Dump** from the CE Options menu.
3. Select **Copy Dump to Tape** to copy a dump from dynamic random access memory (DRAM) to a tape cartridge.
4. At the prompt, load a scratch tape and select **Process Loaded Tape**.

   A screen indicates the status of the copy to medium (Successful Copy or Unsuccessful Copy).
5. When the dump to tape has completed, contact your next level of support for further instructions.

   The dump icon ⚠ disappears from the 3590 operator panel when the dump to tape has completed.

Off-loading Dumps to iSeries (OS/400) System

Use the “Off-loading Dumps to Tape Cartridge” procedure.

Off-loading Dumps to pSeries/RS6000 (AIX) System by Using TAPEUTIL

The dump icon ⚠ appears when the dump is available, and remains on the screen to indicate that trace data is stored in the device.

Note: Trace data is volatile and is lost if you press the Reset pushbutton or switch OFF power to the device.

You may require assistance from the customer during this process.

This procedure reads a dump from the 3590 and writes it to a diskette in AIX/UNIX format.

1. On the drive operator panel, verify that the drive is Online.
2. Verify that the drive is unloaded.
3. Verify that the drive is **not in use** by another host.
4. Insert the diskette that will be used for the dump in the system floppy diskette reader.
5. When the prompt appears, format the diskette by typing **format**, and pressing **Enter**.
6. Start the tape utility program by typing **tapeutil** at the prompt.
7. Select **Tape Drive Service Aids** option from the menu, and press **Enter.**
8. Select **Read Dump** from the following panel, and press **Enter**.

```
IBM Tape Device Service Aid Menu                                  700000


 Select One of the Service Aids to be performed

  Force Microcode Dump
    Perform a microcode dump of the system. The dump is stored in
    the device.
    After the dump is performed it must be read using Read Dump.
  Read Dump
    Transfer a dump from the tape device to a host file, diskette or
    a tape cartridge.
  Microcode load
    Download microcode from host file or diskette to tape device via
    SCSI bus.
  Error Log Analysis
    Analyze system error log for device.
F3=Cancel                          F10=Exit
```

9. Select a **Device**, and press **F7=Commit** from the following panel. You must press **F7=Commit** after selecting the drive.

```
IBM Tape Device Selection Menu.                                   900000

 Select One of the devices listed below.

 NAME        LOCATION     TYPE

 rmt2        00-05-01-10  IBM 3590 Tape Drive and Medium Changer
 rmt3        00-05-01-30  IBM 3590 Tape Drive and Medium Changer









F3=Cancel           F7=Commit           F10=Exit
```

10. At the next screen press **F7=Commit** to write the file to the diskette.

```
Prompting for Srce File for Operation on rmt3 located at 00-05-01-30
                                                                  B00000

Please enter the following fields...

  Enter Filename:                                        /dev/rfd0 +/


F1=Help             F2=Refresh          F3=Cancel           F4=List
F5=Reset            F7=Commit           F10=Exit
```

11. Press **F10** to exit the read dump.

The dump icon ⚠ disappears from the 3590 operator panel when the dump to tape has completed.

12. Press **q** to quit tapeutil.
13. Remove the diskette from the diskette reader. The dump diskette created above is in AIX/UNIX format.

Off-loading Dumps to Sun System by Using TAPEUTIL

TAPEUTIL

Refer to *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for details of the **tapeutil** program in the Sun (Solaris) system.

The 3590 supports forcing a diagnostic dump and storing that dump to a mounted tape cartridge or to a host system file via the SCSI bus.

The dump icon ⚠ appears when the dump is available, and remains on the screen to indicate that trace data is stored in the device.

Notes:

1. Trace data is volatile and is lost if you press the Reset pushbutton or switch OFF power to the device.
2. If you force a dump when the dump icon ⚠ is already displayed, the existing trace data will be overlaid by the new trace data.

You may require information from the customer during this process.

To force and store a diagnostic dump on these devices, perform the following steps:

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the drive is not in use by another host.
3. Verify that the drive has no customer cartridges loaded. Scratch cartridge is OK.
4. Enter the following command to force the dump, substituting **n** with the actual value from the device special file associated with the target device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o fdp -v
   ```

5. Determine the location for the dump to be stored (that is, floppy diskette such as /vol/dev/aliases/floppy0 or host file such as /tmp/diag_dump.file).
6. Enter the following command, substituting **file** with the actual path and filename of the dump destination file, and substituting **n** with the actual value from the device special file associated with the dump device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o sdp -z file -v
   ```

7. The dump may also be written to a tape cartridge mounted in the dump device by using ***tapedrive*** for **file**

Note: The diagnostic dump procedure may also be performed using the menu-driven interface of the tapeutil program. To invoke the tapeutil program in this format, enter the following command, and then choose option 1 to open the device, followed by option 5 to force a dump, and option 6 to store the dump:

```
/opt/IBMtape/tapeutil
```

Off-loading Dumps to HP-UX System by Using TAPEUTIL

TAPEUTIL

Refer to *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for details of the **tapeutil** program in the HP-UX system.

The 3590 supports forcing a diagnostic dump and storing that dump to a mounted tape cartridge or to a host system file via the SCSI bus.

The dump icon ⚠ appears when the dump is available, and remains on the screen to indicate that trace data is stored in the device.

Notes:

1. Trace data is volatile and is lost if you press the Reset pushbutton or switch OFF power to the device.
2. If you force a dump when the dump icon ⚠ is already displayed, the existing trace data will be overlaid by the new trace data.

You may require information from the customer during this process.

To force and store a diagnostic dump on these devices, perform the following steps:

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the drive is not in use by another host.
3. Verify that the drive has no customer cartridges loaded. Scratch cartridge is OK.
4. Enter the following command to force the dump, substituting **n** with the actual value from the device special file associated with the target device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o fdp -v
   ```

5. Determine the location for the dump to be stored (that is, floppy diskette such as /vol/dev/aliases/floppy0 or host file such as /tmp/diag_dump.file).
6. Enter the following command, substituting **file** with the actual path and filename of the dump destination file, and substituting **n** with the actual value from the device special file associated with the dump device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o sdp -z file -v
   ```

7. The dump may also be written to a tape cartridge mounted in the dump device by using ***tapedrive*** for **file**

Note: The diagnostic dump procedure may also be performed using the menu-driven interface of the tapeutil program. To invoke the tapeutil program in this format, enter the following command, and then choose option 1 to open the device, followed by option 5 to force a dump, and option 6 to store the dump:

```
/opt/IBMtape/tapeutil
```

Off-loading Dumps to SP2 by Using TAPEUTIL

The dump icon ⚠ appears when the dump is available, and remains on the screen to indicate that trace data is stored in the device.

Note: Trace data is volatile and is lost if you press the Reset pushbutton or power OFF the device.

You may require assistance from the customer during this process.

This procedure reads a dump from the 3590 and writes it to a file and then to a diskette in AIX/UNIX format.

1. On the drive operator panel, verify that the drive is Online.
2. Verify that the drive is unloaded.
3. Insert the diskette that will be used for the dump in the Control Work Station (CWS) diskette reader.
4. Format the diskette by typing **format** at the prompt, and pressing **Enter**.
5. Connect to the target node by typing **telnet nodeid**.
   Enter a login id and a password when prompted.
6. Start the tape utility program by typing **tapeutil** at the prompt.
7. Choose **Tape Drive Service Aids** from the menu, and press **Enter**.
8. Choose **Read Dump** from the following panel, and press **Enter**.

```
IBM Tape Device Service Aid Menu                                  700000


 Select One of the Service Aids to be performed

  Force Microcode Dump
    Perform a microcode dump of the system. The dump is stored in
    the device.
    After the dump is performed it must be read using Read Dump.
  Read Dump
    Transfer a dump from the tape device to a host file, diskette or
    a tape cartridge.
  Microcode load
    Download microcode from host file or diskette to tape device via
    SCSI bus.
  Error Log Analysis
    Analyze system error log for device.
```

9. Select a **Device**, and press **F7=Commit** from the following panel. You must press **F7=Commit** after selecting the drive.

```
IBM Tape Device Selection Menu.                                   900000

 Select One of the devices listed below.

 NAME        LOCATION     TYPE

 rmt2        00-05-01-10  IBM 3590 Tape Drive and Medium Changer
 rmt3        00-05-01-30  IBM 3590 Tape Drive and Medium Changer


F3=Cancel           F7=Commit           F10=Exit
```

10. Enter the filename **/tmp/3590.dmp** in the destination field.

You must press **F7=Commit** after entering the filename.

```
Prompting for Dest File for Operation on rmt3 located at 00-05-01-30
                                                                B00000

Please enter the following fields...

  Enter Filename:                                      /tmp/3590.dmp


F1=Help             F2=Refresh          F3=Cancel           F4=List
Esc+5=Reset         F7=Commit           F10=Exit
```

11. Press **F10** to exit the read dump.

    The dump icon ⚠ disappears from the 3590 operator panel when the dump to file has completed.
12. Press **q** to quit tapeutil.
13. Press **Ctrl+]** to get a telnet> prompt, then type **quit** to stop the TELNET session.
14. Copy the file /tmp/3590.dmp from the SP2 node that has the 3590 attached.
    a. Connect to the target node by typing **ftp nodeid**.
       Enter a Name and a Password when prompted.
    b. Set Binary mode by typing **binary**.
    c. Transfer the file by typing **get /tmp/3590.dmp /tmp/3590.dmp**.
    d. Quit the connection by typing **quit**.
15. Copy the contents of the file to the diskette on the CWS by typing
    dd if=/tmp/3590.dmp of=/dev/rfd0 bs=18k conv=sync at the prompt.
16. Remove the diskette from the diskette reader. The dump diskette created above is in AIX/UNIX format.

Off-loading Dumps to Windows NT or Windows 2000 System by Using NTUTIL

NTUTIL

Refer to “Appendix A” on page B-1 for more information on using *ntutil* in a Windows NT or Windows 2000 environment. For a complete update on device driver software, see the *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User’s Guide*.

Note: The dump procedure may be performed using the menu-driven interface of the ntutil program. To invoke the ntutil program in this format, enter the common commands and option 80 to Force Dump:

Remember the dump goes to the default drive/directory.

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the tape drive has a tape cartridge loaded.
3. Start ntutil and open the drive (see step 1 on page 9-86).
4. Determine the version of microcode present on the device by entering the following command **85** (Get Version).
5. Force the dump by entering the following command **80** (Force Dump).

   If the operation completed successfully (Message **Error_Success**), go to end of test 11 on page 9-86, or go to the Start Page of “SCSI Bus Problem Determination” on page 9-108.

Off-loading Dumps to Linux System by Using TAPEUTIL

The dump icon ⚠ appears when the dump is available, and remains on the screen to indicate that trace data is stored in the device.

Note: Trace data is volatile and is lost if you press Reset or power off the device.

1. On the drive operator panel, verify that the drive is Online.
2. Verify that the drive is unloaded.
3. Verify that the drive is not in use by another host.
4. Start the tape utility program by typing **IBMtapeutil** at the prompt.

```
IBMtapeutil for Linux
==============================
  1. Tape
 2. Chager
 3. Quit
==============================

Enter your choice:
```

5. Select **1** (Tape).

```
Hit <enter> to continue...

-------------------- General Commands: ----------------------------
    1. Open a Device                7. Request Sense
    2. Close a Device               8. Log Sense Page
    3. Inquiry                      9. Mode Sense Page
    4. Test Unit Ready             10. Switch Tape/Changer Device
    5. Reserve Device              11. Create Special Files
    6. Release Device              12. Query Driver Version
    Q. Quit IBMtapeutil
------------------- Medium Changer Commands: ----------------------
   60. Element Information         65. Load/Unload Medium
   61. Position To Element         66. Initialize Element Status
   62. Element Inventory           67. Prevent/Allow Medium Removal
   63. Exchange Medium             68. Initialize Element Status Range
   64. Move Medium                 69. Read Device Identifiers
-------------------- Service Aid Commands: ------------------------
   70. Dump Device                 72. Load Ucode
   71. Force Dump                  73. Reset Drive
-----------------------------------------------------------------
   99. Back To Main Menu

Enter Selection: :
```

6. Enter **1** (Open a Device).
7. Enter **/dev/IBMtape0** when prompted for the device name.
8. Enter **1** (Read/Write) (not shown).

```
-------------------- General Commands: --------------------------
    1. Open a Device                 7. Request Sense
    2. Close a Device                8. Log Sense Page
    3. Inquiry                       9. Mode Sense Page
    4. Test Unit Ready              10. Switch Tape/Changer Device
    5. Reserve Device               11. Create Special Files
    6. Release Device               12. Query Driver Version
    Q. Quit IBMtapeutil
--------------------- Tape Commands: -----------------------------
   20. Rewind                       33. Set Block Size
   21. Forward Space Filemarks      34. Retension Tape
   22. Backward Space Filemarks     35. Query/Set Tape Position
   23. Forward Space Records        36. Query Tape Status
   24. Backward Space Records       37. Load Tape
   25. FSFM                         38. Unload Tape
   26. BSFM                         39. Lock Tape Drive Door
   27. Space to End of Data         40. Unlock Tape Drive Door
   28. Read and Write Tests         41. Take Tape Offline
   29. Write Filemarks              42. Enable/Disable Compression
   30. Read or Write Files          43. Flush Driver's Buffer
   31. Erase                        44. Self Test
   32. Reset Drive                  45. Display Message
--------------------- IBMtape Commands: ----------------------------
   46. Query Sense                  52. Locate Tape Position
   47. Query Inquiry                53. Read Tape Position
   48. Query/Set Tape Parameters    54. Query Mtdevice Number
   49. Query/Set Tape Position      55. Synchronize Buffers
   50. Query/Set MT/ST Mode         56. List Tape Filemarks
   51. Report Density Support
--------------------- Service Aid Commands: ------------------------
   70. Dump Device                  72. Load Ucode
   71. Force Dump                   73. Reset Drive
-------------------------------------------------------------------
   99. Back To Main Menu

Enter Selection:
```

9. Select **70** (Dump Device).
10. Specify the file name from which the dump is to be read, then press **Enter**.
11. Enter **Q** to quit the program.

Microcode Maintenance

Updating Microcode from iSeries (OS/400) System

Microcode load for the 3590 tape drives directly attached to an iSeries/AS400 (OS/400) System with the SCSI is obtained from the iSeries/AS400 (OS/400) System using the program temporary fix (PTF) process.

1. Notify the customer that a microcode load for the 3590 is available via a PTF.
2. The customer will apply the PTF.
3. Before the customer IPLs the input/output processor (IOP):
   - Verify that the drive is unloaded.
   - On the drive operator panel, verify that the drive is online. The PTF indicates that the drive must be varied on with a reset.
4. The customer can now IPL the IOP. The IPL causes the microcode load to proceed.
5. When the microcode load is complete, the drive performs a soft power-on reset (restarts the code).
6. Update the account FMR cartridge. See “Updating Microcode from FMR Cartridge” on page 9-58.

Updating Microcode from pSeries/RS6000 (AIX) System by Using TAPEUTIL

You may require assistance from the customer during this process.

Notes:

1. Do not use this procedure if the pSeries/RS6000 (AIX) System is in a VTS, 3494, or 3590 A60/A50. Go to the B16/B18 VTS MI.
2. If you were provided **two** FMR diskettes, you are loading microcode at the D0IF_xxx level. For all other levels, you will load microcode from **one** FMR diskette.

This procedure downloads microcode to the tape drive from a file or from diskettes via the SCSI bus or fibre channel. These diskettes must be in AIX/UNIX format. The Microcode Load utility is only supported on the IBM 3590 tape drive.

1. On the drive operator panel, verify that the drive is Online.
2. Verify that the drive is unloaded.
3. Verify that the drive is not in use by another host.

   Notes:

   a. If you are loading microcode at D0IF_xxx, go to step 5.
   b. If you are loading microcode at all levels **other than** D0IF_xxx, go to step 4.
4. Insert the diskette with the microcode load in the pSeries/RS6000 (AIX) System diskette reader. Continue with the remainder of this procedure beginning with step 9.
5. Find a directory (such as **/tmp** or **/etc/microcode**) in the AIX file system that is at least large enough to accommodate a 2MB image:

   ```
   cd/tmp              #   or   cd/etc/microcode
   ```
6. Insert the first AIX FMR diskette (Disk 1 of 2) into the diskette reader.
7. Use the following **tar** command to restore an FMR image:

   ```
   tar -xvf /dev/rfd0
   ```

   The **tar** command will prompt you to to insert the second AIX FMR diskette (Disk 2 of 2) to complete the image extraction.
8. The FMR image (D0IF_xxx.fmrz) will be extracted and restored in the current directory (such as **/tmp** or **/etc/microcode**, for this example), and can be used for FMR.
9. Start the tape utility program by typing **tapeutil** at the prompt.

10. Select Tape Drive Service Aids from the menu by selecting **Tape Drive Service Aids** option, and pressing **Enter**.
11. Select **Microcode load** from the following panel, then press **Enter**.

```
IBM Tape Device Service Aid Menu                                  700000


 Select One of the Service Aids to be performed

  Force Microcode Dump
    Perform a microcode dump of the system. The dump is stored in
    the device.
    After the dump is performed it must be read using Read Dump.
  Read Dump
    Transfer a dump from the tape device to a host file, diskette or
    a tape cartridge.
  Microcode load
    Download microcode from host file or diskette to tape device via
    SCSI bus.
  Error Log Analysis
    Analyze system error log for device.
F3=Cancel                            F10=Exit
```

12. Select a **Device**, and press **F7=Commit** from the following panel. You must press **F7=Commit** after selecting the drive.

```
IBM Tape Device Selection Menu.                                   900000

 Select One of the devices listed below.

 NAME        LOCATION     TYPE

 rmt2        00-05-01-10  IBM 3590 Tape Drive and Medium Changer
 rmt3        00-05-01-30  IBM 3590 Tape Drive and Medium Changer









F3=Cancel           F7=Commit           F10=Exit
```

13. If loading the microcode from the diskette reader, press **F7=Commit** from the following panel. Otherwise, enter the **path** and **filename**, and press **F7=Commit**.

    Enter the filename **./xxx.yyyy** in the source field where xxx.yyyy is the filename of the microcode file to be loaded. For example, type **./762.fmrz**.

    Important: Be sure to select the proper code file for the type of drive to be updated.

    - Base 3590 Model B11/B1A = D0I9_xxx.fmrz, or D0IA_xxx.fmrz
    - Ultra 3590 Model B11/B1A =
      - D0IB_xxx.fmrz
      - D0ID_xxx.fmrz
      - D0IE_xxx.fmrz

      OR

– D0IF_xxx.fmrz (with Common Card Pack)

- 3590 Model E11/E1A =
  – D0IC_xxx.fmrz
  – D0ID_xxx.fmrz
  – D0IE_xxx.fmrz
  OR
  – D0IF_xxx.fmrz
- 3590 Model H11/H1A = D0IF_xxx.fmrz

Note: For more information about microcode compatibility, see Table 3-5 on page 3-30.

To determine the type of drive you are updating, refer to "3590 Drive Model and Feature Levels" on page 3-34.

You must press **F7=Commit** after entering the filename.

```
Prompting for Srce File for Operation on rmt3 located at 00-05-01-30
                                                                B00000

Please enter the following fields...

  Enter Filename:                                      D0IF_xxx.fmrz


F1=Help             F2=Refresh          F3=Cancel           F4=List
F5=Reset            F7=Commit           F10=Exit
```

Note: Use the full path name for the file (such as, **/tmp/D0IF_xxx.fmrz** in the example) if you are in a different directory.

14. While the microcode load takes place, the display shows:

```
   "Operation running, please stand by"
```

The drive display shows the loading status messages at the bottom of the display.

15. When the microcode load completes, the initiator display shows:

```
Operation completed successfully!
```

The drive performs a soft power-on reset (restart the code).

16. Press **F10** to exit the microcode load.
17. Press **q** to quit tapeutil.
18. Remove the diskette from the diskette reader.

Note: You must have root authority to perform the following step.

19. Update the VPD data in the host pSeries/RS6000 (AIX) System by unconfiguring the device **(Example: rmdev -l rmt3)** and reconfiguring the device **(Example: mkdev -l rmt3).**
20. Update the account FMR cartridge. See "Updating Microcode from FMR Cartridge" on page 9-58.

Updating Microcode from LINUX by Using TAPEUTIL

You may require assistance from the customer during this process.

1. On the drive operator panel, verify that the drive is Online.
2. Verify that the drive is unloaded.
3. Verify that the drive is not in use by another host.
4. Start the tape utility program by typing **IBMtapeutil** at the prompt.

```
IBMtapeutil for Linux
=============================
  1. Tape
 2. Chager
 3. Quit
=============================

Enter your choice:
```

5. Select **1** (Tape).

```
Hit <enter> to continue...

---------------------- General Commands: ---------------------
    1. Open a Device           7. Request Sense
    2. Close a Device          8. Log Sense Page
    3. Inquiry                 9. Mode Sense Page
    4. Test Unit Ready        10. Switch Tape/Changer Device
    5. Reserve Device         11. Create Special Files
    6. Release Device         12. Query Driver Version
    Q. Quit IBMtapeutil
---------------------- Medium Changer Commands: --------------
   60. Element Information    65. Load/Unload Medium
   61. Position To Element    66. Initialize Element Status
   62. Element Inventory      67. Prevent/Allow Medium Removal
   63. Exchange Medium        68. Initialize Element Status Range
   64. Move Medium            69. Read Device Identifiers
---------------------- Service Aid Commands: -----------------
   70. Dump Device            72. Load Ucode
   71. Force Dump             73. Reset Drive
-------------------------------------------------------------
   99. Back To Main Menu

Enter Selection: :
```

6. Enter **1** (Open a Device).
7. Enter **/dev/IBMtape0** when prompted for the device name.
8. Enter **1** (Read/Write) (not shown).

```
---------------------- General Commands: ---------------------
    1. Open a Device                  7. Request Sense
    2. Close a Device                 8. Log Sense Page
    3. Inquiry                        9. Mode Sense Page
    4. Test Unit Ready               10. Switch Tape/Changer Device
    5. Reserve Device                11. Create Special Files
    6. Release Device                12. Query Driver Version
    Q. Quit IBMtapeutil
---------------------- Tape Commands: ------------------------
   20. Rewind                        33. Set Block Size
   21. Forward Space Filemarks       34. Retension Tape
   22. Backward Space Filemarks      35. Query/Set Tape Position
   23. Forward Space Records         36. Query Tape Status
   24. Backward Space Records        37. Load Tape
   25. FSFM                          38. Unload Tape
   26. BSFM                          39. Lock Tape Drive Door
   27. Space to End of Data          40. Unlock Tape Drive Door
   28. Read and Write Tests          41. Take Tape Offline
   29. Write Filemarks               42. Enable/Disable Compression
   30. Read or Write Files           43. Flush Driver's Buffer
   31. Erase                         44. Self Test
   32. Reset Drive                   45. Display Message
---------------------- IBMtape Commands: --------------------
   46. Query Sense                   52. Locate Tape Position
   47. Query Inquiry                 53. Read Tape Position
   48. Query/Set Tape Parameters     54. Query Mtdevice Number
   49. Query/Set Tape Position       55. Synchronize Buffers
   50. Query/Set MT/ST Mode          56. List Tape Filemarks
   51. Report Density Support
---------------------- Service Aid Commands: ----------------
   70. Dump Device                   72. Load Ucode
   71. Force Dump                    73. Reset Drive
-------------------------------------------------------------
   99. Back To Main Menu

Enter Selection:
```

9. Select **72** (Load Ucode).
10. Specify the file name from which the microcode image is to be read, then press **Enter**.
11. Enter **Q** to quit the program.

Updating Microcode from Sun System by Using TAPEUTIL

TAPEUTIL

Refer to *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for details of the **tapeutil** program in the Sun (Solaris) system.

You may require assistance from the customer during this process.

The 3590 supports downloading a new microcode image from the host system via the SCSI bus. This procedure downloads microcode to the tape drive from a file or diskette. This diskette must be in AIX/UNIX format.

To download microcode to these devices, perform the following steps:

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the tape drive does not currently have a tape cartridge loaded.
3. Verify that the drive is not in use by another host.
4. Determine the current version of microcode present on the device by entering the following command, substituting **n** with the actual value from the device special file associated with the target device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nm -o qmc -v
   ```

5. Determine the source of the new microcode image file (that is, floppy diskette such as /vol/dev/aliases/floppy0 or host file such as /tmp/ucode_image.file).
6. Enter the following command, substituting **file** with the actual path and filename of the microcode image file, and substituting **n** with the actual value from the device special file associated with the destination device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nm -o dmc -v -z file
   ```

Note: The microcode download procedure may also be performed using the menu-driven interface of the tapeutil program. To invoke the tapeutil program in this format, enter the following command, and then choose option 1 to open the device, followed by option 4 to query the current device microcode level, and option 7 to download new microcode.

```
/opt/IBMtape/tapeutil
```

Updating Microcode from HP-UX System by Using TAPEUTIL

TAPEUTIL

Refer to *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide,*, for details of the **tapeutil** program in the HP-UX system.

You may require assistance from the customer during this process.

The 3590 supports downloading a new microcode image from the host system via the SCSI bus. This procedure downloads microcode to the tape drive from a file or diskette. This diskette must be in AIX/UNIX format.

To download microcode to these devices, perform the following steps:

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the tape drive does not currently have a tape cartridge loaded.
3. Verify that the drive is not in use by another host.
4. Determine the current version of microcode present on the device by entering the following command, substituting **n** with the actual value from the device special file associated with the target device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o qmc -v
   ```

5. Determine the source of the new microcode image file (that is, floppy diskette such as /vol/dev/aliases/floppy0 or host file such as /tmp/ucode_image.file). Be sure to select the proper file for the EC level of the drive (Ultra or Base 3590) that you are attempting to update. For more information, see "3590 Drive Model and Feature Levels" on page 3-34.
6. Enter the following command, substituting **file** with the actual path and filename of the microcode image file, and substituting **n** with the actual value from the device special file associated with the destination device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o dmc -z file -v
   ```

Note: The microcode download procedure may also be performed using the menu-driven interface of the tapeutil program. To invoke the tapeutil program in this format, enter the following command, and then choose option 1 to open the device, followed by option 4 to query the current device microcode level, and option 7 to download new microcode.

```
/opt/IBMtape/tapeutil
```

Updating Microcode from Windows NT or Windows 2000 System by Using NTUTIL

NTUTIL

Refer to APPENDIX A for more information on using *ntutil* in the Windows NT or Windows 2000 system environment. For a complete update on device driver software, see the *IBM SCSI Tape Drive, Medium Changer, and 3590 Device Drivers: Installation and User's Guide*.

You may require assistance from the customer during this process.

The 3590 supports downloading a new microcode image from the host system via the SCSI bus. This procedure downloads microcode to the tape drive from a file or diskette.

Note: The microcode download procedure may be performed using the menu-driven interface of the ntutil program. To invoke the ntutil program in this format, go to the common start: followed by commands: option 20 to open the device, followed by option 85 to query the current device microcode level, and option 82 to download new microcode:

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the tape drive does not have a tape cartridge loaded.
3. Start ntutil and open the drive (see step 1 on page 9-86).
4. Determine the version of microcode present on the device by entering the following command **85** (Get Version).
5. Update the code by entering the following command **82** (Update Code).

   Ntutil will prompt you for the code level.
6. Enter the code level (**D0IA_2FC**, for example).

   This command will call the device driver DeviceIoControl ( ) entry point, and will load the new microcode.
7. Go to the Close routine, and complete step 10 on page 9-86.

Updating Microcode From SP2 by Using TAPEUTIL

You may require information/assistance from the customer during this process.

This procedure downloads microcode to the tape drive from a file or diskette via the SCSI bus fibre channel. This diskette must be in AIX/UNIX format. The Microcode Load utility is only supported on the IBM 3590 Tape Drive.

1. Insert the diskette with the microcode load in the Control Work Station (CWS) diskette reader. Be sure to select the proper EC level of diskette for the drive that is being updated. To determine the EC level of the drive, see "3590 Drive Model and Feature Levels" on page 3-34.
2. Copy the contents of the diskette to a file on the CWS by typing

   cp /dev/rfd0 /tmp/3590.fmr at the prompt.
3. Copy the file /tmp/3590 to the SP2 node that has the 3590 attached.
   a. Connect to the target node by typing **ftp nodeid**.

      Enter a Name and a Password when prompted.
   b. Set Binary mode by typing **binary**.
   c. Transfer the file by typing **put /tmp/3590.fmr /tmp/3590.fmr**.
   d. Quit the connection by typing **quit**.
4. On the drive operator panel, verify that the drive is Online.
5. Verify that the drive is unloaded.

6. Verify that the drive is **NOT IN USE** by another host.
7. Connect to the target node by typing **telnet nodeid**.
   Enter a login id and a password when prompted.
8. Start the tape utility program on the target node by typing **tapeutil** at the prompt.
9. Choose **Tape Drive Service Aids** from the menu, and press **Enter**.
10. Choose **Microcode load** from the following panel, then press **Enter**.

```
IBM Tape Device Service Aid Menu                                  700000


 Select One of the Service Aids to be performed

  Force Microcode Dump
    Perform a microcode dump of the system. The dump is stored in
    the device.
    After the dump is performed it must be read using Read Dump.
  Read Dump
    Transfer a dump from the tape device to a host file, diskette or
    a tape cartridge.
  Microcode load
    Down-load microcode from host file or diskette to tape device via
    SCSI bus.
  Error Log Analysis
    Analyze system error log for device.
```

11. Select a **Device**, and press **F7=Commit** from the following panel. You must press **F7=Commit** after selecting the drive.

```
IBM Tape Device Selection Menu.                                   900000

 Select One of the devices listed below.

 NAME        LOCATION     TYPE

 rmt2        00-05-01-10  IBM 3590 Tape Drive and Medium Changer
 rmt3        00-05-01-30  IBM 3590 Tape Drive and Medium Changer









F3=Cancel           F7=Commit           F10=Exit
```

12. Enter the filename **/tmp/3590.fmr** in the source field.
    You must press **F7=Commit** after entering the filename.

```
Prompting for Srce File for Operation on rmt3 located at 00-05-01-30
                                                                 B00000

Please enter the following fields...

  Enter Filename:                                  /tmp/3590.fmr


F1=Help             F2=Refresh          F3=Cancel           F4=List
F5=Reset            F7=Commit           F10=Exit
```

13. While the microcode load takes place the display shows

```
"Operation running, please stand by"
```

    The drive display shows the loading status messages at the bottom of the display.

14. When the microcode load completes the initiator display shows

```
Operation completed successfully!
```

    The drive performs a soft power-on reset (restart the code).

15. Press **F10** to exit the microcode load.
16. Press **q** to quit tapeutil.

    Note: You must have root authority to perform the following step.

17. Update the VPD data in the host pSeries/RS6000 (AIX) System by unconfiguring the device **(Example: rmdev -l rmt3).** and reconfiguring the device **(Example: mkdev -l rmt3).**
18. Press **Ctrl+]** to get a telnet> prompt, then type **quit** to stop the TELNET session.
19. Remove the diskette from the diskette reader.
20. Update the account FMR cartridge. See “Updating Microcode from FMR Cartridge” on page 9-58.

Starting NT UTILITY (ntutil) from Windows NT or Windows 2000

NTUTIL

Refer to APPENDIX A for more information on using *ntutil* in the Windows NT or Windows 2000 system environment. For a complete update on device driver software, see the *IBM SCSI Tape Drive, Medium Changer, and 3590 Device Drivers: Installation and User's Guide*.

You may require assistance from the customer during this process.

1. This is a common start, open, and close procedure.
2. Click the **Start** icon.
3. Click on the **Program.**
4. Click on the **Command Prompt**

   The cursor will be at the right of the default prompt **C:\>** Any data that is read will be stored in that drive/directory and any data written will try to originate from the same drive/directory. If you wish to read or write to or from a different drive/directory, enter **cd newdir** (where newdir is a fully qualified valid drive and dir) to change to the new directory.
5. Enter **ntutil**
6. The following menu will appear on the screen.

```
Manual Test:
Batch Test:
Exit ntutil:
    Enter Command:
```

7. Select **Manual Test**

   The Manual menu will appear (see Figure 9-38 on page 9-87).
8. Select **Open** by its number **20** open.

```
SYNTAX: open device-file RW
               $D          RO

        where RW means read/write
              RO means read only

        for example,
              open RW         means open default device tape0
              open $D RO      means open device specified by -d option
              open tape0 RO   means open device tape0

  If the special file $D is specified, the -d value must be given on the
  command line, and will be substituted for $D.
```

9. * * * Select the desired test to run by its number. * * *

   Run the appropriate tests and complete the necessary tasks.

   * * * Return here to finish the call. * * *
10. Select **Close 21**, then press **Enter**.
11. After tests are complete, quit the **Command Prompt** window by clicking on the **X** in the upper right hand corner of the screen.
12. Call completed: see "End of Call" on page 9-8.

BASE MODE

```
Test tool version x.x.x.x
Variable settings
=================== BASE MODE =======================================
gp->fd0=-1  gp->fd1=-1 block size=1024  block count=1
hex block id = 0000000000000000
return_error_when_fail 1  exit_on_unexpected_result 0  trace_flag 0

manual test menu:
=========================================================================
  1: set device special file             2: display symbols
  3: set block size R/W (now !0 fixed)   4: set block count (R/W)
  5: set return error when fail          6: set/reset trace
  7: set exit on unexpected result       8: Library Mode
=========================================================================
 20: open                               21: close
 22: read                               23: write
 24: read and display block             25: flush (buffer->media)
 26: read block id                      27: erase
 28: locate block id                    29: display block data
=========================================================================
 30: write filemark(s)                  31: rewind
 32: forward space filemark(s)          33: unload
 34: reverse space filemark(s)          35: load (3590 System Mode)
 36: forward space record(s)            37: return error
 38: reverse space record(s)            39: test unit ready
 43: set media parms (block size)       44: set dev parms (compression)
 46: get device information
 48: get medium information             49: inquiry
 53: space EOD                          54: display message
=========================================================================
 70: system command

=========================================================================
 80: Force Dump                         81: Read Dump
 82: Update Code                        83: Log Sense
 84: Get Last Sense                     85: Get Version
 86: Associative/Persistent WProtect    87: Read/Write Test
 88: Find Devices                       89: Get MTDevice info
=========================================================================
 99: return to main menu

=========================================================================
enter selection:
```

Figure 9-38. Base Mode

Exercising Drive Attached to Windows NT or Windows 2000 by Using NTUTIL

NTUTIL

Refer to “Appendix A” on page B-1 for more information on using *ntutil* in the Windows NT or Windows 2000 system environment. For a complete update on device driver software, see the *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User’s Guide*.

Note: The drive exercise procedure may be performed using the menu-driven interface of the ntutil program. To invoke the ntutil program in this format, enter the common commands and option 87 to Read/Write Test:

Remember the read/write test writes on the tape. **Use a scratch tape.**

1. Verify that the IBM tape subsystem is powered ON and online.
2. Verify that the tape drive has a scratch tape cartridge loaded.
3. Start ntutil and open the drive (see 1 on page 9-86).
4. Perform either a **rewind** (31) or a **test unit ready** (39) to clear not-ready to ready status. If status is present, NTUTIL will issue a 1110 (ERROR_MEDIA_CHANGED) message.
5. Read and write on the tape by using the following command **87** (Read/Write Test).

   If the operation completed successfully (Message **Error_Success**), go to the end of test, step 11 on page 9-86, or go to the Start Page of “SCSI Bus Problem Determination” on page 9-108.

Host Attachment Checkout

Checking Channel Attachment – iSeries (OS/400)

To verify that a 3590 is attached properly to an iSeries/AS400 (OS/400) System, perform the following:

1. Type **WRKCFGSTS *DEV *TAP ASTLVL(*BASIC)** at the prompt. The following screen appears, which shows all of the attached tape device names. In this example, TAP13 **1** is the device name to use for VFYTAP.

```
                            Work with Tape Devices
                                                          System: 12345678
Type options below, then press Enter.
  1=Make available    2=Make unavailable       5=Display details
  7=Display message   8=Work with controller   9=Rename
  13=Change description

Opt  Device      Type    Status
     TAPM1.B1    3590    Unavailable (use Opt 1)
     TAP01       6380    Unavailable (use Opt 1)
     TAP02       3490    Unavailable (use Opt 1)
     TAP03       3490    Unavailable (use Opt 1)
     TAP09       6390    Unavailable (use Opt 1)
     TAP10       3480    Unavailable (use Opt 1)
     TAP11       3480    Unavailable (use Opt 1)
     TAP13  1
   3590    Available to use
     TAP14       6390    Unavailable (use Opt 1)
     TAP15       6380    Unavailable (use Opt 1)
     TAP16       6390    Available to use
     TAP17       6380    Available to use
                                                                      Bottom

F1=Help  F3=Exit  F5=Refresh F9=Command line F11=Display descriptions
F12=Cancel      F17=Top     F18=Bottom  F21=Select assistance level
```

2. Type **VFYTAP** (the Verify Tape command) on the iSeries/AS400 (OS/400) System command line.
3. Type **tap13**, the device associated with the 3590 tape device.
4. Select the **Basic read/write test** **2** option on the Tape Device Test menu and follow the instructions provided.

```
  AJCUHQV2                                        Tape Device Test Menu

        Select one of the following:

             1. Basic read/write test  2
             2. Read/write reliability test
             3. Exit test menu  3

  Selection
      _

  F3=Exit
```

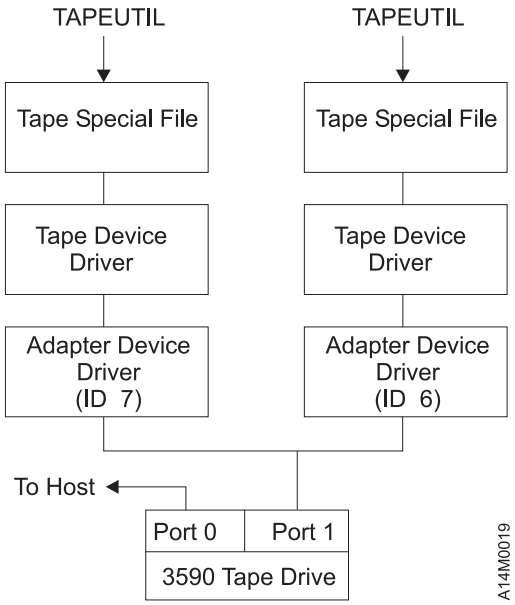
The following screen is displayed when the verification test completes successfully:

```
AJCUHQV3          Tape Problem Analysis

      The verification test completed successfully.

      Press Enter to continue.
```

5. When the Tape Device Test menu is displayed, select **Exit test menu** **3** .

Checking Channel Attachment – AIX

The devices must be fully installed and the host device driver must be configured and available. See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for information about installing and using the IBM tape drive, medium changer, and library device drivers. Also, "Installation and Configuration Instructions" in the above guide describes the *smit* and *cfgmgr* commands. Figure 9-39 shows an example of software and hardware paths that are used in the following tests. The figure below illustrates unique *initiator* addresses for a configuration with more than one initiator sharing a SCSI bus or fibre channel.



Note: Port 1 of a 3590 is connected to two hosts. Host drivers are configured so that one initiator is at SCSI or Fibre ID address 7 and one initiator is at SCSI or Fibre ID address 6. Tape special file names on each host are independent and may be different.

Figure 9-39. Host Attachment Example

Inquiry Command

The following are two sequence of events when we inquiry our tape devices. The first is for SCSI only and the second is for mixed SCSI and fibre channel operation.

SCSI Inquiry Sequence:

1. To check installed tape devices, type **lsdev -Cc tape** command. From the listing of devices, remember the ones you are to test. In the following example, device rmt0 is *defined* **1** to host, but is not configured. Device rmt1 is *available*, which indicates it can communicate with host. The SCSI port address of devices **2** are also shown. The format is "address,0". In the below figure rmt0 (2,0) is SCSI address 2 and rmt1 (1,0) is SCSI address 1.

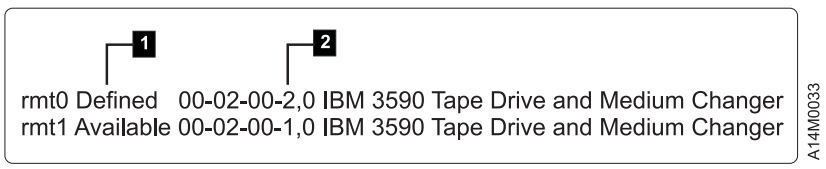


Figure 9-40. Device SCSI Addresses

The example in the following text refers to the device *rmt1*. If you do not know which devices to test, ask the customer's system administrator.

2. Type **tapeutil** and the following menu appears:

   Note: Your tapeutil menus may vary from the examples, depending on the level of **Atape.driver** installed in your system. The following examples are using **Atape.driver** at 2.5.1.0.

```
 General Commands:
    1. Open a Device             5. Inquiry            9. Log Sense Page
    2. Close a Device            6. Test Unit Ready   10. Mode Sense Page
    3. Device Info               7. Reserve Device    11. Release Device
    4. Tape Drive Service Aids   8. Request Sense      Q. Quit Program

 Medium Changer Commands:
   12. Element Information      16. Move Medium
   13. Position To Element      17. Load/Unload Medium
   14. Element Inventory        18. Initialize Element Status
   15. Prevent Medium Removal   19. Allow Medium Removal

 Tape Commands:
   20. Query/Set Parameters     30. Read and Write Tests
   21. Load Tape                31. Unload Tape
   22. Rewind                   32. Erase
   23. Erase Gap                33. Write Filemarks
   24. Forward Space Filemarks  34. Backward Space Filemarks
   25. Forward Space Records    35. Backward Space Records
   26. Space to End of Data     36. Query/Set Tape Position
   27. Log Sense                37. Library Sequence Number
   28. Display Message          38. Read or Write Files
   29. Synchronize Buffers      39. Recover Buffer Data

Enter Selection:
```

3. At the **Enter Selection:** prompt, select the **Open a Device** option, and press **Enter**.
4. At the **Enter the device special file name:** prompt, type **/dev/rmt1** (or your actual device).
5. At the **Select mode (1=Read/Write, 2=Read Only, 3=Write Only, 4=Append):** prompt, type **1** to receive the **Opening device...** prompt.
6. At the **Hit any key to continue...** prompt, press **Enter**.

```
 General Commands:
    1. Open a Device         5. Inquiry              9. Log Sense Page
    2. Close a Device        6. Test Unit Ready     10. Mode Sense Page
```

7. At the **Enter Selection for /dev/rmt1:** prompt, select the **Inquiry** option to receive the **Issuing inquiry...** and the following data:

```
Inquiry Data,  Length 127
           0 1  2 3  4 5  6 7  8 9  A B  C D  E F   0123456789ABCDEF
    0000 - 0180 0202 3300 0038 4942 4D20 2020 2020     ..3..8IBM
    0010 - 3033 3539 3045 3031 3033 3539 3042 3131   03590B1103590B11
    0020 - 3344 3201 4353 3030 3030 3030 3030 3031   3D2.CS0000000001
    0030 - 3632 2041 C000 0180 04D0 6101 82D0 6101   62 A.....Pa..Pa.
    0040 - 80D0                               6101   .Pa.. a..Pa..Pa.
    0050 - 02D0           Example             0000   .Pa..Pa.........
    0060 - 0000                               0000   ................
    0070 - 0000 0000 0000 0000 0000 0000 0000 00     ...............
```

8. At the **Hit any key to continue...** prompt, press **Enter**.

```
General Commands:
   1. Open a Device        5. Inquiry             9. Log Sense Page
   2. Close a Device       6. Test Unit Ready    10. Mode Sense Page
```

9. At the **Enter Selection for /dev/rmt1:** prompt, select the **Close a Device** option.
   The system response is **Device closed...**

Fibre Inquiry Sequence:

1. To check installed tape devices, type **lsdev -Cc tape** command. From the listing of devices, remember the ones you are going to test. In the following example, fibre devices rmt0 and rmt1 are *available*, which indicates they can communicate with host. The fibre address is not shown via this command.

   The SCSI devices rmt2 and rmt3 are *available* and at port addresses (2,0) and (1,0) respectively. These are SCSI addresses 2 and 1.

```
$ lsdev -Cc tape  [enter]
rmt0 Available 30-70-01     IBM 3590 Tape Drive and Medium Changer (FCP)
rmt1 Available 30-70-01     IBM 3590 Tape Drive and Medium Changer (FCP)
rmt2 Available 10-70-00-2,0 IBM 3590 Tape Drive and Medium Changer
rmt3 Available 10-70-00-1,0 IBM 3590 Tape Drive and Medium Changer
```

Figure 9-41. Device Fibre and SCSI Addresses

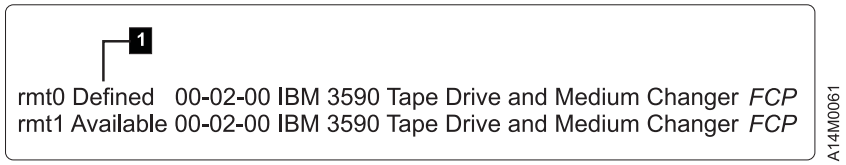


Figure 9-42. Device Fibre Addresses

Perform the following to determine the port address (FCP ID) and port name (FCP World Wide Name). The example in the following text refers to the device *rmt1*. Its port address is 0x26 (with leading 0s not shown) and the port name is “0x500507630040202a”. If you do not know which devices to test, ask the customer’s system administrator.

2. To find out the “unique identifier” use the following:
   a. Enter the following:
      ```
      $ tapeutil -f /dev/rmt0 qrypath
      ```
   b. The following will display on the console:

```
Querying SCSI paths...

  Logical Device................. rmt0
  SCSI Parent.................... fscsi0
  FCP SCSI ID.................... 0x26
  FCP Logical Unit............... 0x0
  FCP World Wide Name............ 0x500507630040202a
  Drive Port Number.............. 0
  Path Enabled................... Yes
  Alternate Path Configured...... No
```

3. Type **tapeutil** and the following menu appears:

Note: Your tapeutil menus may vary from the examples, depending on the level of your **Atape.driver** installed in your system. The following examples are using **Atape.driver** at 2.5.1.0.

```
General Commands:
   1. Open a Device             5. Inquiry            9. Log Sense Page
   2. Close a Device            6. Test Unit Ready   10. Mode Sense Page
   3. Device Info               7. Reserve Device    11. Release Device
   4. Tape Drive Service Aids   8. Request Sense      Q. Quit Program

Medium Changer Commands:
  12. Element Information      16. Move Medium
  13. Position To Element      17. Load/Unload Medium
  14. Element Inventory        18. Initialize Element Status
  15. Prevent Medium Removal   19. Allow Medium Removal

Tape Commands:
  20. Query/Set Parameters     30. Read and Write Tests
  21. Load Tape                31. Unload Tape
  22. Rewind                   32. Erase
  23. Erase Gap                33. Write Filemarks
  24. Forward Space Filemarks  34. Backward Space Filemarks
  25. Forward Space Records    35. Backward Space Records
  26. Space to End of Data     36. Query/Set Tape Position
  27. Log Sense                37. Library Sequence Number
  28. Display Message          38. Read or Write Files
  29. Synchronize Buffers      39. Recover Buffer Data

Enter Selection:
```

4. At the **Enter Selection:** prompt, select the **Open a Device** option, and press **Enter**.
5. At the **Enter the device special file name:** prompt, type **/dev/rmt1** (or your actual device).
6. At the **Select mode (1=Read/Write, 2=Read Only, 3=Write Only, 4=Append):** prompt, type **1** to receive the **Opening device...** prompt.
7. At the **Hit any key to continue...** prompt, press **Enter**.

```
General Commands:
   1. Open a Device         5. Inquiry              9. Log Sense Page
   2. Close a Device        6. Test Unit Ready     10. Mode Sense Page
```

8. At the **Enter Selection for /dev/rmt1:** prompt, select the **Inquiry** option to receive the **Issuing inquiry...** and the following data:

```
Inquiry Data,  Length 127
          0 1  2 3  4 5  6 7  8 9  A B  C D  E F   0123456789ABCDEF
   0000 - 0180 0202 3300 0038 4942 4D20 2020 2020     ..3..8IBM
   0010 - 3033 3539 3045 3031 3033 3539 3042 3131   03590B1103590B11
   0020 - 3344 3201 4353 3030 3030 3030 3030 3031   3D2.CS0000000001
   0030 - 3632 2041 C000 0180 04D0 6101 82D0 6101   62 A.....Pa..Pa.
   0040 - 80D0                               6101   .Pa.. a..Pa..Pa.
   0050 - 02D0           Example             0000   .Pa..Pa.........
   0060 - 0000                               0000   ................
   0070 - 0000 0000 0000 0000 0000 0000 0000 00     ...............
```

9. At the **Hit any key to continue...** prompt, press **Enter**.

```
General Commands:
   1. Open a Device        5. Inquiry              9. Log Sense Page
   2. Close a Device       6. Test Unit Ready     10. Mode Sense Page
```

10. At the **Enter Selection for /dev/rmt1:** prompt, select the **Close a Device** option.

    The system response is **Device closed...**

Read and Write Tests

Load a scratch cartridge in the 3590 before you start this test. (See “Mount specified volume to specified drive” step 4 on page 9-117 if the device is in a 3494 library.)

Attention: This test overwrites any data or tape label on the tape.

1. If the response from the previous test is **Hit any key to continue...**, press **Enter**. Otherwise, type **tapeutil** to restart.

   Note: Your tapeutil menus may vary from the examples, depending on the level of your **Atape.driver** installed in your system The following examples are using **Atape.driver** at 2.5.1.0.

```
General Commands:
   1. Open a Device       5. Inquiry              9. Log Sense Page
   2. Close a Device      6. Test Unit Ready     10. Mode Sense Page
```

2. At the *Enter Selection:* prompt, select the **Open a Device** option, and press **Enter**.
3. At the **Enter the device special file name:** prompt, type **/dev/rmt1** (or your specific device).
4. At the **Select mode (1=Read/Write, 2=Read Only, 3=Write Only, 4=Append):** prompt. type **1**.

   At the **Hit any key to continue...**. prompt, press **Enter**.

```
General Commands:
   1. Open a Device             5. Inquiry            9. Log Sense Page
   2. Close a Device            6. Test Unit Ready   10. Mode Sense Page
   3. Device Info               7. Reserve Device    11. Release Device
   4. Tape Drive Service Aids   8. Request Sense      Q. Quit Program

Medium Changer Commands:
  12. Element Information      16. Move Medium
  13. Position To Element      17. Load/Unload Medium
  14. Element Inventory        18. Initialize Element Status
  15. Prevent Medium Removal   19. Allow Medium Removal

Tape Commands:
  20. Query/Set Parameters     30. Read and Write Tests
```

5. At the **Enter Selection for /dev/rmt1:** prompt, select the **Read and Write Tests** option, and press **Enter**.
6. At the **Select test (1=Read/Write, 2=Read Only, 3=Write Only):** prompt, type **1**.
7. At the **Hit <Enter> for default 10240 block size or enter new block size:**, press **Enter**.
8. At the **Hit <Enter> for default 20 blocks per read/write or enter new blocks:** prompt, press **Enter**.
9. At the **Hit <Enter> for default 1 repetition or enter new repetition:** prompt, press **Enter**.

   The following data is displayed:

```
Read/Write test, blocksize 10240 count 20 repetition 1
Setting block size...
Read/Write test pass 20
Writing 10240 bytes, 20 blocks...
Write complete, bytes written 204800, blocks 20
Writing 2 file marks...
Backward spacing 2 file marks...
Backward spacing 1 records...
Reading 204800 bytes, 20 blocks...
Read complete, bytes read 204800, blocks 20
Forward spacing file mark...
Data verification complete, no discrepancies found
Read/Write test completed, total bytes written 204800
```

10. At the **Hit any key to continue...** prompt, press **Enter**.

```
General Commands:
   1. Open a Device        5. Inquiry             9. Log Sense Page
   2. Close a Device       6. Test Unit Ready    10. Mode Sense Page
```

11. Unload the drive before closing the device in the next step.
12. At the **Enter Selection for /dev/rmt1:** prompt, select the **Close a Device** option, and press **Enter**.
    At the **Device closed...**
    Hit any key to continue... prompt, press Enter.

```
General Commands:
   1. Open a Device             5. Inquiry            9. Log Sense Page
   2. Close a Device            6. Test Unit Ready   10. Mode Sense Page
   3. Device Info               7. Reserve Device    11. Release Device
   4. Tape Drive Service Aids   8. Request Sense      Q. Quit Program
```

13. At the **Enter Selection:** prompt, type **q** to stop the tapeutil program.

Checking Channel Attachment – Linux

The devices must be fully installed, and the host device driver must be configured and available. See *IBM TotalStorage Tape Device Drivers Installation and User's Guide*, for information about installing and using the IBM tape drive, medium changer, and library device drivers. Also, "Installation and Configuration Instructions" in the above guide describes the *smit* and *cfgmgr* commands.

Tape Device Attachment Test

This procedure, which tests the attachment of a tape device to a Linux system, assumes that:

- Your device is attached at */dev/IBMtape0*.
- There is no cartridge in the drive.

When the Hit<Enter>to Continue... message displays or when you are told to enter information, press **Enter** after following the instruction. When the utility displays information, use the appropriate hardware manual to verify that the information is reasonable.

1. Open a Linux window.
2. If you want to perform a more complete test, mount a writable scratch cartridge manually into the driver, or if your device has an autoloader attached, use the "Medium Changer Device Attachment Test" to mount a writable scratch cartridge.
3. Enter **IBMtapeutil**. A menu displays.
4. Enter **1** (Open a Device).
5. Enter **/dev/IBMtape0** when prompted for the device name.
6. Enter **1** (Read/Write).
7. Enter **3** (Inquiry). Specify 0 when prompted for an inquiry page. This concludes a basic test of the device, SCSI connection, and the device driver. You may stop the test here or continue with the following steps to perform a more complete test.
8. Enter **4** (Test Unit Ready) until no error occurs.
9. Enter **20** (Rewind).
10. Enter **28** (Read and Write Tests).
11. Enter **1** (Read and Write). Press **Enter** three times to accept the defaults and to run the test.
12. Enter **38** (Unload Tape).
13. Enter **2** (Close a Device).
14. Enter **Q** to quit the program.

Medium Changer Device Attachment Test

This procedure, which tests the attachment of a medium changer device to a Linux system, assumes that:

- Your device is attached at */dev/IBMchanger0*.
- You have a cartridge in at least one of the slots.

When the Hit<Enter>to Continue... message displays or when you are told to enter information, press **Enter** after following the instruction. When the utility displays information, use the appropriate hardware manual to verify that the information is reasonable.

1. Open a Linux window.
2. Enter **IBMtapeutil**. A menu displays.
3. Enter **1** (Open a Device).
4. Enter **/dev/IBMchanger0** when prompted for the device name.
5. Enter **3** (Inquiry). Specify 0 when prompted for an inquiry page. This concludes a basic test of the device, SCSI connection, and the device driver. You may stop the test here or continue with the following steps to perform a more complete test.
6. Enter **4** (Test Unit Ready).
7. Enter **60** (Element Information).

8. Enter **62** (Element Inventory).
9. From the output of the previous step, select a writable, scratch cartridge, and determine its element ID. Also, select the element ID of an unoccupied slot.
10. Enter **64** (Move Medium), then supply the address of the cartridge, followed by the address of the unoccupied slot. Verify that the cartridge moved.
11. Enter **62** (Element Inventory). Verify that the inventory was updated correctly.
12. Enter **2** (Close a Device).
13. Enter **Q** to quit the program.

3494 Enterprise Tape Library Attachment Test

The following procedure tests the attachment of a 3494 Enterprise Tape Library to a Linux system. The procedure assumes that your device is defined in */etc/ibmat1.conf* as *L3494*.

1. Bring up a shell prompt.
2. Enter mtlib -l L3494 -ql (ends with a lowercase L).
3. Enter mtlib -l L3494 -qL (ends with an uppercase L).

Checking Channel Attachment – Sun

The devices must be fully installed and the host device driver must be configured and available.

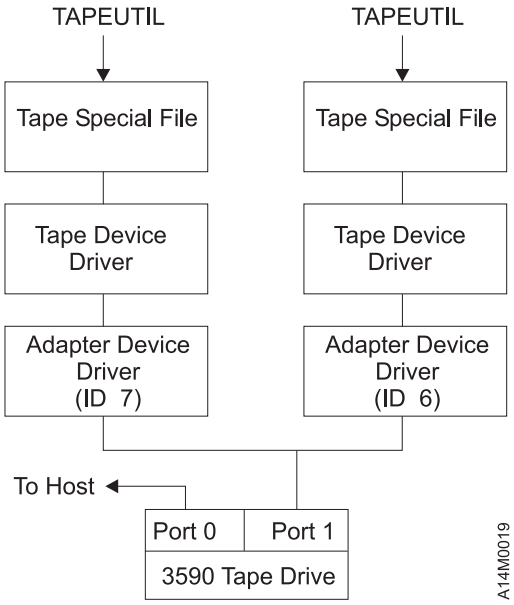
TAPEUTIL

Refer to *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide,* GC35-0154, for details of the **tapeutil** program in the Sun (Solaris) system.

You may require assistance from the customer during this process.

To verify that the device driver and the devices are functional, use the **tapeutil** program, which is provided with the *IBM SCSI Tape Device Driver for SunOS*.

The diagram below shows an example of the software and hardware paths that are used in the following tests.



Note: Port 1 of a 3590 is connected to two hosts. The host drivers are configured so that one initiator is at SCSI or Fibre ID address 7 and one initiator is at SCSI or Fibre ID address 6. The tape special file names on each host are independent and may be different.

1. Load a scratch tape cartridge in the IBM 3590.

   Attention: This test overwrites any data or label existing on the tape cartridge.
2. Type **/opt/IBMtape/tapeutil**. The following menu is displayed: (This menu reappears at the completion of each command.)

```
+-------------------------------------------------+
|                   TEST UTILITY                  |
|       IBM SCSI Tape Device Driver for SunOS      |
+-------------------------------------------------+
 1: Open Device             17: Forward Space File
 2: Close Device            18: Backward Space File
                            19: Forward Space Record
 3: Inquiry                 20: Backward Space Record
 4: Request Sense           21: Locate End Of Data
 5: Test Unit Ready
 6: Reserve                 22: Off-line
 7: Release                 23: Load Tape
                            24: Unload Tape
 8: Element Information
 9: Move Medium             25: Sync Buffer
10: Inventory               26: Display Message

11: Read Data               27: Get Device Status
12: Write Data              28: Get Device Info
                            29: Get Media Info
13: Write File Mark         30: Get Position
14: Erase Tape              31: Set Position
15: Rewind                  32: Get Parameter
16: Retention               33: Set Parameter
 Q: Quit Program
```

3. At the **Enter Selection:** prompt, select **1** to open the device.
4. At the **Enter device special file name:** prompt, type **/dev/rmt/1st** (or the actual device special file for your device).
5. At the **Select mode (1=read-write, 2=read, 3=write, 4=append):** prompt, type **1**. The **Device opened** response is displayed.
6. At the **Enter Selection:** prompt, select **3** to receive the device inquiry data. The inquiry data follows:

```
The IOC_INQUIRY ioctl succeeded.     (EXAMPLE)

The inquiry data is:

 1 80  2  2 33  0  0 38 49 42 4d 20 20 20 20 20
30 33 35 39 30 42 31 31 20 20 20 20 20 20 20 20
34 44 30 33 54 55 20 20 20 20 20 20 30 30 30 30
32 39 30 20  3  0  0 81  0  0  0  0  0  0  0  0
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

7. At the **Enter Selection:** prompt, select **5** to verify device test-unit ready. The response is:

```
The IOC_TEST_UNIT_READY ioctl succeeded.
```

8. At the **Enter Selection:** prompt, select **12** to perform write verification.
9. At the **Enter block size:** prompt, type **1024**.
10. At the **Enter blocking factor:** prompt, type **256**.
11. At the **Enter megabytes to write:** prompt, type **10**.
12. At the **Enter pattern file name:** prompt, press **Enter**.

13. At the **Enter random seed:** prompt, type **0**. The response is:

```
Generated 262144 bytes of random data using seed 7892.
********************************
********
Transferred 10MB in 1.98 seconds for rate of 5.16MB/second.
```

14. At the **Enter Selection:** prompt, select **15** to rewind the tape. The response is:

```
The STIOC_TAPE_OP ioctl succeeded.
```

15. At the **Enter Selection:** prompt, select **11** to perform read verification.
16. At the **Enter block size:** prompt, type **1024**.
17. At the **Enter blocking factor:** prompt, type **256**.
18. At the **Enter megabytes to write:** prompt, type **10**. The response is:

```
********************************
********
Transferred 10MB in 2.19 seconds for rate of 4.69MB/second.
```

19. At the **Enter Selection:** prompt, select **15** to rewind the tape. The response is:

```
The STIOC_TAPE_OP ioctl succeeded.
```

20. At the **Enter Selection:** prompt, select **2** to close the device. The **Device closed** response is displayed.
21. At the **Enter Selection:** prompt, select **Q** to exit the tapetest program.

Checking Channel Attachment – HP-UX

The devices must be fully installed and the host device driver must be configured and available. See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for information about installing and using the IBM SCSI tape drive, medium changer, and library device drivers. Also, "Installation and Configuration Instructions" in the above guide describes the *smit* and *cfgmgr* commands.

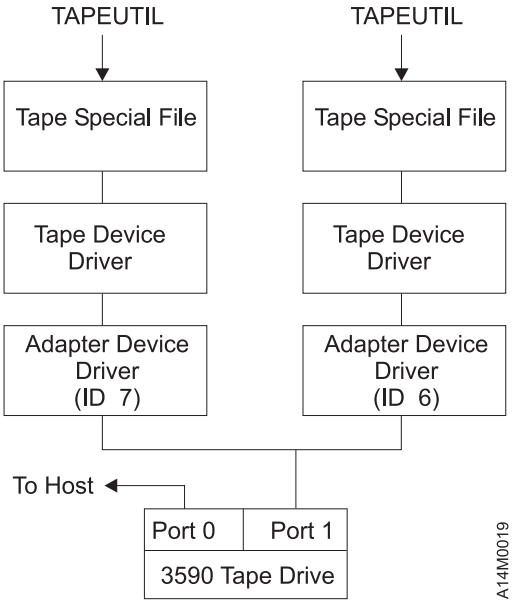
Refer to "Host Attachment Example" diagram below at the right for an example of the software and hardware paths that are used in the following tests. The figure illustrates unique *initiator* addresses for a configuration with more than one initiator sharing a SCSI bus.

__ 1. Load a scratch tape cartridge in the IBM 3590.

Attention: This test overwrites any data or label existing on the tape cartridge.

__ 2. Type **/opt/IBMtape/tapeutil**.
__ 3. At the **Enter Selection:** prompt, select **1** to open the device.
__ 4. At the **Enter device special file name:** prompt, type **/dev/rmt/0st** (or the actual device special file for your device).
__ 5. At the **Select mode (1=read-write, 2=read, 3=write, 4=append):** prompt, type **1**. The **Device opened** response is displayed.
__ 6. At the **Enter Selection:** prompt, select **10** to receive the device inquiry data. Valid data indicating the device is a 3590 should be displayed.
__ 7. At the **Enter Selection:** prompt, select **9** to verify the device test-unit is ready.
__ 8. At the **Enter Selection:** prompt, select **21** to perform write verification.
__ 9. At the **Enter block size:** prompt, type **1024**.
__ 10. At the **Enter blocking factor:** prompt, type **256**.
__ 11. At the **Enter megabytes to write:** prompt, type **10**.
__ 12. At the **Enter pattern file name:** prompt, press **Enter**.
__ 13. At the **Enter random seed:** prompt, type **0**.
__ 14. At the **Enter Selection:** prompt, select **24** to rewind the tape.
__ 15. At the **Enter Selection:** prompt, select **20** to perform read verification.
__ 16. At the **Enter block size:** prompt, type **1024**.
__ 17. At the **Enter blocking factor:** prompt, type **256**.
__ 18. At the **Enter megabytes to write:** prompt, type **10**.
__ 19. At the **Enter Selection:** prompt, select **24** to rewind the tape.
__ 20. At the **Enter Selection:** prompt, select **2** to close the device. The **Device closed** response is displayed.
__ 21. At the **Enter Selection:** prompt, select **Q** to exit the tapetest program.

Host Attachment Example



Note: Port 1 of a 3590 is connected to two hosts. The host drivers are configured so that one initiator is at SCSI address 7 and one initiator is at SCSI address 6. The tape special file names on each host are independent and may be different.

Checking Channel Attachment – Windows NT or Windows 2000

The devices must be fully installed and the host device driver must be configured and available. See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for information about installing and using the IBM SCSI tape drive, medium changer, and library device drivers. Also, "Installation and Configuration Instructions" in the above guide describes the *smit* and *cfgmgr* commands.

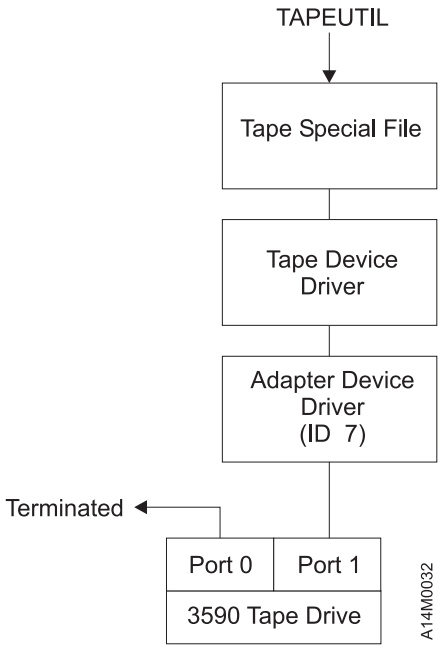
Refer to "Host Attachment Example" diagram below at the right for an example of the software and hardware paths that are used in the following tests.

__ 1. Load a scratch tape cartridge in the IBM 3590.

Attention: This test overwrites any data or label existing on the tape cartridge.

__ 2. Type **ntutil**.
__ 3. At the **Enter Selection:** prompt, select **1** to open the device.
__ 4. At the **Enter device special file name:** prompt, type **tape0** (or the actual device special file for your device).
__ 5. At the **Select mode (1=read-write, 2=read, 3=write, 4=append):** prompt, type **1**. The **Device opened** response is displayed.
__ 6. At the **Enter Selection:** prompt, select **49** to receive the device inquiry data. Valid data indicating the device is a 3590 should be displayed.
__ 7. At the **Enter Selection:** prompt, select **39** to verify the device test-unit is ready.
__ 8. At the **Enter Selection:** prompt, select **23** to perform write verification.
__ 9. At the **Enter block size:** prompt, type **1024**.
__ 10. At the **Enter blocking factor:** prompt, type **256**.
__ 11. At the **Enter megabytes to write:** prompt, type **10**.
__ 12. At the **Enter pattern file name:** prompt, press **Enter**.
__ 13. At the **Enter random seed:** prompt, type **0**. The PC will write data to the tape and status will be displayed.
__ 14. At the **Enter Selection:** prompt, select **31** to rewind the tape.
__ 15. At the **Enter Selection:** prompt, select **22** to perform read verification.
__ 16. At the **Enter block size:** prompt, type **1024**.
__ 17. At the **Enter blocking factor:** prompt, type **256**.
__ 18. At the **Enter megabytes to write:** prompt, type **10**. Data will be read from the tape and status will be displayed.
__ 19. At the **Enter Selection:** prompt, select **31** to rewind the tape.
__ 20. At the **Enter Selection:** prompt, select **2** to close the device. The **Device closed** response is displayed.
__ 21. At the **Enter Selection:** prompt, select **Q** to exit the tapetest program.

Host Attachment Example



Checking Channel Attachment using NTUTIL under Windows NT or Windows 2000

NTUTIL

Refer to APPENDIX A for more information on using *ntutil* in the Windows NT or Windows 2000 system environment. For a complete update on device driver software, see the *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*.

Notes:

1. The 3590 must be powered ON before the Windows NT or Windows 2000 device is powered ON.

   If the 3590 power is **not** ON when the Windows NT or Windows 2000 is powered ON, the Windows NT or Windows 2000 device will not recognize the 3590. If the 3590 is powered ON **after** the Windows NT or Windows 2000 device has been powered ON, the Windows NT or Windows 2000 device will still not recognize the 3590.
2. The sense procedure may be performed using the menu-driven interface of the ntutil program. To invoke the ntutil program in this format enter the common commands, item 83 to Force the Log of Sense, and item 84 Get Last Sense.

To check out the SCSI interface, execute a Force Sense, followed by a Get Last Sense command:

1. Verify that the IBM tape subsystem is powered ON and is online.
2. Verify that the tape drive has a tape cartridge loaded.
3. Start ntutil and open the drive (see 1 on page 9-86).
4. Execute the following command **83** (Log Sense).
5. Read the sense information by executing the following command **84** (Get Last Sense).

   If the operation completed successfully (Message **Error_Success**), go to the end of test, step 11 on page 9-86. If the operation did not complete successful perform one of the following:
   - Go to "SCSI Bus Problem Determination" on page 9-108.
   - Go to "Fibre Channel Problem Determination Procedure" on page 9-113.

SCSI Testing

Setup SCSI Ports Wrap Test

__ 1. Refer to “Installing SCSI Wrap Tool” diagram at right. Be sure that the power switch **1** is in the OFF position.

__ 2. Install the SCSI wrap tool in SCSI port 0 **2** . As viewed from the rear, port 0 is on the left. If your account has another SCSI wrap tool, install it in SCSI port 1, you can check both ports at the same time.

Notes:

a. There are 2 SCSI wrap tools available for the 3590 — the old style black SCSI wrap tool (P/N 62G1324) and the new style grey SCSI wrap tool (P/N 05H9163).

If you have access to both tools, you should use the grey tool for the SCSI Ports Wrap Test. You must use the black tool for the SCSI Cable Wrap Test.

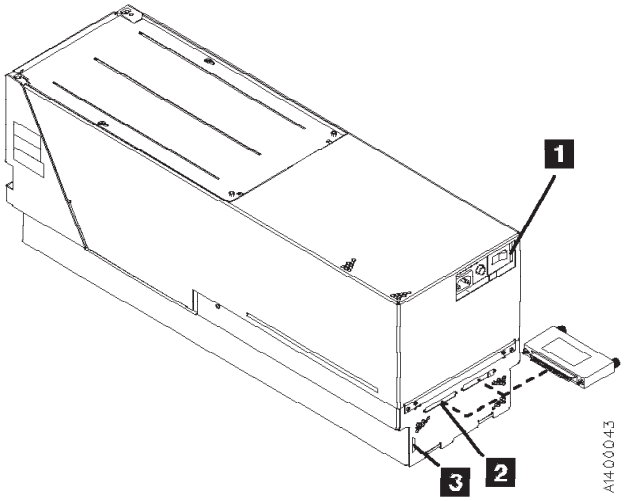
b. The Black SCSI wrap tool (P/N 62G1324) can be plugged directly into the drive connector **2** , as shown, or it can be plugged into the hammerhead connector on the SCSI cable. The grey SCSI wrap tool (P/N 05H9163) MUST be plugged directly into the drive connector **2** , as shown. It will not be detected by the Power On Self Test if it is plugged into the hammerhead connector on the SCSI cable.

c. When you switch OFF power to the 3590, wait approximately 5 seconds before you switch ON power again.

__ 3. Return to the procedure that sent you here.

Use **only** P/N 62G1324 or P/N 05H9163 for the SCSI wrap test; using the wrong wrap tool may cause the 3590 to not run the wrap test.

Installing SCSI Wrap Tool (Rear View)



SCSI Ports Wrap Test

__ 1. Refer to “Installing SCSI Wrap Tool ” diagram at right. Be sure that the power switch **1** is in the OFF position.
__ 2. Install the SCSI wrap tool in SCSI port 0 **2** . As viewed from the rear, port 0 is on the left. If your account has another SCSI wrap tool, you can check both ports at the same time.

Notes:

a. There are 2 SCSI wrap tools available for the 3590 — the old style black SCSI wrap tool (P/N 62G1324) and the new style grey SCSI wrap tool (P/N 05H9163).

   If you have access to both tools, you should use the grey tool for the SCSI Ports Wrap Test and you must use the black tool for the SCSI Cable Wrap Test.

b. The Black SCSI wrap tool (P/N 62G1324) can be plugged directly into the drive connector **2** , as shown. Or it can be plugged into the hammerhead connector on the SCSI cable. The grey SCSI wrap tool (P/N 05H9163) MUST be plugged directly into the drive connector **2** , as shown. It will not be detected by the Power On Self Test if it is plugged into the hammerhead connector on the SCSI cable.

c. When you switch OFF power to the 3590, wait approximately 5 seconds before you switch ON power again.

__ 3. Set the power switch to the ON position. The wrap test runs automatically. When the drive detects that the wrap tool is installed in a port, the drive enters CE mode rather than operator mode during the power-on sequence.

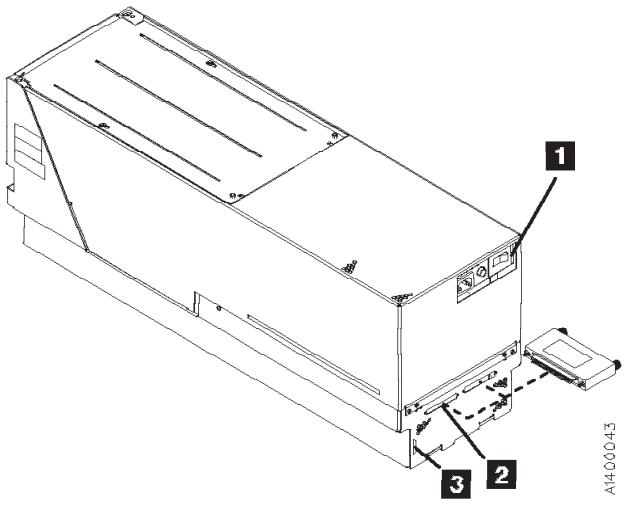
   This power-on test takes approximately 2.5 minutes to complete.

   If a failure occurs, a message can be posted in the operator/CE panel, or the operator/CE panel can be blank. If any of these conditions exist, go to the START section for further analysis.

__ 4. Repeat steps 1 through 3 for SCSI port 1.
__ 5. Set the power switch to the OFF position and remove the SCSI wrap tool.
__ 6. Return to the procedure that sent you here.

Use **only** P/N 62G1324 or P/N 05H9163 for the SCSI wrap test; using the wrong wrap tool may cause the 3590 to not run the wrap test.

Installing SCSI Wrap Tool (Rear View)



SCSI Cable Wrap Test

The entire SCSI bus cabling can be tested using this procedure. By moving the SCSI wrap tool to various locations along the bus, a bad cable or poor connection can be isolated.

Notes:

1. This cable wrap test requires the black SCSI wrap tool (P/N 62G1324). The grey SCSI wrap tool (P/N 05H9163) will not be detected if it is plugged into one of the cable connectors. The grey wrap tool is only effective for the SCSI Port Wrap Test and must be plugged directly into the drive SCSI connector to work properly.
2. The SCSI bus terminator must be removed from the SCSI bus string that you are testing or the wrap test will not detect the wrap tool.
3. The SCSI wrap test does not check for duplicate addresses. Ensure that all drives on this SCSI bus string have unique addresses. This could be causing your SCSI problem.

__ 1. Remove the host cable connection from the 3590 SCSI bus string you will be testing. This will prevent any host interference during the wrap test.

__ 2. Remove the SCSI terminator and install the SCSI wrap tool. As viewed from the rear, port 0 is on the left. If you have another SCSI wrap tool, you can check both ports at the same time.

__ 3. Press reset on all 3590s in this SCSI bus string, or if the 3590s were powered OFF, then turn power ON. The wrap test runs automatically. When the drive detects that the wrap tool is installed in one of the ports, the drive enters CE mode, rather than operator mode during the power-on sequence.

- If any of the drives fail to enter CE mode during the power-on sequence, you can verify the SCSI wrap tool connection with the following procedure:

  From the CE menu,
  a. Select CONFIG/INSTALL.
  b. Select DRV OPTIONS.
  c. Select WRAP TOOLS.
  d. The port you are testing will show PRSNT if the wrap tool was detected.
- If a failure occurs on one or more of the 3590 drives, an error message can be posted on the operator/CE panel, or the operator/CE panel can be blank. If you have a SCSI cable problem and the wrap test fails, a FID message should be displayed. Go to the START section for that FID to isolate the problem.
- The SCSI wrap tool can be moved anywhere on the SCSI bus to help in further problem isolation. The drives must be reset, or powered OFF then ON, each time the wrap tool is moved to a different location. You do not have to disconnect cables, just plug the wrap tool into the hammerhead cable. Once you have isolated the problem to a single cable or drive, you will have to disconnect the cable at the drive to test the cable or drive.
- It is important to know how your drives are cabled and how the cables are stacked at the drive SCSI port. Refer to the cable diagrams in Figure 8-24 on page 8-46 and Figure 8-25 on page 8-47 for cabling examples. Your cabling may vary from the examples, so use them for reference only.
- To test the host to 3590 SCSI cable, you will have to plug the wrap connector into the cable at the host end of the cable. If the cable does not have a hammerhead connector at the host end, it may be necessary to install an interposer to change the connector from male to female so the wrap tool can be plugged in. Run the wrap test from the same drive that the host cable is connected into.

__ 4. After the defective cable has been isolated and replaced, remove the SCSI wrap tool and reinstall the SCSI terminator in the same location that you removed it from previously. Restore the cabling back to its normal state.

__ 5. Run tapeutil or tapetest, depending on the host system, on all drives to verify the SCSI bus. Then return the drives to the customer, or return to the procedure that sent you here.

SCSI Bus Problem Determination

Use the “Solid SCSI Bus Errors” or the “Intermittent SCSI Bus Errors” on page 9-109 procedure.

Attention: Notify the customer that the devices on the SCSI bus must be varied offline before the problem determination procedure can be performed.

Solid SCSI Bus Errors

Determine the number of drives on the SCSI bus.

Single Tape Drive on SCSI Bus:

1. Ensure that the drive power is ON.
2. Ensure that the drive SCSI address is the same as the SCSI address being used by the host program.
3. Ensure that the CE SCSI Config menu options are set correctly. Some SCSI configurations must be set to *Slow and Narrow* to prevent SCSI time-out errors. See “CE SCSI Config Menu” on page 5-55 for more information.
4. If steps 1, 2, and 3 are OK, run the SCSI wrap test. See “SCSI Ports Wrap Test” on page 9-106.

   Note: Refer to “SCSI Bus Attachment” on page 8-43 to ensure that all of the SCSI cables, interposers and terminators are installed correctly.
5. If the SCSI wrap test fails, replace the card pack. See “FID E4: Card Pack” on page 10-67.
6. If the SCSI wrap test runs successful you can test the SCSI cable only if you have the Black SCSI wrap tool P/N 62G1324. See “SCSI Cable Wrap Test” on page 9-107 and install the wrap tool on the end of the cable to be tested. Run the SCSI Cable wrap test. If the test fails, replace the bad cable.
7. If the SCSI Ports wrap test and the SCSI cable wrap test both run successfully, check the SCSI attachment at the host to confirm that a problem still exists.

   Note: Be sure to remove the wrap connector and restore the SCSI cable connections.
   Perform one of the following procedures, depending upon which host system you have:
   - AIX, see “Checking Channel Attachment – AIX” on page 9-91
   - iSeries/AS400 (OS/400) System, see “Checking Channel Attachment – iSeries (OS/400)” on page 9-89
   - HP-UX, see “Checking Channel Attachment – HP-UX” on page 9-102
   - Windows NT or Windows 2000, see “Checking Channel Attachment – Windows NT or Windows 2000” on page 9-103
   - ☼, see “Checking Channel Attachment – Sun” on page 9-99

   This will verify that the drive is available and properly configured at the host.
8. If the problem still exists, check the SCSI attachment at the drive. Refer to “SCSI Bus Attachment” on page 8-43 to ensure that all of the SCSI cables, interposers and terminators are installed correctly.
9. If the problem still exists after checking the SCSI attachment at the host and the drive, replace the SCSI terminator (first), then the SCSI cable and the interposer (if installed).
10. If the problem still exists after replacing the SCSI terminator, cable and interposer, tell the customer that the fault is probably with the host hardware or software.
11. When the problem is corrected (or determined to be a host problem), restore all of the SCSI cables, interposers, and terminators to their correct position, then return to the procedure that sent you here, or go to “End of Call” on page 9-8.

Multiple Tape Drives on SCSI Bus:

1. Use one of the following procedures for host system you have, to determine if all of the drives on the SCSI bus have the problem.
   - iSeries/AS400 (OS/400) System, see “Checking Channel Attachment – iSeries (OS/400)” on page 9-89

- AIX, see “Checking Channel Attachment – AIX” on page 9-91
- Linux, see “Checking Channel Attachment – Linux” on page 9-97
- Hewlett-Packard (HP-UX), see “Checking Channel Attachment – HP-UX” on page 9-102
- Windows NT or Windows 2000, see “Checking Channel Attachment – Windows NT or Windows 2000” on page 9-103
- Sun, see “Checking Channel Attachment – Sun” on page 9-99

2. If all of the drives on the SCSI bus have the problem, either the bus is hung or the SCSI cable from the host to the first device on the bus is defective.

Ensure that the SCSI cable from the host to the first device is connected correctly. Replace the cable, if necessary.

3. If the problem exists on one or more, but not all, of the drives on the bus, it will be necessary to determine the first failing drive on the bus.
   a. Disconnect all except the first drive on the SCSI bus and move the terminator to the first SCSI drive.
   b. Test the bus operation to determine if a failure occurs on that drive.
   c. Continue to connect one drive at a time onto the bus until the first failing drive is located.
4. When you have located the first failing drive on the bus, use the procedure “Single Tape Drive on SCSI Bus” on page 9-108 to correct the problem.
5. When the problem is corrected, restore all of the SCSI cables, interposers, and terminators to their correct position, then return to the procedure that sent you here, or go to “End of Call” on page 9-8.

Intermittent SCSI Bus Errors

1. Get the layout of failing SCSI bus. The maximum SCSI bus length for a differential SCSI bus is 25 m (82 ft.), minus 0.2 m (0.66 ft.) per connection. Figure 9-43 shows an example of how to calculate the bus length. Figure 9-43 shows the cable part numbers for each length. Ensure that the total length does not exceed the maximum of 25 m (82 ft.).

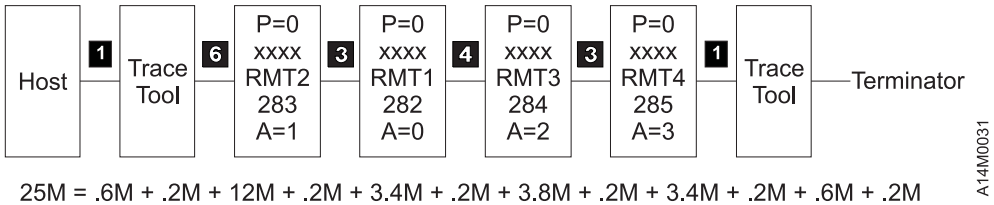


Figure 9-43. SCSI Bus Cable Lengths

Table 9-15. Part Numbers for the 3590 SCSI Bus Cables

Key	Meters	Feet	P/N	Usual Connection
1	0.6	1.97	05H4644	Devices side-by-side in rack
2	2.8	9.19	05H4647	Device in same rack as processor
3	3.4	11.15	05H4645	Device is horizontal with another device in a 3494
4	3.8	12.47	05H4646	Device is vertical with another device in a 3494
5	4.5	14.76	05H4648	Device connection to the host
6	12.0	39.37	05H4649	Device connection to the host
7	18.0	59.06	05H4650	Device connection to the host
8	25.0	82.02	05H4651	Device connection to the host

2. Obtain the errors that the device reported to the host. Refer to the Message Section for details, if necessary. For example, if the device is attached to a pSeries/RS6000 (AIX) System, run **tapeutil**. Select option 9, **Error Log Analysis**. Gather all possible error information.

If Single Drive on SCSI Bus:

Note: This procedure defines using a *trace tool*. The trace tool is used under direct assistance from your next level of support.

1. Replace or swap the SCSI bus cable and the terminator.
2. Start a host trace of the next failure. For example, if you are using the AIX Tape Device Driver, type **atrc** to start the trace. See device driver documentation for more information.
3. Get a 3590 microcode dump and send it to your next level of support for analysis.
4. Connect the SCSI bus trace tool if a failure occurs. On the next failure, get a 3590 microcode dump and a SCSI bus trace. Send the dump and trace to your next level of support for analysis.

If Multiple Drives on SCSI Bus:

Notes:

1. This procedure defines using a *trace tool*. The trace tool is used under direct assistance from your next level of support.
2. If you run a SCSI bus trace tool and you have more than one drive running, the non-failing drives may overlay the error.

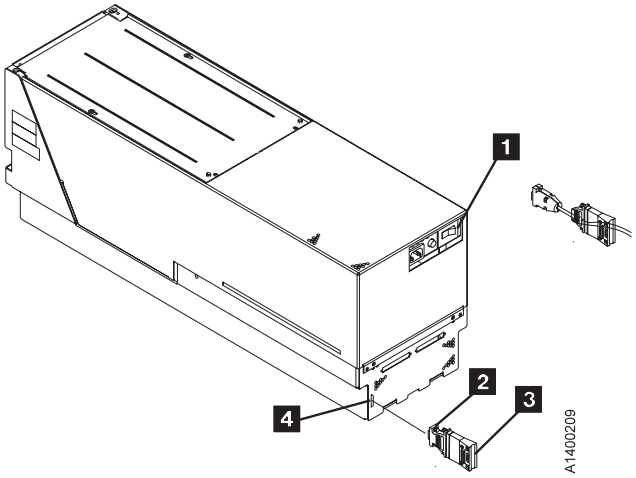
- **If all drives fail:**
  1. Replace or swap the SCSI bus cable between the host and the first device and terminator.
  2. Get a 3590 microcode dump and send it to your next level of support for analysis.
  3. Start a host trace of the next failure. For example, if you are using the AIX Tape Device Driver, type **atrc** to start the trace. See device driver documentation for more information.
  4. Attach the SCSI bus trace tool if a failure occurs. On the next failure, get a 3590 microcode dump and a SCSI bus trace. Send the dump and the device driver trace to your next level of support for analysis.
- **If end drives fail:**
  1. Replace or swap the SCSI bus cable and the terminator between the last drive that works and the first drive that fails.
  2. Get a 3590 microcode dump and send it to your next level of support for analysis.
  3. Start a host trace of the next failure. For example, if you are using the AIX Tape Device Driver, type **atrc** to start the trace. See device driver documentation for more information.
  4. Connect the SCSI bus trace tool if a failure occurs. On the next failure, get a 3590 microcode dump and a SCSI bus trace. Send the dump and the trace to your next level of support for analysis.
- **If only one drive (not end drive) fails:**
  1. Get a 3590 microcode dump and send it to your next level of support for analysis.
  2. Connect the SCSI bus trace tool.
  3. Start a host trace of the next failure. For example, if you are using the AIX Tape Device Driver, type **atrc** to start the trace. See device driver documentation for more information.
  4. On the next failure, get a 3590 microcode dump and a SCSI bus trace. Send the dump and trace to your next level of support for analysis.

Library Manager Testing

Setup Library Manager Port Wrap Test

Use **only** P/N 39F3884 (a 3494 or 3495 special tool) for the wrap test; using the wrong wrap tool may cause the 3590 to not run the wrap test.

Installing Wrap Tool (Rear View)



__ 1. Refer to “Installing Wrap Tool ” diagram at right. Be sure that the power switch **1** is in the OFF position.

__ 2. Plug the 9-pin to 25-pin interposer **2** P/N 05H3895 in the back of the drive **4** (library manager connector), and then plug the terminator **3** P/N 39F3884 in the interposer.

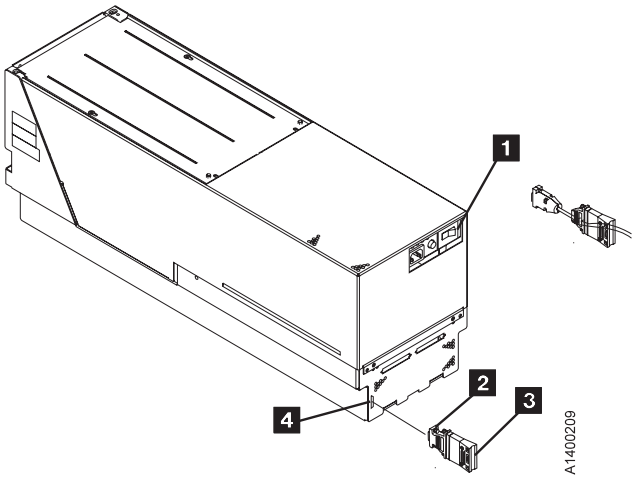
__ 3. Return to the procedure that sent you here.

Library Manager Port Wrap Test

Use **only** P/N 39F3884 (a 3494 or 3495 special tool) for the wrap test; using the wrong wrap tool may cause the 3590 to not run the wrap test.

__ 1. Refer to “Installing Wrap Tool ” diagram at right. Set the power switch **1** to the OFF position.
Note: When you switch OFF power to the 3590, wait approximately 5 seconds before you switch ON power again.

Installing Wrap Tool (Rear View)



__ 2. Plug the 9-pin to 25-pin interposer **2** P/N 05H3895 in the back of the drive **4** (library manager connector), and then plug the terminator **3** P/N 39F3884 in the interposer.

__ 3. Set the power switch to the ON position. The wrap test runs automatically. When the drive detects that the wrap tool is installed in the port, the drive enters CE mode rather than operator mode during the power-on sequence.

This power-on test takes approximately 2.5 minutes to complete.

If a failure occurs, a message can be posted in the operator/CE panel, or the operator/CE panel can be blank. If any of these conditions exist, go to the START section for further analysis.

__ 4. Set the power switch to the OFF position and remove the wrap tool.

__ 5. Return to the procedure that sent you here.

Fibre Channel Testing

Fibre Channel Ports Wrap Test

Attention: Notify the customer that all of the devices on the fibre channel must be varied offline before the Wrap Test procedure can be performed.

Since the channel is an active device, the preferred and safest method to work on a drive is to take all of the fibre channel ports offline first.

To run the fibre channel ports wrap test, perform the following steps:

__ 1. Quiesce all activity to the drives.
__ 2. Remove any cartridges left in the drive.
__ 3. Vary the drive offline.
__ 4. Power OFF the drive.
__ 5. Unplug the fibre channel cable connector. This might open the fibre loop connection.
__ 6. Plug the fibre wrap tool. See Table 3-11 on page 3-48 for usage information, and return here.

Note: Do not run the wrap test without the wrap tool installed. This could disturb the fibre channel loop, causing performance or I/O problems on the fibre loop.

__ 7. Power ON the drive.
__ 8. Select fibre wrap option on the operator/CE panel. See “CE Verify Fix Menu” on page 5-39 and “CE Fibre Wrap Menu” on page 5-60.
   - If wrap test fails, a FID message should be displayed. Go to the START section to isolate the problem.
   - If wrap test passes, continue.

__ 9. Move the wrap tool to the end of the connecting cable at the bulkhead. This will test the drive and all the cable to the bulkhead. See Table 3-11 on page 3-48 for usage information, and return here.
__ 10. Run the wrap test again.
   - If wrap test fails, replace the cable from the drive to the bulkhead.
   - If wrap test passes, continue with this procedure.

__ 11. The 3590 can be ordered with several lengths of fibre cabling. See Table 3-3 on page 3-11. Plug the fibre cable into the bulkhead. Insert the wrap tool and fibre wrap duplex adapter at the host or switch end of the cable. Go to the drive and run the Wrap Test. This will test the drive and all the cabling.
   - If the Wrap Test fails, replace the cabling.
   - If the Wrap Test passes, the drive and the cable are good.

Notes:

a. The tests can be looped at any point. See “CE Loop Diag Menu” on page 5-42.
b. The wrap test can only be run on cable lengths up to 250 m (820 ft). For cable lengths greater than 250 m, verify the cable using the fibre cable tool kit (contact your next level of support for details of test and location of tools).

__ 12. If you still have a fibre channel failure, the problem may be at the host. Go to the service manual for the host or contact your next level of support.
__ 13. Remove the wrap tool and Fibre wrap duplex adapter and restore the fibre channel connection.

Note: At completion of activity, be sure to have the customer do a reconfiguration on all systems to update the configuration.

Fibre Channel Problem Determination Procedure

Common Fibre Messages

See items 4 and 5, Messages and Supplemental Message (Fibre Channel Only) in Table 5-2 on page 5-7 for fibre channel messages displayed on the operator/CE panel.

Fibre Bus Problem Determination

Use the “Solid Fibre Channel Errors” procedure or the “Intermittent Fibre Channel Errors” on page 9-114 procedure.

Attention: Notify the customer that the devices on the fibre channel must be varied offline before the problem determination procedure can be performed.

Before starting, verify the fibre channel topology. Verify that a problem exists between the drive, drive cable, and the device to which it is attached. Use switch, hub, or other fibre product service guides as appropriate. Verify that the switch hub configuration, host adapter, host software levels, and device drivers are supported.

See *IBM Storage Area Network (SAN) Guide* on “Web Site Information” on page xxii for the latest information.

See “SAN Failover Capability” on page 3-14 for information about the Failover function if the drive is attached to a pSeries/RS6000 (AIX) System through a SAN device.

Note: Refer to “Fibre Channel Attachment” on page 8-67 to ensure that all of the fibre channel cables are installed correctly.

Solid Fibre Channel Errors: Determine the number of drives on the fibre channel.

Single Tape Drive on Fibre Channel Loop:

1. Ensure that the drive is powered ON.
2. Ensure that the drive serial number is the same as the drive serial number being used by the host program.
3. Ensure that the Operator fibre channel address menu is set correctly. See “Fibre Addresses Menu” on page 5-28.
4. Ensure that the drive is seeing light and is communicating (the status area should not have “-- -- --” or “?? ?? ??”). Ensure that the AL_PA is valid (status area does not display “CONFLICT” or “OFFLINE”).
5. If steps 1, 2, 3, and 4 are OK, run the fibre channel wrap test. See “Fibre Channel Ports Wrap Test” on page 9-112.

   Note: Refer to “Fibre Channel Attachment” on page 8-67 to ensure that all of the fibre channel cables are installed correctly.
6. If the fibre channel wrap test fails, replace the card pack. See “FID E4: Card Pack” on page 10-67.
7. If the fibre channel wrap test runs successfully you can test the fibre channel cable. See “Fibre Channel Ports Wrap Test” on page 9-112 and install the wrap tool and duplex adapter on the end of the cable to be tested. Run the Fibre Cable wrap test. If the test fails, replace the bad cable.
8. If the fibre channel Ports wrap test and the Fibre cable wrap test both run successfully, check the Fibre attachment at the host to confirm that a problem still exists.

   Note: Be sure to remove the duplex wrap tool and restore the fiber cable connections.

9. Perform one of the following:

- "Checking Channel Attachment – iSeries (OS/400)" on page 9-89
- "Checking Channel Attachment – AIX" on page 9-91
- "Checking Channel Attachment – HP-UX" on page 9-102
- "Checking Channel Attachment using NTUTIL under Windows NT or Windows 2000" on page 9-104
- "Checking Channel Attachment – Sun" on page 9-99

This will verify that the drive is available and properly configured at the host.

10. If the problem still exists, check the fibre channel attachment at the drive. Refer to "Fibre Cables – Model E1A/H1A" on page 8-74 to ensure that all of the fibre channel cables are installed correctly.
11. If the problem still exists after checking the Fibre attachment at the host and the drive, replace the Fibre cable.
12. If the problem still exists after replacing the Fibre cable, tell the customer that the fault is probably with the host hardware or software.
13. When the problem is corrected (or determined to be a host problem), restore all of the fibre channel cables to their correct position, then return to the procedure that sent you here, or go to "End of Call" on page 9-8.

Multiple Tape Drives on Fibre Channel:

1. Use the following procedure to determine if all of the drives on the fibre channel have the problem.
   - "Checking Channel Attachment – iSeries (OS/400)" on page 9-89
   - "Checking Channel Attachment – AIX" on page 9-91
   - "Checking Channel Attachment – HP-UX" on page 9-102
   - "Checking Channel Attachment using NTUTIL under Windows NT or Windows 2000" on page 9-104
   - "Checking Channel Attachment – Sun" on page 9-99
2. Verify the fibre topology and try to isolate which part of the fibre channel network is experiencing problems. Verify that the switch hub configuration, host adapter, host software levels, and device drivers are supported.

   See *IBM Storage Area Network (SAN) Guide* on "Web Site Information" on page xxii for the latest information.
3. If the problem exists on a small number of drives, use the "Single Tape Drive on Fibre Channel Loop" procedure, Otherwise:
   a. Disconnect all except one failing drive on the fibre channel.
   b. Test the fibre connection to determine if a failure occurs on that drive. If it does, use the "Single Tape Drive on Fibre Channel Loop" procedure.
   c. Continue to connect one drive at a time onto the fibre loop.
4. When the problem is corrected, restore all of the fibre channel cables to their correct position, then return to the procedure that sent you here, or go to "End of Call" on page 9-8.

Intermittent Fibre Channel Errors:

1. Verify the fibre channel topology. Check the maximum length of the cables. Verify that a problem exists between the drive, drive cable, and the device to which it is attached. Use switch, hub, or other fibre product service guides as appropriate. Verify that the switch hub configuration, host adapter, host software levels, and device drivers are supported.

   See *IBM Storage Area Network (SAN) Guide* on "Web Site Information" on page xxii for the latest information.

   Note: Refer to "Fibre Channel Attachment" on page 8-67 to ensure that all of the fibre channel cables are installed correctly.
2. Obtain the errors reported by the drive to the host. Refer to Message Section for details. For example, if the drive is attached to a pSeries/RS6000 (AIX) System, run tapeutil. Select option 9, Error Log Analysis. Gather all possible error information.

3. If appropriate, refer to other fibre products documentation to try to isolate which part of the Storage Area Networks (SAN) is experiencing problems. Verify SAN configurations are correct (such as switch zoning for drive sharing).
4. Start a device driver trace to capture more information. For example, if you are using the AIX Tape Device driver, type **atrc** to start the trace. See device driver documentation for more information.
5. On the next failure, get a 3590 microcode dump. Send the dump and the Device Driver trace to your next level of support for analysis.

Checking 3494 Control Path by Using MTLIB Command from pSeries/RS6000 (AIX) System

The devices must be fully installed and the host device driver must be configured and available. See *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for information about installing and using the 3590 in a tape library. Also, "Tape Library Support Programs" in the above guide describes the *mtlib* program.

Figure 9-44 shows an example of the software and hardware paths that are used in the following test.

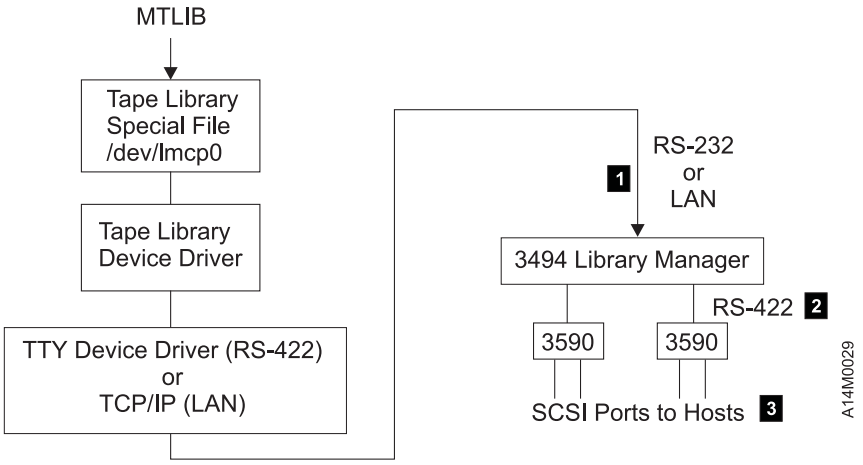


Figure 9-44. Tape Library Control Path Example

This procedure verifies the control path, **1** which connects the host through the RS-232 port or the LAN to the library manager. This path is where the host sends commands to the library manager to perform tasks that do not require the 3590.

To verify the library manager to the 3590 connections **2**, see "Library Manager Port Wrap Test" on page 9-111.

To verify the SCSI connections **3**, see "Checking Channel Attachment – AIX" on page 9-91 or "Checking Channel Attachment – Sun" on page 9-99.

The following responses to the commands are examples only.

1. Determine the library manager control points for the installation by typing

   lsdev -Cc tape and you will receive the following response:

   ```
   ...
   lmcp0 Available              LAN/TTY Library Management Control Point
   rmt2  Available 00-01-01-2,0 IBM SSD 3590 Tape Drive
   ...
   ```

   Use the following commands to exercise the control path to the device. Run these commands for each control path. The examples use library control point device */dev/lmcp0*, tape device */dev/rmt2*, and volume id *CS2201*.

2. Display the library inventory by typing

   mtlib -l /dev/lmcp0 -ql and you will receive the following response:

   ```
   ...
   CS2200 FF00
   CS2201 FF00
   ...
   ```

3. Audit a specified volume by typing

   mtlib -l /dev/lmcp0 -v -a -V CS2201 and you will receive the following response:

   ```
   Performing Audit of volume CS2201 using /dev/lmcp0
   Audit was performed for volser: CS2201
   ```

   Use the following commands to mount and eject a scratch volume through the convenience input/output (CIO) station.

   The examples use library control point device */dev/lmcp0*, tape device */dev/rmt2*, and volume id *CS2201*.

4. Type **mtlib -l /dev/lmcp0 -m -f /dev/rmt2 -V CS2201** to mount the specified volume on the specified drive. (No output response is produced when the mount is successful.)
5. Go to “Read and Write Tests” on page 9-95 if you want to perform read/write tests, then return here.
6. Demount the volume from the specified drive (demount may be automatic) by typing:

   mtlib -l /dev/lmcp0 -d -f /dev/rmt2 to demount the volume. (No output response is produced when demount is successful.)
7. Eject the specified volume from the library through the convenience input/output (CIO) station by typing

   mtlib -l /dev/lmcp0 -v -C -t FF10 -V CS2201 and you will receive the following response:

   ```
   Performing Change volume category of CS2201 to FF10.
   ```
8. Return to the procedure that sent you here.

FID E5 – Microcode Problem

If FID E5 is currently displayed on the drive, go to step 1. If FID E5 is not currently displayed on the drive, go to step 2.

1. If FID E5 **is currently displayed** on the drive:
   a. From FID display, write down the support data (12 characters).
   b. Call your next level of support with the FID and support data to determine if this problem is a new or known microcode problem.
   c. For *known* microcode problems, ask your next level of support to see if a fix exists on latest EC Level. If a fix exists, update the device to latest EC level.

      If a fix is not yet available, tell the customer that engineering is aware of problem and is working on a fix. Install the fix when available. For known microcode problems, use TAC M01.

New Microcode Problem

   d. For *new* microcode problems, you must provide a microcode dump, the reported FID, and FID support data to your next level of support.
   e. For certain failures, the drive automatically collects dump information. If the dump icon  **is displayed** when FID E5 is displayed, retrieve the dump via SCSI or cartridge and provide it to your next level of support. See START section entry point for microcode dump procedures. For new microcode problems, use TAC M02.
   f. If the dump icon is **not displayed** when FID E5 is displayed, a dump must be forced:
      1) Check with the customer to determine if they collected a dump via SCSI for this problem (this could be the reason why no dump icon is displayed).
      2) If the customer has the dump data, provide it to your next level of support.
      3) If the customer does not have dump data or is not sure, go to CE Main Dump menu, and select **Force Dump**. A dump is available when the dump icon is displayed.
      4) Retrieve the dump via SCSI, 3591 Control Unit, or cartridge and provide it to your next level of support. Go to START section for the entry point to microcode dump procedures. For new microcode problems, use TAC M02.

End of New Microcode Problem

2. If FID E5 is **not currently displayed** on the drive:
   a. Look at the FID log for most recent FID E5 entry. From the FID log, write down the support data (twelve characters). Call your next level of support with the FID and support data to determine if this problem is a new or known microcode problem.
   b. For *known* microcode problems, ask your next level of support to see if a fix exists on latest EC Level. If one exists, update customer to latest EC level.

      If a fix is not available, tell the customer that engineering is aware of problem and working on fix. Install the fix when available. For known microcode problems, use TAC M01.
   c. For *new* microcode problems, a dump is needed. Check with customer to determine if they had collected a dump via SCSI for this problem when the FID and the dump icon was displayed. Go to START section for the entry point to microcode dump procedures.

      If the customer has the dump information, provide the dump, the FID, and the FID support data to your next level of support.

      If no dump exists, go to step 3. For new microcode problems, use TAC M02.
3. Determine if the customer can easily recreate the FID E5 message.

   If the customer **can** easily perform operations and/or run job that caused the E5 message, wait until it occurs and follow the procedure starting at step 1.

If the customer **cannot** easily recreate the message or it is an inconvenient time, the following options exist to acquire the dump for the next level of support:

a. Allow the problem to reoccur and customer to take the initiative.
   1) The customer can leave the drive with FID E5 message displayed and then call for service.
   2) If the dump icon is also displayed, the customer can retrieve the dump via SCSI/fibre channel (if host device driver software supports the dump function). Go to “Maintenance Starting Point” on page 1-2 for entry point to microcode dump procedures.
   3) If the dump icon is not displayed, the customer can force an error dump (Op Services menu), which provides a FID FF and the dump icon. The FID FF indication means that a dump was forced (information message). The icon is for the FID E5, so now the customer can retrieve a dump via SCSI/fibre channel (if the host device driver software supports the dump function). Go to “Maintenance Starting Point” on page 1-2 for entry point to microcode dump procedures.

b. If the customer does not take the initiative, you can set a microcode trap. From the 12-character support data, do the following:
   1) Use the first four characters (if not starting with ‘A’ such as Axxx). If the first four characters are Axxx, use the second set of four characters.
   2) Take the four characters (FSC) and select **Microcode Trap** under the CE Service Utilities menu. Select the four FSC characters. Use the **Saved Traps** option, so that POR or Reset cannot reset the trap. Then select **Add Saved FSC Trap** from the CE Saved Traps menu. With this trap set, a dump will automatically be taken when this FSC is encountered, and the dump icon is displayed.
   3) The customer can retrieve the dump via SCSI/fibre channel for you or call you when the dump icon appears. Go to “Maintenance Starting Point” on page 1-2 for entry point to microcode dump procedures.

4. Return to the procedure that sent you here or go to “End of Call” on page 9-8.

FID E6 or E7– Isolate Fault Between Microcode and Hardware

FID E6 can be displayed in large letters (normal FID) or in small letters with several lines of support data (abnormal condition). If FID E6 is displayed in large letters, use “FID E6, E7– Normal FID Display Procedure”.

If FID E6 is displayed in small letters, use “FID E6 – Small Letters (Abnormal Display Condition)” on page 9-122.

FID E6, E7– Normal FID Display Procedure

Use either the “FID Currently Displayed on Drive” or the “FID Not Currently Displayed on Drive” on page 9-121 procedure.

FID Currently Displayed on Drive

1. From FID display, write down the support data (12 characters). Call your next level of support with the FID and support data to determine if this problem is a new or a known microcode problem.

Known Microcode Problem

2. For known microcode problems, see if fix exists on latest EC Level. If a fix exists, update the drive to the latest EC level. For known microcode problems, use TAC M01.
3. If a fix does not exist, tell the customer that engineering is aware of problem and working on a fix. Install the fix when it is available.

End of Known Microcode Problem

Possible New Microcode Problem

4. At this point it could be a new microcode problem or a hardware problem. Because it could be a potential new microcode problem, get a microcode dump.

   Dump Icon Also Displayed ⚠

   For certain failures, the drive automatically collects dump information. Retrieve the dump via SCSI/fibre channel or cartridge (save for now).

   Dump Icon Not Displayed

   For certain failures, the drive automatically collects dump information, other failures require you to force a microcode dump.
5. Check with the customer to determine if they collected a dump via SCSI/fibre channel for this problem (could be why no dump icon is displayed).
6. If the customer has the dump data, save it for now.
7. If the customer does not have the dump data, or is not sure, go to the CE Main Dump menu, and select the **Force Dump** option. Dump exists when dump icon is displayed.
8. Retrieve a dump via SCSI/fibre channel or cartridge or 3591 Control Unit; save it for now.
9. Press the Reset pushbutton on the operator/CE panel.
10. Run Verify Fix diagnostics.
    a. If you get a new or a different FID, go to “FID Entry Point” on page 1-8 with that information.
    b. If you get the same FID (E6 or E7), a hardware problem exists. Do not save the microcode dump. Perform actions for next FRU in the FID List.

c. If an error does not occur, the fault could be a new microcode problem or an intermittent electronics problem. Call your next level of support and provide them with dump and the 12-character support data. For new microcode problems, use TAC M02. For electronic problems, use TAC T21.

d. Go to “End of Call” on page 9-8.

End of Possible New Microcode Problem

FID Not Currently Displayed on Drive

1. Look at the Error Log for most recent FID E6 or FID E7 entry.
2. From the Error Log, record the support data (12 characters). Call your next level of support with the FID and support data to determine if this problem is a known microcode problem.
3. For known microcode problems:
   a. From support, see if fix exists on latest EC Level. If a fix exists, update the drive to latest EC level.
   b. If a fix does not exist, tell customer that engineering is aware of problem and working on a fix. Install the fix when it is available. For known microcode problems, use TAC M01.
4. At this point it could be a new microcode problem or a hardware problem.
   a. Press the Reset pushbutton on the operator/CE panel.
   b. Run **Verify Fix** from the CE Options menu.
   c. If you get a new or a different FID, go to “FID Entry Point” on page 1-8 with that information.
   d. If you get the same FID (E6 or E7), a hardware problem exists. Perform the actions for next FRU in FID List.
5. If an error does not occur, the fault could be a new microcode problem or an intermittent electronics problem. You need to get a dump.
   a. A dump may already exist. Check with the customer to determine if they had collected a dump via SCSI/fibre channel for this problem when the FID and the dump icon were displayed.

      If the customer has the dump data, provide the dump, the FID, and the FID support data to your next level of support.
   b. If no dump exists, go to step 6.
6. Determine if the customer can easily recreate the FID message.
7. If the customer can easily perform operations and/or run the job that caused the message, wait until it occurs and follow the procedure for the FID currently displayed.
8. If the customer cannot easily recreate the message, or if this is an inconvenient time, the following options exist to acquire the dump for your next level of support.

   Allow the problem to reoccur and have the customer take the initiative (go to step 8a) or you can take the initiative (go to step 9).
   a. The customer can leave the drive with FID message displayed and then call for service.
   b. If the dump icon is also displayed, the customer can retrieve a dump via SCSI/fibre channel (if host device driver software supports).
   c. If the dump icon is not displayed, the customer can select Force Error Dump (operator Services menu), which will provide a FID FF and the dump icon. FID FF indicates that a dump was forced (information message). The icon is for the FID E6, so now the customer can retrieve a dump via SCSI/fibre channel (if the host device driver software supports dumps)
9. You can take the initiative and Set a Microcode Trap, as follows:
   a. From the 12-character support data, use the first four characters (if it does not start with ‘A’ such as Axxx). Use the second set of four characters if the first four are Axxx.
   b. Take the four characters (FSC) and use the Microcode Trap facility under CE Utilities menu. Use the Add FSC Trap function. With this trap set, a dump will automatically be taken when this FSC is encountered, and the dump icon is displayed. The customer can retrieve the dump via SCSI/fibre channel for you or can call for service when the dump icon appears.
10. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

FID E6 – Small Letters (Abnormal Display Condition)

FID1 E6 is presented in small letters followed by four lines of support data. As the following example shows, each line contains eight characters:

```
     FID1 E6
FSC  AAAA BBBB
FSC  CCCC DDDD
FSC  EEEE FFFF
FSC  F020 EEEE
```

When the above is displayed (EEEE is repeated), the operator panel is frozen (you cannot select another menu, and the pushbuttons do not respond). Therefore, you cannot use the panel or cannot get dumps from either the host or the panel.

1. Obtain as much information as possible regarding the job being run, any drive operations, and the failure scenario. Record the information displayed on the panel (including the four lines of support data). Save this information for now.
2. Switch OFF power, wait 5 seconds and then switch ON power. The drive automatically runs the power-on self-test (POST).
3. See Figure 9-45.

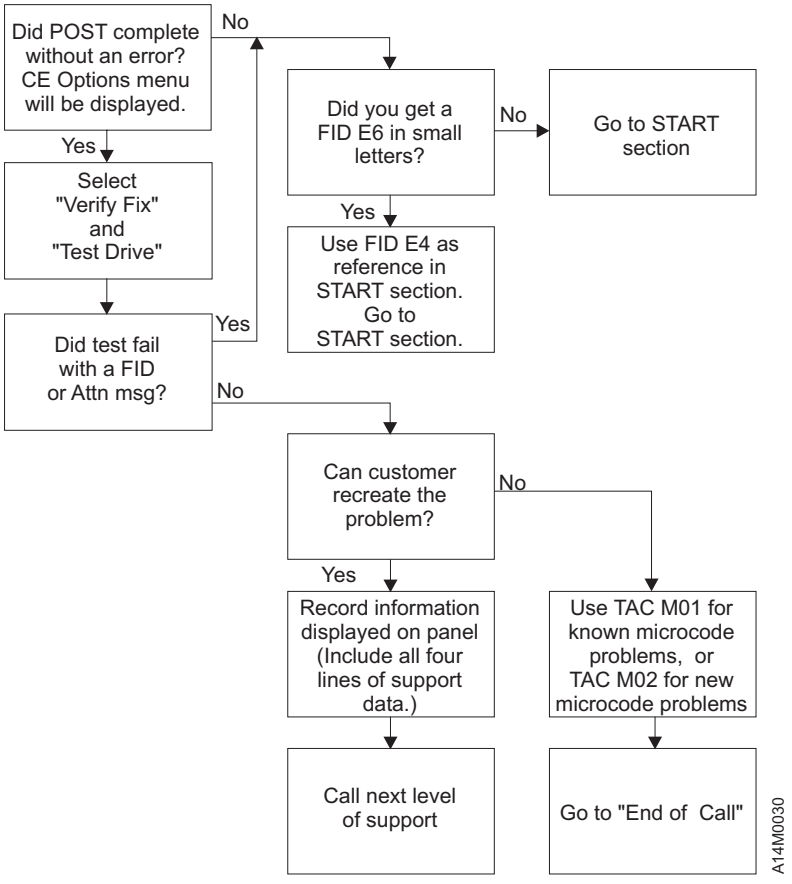


Figure 9-45. Flow Diagram for FID E6 in Small Letters

FID FE – Isolate Fault Between Media and Hardware

A FID FE will be generated when the drive experiences an error and cannot determine if the error was caused by the tape cartridge or by a problem in the drive hardware. The FID FE is not displayed on the drive, but is logged in the sense information that is returned to the host system. If the customer receives errors when reading or writing to the drive and there is no FID displayed on the drive, a FID FE was probably returned in the sense information to the host. If needed, refer to the Message Section to determine how to obtain service information from the host system.

To determine the cause of the read or write errors, follow the steps below:

1. Determine which VOLSER numbers or cartridges are potential problems:
   a. Ask the customer to note which cartridges (VOLSER numbers) fail during the operation. (It is possible to have multiple bad cartridges.)
   b. If the customer received MIM Messages at the host, get the “Message Code” and associated VOLSER number, if available. Refer to “Message Codes” on page 4-8 and Figure 4-2 on page 4-5.

      If a bad cartridge cannot be identified at the time of failure, the VOLSER field of the MIM will be blank and the VOLSER Valid Flag will be **00**; VOLSER not Valid.
   c. Examine the FID FE log using the “LOGS” option of the CE menu on the operator panel. Collect both FIDs and associated VOLSER numbers. See Figure 5-8 on page 5-17 and “CE FID FE Log Menu” on page 5-63. The FE log will display entries for up to 10 of the most recent occurrences of the FE error. Each entry consists of four lines of information that pertain to the error:
      1) The first line provides an alternate FID number that you can use to isolate the problem.
      2) The second line displays the first and last FSC’s and the microcode link.
      3) The third line provides a power-on date/time stamp which can be correlated with power-on hours in the “Show Statistics” menu, or a “Current Time Stamp” option (if present).
      4) The fourth line provides VOLSER number of the suspect cartridge, if available.
   d. If the customer received SIM messages at the host, get VOLSER numbers if available from Sense Data which accompanied the SIM. Refer to Message Section for details.
2. Determine if the cartridges are bad:
   a. If you have a MIM Message Code for the suspect VOLSER number cartridge, perform the action stated in the “Message Codes” on page 4-8.
   b. Examine cartridge for damage, for example, leader block not attached or cracked cartridge. If damaged, ask customer to repair or replace cartridge.

      Note: A repaired cartridge may be used long enough to recover data on that cartridge. When the data has been recovered, the cartridge should be taken out of service by the customer and discarded.
   c. If the cartridges look OK and you have access to another 3590 try the operation with the suspect cartridges in another 3590.
   d. Have the customer replace any cartridges that have failed in more than one 3590.
3. If the cartridges are not bad, isolate the problem to a drive FRU:
   a. Examine the log entries and, using the alternate FID numbers provided, try to determine the cause of the FE errors.

      Note: A FID FE with a Fault Symptom Code (FSC) of 3541 may be caused by an intermittent file protect switch or a faulty cable in the loader. If the FSC is 3541, install a new loader assembly, FRU BC.
   b. Use the “Error Log Analysis Procedure” on page 9-126 as an approach to problem isolation.
   c. Test the drive:
      1) Press the Change Mode  pushbutton to place the drive in CE mode.
      2) Select **Verify Fix**.

3) From the Verify Fix menu, select **Test Drive**. Use the CE scratch tape when you are prompted to load a tape.

   If the test fails with the same FID as the one reported or logged, go to “FID Entry Point” on page 1-8 to fix the fault. Continue with the FRU list for this FID.

   If the test fails with a different FID from the one reported or logged, use the new FID and go to “FID Entry Point” on page 1-8 to fix the fault.

   Note: Before replacing any FRUs, check the head cable connections. Ensure that the head cables are not loose.

4. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

FID FF – Operator Action or Host Program Error

FID FF is always presented to the host. Some types of problems are also presented on the operator panel.

The “CE FID FF Log Menu” on page 5-64 provides a log of a filtered subset of all sense data sent to the host with a FID of FF. Use this log to assist you in diagnosing a FID FF problem.

FID FF Displayed on Drive Panel

FID FF is displayed on drive panel (it also went to host).

- FID FF is automatically displayed when the operator selects Force Error Dump from the operator Services menu. This causes a FID1 FF with expert systems data of E009 XXXX XXXX.

  Action: Remove the dump icon and the FID message by pressing the Reset pushbutton or by powering the drive OFF, and then ON.
- The FID message can be removed without removing the dump icon by selecting **Reset Drive** on the operator Services menu.

FID FF Displayed at Host Only – Not at Drive Panel

FID FF is not displayed on drive panel (it went to host only).

- The host receives this FID, but it is not presented on the drive operator panel. If FID ‘FF’ was reported in host error log via a **SIM message**, then perform action indicated in SIM message codes (for example clean drive). Refer to MSG section.
- This FID is presented for an invalid and unsupported SCSI command or parameter, which is a SCSI application program software problem. Sense data exists at the host.
- This FID can also be presented for a drive operator procedural problem. For example, FID FF is presented when a magazine is not in the ACF and the host issues a Load command. Another example is when the operator tries to switch to random mode and the magazine is not locked.

The service representative should look in the drive error log for any ATTN DRIVE or ATTN ACF messages (which may have caused the FID FF to be sent to the host via sense data). If any of these ATTN messages are present in the error log, use that data to perform further isolation for the FID FF cause.

Suspected Microcode Problem

1. Press Reset on the operator/CE panel.
2. Run Verify Fix test.
3. If you get a FID, go to Table 1-2 on page 1-9 with that FID.
4. If the drive tests work OK, the fault could be a microcode problem or an intermittent hardware problem.

   Go to “Problem Determination” on page 9-4 or “FID E5 – Microcode Problem” on page 9-118 to assist with the problem determination.
5. If the failure still occurs, collect as much information as you can from the customer and contact your next level of support.

Error Log Analysis Procedure

The Error Log Analysis Procedure is designed to assist the service representative in isolation of intermittent failures, or chronic problems that seldom happen but occur often enough to cause a concern. An example of using the error log to demonstrate how one might look for possible leads on which FRUs to replace in such a case follows. The example does not use real data, and is intended for demonstration only.

Figure 9-46 on page 9-128 shows a blank Error Log Analysis Work Sheet that you can make a copy of and use to write down FIDs with the following procedure. Figure 9-47 on page 9-129 shows the same Error Log Analysis Work Sheet with a sample extraction from the 3590 error log.

Following is a sample of how you might gather and analyze error log data. The following list is a summary of what you might find in the 3590 error log:

Note: Only 10 positions are shown in this example. You may prefer to use the most recent 10 or the entire error log in your analysis. The first (top) errors are the most current, as shown by the relative time stamp.

```
Entry 1  FID 98
Entry 2  FID A7
Entry 3  FID 9F
Entry 4  FID C6
Entry 5  FID 95
Entry 6  FID CA
Entry 7  FID C6
Entry 8  FID A8
Entry 9  FID 9F
Entry 10 FID A9
```

Fill out the blank sheet, as follows (note that our example has all the sample data already there for your information):

1. Take the FID from the most recent error log entry and put it in the first column (FID 98 in our example). Continue listing FIDs that you find in the error log until you get to the last one you choose to use in the analysis.

   Note: If the time stamp shows a long duration between one entry and the next, you may want to ignore any of the older entries for the purpose of this exercise.

2. Go to "FID Entry Point" on page 1-8 and look up each FID listed in the left column of your work sheet, and list horizontally each FID listed in START in the order that they are listed (in our example, we found FIDs 98, 99, 95, 97 and 9A).
3. Next, look first in the left two or three columns of your ERROR LOG ANALYSIS WORK SHEET, under the START SECTION FID ENTRIES and draw a circle around the FID that appears most often (in our example we circled FID 99 five times).
4. Next, look in the left two or three columns and draw a square around the next FID that occurs the most often (in our example we drew a square around FID A9, five times).
5. Now, look at the overall entries, and draw a diamond around any FID that occurs most often (in our example, we drew a diamond around FID 97.)

   Note: The error log analysis procedure is intended to show the limitations of the logging process and to minimize the affect. In the example, FID 97s only occur in the lower priority columns on the right-hand portion of the work sheet. They are low priority because failure priority are based on one FID at a time. If a FID occurs often and always falls in a low probability position the FID may still be causing the problem. The error log procedure will still isolate the failure overcoming the limitations of the error logging.

6. Last, look up the FID number and associated names of the FRUs they represent (in our example, the three FIDs are listed under **Legend**). Now use your training, intuition, or experience to decide which

FRU is most likely to be causing the problem. In our example, the likely failing FRU might be the transport cable, the feed motor assembly, or the Motor control card. A decision at this time might be to replace the FID 97 FRU (the motor control card) for the following reasons:

- FID 99 and A9 occurred very often, but with too large a variation in the ERROR LOG FID ENTRIES.

  Note: Variation here is used as a measure of how often an error occurred exactly the same (contained identical error data) in a sample of error log entries. Low variation (similar to high correlation) points to components that are more likely to have failed, while high variation (similar to low correlation) tends to point to less likely failing components.

- The FID 97 seems to be a low probability, but occurs too often to ignore.

Had the FID 99 or A9 occurred with similar or identical ERROR LOG FID ENTRIES, it might have been better to replace these FRUs first. These kind of decisions must rely heavily on your experience and knowledge of the device, the timing of the errors that occurred, error history of this device, and your customer environment.

Error Log Analysis Work Sheet

ERROR LOG FID ENTRIES	START SECTION FID ENTRIES (Enter from Highest Priority FIDs on Left to Lowest Priority FIDs on Right)											

A141CEL1

Figure 9-46. Blank Error Log Analysis Work Sheet

Error Log Analysis Work Sheet

ERROR LOG FID ENTRIES	START SECTION FID ENTRIES (Enter from Highest Priority FIDs on Left to Lowest Priority FIDs on Right)											
98	98	(99)	95	<97>	9A							
A7	[A9]	9A	9D	99	<97>	A1						
9F	(99)	[A9]	C9	CA	CD	9A	A1	<97>	D5	DA	E4	
C6	C6	D6	DA	E4								
95	(99)	95	92	9A	A1	<97>	A2					
CA	CA	D5	DA	E4								
C6	C6	D6	DA	E4								
A8	[A9]	9A	FD	9D	99	<97>	A1					
9F	(99)	[A9]	C9	CA	CD	9A	A1	<97>	D5	DA	E4	
A9	[A9]	(99)	9A	A1	<97>	9D						

Legend:

99=Transport Cable
A9=Feed Motor Asm.
97=Motor Control Card

A141CEL2

Figure 9-47. Example – Error Log Analysis Work Sheet

Set Error Match Trap (To Get Dump)

The dump icon ⚠ appears when the dump is available, and this icon remains on the screen to indicate that trace data is stored in the device. In addition, when the error match trap is hit, an ATTN DRV FSC Trap Taken message is displayed on the operator panel. If a FID1 E5 occurs, it may overlay the ATTN DRV message. The dump icon will still be displayed, with the ATTN DRV message existing behind the dump icon.

Note: *Normal* error match traps are volatile and are lost if you press the Reset pushbutton, power OFF the device, or the microcode recovery occurs (via Check-1, FMR, and so on). *Saved* error match traps cannot be lost by a Reset, and require a special procedure for removal. Please see procedure “Remove Error Match Trap” on page 9-131 for details.

To set an error match trap:

1. Press the Change Mode pushbutton to place the drive in CE mode.
2. Select **Proceed**.
3. Select **Utilities** from the CE Options menu.
4. Select **Microcode Trap** from the CE Utilities menu.

   After the CE Microcode Trap menu is displayed, four characters matching the desired error code (FSC) must be entered. Select each character and modify to the desired value.
5. With the CE Microcode Trap menu still selected there will be 4 options presented:
   - Add FSC Trap
   - Remove FSC Trap
   - List FSC Traps
   - Saved Trap

   There are two options available to set the trap:

   Use option **a** - Select **Add FSC Trap** which saves the *normal* trap until the next code reset. Selection of this option ends the procedure. Skip to step 9 for completion of the procedure.

   Or use option **d** - Select **Saved Trap** to save the *saved* trap in the drive until it is manually removed. A code reset will not eliminate a *saved* trap from the drive. See procedure “Remove Error Match Trap” on page 9-131 for removal of a saved FSC trap.
6. Selection of the **Saved Trap** option from the CE Microcode Trap menu will cause the CE Saved Traps menu to be displayed next.
7. Select **Add Saved FSC Trap** from the CE Saved Traps menu to save the trap.
8. Select **Cancel** when the status screen comes up.
9. Select **Cancel** to return to the previous CE menu. Repeat this step as needed to return to previous CE menus.
10. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

Note: Only three **saved** traps can be active at a time. If more than three are selected, the procedure will not be successful. To see how many saved traps are active, select **Saved Trap** from the CE Microcode Trap menu, and select the **List Saved FSC Traps** option.

Remove Error Match Trap

Note: This procedure is similar to procedure “Set Error Match Trap (To Get Dump)” on page 9-130, except that it removes the trap(s) set in the previous procedure. See the definition of *normal* trap versus *saved* trap in procedure “Set Error Match Trap (To Get Dump)” on page 9-130.

1. Press the Change Mode pushbutton to place the drive in CE mode.
2. Select **Proceed**.
3. Select **Utilities** from the CE Options menu.
4. Select **Microcode Trap** from the CE Utilities menu.

   At this point it is necessary to distinguish between removal of a *normal* trap or a *saved* trap. If the trap is known to be *normal*, go to heading “Remove NORMAL Trap”. If the trap is known to be *saved*, go to heading “Remove SAVED Trap” on page 9-132. If the *type* of trap is unknown, but the error code is known, proceed, as follows:

   a. Select **Saved Trap** from the CE Microcode Trap menu.
   b. Select **List Saved FSC Traps** from the CE Saved Traps menu. The list is displayed.
   c. Check the list of Saved FSC traps for a match of the error code.
   d. If there is no match, the trap is presumed to be *normal*. Select **Cancel** twice to return to the CE Microcode Trap menu. Skip to heading “Remove NORMAL Trap”.
   e. If there is a match, then select the appropriate error code.
   f. Select **Remove Saved FSC Trap** from the CE Remove Saved FSC Trap menu. Success or failure of the CE action will be indicated on the operator/CE panel.
   g. Select **Cancel** twice to return to CE Microcode Trap menu. Repeat this step as needed to return to previous CE menus.

      This completes removal of a known, saved FSC trap.
5. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

Remove NORMAL Trap

Known Normal Error Code

If the error code is unknown, go to heading “Unknown Normal Error Code”. With the error code **known**, proceed:

1. With the CE Microcode Trap menu still selected, four characters matching the error code (FSC) must be set. Select each character and modify to the desired value.
2. Select the **Remove FSC Trap** option from the CE Microcode Trap menu. The Op panel will indicate success or failure of the CE action.
3. Select **Cancel** to return to CE Utilities menu and repeat this step as needed to return to the previous CE menu.

   This completes removal of a known, normal FSC trap.
4. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

Unknown Normal Error Code

1. With the CE Microcode Trap menu displayed, select **List FSC Traps**. The list is displayed.
2. Select the error code to be removed (from the list).
3. Select **Remove FSC Trap** from the CE Remove FSC Trap menu. The Op panel will indicate success or failure of the CE action.
4. Select **Cancel** to return to the CE Microcode Trap menu. Repeat this step as needed to return to previous CE menus.

   This completes removal of an unknown, normal FSC trap.
5. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

Remove SAVED Trap

Known Saved Error Code

If the error code is unknown, go to “Unknown Saved Error Code”. With the error code **known**, proceed:

1. From the CE Microcode Trap menu (still displayed), select **Saved Trap**.
2. The CE Saved Traps menu is selected. Four characters matching the error code (FSC) must be set. Select each character and modify to the desired value.
3. Select the **Rmv Saved FSC Traps** option from the CE Saved Traps menu. The Op panel will indicate success or failure of the CE action.
4. Select **Cancel** to return to CE Microcode Trap menu. Repeat this step as needed to return to previous CE menus.

   This completes removal of a known, saved FSC trap.
5. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

Unknown Saved Error Code

1. From the CE Microcode Trap menu (still displayed), select **Saved Trap**.
2. Select **List Saved FSC Traps** from the CE Saved Traps menu. The list is displayed.
3. Select the error code to be removed (from the list).
4. Select **Rmv Saved FSC Trap** from the CE FSC Trap List menu. The Op panel will indicate success or failure of the CE action.
5. Select **Cancel** to return to the CE Saved Traps menu. Repeat this step as needed to return to previous CE menus.

   This completes removal of an unknown, saved FSC trap.
6. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

No Response from Operator/CE Panel and No Message

Note: The Reset pushbutton is active, but **do not** press it until instructed.

1. If hung/frozen panel was reported by customer but **does not currently exist** on drive, ask the customer if they can easily recreate the failure. If they cannot recreate the failure or it is an inconvenient time for the customer, have them call for service when the fault reoccurs. When the fault occurs, ask them to leave the drive in that condition and call for service.

   Note: An attempt to **unfreeze** the panel may be made, as follows:

   > Force microcode recovery and a dump by pressing the Change Mode pushbutton **ten times** consecutively.

   If the host software supports microcode dumps, ask the customer to force a dump via SCSI/fibre channel and retrieve dump via SCSI/fibre channel because this type of fault prevents dumps via the panel.

   When the problem is recreated, with or without a dump, contact your next level of support.

2. If hung/frozen panel **currently exists** on the drive, check to see if the dump icon is displayed.
   a. If the dump icon is not displayed and the host software supports microcode dumps, ask the customer to force a SCSI/fibre channel dump and retrieve the dump via SCSI/fibre channel.
   b. Get the dump and contact your next level of support.
3. If the dump icon is displayed and the host software supports microcode dumps, ask the customer to retrieve the dump via SCSI/fibre channel.

   Take a microcode dump and contact your next level of support.
4. If the host does not support SCSI/fibre channel retrieval of dump:
   a. Press Change Mode (wrench) to try to get into service mode.
   b. If you cannot get into service mode, contact your next level of support.

      Note: An attempt to **unfreeze** the panel may be made, as follows:

      > Force microcode recovery and a dump by pressing the Change Mode pushbutton **ten times** consecutively.

   c. If you can get into service mode, copy dump to cartridge and save it for now.
      1) Press Reset Button on the operator/CE panel.
      2) Run the Verify Drive diagnostic.
      3) If a failure occurs with a new FID, use the new FID and go to “FID Entry Point” on page 1-8.
      4) If no error occurs, the problem can be a microcode problem or an intermittent hardware problem. Call your next level of support and provide them with the microcode dump.
5. Perform “End of Call” on page 9-8 or return to the procedure that sent you here.

Chapter 10. Locations, Checks, Adjustments, Removals, and Replacements

Contents

Measurement and Adjustment of Pneumatic System

Note: Remove the **cleaner blade** (if installed) from the drive or HGA before beginning this procedure. See Figure 10-78 on page 10-113 to determine the location of the cleaner blade on the HGA. Also, see "Cleaner Blade Removal (Model B11/B1A)" on page 10-112 for the cleaner blade removal procedure.

Attention: When the cleaner blade is removed the cleaner blade vacuum hose must be either removed or plugged to prevent vacuum system leaks. See "Cleaner Blade Removal (Model B11/B1A)" on page 10-112 for details.

The pneumatic system vacuum adjustment is done by adjusting a bleed valve with a scratch cartridge loaded in the drive. The gauge in the Pressure/Vacuum Kit is used to measure the vacuum at the pneumatic assembly vacuum test port.

The pressure is adjusted by the microcode when the **Adjust Pressure** routine is run from the Config/Install menu. While this routine is running, the microcode senses the output of the pressure transducer, then adjusts the compressor speed to ensure the pressure is within specification.

The vacuum and pressure specifications are listed here for reference only:
- Vacuum: -4.1 to -6.6 kilopascals (-16.0 to -26.0 inches of water).
- Pressure: 29.5 to 36.6 kilopascals (116 to 144 inches of water).

Important Hints

1. The vacuum and pressure adjustments have an affect on each other. The **Adjust Pressure** routine changes the compressor speed, which will affect the vacuum. The vacuum bleed valve adjustment changes the overall load on the pneumatic system, which will affect the pressure. Consequently, it will be necessary to repeat the **Adjust Pressure** routine after each adjustment of the vacuum bleed valve. It may be necessary to **repeat** the vacuum and pressure adjustment routines **3 or 4 times** before the **Adjust Pressure** routine no longer changes the vacuum.
2. The pneumatic system compressor is very temperature sensitive. The compressor does not start to run until a tape is loaded. It takes a **minimum** of 2 minutes for the compressor to be warm enough to adjust.
3. Use Table 10-1 with Figure 10-1 on page 10-6 and Figure 10-2 on page 10-6.

Note: There are two levels of deck enclosure back cover. See Figure 10-1 on page 10-6. The old style back cover is one piece and must be removed to perform the pneumatic system check and adjustment. The new style back cover has a small, removable access cover **10** over the pneumatic system test ports and adjustment screw. With the new style cover, it is not necessary to power OFF and remove the deck enclosure rear cover before performing the pneumatic system check and adjustment.

1. If you have the new style deck enclosure rear cover, remove screw **11** and the small access cover **10** over the pneumatic system and go to step 7 on page 10-6.
2. If you have the old style one-piece deck enclosure rear cover, switch OFF the 3590 power **2** and continue with step 3.
3. Disconnect the power cord at its source, then at the back of the 3590 **3** .
4. Remove the deck enclosure back cover.
5. Connect the power cord **3** to the back of the 3590, then to the power source.
6. Power ON the 3590 **2** . Wait for the power-on diagnostics to run.

Table 10-1. Pneumatic System Components

Figure Item #	Component Name
1	Test Port

Table 10-1. Pneumatic System Components (continued)

2	Power Switch
3	Power Cord
4	Bleed Valve Lock Nut
5	Bleed Valve
6	Pressure/Vacuum Gauge
10	Access Cover
11	Access Cover Screw

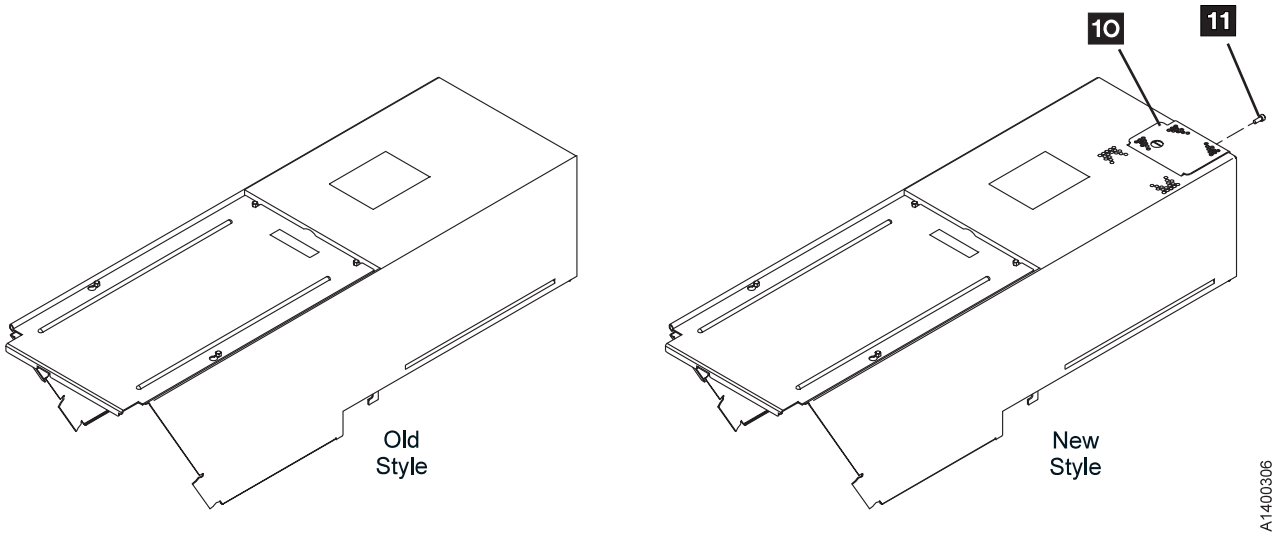


Figure 10-1. Deck Enclosure Back Cover

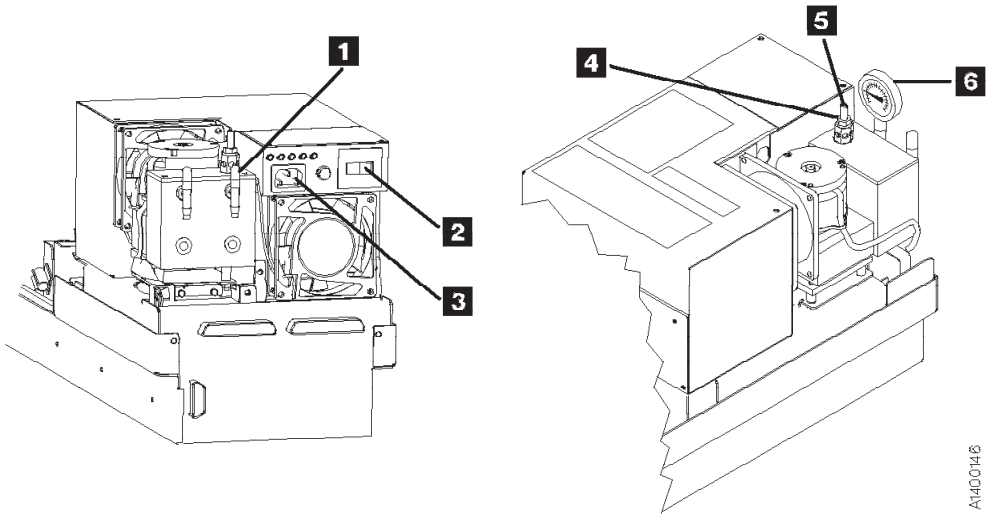


Figure 10-2. Measuring and Adjusting Pneumatic System

7. Remove the pneumatic system vacuum test-port cap **1** and attach the pressure/vacuum gauge **6** to the vacuum test port by using the CE vacuum gauge adapter P/N 05H9895.
8. Clean the wholes (not shown) that are located below the bleed valve adjustment shaft **5** to ensure adequate air flow.
9. Load a scratch cartridge, supplied with the ship group, into the 3590. Wait for the **Ready-At Loadpoint** message.

   Note: Do not use a cleaner cartridge for this adjustment. The vacuum and pressure will vary due to the surface texture of the tape. Use only a scratch data cartridge.

10. Press the Change Mode pushbutton. Select **Proceed**, and press **Enter**.
11. Select **Config/Install** from the CE Options menu, and press**Enter**.

    Attention: The pneumatic system is temperature sensitive. The compressor should run for a minimum of 2 minutes before you start the **Adjust Pressure** routine.
12. Select **Adjust Pressure** from the Config/Install menu, and press **Enter**.

    Attention: There are two levels of microcode for the Pneumatic System adjustment routine.

- If the message **UNLOAD DRIVE FIRST** appears, you have the new level of microcode. Skip to step 22.
- If the **CE Wait** menu and the message **RUNNING** appears, you have the early level of microcode. Continue with step 13.

Early Level Microcode Procedure

13. The program will run until you stop it. Allow the program to run for at least 10 seconds, select **Stop Running**, and press **Enter**.
14. Ensure the message **Pump OK** is displayed. If **Pump OK** is displayed, skip to 15.

    If any of the following messages are displayed, run the **Adjust Pressure** routine again.

    If any of the following messages are displayed again, continue with this step.

```
No Air          -- leak in pneumatic hose
Pump Fast       -- leak in pneumatic hose
Pump Slow       -- blockage in pneumatic hose
Pump Not Set    -- the pressure is out of
                   specification.  Continue
                   with the next step to
                   adjust vacuum.  If this
                   message repeats, go to
                   Pneumatic Problems MAP.
Unknown Results -- microcode problem
```

    For any problem related to hoses go to“Pneumatic Problems” on page 2-3. For microcode problems, get a microcode dump by selecting **Dump** from the CE Options menu. Select the appropriate dump option and call your next level of support.
15. Check the vacuum measurement on the gauge **6** . The required range is -4.1 to -6.6 kilopascals (-16.0 to -26.0 inches of water). The optimum setting is -5.4 kilopascals (-21 inches of water).
16. If the vacuum is within the required range after the **Adjust Pressure** routine has completed, no further adjustment is necessary. Select **Cancel**, as necessary, to return to the CE Options menu, then go to step 34 on page 10-8.
17. If the vacuum is not within the required range, continue with step 18.
18. Loosen the locking nut **4** on the bleed valve adjustment shaft **5** . Turn the adjustment shaft until the gauge indicates a reading close to the optimum setting given above.
19. Tighten the locking nut while using a screwdriver to hold the position of the bleed valve adjustment shaft. Ensure the vacuum measurement remains within the required range while tightening the lock nut.
20. Return to 12 on page 10-6 and run the **Adjust Pressure** routine again. Repeat step 12 on page 10-6 through step 19 until the vacuum does not require adjustment after the **Adjust Pressure** routine has been run.

    It may be necessary to **repeat** the vacuum and pressure adjustment routines **3 or 4 times** before the **Adjust Pressure** routine no longer changes the vacuum.

    If vacuum cannot be set, see “Pneumatic Problems” on page 2-3.
21. Select **Cancel**, as necessary, to return to the CE Options menu, then go to step 34 on page 10-8.

End of Early Level Microcode Procedure

New Level Microcode Procedure

22. Unload the drive and select **Adjust Pressure** again to restart the new procedure. The **Load Scratch Tape** message will be displayed.
23. Load a scratch tape, supplied with the ship group, into the 3590. Wait for the **Ready-At-Loadpoint** message.

    Note: Do not use a cleaner cartridge for this adjustment. The vacuum and pressure will vary due to the surface texture of the tape. Use only a scratch data cartridge.

Attention: The pneumatic system is temperature sensitive. The compressor should run for a **minimum** of 2 minutes before you start the **Adjust Pressure** routine.

24. Select **Process Loaded Tape**, and press **Enter**. This will start the **Adjust Pressure** routine. Allow the routine to run for at least 10 seconds to ensure that the microcode has enough time to adjust the pressure.

    Note: If you get an **Attention Drive** error message during this procedure, select the **Set Pressure to Default** option, then unload the drive and start over.

25. Select **Stop Running**, and press **Enter**. Ensure the message **PUMP OK--CHK VACUUM** is displayed.

    If **PUMP OK--CHK VACUUM** is displayed, skip to 26.

    If any of the following messages are displayed, run the **Adjust Pressure** routine again.

    If any of the following messages are displayed again, continue with this step.

```
No Air          -- leak in pneumatic hose
Pump Fast       -- leak in pneumatic hose
Pump Slow       -- blockage in pneumatic hose
Pump Not Set    -- the pressure is out of
                   specification. Continue
                   with the next step to
                   adjust vacuum.  If this
                   message repeats, go to
                   Pneumatic Problems MAP.
Unknown Results -- microcode problem
```

    For any problem related to hoses go to “Pneumatic Problems” on page 2-3. For microcode problems, get a microcode dump by selecting **Dump** from the CE Options menu. Select the appropriate dump option and call your next level of support.

26. Check the vacuum measurement on the gauge **6** . The required range -4.1 to -6.6 kilopascals (-16.0 to -26.0 inches of water). The optimum setting is -5.4 kilopascals (-21 inches of water).
27. If the vacuum is within the required range after the **Adjust Pressure** routine has completed, no further adjustment is necessary. Go to step 31.
28. If the vacuum is not within the required range, continue with step 29.
29. Loosen the locking nut **4** on the bleed valve adjustment shaft **5** . Turn the adjustment shaft until the gauge indicates a reading close to the optimum setting given above.
30. Tighten the locking nut while using a screwdriver to hold the position of the bleed valve adjustment shaft. Ensure the vacuum measurement remains within the required range while tightening the lock nut.
31. Select **PUMP OK--CHK VACUUM**, and press **Enter**. The message **WAS VAC ADJUSTED?** will be displayed.
32. Select **YES** or **NO**, and press **Enter**.

    If you selected **NO**, skip to step 33.

    If you selected **YES**, the **Adjust Pressure** routine will automatically start and run again. Return to step 25 and repeat steps 25 through 31 until the vacuum does not require adjustment after the **Adjust Pressure** routine has been run.

    Note: It may be necessary to **repeat** the vacuum and pressure adjustment routines **3 or 4 times** before the **Adjust Pressure** routine no longer changes the vacuum.

    If vacuum cannot be set, see the Pneumatic Problems MAP.

33. When the vacuum no longer requires adjustment and you answer **NO** in step 32, select **Cancel**, as necessary, to return to the CE Options menu, then continue with step 34.

End of New Level Microcode Procedure

34. To ensure the SCSI ports are on-line, press the Change Mode pushbutton, then select **Proceed**, and press **Enter** to return to the operator Options menu.

35. Select **Unload Drive**, and press **Enter**. Remove the scratch cartridge from the drive.
36. Load a cleaner cartridge to ensure that automatic pressure adjustment works correctly.
37. Remove the pressure/vacuum gauge and adapter hose **6** from vacuum test port and install the test port cap back onto the test port.
38. If you have a new style back cover, reinstall the small access cover over pneumatic system, then return to procedure that sent you here.
39. If you have an old style back cover, switch OFF power from the back of drive **2** , then continue with step 40.
40. Remove the power cord, first from the power source, then from the back of the drive.
41. Reinstall the deck enclosure back cover.
42. Reinstall the power cord to the back of the drive, then to the power source.
43. Return to the procedure that sent you here.

ACF Component Locations

The FRUs in Figure 10-3 are identified by their FID number; for example, 90 is FID 90, the operator/CE panel. The list following the figure shows the locations of the ACF cables.

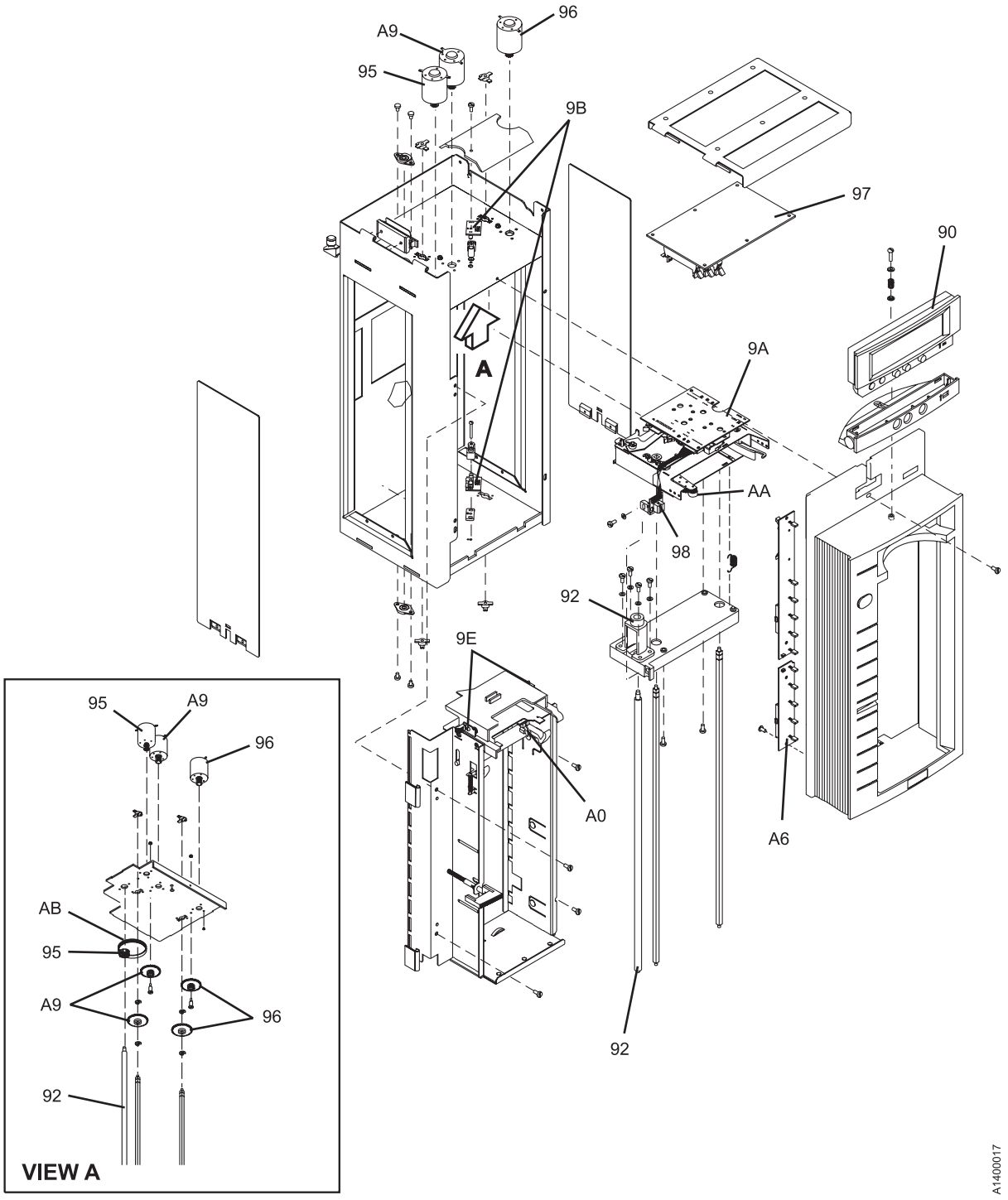


Figure 10-3. ACF Component Locations

FID Number	FID Name
90	Operator/CE panel
92	Leadscrew assembly
95	Elevator motor assembly
96	Pinch motor assembly
97	Motor control card
98	Transport position sensor
9A	Transport assembly
9B	Global/interference sensor assembly
9E	Priority cell sensor pair
A0	Magazine-present sensor assembly
A6	LED cards and random lock sensor
A9	Feed motor assembly
AA	Transport Pinch Rollers
AB	Leadscrew Drive Belt

See the following for the ACF cable locations:

FID	Name and FRU Location
91	Operator/CE Panel Cable 10-14
99 (old)	Transport Cable 10-31
99 (new)	Transport Cable 10-33
A1	Motor Cable Assembly 10-42
A2	Drive/ACF Cable 10-44
A4	LED Cable 10-45
A5	Sensor Cable 10-46

FID 90: Operator/CE Panel

See “ACF Component Locations” on page 10-10 for FRU identifier 90.

Model B11/E11/H11

Remove Operator/CE Panel:

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. See Figure 10-4. Press the two buttons **2** on the rear of the panel **1**.
3. Lift the panel out of the holder.
4. Disconnect the operator/CE panel cable connector **3**.

Replace Operator/CE Panel:

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **V08** for the area of failure.

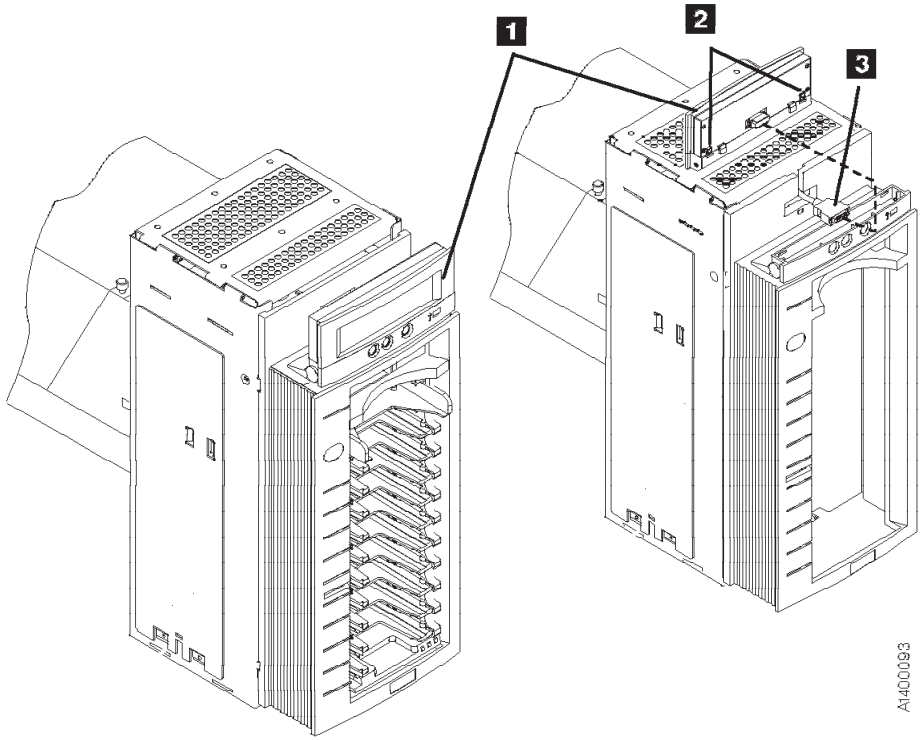


Figure 10-4. Operator/CE Panel, Model B11/E11/H11

Model B1A/E1A/H1A

Remove Operator/CE Panel:

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. See Figure 10-5. Press the two buttons **2** on the rear of the panel **1** .
3. Lift the panel out of the holder.
4. Disconnect the operator/CE panel cable connector **3** .

Replace Operator/CE Panel:

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **V08** for the area of failure.

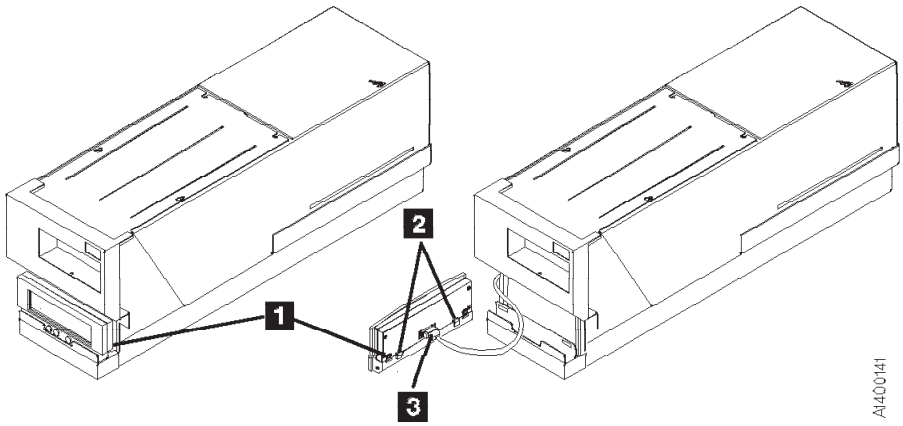


Figure 10-5. Operator/CE Panel, Model B1A/E1A/H1A

FID 91: Operator/CE Panel Cable

See “ACF Component Locations” on page 10-10 for FRU identifier 91.

(Model B11/E11/H11 Only)

Remove Operator/CE Panel Cable:

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF left side cover if not obstructed by another device; otherwise, you will use the magazine opening for access to the cables. See page 9-30.
3. Open the ACF top cover. See page 9-31.
4. Lift the operator/CE panel from its holder. See page 9-25.
5. See Figure 10-6. Disconnect the operator/CE panel cable connector from the panel **1**.
6. Move the elevator up or down (turn the leadscrew) to access the cable connected to the deck enclosure.
7. Disconnect the panel cable **2** from the lower connector on the deck enclosure and remove the cable.

Replace Operator/CE Panel Cable:

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **C09** for the area of failure.

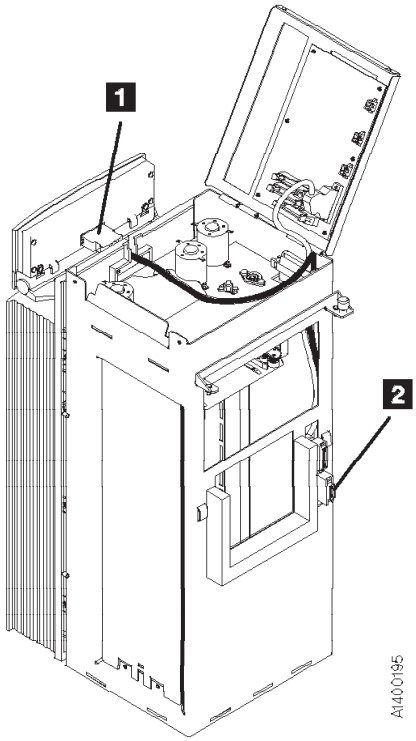


Figure 10-6. Operator/CE Panel Cable

FID 92: Leadscrew Assembly

See “ACF Component Locations” on page 10-10 for FRU identifier 92.

Note: Do not attempt to lubricate the ACF leadscrew. Lubricants will ruin the leadscrew coating.

Attention: The transport assembly card and sensors are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Engineering Change

There are two levels of leadscrew drive. See Figure 10-7 on page 10-16 and Figure 10-8 on page 10-17. The former level is gear-driven, 6 , and the current level is belt-driven, 7 and 8 .

The former level gear-drive parts are no longer available for field replacement use. If you have to replace any of the gear-drive parts, it will be necessary to upgrade the leadscrew drive mechanism to a belt-driven system. See Chapter 11, “Parts Catalog” on page 11-1 for additional information.

Both Styles

Remove Leadscrew Assembly:

1. “Prepare Tape Drive for Service” on page 9-6, then return here.

   This procedure can be done with the ACF attached to the drive; however, it may be easier if the ACF is removed and put on a work surface. If you have a work surface available, continue with step 2. If you do not have a work surface available, skip to step 3.
2. Remove the ACF from the drive and place it on a work surface. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.
3. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.

   Note: Ensure the pinch rollers are open before moving the elevator assembly. If not, rotate the pinch shaft by hand to open the pinch rollers.
4. See Figure 10-7 on page 10-16. Rotate the elevator leadscrew 1 to position the elevator assembly all the way to the bottom of the ACF.

   Attention: Ensure that the elevator assembly is all the way to the bottom of the ACF before removing the lower leadscrew bearing in the next step. This will ensure that the elevator assembly does not drop to the bottom of the ACF and damage the assembly.
5. Remove the two screws 5 from the lower leadscrew bearing and remove the bearing 4 from the leadscrew.
6. Lower the leadscrew by rotating it clockwise (from the top) far enough to disengage it from the upper bearing and gear 6 (gear-driven leadscrew) or gear 7 and belt 8 (belt-driven leadscrew).
7. Remove the gear 6 (gear-driven leadscrew) or gear 7 and belt 8 (belt-driven leadscrew).
8. Continue rotating the leadscrew out of the elevator assembly.
9. Remove the four screws 3 and remove the leadscrew nut and retainer assembly 2 .

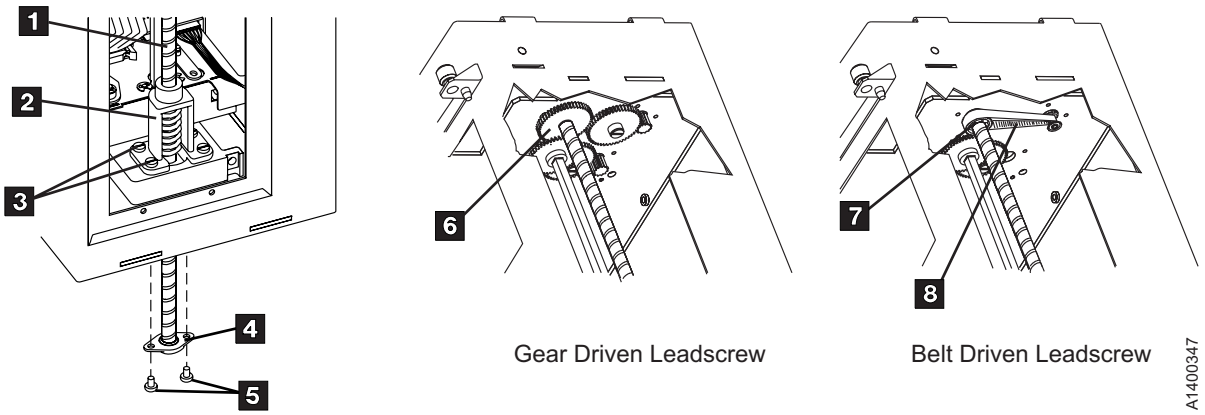


Figure 10-7. Gear-driven and Belt-driven Leadscrew Assembly

Replace Leadscrew Assembly:

HINT

If you are upgrading an ACF from a gear-driven leadscrew to a belt-driven leadscrew, it will be easier if you install the new elevator motor before installing the new leadscrew assembly.

Go to "FID 95: Elevator Motor Assembly" on page 10-20. Perform steps 9 on page 10-21 through 12 on page 10-21 to remove the gear-drive motor, then do the same steps in the reverse order to install the new level belt-drive motor. Then return here to install the new leadscrew.

Note: Do not reinstall the intermediate gear. It is not used on the belt-drive system.

Figure 10-8 on page 10-17 shows the differences between the former level and new level leadscrew assemblies.

Note: Do not attempt to lubricate the ACF leadscrew. Lubricants will destroy the leadscrew coating.

1. See Figure 10-9 on page 10-17. If a new leadscrew assembly is being installed, it will be necessary to remove the nut from the new leadscrew and install it in the new retainer before the retainer is installed in the ACF.

   Hold the leadscrew nut **1** with one hand, keeping the spring compressed, while you unscrew the leadscrew **2** from the nut assembly.
2. Continue to hold the spring compressed while you install the nut assembly **3** into the new retainer **4**.
3. Install the retainer and nut assembly **5** on the elevator plate with the four screws **6**.

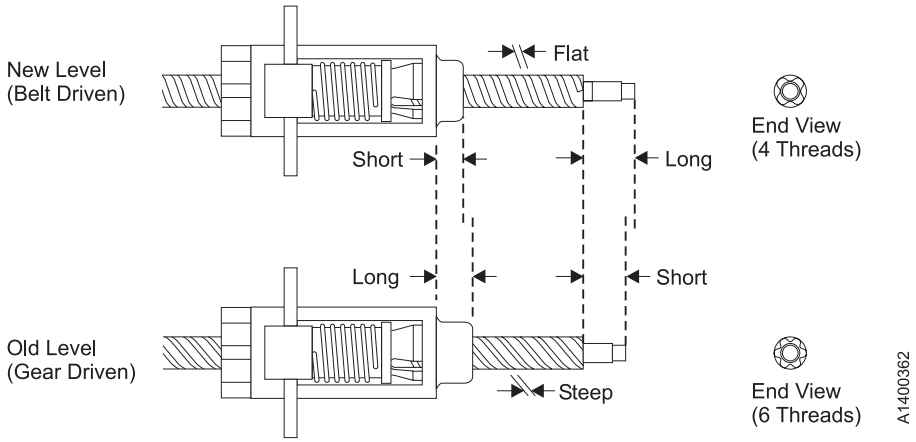


Figure 10-8. Differentiating Between Former Level and Current Level Leadscrew

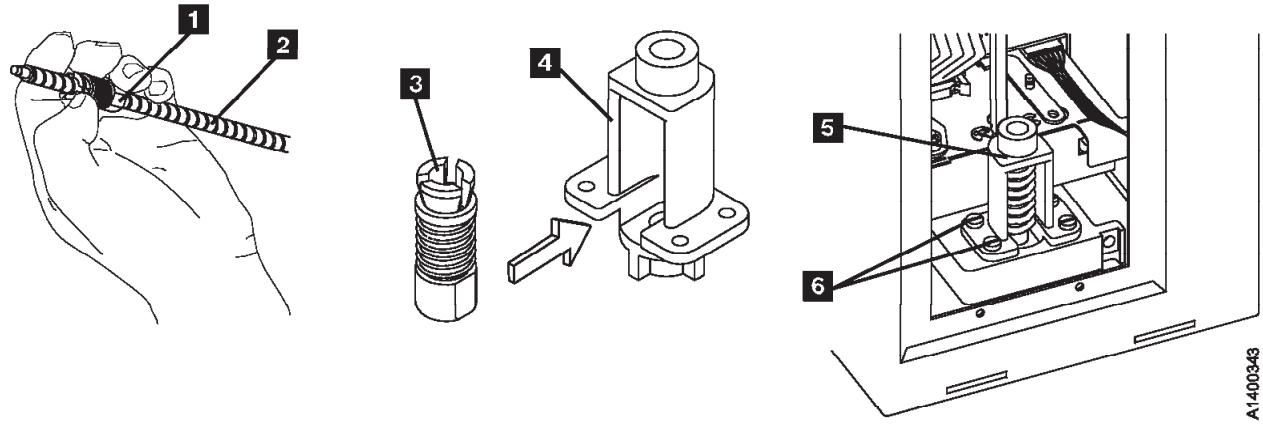


Figure 10-9. Leadscrew, Nut, and Retainer

4. See Figure 10-10 (gear-driven leadscrew) or, Figure 10-11 on page 10-19 (belt-driven leadscrew). The D-shaped end of the leadscrew must be up for this step. Insert the leadscrew up through the leadscrew bearing hole **1**.

   The leadscrew nut spring **2** must be held compressed during the remainder of this step.

   Insert the end of the leadscrew into the leadscrew nut **3** on the elevator and rotate the leadscrew upward in a counterclockwise direction (from the top). Continue rotating the leadscrew until the leadscrew extends through the nut approximately 75 mm (3 in.), then release the compression spring.

   Note: If you have the gear-driven leadscrew, continue with steps 5 through 9, then skip to step 14 on page 10-19.

   Note: If you have the belt-driven leadscrew, skip to steps 10 on page 10-19 through 13 on page 10-19, then continue with step 14 on page 10-19.

Gear-driven Leadscrew ONLY

5. See Figure 10-10. Continue rotating the leadscrew counterclockwise until the top of the leadscrew **8** is just below the bottom of the feed shaft gear **4**, as shown.
6. Hold the leadscrew shaft gear **5** (with the long collar up) in position above the feed shaft gear **4** and meshed with the elevator motor idler gear **6**.
7. Lift the leadscrew up, without rotating it, until the top of the leadscrew shaft **8** enters the D-shaped hole in the gear **7**.
8. With the top of the shaft in the gear, hold the gear and rotate the shaft **clockwise** (from the top) until the D-shaped shaft aligns with the D-shaped hole in the gear.
9. Continue raising the leadscrew to engage it with the gear and bearing in the top of the ACF, then rotate the leadscrew shaft **counter clockwise** to lower the transport all the way to the bottom of the ACF. This will hold the leadscrew gear, shaft, and transport assembly in place while you install the bearing. Skip to step 14 on page 10-19.

End of Gear-driven Leadscrew ONLY

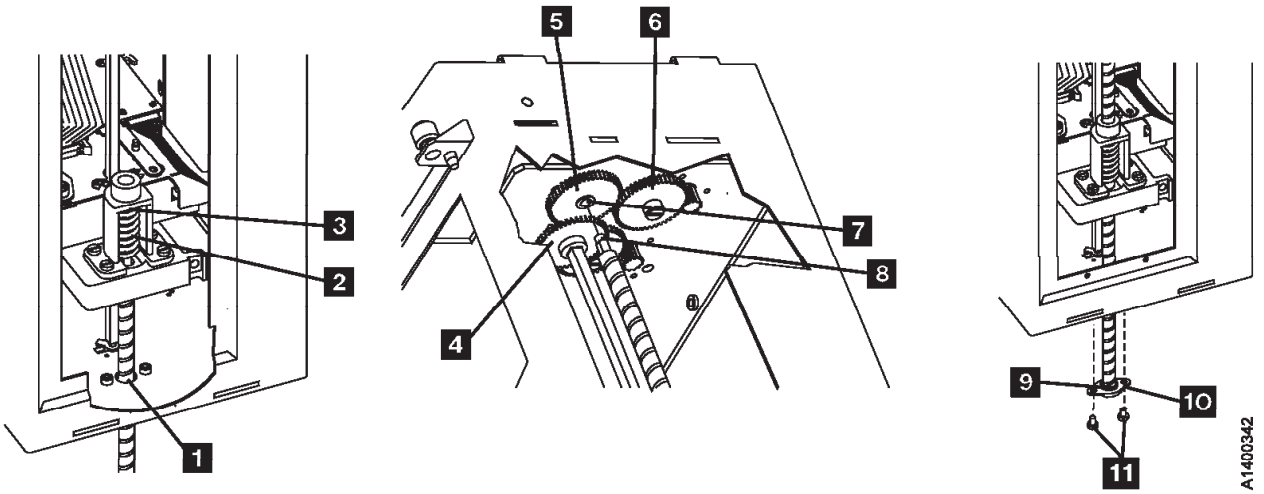


Figure 10-10. Gear-driven Leadscrew, Gears, and Bearing

Belt-driven Leadscrew ONLY

10. See Figure 10-11. Install the belt **4** over the leadscrew **5**.
11. Install the gear **6**, (with the long collar up), onto the D-shaped shaft of the leadscrew.
12. Continue rotating the leadscrew counterclockwise until the shaft on top of the leadscrew enters the bearing **7** in the top of the ACF.
13. Lift the belt **4** and install it, first on the motor pulley **8**, then onto the leadscrew gear **6**.

End of Belt-driven Leadscrew ONLY

14. Install the bottom leadscrew bearing **10** with the two screws **11** removed earlier. Ensure the outer bearing race **9** is inserted up into the frame and the bearing housing is flat against the frame.
15. Manually move the elevator assembly (by rotating the leadscrew) to its upper and lower limits to ensure there are no binds in the elevator or cables catching on the mechanism.
16. The alignment of the transport assembly to the priority cell must be checked after this procedure. Go to “Check and Adjustment of Transport Position Sensor” on page 10-28 to check and adjust the transport position sensor, then return here.
17. Perform “End of Call” on page 9-8.
18. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

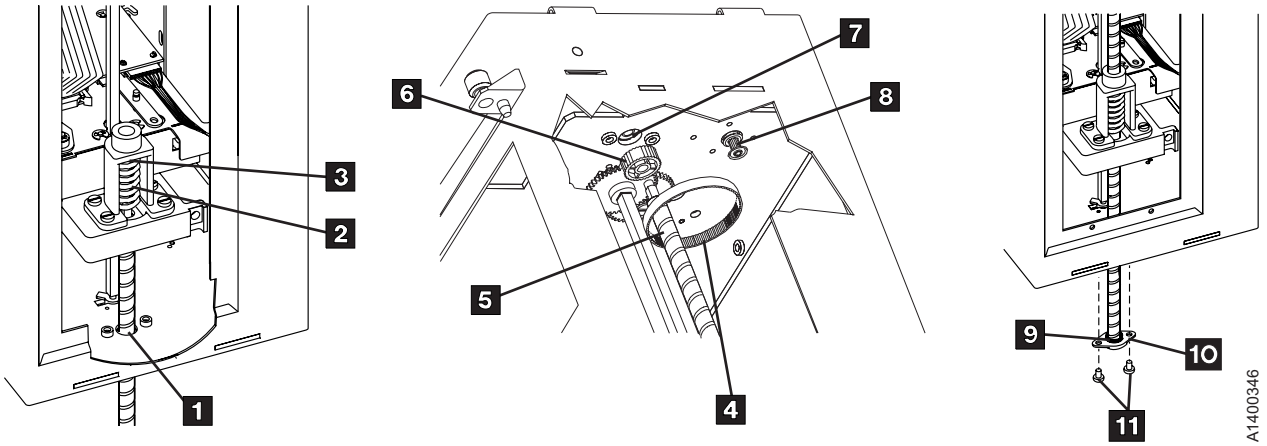


Figure 10-11. Belt-driven Leadscrew, Gears, Belt, and Bearing

FID 95: Elevator Motor Assembly

See “ACF Component Locations” on page 10-10 for FRU identifier 95.

Note: Do not attempt to lubricate ACF leadscrew. Lubricants will ruin the leadscrew coating.

Engineering Change

There are two levels of leadscrew drive. See Figure 10-13 on page 10-21 and Figure 10-15 on page 10-22. The former level uses a gear-driven leadscrew **6** and the current level uses a belt-driven leadscrew **7** and **8**.

The former level gear-driven parts are no longer available for field replacement use. If you have to replace any of the gear-driven parts, it will be necessary to upgrade the leadscrew drive mechanism to a belt-driven system. See Chapter 11, “Parts Catalog” on page 11-1 for the necessary ordering information.

Remove Elevator Motor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.

   This procedure can be done with the ACF attached to the drive; however, it may be easier if the ACF is removed and put on a work surface. If you have a work surface available, continue with step 2. If you do not have a work surface available, skip to step 3.
2. Remove the ACF assembly from the drive and place it on the work surface. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.
3. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.

   Note: Ensure the pinch rollers are open before moving the elevator assembly. If not, turn the pinch shaft by hand in the clockwise direction to open the pinch rollers.
4. See Figure 10-12. Rotate the elevator leadscrew **7** to position the elevator assembly all the way to the bottom of the ACF.

   Attention: Ensure that the elevator assembly is all the way to the bottom of the ACF before removing the lower leadscrew bearing in the next step. This will ensure that the elevator assembly does not drop to the bottom of the ACF and damage the assembly.

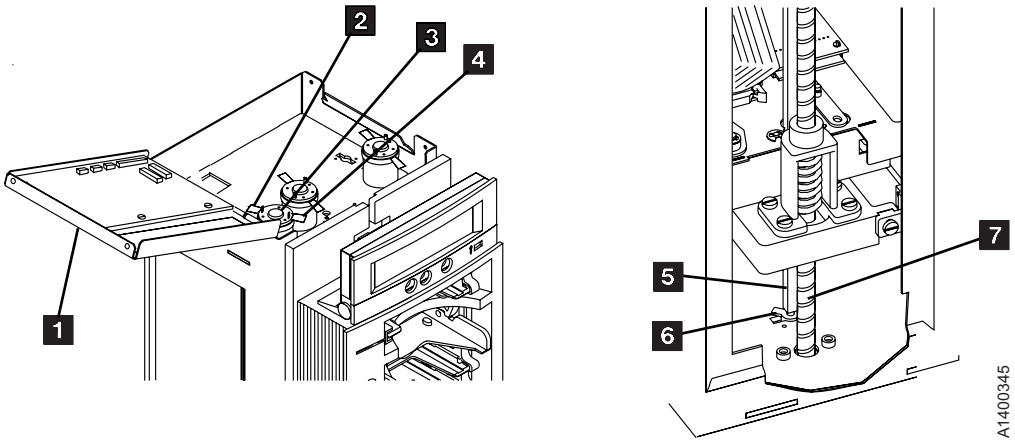


Figure 10-12. Elevator Motor Assembly

5. See Figure 10-13 on page 10-21. Remove the two screws **5** from the lower leadscrew bearing and remove the bearing **4** from the leadscrew.
6. Lower the leadscrew by rotating it clockwise (from the top) far enough to disengage it from the upper bearing and gear **6** (gear-driven leadscrew) or gear **7** and belt **8** (belt-driven leadscrew).

7. Remove the gear 6 (gear-driven leadscrew) or gear 7 and belt 8 (belt-driven leadscrew).
8. Lower the leadscrew by rotating it clockwise (from the top) far enough to allow access to the elevator motor mounting screws.
9. See Figure 10-12 on page 10-20. Open the ACF top cover 1. See “ACF Top Cover” on page 9-31.
10. Remove the following wires from the elevator shaft motor 3:
    a. Yellow wire from the front terminal 4 (post 2).
    b. Black wire from the rear terminal 2 (post 1).

    See Figure 10-14. The view is looking up at the underside of the motor mounting plate.

Gear-driven Leadscrew ONLY

11. Remove the screw 1 and nut on the top side of the motor mounting plate. Remove the intermediate gear 2.

End of Gear-driven Leadscrew ONLY

12. Remove the three motor-mounting screws 3 and remove the motor from the top.

Figure 10-13. Gear-driven and Belt-driven Leadscrew

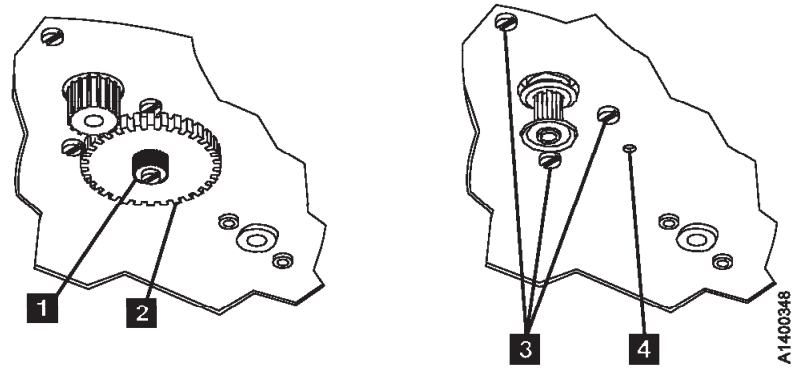


Figure 10-14. Intermediate Gear and Motor

Replace Elevator Motor

Engineering Change

If the Elevator Motor assembly is being replaced for any reason, it should be replaced with a belt-drive motor only.

Figure 10-15 shows the differences between the former level and current level elevator motor assemblies.

1. Perform the removal procedure in the reverse order, then return here.

   Notes for Reassembly:

   a. Do not reinstall the intermediate gear. It is not used on the belt-driven leadscrew system.

   b. If you are replacing the Elevator Motor as part of an upgrade from a gear-driven leadscrew to a belt-driven leadscrew, you should return to “Replace Leadscrew Assembly” on page 10-16 to install the new leadscrew.

   c. Motor terminal post 2 is oriented to the front, comparable to the 5:30 position on an analog clock face.

   d. The **yellow** motor wire is connected to the front terminal (post 2).

   e. The **black** motor wire is connected to the rear terminal (post 1).

2. The alignment of the transport assembly to the priority cell must be checked after this procedure. Go to “Check and Adjustment of Transport Position Sensor” on page 10-28 to check and adjust the transport position sensor, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

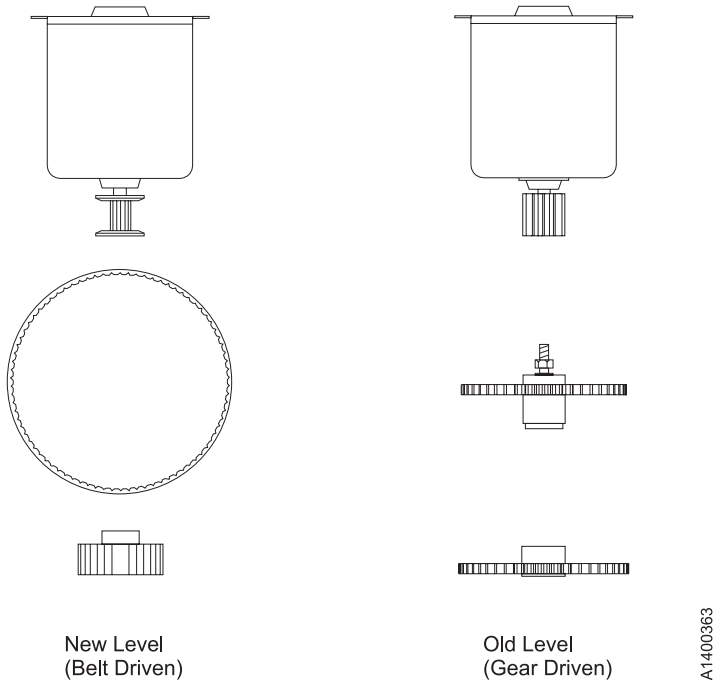


Figure 10-15. Differentiating Between Former Level and Current Level Elevator Motor

FID 96: Pinch Motor Assembly

See “ACF Component Locations” on page 10-10 for FRU identifier 96.

Remove Pinch Motor Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.

   Note: Ensure the pinch rollers are open before moving the elevator assembly. If not, turn the pinch shaft by hand in the clockwise direction to open the pinch rollers.
3. Rotate the leadscrew to lower the elevator assembly to the bottom.

   This procedure can be done with the ACF attached to the drive; however, it may be easier if the ACF is removed and put on a work surface.

   If you do not have a work surface available, proceed with step 5.

   Or, if you have a work surface available, continue with step 4.
4. Remove the ACF assembly from the drive and place it on its left side (pinch shaft up) on the work surface. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.

   See Figure 10-16.
5. Open the ACF top cover **1**. See “ACF Top Cover” on page 9-31.
6. Remove the wires from the pinch shaft motor **3**.
   a. Yellow wire from the front terminal **4** (post 2).
   b. Black wire from the rear terminal **2** (post 1).
7. Remove the lower (cross) bearing **6** from the pinch shaft **7** and lower or pull the shaft through the elevator assembly until the gear is against the transport **5**.

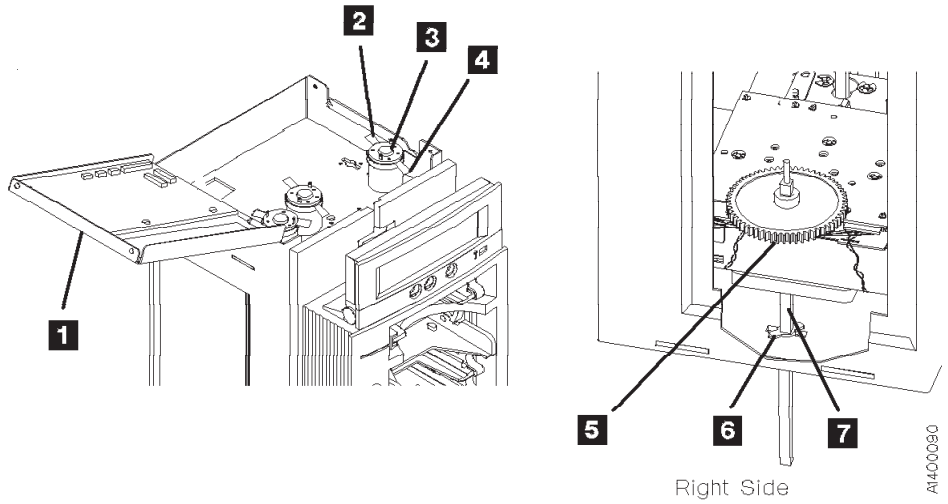


Figure 10-16. Motor Wires and Pinch Shaft

See Figure 10-17. The view is looking upward at the underside of the motor mounting plate.

8. Remove the global cartridge present sensor cover to get access to the nut in the next step.
9. Remove the screw 1 and nut on the top side of the motor mounting plate. Remove the intermediate gear 2 .
10. Remove the three motor-mounting screws 3 and remove the motor from the top.

Replace Pinch Motor Assembly

1. Perform the removal procedure in the reverse order, then return here.
2. When reinstalling or replacing the motor, use the ACF motor alignment tool P/N 05H4724 to set the gear mesh gap. This procedure is easier if you remove the ACF and put it on a work surface.
3. When the motor has been reinstalled, leave the screws 3 loose enough so the motor can be adjusted.
4. Position the ACF so that the motor gears face up.
5. Place the tool 5 dowel pin into the intermediate gear threaded hole 4 while aligning the tool hole over the motor gear 6 . Orient the tool 5 , as shown. While holding the tool 5 firmly in position, tighten the 3 screws 3 that hold the motor in place.

   Notes for Reassembly:

   a. Motor terminal post 2 is oriented to the front.
   b. The intermediate gear 2 is a two-step gear, oriented with the smaller diameter gear down, as shown.
   c. The yellow motor wire is connected to the front terminal (post 2).
   d. The black motor wire is connected to the rear terminal (post 1).
6. Perform “End of Call” on page 9-8.
7. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

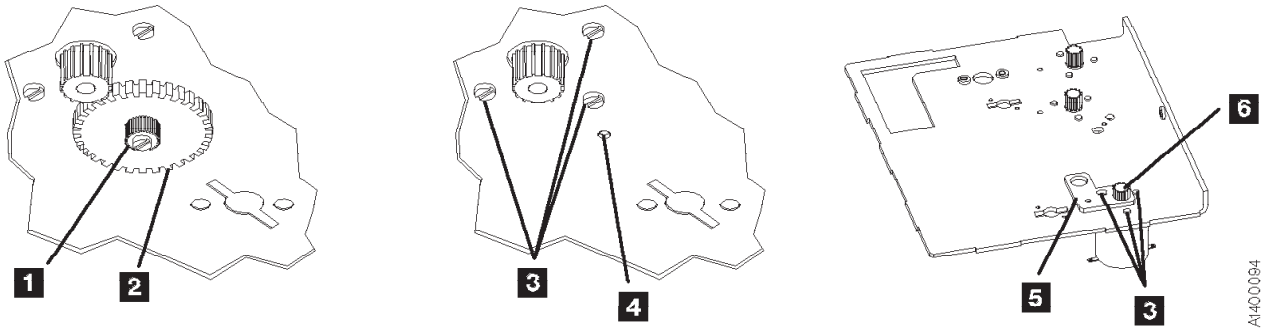


Figure 10-17. Intermediate Gear and Motor

FID 97: Motor Control Card

See “ACF Component Locations” on page 10-10 for FRU identifier 97.

Remove Motor Control Card

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Open the top cover **1** . See “ACF Top Cover” on page 9-31.
3. See Figure 10-18 on page 10-25. Disconnect the seven connectors (CD1, CD5, CD6, CD7, P2, P3, and P4 **3** from the motor control card.
4. The motor control card is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.
5. Carefully pull the motor control card **2** off its six mounting studs.

Replace Motor Control Card

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T02** for the area of failure.

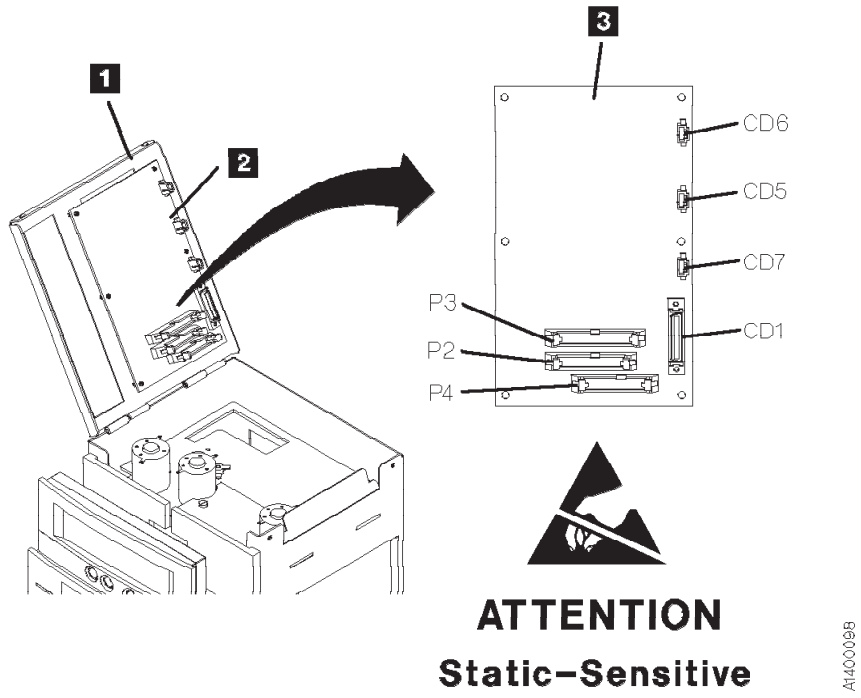


Figure 10-18. Motor Control Card

FID 98: Transport Position Sensor

See “ACF Component Locations” on page 10-10 for FRU identifier 98.

Poor sensor connection, sensor cable connection, or debris on the sensor may be causing the problem.

1. If access is possible, try to check the sensor connection, reseat the sensor cable, and clean the sensor with a brush (standard tool kit soft bristle brush). Verify that the problem remains prior to replacing the FRU.
2. If access to the sensor is too difficult, then replace the sensor.

Remove Transport Position Sensor

1. Go to “Prepare Tape Drive for Service” on page 9-6, then return here.
2. If you cannot access the left side of the ACF, remove the ACF from the drive. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.
3. Remove the ACF left side cover. See “ACF Side Covers” on page 9-30.

   Notes:

   a. Ensure the pinch rollers are open before moving the elevator assembly. If not, turn the pinch shaft by hand in the clockwise direction to open the pinch rollers.

   b. See Figure 10-19 on page 10-27.
4. Position the elevator and transport **7** to gain access to the transport position sensor **4**.
5. Disconnect the sensor connector **3** and remove cable ties, as necessary.
6. The sensor and transport board are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Remove the sensor mounting screw **5** and carefully lift the sensor up to remove the sensor from both the groove **6** in the elevator plate and from the sensor bar.

Replace Transport Position Sensor

See Figure 10-19 on page 10-27.

1. Position the sensor around the edge of the sensor bar and slide the sensor mounting bracket into the elevator groove. Fasten the sensor to the elevator plate with the screw removed earlier **5**.

   Note: When fastening the early level transport position sensor with the side adjust screw, align the top edge of the sensor bracket **2** to the top edge of the elevator plate **1**.
2. Connect the new transport-position-sensor cable connector to the transport assembly board **3**. Route the cable under the Import/Export sensor cable **8**.
3. Reinstall new cable ties in the same locations from which the old ties were removed.
4. If you were required to remove the ACF unit, reinstall the ACF unit now. See “Automatic Cartridge Facility (ACF)” on page 9-33.
5. The alignment of the transport assembly to the priority cell must be checked anytime the transport position sensor is loosened or removed. See “Check and Adjustment of Transport Position Sensor” on page 10-28 to check and adjust the transport position sensor, then return here.
6. Check that transport Limit-1 and Limit-2 sensors were not accidentally knocked loose and that they are firmly seated in the transport assembly. Refer to Figure 6-7 on page 6-11 for location of these sensors.
7. Perform “End of Call” on page 9-8.
8. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T01** for the area of failure.

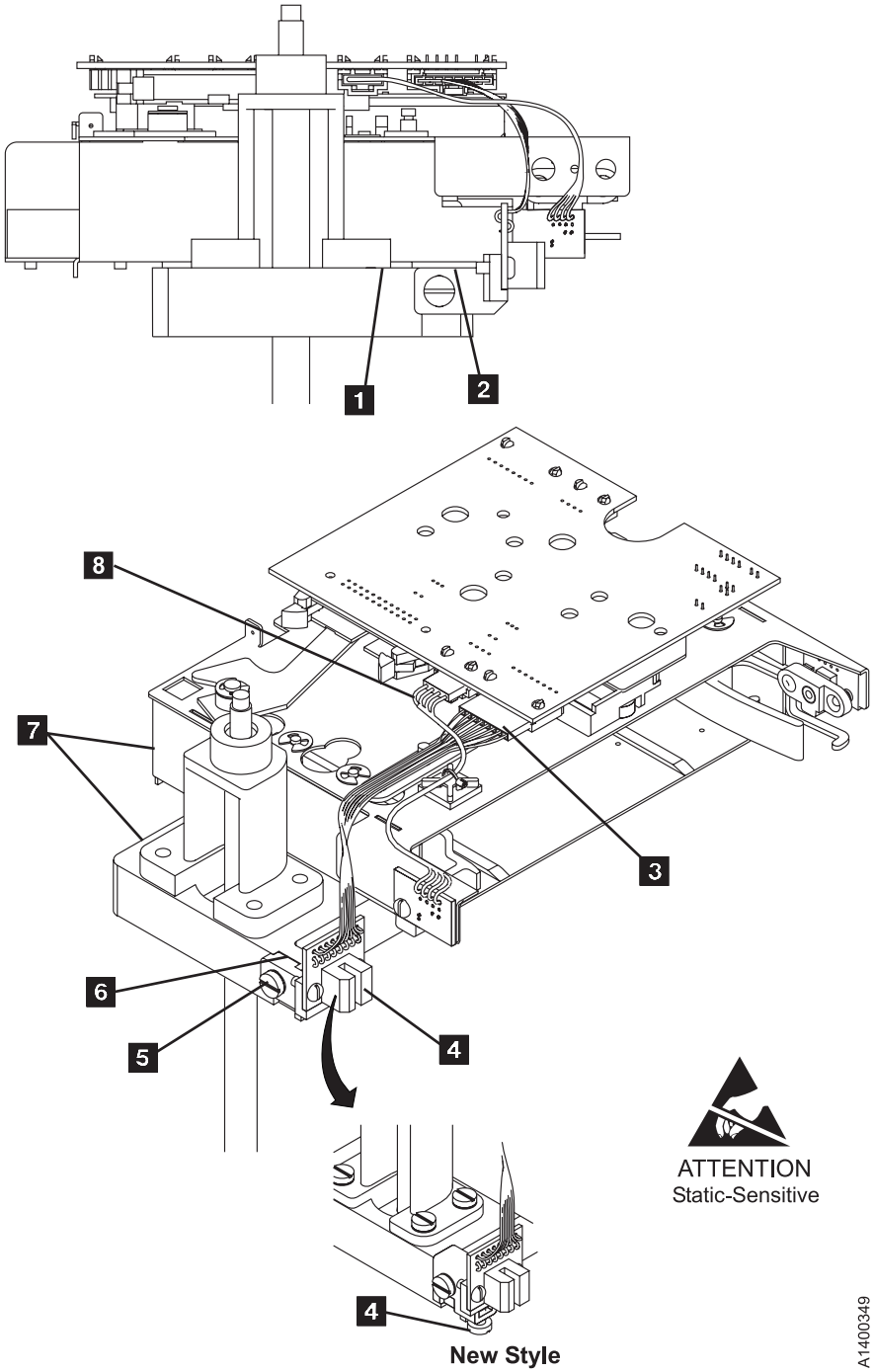


Figure 10-19. Transport Position Sensor

Check and Adjustment of Transport Position Sensor

This procedure is used to verify and adjust the alignment of the ACF transport. Result of this check is that the alignment is correct or that an adjustment is needed.

See Figure 10-20 on page 10-30.

The top of the transport rails **2** must be aligned with the bottom of the priority cell **5** . Adjusting the transport-position sensor **up** causes the transport assembly to stop at a **lower** position in relationship to the priority cell.

With ACF Transport Position Adjustment Tool (P/N 05H3388):

1. Lift the operator/CE panel out of its holder.
2. Power ON the tape drive. See page 9-6. During the power-on sequence, the ACF positions the transport at the priority cell.
3. Ensure the power-on diagnostics have successfully completed and the transport is located at the priority cell before continuing. If you get a FID at this point, do **not** continue with this procedure, use the FID and go to “FID Entry Point” on page 1-8.
4. Press the Change Mode pushbutton, and select **Proceed**, if the display is not already in CE Mode.
5. Select **Config/Install** from the CE Options menu.

   Note: If **ATTN ACF** displays, the priority-cell sensor was activated. Ensure that the priority cell is empty. Press **Enter** to reset the condition and return to the menu.
6. Select **Align ACF** from the Config/Install menu.

   The transport position sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Attention: To prevent damage to the transport drive mechanism and the adjustment tool — always remove the adjustment tool from the priority cell before running the Align Low test.
7. Select **Align Low** from the CE Align ACF menu.

   Note: On some levels of microcode, the **Align Low** test will not run if the adjustment tool, or a cartridge, is in the priority cell. If **ATTN ACF - Clear Picker Path** displays, the priority-cell sensor was activated. Ensure that the priority cell is empty. Press **Enter** to reset the condition and return to the menu. Allow the test to complete. The transport should be located at the priority cell and the display should read **Aligned Low**.
8. Use the ACF Transport Position Adjustment Tool, P/N 05H3388, to check the transport alignment to the priority cell floor. See “ACF Transport Position Adjustment Tool” on page 3-45.

   Place the tool **3** on the priority cell floor, as shown in Figure 10-20 on page 10-30.
9. Slide the tool into the priority cell until it contacts the stops **4** .

   Note: Do not force it in too hard, and do not touch the tool while you are reading the gauge.

Hint

a. If the adjustment tool pointer slowly drifts up (towards **1** on the scale) when the tool is first inserted into the priority cell, it will be necessary to hold the transport leadscrew to prevent it from turning.

b. Remove the adjustment tool.

c. Rerun the **Align Low** test, then hold the leadscrew, and slide the tool into the priority cell. Read the gauge while still holding the leadscrew.

10. See Figure 10-20 on page 10-30.

    The distance (in millimeters) from the priority cell floor **5** to the top of the transport rail **2** is indicated on the gauge.

    The gauge should read **0 to 0.25**, as shown.

    Note: Slide the tool out and back in two or three times to ensure that the readings are consistent.

> **Engineering Change**
>
> There are two levels of position sensor adjustments. The former level has a locking screw **1** on the side, and the sensor assembly slides up and down in a slot. The current level has an adjusting screw **6** in the bottom of the sensor, that is accessed from the front. See Figure 10-20 on page 10-30.
>
> Use bristol tool P/N 9900103 to adjust the new level. One turn of the screw equals a change of 0.5 on the transport adjust tool scale.
>
> **Attention:** Do not turn the screw beyond the end of it's travel. The plastic housing may break.

11. If the gauge reads below 0, the transport is **too high**.

    Adjust the transport position by loosening screw **1** and raising the position sensor (former level, side adjust) — — or — —

    Turn the adjusting screw **6** counterclockwise, as viewed from the bottom (current level, front adjust).

    Remove the adjustment tool from the priority slot.

    Rerun the **Align Low** test to ensure that the adjustment is correct. Repeat the adjustment procedure, if necessary.

12. If the gauge reads above 0.25, the transport is **too low**.

    Adjust the transport position by loosening screw **1** and lowering the position sensor (former level, side adjust).

— — **OR** — —

    Turn the adjusting screw **6** clockwise, as viewed from the bottom, (current level, front adjust).

    Remove the adjustment tool from the priority slot.

    Rerun the **Align Low** test to ensure the adjustment is correct and repeat the adjustment, if necessary.

13. After rerunning **Align Low**, complete the following:
    a. Select **Done** from the CE Align ACF menu.
    b. Select **Cancel** from the Config/Install menu.
    c. Select **Verify Fix** from the CE Options menu.
    d. Select **Test ACF** from the CE Verify Fix menu.
    e. After the test completes successfully, select **Cancel**.
14. Return to the procedure which sent you here or perform "End of Call" on page 9-8.

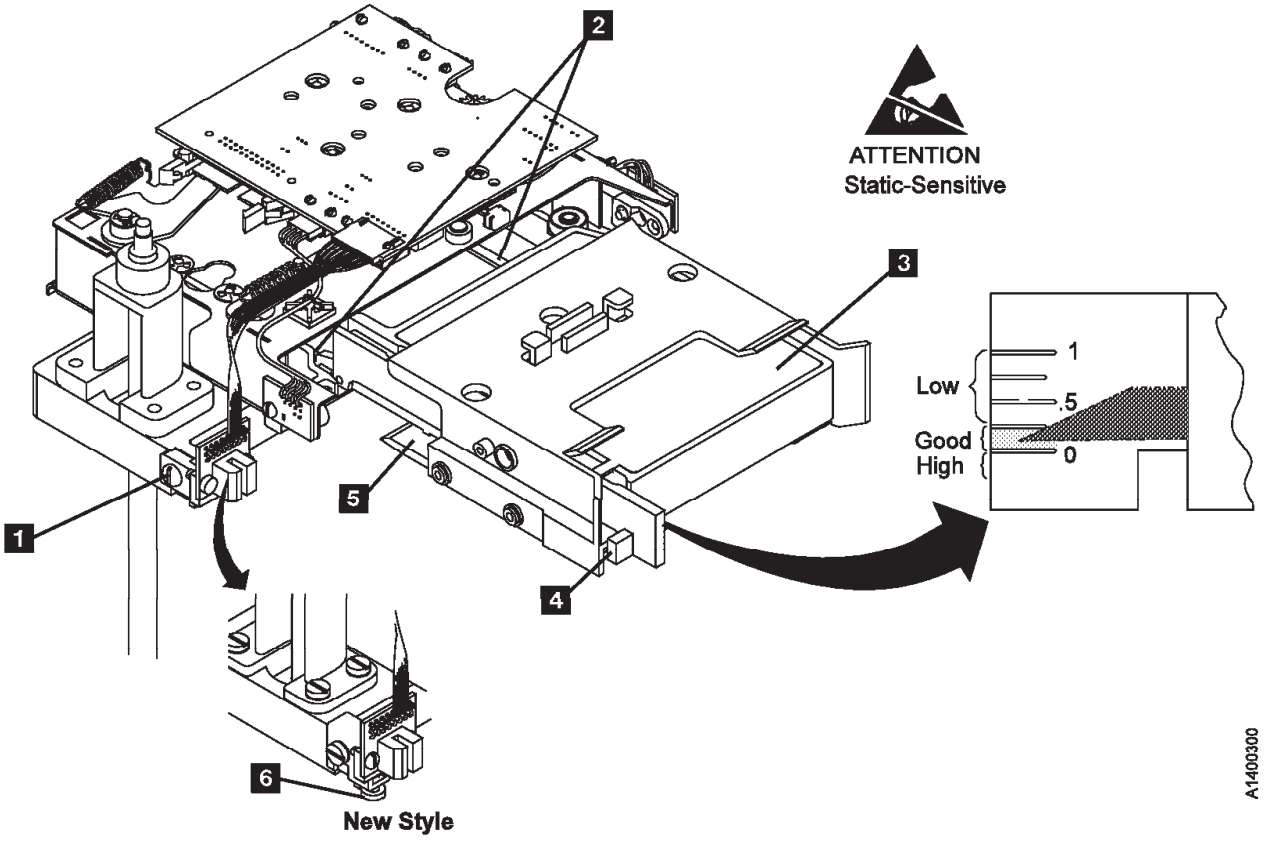


Figure 10-20. Transport Position Check (Using ACF Transport Adjust Tool)

FID 99: Transport Cable (Former Style)

See “ACF Component Locations” on page 10-10 for FRU identifier 99.

Note: The former style transport cable has a “Z” bend in the cable. If your machine has the former style transport cable, replace it with the new style transport cable shown on Figure 10-22 on page 10-34. The new style transport cable has a smooth shape instead of the “Z” shape, and uses two cable retention brackets that are riveted to one of the side covers. The new cable will come as a FRU kit that will include a new side cover. Discard the old cable and cover; use the new parts. The new style transport cable replacement procedure is at “FID 99: Transport Cable (Current Style)” on page 10-33.

Remove Transport Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the side covers. See “ACF Side Covers” on page 9-30.
3. Open the top cover of the ACF. See “ACF Top Cover” on page 9-31.

   Note: Ensure the pinch rollers are open before moving the elevator assembly. If not, turn the pinch shaft by hand in the clockwise direction to open the pinch rollers.
4. Lower the elevator assembly approximately half way by turning the leadscrew.
5. See Figure 10-21 on page 10-32. Disconnect the transport ribbon cable from P4 connector **1** on the motor control card.
6. Disconnect the lower transport ribbon cable connector **4** from the transport card.
7. Open the cable retainer **2** and remove the cable **3**.
8. Remove and discard any foam from underside of motor mount plate, if it exists.

Replace Transport Cable

Install a new style cable and side cover FRU kit. See “FID 99: Transport Cable (Current Style)” on page 10-33.

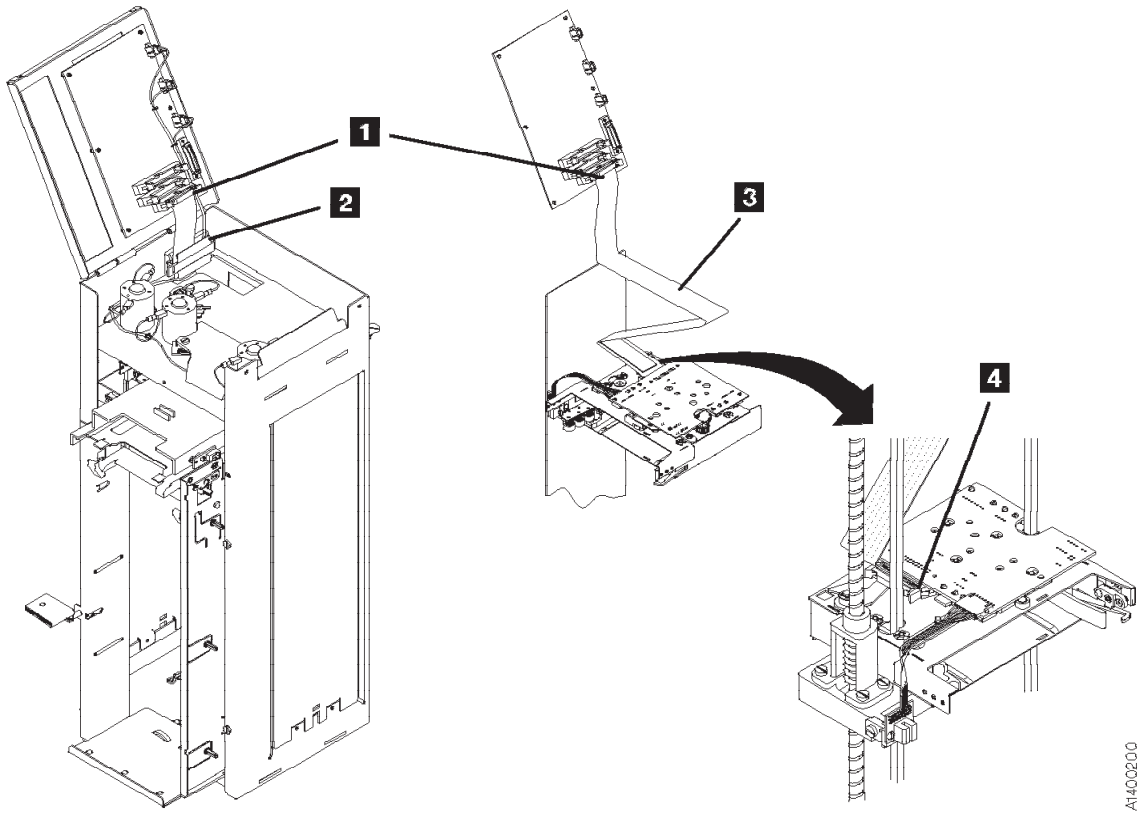


Figure 10-21. Transport Cable (Former Style)

FID 99: Transport Cable (Current Style)

See “ACF Component Locations” on page 10-10 for FRU identifier 99.

Remove Transport Cable

1. Perform the procedure in “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the side covers. See “ACF Side Covers” on page 9-30.

   Note: The new style transport cable has a smooth surface instead of the “Z” shape found in the former style transport cable. It also uses two cable retention brackets that are riveted to one of the side covers. **Use care when you remove this cover, as it will be attached to the ribbon cable.** The new cable will come as a FRU kit that will include a new side cover. Discard the old cable and cover; use the new assembly.
3. Open the top cover of the ACF. See “ACF Top Cover” on page 9-31.

   Note: Ensure the pinch rollers are open before moving the elevator assembly. If not, turn the pinch shaft by hand in the clockwise direction to open the pinch rollers.
4. Lower the elevator assembly approximately two-thirds of the way down by turning the leadscrew.
5. See Figure 10-22 on page 10-34. Disconnect the transport ribbon cable connector, item **2** from the motor control card.
6. Disconnect the lower transport ribbon cable connector, item **6** from the transport card.
7. Open the top cable retainer, item **1** and remove the cable, item **5**.
8. Remove and save two screws and washers **7** from the transport, then remove the cable from the ACF.

Replace Transport Cable

1. Install the new cable bracket to the transport with two screws and washers **7**.
2. Connect the cable to the transport card **6**.
3. Connect the upper end of the cable to the Motor Control card **2**.
4. Using the two marks on the cable as a guide, close the upper cable retainer **1** over the cable.
5. Install the side covers on the ACF. The left side cover **4** has two cable retainers **3**.
6. Using the four marks on the cable as a guide, close the cable retainers **3** over the cables.
7. Close the top cover.
8. Ensure that neither the transport cable or any other cable is not obstructing movement of the transport assembly.
9. Perform the procedure “End of Call” on page 9-8.
10. Use your local procedures to report the FRU part number for the FID, and use technical area code (TAC) **T04** for the area of failure.

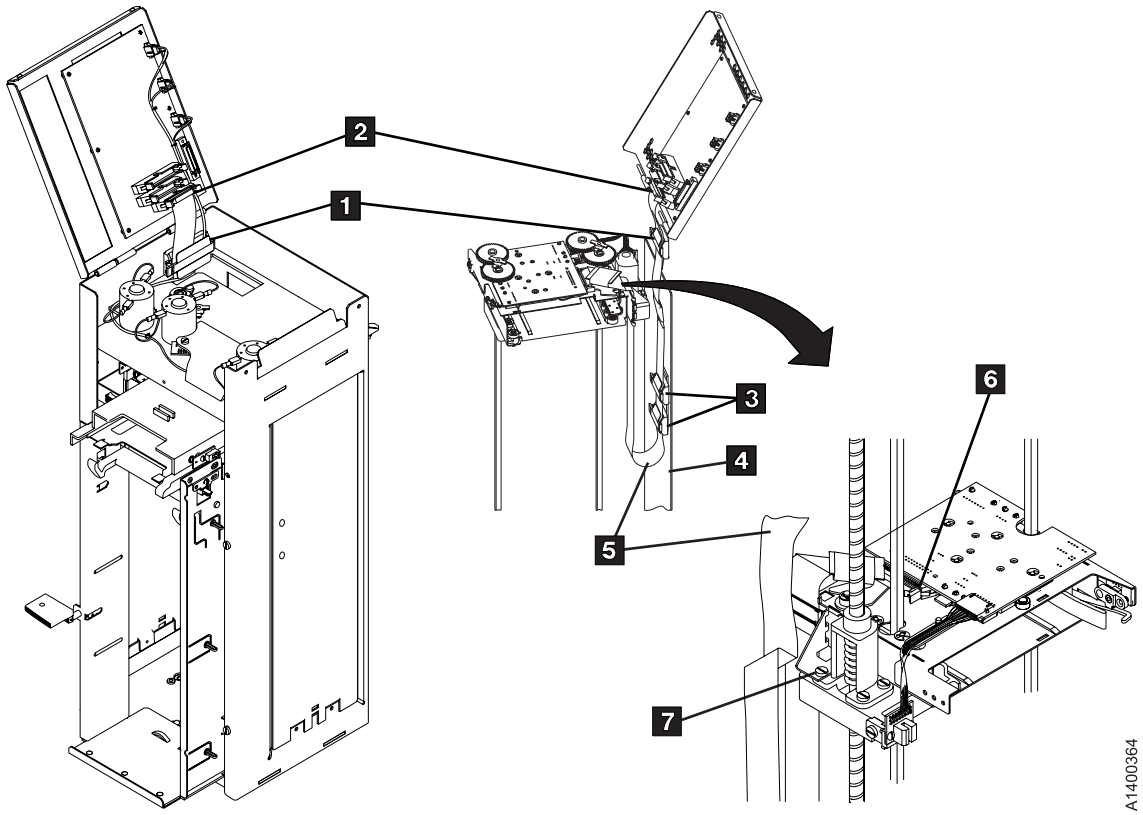


Figure 10-22. Transport Cable (Current Style)

FID 9A: Transport

See “ACF Component Locations” on page 10-10 for FRU identifier 9A.

Prior to replacing the transport:

1. Check that the transport Limit 1 and Limit 2 sensors are firmly connected to the transport assembly. See Figure 6-7 on page 6-11.
2. Debris may be causing the problem, try to clean the Limit 1, Limit 2, Import, Export and Transport Position Sensors with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the Transport. If access to the sensors is too difficult, then replace the Transport.

Remove Transport

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.
3. Lower the elevator assembly approximately half way.
4. See Figure 10-23 on page 10-36. Disconnect the ribbon cable connector **2** from the transport card.
5. The transport position sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Disconnect the transport position sensor connector **14** and remove cable ties, as necessary to position the cable and connector out of the way (away from the transport).
6. Lower the elevator assembly to the bottom.

   This procedure can be done with the ACF attached to the drive; however, it may be easier if the ACF is removed and put on a work surface. If you do not have a work surface available, proceed with step 8. If you have a work surface available, continue with step 7.
7. Remove the ACF from the drive:

   See Figure 9-19 on page 9-34 for the next step.
   a. Disconnect the two ACF cables **2** from the deck enclosure and loosen the thumb screw **1** on the upper-left-rear of the ACF.
   b. Lift the ACF assembly off the drive and place it on its right side (leadscrew is up) onto a work surface.
8. See Figure 10-23 on page 10-36 and remove the pinch shaft **3**:
   a. Remove the bottom (cross) bearing **12**.
   b. Lower or pull the shaft toward the bottom and remove the top E-clip **4** from the shaft and remove the gear **5**. Observe the orientation of the gear to the shaft (the longer gear hub is toward the transport).
   c. Remove the other E-clip **6** from the shaft and remove the shaft through the bottom of the ACF.
9. Repeat steps 8a through 8c to remove the feed shaft **1**.
10. Raise the elevator plate up far enough to gain access to the 2 transport mounting screws **15** on the bottom of the elevator plate.
11. Ensure the ribbon cable is out of the way.
12. The transport board and transport position sensor are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

    Remove the two transport mounting screws **15** from the bottom of the elevator plate.

    If the ACF is attached to the drive, go to step 13.

    Or, if the ACF is being repaired on a work surface, go to step 14.
13. Lower the elevator plate far enough to remove the transport assembly out through the right side of the ACF.
14. Remove the transport assembly out through the large hole in the back of the ACF.

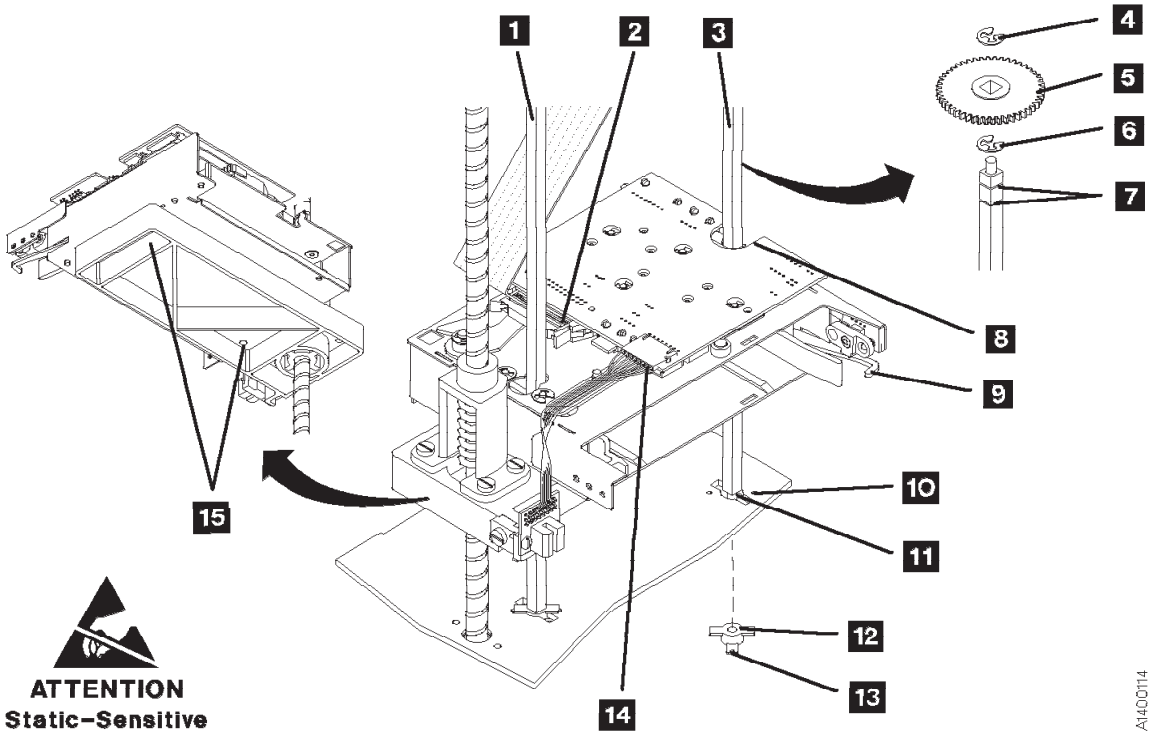


Figure 10-23. Transport

Replace Transport

1. Install the new transport assembly onto the elevator plate.

   Attention Items:

   a. Ensure the sensor wires are not between the transport and elevator plate.

   b. The transport assembly can be mounted on the elevator plate 180 out from its correct position. Ensure the notch in the transport board **8** is on the far end of the transport from the leadscrew.

   c. Ensure the guide pins on the elevator plate are seated into their holes on the bottom of the transport assembly. Then reinstall the two transport mounting screws **15** from the bottom of the elevator plate to fasten transport to the elevator plate.
2. Lower the elevator to the bottom of the ACF.
3. Replace the pinch shaft:

   a. Reinsert the shaft through the hole in the bottom of the ACF **11** and through the elevator plate and transport (the end of the shaft with two grooves **7** is inserted first).

   b. Install an E-clip in the groove nearest to the transport **6** .

   c. Reinstall the gear **5** on the shaft and slide it against the E-clip. Ensure the longer gear hub is next to the transport.

   d. Install the other E-clip **4** in the groove next to the gear.

   e. Insert the upper end of the shaft into the top (cross) bearing and ensure the gears are properly meshed.

   f. In this step, ensure the small protrusions **13** on the (cross) bearing **12** will be on the outside of the frame. Insert the lower (cross) bearing **12** onto the end of the shaft and through the slot **11** in the frame. Rotate the bearing (cross member with the protrusions) in the direction of the small holes in the frame **10** , until the protrusions snap into the holes in the frame.
4. Repeat steps 3a through 3f to reinstall the feed shaft.
5. Reinstall the ACF onto the drive if it was removed earlier.

6. Rotate the pinch shaft clockwise (from the top) to ensure the cartridge release lever **9** is fully retracted.
7. Raise the elevator assembly approximately half way.
8. Reconnect the transport position sensor connector **14** to the transport board and ensure the sensor is properly positioned over the transport position bar. The (transport position) sensor mounting bracket should still be positioned so its top edge is even with the top surface of the elevator plate.
9. Reconnect the ribbon cable connector **2** to the transport card.
10. The alignment of the transport assembly to the priority cell must be checked anytime the transport position sensor is loosened or removed. Go to “Check and Adjustment of Transport Position Sensor” on page 10-28 to check and adjust the transport position sensor, then return here.
11. Reinstall all covers removed in this procedure.
12. Perform “End of Call” on page 9-8.
13. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

FID 9B: Global/Interference Sensor Assembly (Upper and Lower)

See “ACF Component Locations” on page 10-10 for FRU identifier 9B.

Debris may be causing the problem. **Clean the top and bottom pair of sensors** with a brush (standard tool kit soft bristle brush). Verify that the problem remains before you replace the FRU.

Remove Upper Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Open the ACF top cover. See “ACF Top Cover” on page 9-31.

   See Figure 10-24. The cable cover **1**, the sensor board **4**, and the sensor cover **5** (under the sensor board), are all held in place by the same mounting screw **2**.
3. Remove the mounting screw **2** and remove the covers.

   Note: For correct reinstallation of the sensor assembly, note the orientation of the sensor cover **5** relative to the sensor board **4** and the ACF mounting surface.
4. The sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Disconnect the sensor connector SC2 **3** and remove the sensor.

Replace Upper Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Go to “Remove Lower Sensor” and remove and replace the lower sensor.

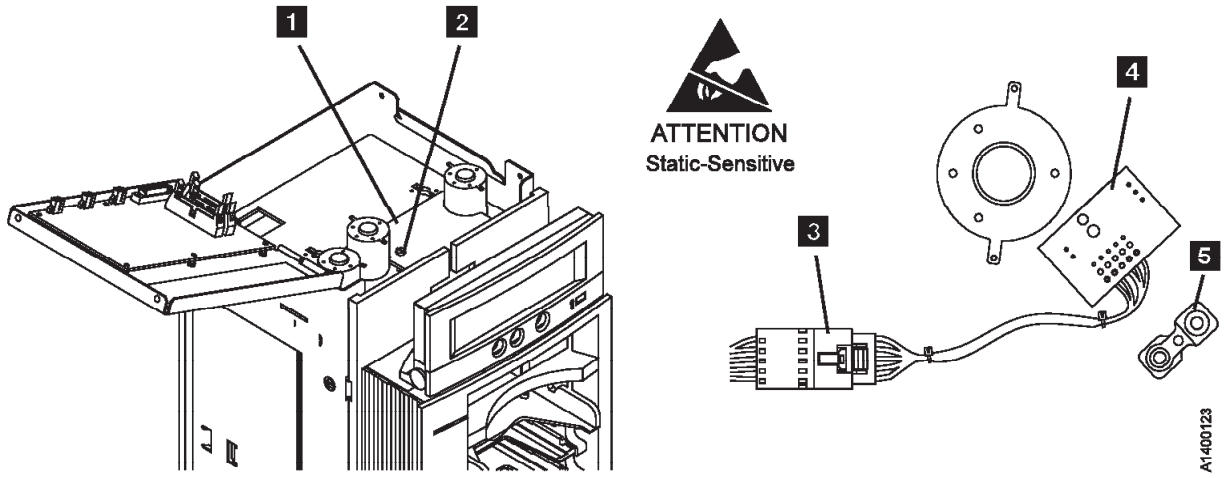


Figure 10-24. Global/Interference Sensor Assembly (Upper)

Remove Lower Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.
3. See Figure 10-25 on page 10-39. Remove the sensor mounting screw **2**, the sensor cover **5**, and the spacer **4**. Notice the spacer **4** has locating pins for the sensor board **3** and the base. Also note the orientation of the sensor cover **5** relative to the sensor board **3**.
4. The sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Disconnect the sensor connector, SC2 **1**.

Replace Lower Sensor

1. Perform the removal procedure in the reverse order, then return here.

Notes:

a. When installing the sensor, ensure the spacer **4** locating pins are seated correctly in the base and the sensor card.

b. Reseat the sensor cover **5** over the sensors on top of the sensor board **3**, as shown in Figure 10-25.

c. Route the sensor cable to the front side of the ACF, so it will not block the sensor.

2. Perform "End of Call" on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T01** for the area of failure.

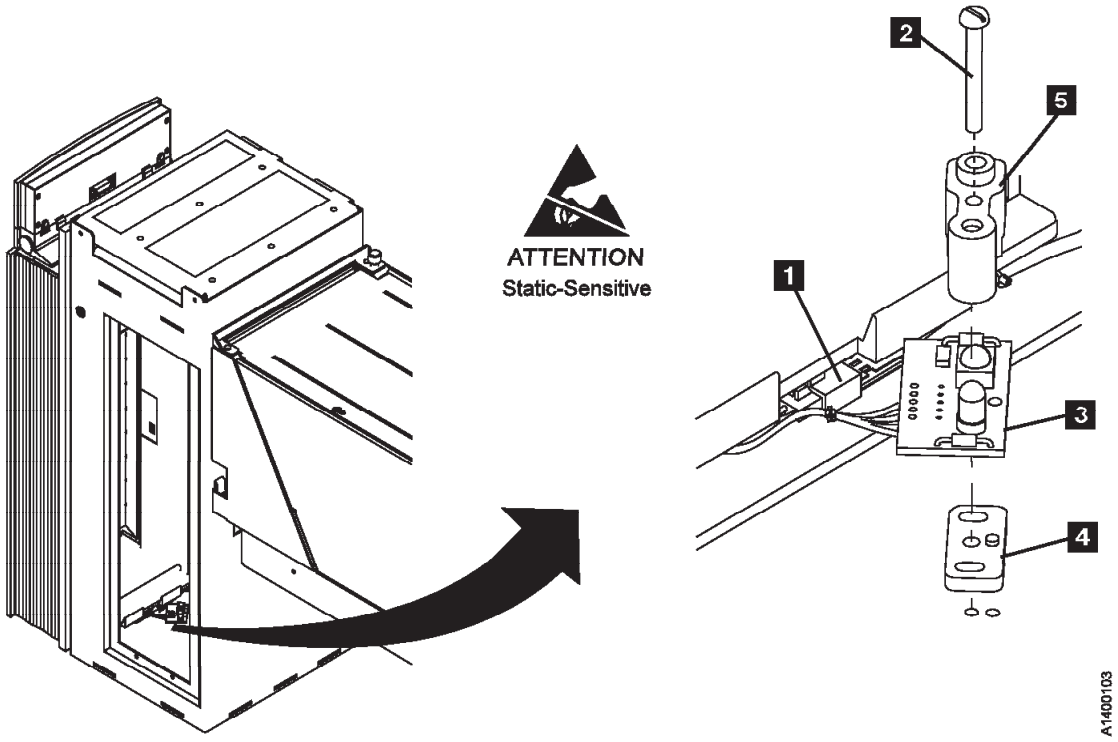


Figure 10-25. Global-Interference Sensor Assembly (Lower)

FID 9E: Priority Cell Sensor

See "ACF Component Locations" on page 10-10 for FRU identifier 9E. The sensors are ESD sensitive. See "Working with Electrostatic Discharge (ESD) Sensitive Parts" on page 9-23.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove Priority Cell Sensor

1. "Prepare Tape Drive for Service" on page 9-6, then return here.
2. Remove the operator/CE panel. See page "Operator/CE Panel Service Position" on page 9-25.
3. Remove the bezel. See page "Bezel (Model B11/E11/H11 Only)" on page 9-32.

Note: The left and right priority cell sensors are different. The new sensors must be installed in their correct positions.

4. See Figure 10-26 on page 10-40. Remove the mounting screw **3** from the emitter card **2**. Disconnect the emitter (PSBE) connector **1** from the emitter card.
5. Remove the mounting screw **5** from the detector card **4** (left side).

Disconnect the detector (PSBD) connector 6 from the detector card.

Replace Priority Cell Sensor

The left priority cell sensor is the detector and the right priority cell sensor is the emitter. They must be installed in their correct locations.

1. Reconnect the detector (PSBD) connector 6 to the detector card. The connector receptacle is mounted at a 90 angle to the card surface.
2. Install the detector sensor 4 on the left side of the priority cell by using the screw removed earlier.
3. Reconnect the emitter (PSBE) connector 1 to the detector card. The connector receptacle is mounted parallel to the card surface.
4. Install the emitter sensor 2 on the right side of the priority cell by using the screw removed earlier.
5. Reinstall the bezel and operator/CE panel.
6. Perform “End of Call” on page 9-8.
7. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T01** for the area of failure.

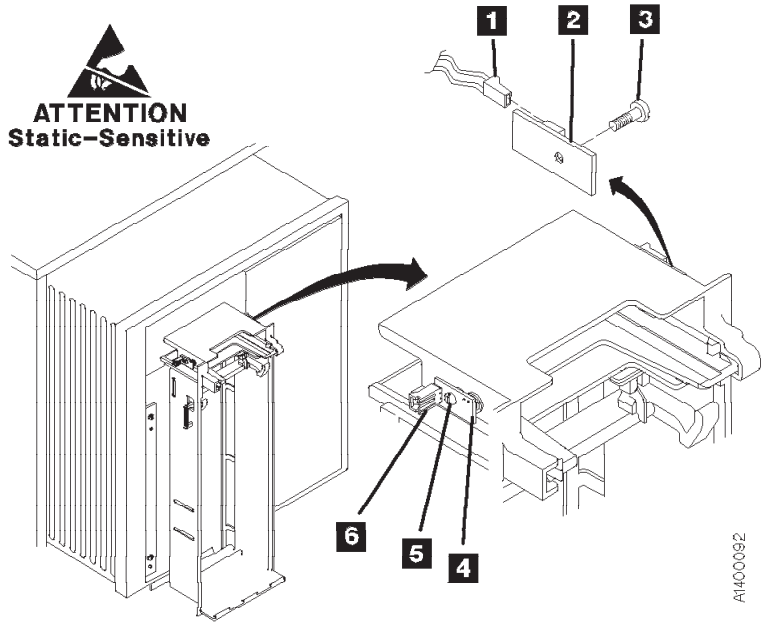


Figure 10-26. Priority Slot Sensor

FID A0: Magazine-Present Sensor Assembly

See “ACF Component Locations” on page 10-10 for FRU identifier A0.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove Magazine-Present Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the bezel. See “Bezel (Model B11/E11/H11 Only)” on page 9-32.
3. See Figure 10-27. Disconnect the magazine-present sensor connector MP **3** .
4. The magazine-present sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Remove the sensor mounting bracket screw **2** and remove the sensor assembly **1** .
5. Remove the sensor from the mounting bracket.

Replace Magazine-Present Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T01** for the area of failure.

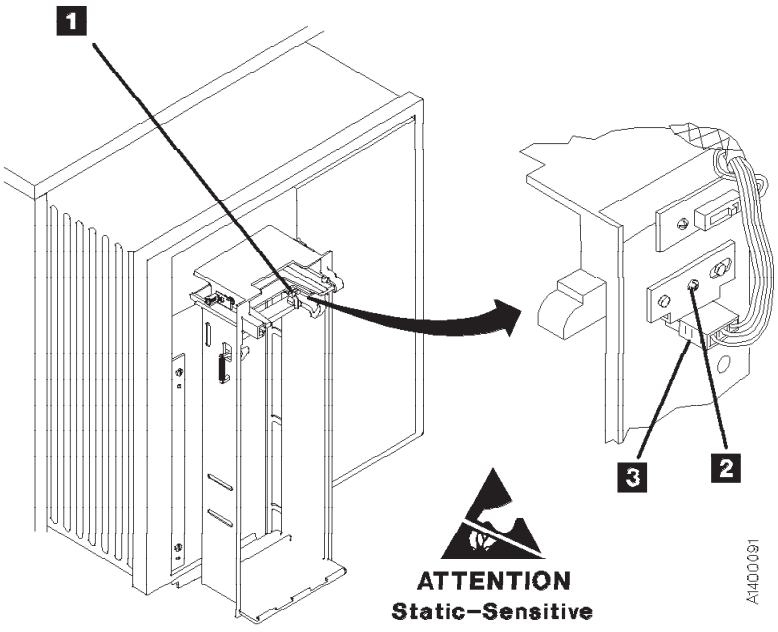


Figure 10-27. Magazine Present Sensor

FID A1: Motor Cable Assembly

See “ACF Component Locations” on page 10-10 for FRU identifier A1.

Remove Motor Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Open the top cover. See “ACF Top Cover” on page 9-31.
3. See Figure 10-28 on page 10-43. Remove the pinch motor connector from CD6 **1** , the feed motor connector from CD5; **2** , and the elevator motor connector from CD7 **3** .
4. From the three motors, remove the yellow wires from the front terminals **6** (post 2), and the black wire from the rear terminals **5** (post 1).
5. Remove the cable cover/sensor mounting screw **8** and remove the cable cover **7** , which allows you to remove the wires on the pinch motor.

   Note: The cable cover **7** and the upper global/interference sensor are held in place by the same mounting screw **8** .
6. Open the cable retainer **4** and remove the cable.

Replace Motor Cable

Notes for Replacement

1. Motor terminal post 2 is to the front on all three motors **6** .
2. The yellow wire on the motors is connected to the front terminal (post 2) and the black motor wires are connected to the rear terminal (post 1) **5** .
3. Ensure the connections on the motors are correct:
   - Yellow wire (T1) goes to pinch motor.
   - Yellow wire (T2) goes to feed motor.
   - Yellow wire (T3) goes to elevator motor.
4. Ensure the connectors on the motor control card are correct:
   - The pinch motor connector attaches to CD6 **1** .
   - The feed motor connector attaches to CD5 **2** .
   - The elevator motor connector attaches to CD7 **3** .

End of Notes for Replacement

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T04** for the area of failure.

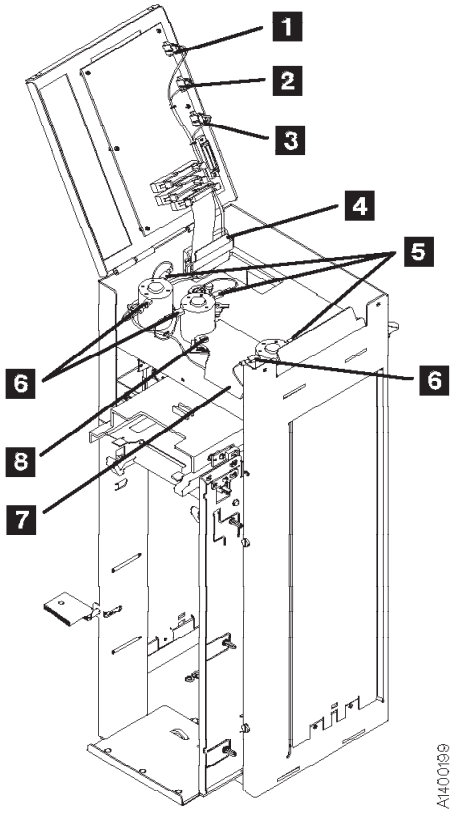


Figure 10-28. Motor Cable

FID A2: Drive/ACF Cable

See “ACF Component Locations” on page 10-10 for FRU identifier A2.

Remove Drive/ACF Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF left side cover, if not obstructed by another device; otherwise, remove the right side cover. See “ACF Side Covers” on page 9-30.

   Note: Use caution when removing the left side cover when the new style transport cable is present on your ACF. The new style transport cable is attached to the left side cover by two cable clamps mounted on a small plate. This plate is riveted to the side cover. See Figure 10-22 on page 10-34 for an illustration of the new style transport cable.
3. Open the ACF top cover. See “ACF Top Cover” on page 9-31.
4. See Figure 10-29. Disconnect the drive/ACF cable connector from the CD1 connector **1** on the motor control card.
5. Move the elevator up or down (turn the leadscrew) to access the cable in the deck enclosure.
6. Disconnect the cable **2** from the upper connector on the deck enclosure.
7. Remove the cable.

Replace Drive/ACF Cable

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T04** for the area of failure.

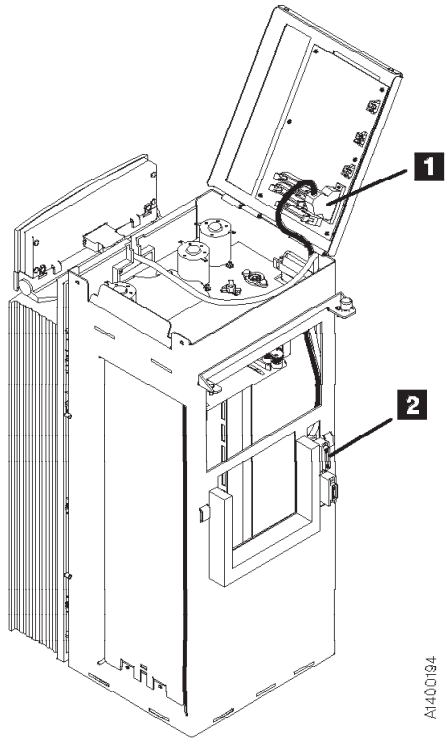


Figure 10-29. Drive/ACF Cable

FID A4: LED Cable

Remove LED Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.
3. Open the top cover **1** . See “ACF Top Cover” on page 9-31.
4. See Figure 10-30. Disconnect the LED ribbon cable connector from connector P2 **1** on the motor control card.
5. Remove the bezel. See “Bezel (Model B11/E11/H11 Only)” on page 9-32.
6. Remove the cable **2** .

Replace LED Cable

Note: When reconnecting the cable connector **3** to the bezel, ensure that the two connectors **4** remain strongly in place.

1. Fold the new LED cable like the old one that was removed.
2. Perform the removal procedure in the reverse order, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T04** for the area of failure.

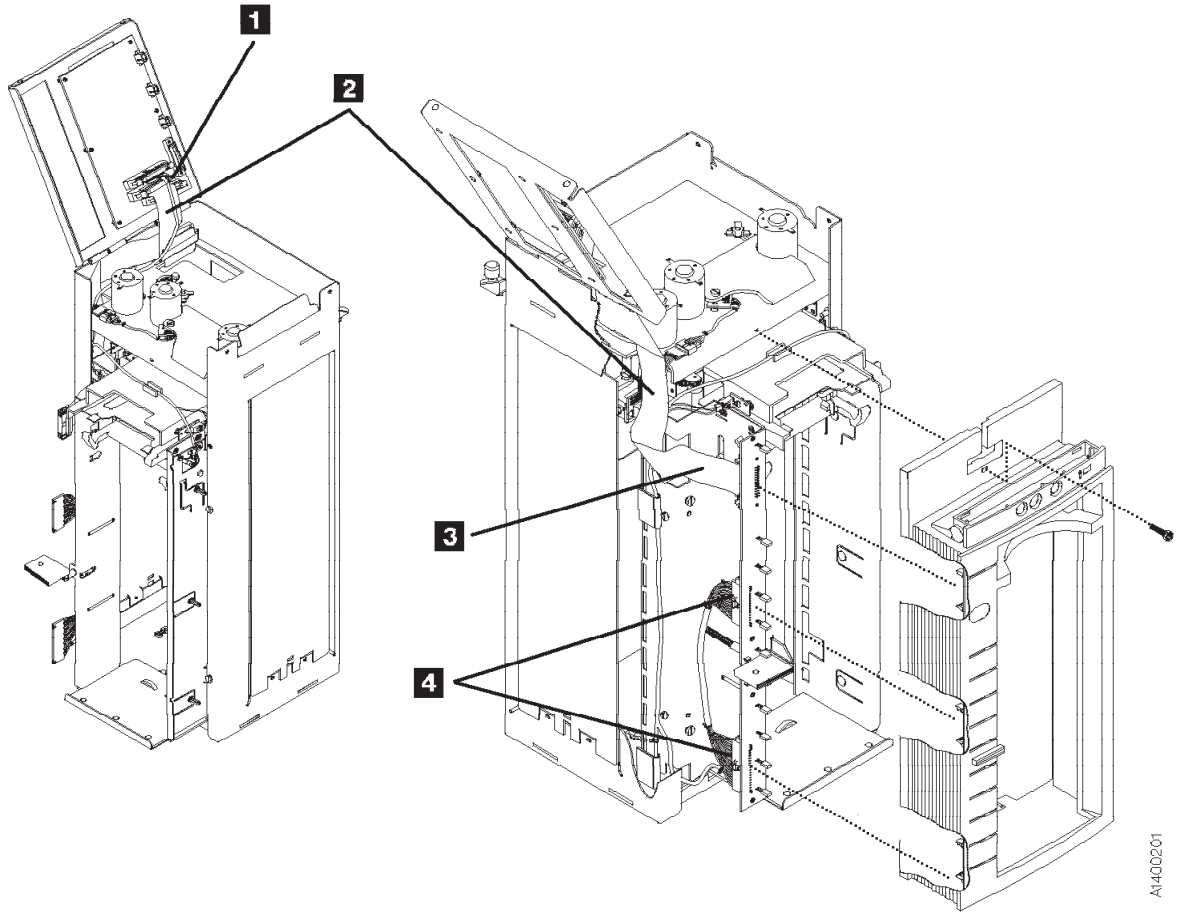


Figure 10-30. LED Cable

FID A5: Sensor Cable

 The sensors are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

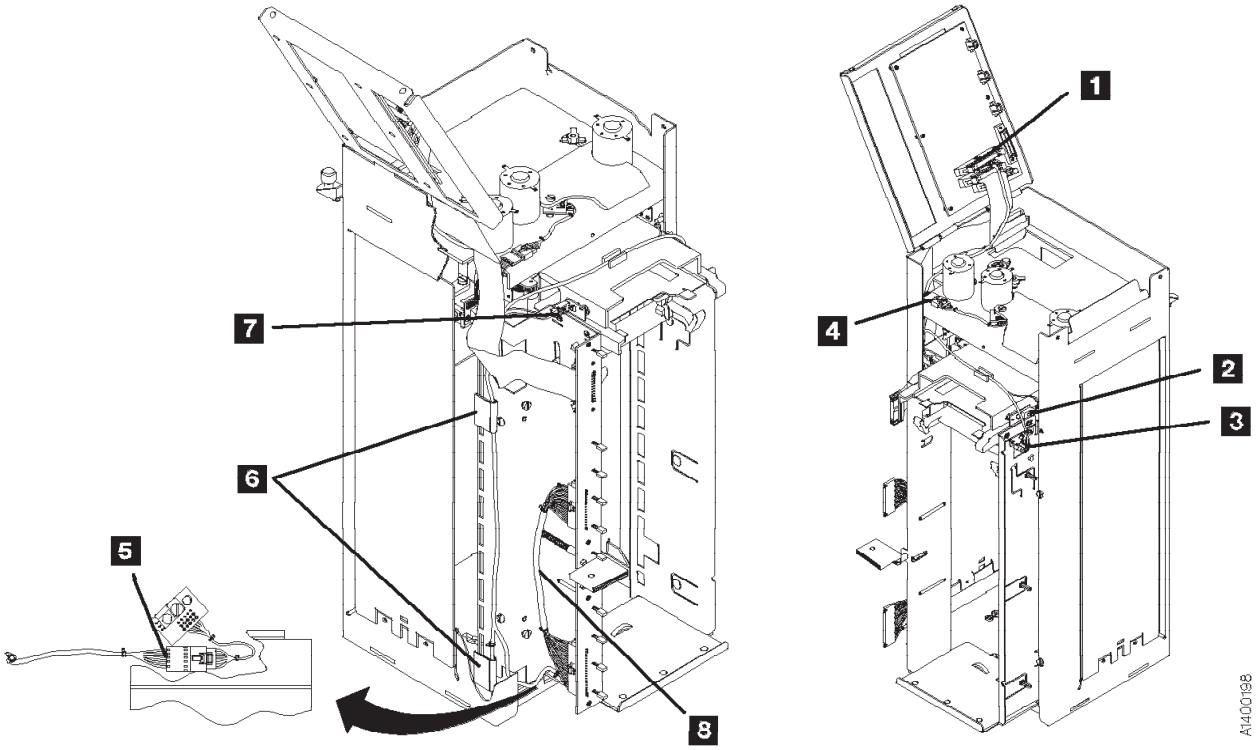
Remove Sensor Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.

   Note: Use caution when removing the left side cover when the new style transport cable is present on your ACF. The new style transport cable is attached to the left side cover by two cable clamps mounted on a small plate. This plate is riveted to the side cover. See Figure 10-22 on page 10-34 for an illustration of the new style transport cable.
3. Open the top cover **1** . See page “ACF Top Cover” on page 9-31.
4. Remove the bezel. See page “Bezel (Model B11/E11/H11 Only)” on page 9-32.
5. See Figure 10-31 on page 10-47. Disconnect the sensor cable connector P3 **1** from the top cover (the round cable).
6. Disconnect the cables from the global/interference sensors **5** and **4** (SC2 lower and SC2 upper).
7. Disconnect the cable from the priority cell connectors **7** (PSBD) and **2** (PSBE).
8. Disconnect the cable from the magazine-present sensor **3** .
9. Disconnect the cable connectors **8** from the LED card.
10. Open the cable retainers **6** and remove the cable.

Replace Sensor Cable

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T04** for the area of failure.



ATTENTION Static-Sensitive

Figure 10-31. Sensor Cable

FID A6: LED Cards and Random Lock Sensor

See “ACF Component Locations” on page 10-10 for FRU identifier A6.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove LED Cards and Random Lock Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the operator/CE panel. See “Operator/CE Panel Service Position” on page 9-25.
3. Remove the bezel. See “Bezel (Model B11/E11/H11 Only)” on page 9-32.
4. The LED cards and random lock sensor are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   The random lock sensor is mounted to and is part of the upper LED card.

   See Figure 10-32. Remove the mounting screws **1** from the two LED cards **2** and **3** then remove the cards.

Replace LED Card and Random Lock Sensor

Attention: The LEDs fit into slots in the bezel. Do not damage (bend) the LEDs when replacing the LED card.

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T02** for the area of failure.

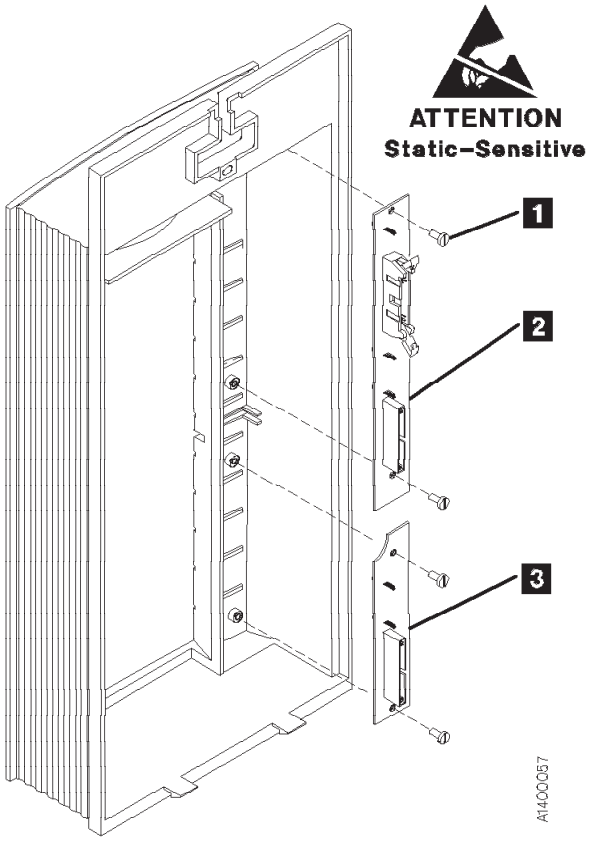


Figure 10-32. LED Cards (Rear View of Bezel)

FID A9: Feed Motor Assembly

See “ACF Component Locations” on page 10-10 for FRU identifier A9.

Remove Feed Motor Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.

   Notes:

   a. Use caution when removing the left side cover when the new style transport cable is present on your ACF. The new style transport cable is attached to the left side cover by two cable clamps mounted on a small plate. This plate is riveted to the side cover. See Figure 10-22 on page 10-34 for an illustration of the new style transport cable.

   b. Ensure the pinch rollers are open before moving the elevator assembly. If not, turn the pinch shaft by hand in the clockwise direction to open the pinch rollers.
3. Rotate the leadscrew to lower the elevator assembly to the bottom.

   This procedure can be done with the ACF attached to the drive; however, it may be easier if the ACF is removed and put on a work surface.

   If you do not have a work surface available, proceed with step 5.

   Or, if you have a work surface available, continue with step 4.
4. Remove the ACF assembly from the drive and place it on its left side (pinch shaft up) onto the work surface to allow access to the feed shaft and feed motor assembly from the right side of the ACF. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.

   See Figure 10-33.

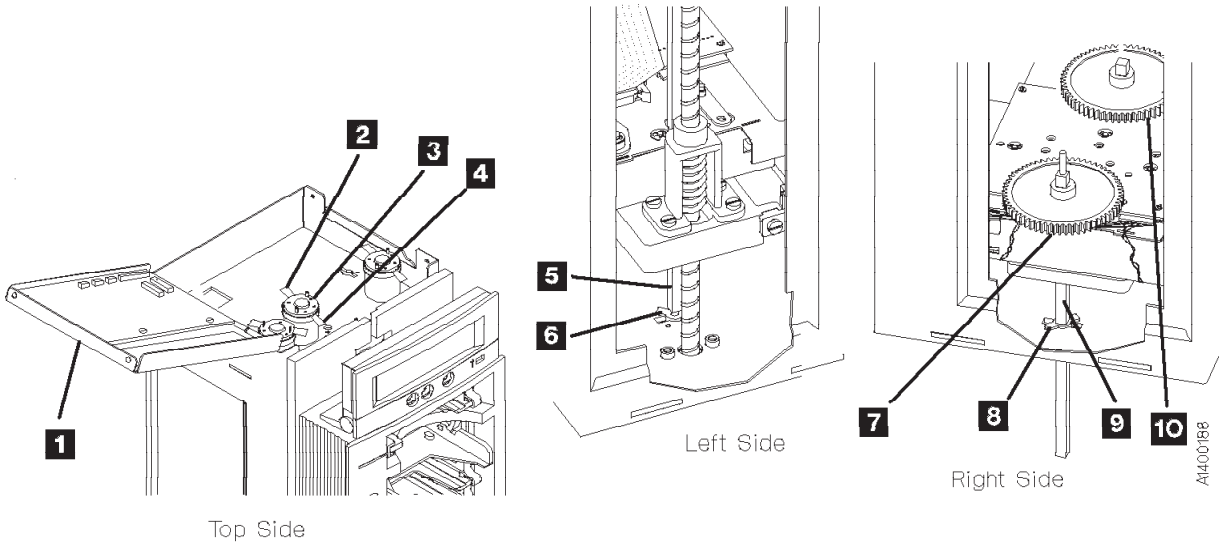


Figure 10-33. Feed Motor, Feed Shaft, and Pinch Shaft

5. Open the ACF top cover **1** . See “ACF Top Cover” on page 9-31.
6. Remove wires from feed shaft motor **3** :

   a. Yellow wire from front terminal **4** (post 2).

   b. Black wire from rear terminal **2** (post 1).
7. For easier access to the feed shaft and feed motor assembly, remove the lower (cross) bearing **8** from the pinch shaft **9** and lower or pull the shaft through the elevator assembly until the gear is against the transport **7** .
8. Remove the lower (cross) bearing **6** from the feed shaft **5** and lower or pull the shaft through the elevator assembly until the gear is against the ribbon cable on the transport board **10** .

Note: When reinstalling the pinch and feed shafts, ensure that the protrusions on one arm of the lower cross bearings rest against the outside frame of the bottom of the ACF.

See Figure 10-34. The view is looking upward at the underside of the motor mounting plate.

9. Remove the screw 1 and nut on the top side of the motor mounting plate. Remove the intermediate gear 2 .
10. Remove the three motor-mounting screws 3 and remove the motor from the top.

Replace Feed Motor Assembly

1. Perform the removal procedure in the reverse order, then return here.
2. When reinstalling or replacing motor use the ACF motor adjustment tool P/N 05H4724 to set the gear mesh gap. This procedure is easier if you remove the ACF and put it on a work surface.
3. When the motor has been reinstalled, leave the screws 3 loose enough so that the motor can be adjusted.
4. Position the ACF so that the motor gears face up.
5. Place the tool 5 dowel pin into the intermediate gear threaded hole 4 while aligning the tool hole over motor gear 6 . Orient the tool 5 , as shown. While holding the tool 5 firmly in position, tighten the three screws 3 that hold the motor in place.

   Notes for Reassembly:

   a. Motor terminal post 2 is oriented to the front.

   b. The intermediate gear 2 is a 2-step gear, oriented with the smaller diameter gear down, as shown.

   c. The yellow motor wire is connected to the front terminal (post 2).

   d. The black motor wire is connected to the rear terminal (post 1).
6. Perform “End of Call” on page 9-8.
7. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

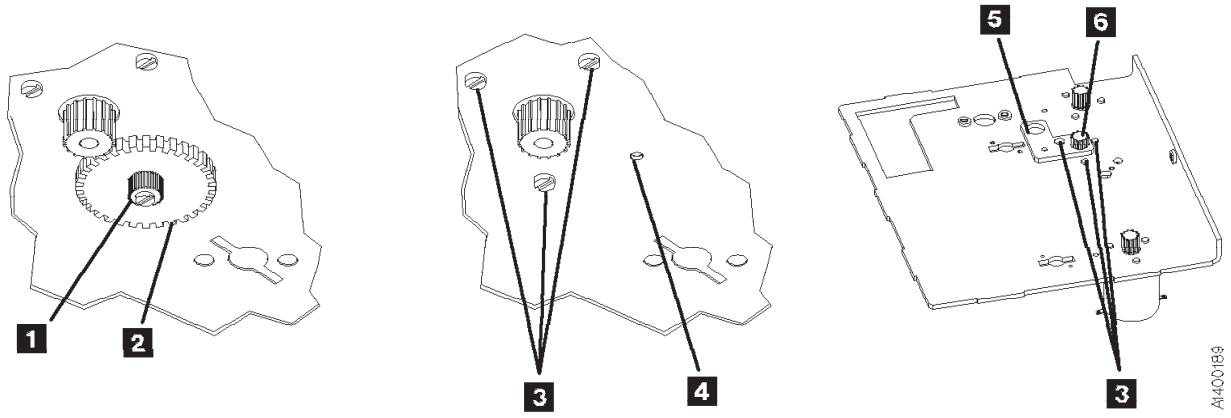


Figure 10-34. Intermediate Gear and Motor

FID AA: Transport Pinch Rollers

See “ACF Component Locations” on page 10-10 for FRU identifier AA.

Attention: The transport assembly card and sensors are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Removal and Replace Transport Pinch Rollers

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the ACF assembly from the drive and place it on a work surface. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.
3. See Figure 10-35. Ensure the pinch roller arms **1** and **2**, and the cartridge release lever **4**, are open before moving the elevator assembly. If not, turn the pinch shaft **3** in the clockwise direction, as shown, to open the pinch rollers.

   CAUTION:
   The cartridge release lever 4 can be broken if the elevator assembly is moved while the release lever is in the closed (extended) position.

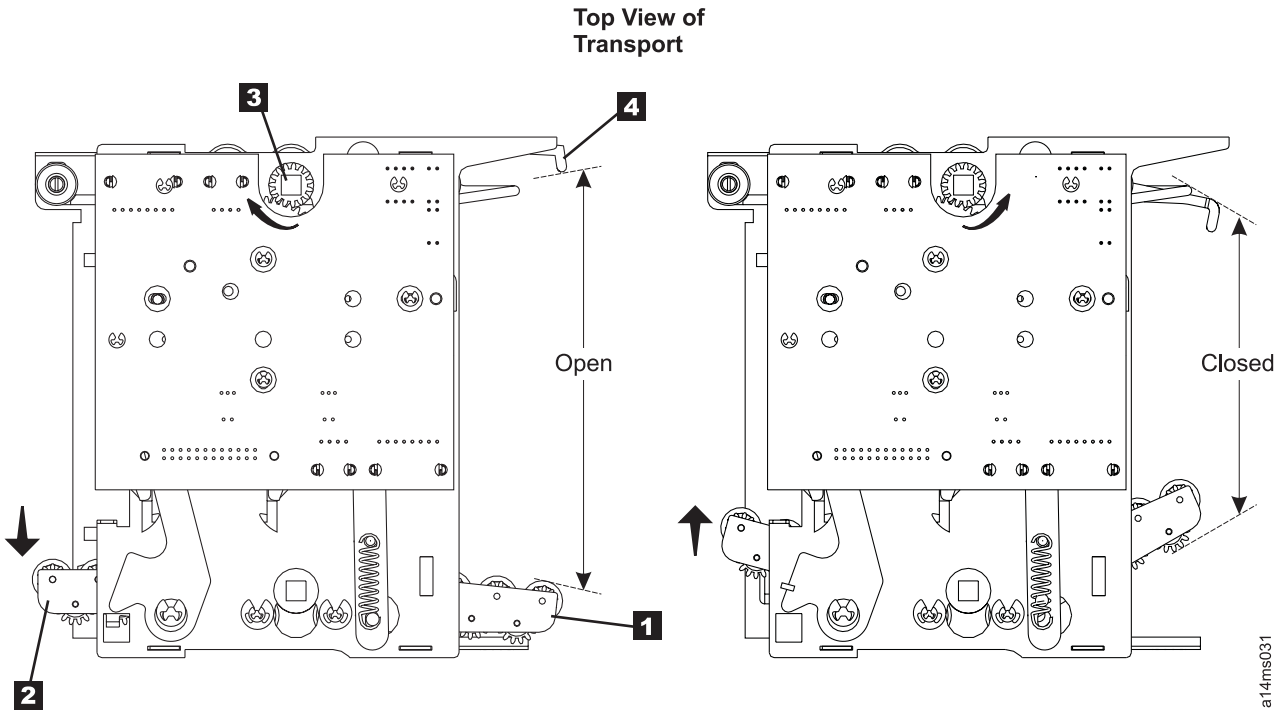


Figure 10-35. Pinch Roller Arm Positions

4. See Figure 10-36. Rotate the elevator leadscrew to position the elevator assembly 1 about half way between the top and bottom, as shown.

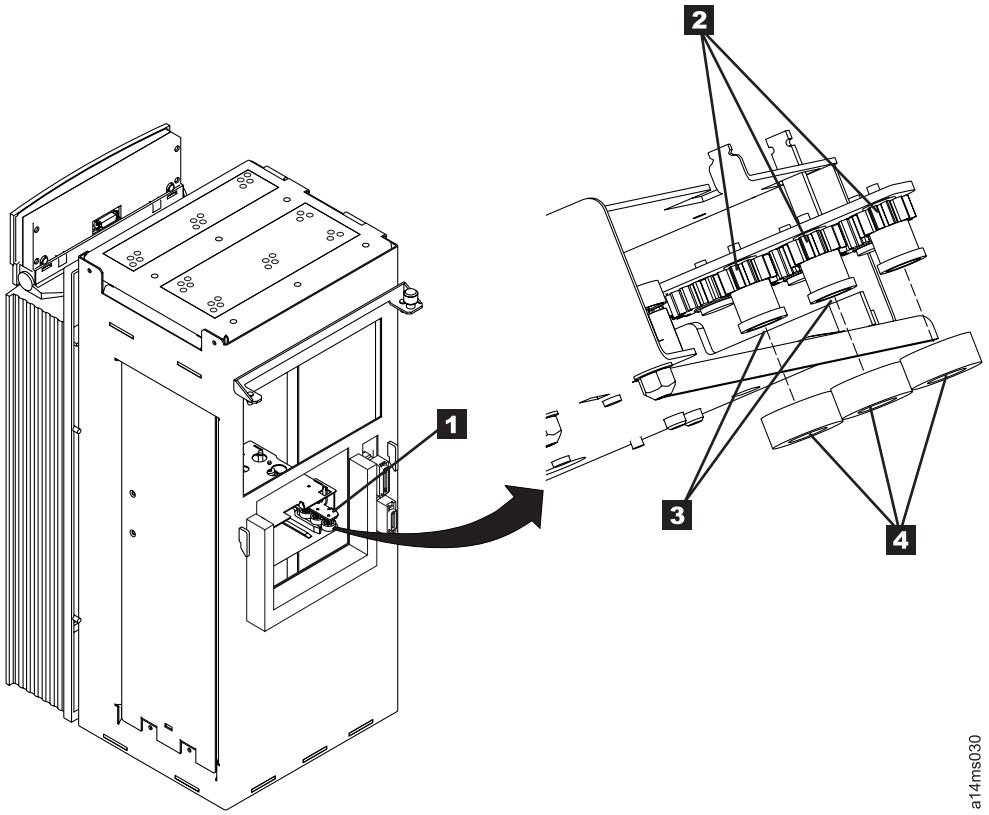


Figure 10-36. Transport Pinch Roller Assembly

5. Remove and Replace the rear transport pinch rollers as follows:

   Note: The rear rollers are easier to remove and replace if the pinch roller arms are open (retracted).
   a. See Figure 10-36. Use a spring hook or small screwdriver to remove the 3 rollers 4 from the gears 2 .
   b. Install the new rollers, one at a time, by squeezing them into the gap between the bottom of the gear shaft and the top of the ridge 3 on the elevator tray, then push the roller up onto the gear shaft.
   c. Observe the rollers while you rotate the pinch roller drive shaft. Ensure the rollers are properly seated on the gear shaft.

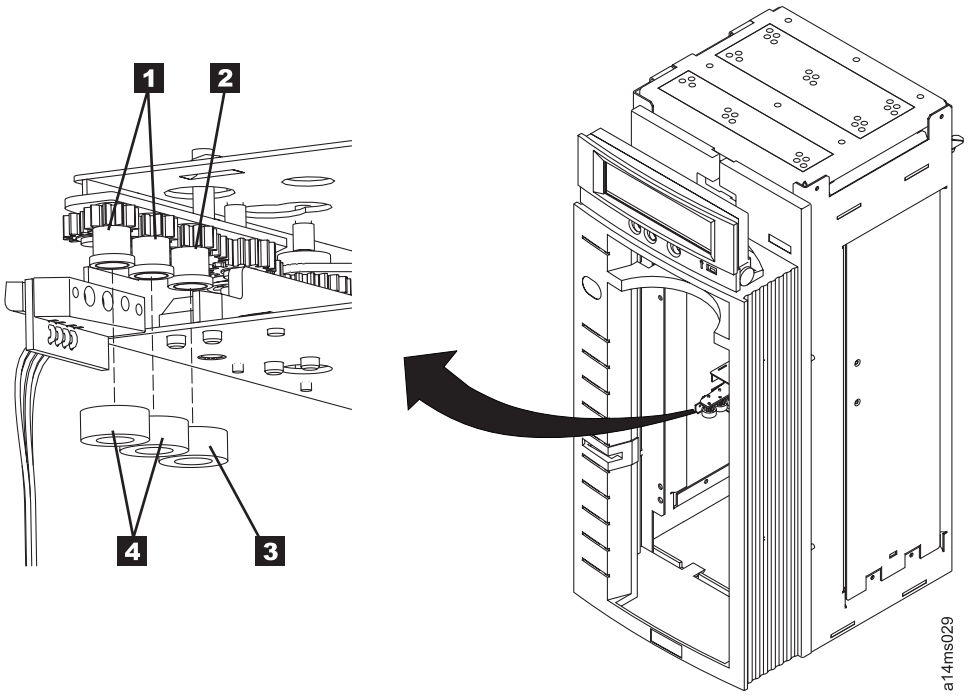


Figure 10-37. Front Transport Pinch Rollers

6. Remove and replace the front transport pinch rollers as follows:
   a. Rotate the pinch shaft counterclockwise to close the roller arms.
   b. See Figure 10-37. Use a spring hook or small screwdriver to remove the first and second rollers **4** from the front pinch roller arm.
   c. Rotate the pinch shaft clockwise to open the pinch roller arms so the third roller **3** can be removed.
   d. Use a spring hook or small screwdriver to remove the third roller **3** from the front pinch roller arm.
   e. Install a new roller **3** on the third gear shaft **2**.
   f. Rotate the pinch shaft counterclockwise to close the pinch roller arms so the first and second rollers **4** can be installed.
   g. Install the new rollers **4** on the first and second gear shafts **1**.
   h. Observe the rollers while you rotate the pinch roller drive shaft. Ensure the rollers are properly seated on the gear shaft.
7. See Figure 10-35 on page 10-51. Rotate the pinch shaft clockwise to ensure the pinch rollers arms **1** and **2**, and the cartridge release lever **4**, are open before installing the ACF on the drive.

   CAUTION:
   The cartridge release lever can be broken if the elevator assembly is moved while the release lever is in the closed (extended) position.
8. Reinstall the ACF onto the drive. See “Automatic Cartridge Facility (ACF)” on page 9-33.
9. Reinstall all covers removed in this procedure.
10. Perform “End of Call” on page 9-8.
11. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

FID AB: Leadscrew Drive Belt

See “ACF Component Locations” on page 10-10 for FRU identifier AB.

Note: Do not attempt to lubricate the ACF leadscrew. Lubricants will ruin the leadscrew coating.

Attention: The transport assembly card and sensors are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Remove Leadscrew Drive Belt

1. “Prepare Tape Drive for Service” on page 9-6, then return here.

   This procedure can be done with the ACF attached to the drive; however, it may be easier if the ACF is removed and put on a work surface. If you have a work surface available, continue with step 2 on page 10-15. If you do not have a work surface available, skip to step 3 on page 10-15.
2. Remove the ACF from the drive and place it on a work surface. See “Automatic Cartridge Facility (ACF)” on page 9-33 for ACF removal, then return here.
3. Remove the ACF side covers. See “ACF Side Covers” on page 9-30.

   Note: Ensure the pinch rollers are open before moving the elevator assembly. If not, rotate the pinch shaft by hand to open the pinch rollers.
4. See Figure 10-38. Rotate the elevator leadscrew **1** to position the elevator assembly all the way to the bottom of the ACF.

   Attention: Ensure that the elevator assembly is all the way to the bottom of the ACF before removing the lower leadscrew bearing in the next step. This will ensure that the elevator assembly does not drop to the bottom of the ACF and damage the assembly.
5. Remove the two screws **5** from the lower leadscrew bearing and remove the bearing **4** from the leadscrew.
6. Lower the leadscrew by rotating it clockwise (from the top) far enough to disengage it from the upper bearing, gear **6** and belt **7** .
7. Remove the belt **7** .

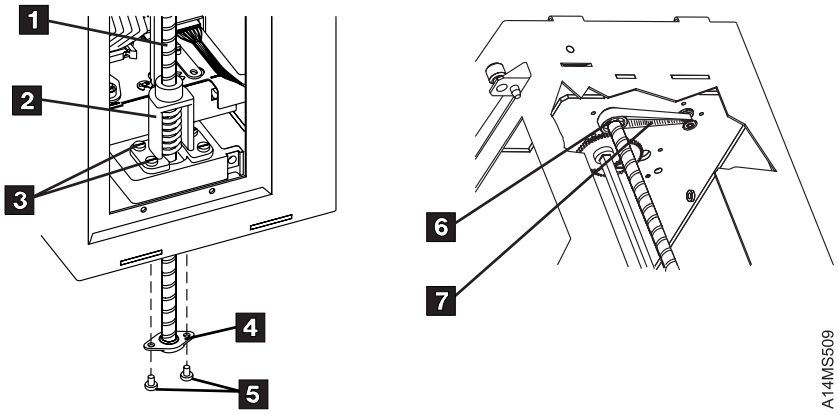


Figure 10-38. Leadscrew and Leadscrew Drive Belt

Replace Leadscrew Drive Belt

1. See Figure 10-39 on page 10-55. Install the belt **1** over the leadscrew **2** .
2. Install the gear **3** , (with the long collar up), onto the D-shaped shaft of the leadscrew.
3. Rotate the leadscrew counterclockwise until the shaft on top of the leadscrew enters the bearing **4** in the top of the ACF.
4. Lift the belt **1** and install it, first on the motor pulley **5** , then onto the leadscrew gear **3** .
5. Install the bottom leadscrew bearing **7** with the two screws **8** removed earlier. Ensure the outer bearing race **6** is inserted up into the frame and the bearing housing is flat against the frame.

6. Manually move the elevator assembly (by rotating the leadscrew) to its upper and lower limits to ensure there are no binds in the elevator or cables catching on the mechanism.
7. The alignment of the transport assembly to the priority cell must be checked after this procedure. Go to “Check and Adjustment of Transport Position Sensor” on page 10-28 to check and adjust the transport position sensor, then return here.
8. Perform “End of Call” on page 9-8.
9. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T03** for the area of failure.

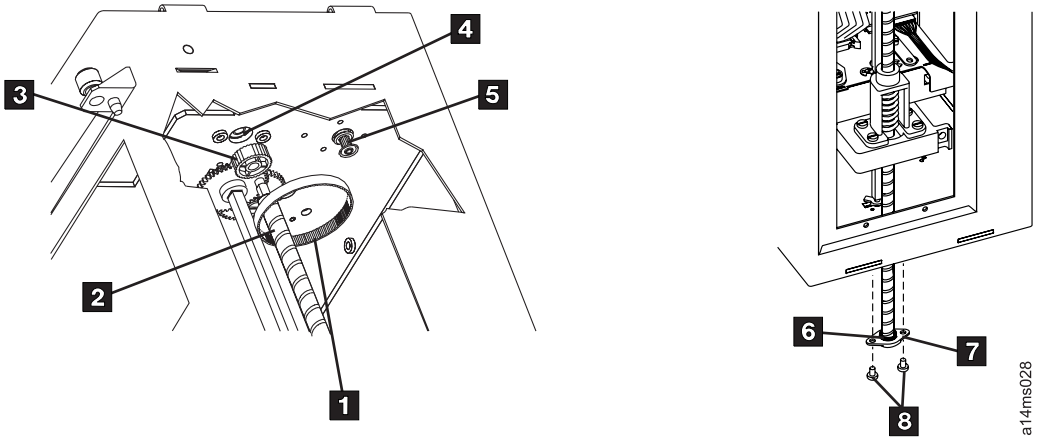


Figure 10-39. Leadscrew Drive Belt Replacement

Locations and Removal Procedures for Deck Enclosure

The FRUs in Figure 10-40 are identified by their FID number, for example, C1 is FID C1, the power supply. The list following the figure shows the FID names. For the deck enclosure cables, see the appropriate FID.

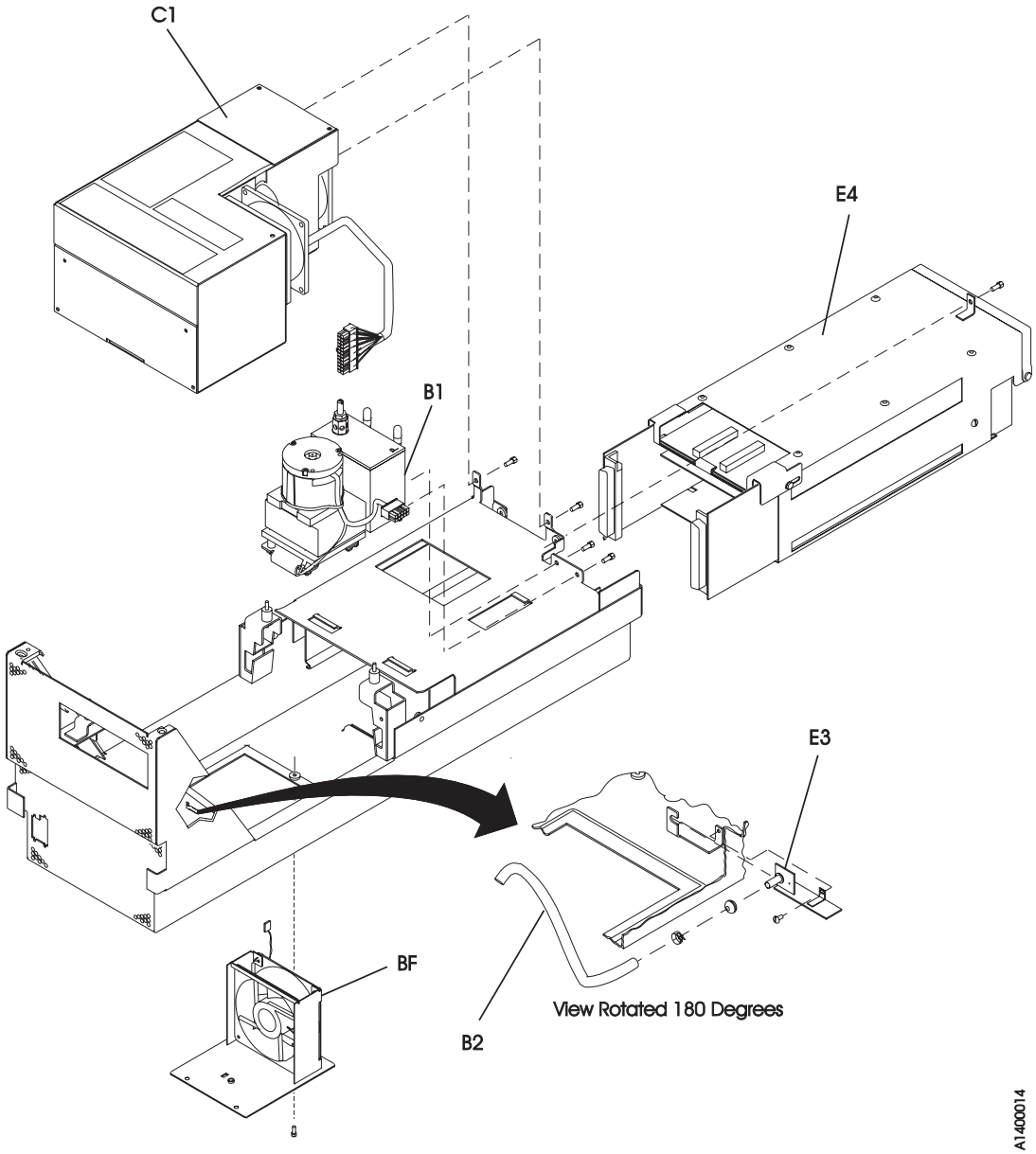


Figure 10-40. Deck Enclosure Locations

FID Number	FID Name	FID Number	FID Name
B1	Pneumatic assembly	B2	Pneumatic hose kit
BF	Card pack fan	C1	Power supply
E3	Pressure sensor assembly	E4	Card pack

FID B1: Pneumatic Assembly

This assembly contains the compressor and filter assembly. See “Locations and Removal Procedures for Deck Enclosure” on page 10-56 for FRU identifier B1.

Remove Pneumatic Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover and back plate. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-41 on page 10-58. Label and disconnect the vacuum **3** and pressure **2** hoses from the rear of the pneumatic assembly. The vacuum and pressure hose positions are marked with a letter on top of the assembly; V for vacuum and P for pressure.
5. Disconnect the pneumatic motor-control connector **4** from the rear of the card pack and carefully pull the cable free.

   Attention: Observe the correct cable routing for reassembly.
6. Loosen the power supply mounting screws **8** and slide the power supply forward.
7. Remove the two mounting screws **5**.
8. Slide the pneumatic assembly **1** forward to disengage the locking tabs **6** from the front of the assembly.
9. Lift the pneumatic assembly off the enclosure.

Replace Pneumatic Assembly

Note: Ensure that the pneumatic motor-control cable is routed so that it is always outside of the Card Pack metal enclosure. If the cable is routed near the two large modules on the top card in the Card Pack, intermittent data errors can occur.

The recommended cable routing is straight down from the pneumatic assembly **7**, past the library manager connector **9**, then across the bottom of the enclosure to the card pack connector **4**.

1. Perform the removal procedure in the reverse order, then return here.
2. The pressure and vacuum for the new pneumatic assembly must be checked and adjusted. Go to “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here. Both pressure and vacuum are adjusted in this procedure. Return here after the adjustment.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T63** for the area of failure.

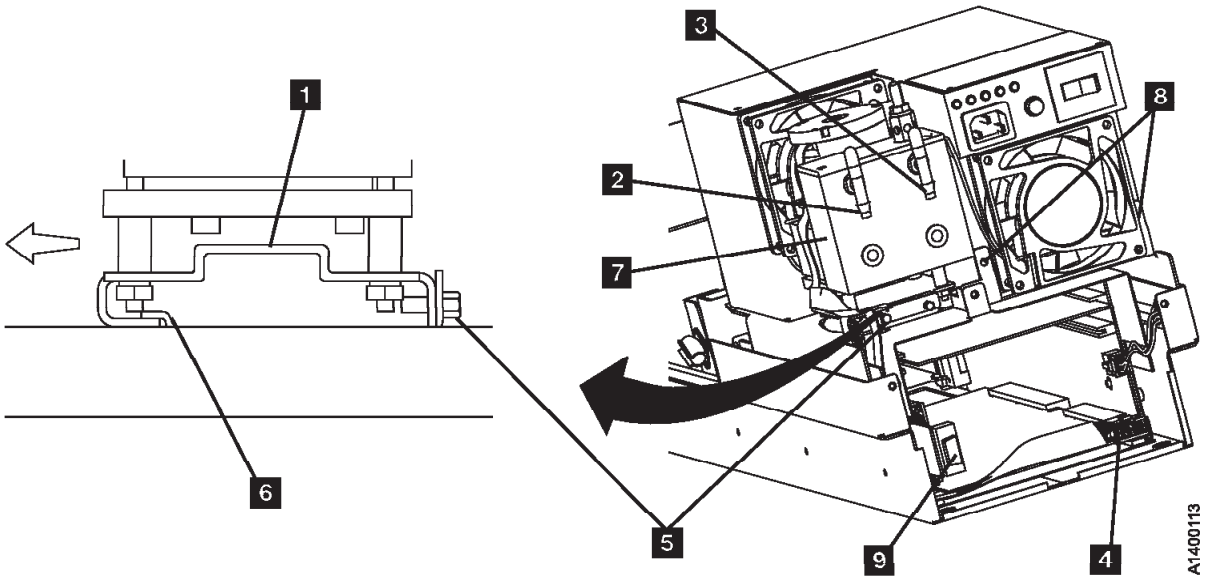


Figure 10-41. Pneumatic Assembly

FID B2: Pneumatic Hose Kit

Removal and Replace the Pneumatic Hoses and Hose Connectors

1. "Prepare Tape Drive for Service" on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See "Deck Enclosure Covers" on page 9-27.

Both sides of the drive must be accessible to replace the components of the pneumatic hose kit.

If your configuration is two Model B11/E11/H11 drives on a rack mounted shelf, it will be necessary to remove the failing drive from the shelf. Go to step 4.

Or,

If your drive is individually mounted on shelf slides, go to step 8 on page 10-59.

4. Remove the SCSI or fibre channel cable connector or connectors from the back of the drive.

   Note: For SCSI drives, **do not** separate the terminator or the daisy-chained cable connector from the back of the SCSI cable connector.

   CAUTION:
   The 3590 Model B11/E11/H11 with the ACF weighs 40.5 kilograms (89 pounds) so remove the ACF before lifting the 3590. The 3590 weighs 28.6 kilograms (63 pounds) without the ACF attached; it takes two persons to safely lift this unit.

   Note: This notice is translated into selected languages. See **C1** in the INSP section.
5. Remove the ACF assembly from the drive. Go to "Automatic Cartridge Facility (ACF)" on page 9-33, then return here.
6. Remove the two screws securing the failing drive to the shelf.
7. Remove the drive and put on a work surface.

   See Figure 10-42 on page 10-60.

8. Start the hose replacement procedure with the vacuum **11** and pressure **12** hoses. Disconnect these hoses from the pneumatic assembly and the other ends from hose connectors **13** and **14**.
9. Pull both hoses out the back of the drive.
10. Select the new vacuum and pressure hoses from the hose kit, place them side-by-side, and feed them through the channel from which the old hoses were removed.
11. Connect the vacuum **11** and pressure **12** to the vacuum and pressure ports at the rear of the pneumatic assembly.
12. While observing the hose routing, remove and replace the remaining vacuum hoses and hose connectors one at a time until all the new vacuum hoses are installed.

    No Cleaner Blade:

    a. The cleaner blade is no longer used on the 3590. See “Cleaner Blade Removal (Model B11/B1A)” on page 10-112.

    b. The new hose kit will not have a cleaner blade vacuum hose and connector **13** will be a straight, inline connector instead of a tee connector.
13. Next, connect the remaining pressure hoses and hose connectors one-at-a-time until all the new pressure hoses are installed.
14.  The pressure sensor assembly and VPD card are ESD sensitive. Use care when connecting hoses in these areas. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

    Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
15. Perform “End of Call” on page 9-8.
16. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T64** for the area of failure.

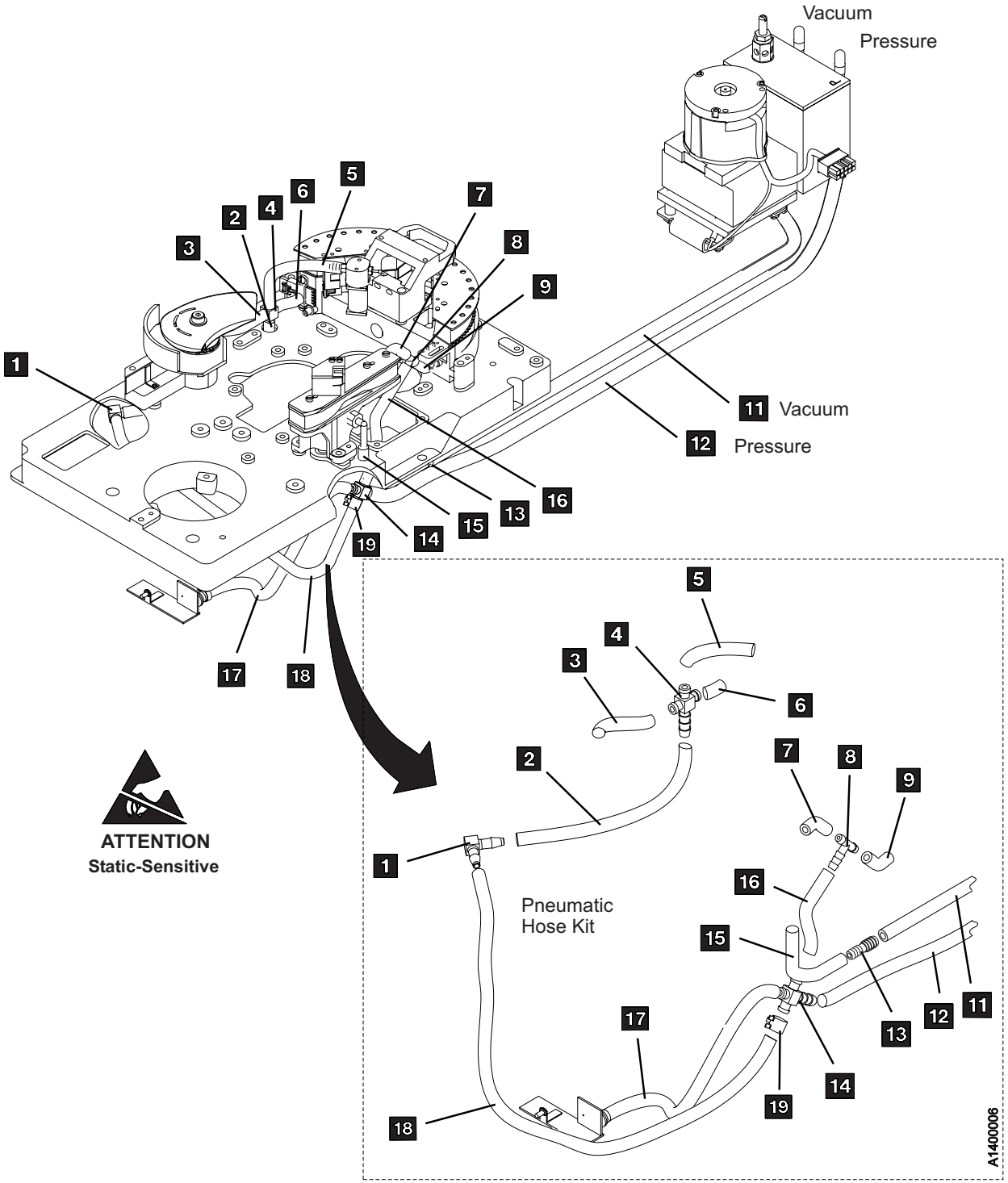


Figure 10-42. Pneumatic Hose Kit

FID BF: Fan (Card Pack)

See “Locations and Removal Procedures for Deck Enclosure” on page 10-56 for FRU identifier BF.

Remove Fan (Card Pack)

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Unplug the power cord from the drive.

   Attention: Support the fan plate when removing the mounting screws. The fan assembly can drop and damage parts.
3. See Figure 10-43. Remove three screws **4** from the plate.
4. Lower the fan assembly **3** and disconnect the fan connector **2**.
5. Remove four fasteners (or screws) **1** from the fan bracket and remove the fan.

Replace Fan (Card Pack)

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **A03** for the area of failure.

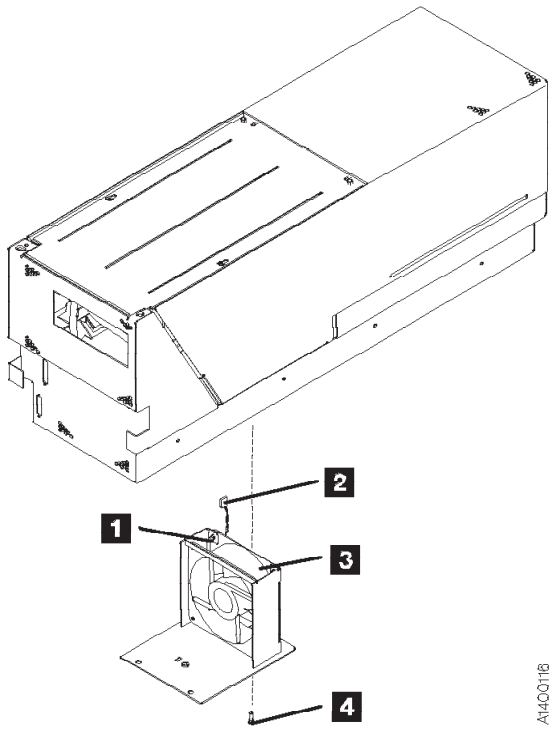


Figure 10-43. Fan (Card Pack)

FID C1: Power Supply

See “Locations and Removal Procedures for Deck Enclosure” on page 10-56 for FRU identifier C1.

Remove Power Supply

There are two levels of power supplies used on the 3590. See Figure 10-44. The **New Level** is used on all E11/E1A and H11/H1A drives and also on the new built Model B11/B1A drives with Common Card Pack. The **Former Level** is used on all Base Model B11/B1A drives and on the Model B11/B1A drives with the Ultra Card Pack (P/N 35L0818) or older.

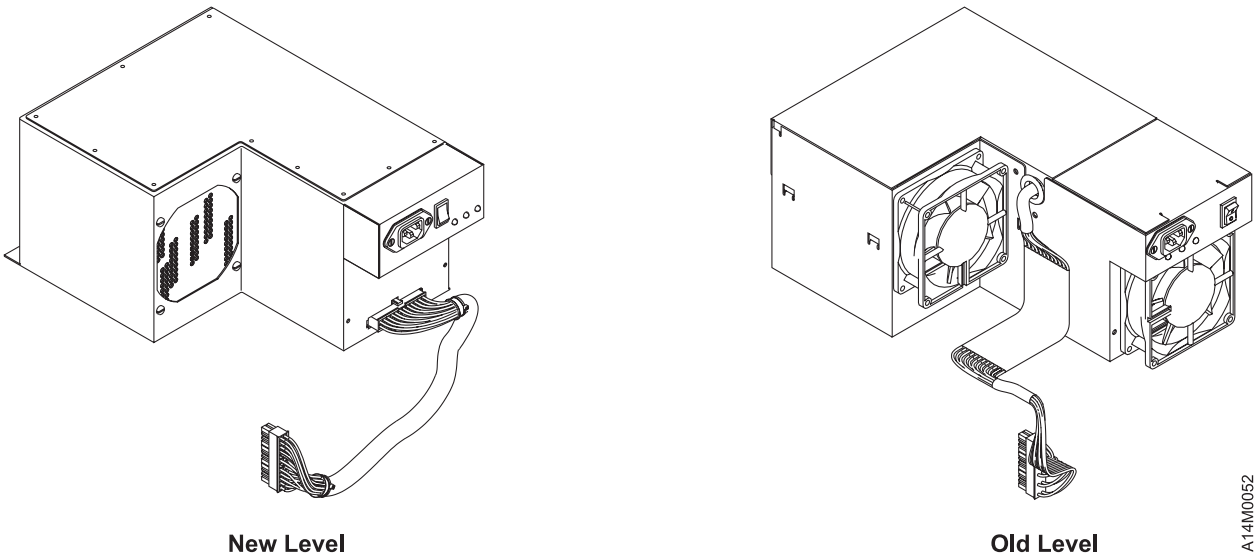


Figure 10-44. Power Supplies

Old Level Power Supply

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the Library Manager (LM) connector, if present and the SCSI or fibre channel cable connector or connectors from the back of the drive.

   Note: For SCSI drives, **do not** separate the terminator or the daisy-chained cable connector from the back of the SCSI cable connector.
4. Remove the deck enclosure back cover and back plate. See “Deck Enclosure Covers” on page 9-27.
5. See Figure 10-45 on page 10-63. Disconnect the power supply connector **2** .

   Note: Observe the power supply cable routing for later reassembly.

   Before removing the power supply, free the power supply cable from the card pack and pneumatic assembly:

   a. Carefully pull the connector end of the power supply cable up and out of the card pack area.
   b. Remove the two screws **1** from the rear of the power supply.
   c. Remove the two pneumatic assembly mounting screws. See Figure 10-41 on page 10-58 **5** .
   d. Slide the pneumatic assembly forward to disengage the locking tabs from the front of the assembly.
   e. Lift the pneumatic assembly up enough to remove the power supply cable from under the pneumatic assembly so the cable will not become caught as the power supply is removed.

Note: To allow more room for power supply removal, the cleaner brush mechanical assembly (left tape guide) can be removed. See “FID D4: Head Cleaning Brush Assembly” on page 10-114.

6. Slide the power supply forward to disengage the locking tabs from the front of the power supply.

   Lift the power supply carefully off the enclosure, taking care not to damage the cable.

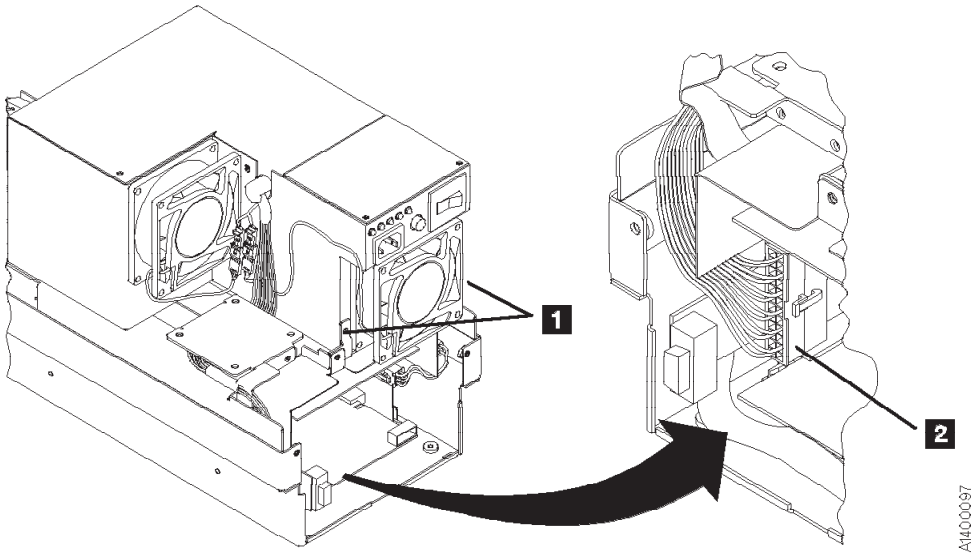


Figure 10-45. Power Supply (Former Level)

Note: **Prior** to replacement of the power supply **check the part number of the pneumatic assembly** on the side of the pneumatic assembly filter **7** in Figure 10-41 on page 10-58.

If the part number is **not** 05H4802, it will be necessary **to remove** the spiral wrapping **1** in Figure 10-46 from the power supply cable of the new power supply, before installing the new power supply.

If the pneumatic assembly part number **is** 05H4802, then **do not** remove the spiral wrap from the power supply cable before installing the new power supply.

End of Old Level Power Supply

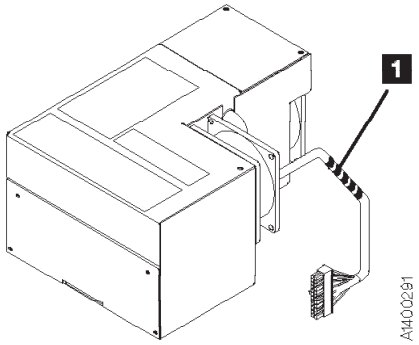


Figure 10-46. Power Supply Cable Spiral Wrap

New Level Power Supply

1. “Prepare Tape Drive for Service” on page 9-6, then return here.

2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-47. Disconnect the power distribution cable **1** from the power supply at connector J2.
5. Remove the two screws **2** from the rear of the power supply.
6. Slide the power supply forward to disengage the locking tabs from the front of the power supply. Lift the power supply carefully off the enclosure.

End of New Level Power Supply

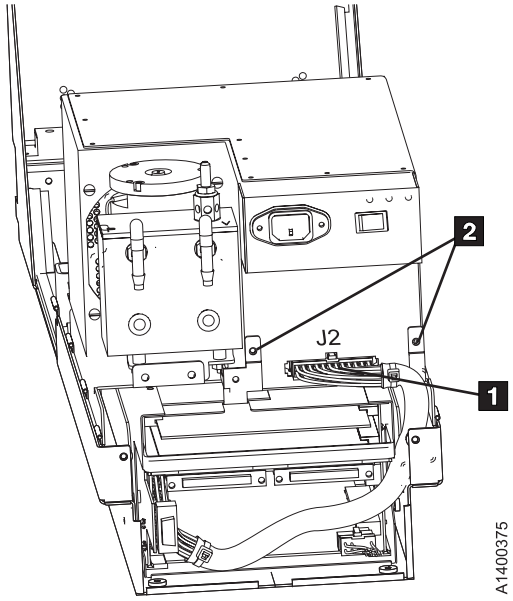


Figure 10-47. Power Supply (New Level only)

Replace Power Supply (Former and Current Levels)

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **P04** for the area of failure.

FID E3: Pressure Sensor

See “Locations and Removal Procedures for Deck Enclosure” on page 10-56 for FRU identifier E3.

Remove Pressure Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the Library Manager (LM) connector, if present and the SCSI or fibre cable connector or connectors from the back of the drive.

   Note: For SCSI drives, **do not** separate the terminator or the daisy-chained cable connector from the back of the SCSI cable connector.

CAUTION:
The 3590 Model B11/E11/H11 with the ACF weighs 40.5 kilograms (89 pounds) so remove the ACF before lifting the 3590. The 3590 weighs 28.6 kilograms (63 pounds) without the ACF attached; it takes two persons to safely lift this unit.

Note: This notice is translated into selected languages. See **C1** in the INSP section.

4. If the drive has an ACF, remove the ACF. See “Automatic Cartridge Facility (ACF)” on page 9-33.
5. Remove the drive from the rack and place it on a work surface.
6. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
7. Position the drive on its left side so you can work from the bottom and right sides.
8. Remove the card pack fan-plate from the bottom of the drive. See “FID BF: Fan (Card Pack)” on page 10-61.
9.  See Figure 10-48 on page 10-66. From the bottom access hole, remove the screw **2** that secures the pressure sensor card assembly **4** .
10. Carefully move the card assembly out of the sensor mounting bracket slot **5** and pull the assembly out the bottom of the drive.
11. Disconnect the cable connector **1** from the card.
12. Disconnect the pressure hose from the hose connection **3** and remove the card.

Replace Pressure Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T62** for the area of failure.

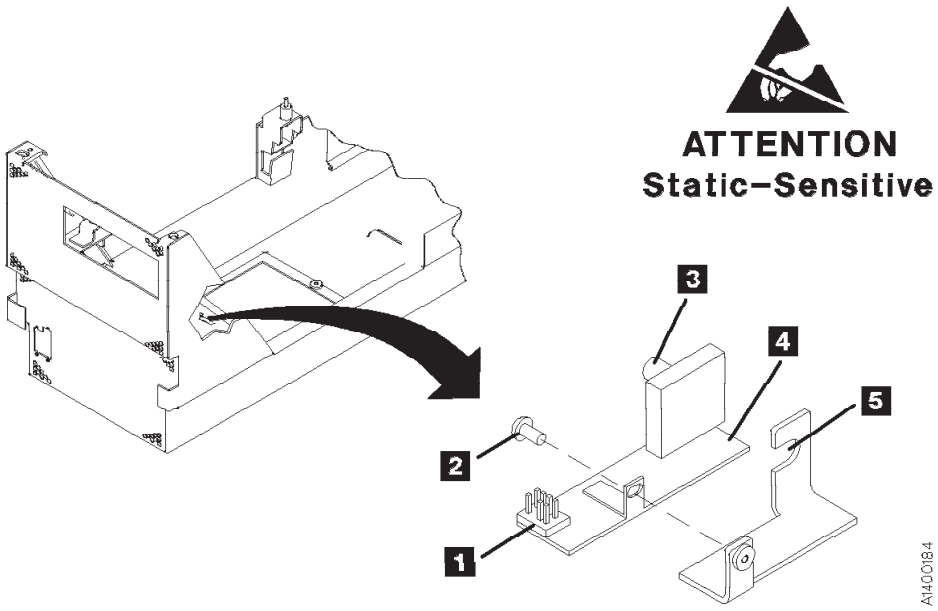


Figure 10-48. Pressure Sensor. (View Rotated 90°)

FID E4: Card Pack

See “Locations and Removal Procedures for Deck Enclosure” on page 10-56 for FRU identifier E4.

Attention: The card pack is ESD sensitive. Special care must be used when handling ESD parts. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Card Pack Part Numbers

There are multiple card pack part numbers that can be used on the 3590 drives, but they are not all interchangeable. Before you order a replacement card pack, ensure that you are ordering the correct part number. If you order the part number from the Card Pack that is being removed, the ordering system will automatically ship the correct replacement part. See Table 10-2 on page 10-67 below or the Parts Catalog, “Assembly 3: Deck Enclosure” on page 11-10.

Table 10-2. Card Pack Part Numbers

Part Number	Drive Model	SCSI/ Fibre	Power Supply	uCode Increment Level	Ship Through Date	Comments
45G0100 05H4453 05H8916 05H9074 05J9895	Base B11/B1A	SCSI	05H9098	D0IA_xxx	02/1995 03/1995 12/1996 04/1998 03/2000	
06J0015 35L0818	Ultra B11/B1A	SCSI	05H9098	D0IB_xxx	11/1998 03/2000	
09L4673	E11/E1A	SCSI	05J9721	D0IC_xxx *	03/2000	* Can be field upgraded to D0ID or D0IE
35L1856	Ultra B11/B1A or E11/E1A	SCSI	05J9721	D0ID_xxx *	07/2000	Common Card Pack * Can be field upgraded to D0IE
19P0174	Ultra B11/B1A	SCSI	05H9098 * or 05J9721	D0ID_xxx, D0IE_xxx	04/2001	Common Card Pack with Load Resistor * Approx 1000 shipped with Power Supply P/N 09H9098
	E11/E1A	SCSI	95J9721	D0ID_xxx, D0IE_xxx	04/2001	Common Card Pack with Load Resistor
19P3431	Ultra B11/B1A or E11/E1A	SCSI	05J9721	D0IE_xxx	Current	
19P6251	E11/E1A or H11/H1A	SCSI	05J9721	D0IF_xxx	Current	First Hxx support level card pack (includes ReadMe information)
35L1986	E11/E1A	Fibre	05J9721	D0IE_xxx	07/2000	First Fibre Channel Card Pack
19P0175	E11/E1A	Fibre	05J9721	D0IE_xxx	04/2001	Second Fibre Channel Card Pack
19P3432	E11/E1A	Fibre	05J9721	D0IE_xxx	Current	Third Fibre Channel Card Pack

Table 10-2. Card Pack Part Numbers (continued)

Part Number	Drive Model	SCSI/ Fibre	Power Supply	uCode Increment Level	Ship Through Date	Comments
19P6252	E11/E1A or H11/H1A	Fibre	05J9721	D0IF_xxx	Current	Fourth Fibre Channel Card Pack (includes ReadMe information)

Before Removing Card Pack

Note: Before proceeding, ensure that you are not trying to attach the 3590 to an LVD device. The 3590 is an HVD device and does not support LVD.

Attention: ***Handle card packs by the side of the card pack frame. Do not handle at the ends.*** Damage to components and the internal card assembly solder joints will occur if packs are handled at the ends.

Card Pack Replacement Notes

- Do not push on fibre connectors! Push on the edge of the card between the connectors, if necessary. Use the metal bar and handle.
- Before replacing a card pack to correct a drive failure, try reseating all of the connectors to see if that will correct the problem.

1. Attempt to recover the microcode EC level and link level of the failing card pack before replacing it with a new card pack.
   a. Press the Change Mode pushbutton if the operator Options menu is not displayed.
   b. Select **Services** from the Options menu, and press **Enter**.
   c. Select **Microcode Level** from the Services menu, and press **Enter**.
2. If the microcode EC level was obtained from the previous step:
   a. Write the EC level, link level and date in “Microcode EC Level History Log” on page 9-61.
   b. Go to Figure 5-2 on page 5-6 and Table 5-2 on page 5-7. Record the ACF Mode **1**, Drive Type **2** and SCSI or fibre channel address information from Supplemental Messages **5**.
   c. Go to “CE Drive Options Menu” on page 5-52. Record the Drive Serial Number, Drive Features and any other CE Drive Options that will be lost when the card pack is replaced.
3. For fiber attachment only, attempt to display and record the fibre channel world wide node and port names of the failing card pack before replacing it with a new card pack.
   a. For fibre channel attached drives, perform the “Display WW Names Procedure” on page 9-63.
   b. Record the World Wide Node and Port Names in the “Fibre Channel World Wide Name History Log” on page 9-63.

      Note: It is very important to record the Node and Port Names from the failing card pack if the customer’s Fibre Network contains any switches with the “Zoning” function. These names will have to be set into the VPD memory of the new card pack. If the old Node and Port names are not available, it will be necessary to have the customer reconfigure the entire Fibre Network to establish new names for the drives.
4.

OEM Drive Only

If the failing card pack is in an OEM drive that **does not** report to the host as an IBM 3590, it will be necessary to update the **Manufacturer**, **Drive Type**, and **Drive Model Number** fields in VPD memory after the new card pack is installed.

If possible, recover the Manufacturer, Drive Type, and Drive Model Number information from the failing card pack before it is removed.

This procedure requires a password and is normally done by OEM support personnel.

See “OEM Use Only Menu” on page 5-78 for details.

End of OEM Drive Only

Remove Card Pack

Attention: The head guide assembly cables, which attach to the card pack, interfere with the card pack when it is being removed or installed. Use extreme care when removing or installing the card pack to avoid damaging the head guide assembly cables.

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.

   Attention: Support the fan plate when removing the mounting screws. The fan assembly can drop and damage parts.
3. See Figure 10-49 on page 10-70. Remove the screws **19** that secure the card pack fan **18** to the bottom of the deck enclosure and lower the fan assembly.
4. Disconnect the fan connector and remove the fan.
5.  Disconnect the two head cables **6** (from the top card in the card pack):

   Note: Each head cable connector **3** is locked to the card receptacle **4** with a sliding retaining bar **1**. The retaining bar has a tab at the front **2** and rear **5** that engage slots in the receptacle to lock the connector in place.

   a. Reach into the fan opening and pull the retaining bar **1** toward the front of the drive until it stops, approximately 6 mm (1/4 in.).
   b. With the retaining bar disengaged, pull upward on the retaining bar while carefully tilting the front and rear of the connector until it is disconnected from the card receptacle (rock it several times).
   c. Repeat this procedure to disconnect the other head cable connector.
6. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
7. Remove the Library Manager (LM) connector, if present and the SCSI or fibre channel cable connector or connectors from the back of the drive.

   Notes:

   a. For SCSI drives, **do not** separate the terminator **17** or the daisy-chained cable connector **16** from the back of the SCSI cable connector **15**.
   b. For Fibre drives, **do not** expose the ends to dust and moisture, use caps if available. **21** Handle the cables and connectors with care or damage will occur.
8. Remove the deck enclosure back plate. See “Deck Enclosure Covers” on page 9-27.
9. Disconnect the following internal cable connectors from the card pack **7**:
   - Motor drive connector **11**
   - Pneumatic motor drive connector **12**
   - Power input connector **14** (behind the library manager connector). On drives with the new level power supply, the cable can be disconnected from the power supply also.

     Attention: Observe the correct cable routing for reassembly.
10. Remove the card pack retaining screw **8**.

    Attention: To protect the head guide assembly cables while the card pack is being removed, insert a punch card or similar object between the top of the card pack and the head guide assembly cables. Ensure the card remains between the card pack and cables while the card pack is pulled from the enclosure.

Note: On some library installations there may be a cable mounting bracket attached to the bottom of the drive enclosure. The screws for this bracket may be long enough to interfere with the bottom of the card pack 9 as it is being removed. Loosen these screws and back them part of the way out, if necessary.

11. Carefully pull the card pack out the rear of the deck enclosure, ensuring the head cables do not become caught on the card pack.

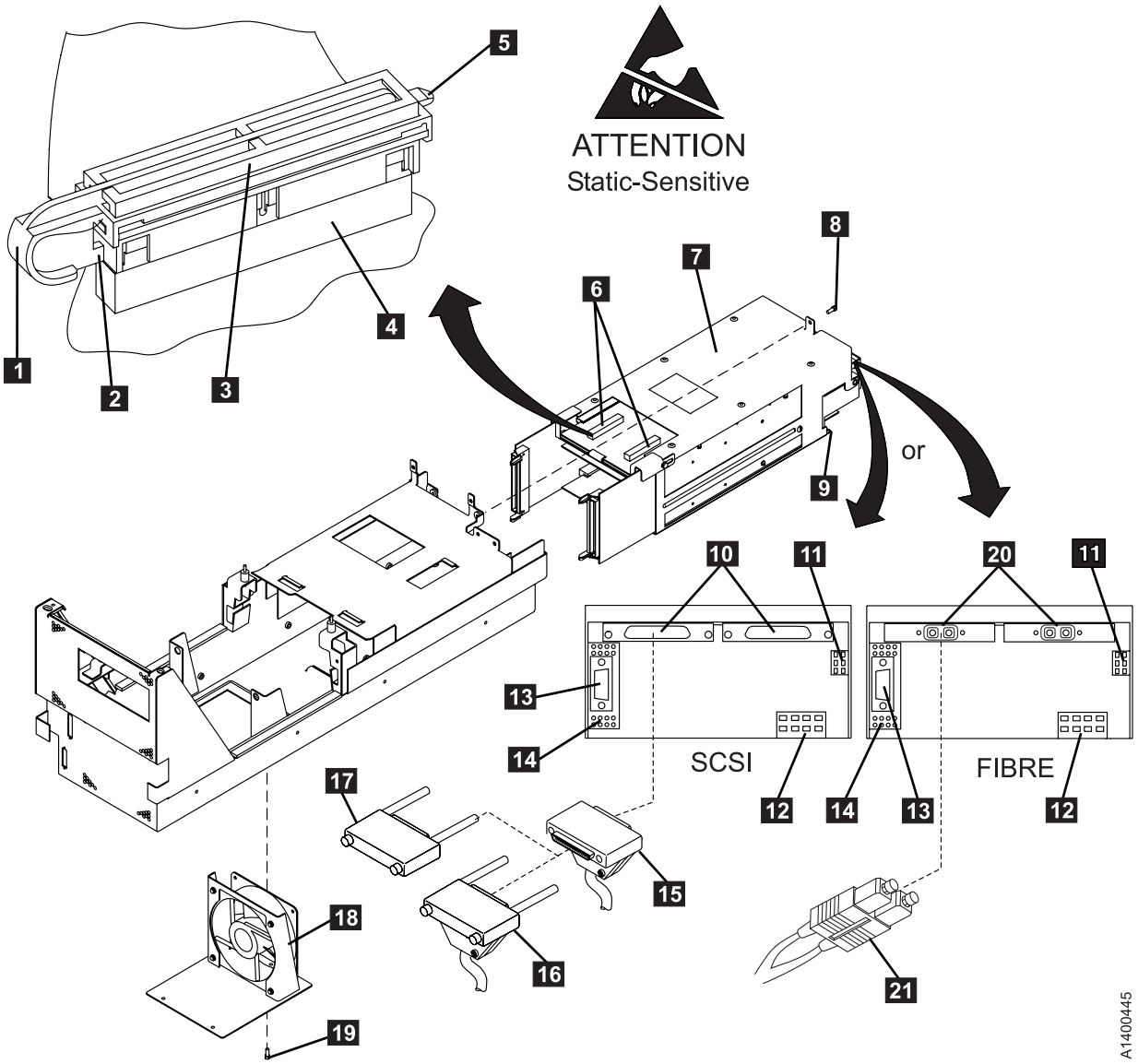


Figure 10-49. Card Pack Showing SCSI and Fibre Cables

Note: As you pull the card pack out, raise it to clear the bottom 9 of the enclosure.

Replace Card Pack

Note: Do not push on fibre connectors! Push on the edge of the card between the connectors, if necessary.

1. Remove the card pack from the packaging by removing the foam from the side. Hold the card pack by the side while using the handle to lift it out of the package.

SCSI Channel Only

2. See Figure 10-50. There is a selectable mode switch **1** on the bottom of the SCSI card in the E11/E1A and H11/H1A Card Pack and also in the Common Card Pack. Future microcode releases may use this switch for model or mode selection. This switch should always be set to the “F” position.

   Note: Use the Potentiometer Adjusting tool P/N 1864853, to set this switch. See Figure 3-27 on page 3-46.

End of SCSI Channel Only

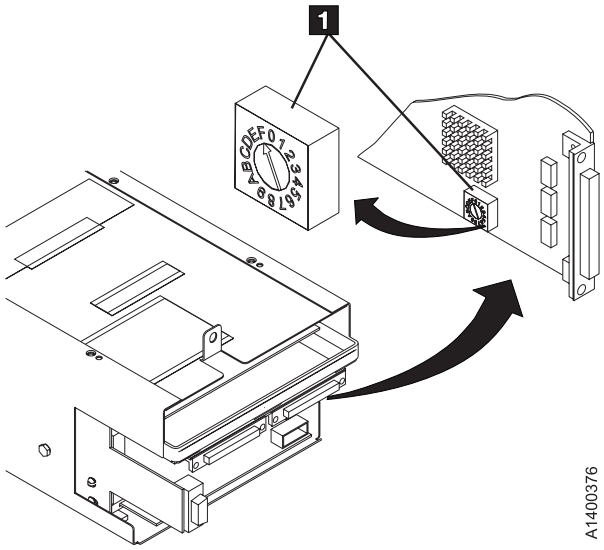


Figure 10-50. SCSI Card Mode Switch

Attention

a. Ensure that the metal tab on top of the card pack is bent straight up. If it is bent toward the front of the drive, it may prevent the card pack connectors from seating correctly.
b. Ensure the head cables do not become caught on the card pack. Use a punch card or similar object between the card pack and head guide assembly cables while the card pack is being inserted.
c. Lift the power supply if you need more space to install the card pack.
d. Ensure that the head connectors and the power transistors that protrude through the sheet metal casing of the card pack do not get bent or otherwise damaged.
e. Ensure that the pneumatic motor-control cable is routed so that it is always outside of the Card Pack metal enclosure. If the cable is routed near the two large modules on the top card in the Card Pack, intermittent data errors can occur.

   The recommended cable routing is straight down from the pneumatic assembly, past the library manager connector, then across the bottom of the enclosure to the card pack connector. See .

Note: Do not push on the connectors when installing the card! Use the metal bar and handle.

3. Perform the removal procedure in the reverse order, then return here.

Note: **DO NOT** connect the external SCSI or fibre channel cables at this time. They will be connected in a later step, after the Customer and Drive Options have been set.

4. After installing the new card pack, restore power to the 3590.

   Attention: If any of FIDs **00 - 04 (Configuration Errors)** are displayed on the operator/CE panel after power-on, **do not** try to repair, as indicated in next step, but continue to step 6.

5. If the power-on test did not complete successfully, repair as needed, then go to step 6.

Or

If the power-on test completed successfully, go to step 6.

6. Perform procedure “Drive Serial Number” on page 9-51.
7. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4.
8. Perform the “Set Customer Options” on page 8-35 procedure.
9. Perform the “Set Drive Options” on page 8-36 procedure.
10. Perform the “SCSI Ports Wrap Test” on page 9-106 or the “Fibre Channel Ports Wrap Test” on page 9-112.
11. Connect the external SCSI or fibre channel cables.
12. To ensure the EC level of the microcode on the new card pack is not down level, do the following:

    a. Press the Change Mode pushbutton  if the operator Options menu is not already displayed.

    b. Select **Services** from the Options menu, and press **Enter**.

    c. Select **Microcode Level** from the Services menu, and press **Enter** to display the EC level and link level of the microcode on the new card pack.

    d. Look at the latest EC level and link level written in “Microcode EC Level History Log” on page 9-61.

       Note: The latest EC level is determined by the link level (LL), as the EC level may not always increment to a higher number. The following example shows that the second entry is the latest level microcode.

       ```
       EC Level   Link Level
       6C56789    4D0D
       3C56789    5B02  (highest EC level)
       ```

       Compare the displayed EC level (new card pack) to latest written EC level and link level previously installed. If they compare, go to step 18.

    - If the card pack is up-level from the FMR tape, perform steps 13 through 15, then go to step 18.
    - If the card pack is down-level from the previously-installed level, go to step 13.

13. Select **Cancel** to return to the CE Options menu.
14. Select **Microcode Update** from the CE options menu, and press **Enter**. (See “Updating Microcode from FMR Cartridge” on page 9-58 for details.)
15. After you load the FMR tape when prompted, the Select EC Level menu displays a series of EC levels.

Note: If the card pack has a different EC level than that which is on the FMR tape, the microcode is automatically written on the FMR tape and is also displayed.

16. Find the EC level on the menu that matches the EC level written in “Microcode EC Level History Log” on page 9-61.
17. Select the **EC level and link level** from the menu that matches the written level, and press **Enter**.
18. After the microcode is written into the card pack, unload the tape, and press Reset to activate the code.

pSeries/RS6000 (AIX) System Only

a. You must have root authority to do the following step. If you do not have root authority, ask your customer to enter these commands.
b. Update the VPD data in the host pSeries/RS6000 (AIX) System by unconfiguring the device **(Example: rmdev -l rmt3)** and reconfiguring the device **(Example: mkdev -l rmt3).**
c. In this example, the 3 in **rmt3** is the drive number.

End of pSeries/RS6000 (AIX) System Only

OEM Drive Only

If you are replacing the card pack in an OEM drive that **does not** report to the host as an IBM 3590, it will be necessary to update the **Manufacturer**, **Drive Type**, and **Drive Model Number** fields in VPD memory after the new card pack is installed.

This procedure requires a password and is normally done by OEM support personnel.

See “OEM Use Only Menu” on page 5-78 for details.

End of OEM Drive Only

19. Perform “End of Call” on page 9-8.
20. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T21** for the area of failure.

Locations and Removal Procedures for Deck

The FRUs in Figure 10-51 are identified by their FID number for example, C6 is FID C6, the machine reel motor. The list following part 2 of the figure shows the FID names.

For the locations of the deck cables, see the list following the figures.

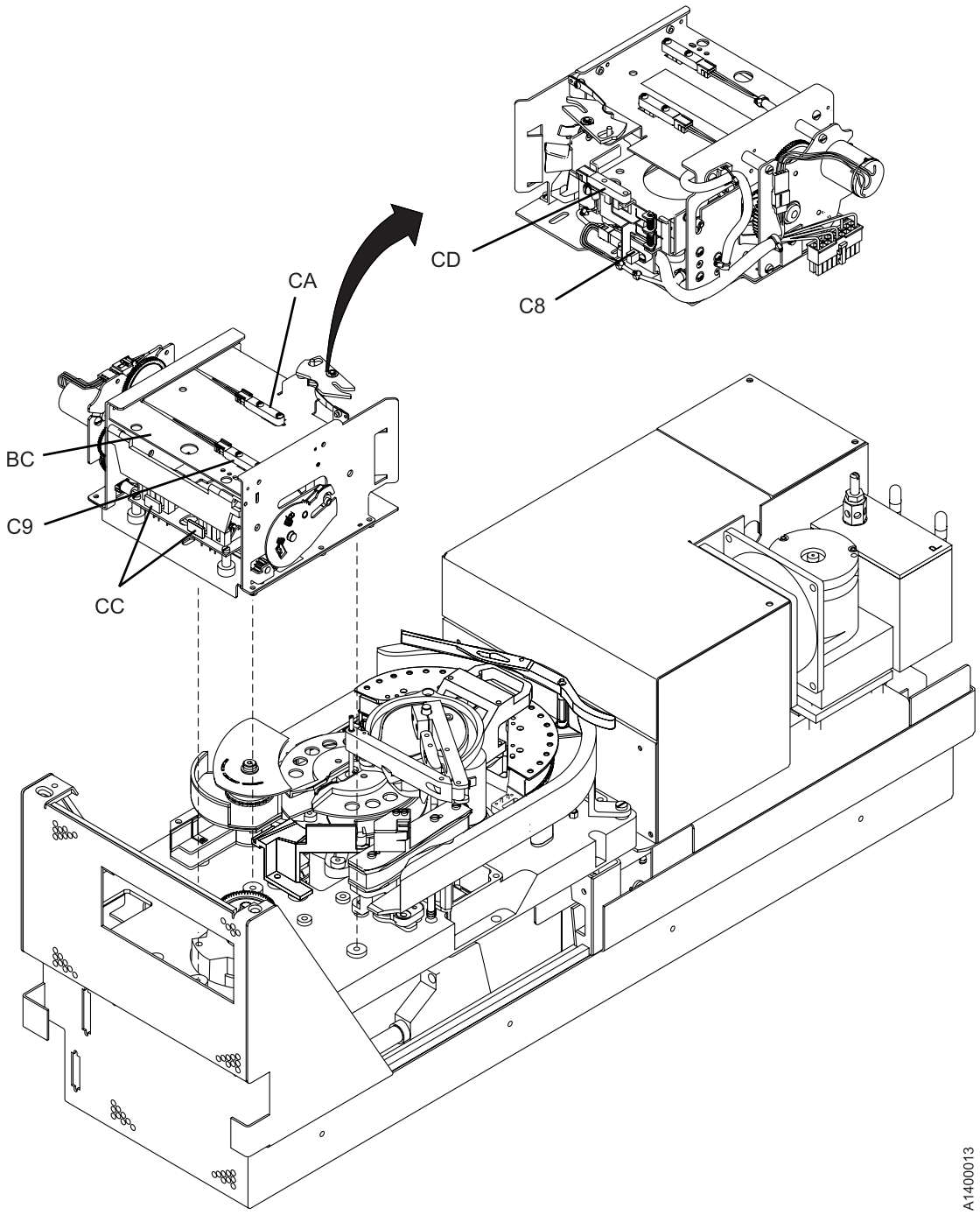


Figure 10-51. Deck Locations (Part 1 of 2)

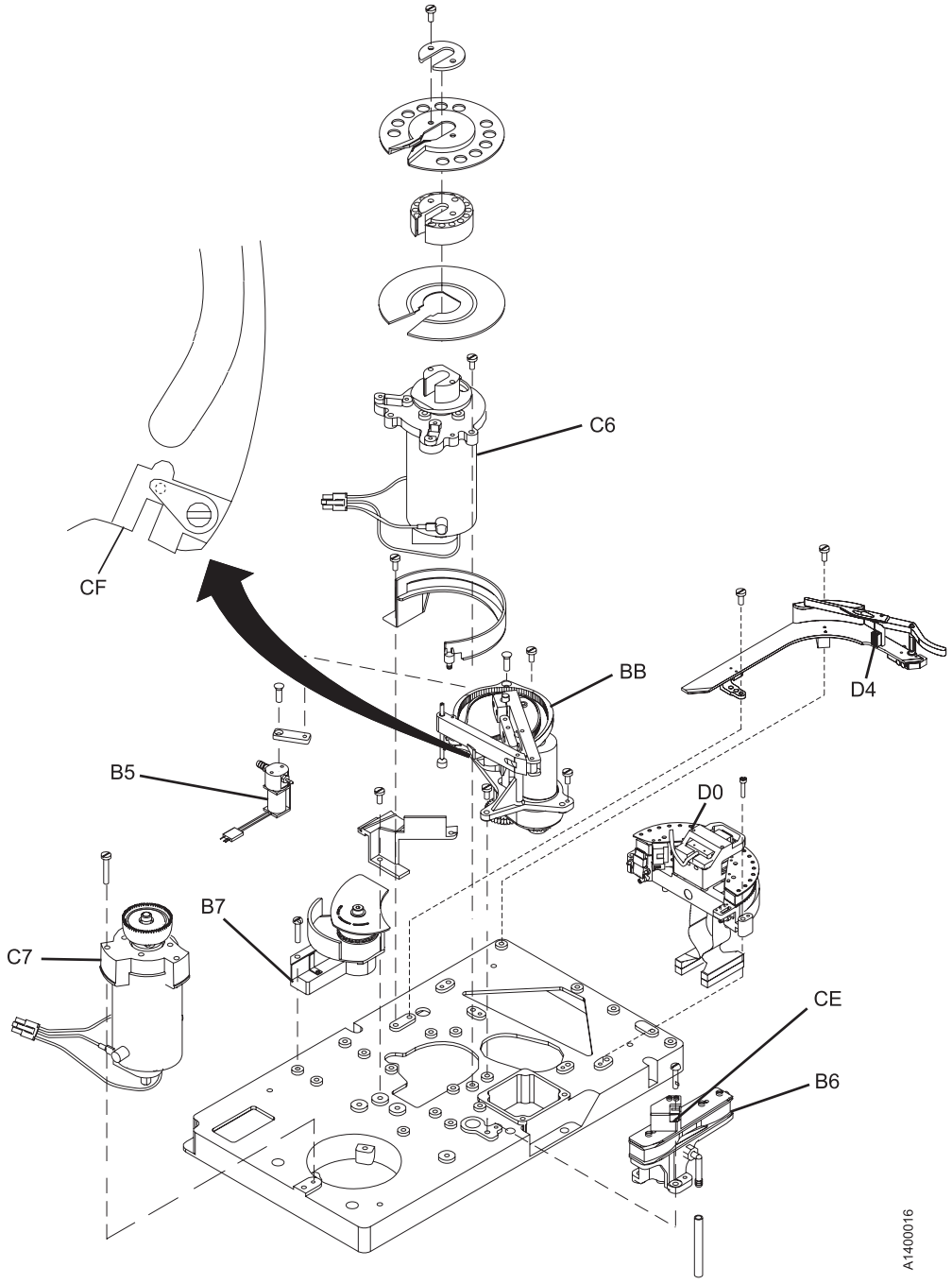


Figure 10-52. Deck Locations (Part 2 of 2)

FID Number	FID Name	FID Number	FID Name
B5	Tape-lifter solenoid	C9	Door-open sensor
B6	Decoupler	CA	Tray-up sensor
B7	Tension transducer assembly	CC	Cartridge-type sensor
BB	Pantocam	CD	Cartridge-present sensor
BC	Loader assembly	CE	Tape path A sensor
C6	Machine reel motor	CF	Tape path B sensor
C7	File reel motor	D0	Head guide and brush assembly
C8	File-protect sensor	D4	Head cleaning brush assembly

See the following for the deck cable locations:

FID	Cable FRU Name and Location
D6	Motor Power Cable 10-117.
DA	Motor, Loader, and Sensor Cable 10-118.
DB	Power Supply Cable (E11/E1A and H11/H1A only) 10-120
DC	ACF and Operator/CE Panel Cable 10-121.

FID B5: Tape-Lifter Solenoid

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier B5.

Remove Tape-Lifter Solenoid

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-53 on page 10-78. Remove the large hose **1** from the tape-lifter solenoid.

   Attention: The VPD card is ESD sensitive and care must be used not to touch the card when disconnecting the VPD cable connector or disconnecting the hoses from the tape-lifter solenoid.

   Disconnect the VPD cable connector **2**.
5. Loosen the tape-lifter solenoid mounting screw **3**.
6. Remove the tape-lifter solenoid mounting bracket screw **5**.

   Attention: When disconnecting the small tape-lifter solenoid hose, **do not** pull the other end of the hose out of the head guide.

   Carefully disconnect the small hose **4** from the tape-lifter solenoid (under the tape-lifter solenoid mounting bracket) and move the tape-lifter solenoid out of the way.
7. Disconnect the tape-lifter solenoid connector (J4) **7** as follows:

   Note: Connector J4 is located under the deck casting **6** and can be reached two ways, depending on access to the drive.

   If you have access to the left side of the drive, the J4 connector can be reached through the opening **8** in the left side.

   or, if you do not have access to the left side of the drive, remove the 3 screws **9** that secure the cooling fan to the bottom of the deck enclosure.

   Attention: Support the fan plate when removing the mounting screws. The fan assembly can drop and damage parts. Lower the fan and disconnect the fan connector **10**. The J4 connector can now be reached through the fan opening.
8. Remove the tape-lifter solenoid.

Replace Tape-Lifter Solenoid

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T41** for the area of failure.

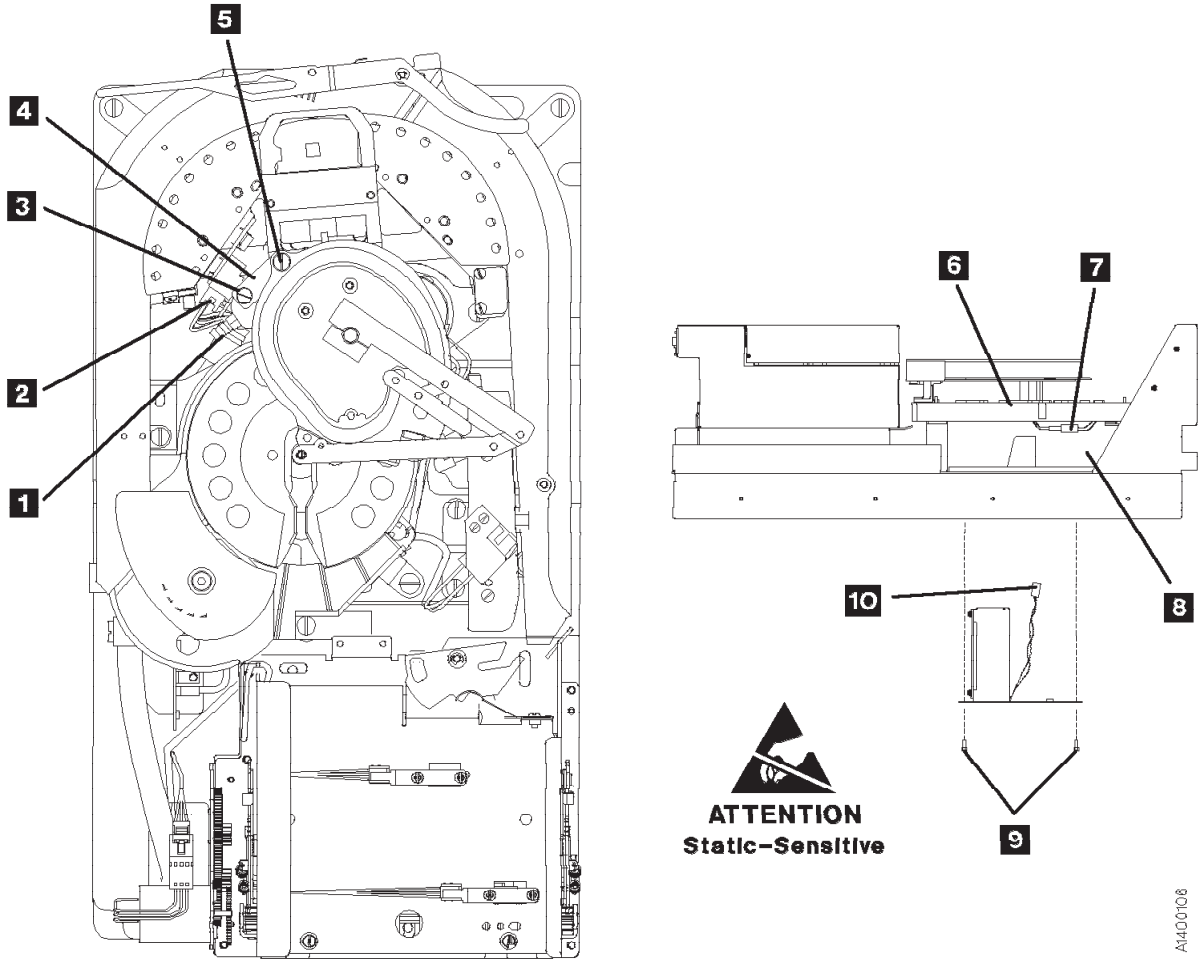


Figure 10-53. Tape Lifter Solenoid

FID B6: Decoupler

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier B6.

Remove Decoupler

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-54 on page 10-80. Position the pantocam arm **3** so the arm is out of the way of the decoupler **5**.

   Note: When positioning the pantocam, always grip the arm next to the pantocam motor shaft **2**. Never grip the outer pantocam arm to reposition the pantocam.
5. Remove the two screws **1** and **4** from the right tape guide and remove the guide.
6. Disconnect the tape-path-A sensor connector **8**.
7. Disconnect the two hoses **7** from the decoupler.
8. Remove the three decoupler mounting screws **6** and **9** then remove the decoupler.

Replace Decoupler

1. Perform the removal procedure in the reverse order, then return here.

   Attention: When reinstalling the right tape guide with screws **1** and **4**, make sure that the horizontal surfaces of the right and left tape guides are **exactly level to each other** where the two edges meet. Check this with the edge of a small metal ruler.

2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T41** for the area of failure.

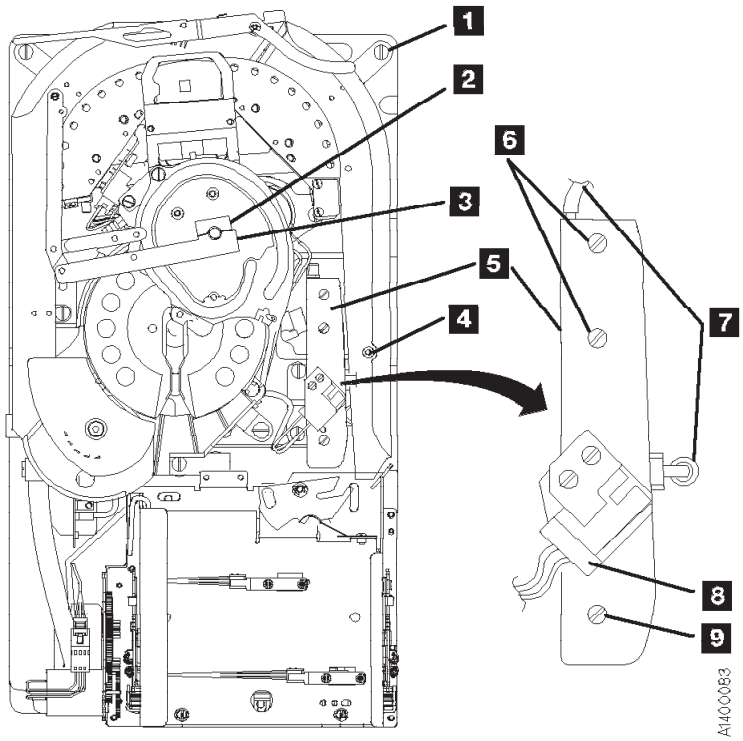


Figure 10-54. Decoupler

FID B7: Tension Transducer Assembly

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier B7.

Remove Tension Transducer

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.

   Attention: If this FRU is in the right hand drive and it is installed in a rack with a second drive next to it, the left tape guide cannot be removed with the head guide protector installed. ***Use extreme care not to damage the read/write head when removing the tape guide assembly.***
4. See Figure 10-55. Install the orange head protector P/N 45G0145 on the head **6**.
5. Remove the left tape guide screws **5** and remove the guide.
6. If tension transducer screws **1** cannot be accessed with plastic shield **8** in place, loosen the internal socket head cap screw **7** and rotate the plastic shield **8** to gain access to pressure hose **2** and screws **1**.

   Note: You must follow “Adjustment of Tension Transducer Plastic Shield” on page 10-83 during the replacement of this part.
7. Disconnect the pressure hose **2**.
8. Remove the two clamp screws **3** from the transducer mounting.
9. Remove the three transducer mounting screws **1**.
10. The tension transducer card is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

    Lift the transducer assembly off the base casting far enough to disconnect the transducer connector, P14 **4** and remove the assembly.

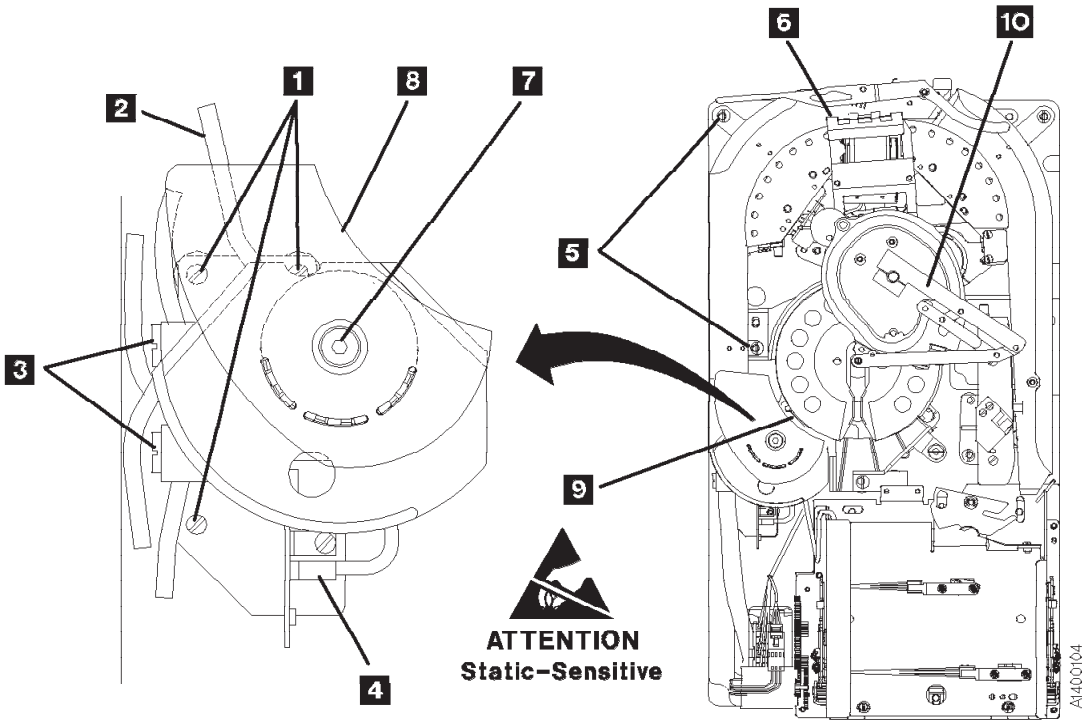


Figure 10-55. Tension Transducer Assembly

Replace Tension Transducer Assembly

1. Perform the removal procedure in the reverse order, then return here.
2. See Figure 10-56.

   Attention:

   If the plastic shield **6** was moved, or if the center hex head screw **7** was loosened, perform "Adjustment of Tension Transducer Plastic Shield" on page 10-83, then return here.

   When reinstalling the left tape guide **3**, make sure that the horizontal surfaces of the right **4** and left **3** tape guides are **exactly level to each other** where the two edges meet. Check this with the edge of a small metal ruler.
3. Perform "Measurement and Adjustment of Pneumatic System" on page 10-4, then return here.
4. Perform "End of Call" on page 9-8.
5. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T41** for the area of failure.

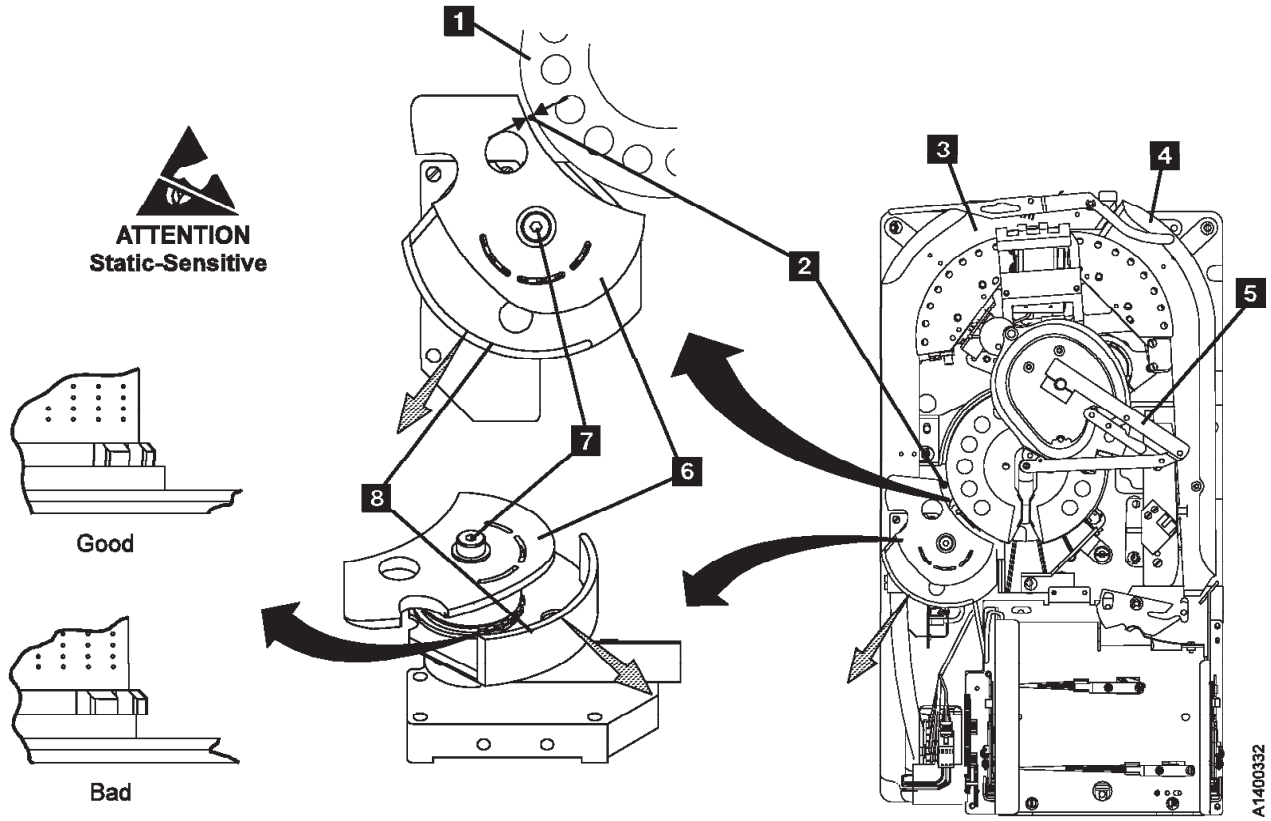


Figure 10-56. Tension Transducer Plastic Shield

Adjustment of Tension Transducer Plastic Shield

See Figure 10-56 on page 10-82.

Note: There are two levels of Tension Transducer assemblies. The newer level is adjusted at the factory, and the screw 7 is sealed. **DO NOT** adjust the newer level assembly.

1. **Attention:** If screw 7 is loosened for any reason, there are two conditions that must be met when it is tightened:
   a. The gap between the plastic shield 6 and the take-up reel flange 1 must be set. See step 2.
   b. The position of the black plastic guide 8 must be set in relation to the teeth on the lower ceramic guide. See step 3.
2. Ensure that the gap between the edge of the shield 6 and the take-up reel flange 1 is 4 mm (0.156 in.) at a point approximately 6 mm (0.250 in.) from the corner of the shield, as shown 2. You can use a 4 mm or 5/32 in. hex wrench to check the gap.
3. Ensure that the first four teeth on the lower ceramic guide do not extend beyond the top edge of the inner hub of the black plastic guide 8. See the **Good** and **Bad** illustrations in Figure 10-56 on page 10-82.
4. If either of the above conditions are not correct, perform the adjustment as follows:
   a. Loosen screw 7 just enough so the lower black plastic guide 8 can be moved easily.
   b. Move the lower black plastic guide 8 outward along a line that runs from the center of the pantocam through the center of the tension transducer. See the grey shaded arrows in Figure 10-56 on page 10-82.

      Note: You should be able to move the lower black plastic guide so that all or most of the ceramic teeth do not extend beyond the top edge of the inner hub of the black plastic guide. See the **Good** and **Bad** illustrations in Figure 10-56 on page 10-82. The most important area is the first four teeth that the leader block will pass on a load operation.

   c. Tighten screw 7 just enough to allow the shield 6 to move, but be held in place (snug).
   d. Hold a 4 mm or 5/32 in. hex wrench vertically in the gap at a point approximately 6 mm (0.25 in.) from the corner of the shield 2.
   e. Move the shield towards the take-up reel until it just touches the hex wrench.
   f. Tighten screw 7.

      Do NOT overtighten the screw. The ceramic guides break easily.

   g. After the gap is set, rotate the pantocam arm 5 all the way around the transducer in both directions. Ensure the cross-pin on the pantocam does not touch the transducer plastic shield 6.
   h. Check again to ensure that the teeth on the lower ceramic guide do not extend beyond the top edge of the inner hub of the black plastic guide. See the **Good** and **Bad** illustrations in Figure 10-56 on page 10-82.
5. Return to the procedure that sent you here.

FID BB: Pantocam

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier BB.

Reel Hub Assemblies:

1. There are 3 levels of machine reel hub assemblies. See Figure 10-57.
2. The new style (green) parts have different dimensions and tolerances than the old style (grey or black) parts. The new style upper 3 and lower 5 flanges have a groove near the hub to prevent damage to the edge of the tape. The new style also adds a retainer plate 2 at the top to prevent distortion of the hub when the screws are tightened.
3. The old style (black or grey) parts are no longer available. The new style (green) parts are available as a FRU kit. (See the Chapter 11, “Parts Catalog” on page 11-1 for P/N and ordering information).

   Attention: **DO NOT** mix the old style (grey or black) and new style (green) parts. The dimensions are different and they are not interchangeable. If you are replacing the old style grey or black parts with the new style green parts, be sure to remove any shims. There are no shims used with the new style green parts.

Note: The new style retainer plate 2 is black anodized metal and is flat on both sides.

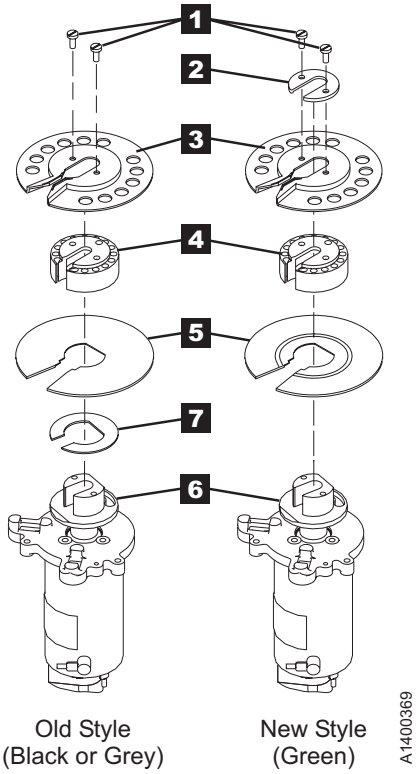


Figure 10-57. Machine Reel Hub Assembly

When removing the pantocam you will be working very close to the head guide and brush assembly components.

Attention: Do not touch the read/write surface or the circuit board on the head guide assembly. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Remove Pantocam

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.

3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-58. Disconnect the two pantocam motor leads:
   - Black motor lead: right terminal **2**
   - Yellow motor lead: left terminal **1**

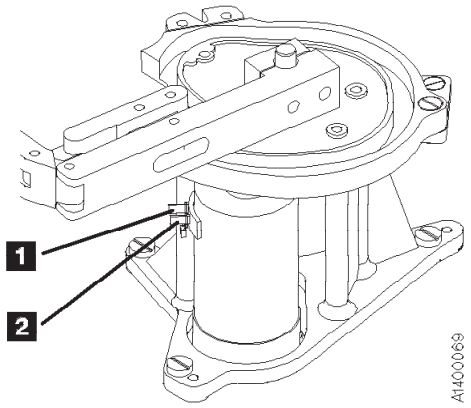


Figure 10-58. Pantocam Motor Connectors

See Figure 10-59 on page 10-86.

5. Remove the left tape guide screws **2** and **8** then remove the guide.
6. Loosen the machine-reel guide screw **3**.
7. Remove the large hose **5** from the tape-lifter solenoid and the tee connection **4**.
8. Remove the right D-bearing hose **16** and the rear decoupler hose **15**.
9. Loosen the tape-lifter solenoid mounting screw **7**.
10. Remove the tape-lifter solenoid mounting bracket screw **10**.
11. Disconnect VPD cable connector **6**.

    Attention: When disconnecting the small solenoid hose, **do not** pull the other end of the hose out of the head guide.

    Carefully disconnect the small hose from the tape-lifter solenoid (under the tape-lifter solenoid mounting bracket **9**) and move the tape-lifter solenoid out of the way.
12. Position the pantocam arm so the threader pin **13** is away from the loader. When positioning the pantocam, always grip the arm next to the pantocam motor shaft. Never grip the outer pantocam arm to reposition the pantocam.
13. Position the machine reel **12** to gain access to the front pantocam-base mounting screw (located under the edge of the pantocam).
14. Remove the three pantocam-base mounting screws **11** and carefully lift the pantocam assembly up approximately 13 mm (1/2 in.) and let it rest at this position.
15. Remove the two screws **22** in the top of the upper flange **1** and remove the flange and retainer plate, if present.
16. Rotate the hub **18** so the opening is toward you. Use both thumbs to spread the opening apart **19** and lift off the hub.

    Note: Do not use tools to remove the hub. Damage to the hub may result.
17. Remove the lower flange **20**.
18. Unsnap the machine reel guide from the center tape guide and rotate the machine reel guide **17** away from the pantocam.
19. Carefully lift the pantocam out of the drive, taking care not to damage the head cable wiring.
20. Disconnect tape-path-B sensor connector **14**.

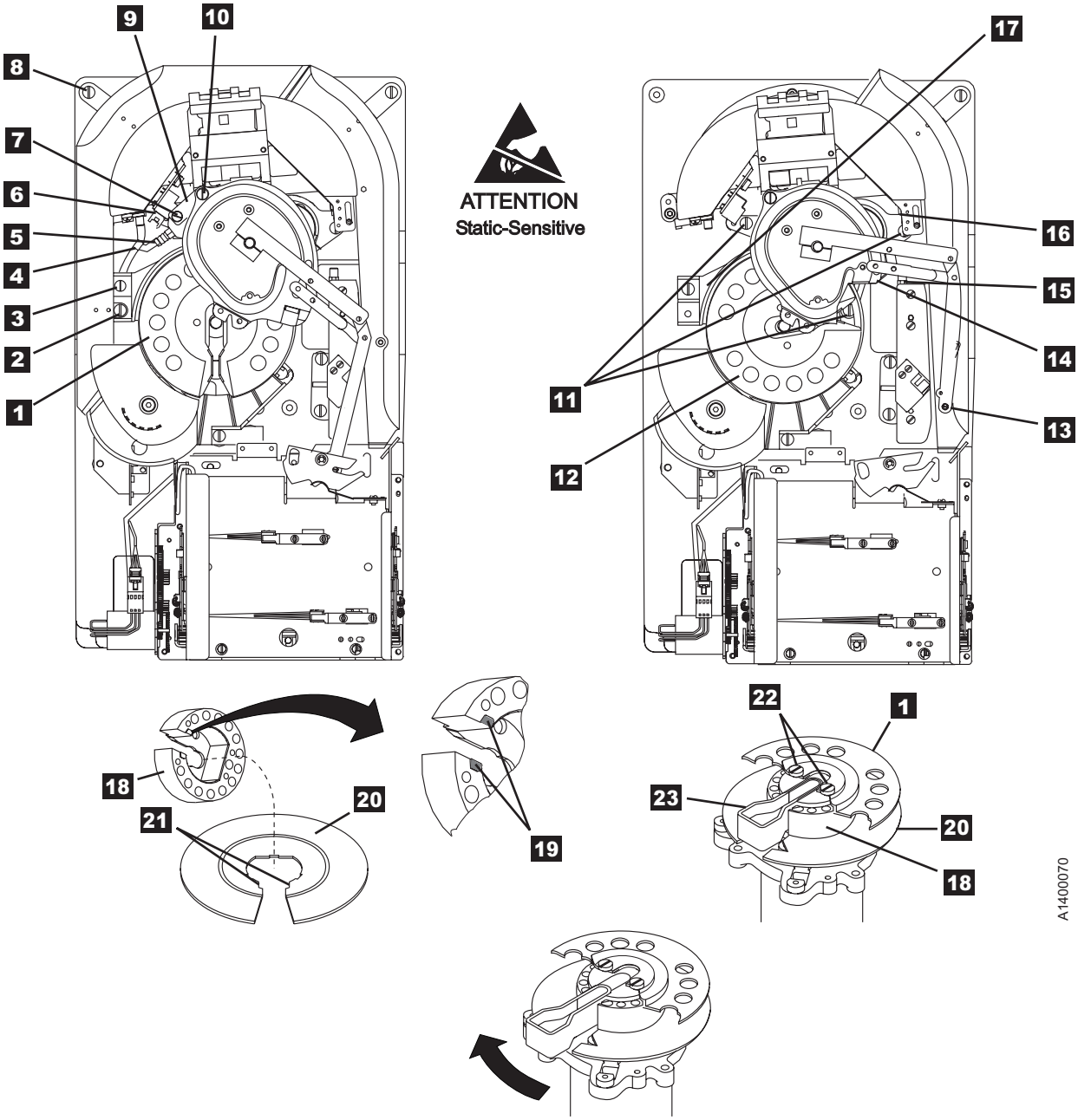


Figure 10-59. Pantocam

Replace Pantocam

Note: The new pantocam FRU kit should contain a ferrite ring, see Figure 10-60 on page 10-87. It should be installed on the pantocam lead when the new pantocam is installed. This ferrite reduces electrical noise in the cable. Follow the instructions in the FRU kit.

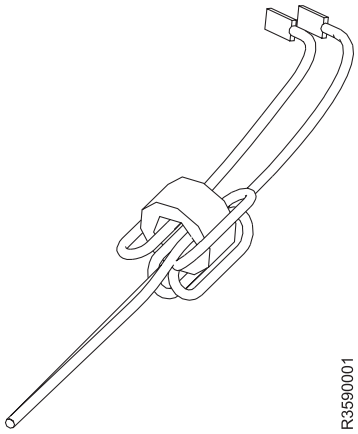


Figure 10-60. Pantocam Motor Leads Ferrite

See Figure 10-59 on page 10-86.

1. Place the new pantocam in position so it is raised up approximately 13 mm (1/2 in.) and let it rest in this position.
2. Connect the tape-path-B sensor connector **14** .
3. Rotate the machine reel guide **17** toward the pantocam and snap it into the center tape guide.
4. Place the lower flange **20** onto the motor hub.

   Note: The new style green lower flange has a groove on one side of the flange. See item **5** Figure 10-57 on page 10-84. **Ensure the groove is on the top, as shown.**
5. Install the take-up hub **18** onto the motor hub. Ensure that the keys **19** at the bottom of the hub **18** are set into the cutouts **21** in the lower flange **20** . The hub should sit flat on the lower flange with no gaps between the two parts. Rotating the lower flange may be required to ensure proper seating.
6. Insert the gap set tool **23** (PN 05H4671) into the gap in the hub **18** .
7. Install the upper flange **1** , retainer plate, and the two screws **22** .

   Notes:
   a. Some of the retainers have a ridge on one side of the part. This ridge is non-functional and should be on the top side of the retainer. The flat side of the retainer should be against the top flange.
   b. The screw tightening procedure is very important. If it is not done correctly the hub gap will not be adjusted properly.
8. With the gap set tool inserted all the way into the hub, tighten the two screws **22** enough to ensure the hub and flanges are seated all the way down on the motor hub.
9. Loosen the screws and retighten them so they are finger–tight against the retainer plate.
10. Tighten the two screws a minimum of 1/4 turn (maximum of 3/8 turn) each.

    Note: If the screws are not tight enough, the pressure of the tape wrapped around the machine reel hub will cause the hub gap to close up tight on the leader block. This may result in load or unload errors.
11. After the screws are tightened, ensure the gap set tool slides in and out of the hub with just a slight amount of drag or the leader block on the tape will bind in the slot. If the gap set tool is still tight, the screws may not have been tightened correctly. Loosen the screws and repeat steps 8 through 11.

Grey Hubs Only

12. If the gap set tool is still tight after two attempts, perform the following procedure:

a. Loosen two screws **22** .

b. Insert the gap set tool into the hub **18** part way, as shown in the bottom of Figure 10-59 on page 10-86. Do not insert it all the way into the motor hub.

c. Hold the top flange **1** while using the gap set tool to rotate the hub **18** left (clockwise). Refer to the arrow that indicates the direction of rotation at the bottom of Figure 10-59 on page 10-86. The hub will only move a small distance.

d. Tighten the screws again and ensure that the tool slides in and out freely.

End of Grey Hubs Only

13. Reinstall the Pantocam assembly on the locating pins.
14. Reinstall and tighten the pantocam screws **11** .
15. Connect the small hose from the tape-lifter solenoid (under the tape-lifter solenoid mounting bracket **9**). Allow the solenoid to rest in place under the pantocam for VPD connector access.
16.  Reconnect the VPD cable connector **6** .
17. Reinstall the tape-lifter solenoid mounting bracket screw **10** .
18. Tighten the tape-lifter solenoid mounting screw **7** .
19. Reinstall the right D-bearing hose **16** and the rear decoupler hose **15** .
20. Reinstall the large hose **5** to the tape-lifter solenoid and the tee connection **4** .
21. Tighten the machine reel guide screw **3** .
22. Reinstall the left tape guide, using screws **2** and **8** .

    Attention: When reinstalling the left tape guide with screws **2** and **8** , make sure that the horizontal surfaces of the right and left tape guides are **exactly level to each other** where the two edges meet. Check this with the edge of a small metal ruler.
23. See Figure 10-58 on page 10-85. Reconnect the two pantocam motor leads, if not already done as part of the ferrite ring installation.
24. The pressure must be adjusted after replacing the pantocam. Go to “Measurement and Adjustment of Pneumatic System” on page 10-4 and perform the adjustment, then return here.
25. Perform “End of Call” on page 9-8.
26. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T45** for the area of failure.

FID BC: Loader Assembly

Notes:

1. There are two styles of loaders present in the field; one with the old style loader cable shown on Figure 10-61 on page 10-90 and one with a new, more reliable loader cable shown in Figure 10-62 on page 10-91. If you are asked to determine which loader is present, as part of the FRU isolation, refer to the cable in the area of screw items **2** and **3** to see the subtle difference. The new cable has a built-in loop with improved cable restraint for longer life.
2. The new loader FRUs will be shipped with loader spring kit. Discard them if they are not necessary on your loader.

Note:

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier BC.

Attention:  All of the sensors in the loader assembly are ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Remove Loader Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.

   Note: When you replace the loader assembly **of a drive in the 3590 Model C12/C14** drive frame, you must follow the **Model B1A/E1A/H1A drive** replacement instructions starting in step 5.

Model B11/E11/H11 Only

4. Remove the ACF assembly. See “Automatic Cartridge Facility (ACF)” on page 9-33, then return here.

End of Model B11/E11/H11 Only

Model B1A/E1A/H1A Only

5. See Figure 10-61 on page 10-90. Insert a cartridge **10** in the loader before you turn the loader gear to prevent bending the file-protect sensor.
6. Turn the loader gear **4** to expose the two cartridge-present sensor screws, then remove the screws from the sensor and remove the loader spring **1**. Replace the sensor and **save the loader spring for installation in the new loader**.

Note: Skip the **next** step and go to step 8 on page 10-90, if you are replacing the loader of a drive in a **Model C12/C14** drive frame.

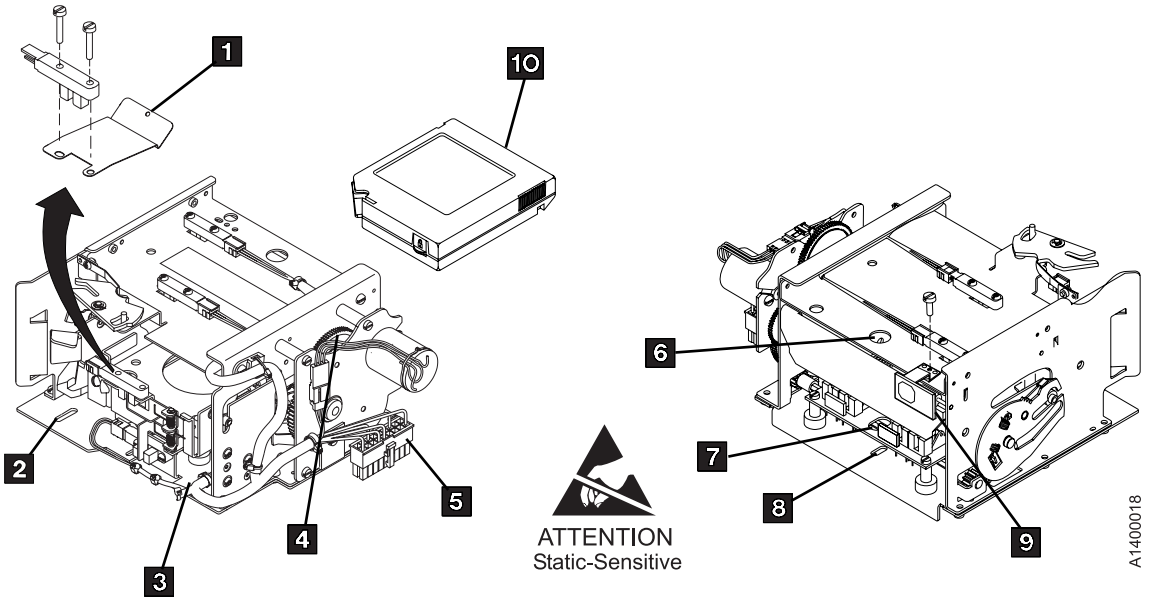


Figure 10-61. Loader Assembly (Former Cable)

7. For better access, remove the “FID 93: Library Interface Cover (Model B1A/E1A/H1A Only)” on page 10-124 (you may not have to disconnect the cables). Remove and save the fiducial bracket **9** by removing the screw. Then skip to step 9.
8. If you are replacing the loader of a drive in a **Model C12/C14**, remove the fiducial bracket, screw, and lockwasher. Refer to “Begin Model B1A/E1A/H1A Drive Installation” in the INST section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for the correct procedure, if necessary. Save the fiducial bracket, screw and lockwasher for reinstallation on the new loader.

End of Model B1A/E1A/H1A Only

9. Position the pantocam arm so the threader pin is away from the loader. When positioning the pantocam, always grip the arm next to the pantocam motor shaft. Never grip the outer pantocam arm to reposition the pantocam.
10. See Figure 10-61. Disconnect cable **5**.
11. Remove screws **2** and **3**.
12. Remove screw **8** by inserting a narrow-shaft screwdriver through hole **6**. Do not force the screwdriver against the hex-shaped shaft **7** when removing or replacing this screw as damage to the shaft and to the FRU may occur.
13. Carefully remove the loader assembly (tilt it to remove). Use care not to damage the cables.

Replace Loader Assembly

1. Perform the removal procedure in the reverse order, then return here. If the loader spring (**1** in Figure 10-61 or Figure 10-62 on page 10-91) was removed from a **Model B1A/E1A/H1A loader**.

   Note: Be sure the cable (see Figure 10-62 on page 10-91, between **2** and **3**) is tucked between the loader assembly (under the file protect sensor) and the machine reel tape guide assembly. Hand cycle the loader to ensure no interference between the cable and other assemblies exist.
2. **Important Note:** Whenever the loader assembly or fiducial bracket are removed or replaced on a Model B1A/E1A/H1A, it will be necessary to run the **Teach Selected Devices** routine from the **Teach** pull down on the library controller. See *IBM 3494 Tape Library Dataserver Maintenance Information* for details.
3. If you are replacing the loader of a drive in a **Model C12/C14**, make sure to install the fiducial bracket, screw, and lockwasher that were saved in an earlier step. The fiducial alignment with respect to the loader is critical. Refer to “Begin B1A/E1A/H1A Drive Installation” in the INST section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information* for the fiducial installation procedure. For

correct alignment of the fiducial, refer to procedure “Align the Fiducial” in the PROC section of *IBM 3590 Tape Subsystem Models C12/C14 Maintenance Information*.

4. Perform “End of Call” on page 9-8.
5. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T42** for the area of failure.

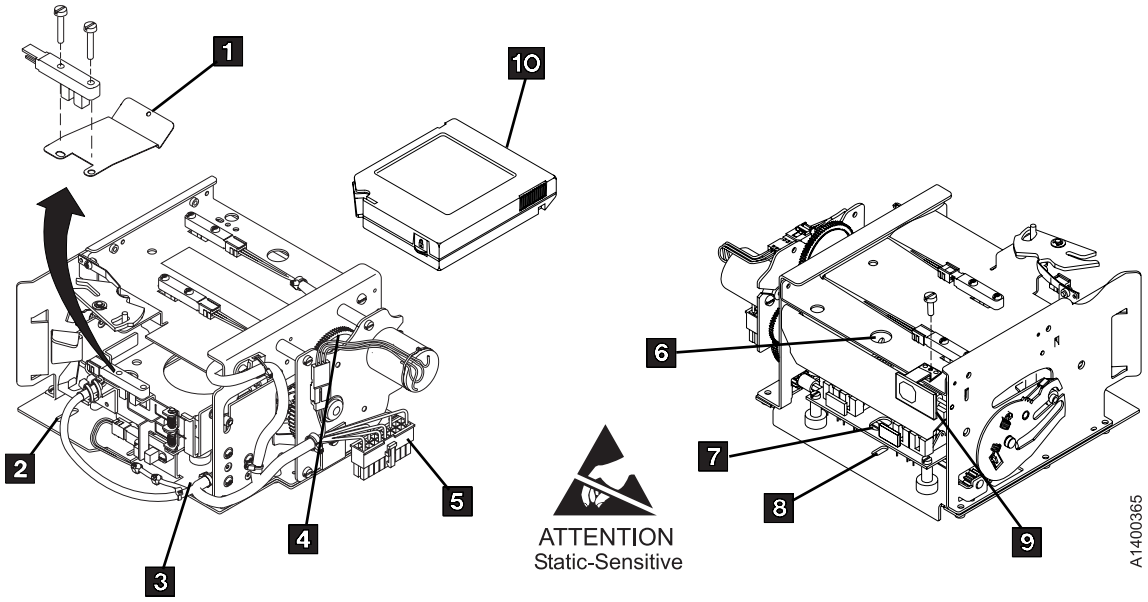
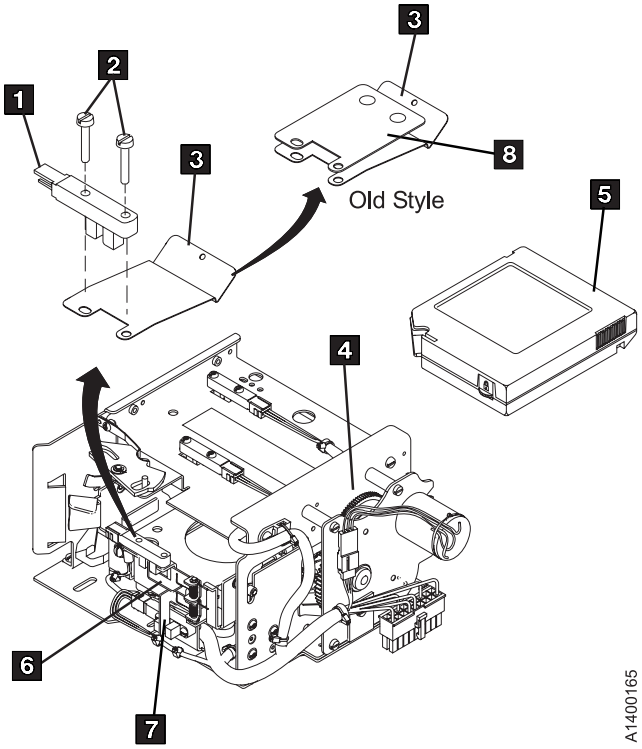


Figure 10-62. Loader Assembly (Newer Cable)

Replace Loader Spring

1. For replacement of the **loader spring**, perform the following steps:
   - __ a. Refer to Figure 10-63
   - __ b. Check that the loader door moves freely.
   - __ c. Rotate the top of the loader gear **4** towards the rear of the device to move the loader's tray to the front of the drive.
   - __ d. Insert a cartridge **5** in the loader to prevent bending the file-protect sensor's flag **7**.
   - __ e. Rotate the top of the loader gear **4** to the front of the device to expose the cartridge-present sensor **1**, which is the top sensor at the rear of the loader.
   - __ f. Remove the two screws **2** that hold the sensor.
   - __ g. Install the loader spring **3** under the sensor and reinstall the screws **2**.

     Note: The old style used both spring **3** and stiffener **8**. Stiffener **8** is no longer used.
   - __ h. Rotate the top of the loader gear **4** towards the rear of the device to move the loader's tray to the front of the drive.
   - __ i. Remove and reinsert the cartridge while observing the cartridge-present flag **6**. It should freely exit and enter the cartridge-present sensor **1**.
   - __ j. Remove and save the cartridge.
2. Perform "End of Call" on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T42** for the area of failure.



ATTENTION Static-sensitive

Figure 10-63. Cartridge-Present Loader Spring

FID C6: Machine Reel Motor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier C6.

Remove Machine Reel Motor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. Remove the pantocam. See “FID BB: Pantocam” on page 10-84.
5. See Figure 10-64. Remove the center-tape-guide mounting screw **3** and remove the guide.
6. Rotate the machine reel guide **5** out of the way of the machine reel motor.
7. Remove the three machine-reel-motor mounting screws **6**.
8. If needed, remove the card pack fan to access the motor connectors. See “FID BF: Fan (Card Pack)” on page 10-61, then return here.
9. Disconnect motor connector MMP1 **1**.
10. Disconnect the motor connector on the bottom of the motor **2** (the connector has a locking tab on the bottom).
11. Carefully pull the motor **4** up and out of the drive.

Replace Machine Reel Motor

Note: You will use the gap set tool P/N 05H4671 to adjust the motor hub clearance (see “Replace Pantocam” on page 10-86).

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T54** for the area of failure.

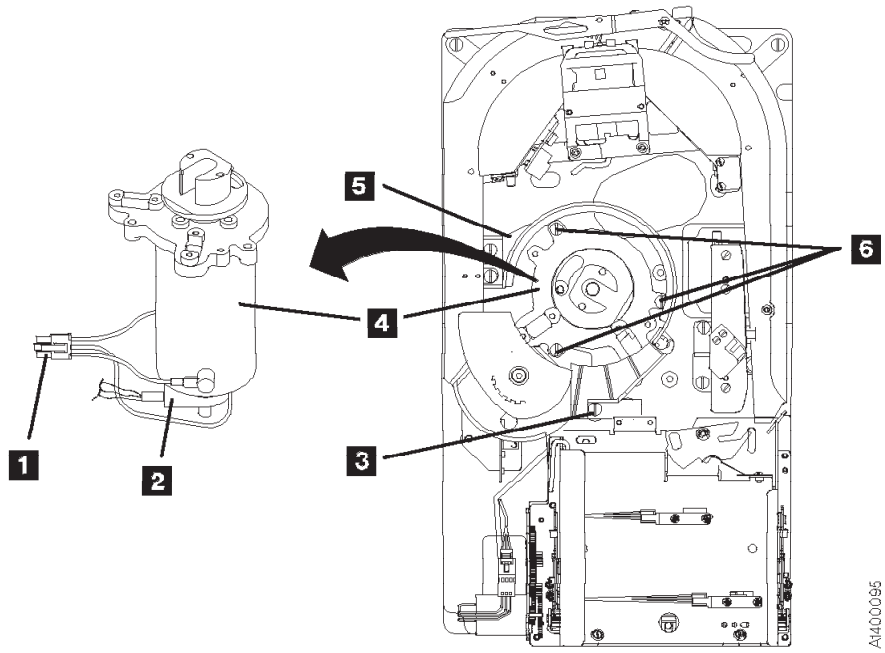


Figure 10-64. Machine Reel Motor

FID C7: File Reel Motor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier C7.

Remove File Reel Motor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. Remove the loader assembly. See “FID BC: Loader Assembly” on page 10-89.
5. If needed, remove the card pack fan to get access the motor connectors. See “FID BF: Fan (Card Pack)” on page 10-61, then return here.
6. See Figure 10-65 on page 10-95. Disconnect connector MT1 **2** .
7. Disconnect the motor connector on the bottom of the motor **3** (the connector has a locking tab on the bottom).
8. The two spade connectors **4** will interfere with removing the motor. Remove the two spade connectors **4** from the motor terminals (one on each side of the motor).
   - Plus (+) lead to the red **5** terminal
   - Minus (-) lead to the black terminal

   It is not necessary to remove the ground lead now.
9. Remove the three motor-mounting screws **1** .
10. Carefully lift the motor out of the casting, taking care not to damage the wiring.

Replace File Reel Motor

1. Perform the removal procedure in the reverse order, then return here.

   Note: When reinstalling motor, red (+) motor terminal **5** should be toward the front.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. **Important Note:** Whenever the loader assembly or fiducial bracket are removed or replaced on a Model B1A/E1A/H1A, it will be necessary to run the **Teach Selected Devices** routine from the **Teach** pull down on the library controller. See *IBM 3494 Tape Library Dataserver Maintenance Information* for details.
4. Perform “End of Call” on page 9-8.
5. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T54** for the area of failure.

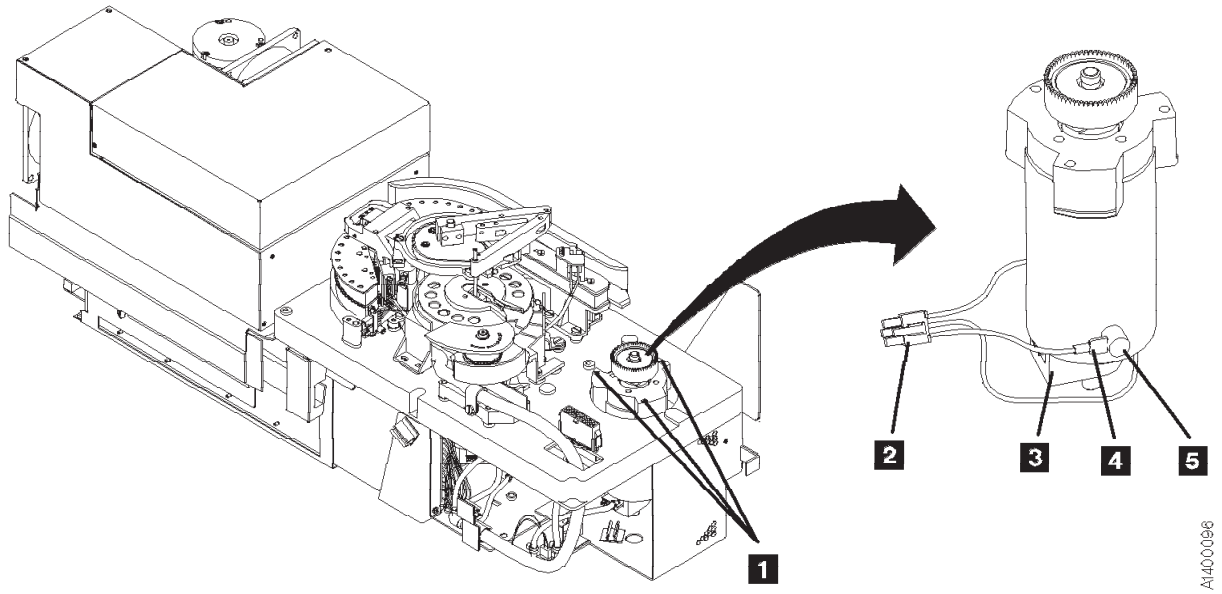


Figure 10-65. File Reel Motor

FID C8: File-Protect Sensor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier C8.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove File-Protect Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. See Figure 10-66. Remove two screws **3** securing the file-protect sensor **2** .
4. The file-protect sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Disconnect the connector **1** from the file-protect sensor and remove the sensor.

Replace File-Protect Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T32** for the area of failure.

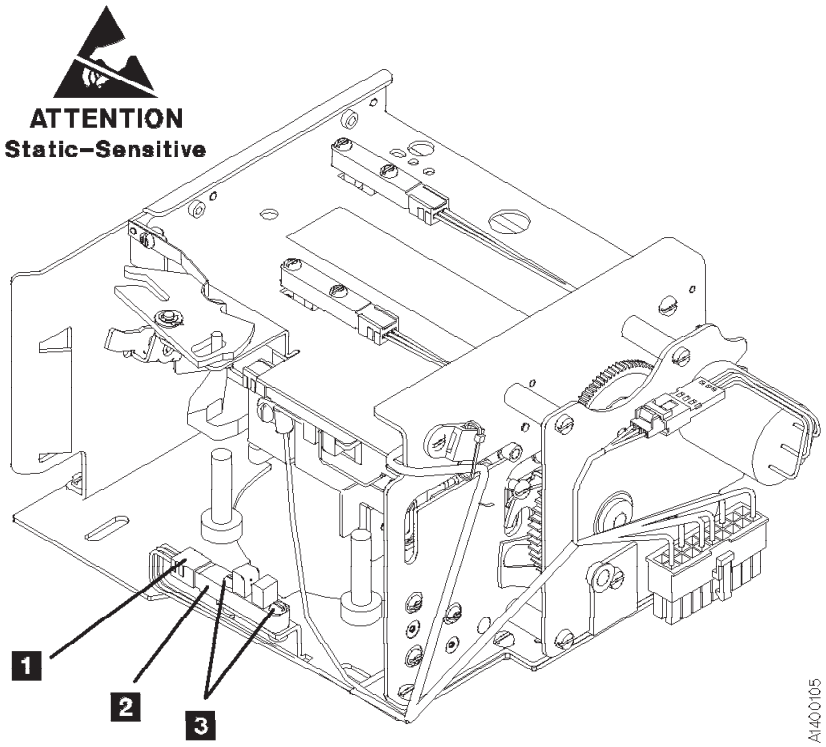


Figure 10-66. File-Protect Sensor

FID C9: Door-Open Sensor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier C9.

Check the sensor and sensor cable connections, reseat if needed.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove Door-Open Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. See Figure 10-67. Remove two screws **3** holding door-open sensor **2** .
4. The door-open sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Disconnect the connector **1** from the sensor and remove the sensor.

Replace Door-Open Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

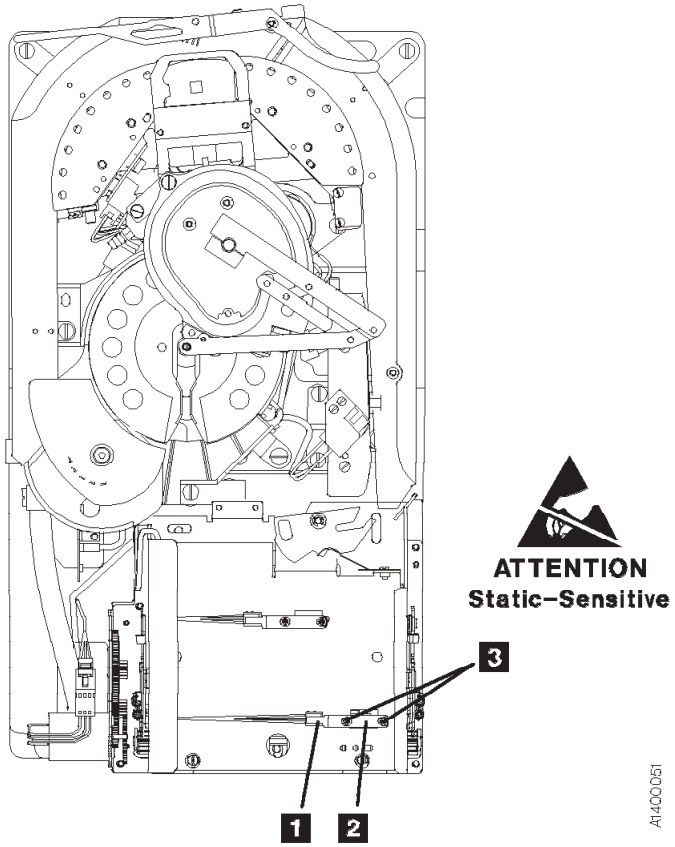


Figure 10-67. Door-Open Sensor

FID CA: Tray-Up Sensor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier CA.

A bind in the loader can cause this FID to be presented. So before you replace this FRU, check for a bind by inserting a cartridge in the loader and turning the loader gear (see Figure 10-61 on page 10-90 keys **10** and **4**). If a bind exists, go to “FID BC: Loader Assembly” on page 10-89.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove Tray-Up Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. See Figure 10-68. Remove two screws **2** holding tray-up sensor **3**.
4. Tray-up sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

   Disconnect the connector **1** from the sensor and remove the sensor.

Replace Tray-Up Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

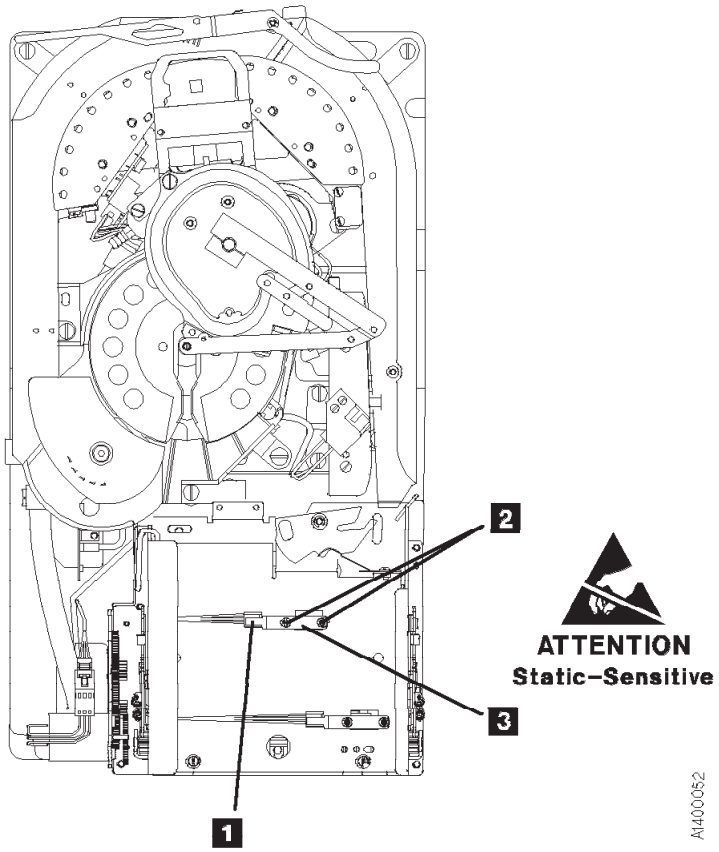


Figure 10-68. Tray-Up Sensor

FID CC: Cartridge-Type Sensor Card Assembly

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier CC.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Notes:

1. When cleaning this sensor also check flags for sticking.
2. New style loaders have a sensor guard **5** to protect the sensors from damage during a cartridge load operation.

Remove Cartridge-Type Sensor Card Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. See Figure 10-69 on page 10-100. Remove the cartridge loader assembly to gain access to the cartridge-type sensor card assembly **3**. See “FID BC: Loader Assembly” on page 10-89.
4. Remove two screws **4** holding the sensor guard **5** (if present) and the sensor card **3**, by inserting a screwdriver through the two holes **2** in the top of the loader.
5.  The cartridge type sensor card assembly is ESD sensitive.

   See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23. Disconnect the connector **1** from the sensor card and remove the sensor.

Replace Cartridge-Type Sensor Card Assembly

1. Perform the removal procedure in the reverse order, then return here.
2. **Important Note:** Whenever the loader assembly or fiducial bracket are removed or replaced on a Model B1A/E1A/H1A, it will be necessary to run the **Teach Selected Devices** routine from the **Teach** pull down on the library controller. See *IBM 3494 Tape Library Dataserver Maintenance Information* for details.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

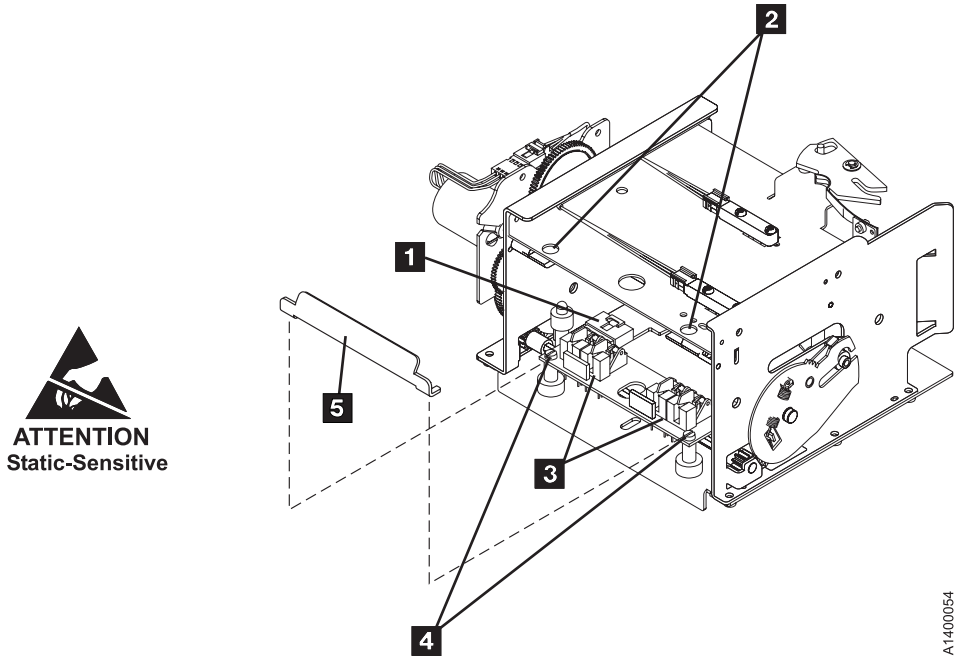


Figure 10-69. Cartridge-Type Sensor Card

FID CD: Cartridge-Present Sensor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier CD.

Note: Before replacing the cartridge-present sensor, check for broken wires in the sensor cable in the area of the strain relief clamp **6** (see Figure 10-70 on page 10-102). Verify the sensor operation by flexing the cable while running “Display Sensors Procedure” on page 9-35. If the cable is bad, replace the Loader assembly. See “FID BC: Loader Assembly” on page 10-89.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Remove Cartridge-Present Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. ***Insert a cartridge 5 in the loader before you turn the loader gear to prevent bending the file-protect sensor.***
4. See Figure 10-70 on page 10-102. If the cartridge-present sensor **2** is not accessible, rotate the loader gear **4** to the front to expose the sensor.
5. Remove the two screws **3** that hold the sensor.

   The cartridge-present sensor is ESD sensitive. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.
6. Disconnect the connector **1** to remove the sensor.

Replace Cartridge-Present Sensor

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

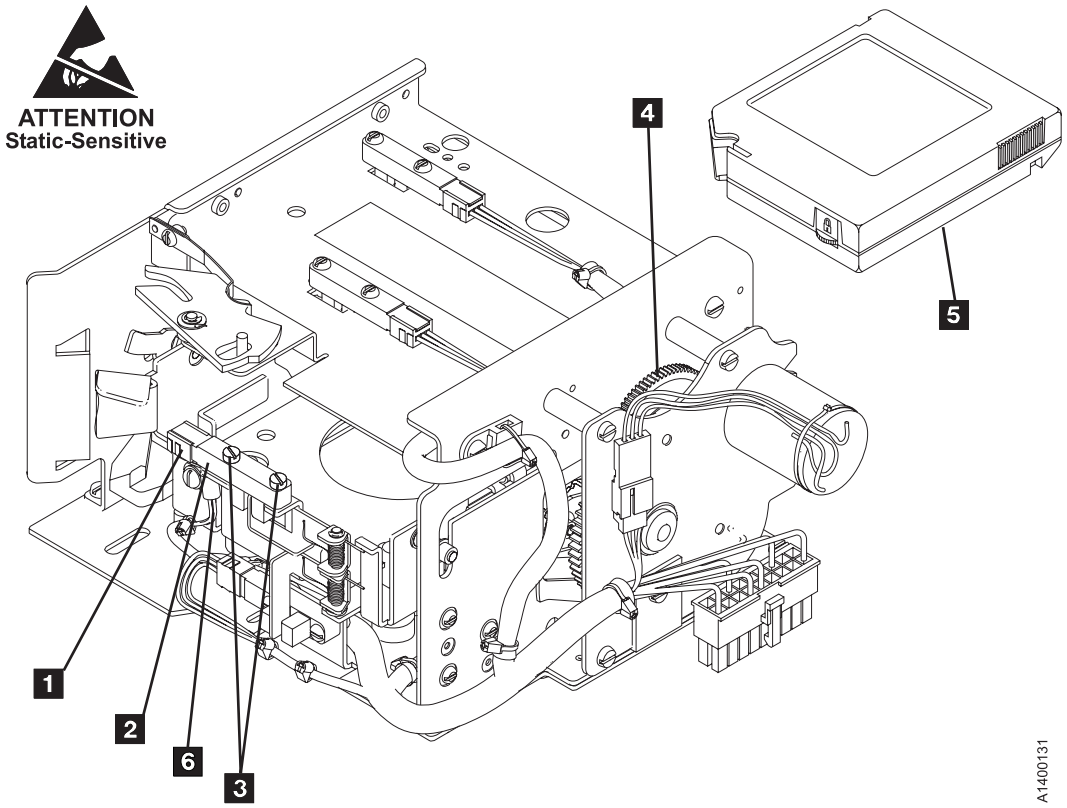


Figure 10-70. Cartridge-Present Sensor

FID CE: Tape Path A Sensor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier CE.

Remove Tape Path A Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. See Figure 10-71. Position the pantocam arm **2** so the arm is away from the tape path A sensor **5**.

   Attention: When positioning the pantocam, always grip the arm next to the pantocam motor shaft **1**. Never grip the outer pantocam arm to reposition the pantocam.
4. Remove two screws **3** securing tape path A sensor retaining bracket **4** to the decoupler.
5. Remove the sensor retaining bracket **4**.
6. Remove the sensor **5** from the decoupler.
7. Disconnect the sensor connector **7** from the sensor **5**.

Replace Tape Path A Sensor

Attention: Ensure that the positive sign (+) located on the leading end of the sensor and positive sign (+) on the cable are aligned when plugging the sensor cable.

1. Perform the removal procedure in the reverse order. Return here before tightening the screws **3**.
2. Ensure that the front edge of the sensor **5** is flush with the front edge of the sensor mounting surface **6**, then tighten screws **3**.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

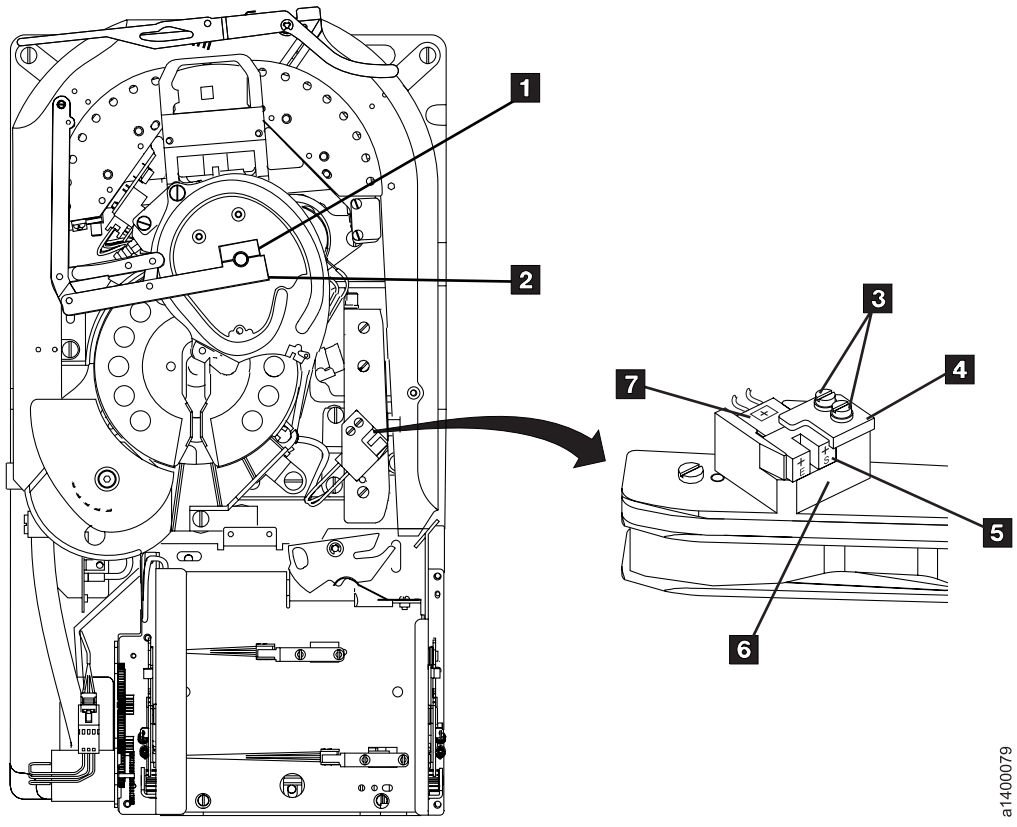


Figure 10-71. Tape Path A Sensor

FID CF: Tape Path B Sensor

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier CF.

Remove Tape Path B Sensor

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the deck enclosure top cover. See “Deck Enclosure Covers” on page 9-27.
3. See Figure 10-72. Position the pantocam arm **2** so the arm is away from the tape path B sensor **4**.

   Attention: When positioning the pantocam, always grip the arm next to the pantocam motor shaft **1**. Never grip the outer pantocam arm to reposition the pantocam.
4. Remove the bracket screw **3** that clamps the sensor to the pantocam and remove the bracket.
5. From under the pantocam, push the sensor **4** and its connector (in the direction of the arrow **5**) out of the pantocam.
6. Disconnect the sensor connector.

Replace Tape Path B Sensor

Attention: Ensure that the positive sign (+) located on the leading end of the sensor and positive sign (+) on the cable are aligned when plugging the sensor cable.

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

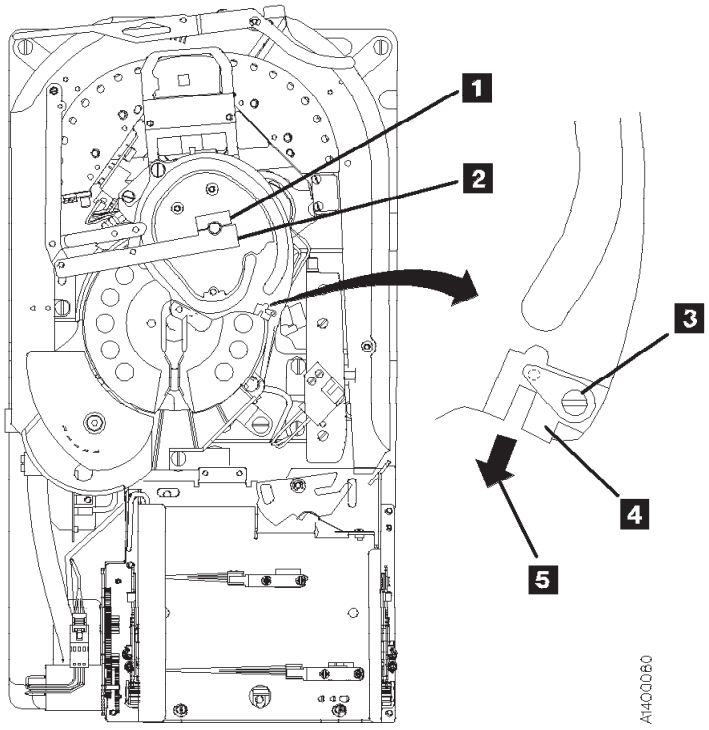


Figure 10-72. Tape Path B Sensor

FID D0: Head Guide and Brush Assembly

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier D0.

Attention:

1. Handle the head guide assembly (HGA) very carefully to prevent movement of the actuator calibration, the head actuator beam, and the flexures on top and at the bottom. Ensure that they are not touched or bumped in any way. The flexures are susceptible to handling damage with the bottom flexure the most exposed.
2. Handle the HGA by the casting and the compliant guide screw-heads only.
3. Avoid bumping the HGA against any hard surfaces.
4. Never drop the HGA from heights even as low as 3.175 mm (1/8 in.).
5. Never strike the HGA with your hand or any object. For example do not tap on the HGA to move it into position.
6. Always keep the HGA in the protective shipping container when it is not installed in a tape deck. The HGA should be taken directly from the shipping container at installation and placed directly into a shipping container after removal.
7. **Do not use any magnetized tools on or near the head assembly, as they will destroy the head!**

Before You Replace the Head Guide Assembly

If the 3590 has a failure that requires the head guide assembly to be replaced, do the following to determine if cleaning the heads will correct the fault before you replace the head.

Attention: Do not perform any manual cleaning of the read/write head because any solvents, minerals, or oils in the tape path will cause the head guide assembly to become unusable.

1. Load the cleaning cartridge into the drive; the cleaning procedure is done automatically.
2. Perform “Test the Drive” on page 10-111 to see if cleaning the tape path corrected the fault.
3. If cleaning the heads and tape path corrected the fault, the clean brush may not be cleaning the heads properly. Go to “FID D4: Head Cleaning Brush Assembly” on page 10-114 and replace the clean brush.
4. If the above cleaning did not correct the fault, continue with this procedure.

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier D0.

Note: Be sure you have the correct replacement part number HGA assembly. The HGA for E11/E1A and H11/H1A drive is not interchangeable with the HGA for the Model B11/B1A drive. The only visual difference between the two HGAs is the serial number on the bar code label on top of the R/W head. Each model has a discrete identifier:

- Model B11/B1A serial numbers begin with a “B”
- Model E11/E1A serial numbers begin with a “T”
- Model H11/H1A serial numbers begin with an “M”

Drives with the Extended High Performance Cartridge feature require an HGA assembly with the **2X** label. The **2X** HGAs are downward compatible and will work on drives without the Extended High Performance Cartridge feature.

Attention:  The head guide assembly has ESD-sensitive components. Do not touch the circuit board on the head guide assembly. Also, do not touch the surface of the read/write head or the bristles on the cleaning brush as finger prints cause corrosion on the head. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Remove Head Guide and Brush Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.

See Figure 10-73.

Attention: Use extra care when installing (or removing) the head protector as to not damage the head assembly. **Do NOT push down hard** on the head protector as this may destroy the springs in floating head!

4. Install the orange head protector **1** P/N 45G0145 on the head guide assembly **3**.
   a. Squeeze the head protector at positions **1** and **2**.
   b. Insert the head protector into the head guide assembly, as shown **4**.

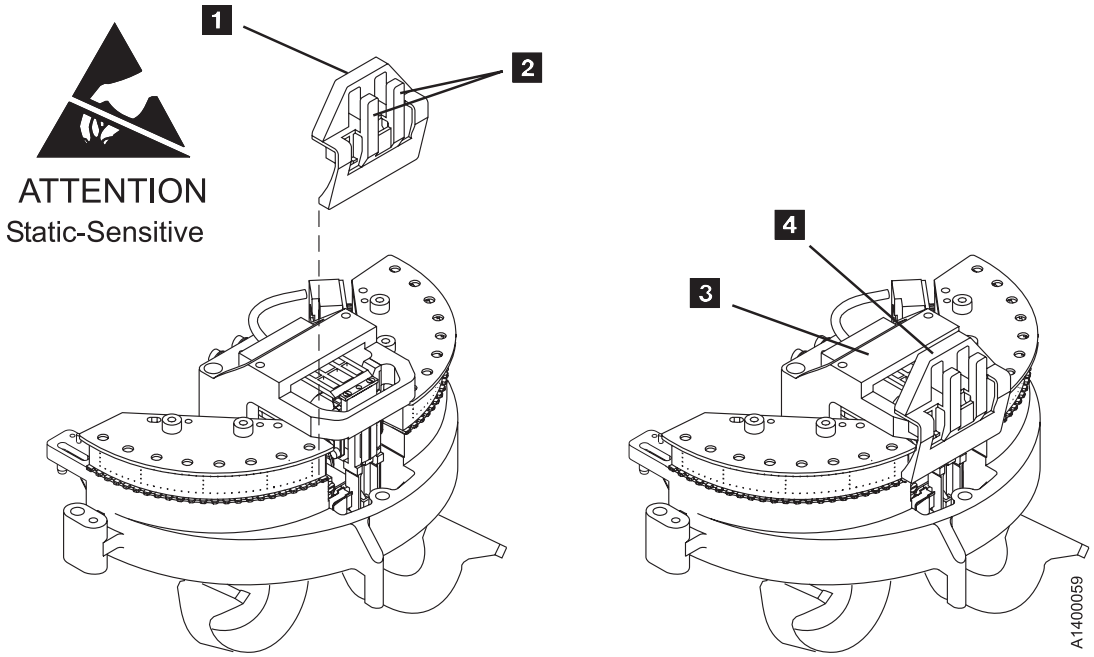


Figure 10-73. Head Protector

See Figure 10-74 on page 10-107.

5. Remove the screws **1** that secure the card pack fan **2** to the bottom of the deck enclosure.
6. Disconnect the fan connector and remove the fan.
7. The head cable receptacles **3** are part of the card pack assembly **4** and are accessible through the electronics fan hole. Disconnect the two head cables as follows:

   Note: Each head cable connector **6** is locked to its receptacle **7** with a sliding retaining bar **9**. The retaining bar has a tab at the front **5** and rear **8** that engage slots in the receptacle to lock the connector in place.

8. Reach into the fan opening and pull the retaining bar **9** toward the front of the drive until it stops, approximately 6 mm (1/4 in.).
9. With the retaining bar disengaged, lift the retaining bar upward while carefully tilting the front and rear of the connector until it is disconnected.
10. Repeat this procedure to disconnect the other head cable connector.

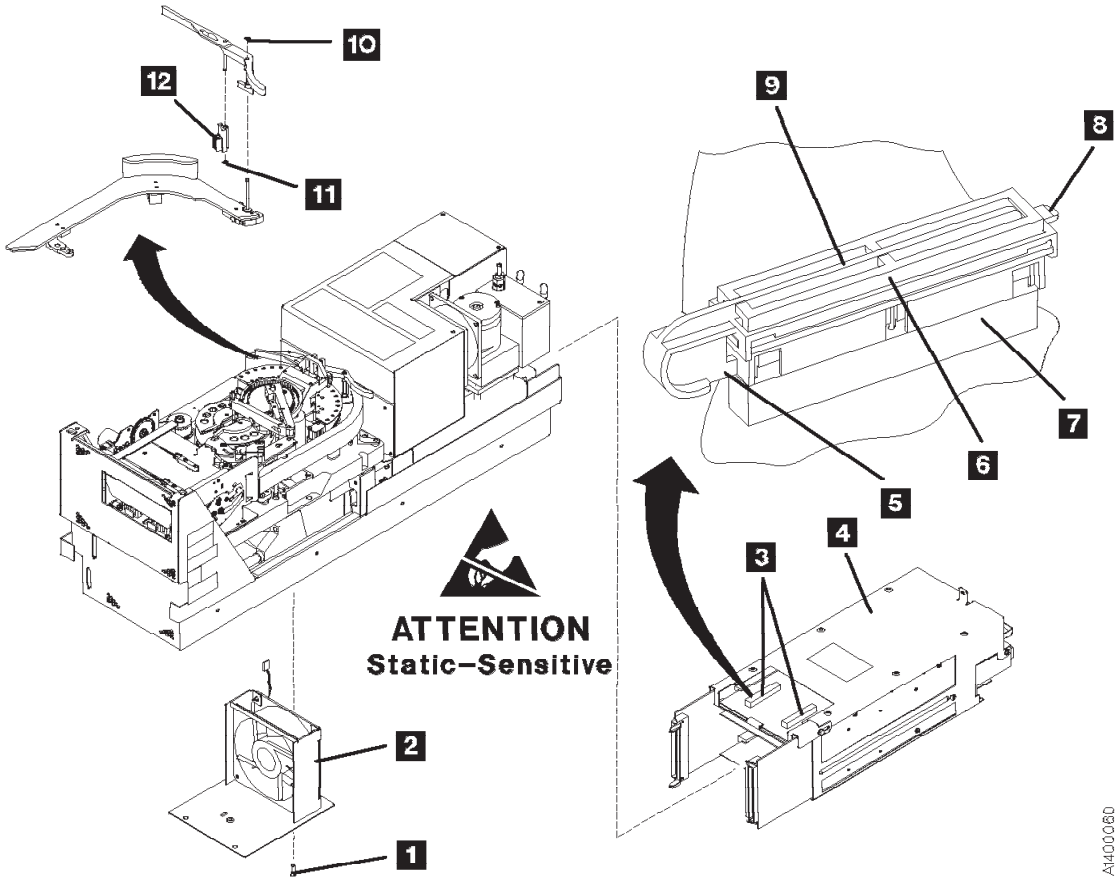


Figure 10-74. Head Cable Connectors

See Figure 10-75 on page 10-108.

Attention: If this FRU is in the right hand drive and it is installed in a rack with a second drive next to it, the left tape guide cannot be removed with the head guide protector installed. ***Use extreme care not to damage the read/write head when removing the tape guide assembly.***

11. Remove the left tape guide screws **1** and remove the guide.

Note: If another tape drive is installed to the left of the drive you are working on, the clearance to remove the tape guide is restricted. Do the following:

a. With the mounting screws removed, move the rear of the tape guide to the left to disengage the tab, then move the tape guide to the rear (toward the power supply).

b. Carefully lift the front of the tape guide up while keeping the hose and cable away from the front tape guide support.

See Figure 10-74.

12. Note: **Do not touch the bristles on the brush** so that it can be analyzed when you return it with the head guide assembly. Use lint-free gloves P/N 461621 to handle the cleaning brush.

    Remove the head-cleaning brush **12** by removing the clip **10**, lift the arm off the stud, and remove the clip **11**.

See Figure 10-75 on page 10-108.

13. Remove the right tape guide screws **2** and remove the guide.
14. Remove the large hose **3** from the tape-lifter solenoid.
15. Remove the left D-bearing hose **4**.

16. Disconnect IPS cable connector 5 .
17. Disconnect VPD cable connector 6 .
18. Loosen tape-lifter solenoid mounting screw 7 .
19. Remove the tape-lifter solenoid mounting bracket screw 9 .

    Attention: Do not disconnect the small hose from the head guide assembly. Remove the small hose 8 from the tape-lifter solenoid (under the tape lifter solenoid mounting bracket) and move the tape-lifter solenoid out of the way.
20. If this HGA has a cleaner blade installed, disconnect the vacuum hose 11 from the bottom of the cleaner blade.
21. Remove the right D-bearing hose 10 (under the cleaner blade).

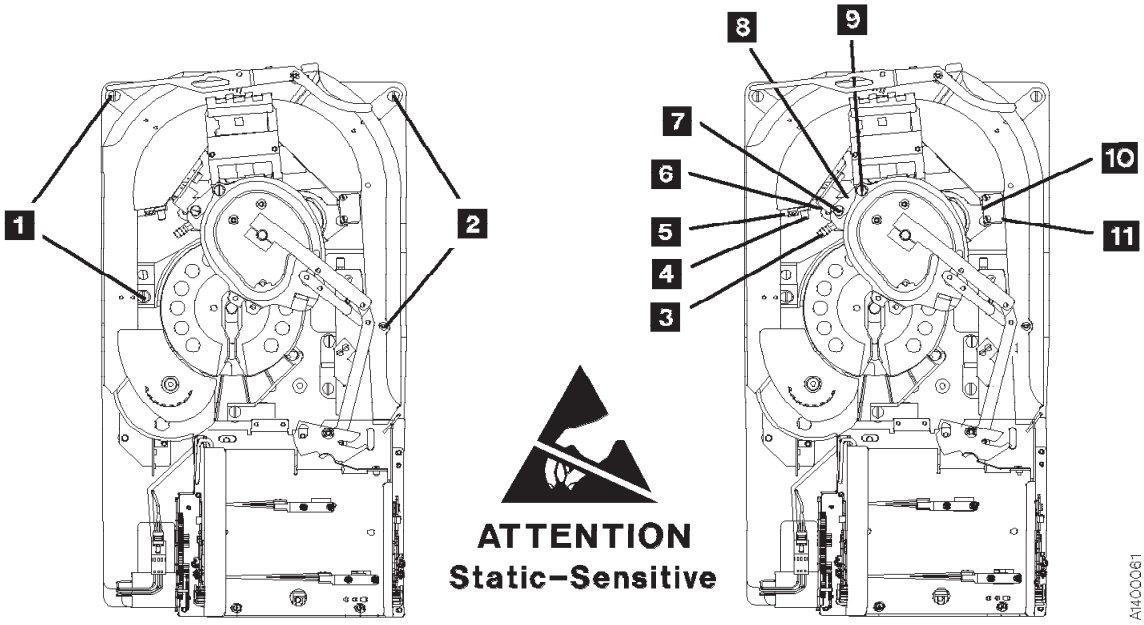


Figure 10-75. Tape Guides, Tape-Lifter Solenoid, Hoses, and Connectors

See Figure 10-76 on page 10-109.

22. Remove the three head guide assembly mounting screws 4 .
23. Position the pantocam arm so the threader pin 5 is away from the loader.
24. Loosen the rear pantocam base mounting screws 3 , but do not remove them from the pantocam base casting.
25. Position the machine reel 2 to gain access to the front pantocam base mounting screw 1 (located under the edge of the pantocam).
26. Loosen the front pantocam base mounting screw 1 , but do not remove it from the pantocam base casting.

    Attention: In the next two steps, do not rub the head cables on the casting as the wires are very fragile. Lift the pantocam until it clears the locating pins, then tilt the pantocam assembly to the front 6 while removing the head guide assembly.
27. Carefully lift the head guide assembly 7 off its locating pins 8 . Continue lifting the head guide assembly and tilting the pantocam until the head guide assembly can be removed, and at the same time, ***carefully guiding the head cables and connectors through the opening in the casting.***

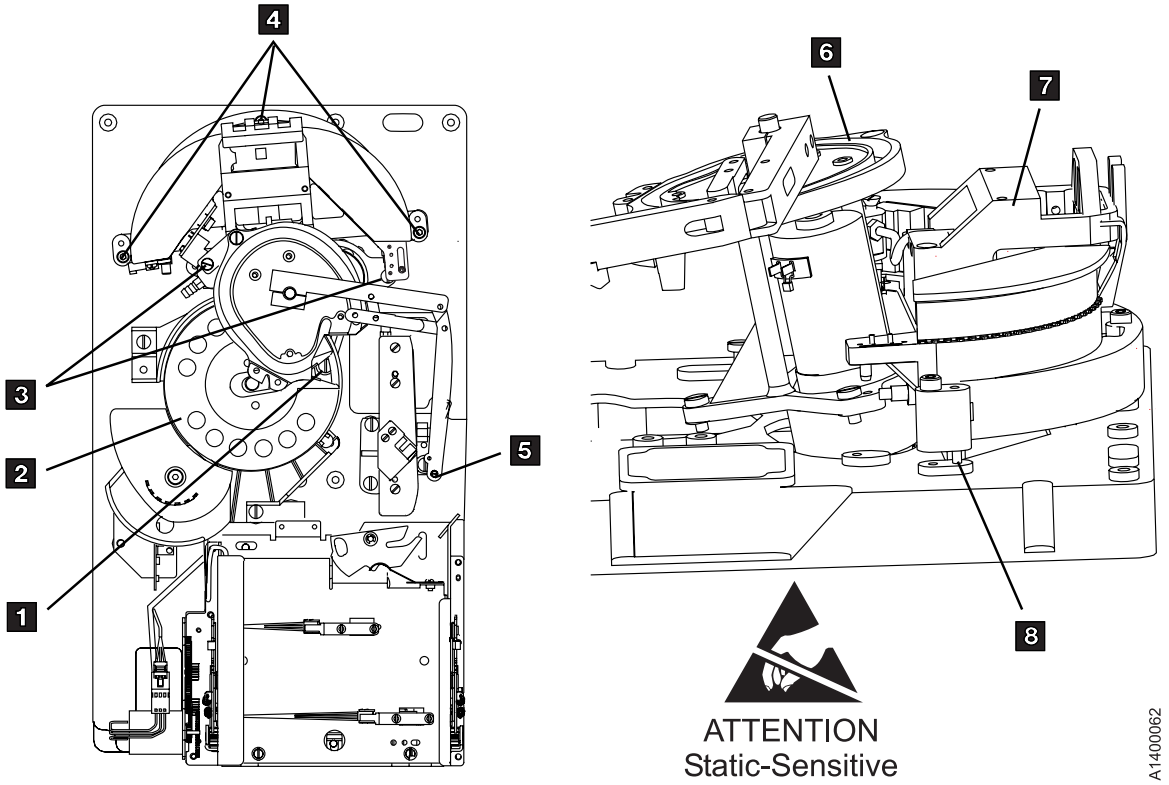


Figure 10-76. Pantocam Assembly, and Head Guide and Brush Assembly

Replace Head Guide and Brush Assembly

Cleaner Blade

Notes:

1. The cleaner blade is no longer used in the 3590 drive.
2. All of the E11/E1A and H11/H1A Head Guide Assemblies (HGAs) and most of the Model B11/B1A HGAs will not have a Cleaner Blade, shown as item **2** in Figure 10-77.
3. If the replacement part you just received **does** have a cleaner blade installed, carefully remove it using the procedure at “Cleaner Blade Removal (Model B11/B1A)” on page 10-112.
4. New HGA FRU kits for Model B11/B1A will contain a new inline connector **6** to be used in place of the tee connector **5** when the cleaner blade vacuum hose **4** is removed.
5. If you **do not** have a new inline connector **6**, the hose **4** can be plugged with a 4 mm screw, or the end of the hose can be folded over and tied with a cable tie-wrap.

Attention: When the cleaner blade has been removed, the vacuum hose **4** must be either removed or plugged to prevent vacuum system leaks.

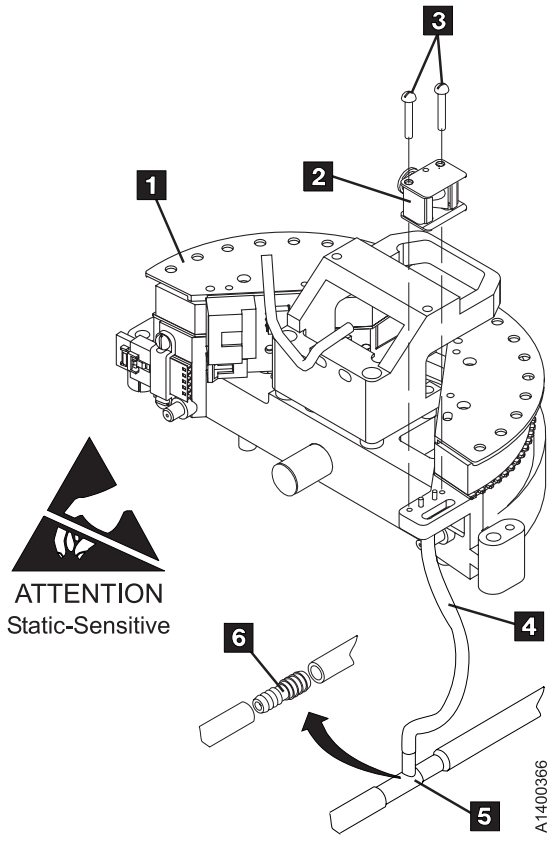


Figure 10-77. Cleaner Blade Removal – During Head Guide and Brush Removal

When the cleaner blade has been removed, continue the Head Guide and Brush Assembly installation.

Note: The head guide assembly (HGA) is awkward to install because the flex cables must be fed through a hole in the deck at the same time that the HGA is being mounted; there is only 6 mm (1/4-in.) clearance between the side of the deck opening and the flexure. In addition, care must be used so as not to allow the cables to drag on the edge of the casting. The cables can be easily damaged.

Do not bump the flexure into the deck frame while moving the HGA to locate it on the two dowel pins.

Hints on Reinstallation

Use extreme care when installing the HGA; use the following pointers to help you install this fragile assembly:

Note: To prevent head contamination, do not touch the bristles on the brush or the air bearing surface. Use lint-free gloves P/N 461621 to handle the automatic cleaning brush. Return the cleaning-brush with the head guide assembly.

1. Loosen the pantocam by tilting it away from the head guide assembly or removing it completely.
2. Install the HGA with the end facing the pantocam position tilted downward so that the two rear bottom posts are inserted into the triangular opening of the deck first.
3. Lightly press these posts against the side of the opening toward the pantocam as the head guide assembly is tilted back to a horizontal position and gently lower it onto the deck.
4. As the assembly nears the two locating dowels on the deck, move the HGA slightly away from the pantocam position until the HGA is lined up with the dowel pins, then gently lower it into the final position.

End of Hints on Reinstallation

1. Perform the removal procedure in the reverse order, then return here.

   Attention: When reinstalling the right tape guide and the left tape guide with screws **2** and **1**, as indicated in Figure 10-75 on page 10-108, make sure that the horizontal surfaces of the right and left tape guides are **exactly level to each other** where the two edges meet. Check this with the edge of a small metal ruler.
2. **Remove the head protector before switching ON the device power.** Damage may occur if the protector remains on the head. Save the head protector for later use.
3. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
4. Perform “End of Call” on page 9-8.
5. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T22** for the area of failure when you replace the head guide and brush assembly. Use TAC **D08** if you only clean the read/write head.

Test the Drive

After the head cleaning procedure is completed, run the verify fix diagnostic:

1. If the CE Options menu is not displayed, press the Change Mode pushbutton.
2. Select **Verify Fix** from the CE Options menu, and press **Enter**.
3. Select **Test Drive** from the CE Verify Fix menu, and press **Enter**.
4. If the test did not complete successfully, return to the procedure that sent you here and complete the repair action.
5. Perform “End of Call” on page 9-8.
6. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **D08** for the area of failure when you perform a cleaning operation.

Cleaner Blade Removal (Model B11/B1A)

- The cleaner blade is no longer used in the 3590 drive.
- All of the E11/E1A and H11/H1A Head Guide Assemblies (HGAs) and most of the Model B11/B1A HGAs will not have a Cleaner Blade, as shown in Figure 10-78 on page 10-113, item 2 . If you are replacing a Head Guide and Brush Assembly, and the replacement part **does** have a cleaner blade attached to it, follow this procedure to remove it.
- If you were sent here from another section of the MI, perform this procedure, install a new head cleaning brush assembly, and return to the procedure that sent you here.

To remove the cleaner blade from the HGA, perform the following:

1. "Prepare Tape Drive for Service" on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See "Deck Enclosure Covers" on page 9-27.

   Note: You may remove the cleaner blade without removing the HGA.
4. Referring to Figure 10-78 on page 10-113, remove two screws, 3 holding the cleaner blade assembly, item 2 onto the Head Guide and Brush Assembly, item 1 .
5. Remove or plug the cleaner blade vacuum hose 4 to prevent vacuum system leaks.
   - If you have a new, inline connector 6 (included with new HGA FRU kits for (Model B11/B1A) you can remove the hose and install the inline connector in place of the connector 5 .
   - If you **do not** have a new inline connector 6 , the hose 4 can be plugged with a 4 mm screw, or the end of the hose can be folded over and tied with a cable tie-wrap.
6. Discard the used parts that were removed.
7. If you are removing the cleaner blade from an HGA that is already installed in the drive, it also will be necessary to install a new head cleaning brush. Refer to "FID D4: Head Cleaning Brush Assembly" on page 10-114, install a new head cleaning brush assembly, then return here.
8. Perform the "Measurement and Adjustment of Pneumatic System" on page 10-4, and return to the procedure that sent you here.

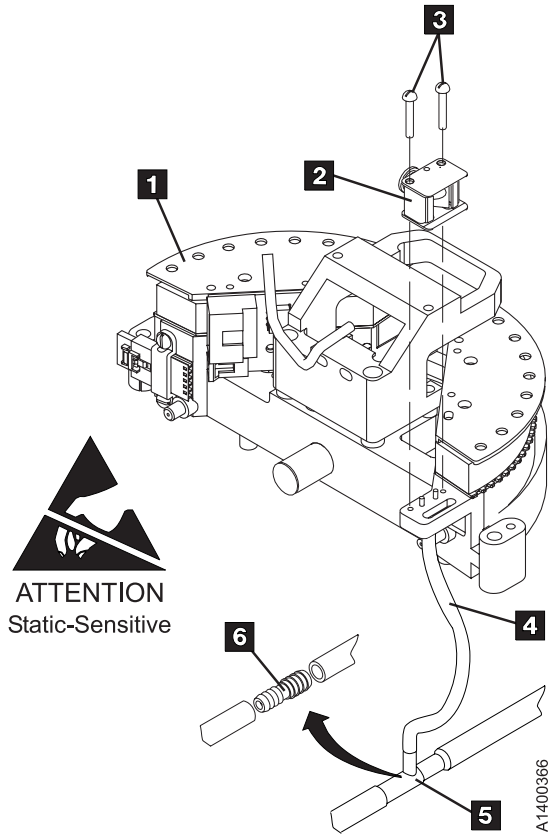


Figure 10-78. Cleaner Blade Removal – Models B11/B1A

FID D4: Head Cleaning Brush Assembly

See “Locations and Removal Procedures for Deck” on page 10-74 for FRU identifier D4.

Attention: The head guide assembly (HGA) has ESD-sensitive components. Do not touch the circuit board on the HGA. Also, do not touch the surface of the read/write head or the bristles on the cleaning brush as finger prints cause corrosion on the head. See “Working with Electrostatic Discharge (ESD) Sensitive Parts” on page 9-23.

Remove Head Cleaning Brush Assembly

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.

   See Figure 10-79.

   Attention: Use extra care when installing (or removing) the head protector so you do not damage the head assembly. **Do NOT push down hard** on the head protector as this may destroy the springs in the floating head!
4. Install the orange head protector 1 P/N 45G0145 on the head guide assembly (HGA) 3 .
   a. Squeeze the head protector at positions 1 and 2 .
   b. Insert the head protector into the HGA, as shown 4 .

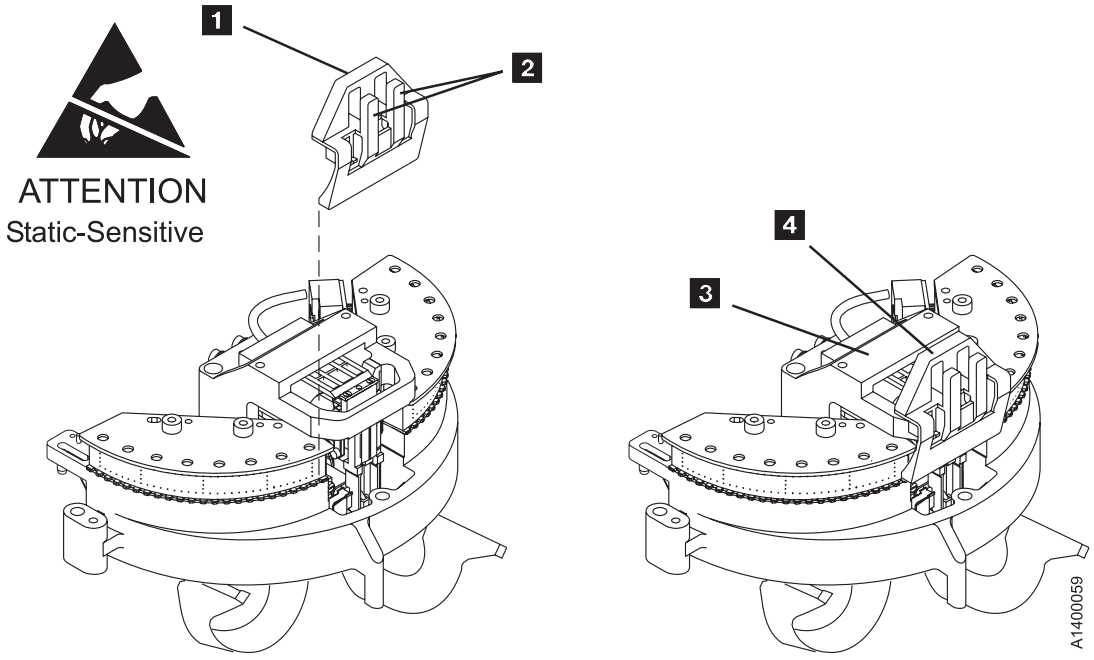


Figure 10-79. Head Protector

See Figure 10-80.

Attention: If this FRU is in the right hand drive and it is installed in a rack with a second drive next to it, the left tape guide cannot be removed with the head guide protector installed. ***Use extreme care not to damage the read/write head when removing the tape guide assembly.***

5. Remove the left tape guide screws **1** and remove the guide.

   Note: If another tape drive is installed to the left of the drive you are working on, the clearance to remove the tape guide is restricted. Perform the following:

   a. With the mounting screws removed, move the rear of the tape guide to the left to disengage the tab, then move the tape guide to the rear (toward the power supply).
   b. Carefully lift the front of the tape guide up while keeping the hose and cable away from the front tape guide support.

   Note: **Do not touch the bristles on the brush**. Use lint-free gloves P/N 461621 to handle the cleaning brush.

   Remove the head-cleaning brush **3** by removing the clip **2**, lift the arm off the stud, and remove the clip **4**.

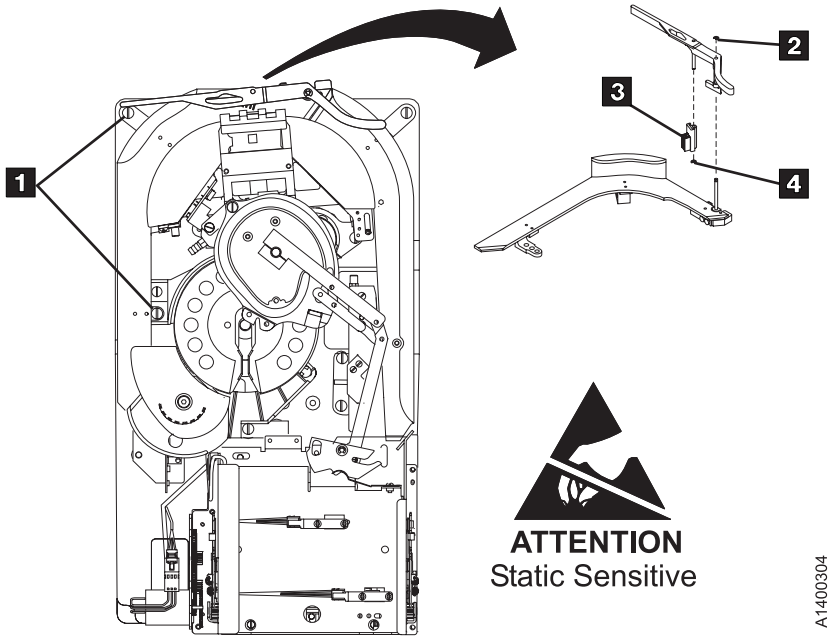


Figure 10-80. Head Cleaning Brush (In-Place)

Replace Head Cleaning Brush Assembly

Note: To prevent head contamination, do not touch the bristles on the brush. Use lint-free gloves P/N 461621 to handle the automatic cleaning brush.

1. Refer to Figure 10-81 for the location of the identifying mark **1** on the new level of brush. Also notice the correct orientation for installing the brush.
2. Perform the removal procedure in the reverse order, then return here.

   Attention: When reinstalling the left tape guide, make sure that the horizontal surfaces of the right and left tape guides are **exactly level to each other** where the two edges meet. Check this with the edge of a small metal ruler.
3. **Remove the head protector before switching ON the device power.** Damage may occur if the protector remains on the head. Save the head protector for later use.

   Attention: Perform the heads and tape path cleaning procedure before loading a data tape.
4. Load the cleaning cartridge into the drive; the cleaning procedure is done automatically.
5. Perform “End of Call” on page 9-8.
6. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T49** for the area of failure when you replace the head cleaning brush assembly. Use TAC D08 if you only clean the read/write head.

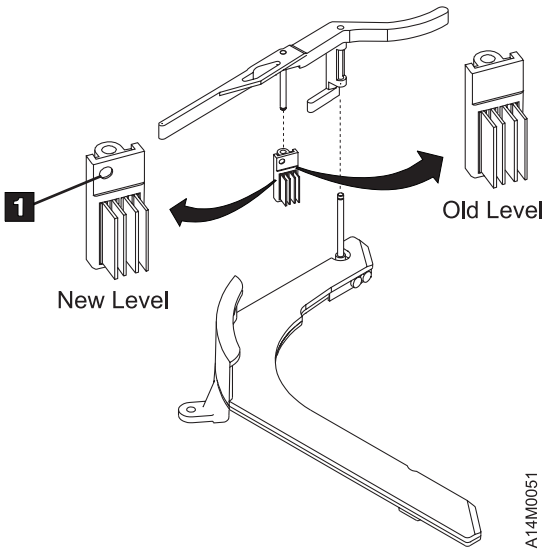


Figure 10-81. Head Cleaning Brush (Detail)

Drive Test

After the head cleaning procedure is completed, run the verify fix diagnostic:

1. If the CE Options menu is not displayed, press the Change Mode pushbutton.
2. Select **Verify Fix** from the CE Options menu, and press **Enter**.
3. Select **Test Drive** from the CE Verify Fix menu, and press **Enter**.
4. If the test did not complete successfully, return to the procedure that sent you here and complete the repair action.
5. Perform “End of Call” on page 9-8.
6. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **D08** for the area of failure when you perform a cleaning operation.

FID D6: Motor Power Cables

Remove Cables

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-82. Disconnect the motor cables at the rear of the drive **1**.
5. Disconnect the two motor cables **2** and **4** under the deck.
6. Remove the cable from the cable clamp **3**.
7. Extract the cables through the cable trough toward the front.

Replace Cables

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **C09** for the area of failure.

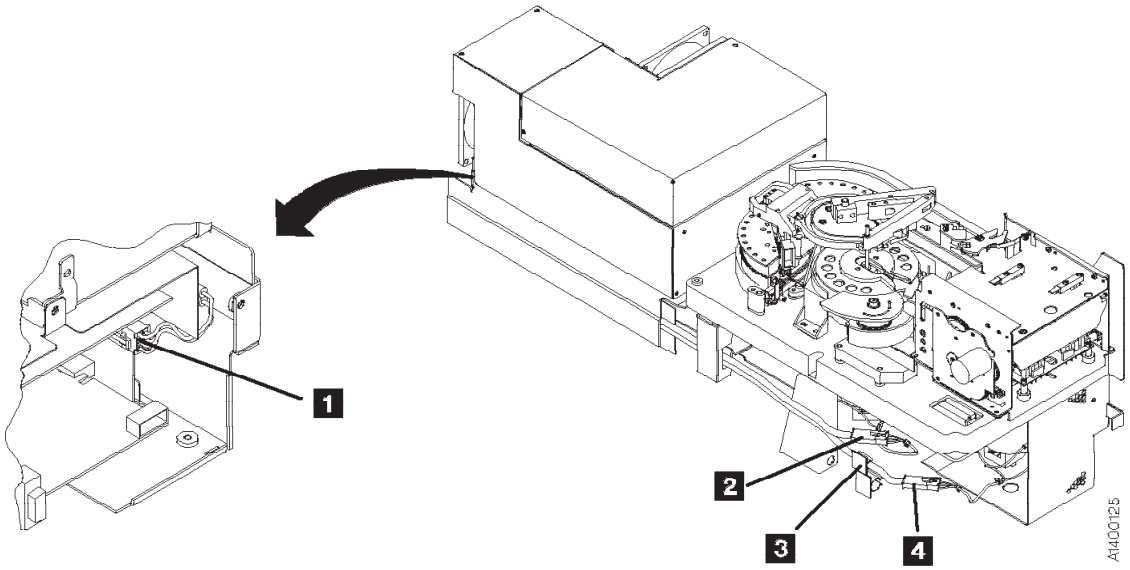


Figure 10-82. Motor Cables

FID DA: Motor, Loader, and Sensor Cable

Remove Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.

> **Hint**
> It is easier to perform this procedure if the drive is removed from the rack and placed on a work surface.

Refer to Figure 10-73 on page 10-106 for installing the head protector in the next step.

4. Install the orange head protector **1** P/N 45G0145 onto the head guide assembly (HGA) **3**.
   a. Squeeze the head protector at positions **1** and **2**.
   b. Insert the head protector into the HGA, as shown **4**.
5. Remove the card pack. Refer to for the removal procedure.
6. See Figure 10-83 on page 10-119. Remove cable clamps **1**, **6**, and **9**.
7. Disconnect connectors **2**, **3**, **7**, **8**, **10**, **11**, **12**, and **13**.
8. Disconnect the cable connections from the pantocam motor **5**.
9. Remove the two screws from the cable docking connector.
10. Remove the cable **4**.

Replace Cable

Notes:
When replacing the Cable, the following information applies to the Tape Path Sensors:

1. When connecting the tape path A sensor connector, ensure that the + on the cable connector and the sensor are aligned.
2. When connecting the tape path B sensor connector, ensure that the + on the cable connector and the sensor are aligned.
3. The new Cable FRU kit should contain a ferrite ring which should be installed on the pantocam motor leads. It reduces electrical noise in the cable. Follow the instructions in the FRU kit, see Figure 10-60 on page 10-87.

Follow this procedure to replace the cable:

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “Measurement and Adjustment of Pneumatic System” on page 10-4, then return here.
3. Perform “End of Call” on page 9-8.
4. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **C09** for the area of failure.

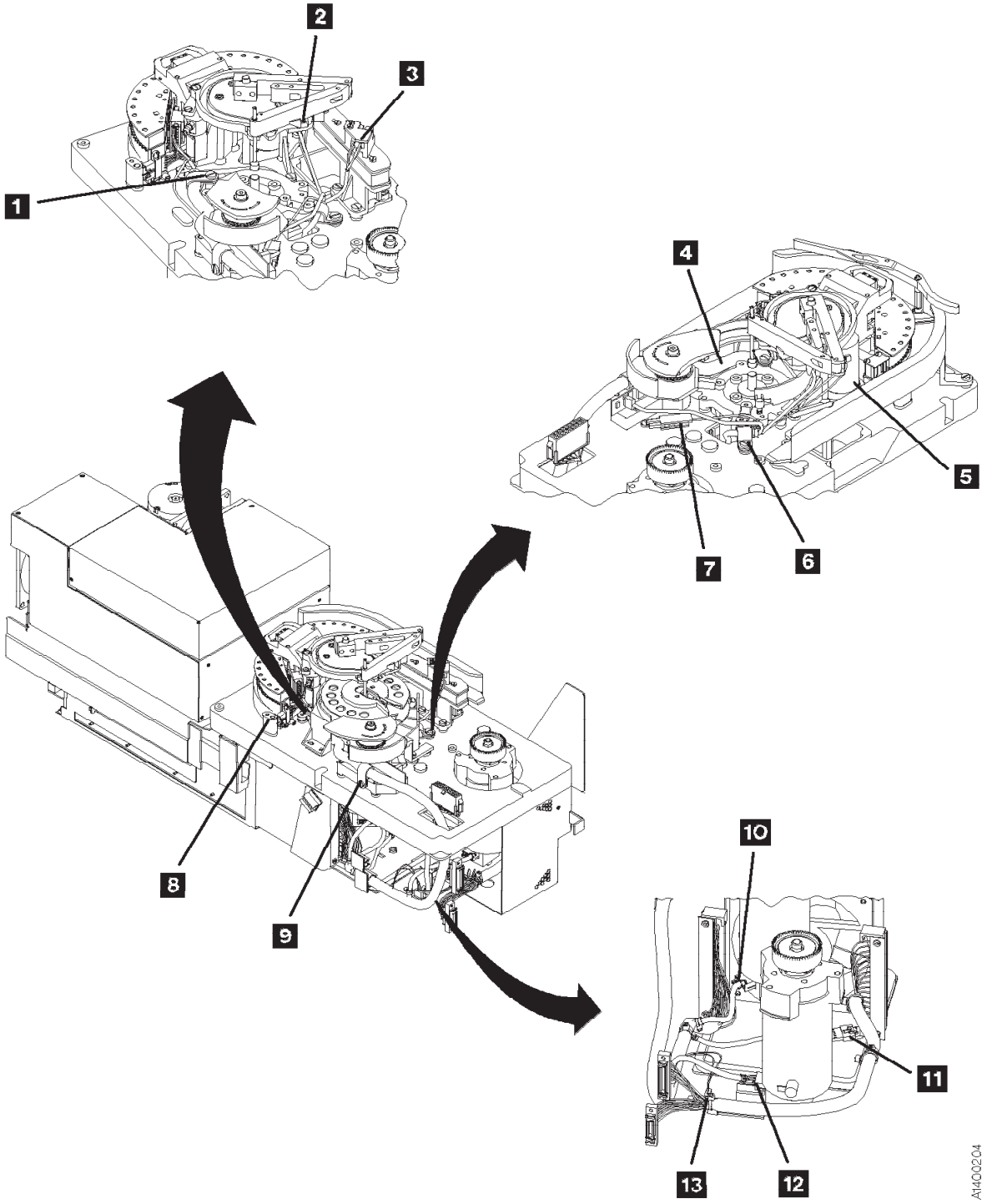


Figure 10-83. Tach, Motor, and Loader Cable

FID DB: Power Supply Cable (New Level)

Remove Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from the source, then from the 3590.
3. Remove the deck enclosure back cover and back plate. See “Deck Enclosure Covers” on page 9-27
4. See Figure 10-84. Disconnect the power supply cable **1** from the power supply at connector J2.
5. Disconnect the other end of the power supply cable from the card pack connector.
6. Remove the cable from the drive.

Replace Cable

1. Perform the removal procedure in reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **CA** for the area of failure.

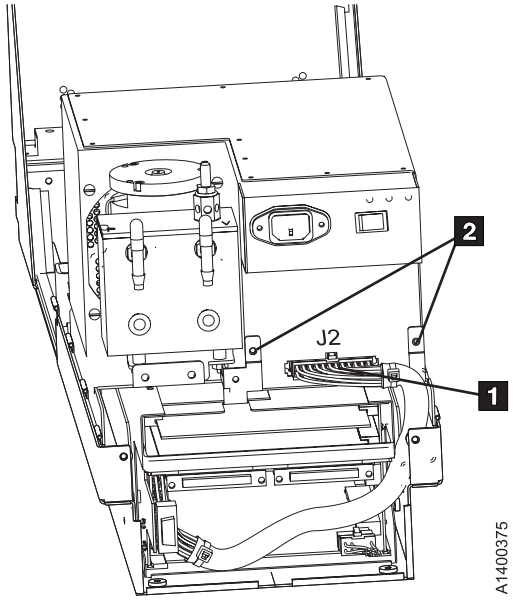


Figure 10-84. Power Supply Cable

Note: This FID is removable on the New Level Power Supplies only.

FID DC: ACF and Operator/CE Panel Cable

Remove Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. Remove the power cord from its source, then from the back of the 3590.
3. Remove the deck enclosure back cover. See “Deck Enclosure Covers” on page 9-27.
4. See Figure 10-85 on page 10-122.
5. Remove the cable from the clamps **1** and **3**.
6. Unplug the cable from connector **2**.
7. Remove the four screws **4** from the two connectors.
8. Remove any necessary parts to obtain access to the cable and connectors. Refer to the appropriate procedures in this section.
9. Note the routing and remove the cable.

Replace Cable

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **C09** for the area of failure.

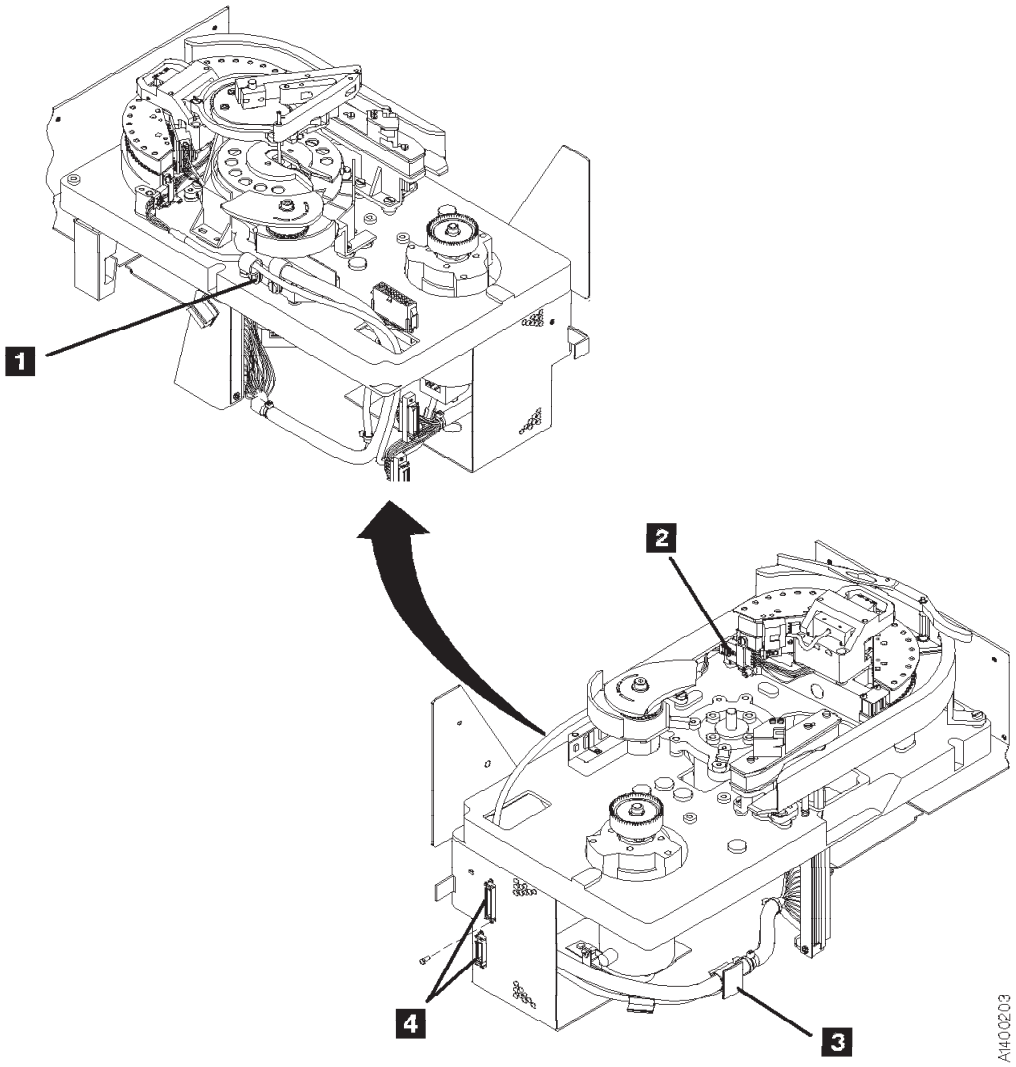


Figure 10-85. ACF and Operator/CE Panel Cable

Locations and Removal Procedures – Model B1A/E1A/H1A (Library) Components

The FRUs in Figure 10-86 are identified by their FID number for example, 90 is FID 90, the operator/CE panel. The list following the figure shows the FID names.

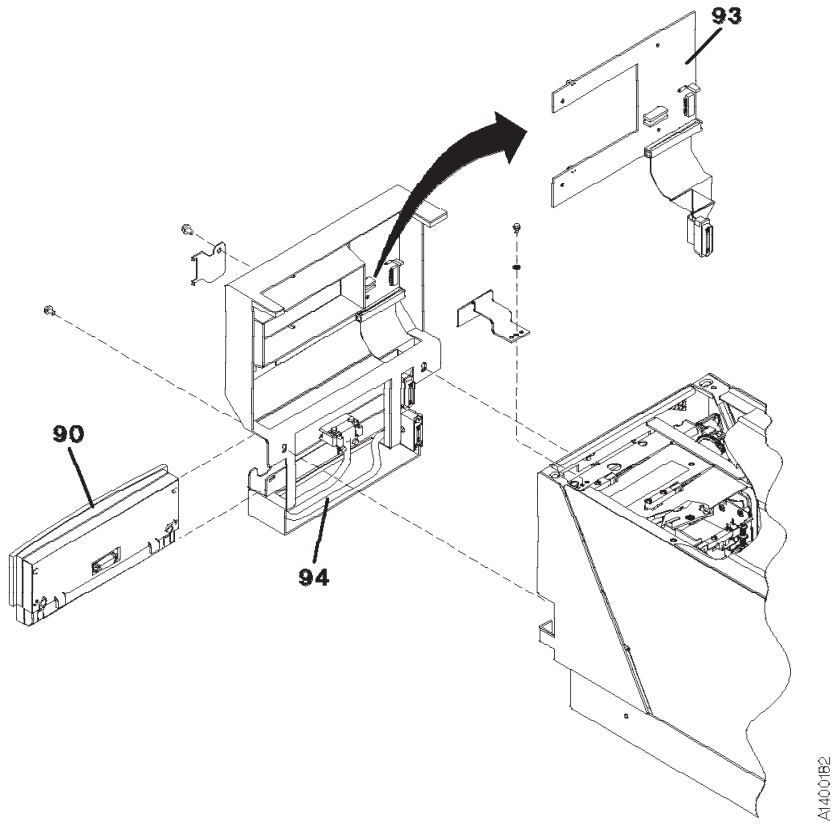


Figure 10-86. Locations for Model B1A/E1A/H1A Components

FID Number	FID Name
90	Operator/CE Panel (See “Model B1A/E1A/H1A” on page 10-13
93	Library Interface Cover
94	Operator panel cable

FID 93: Library Interface Cover (Model B1A/E1A/H1A Only)

See “Locations and Removal Procedures – Model B1A/E1A/H1A (Library) Components” on page 10-123 for FRU identifier 93.

Debris may be causing the problem, **clean the sensor** with a brush (standard tool kit soft bristle brush). Verify problem remains prior to replacing the FRU.

Hint

Before you change this FRU, ensure you have the proper setting in the “CE Drive Options Menu” on page 5-52. For example, FID 93 occurs if the configuration reflects the drive being in a library and the library interface cover is not installed.

Removing Library Interface Cover

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. See Figure 10-87 on page 10-125. Lift the display panel **2** out of its holder **3** by pressing on the release tabs at each end of the panel.
3. Disconnect the display panel connector **1** and set the panel aside.
4. Remove the two cover mounting screws **5** and remove the cable retaining bracket **6**.
5. Rotate **7** the cover away from the drive far enough to get access to the two connectors **8**.
6. Disconnect the connectors **8**, and remove the cover.

Replace Library Interface Cover

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

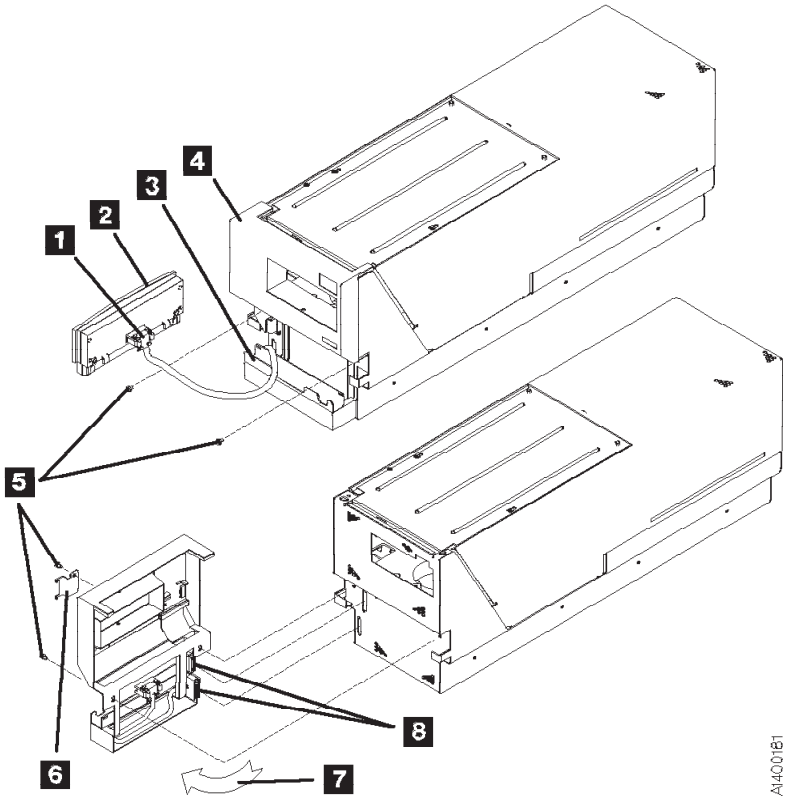


Figure 10-87. Library Interface Cover

FID 94: Operator Panel Cable (Model B1A/E1A/H1A Only)

See “Locations and Removal Procedures – Model B1A/E1A/H1A (Library) Components” on page 10-123 for FRU identifier 94.

Remove Cable

1. “Prepare Tape Drive for Service” on page 9-6, then return here.
2. See Figure 10-88. Remove the library interface cover **1** . See “FID 93: Library Interface Cover (Model B1A/E1A/H1A Only)” on page 10-124, then return here.
3. Remove the cable **2** by pulling it away from the cover.

Replace Cable

1. Perform the removal procedure in the reverse order, then return here.
2. Perform “End of Call” on page 9-8.
3. Use your local procedures to report the FRU part number for the FID and use technical area code (TAC) **T33** for the area of failure.

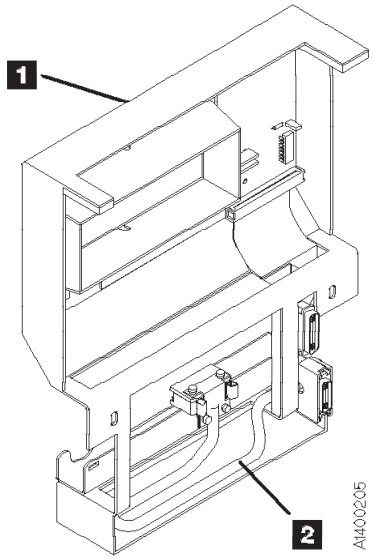


Figure 10-88. Operator Panel Cable

Chapter 11. Parts Catalog

How to Use This Parts Catalog

- SIMILAR ASSEMBLIES: If two assemblies contain a majority of identical parts, they are broken down on the same list. Common parts are shown by one index number. Parts peculiar to one or the other of the assemblies are listed separately and identified by description.
- AR: (As Required) in the Units column indicates the quantity of the part is used as required.
- NP: (Non-Procurable) in the Units column indicates that the part is non-procurable and that the individual parts or the next higher assembly should be ordered.
- NR: (Not Recommended) in the Units column indicates that the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.
- R: (Restricted) in the Units column indicates the part has a restricted availability.
- INDENTURE: The indenture is marked by a series of dots located before the parts description. The indenture indicates the relationship of a part to the next higher assembly. For example:

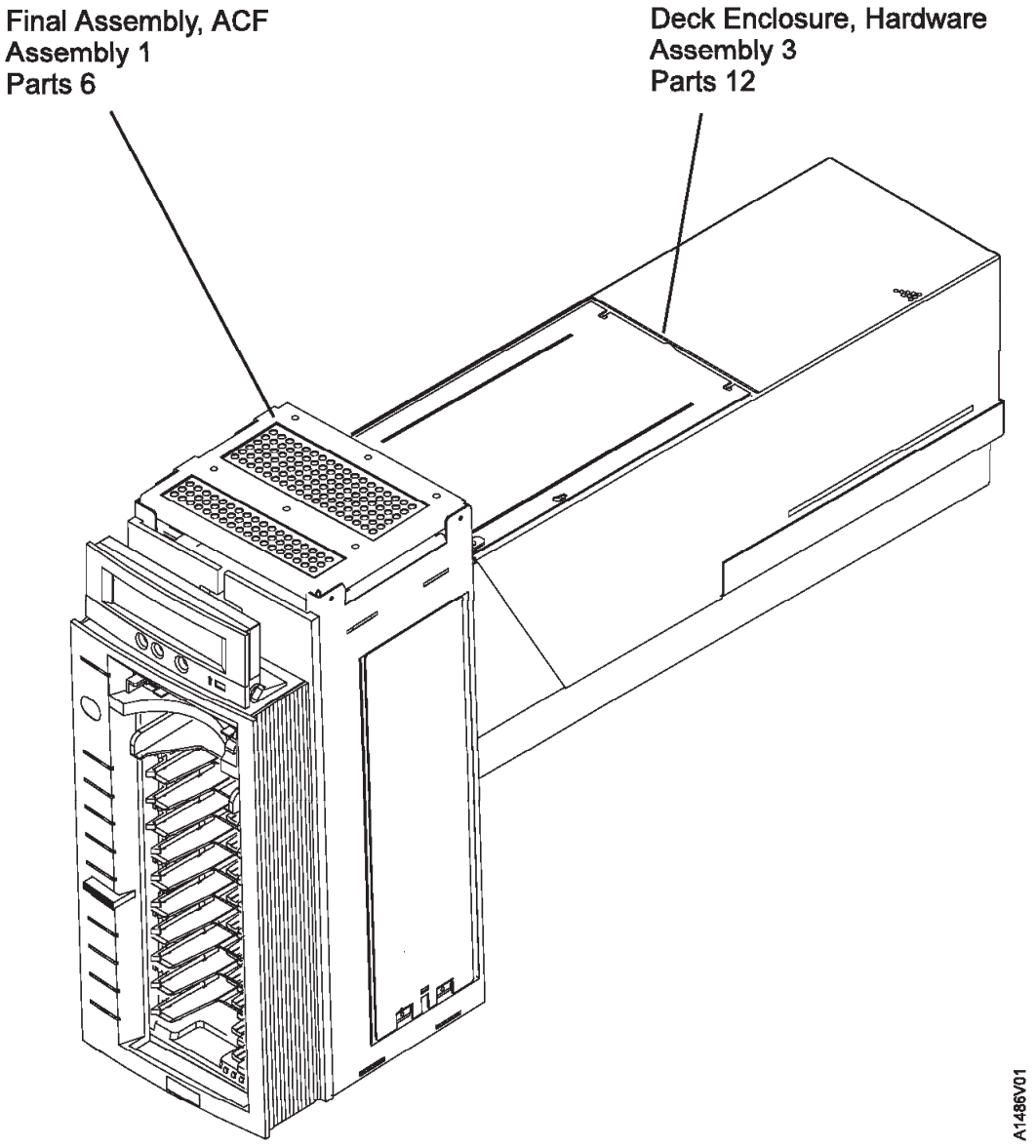
Indenture	Relationship of Parts
(No dots)	MAIN ASSEMBLY
(One dot)	• Detail parts of a main assembly
(One dot)	• Subassembly of the main assembly
(Two dots)	•• Detail part of a one-dot subassembly
(Two dots)	•• Subassembly of a one-dot subassembly
(Three dots)	••• Detail part of a two-dot subassembly

Assembly 1: Cover Assembly (Sample)

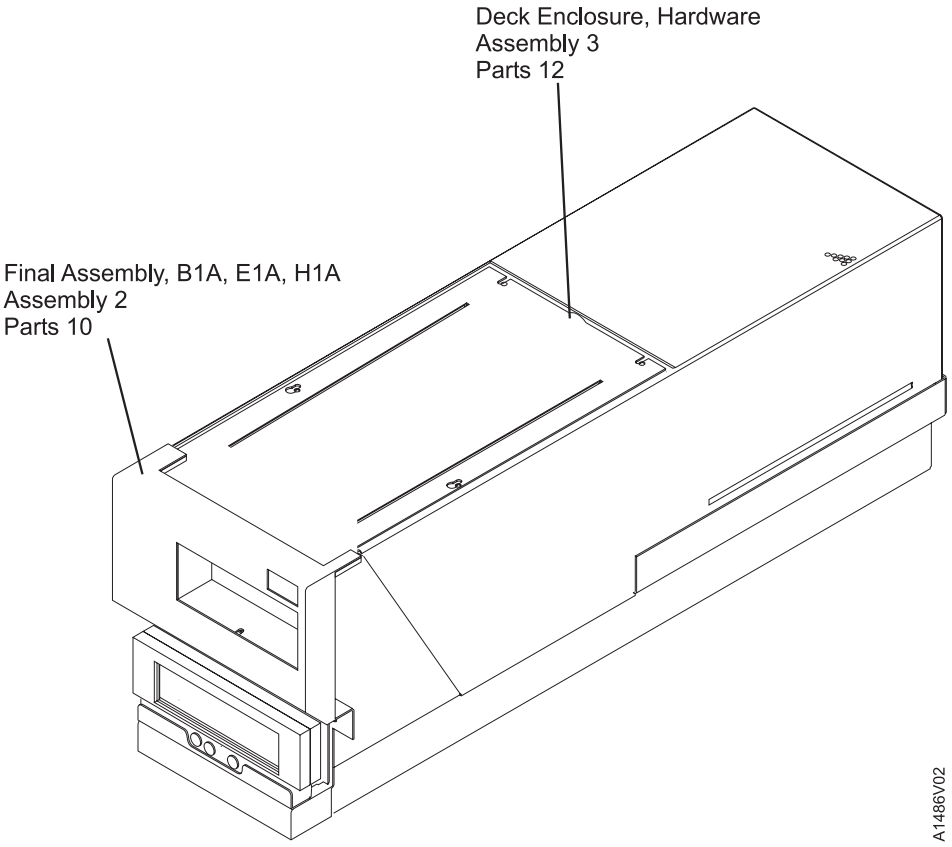
Asm-Index	Part Number	Units	Description
1–	2512667	1	Cover Asm, Rear, Red
-	2512668	1	Cover Asm, Rear, Yellow
-	2512669	1	Cover Asm, Rear, Blue
-	2512670	1	Cover Asm, Rear, Gray
-	2513714	1	Cover Asm, Rear, White
			For Next Higher Assembly, See 1–2 on page 15
-1	5373637	1	• Seal, Top
-2	5356429	2	• Clip, Retaining
-3	2513013	3	• Liner, Cover
-4	5373727	1	• Seal, Left Side
-5	5356429	3	• Clip, Retaining
-6	513668	2	• Catch,Cover
-7	81693	4	• Screw, Mach Bind Hd- 6-32 X 0.375 in.
-8	1847630	R	• Finger Stock Asm
-9	1847602	NR	•• Channel, Finger Stock
-10	1847604	NR	•• Finger Stock, 2.00 Long
-11	5373639	AR	• Seal, Bottom
-12	5356429	2	• Clip, Retaining

Assemblies List

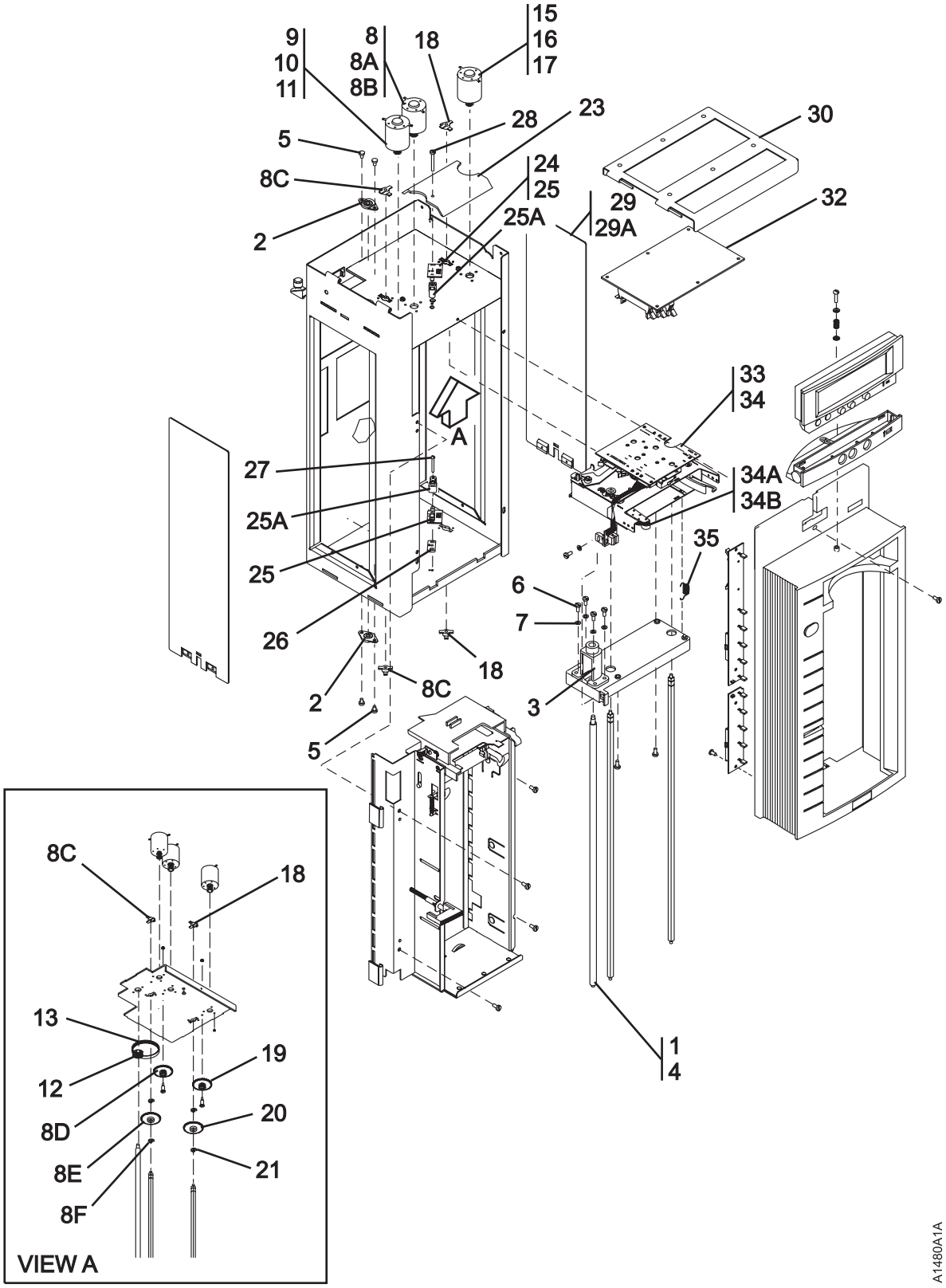
Visual Index, Model B11/E11/H11



Visual Index, Model B1A/E1A/H1A

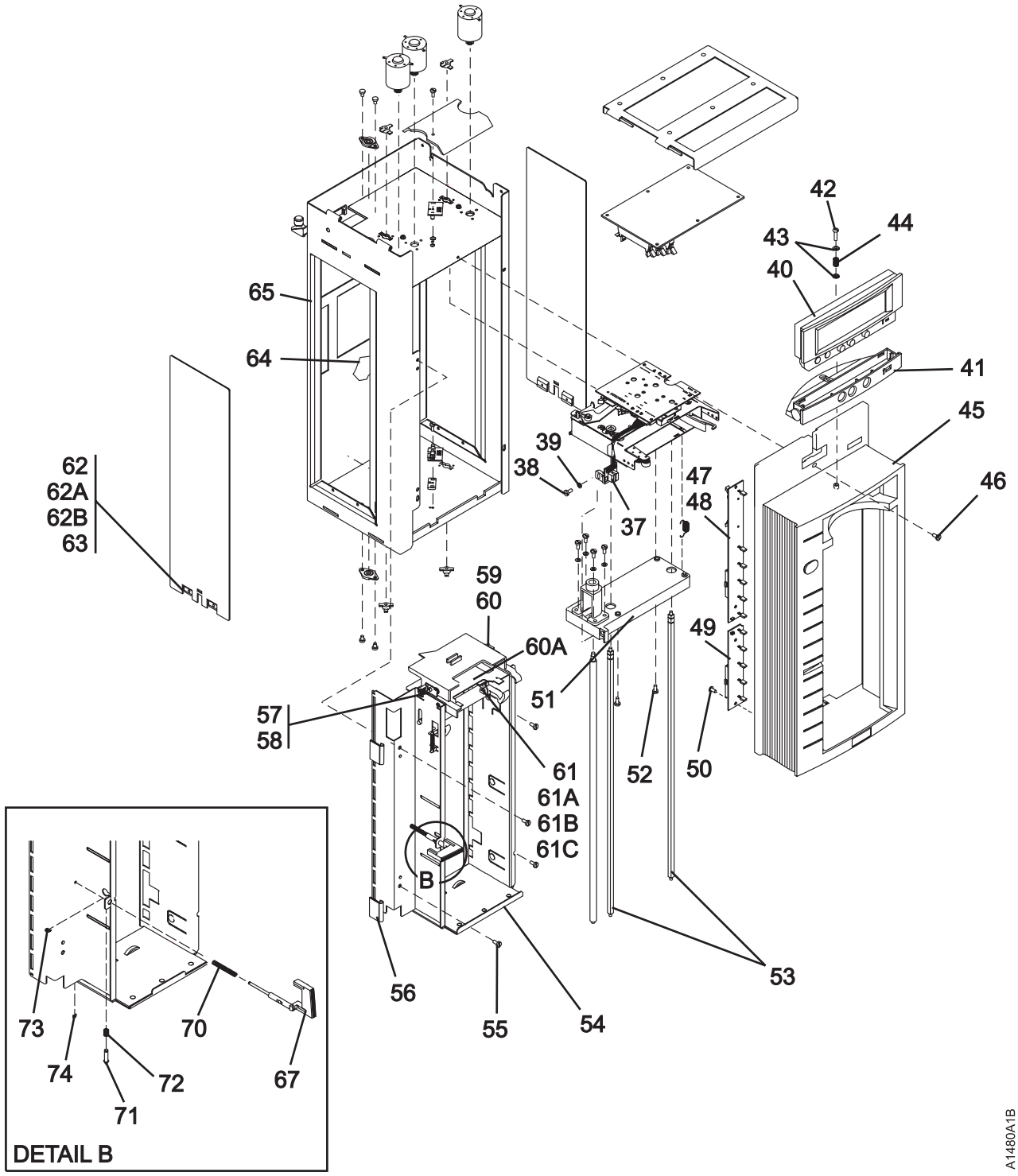


Assembly 1: ACF Final Assembly



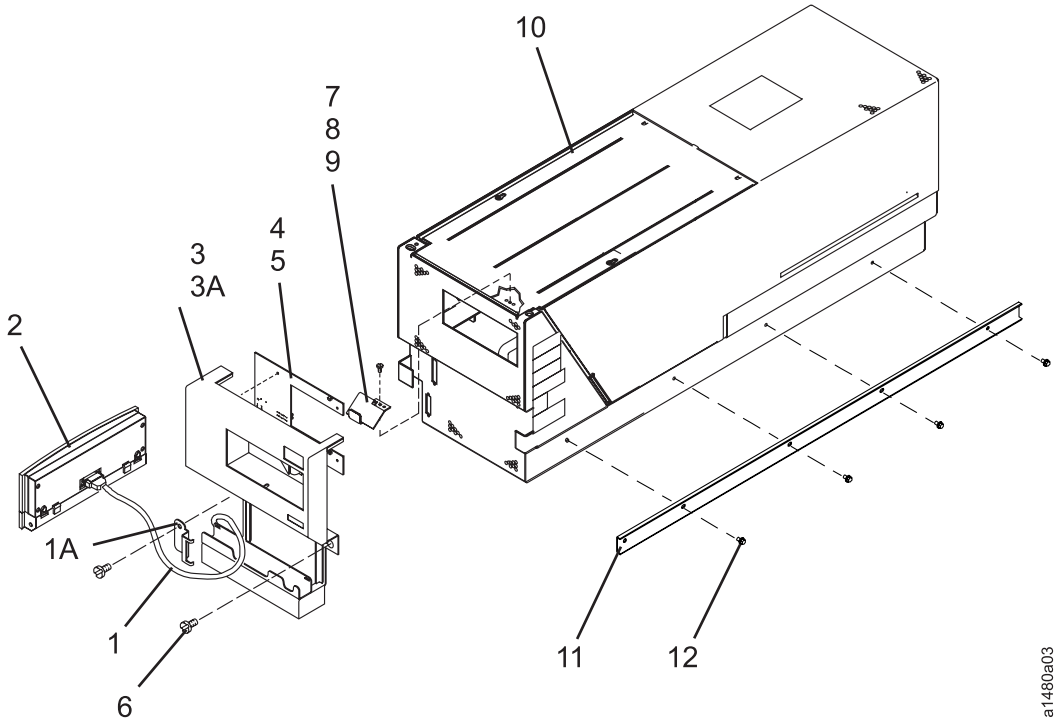
Asm–Index	Part Number	Units	Description
1–	NA	NP	ACF Final Assembly (Sheet 1 of 2)
–1	05H2960	1	• Kit, Leadscrew Asm NOTE: If the ACF has a gear-driven leadscrew (below EC C88823), also order "Kit, Elevator Motor, Pulley and Belt Set, P/N 05H2959" to convert to a-belt driven leadscrew.
–2	39F3447	NP	• • Bearing Asm
–3	50G0551	NP	• • Retainer, Nut
–4	50G0545	NP	• • Leadscrew and Nut
–5	1621197	4	• Screw, Metric-Slot Pan Hd M4 X 6 mm
–6	1621192	4	• Screw, Metric-Slot Pan Hd M4 X 12 mm
–7	1622304	4	• Washer, Metric-Flat 4.3 ID X 9 OD X 0.8 Thick
–8	05H2388	1	• Kit, Feed Motor and Gear Set
–8A	39F3433	NP	• • Motor, Feed
–8B	39F3449	NP	• • Screw
–8C	05H4676	NP	• • Bearing
–8D	39F3435	NP	• • Gear
–8E	39F3436	NP	• • Gear
–8F	1126831	NP	• • E-Ring
–9	05H2959	1	• Kit, Elevator Motor, Pulley and Belt Set NOTE: If the ACF has a gear-driven leadscrew (below EC C88823), also order "Kit, Leadscrew Asm, P/N 05H2960" to convert to a belt-driven leadscrew.
–10	50G0547	NP	• • Motor, Elevator
–11	39F3449	NP	• • Screw
–12	50G0544	NP	• • Pulley
–13	50G0546	1	• • Belt
–15	05H2388	1	• Kit, Pinch Motor and Gear Set
–16	39F3433	NP	• • Motor, Pinch
–17	39F3449	NP	• • Screw
–18	05H4676	NP	• • Bearing
–19	39F3435	NP	• • Gear
–20	39F3436	NP	• • Gear
–21	1126831	NP	• • E-Ring
–23	62G2630	NP	• Cover, Cable
–24	05H9041	1	• Kit, Global and Interference Sensor
–25	05H9038	NP	• • Sensor, Global Upper and Lower
–25A	05H2692	NP	• • Cover, Global Sensor, Upper and Lower
–26	62G2597	NP	• Standoff - Spacer
–27	1621177	1	• Screw, Metric-Slot Pan Hd M3 X 25 mm
–28	1621177	1	• Screw, Metric-Slot Pan Hd M3 X 25 mm
–29	62G2540	NP	• Cover, Right
–29A	1621170	2	• Screw, Metric-Slot Pan Hd M3 X 6 mm
–30	39F3431	NP	• Cover
–32	50G0574	1	• Card, ACF Motor Control
–33	05H9839	1	• Transport Asm
–34	50G0552	NP	• • Cartridge Transport Asm
–34A	19P2840	1	• • • Kit, Transport Pinch Rollers (Qty 6)
–34B	05H4719	NP	• • • Transport Pinch Rollers
–35	50G0566	NP	• • Spring

Assembly 1: (continued)



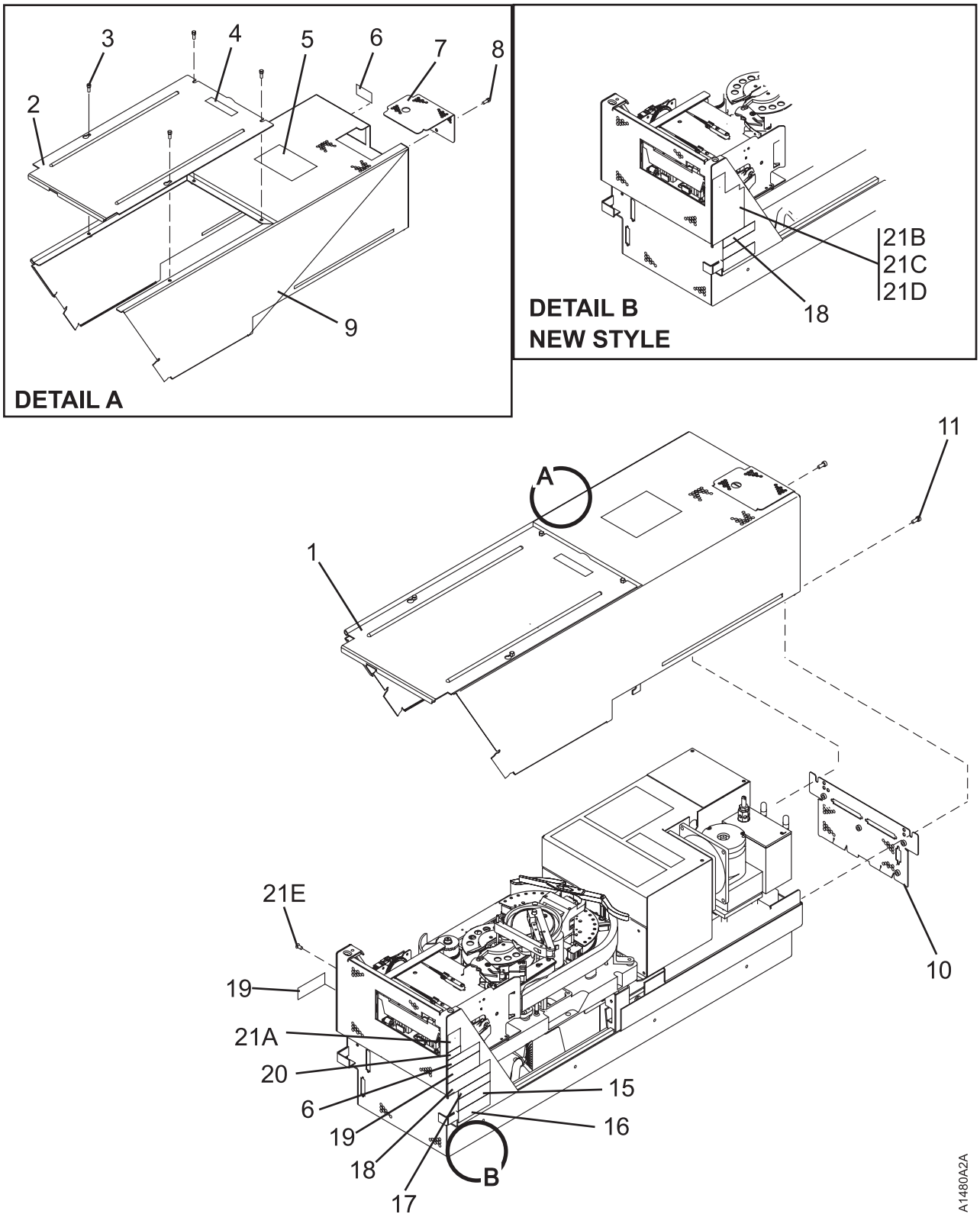
Asm–Index	Part Number	Units	Description
1–	NA	NP	ACF Final Assembly (Sheet 2 of 2)
–37	50G0542	1	• Vertical Position Sensor Asm
–38	1621192	1	• Screw, Metric-Slot Pan Hd M4 X 12 mm
–39	1622304	1	• Washer, Metric-Flat 4.3 ID X 9 OD X 0.8 Thick
–40	39F3450	1	• Display, Operator/CE Panel
–41	62G2542	1	• Base Asm
–42	05H4465	NR	• Screw, Metric-Slot Pan Hd M4 X 16 mm
–43	05H4459	NR	• Washer, Spring
–44	05H4460	NR	• Spring, Compression
–45	39F3456	NR	• Bezel Asm
–46	1621194	1	• Screw, Metric-Slot Pan Hd M4 X 20 mm
–47	05H2452	1	• Kit, LED Cards
–48	05H4441	NP	• • Card, Bld2
–49	05H9921	NP	• • Card, Bld3
–50	05H4447	4	• Screw, M4 X 8 mm
–51	39F3445	NP	• Plate, Elevator
–52	1621190	2	• Screw, Metric-Slot Pan Hd M4 X 8 mm
–53	39F3438	NP	• Shaft
–54	39F3444	NP	• Support Asm, Magazine
–55	1621197	NP	• Screw, Metric-Slot Pan Hd M4 X 6 mm
–56	05H8970	NP	• Retainer, Cable
–57	05H2451	1	• Kit, Priority Cell Sensor Pair
–58	05H8925	NP	• • Card, BDT1 Detector
–59	62G2620	NP	• • Card, BEM1 Emitter
–60	1621844	2	• Screw, Metric-Thd Form Slot Pan Hd M3 X 6 mm
–60A	39F4761	1	• Base Asm, Priority Slot
–61	62G2609	NP	• Sensor Asm, Magazine Present
–61A	62G2611	NP	• • Bracket
–61B	45G0277	1	• • Sensor
–61C	1621172	NP	• • Screw, Metric-Slot Pan Hd M3 X 10 mm
–62	08L5760	1	• Kit, Cover and Cable Asm
–62A	06J0056	NP	• Cable Asm, ACF Transport (new style)
–62B	06J0057	NP	• Cover, Left
–63	1621170	2	• Screw, Metric-Slot Pan Hd M3 X 6 mm
–64	62G2615	NP	• Seal
–65	39F3430	NP	• Frame
–67	50G0548	NR	• Button, Magazine Lock
–70	05H4721	NR	• Spring, Shaft Magazine Lock
–71	05H4445	NR	• Pin, Detent
–72	05H4450	NR	• Spring, Detent Magazine Lock
–73	1126829	NR	• Ring, Retaining M4
–74	1126828	NR	• Ring, Retaining M3

Assembly 2: Model B1A/E1A/H1A Final Assembly



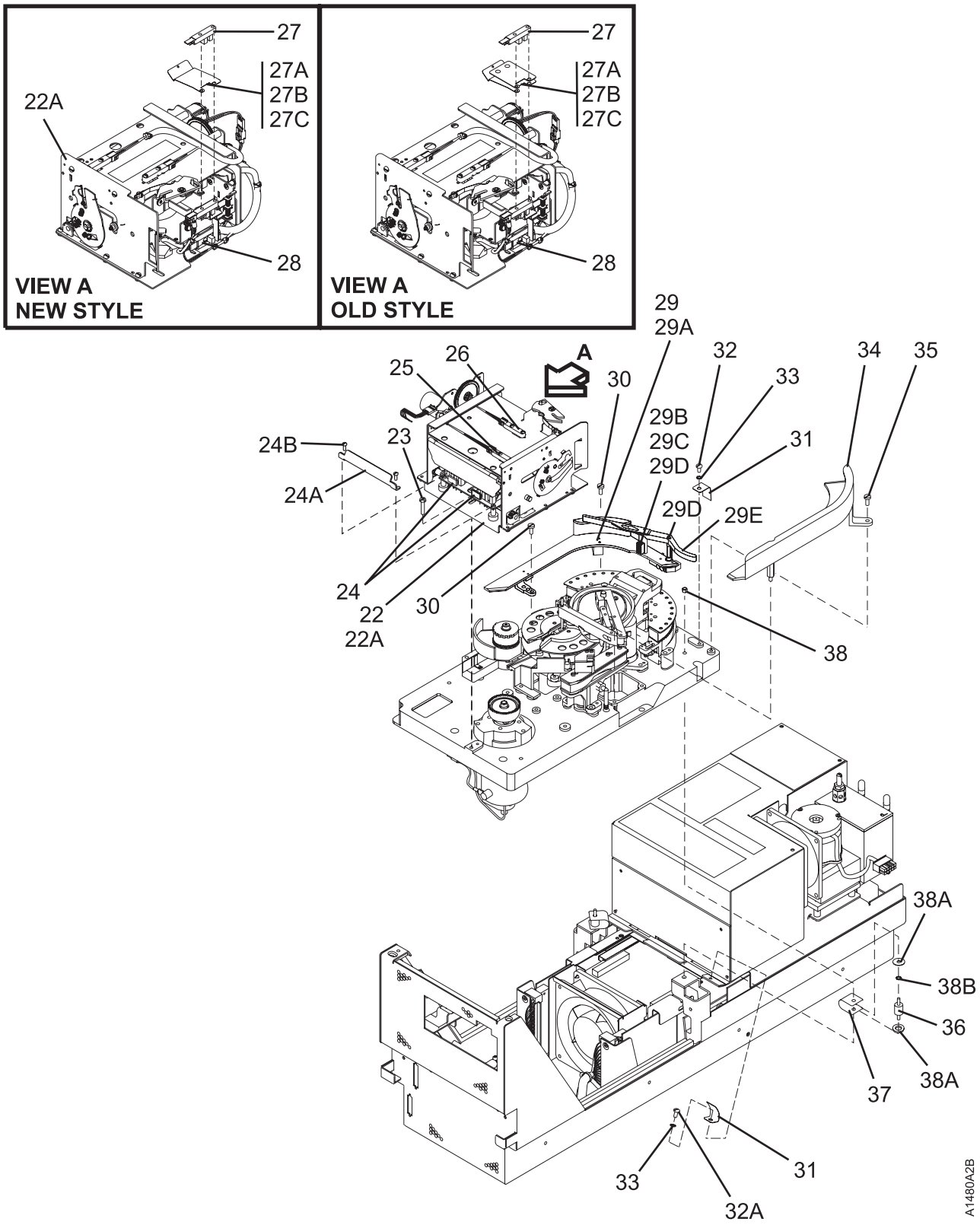
Asm–Index	Part Number	Units	Description
2–	NA	NP	Model B1A/E1A/H1A Final Assembly
–1	45G0275	1	• Cable Asm, Operator Panel
–1A	05H4756	NP	• Bracket, Cable Retention
–2	39F3450	1	• Display, Operator/CE Panel
–3	05H4255	1	• Cover Asm, Library Interface
–3A	05H4254	NP	• • Weldment, Front Cover
–4	05H4678	NP	• • Card Asm, Gripper Present Sensor
–5	1621019	NP	• • Screw, Metric-Slot Pan Hd M3 X 4 mm
–6	1621197	2	• Screw, Metric-Slot Pan Hd M4 X 6 mm
–7	05H3143	1	• Bracket Asm, Fiducial
–7	05H2689	1	• Bracket Asm, Fiducial (3590 A14 in 3495 library only)
–8	1621019	1	• Screw, Metric-Slot Pan Hd M3 X 4 mm
–9	1622332	1	• Lockwasher, Metric-Int Tooth 3.2 mm ID X 6 mm OD
–10		NP	• Deck Enclosure For detail breakdown, see “Assembly 3: Deck Enclosure” on page 11-10.
–11	05H4256	2	• Slides (3494 only)
–12	1621197	8	• Screw, Metric-Slot Pan Hd M4 X 6 mm

Assembly 3: Deck Enclosure



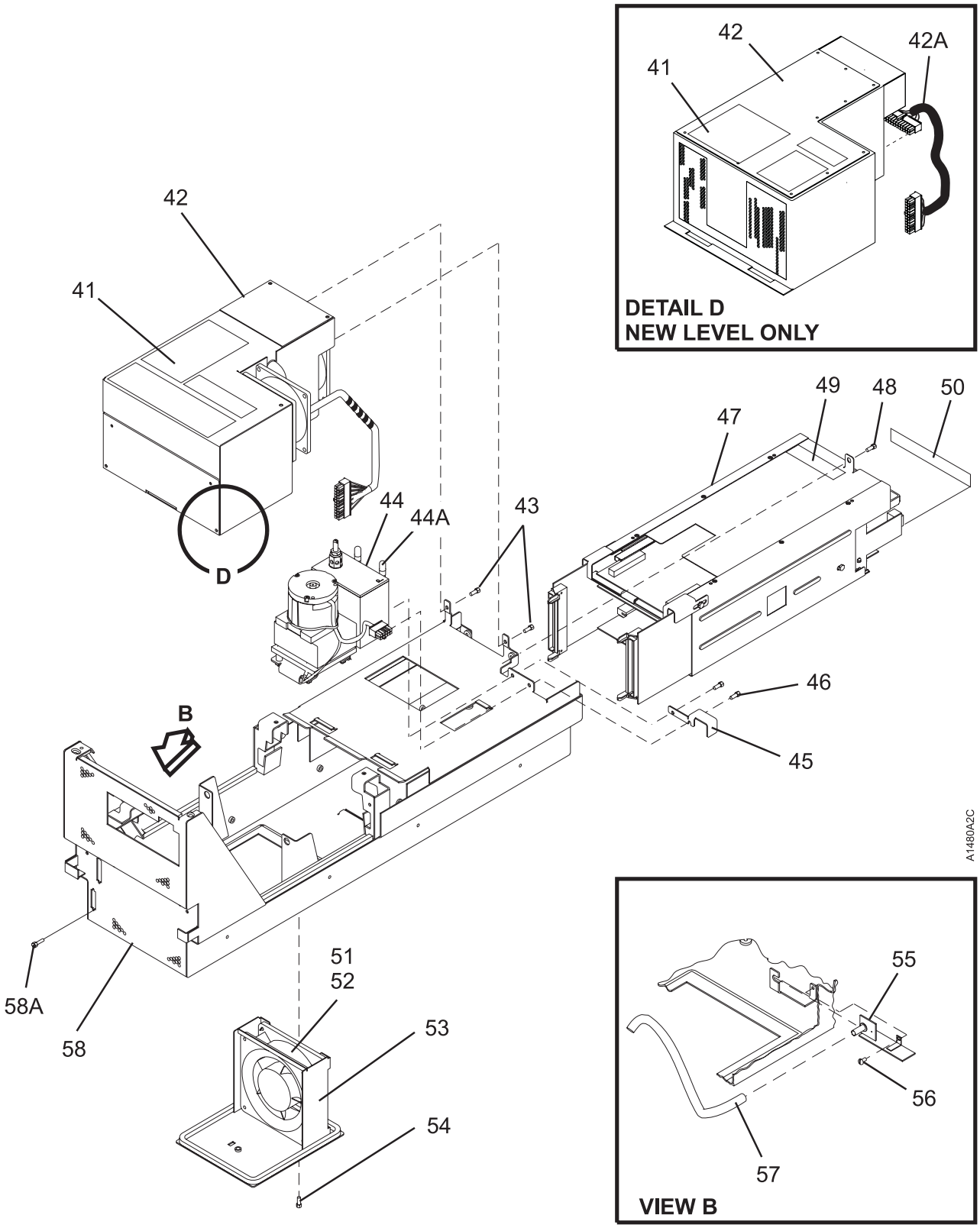
Asm–Index	Part Number	Units	Description
3–	NA	NP	Deck Enclosure (Sheet 1 of 5) For next higher assembly, see 2–10 on page 11-9
–1	05H3294	NP	• Cover Asm
–2	45G0152	NP	• • Cover, Top
–3	1624765	4	• • Screw, Metric-Thd Form Hex Flng Hd M4 X 8 mm
–4	05H4716	NP	• • Label
–5	21F7954	NP	• • Label
–6	31F7453	2	• • Label, Serial Plate
–7	05H3281	1	• • Cover, Pneumatic Access
–8	1624765	1	• • Screw, Metric-Thd Form Hex Flng Hd M4 X 8 mm
–9	45G0151	NP	• • Cover, Back
–10	05H3183	NP	• Plate, Back (SCSI)
–10	35L1671	NP	• Plate, Back (Fibre)
–11	1624765	2	• Screw, Metric-Thd Form Hex Flng Hd M4 X 8 mm
–15		1	• Label, FCC NOTE: To order this Part Number, see assembly index 21B, 21C, or 21D for appropriate Model on this page
–16		1	• Label, Canada EMC NOTE: To order this Part Number, see assembly index 21B, 21C, or 21D for appropriate Model on this page
–17		1	• Label, Manufactured in USA Order by P/N in Asm Index 3–21B, 21C, or 21D
–18	94F9116	2	• Label, Bar Code
–19		1	• Label, Power Rating UL/CSA Order by P/N in Asm Index 3–21B, 21C, or 21D
–20		1	• Label, CE Order by P/N in Asm Index 3–21B, 21C, or 21D
–21A		1	• Label, Weight Order by P/N in Asm Index 3–21B, 21C, or 21D
–21B	19P5279	1	• Multi-Label, Model B11/B1A
–21C	19P5280	1	• Multi-Label, Model E11/E1A
–21D	19P5281	1	• Multi-Label, Model H11/H1A
–21E	1621308	1	• Screw, Metric-Slot Flat Hd M4 X 8 mm

Assembly 3: (continued)



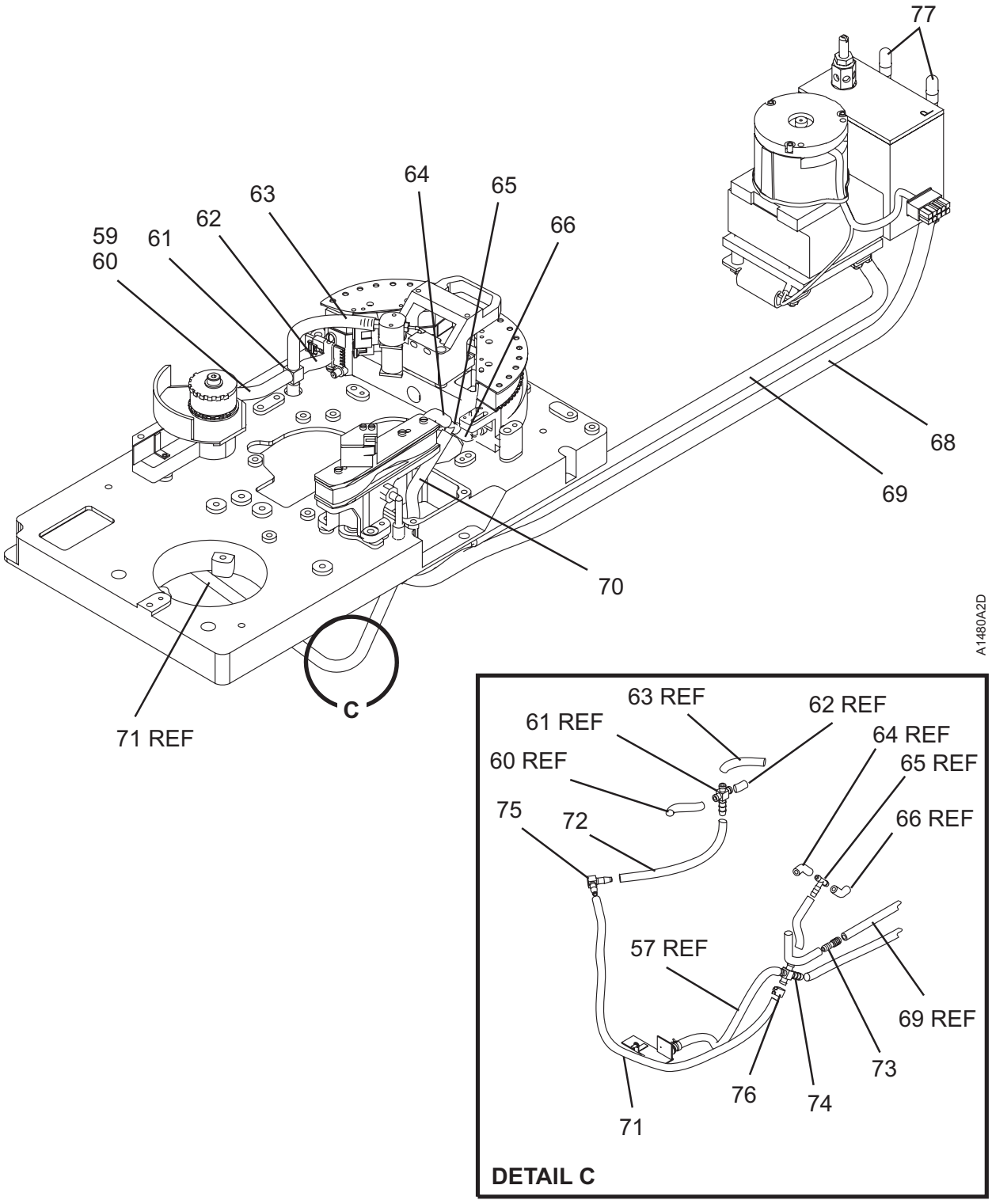
Asm–Index	Part Number	Units	Description
3–	NA	NP	Deck Enclosure (Sheet 2 of 5)
–22	19P0916	1	• Loader Asm (Kit)
–22A	05H4804	1	• • Loader
–27A	19P0721	1	• • Kit, Latch Spring
–27B	08L6060	1	• • • Spring, Latch
–27C	1621172	2	• • • Screw, Metric-Slot Pan Hd M3 X 10 mm Used on Model B1A/E1A/H1A (all)
–23	1621190	3	• Screw, Metric-Slot Pan Hd M4 X 8 mm
–24	49G8239	2	• Sensor, Cartridge Type
–24A	05H7137	1	• Guard, Sensor
–24B	1621171	2	• Screw, Metric-Slot Pan Hd M3 X 8 mm
–25	45G0277	1	• Sensor, Door Open
–26	45G0277	1	• Sensor, Tray Up
–27	45G0277	1	• Sensor, Cartridge Present
–27A	19P0721	1	• Kit, Latch Spring
–27B	08L6060	1	• • Spring, Latch
–27C	1621172	2	• • Screw, Metric-Slot Pan Hd M3 X 10 mm Used on Model B1A/E1A/H1A (all)
–28	45G0277	1	• Sensor, File Protect
–29	35L1566	1	• Mechanical Asm, Cleaner Brush
–29A	05J9553	NP	• • Tape Guide, Left
–29B	35L1445	NP	• • Brush Asm, Cleaning See also 11-18 See also 11-18
–29C	1126828	NP	• • Retainer, E-Clip
–29D	05J9601	NP	• • Arm, Cleaning Brush
–30	1621191	2	• Screw, Metric-Slot Pan Hd M4 X 10 mm
–31	05H9015	NP	• Strap, Ground
–32	1621191	1	• Screw, Metric-Slot Pan Hd M4 X 10 mm
–32A	1621308	1	• Screw, Metric-Slot Pan Hd M4 X 12 mm
–33	1622346	2	• Lockwasher, Metric-Ext Tooth 4.3 ID X 8 OD
–34	05J9554	NP	• Tape Guide, Right
–35	1621191	1	• Screw, Metric-Slot Pan Hd M4 X 10 mm
–36	45G0047	NP	• Shockmount
–37	05H4438	NP	• Strap, Ground High Frequency
–38	257189	NP	• Nut, Hex 8-32 X 0.344 Flat W
–38A	05H9898	NP	• Shim, 0.5 mm Thick
–38A	05H9899	NP	• Shim, 1 mm Thick
–38B	55901	NP	• Washer, Lock-Ext Tooth 0.168 ID X 0.381 OD

Assembly 3: (continued)



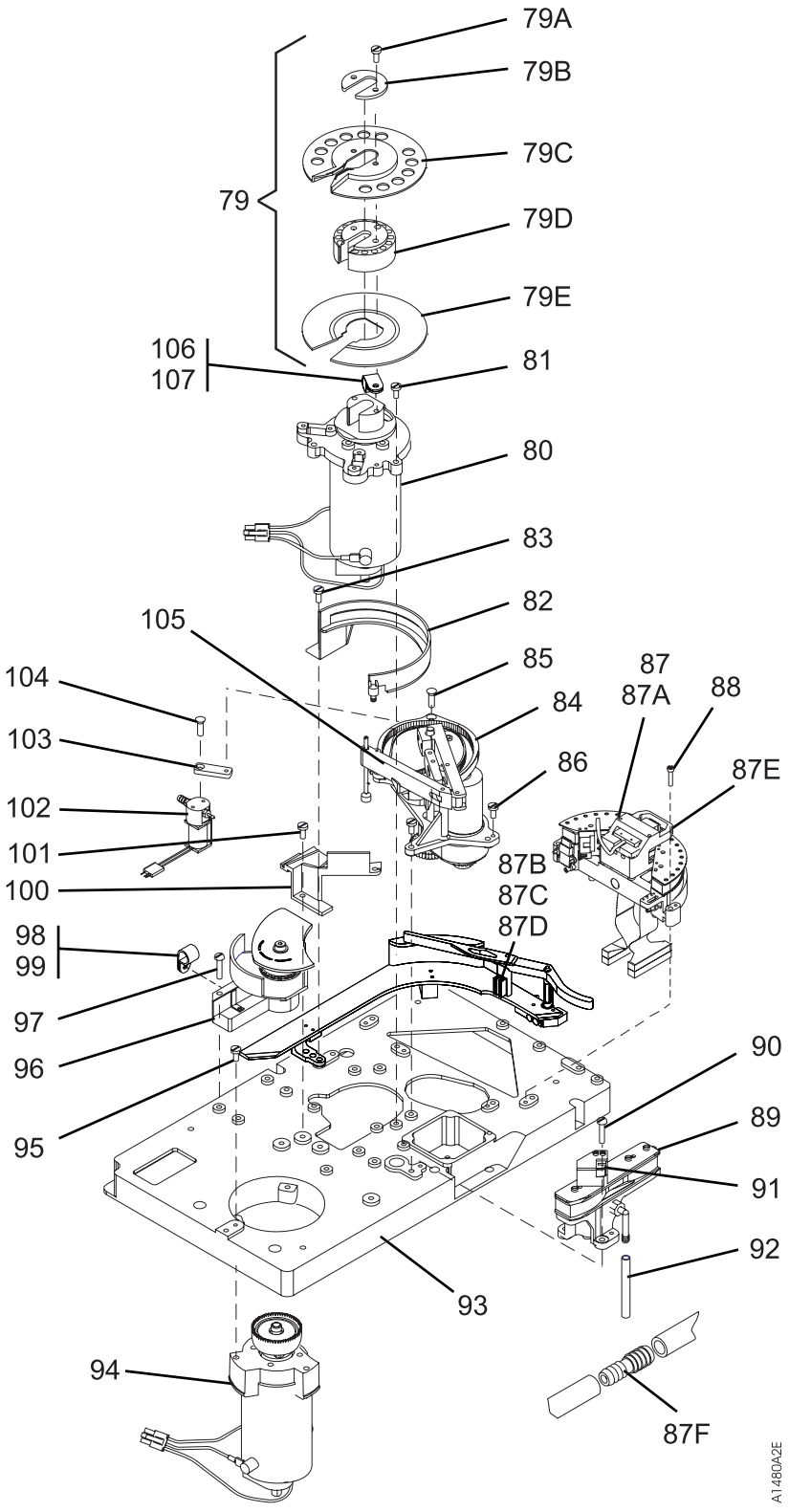
Asm–Index	Part Number	Units	Description
3–	NA	NP	Deck Enclosure (Sheet 3 of 5)
–41	09G5418	NP	• Label, Safety
–42	05H9098	1	• Power Supply (old level) Used on all base Model B11/B1A and on Ultra Model B11/B1A with Ultra Card Pack (P/N 35L0818) or older
–42	05J9721	1	• Power Supply (new level) Used on all E11/E1A and H11/H1A and on Ultra Model B11/B1A with Common Card Pack
–42A	08L6082	1	• Cable, Power Supply-to-Card Pack Used on E11/E1A and H11/H1A only
–43	1624765	2	• Screw, Metric-Thd Form Hex Flng Hd M4 X 8 mm
–44	05H4802	1	• Pneumatic Asm
–44A	45G0110	2	• Cap, Pressure and Vacuum
–45	05H4469	NP	• Bracket, Power Supply Cable
–46	1624765	2	• Screw, Metric-Thd Form Hex Flng Hd M4 X 8 mm **– Card Pack – Be sure to order the correct Part Number** (If you order the part number from the Card Pack that is being removed, the ordering system will automatically ship the correct replacement part.)
–47	05J9895	1	• Card Pack Asm– Used on Base 3590, Model B11/B1A. See Table 10-2 on page 10-67.
–47	35L0818	1	• Card Pack Asm– Used on Ultra level 3590, Model B11/B1A, with FC 9790/5790
–47	19P3431	1	• Card Pack Asm– Used on SCSI 3590 Model B11/B1A, E11/E1A
–47	19P3432	1	• Card Pack Asm – Used on Fibre Channel 3590 Model E11/E1A, with FC 9510/3510
–47	19P6251	1	• Card Pack Asm– Used on SCSI 3590 Model H11/H1A
–47	19P6252	1	• Card Pack Asm– Used on Fibre Channel 3590 Model H11/H1A
–48	1624765	1	• Screw, Metric-Thd Form Hex Flng Hd M4 X 8 mm
–49	94F9116	NP	• Label, Bar Code
–50	05H2423	NP	• Label, Caution
–51	45G0288	1	• Fan Asm
–52	62G0632	NP	• • Fan
–53	05H9155	NP	• • Bracket, Fan
–54	1621308	3	• Screw, Metric-Slot Flat Hd M4 X 8 mm
–55	05H2454	1	• BTD0 Card Asm, Transducer
–56	1621170	1	• Screw, Metric-Slot Pan Hd M3 X 6 mm
–57	45G0131	NP	• Hose, Vacuum Switch 4.76 ID X 235 mm Part of Pneumatic Hose Kit, part number 05H3203. See Item 3–59 on page 11-17.
–58	05H2428	NP	• Weldment, Deck Enclosure
–58A	1621161	4	• Screw, Metric-Slot Pan Hd M2.5 X 6 mm

Assembly 3: (continued)



Asm–Index	Part Number	Units	Description
3–	NA	NP	Deck Enclosure (Sheet 4 of 5)
–59	05H3203	1	• Kit, Pneumatic Hose
–60	45G0129	NP	• • Hose, Transducer 4.76 ID X 100 mm
–61	45G0116	NP	• • Tee, Modified Cross
–62	45G0126	NP	• • Hose, Head Casting 4.76 ID X 25 mm
–63	45G0128	NP	• • Hose, Puffer 4.76 ID X 62 mm
–64	45G0127	NP	• • Hose, Decoupler 4.76 ID X 32 mm
–65	49G0117	NP	• • Tee
–66	45G0127	NP	• • Hose, Head Casting 4.76 ID X 32 mm Used for HGAs w/cleaner blade. Not used if HGA has no cleaner blade
–68	62G2557	NP	• • Hose, Pressure 6.35 ID X 610 mm
–69	45G0134	NP	• • Hose, Vacuum 6.35 ID X 580 mm
–70	45G0130	NP	• • Hose, Cross Tee 4.76 ID X 115 mm
–71	05H3202	NP	• • Hose, Vacuum Switch 4.76 ID X 235 mm
–72	45G0129	NP	• • Hose, 4.76 ID X 100 mm
–73	09L4687	NP	• • Connector, In-line, Vacuum
–74	45G0116	NP	• • Tee, Modified Cross
–75	05H2263	NP	• • Elbow
–76	6857796	NP	• • Clamp, Hose
–77	45G0110	2	• • Cap, Pressure and Vacuum

Assembly 3: (continued)



Asm–Index	Part Number	Units	Description
3–	NA	NP	Deck Enclosure (Sheet 5 of 5)
–79	09L5446	1	• Kit, Machine Reel Motor Hub Asm
–79A	1621192	NP	• • Screw, Metric-Slot Pan Hd M4 X 12 mm
–79B	09L5117	NP	• • Retainer
–79C	35L0814	NP	• • Flange, Upper
–79D	34L2659	NP	• • Hub
–79E	35L0815	NP	• • Flange, Lower
–80	45G0009	1	• Machine Reel Motor Asm
–81	1621194	3	• Screw, Metric-Slot Pan Hd M4 X 20 mm
–82	65F3709	1	• Guide, Machine Reel
–83	1621191	1	• Screw, Metric-Slot Pan Hd M4 X 10 mm
–84	05J9577	1	• Kit, Pantocam Asm
–84A	09G7781	NP	• • Ferrite Ring
–85	512508	1	• Screw, Mach-Flat Hd 6-32 X 0.500
–86	1621191	3	• Screw, Metric-Slot Pan Hd M4 X 10 mm
			— Head Guide Kit, Model B11/B1A only —
–87	35L1063	1	• Kit, Head, Guide and Brush Asm (w/o cleaner blade)
–87A	35L1040	NP	• • Head Guide Asm
–87B	35L1569	1	• • Kit, Brush Asm, In Protective Tube, (see also on page 11-12)
–87C	35L1445	NP	• • • Brush Asm, Cleaning
–87D	1126828	NP	• • • Retainer, E-Clip
–87E	45G0145	NP	• • Head Protector, (Orange)
–87F	09L4687	NP	• • Connector, Inline, Vacuum
			— Head Guide Kit, E11/E1A only —
–87	35L0586	1	• Kit, Head, Guide and Brush Asm (w/o cleaner blade)
–87A	35L1175	NP	• • Head Guide Asm
–87B	35L1569	1	• • Kit, Brush Asm in protective tube (see also on page 11-12)
–87C	35L1445	NP	• • • Brush Asm, Cleaner
–87D	1126828	NP	• • • Retainer, E-Clip
–87E	45G0145	NP	• • Head Protector, (Orange)
			— Head Guide Kit, H11/H1A only —
–87	19P5779	1	• Kit, Head, Guide and Brush Asm (w/o cleaner blade)
–87A	19P5014	NP	• • Head Guide Asm
–87B	35L1569	1	• • Kit, Brush Asm in protective tube (see also on page 11-12)
–87C	35L1445	NP	• • • Brush Asm, Cleaner
–87D	1126828	NP	• • • Retainer, E-Clip
–87E	45G0145	NP	• • Head Protector, (Orange)
–88	1621490	3	• Screw, Metric-Spln Cap Hd M4 X 25 mm
–89	45G0094	1	• Decoupler Asm
–90	1621191	3	• Screw, Metric-Slot Pan Hd M4 X 10 mm
–91	4780523	1	• Sensor A, Tape Path
–92	45G0130	NP	• Hose Decoupler, 4.76 ID X 115 mm
			Part of Pneumatic Hose Kit, part number 45G0286
–93	45G0007	NP	• Deck Press Asm
–94	45G0010	1	• Motor Asm, File Reel
–95	1621200	3	• Screw, Metric-Slot Pan Hd M4 X 35 mm
–96	05J9807	1	• Transducer Asm
–97	1621194	3	• Screw, Metric-Slot Pan Hd M4 X 20 mm
–98	356742	3	• Clamp, Cable 1/4 in.
–99	1621190	3	• Screw, Metric-Slot Pan Hd M4 X 8 mm
–100	4780540	1	• Tape Guide, Center
–101	1621191	1	• Screw, Metric-Slot Pan Hd M4 X 10 mm
–102	05H2406	1	• Solenoid Asm

Assembly 3: (continued)

Asm–Index	Part Number	Units	Description
–103	45G0258	NP	• Bracket
–104	316807	1	• Screw, Mach-Flat Hd 6-32 X 0.375
–105	4780523	1	• Sensor B, Tape Path
–106	2102365	1	• Clamp, Cable 3/8 in.
–107	1621190	1	• Screw, Metric-Slot Pan Hd M4 X 8 mm

Assembly 4: Cable List

Asm–Index	Part Number	Units	Description
4–	NA	NP	Cable List
–	05H3226	AR	• Cable, ACF and Operator/CE Panel/IPS Sensor
–	19P5017	AR	• Cable, Motor/Loader/Sensors
–	05H4647	AR	• Cable, SCSI, 2.8 m
–	05H8911	AR	• Cable Asm AC Power (Drive-to-PCC)
–	05J9535	AR	• Cable, ACF Drive For illustration, see “FID A2: Drive/ACF Cable” on page 10-44
–	06J0056	AR	• Cable, ACF Transport (new style) For illustration, see Figure 10-22 on page 10-34
–	08L6082	AR	• Cable, Power Supply-to-Card Pack Used on new level power supplies only
–	45G0273	AR	• Cable, Motors (Power)
–	45G0275	AR	• Cable, Operator Panel Used on Model B1A/E1A/H1A. For illustration, see “FID 94: Operator Panel Cable (Model B1A/E1A/H1A Only)” on page 10-126.
–	46F4593	AR	• Cable, Line Cord, Watertight 6 ft
–	46F4594	AR	• Cable, Line Cord, Watertight 14 ft
–	46F6063	AR	• Cable, WTC Hardware
–	62G0681	AR	• Cable, ACF Operator Panel to Drive Used on Model B11/E11/H11. For illustration, see “FID 91: Operator/CE Panel Cable” on page 10-14.
–	62G1012	AR	• Cable, ACF LED For illustration, see “FID A4: LED Cable” on page 10-45.
–	62G1013	AR	• Cable, ACF Sensor For illustration, see “FID A5: Sensor Cable” on page 10-46.
–	62G1024	AR	• Cable, ACF Motors For illustration, see “FID A1: Motor Cable Assembly” on page 10-42. For SCSI cable information, see “SCSI Bus Attachment” on page 8-43.

Assembly 5: Installation Parts and Tools

Asm–Index	Part Number	Units	Description
5–	NA	NP	Part Listing
–	05H4724	AR	• ACF Motor Alignment Tool (see page 8-4)
–	05H3388	AR	• ACF Transport Position Adjustment Tool (see page 8-4)
–	05H9895	AR	• Adapter, Vacuum Gauge (see page 8-4)
–	39F3884	AR	• Block, RS-422 Wrap (see page 8-4)
–	05H2630	AR	• Bracket (see page 8-61)
–	45G0181	AR	• Bracket (see page 8-61)
–	45G0178	AR	• Bracket, Cable (see page 8-60)
–	45G0193	AR	• Bracket, Cable (see page 8-61)
–	05H4756	AR	• Bracket, Cable Retaining (see page 8-27)
–	05H3143	AR	• Bracket, Fiducial (see page 8-27)
–	05H4645	AR	• Cable, Device-to-Device (see page 8-45)
–	05H4646	AR	• Cable, Device-to-Device (see page 8-45)
–	05H4647	AR	• Cable, Device-to-Host (see page 8-45)
–	05H4648	AR	• Cable, Device-to-Host (see page 8-45)
–	05H4649	AR	• Cable, Device-to-Host (see page 8-45)
–	05H4650	AR	• Cable, Device-to-Host (see page 8-45)
–	05H4651	AR	• Cable, Device-to-Host (see page 8-45)
–	45G0275	AR	• Cable, Display (see page 8-25)
–	11P1345	AR	• Cable, Fibre, 7 m (23 ft) - LC/SC (see page 3-9)
–	11P1346	AR	• Cable, Fibre, 13 m (42.6 ft) - LC/SC (see page 3-9)
–	11P1347	AR	• Cable, Fibre, 22 m (72 ft) - LC/SC (see page 3-9)
–	11P1350	AR	• Cable, Fibre 61 m (200 ft) - LC/SC (see page 3-9)
–	19P0160	AR	• Cable, Fibre, 3 m (10 ft) - SC/SC (see page 3-9)
–	03K9201	AR	• Cable, Fibre, 5 m (16.4 ft) - SC/SC (see page 3-9)
–	54G3386	AR	• Cable, Fibre, 13 m (42.6 ft) - SC/SC (see page 3-9)
–	03K9203	AR	• Cable, Fibre, 25 m (82 ft) - SC/SC (see page 3-9)
–	54G3390	AR	• Cable, Fibre, 61 m (200 ft) - SC/SC (see page 3-9)
–	05H8953	AR	• Cable, RS-422 (see page 8-48)
–	05H8953	AR	• Cable, RS-422 (see page 8-47)
–	05H8981	AR	• Cable, RS-422 (see page 8-48)
–	05H8981	AR	• Cable, RS-422 (see page 8-47)
–	05H4644	AR	• Cable, SCSI Device-to-Device (see page 8-45)
–	05H4435	AR	• Cartridge, Cleaner (see page 8-3)
–	05H4434	AR	• Cartridge, Scratch (see page 8-3)
–	05H2629	AR	• Clamp, Cable (see page 8-60)
–	05H2629	AR	• Clamp, Cable (see page 8-61)
–	74F1823	AR	• Clip, Nut (see page 8-13)
–	74F1823	AR	• Clip, Nut (see page 8-16)
–	74F1823	AR	• Clip, Nut (see page 8-57)
–	74F1823	AR	• Clip, Nut (see page 8-58)
–	05H2342	AR	• Cover, 2-drive (see page 8-59)
–	05H2343	AR	• Cover, Blank-out (see page 8-59)
–	05H4255	AR	• Cover, Front (see page 8-27)
–	05H4671	AR	• Gap Set Tool (see page 8-4)
–	45G0188	AR	• Guide, Cable (see page 8-16)
–	45G0179	AR	• Guide, Cable (see page 8-57)
–	45G0188	AR	• Guide, Cable Pivot Arm, Cable (see page 8-14)
–	05H3834	AR	• Interposer, AS/400 with FC 9410 (see page 8-3)
–	05H3834	AR	• Interposer, AS/400 with FC 9410 (see page 8-64)
–	50G0460	AR	• Interposer, RS/6000 with FC 9702 (see page 8-3)
–	50G0460	AR	• Interposer, RS/6000 with FC 9702 (see page 8-64)
–	61G8323	AR	• Interposer, RS/6000 with FC 9701 (see page 8-3)

Assembly 5: (continued)

Asm–Index	Part Number	Units	Description
–	61G8323	AR	• Interposer, RS/6000 with FC 9701 (see page 8-64)
–	05H3895	AR	• Interposer Wrap Tool, Library Attachment (see page 8-4)
–	05H8904	AR	• Label, Address (see page 8-20)
–	44F0904	AR	• Label, Serial Number (see page 8-20)
–	44F0904	AR	• Label, Serial Number (see page 8-25)
–	1622332	AR	• Lockwasher (see page 8-27)
–	05H2347	AR	• Mount, Rack (see page 8-13)
–	05H2347	AR	• Mount, Rack (see page 8-16)
–	1622404	AR	• Nut (see page 8-57)
–	39F3450	AR	• Panel (see page 8-61)
–	05H2346	AR	• Panel, Rear Internal (see page 8-58)
–	05H8922	AR	• Plate, Shipping (see page 8-23)
–	05H9822	AR	• Plate, Shipping (see page 8-58)
–	05H7539	AR	• Scratch Cartridge (see page 8-4)
–	05H4782	AR	• Screw (see page 8-4)
–	05H4782	AR	• Screw (see page 8-44)
–	05H4782	AR	• Screw (see page 8-56)
–	05H8983	AR	• Screw (see page 8-6)
–	05H8983	AR	• Screw (see page 8-44)
–	05H8983	AR	• Screw (see page 8-56)
–	05H8983	AR	• Screw (see page 8-61)
–	1621197	AR	• Screw (see page 8-25)
–	1621197	AR	• Screw (see page 8-27)
–	1621308	AR	• Screw (see page 8-13)
–	1621308	AR	• Screw (see page 8-14)
–	1621537	AR	• Screw (see page 8-14)
–	1621537	AR	• Screw (see page 8-16)
–	1624765	AR	• Screw (see page 8-60)
–	1624775	AR	• Screw (see page 8-60)
–	1624778	AR	• Screw (see page 8-13)
–	1624778	AR	• Screw (see page 8-13)
–	1624778	AR	• Screw (see page 8-14)
–	1624778	AR	• Screw (see page 8-16)
–	1624778	AR	• Screw (see page 8-58)
–	1624778	AR	• Screw (see page 8-60)
–	1624780	AR	• Screw (see page 8-60)
–	45G0236	AR	• Shelf, Drive (see page 8-13)
–	45G0236	AR	• Shelf, Drive (see page 8-16)
–	05H2340	AR	• Slide, Rack Left (see page 8-12)
–	05H2340	AR	• Slide, Rack Left (see page 8-16)
–	05H2341	AR	• Slide, Rack Right (see page 8-12)
–	05H2341	AR	• Slide, Rack Right (see page 8-16)
–	05H4256	AR	• Slide, 3494 (see page 8-25)
–	6850663	AR	• Tape Removal Tool (see page 8-4)
–	05H4793	AR	• Terminator, SCSI (see page 8-6)
–	05H4793	AR	• Terminator, SCSI (see page 8-44)
–	05H4793	AR	• Terminator, SCSI (see page 8-56)
–	61G8324	AR	• Terminator, SCSI (see page 8-4)
–	61G8324	AR	• Terminator, SCSI (see page 8-44)
–	61G8324	AR	• Terminator, SCSI (see page 8-56)
–	05N6766	AR	• Wrap Duplex Adapter, LC/LC Fibre (see page 8-4)
–	19P0913	AR	• Wrap Duplex Adapter, SC/SC Fibre (see page 8-4)
–	34L2629	AR	• Wrap Tool, SC Fibre (see page 8-4.

Asm–Index	Part Number	Units	Description
–	08L9459	AR	• Wrap Tool, SC Fibre (see page 8-4.
–	11P3847	AR	• Wrap Tool, LC Fibre (see page 8-4.
–	62G1324	AR	• Wrap Tool, SCSI (see page 8-4)
–	05H9163	AR	• Wrap Tool, SCSI (see page 8-4)
–	62G1324	AR	• Wrap Tool, SCSI (see page 8-4)

Part Number Index

Appendix A

Contents

TAPEUTIL in a Sun (Solaris) System Environment

A SCSI Tape and Medium Changer Utility Program called *tapeutil* is provided with the IBM SCSI Tape and Medium Changer Device Driver for Solaris and installed in the */opt/IBMtape* directory as part of the IBMtape package. This program fulfills several purposes:

- It provides the following service aids for IBM tape subsystems:
  - Query Device Type/Verify Device Attachment
  - Query Device Serial Number
  - Query Device Microcode Level
  - Force Device Diagnostic Dump
  - Store Device Diagnostic Dump
  - Download Device Microcode
- It provides a menu-driven test tool for exercising or testing IBM tape and medium changer devices with a full suite of supported operations:
  - Reading/Writing Data
  - Tape Motion Commands
  - Setting/Displaying Device Information/Status
  - Mounting/Demounting Cartridges
  - Cartridge Inventory
- In addition to the menu-driven front end, the *tapeutil* program provides a command-line interface that is convenient for use in shell scripts.

  Note: When using the command-line calls to the *tapeutil* program, the tape device is opened and closed for each invocation. Configuration parameters that are changed in one call to the *tapeutil* program are returned to default values when the device is closed.
- The source code for the *tapeutil* program is provided for example purposes, and is installed in the */opt/IBMtape* directory during the IBMtape package installation. This source code is commented and demonstrates calls to all of the supported device driver entry points and *ioctl* commands, thus giving the application developer a starting point for interfacing to the IBMtape device driver.

The *tapeutil* program provides both an interactive menu-driven interface as well as a command-line interface. If the *tapeutil* program is invoked with no command-line parameters, the menu-driven version will be started. In the menu-driven version, the device to be operated on should first be opened using option 1. Other options may then be selected.

The user will be prompted for additional information if required for the specific options selected. The results of a command are displayed after it is executed. If an error occurs for the command, error information and device sense data are displayed. The device can be closed using option 2, or it will automatically be closed when the Quit option is selected. The menu is automatically displayed once when the program is first invoked. To prevent unnecessary scrolling of the screen, the menu is not automatically displayed again after each command, but is instead refreshed only after the M (menu refresh) command is entered.

Figure B-1 on page B-3 shows the menu that is displayed by the *tapeutil* program.

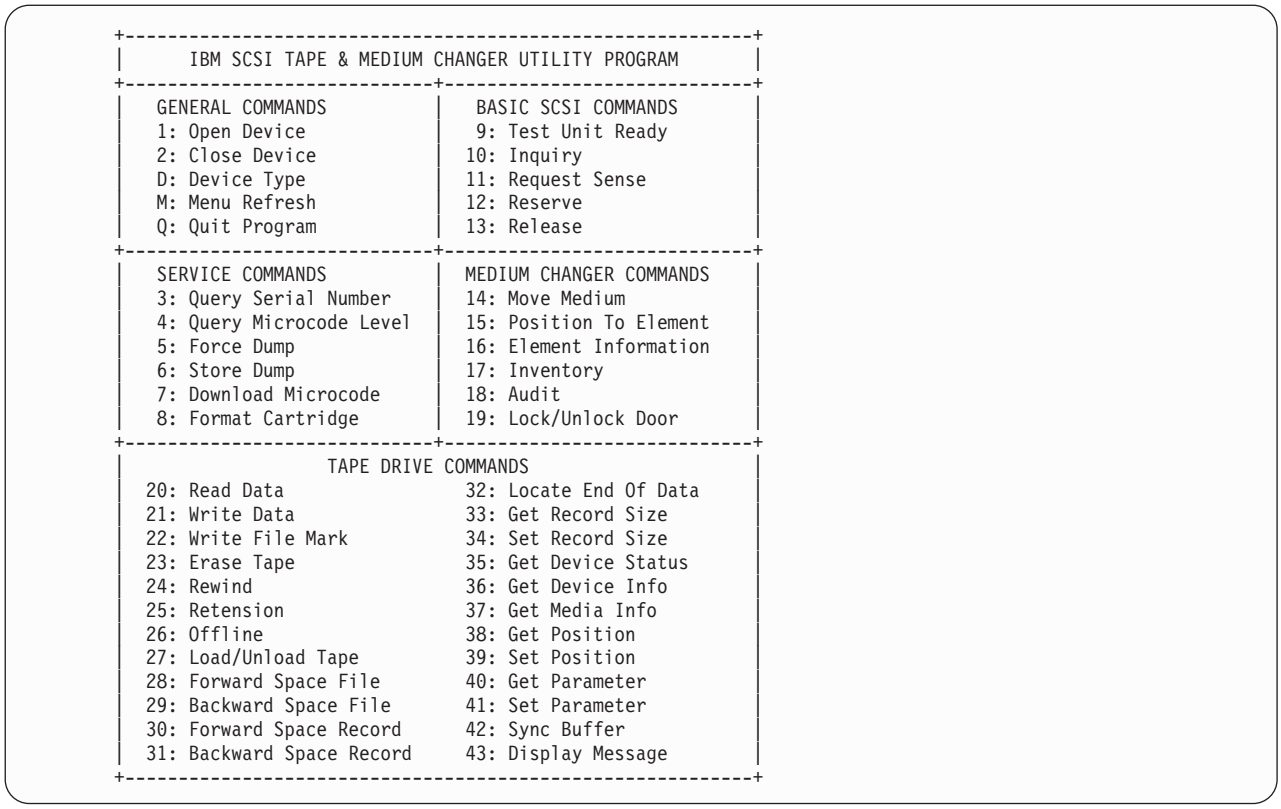


Figure B-1. TAPEUTIL Program Menu

If command-line parameters are provided when the program is invoked, the command-line mode will be started. For each command-line execution of the program, the device is first opened, the specific command is issued, and the device is then closed. The program can be driven from within a shell script if desired. Results of the operation will be displayed only when executed in verbose mode. No information is displayed when not in verbose mode. This is particularly useful for quiet shell script implementations. A completion code, as defined in */usr/include/sys/errno.h* for the operation requested is always returned from the program upon exit (in both verbose and quiet mode).

Note: Options 4 through 8 of the *tapeutil* program supported **only** by the IBM 3570 Magstar MP Tape Subsystem and the IBM 3590 High Performance Tape Subsystem.

The usage of the *tapeutil* program in command-line mode is as follows:

```
tapeutil -f device -o operation [options]
```

where **device** is the name of the tape device special file (for example: /dev/rmt/1st) and **operation** is one of the values listed below. The device special file and the operation are required. The specific **options** associated with a particular operation are indicated in Table B-1 on page B-4, Table B-2 on page B-4, Table B-3 on page B-4 and Table B-4 on page B-4. Parameters enclosed in square brackets are optional. All others are required.

Table B-1. Service Commands and Syntax

Service Commands	**Syntax**
Query Serial Number	tapeutil -f **f**.-o qsn [-w w][-v]
Query Microcode Level	tapeutil -f **f**.-o qmc [-w w][-v]
Force Dump	tapeutil -f **f**.-o fdp [-w w][-v]
Store Dump	tapeutil -f **f**.-o sdp [-w w][-v] -z **z**
Download Microcode	tapeutil -f **f**.-o dmc [-w w][-v] -z **z**
Format Cartridge	tapeutil -f **f**.-o fmt [-w w][-v]
Query Device Type	tapeutil -f **f**.-o chk [-w w][-v]

Table B-2. Basic SCSI Commands and Syntax

Basic SCSI Commands	**Syntax**
Test unit Ready	tapeutil -f **f**.-o tur [-w w][-v]
Inquiry	tapeutil -f **f**.-o inq [-w w][-v]
Request Sense	tapeutil -f **f**.-o req [-w w][-v]
Reserved	tapeutil -f **f**.-o res [-w w][-v]
Reserved	tapeutil -f **f**.-o rel [-w w][-v]

Table B-3. Medium Changer Commands and Syntax

Medium Changer Commands	**Syntax**
Move Medium	tapeutil -f **f**.-o mov [-w w][-v] -s **s** -d **d**
Position To Element	tapeutil -f **f**.-o pos [-w w][-v] -s **s**
Element Information	tapeutil -f **f**.-o ele [-w w][-v]
Inventory	tapeutil -f **f**.-o inv [-w w][-v]
Audit	tapeutil -f **f**.-o aud [-w w][-v]
Lock/Unlock Door	tapeutil -f **f**.-o lck [-w w][-v] -x **x**

Table B-4. Tape Drive Commands and Syntax

Tape Drive Commands	**Syntax**
Read	tapeutil -f **f**.-o rea [-w w][-v] -b **b** -n **n** -m **m**
Write	tapeutil -f **f**.-o wri [-w w][-v] -b **b** -n **n** -m **m** [-r **r**] [-z **z**]
Write File Mark	tapeutil -f **f**.-o eof [-w w][-v] -c **c**
Erase Tape	tapeutil -f **f**.-o era [-w w][-v]
Rewind	tapeutil -f **f**.-o rew [-w w][-v]
Retension	tapeutil -f **f**.-o ret [-w w][-v]
Offline	tapeutil -f **f**.-o off [-w w][-v]
Load/Unload Tape	tapeutil -f **f**.-o lod [-w w][-v] -x **x**
Forward Space File	tapeutil -f **f**.-o fsf [-w w][-v] -c **c**
Backward Space File	tapeutil -f **f**.-o bsf [-w w][-v] -c **c**
Forward Space Record	tapeutil -f **f**.-o fsr [-w w][-v] -c **c**
Backward Space Record	tapeutil -f **f**.-o bsr [-w w][-v] -c **c**
Locate End of Data	tapeutil -f **f**.-o eod [-w w][-v]

Table B-4. Tape Drive Commands and Syntax (continued)

Tape Drive Commands	Syntax
Get Record Size	tapeutil -f **f**.-o grs [-w w][-v]
Set Record Size	tapeutil -f **f**.-o srs [-w w][-v]
Get Device Status	tapeutil -f **f**.-o gds [-w w][-v]
Get Device Information	tapeutil -f **f**.-o gdi [-w w][-v]
Get Media Information	tapeutil -f **f**.-o gmi [-w w][-v]
Get Position	tapeutil -f **f**.-o gpo [-w w][-v] -t **t**
Set Position	tapeutil -f **f**.-o spo [-w w][-v] -t **t** -x **x**
Get Parameter	tapeutil -f **f**.-o gpa [-w w][-v] -t **t**
Set Parameter	tapeutil -f **f**.-o spa [-w w][-v] -t **t** -x **x**
Sync Buffer	tapeutil -f **f**.-o syn [-w w][-v]
Display Message	tapeutil -f **f**.-o msg [-w w][-v] -t **t** -y **y1,y1**

Note: Invoking the *tapeutil* program with the **-h** flag (for example, **tapeutil -h**) or the **-?** flag (for example, **tapeutil -?**) will display the usage help information.

The supported flags, their meanings, their associated operations, and their acceptable ranges are as follows:

Flag **Description**

-? Usage Help (stand-alone flag) {no value required}

-b Block Size (rea, wri) {0 < (block size x blocking factor) <2097152}

-c Operation Count (eof, fsf, fsr, bsf, bsr) {0 - 65535}

-d Destination Address (mov) {device specific, determine range from Element Info}

-f Device Special File Name (always required) {/dev/rmt/0mn or similar}

-h Usage Help (stand-alone flag) {no value required}

-m Multiples to Read or Write (rea, wri) {0 - 2097152}

-n Blocking Factor (rea, wri) {0 > (block size x blocking factor) <2097152}

-o Operation (always required) {refer to previous list}

-r Random Seed (wri) {0 - 65535}

-s Source Address (mov, pos) {device specific, determine range from Element Info}

-t Type of Parameter Value

- (gpo) {1=logical block, 2=physical block}
- (spo) {1=logical block, 2=physical block}
- (gpa) {1=block size, 2=compression, 3=buffering, 4=immediate, 5=trailer, 6=write protect, 7=acf mode, 8=capacity, 9=sili}
- (spa) {1=block size, 2=compression, 3=buffering, 4=immediate, 5=trailer, 6=write protect, 8=capacity, 9=sili}
- (msg) {1=display msg0, 2=display msg1, 3=flash msg0, 4=flash msg1, 5=alternate msg1/msg2}

-v Verbose Mode (optional for all commands, stand-alone flag) {no value required, absence of flag means quiet mode}

-w Open Mode (optional for all commands) {1=read/write, 2=read only (default), 3=write only, 4=append}

-x Parameter Value

- (lck) {1=lock, 2=unlock}
- (lod) {1=load, 2=unload}
- (srs) {0 - 65536}
- (spo) {0 - 65535}
- (spa) {0 - 65535}

-y Messages (msg) {message1,message2}

-z Input/Output File Name

- (sdp) {path and name of the file in which to store dump}
- (dmc) {path and name of the microcode image file}
- (wri) {path and name of the file containing write data pattern}

Notes:

1. For read and write operations, the size of one buffer of data transferred during a single SCSI read or write command is determined by the product of the *Block Size* value and the *B Factor* value. The number of these buffers transferred is determined by *Multiplier* value. The actual total number of bytes transferred is then (Block Size) x (Blocking Factor) x (Multiplier). If the device is set to fixed block mode (block size not equal to zero), the product of *Block Size* and *Blocking Factor* must be a multiple of the device block size setting.
2. For further information on the Get Parameter (gpa) and Set Parameter (spa) operations, refer to the STIOC_GET_PARM and STIOC_SET_PARM ioctl commands described in the *Programming Reference*.

The following examples should help to demonstrate and clarify the command-line usage of the *tapeutil* program. For all examples, substitute the actual value of the special file associated with the target device.

- To query the serial number of the device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0st -o qsn -v
```

- To request inquiry data from the device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0st -o inq -v
```

- To move a cartridge from cell 32 to the tape drive (16):

```
/opt/IBMtape/tapeutil -f /dev/rmt/0smc -o mov -s 32 -d 16 -v
```

- To set the block size of the device to 64K:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0st -o spa -t 1 -x 65535 -v
```

- To write 100 64K blocks of data to the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0stn -w 1 -o wri -b 65535
-n 1 -m 100 -v
```

- To write two file marks to the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0stn -w 1 -o eof -c 2 -v
```

- To rewind the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0stn -o rew -v
```

- To read 100 64K blocks of data from the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0stn -o rea -b 65535 -n 1 -m
100 -v
```

TAPEUTIL in HP-UX System Environment

Introduction

A SCSI Tape and Medium Changer Utility Program called *tapeutil* is provided with the IBM SCSI Tape and Medium Changer Device Driver for HP-UX and installed in the */usr/bin* directory. The *tapeutil* program fulfills several purposes:

- It provides the following service aids for IBM tape subsystems:
  - Query Device Type/Verify Device Attachment
  - Query Device Serial Number
  - Query Device Microcode Level
  - Force Device Diagnostic Dump
  - Store Device Diagnostic Dump
  - Download Device Microcode
- It provides a menu-driven test tool for exercising or testing IBM tape and medium changer devices with a full suite of supported operations:
  - Reading/Writing Data
  - Tape Motion Commands
  - Setting/Displaying Device Information/Status
  - Mounting/Demounting Cartridges
  - Cartridge Inventory
- In addition to the menu-driven front end, the tapeutil program provides a command-line interface which is convenient for use in shell scripts.
- The source code for the tapeutil program is provided for example purposes, and is installed in the *tapeutil* directory during the tapeutil package installation. This source code is commented and demonstrates calls to all of the supported device driver entry points and *ioctl* commands, thus giving the application developer a starting point for interfacing to the HP-UX device driver.

The tapeutil program provides both an interactive menu-driven interface as well as a command-line interface. If the tapeutil program is invoked with no command-line parameters, the menu-driven version will be started. In the menu-driven version, the device to be operated on should first be opened using option 1. Other options may then be selected. The user will be prompted for additional information if required for the specific options selected. The results of a command are displayed after it is executed. If an error occurs for the command, error information and device sense data are displayed. The device can be closed using option 2, or it will automatically be closed when the Quit option is selected. The menu is automatically displayed once when the program is first invoked. To prevent unnecessary scrolling of the screen, the menu is not automatically displayed again after each command, but is instead refreshed only after the M (menu refresh) command is entered.

Interactive Menu-Driven Interface

Figure B-2 on page B-8 shows the menu that is displayed by the *tapeutil* program when the program is invoked, and no command-line parameters are entered:

```
+-------------------------------------------------------------+
|      IBM SCSI TAPE & MEDIUM CHANGER UTILITY PROGRAM         |
+-----------------------------+-------------------------------+
|   GENERAL COMMANDS          |  BASIC SCSI COMMANDS          |
|   1: Open Device            |   9: Test Unit Ready          |
|   2: Close Device           |  10: Inquiry                  |
|   D: Device Type            |  11: Request Sense            |
|   M: Menu Refresh           |  12: Reserve                  |
|   Q: Quit Program           |  13: Release                  |
+-----------------------------+-------------------------------+
|   SERVICE COMMANDS          | MEDIUM CHANGER COMMANDS       |
|   3: Query Serial Number    |  14: Move Medium              |
|   4: Query Microcode Level  |  15: Position To Element      |
|   5: Force Dump             |  16: Element Information      |
|   6: Store Dump             |  17: Inventory                |
|   7: Download Microcode     |  18: Audit                    |
|   8: Format Cartridge       |  19: Lock/Unlock Door         |
+-----------------------------+-------------------------------+
|                    TAPE DRIVE COMMANDS                      |
|  20: Read Data                32: Locate End Of Data        |
|  21: Write Data               33: Get Record Size           |
|  22: Write File Mark          34: Set Record Size           |
|  23: Erase Tape               35: Get Device Status         |
|  24: Rewind                   36: Get Device Info           |
|  25: Retension                37: Get Media Info            |
|  26: Offline                  38: Get Position              |
|  27: Load/Unload Tape         39: Set Position              |
|  28: Forward Space File       40: Get Parameter             |
|  29: Backward Space File      41: Set Parameter             |
|  30: Forward Space Record     42: Sync Buffer               |
|  31: Backward Space Record    43: Display Message           |
+-------------------------------------------------------------+
```

Figure B-2. TAPEUTIL Program Menu

Command-Line Mode

If command-line parameters are provided when the *tapeutil* program is invoked, the command-line mode will be started. For each command-line execution of the program, the device is first opened, the specific command is issued, and the device is then closed. The program can be driven from within a shell script if desired. Results of the operation will be displayed only when executed in verbose mode. No information is displayed when not in verbose mode. This is particularly useful for quiet shell script implementations. A completion code, as defined in */usr/include/sys/errno.h* for the operation requested is always returned from the program upon exit (in both verbose and quiet mode).

Command-Line Commands and Syntax

The usage of the *tapeutil* program in command-line mode is as follows:

```
  tapeutil -f device -o
operation [options]
```

where **device** is the name of the tape device special file (for example: /dev/rmt/1m) and **operation** is one of the values listed below. The device special file and the operation are required. The specific **options** associated with a particular operation are indicated in Table B-5, Table B-6 on page B-9, Table B-7 on page B-9 and Table B-8 on page B-10. Parameters enclosed in square brackets are optional. All others are required.

Table B-5. Service Commands and Syntax

Service Commands	Syntax
Query Serial Number	tapeutil -f **f**.-o qsn [-w w][-v]
Query Microcode Level	tapeutil -f **f**.-o qmc [-w w][-v]
Force Dump	tapeutil -f **f**.-o fdp [-w w][-v]

Table B-5. Service Commands and Syntax (continued)

Service Commands	**Syntax**
Store Dump	tapeutil -f **f**.-o sdp [-w w][-v] -z **z**
Download Microcode	tapeutil -f **f**.-o dmc [-w w][-v] -z **z**
Format Cartridge	tapeutil -f **f**.-o fmt [-w w][-v]
Query Device Type	tapeutil -f **f**.-o chk [-w w][-v]

Table B-6. Basic SCSI Commands and Syntax

Basic SCSI Commands	**Syntax**
Test unit Ready	tapeutil -f **f**.-o tur [-w w][-v]
Inquiry	tapeutil -f **f**.-o inq [-w w][-v]
Request Sense	tapeutil -f **f**.-o req [-w w][-v]
Reserved	tapeutil -f **f**.-o res [-w w][-v]
Reserved	tapeutil -f **f**.-o rel [-w w][-v]

Table B-7. Medium Changer Commands and Syntax

Medium Changer Commands	**Syntax**
Move Medium	tapeutil -f **f**.-o mov [-w w][-v] -s **s** -d **d**
Position To Element	tapeutil -f **f**.-o pos [-w w][-v] -s **s**
Element Information	tapeutil -f **f**.-o ele [-w w][-v]
Inventory	tapeutil -f **f**.-o inv [-w w][-v]
Audit	tapeutil -f **f**.-o aud [-w w][-v]
Lock/Unlock Door	tapeutil -f **f**.-o lck [-w w][-v] -x **x**

Table B-8. Tape Drive Commands and Syntax

Tape Drive Commands	Syntax
Read	tapeutil -f **f**.-o rea [-w w][-v] -b **b** -n **n** -m **m**
Write	tapeutil -f **f**.-o wri [-w w][-v] -b **b** -n **n** -m **m** [-r **r**] [-z **z**]
Write File Mark	tapeutil -f **f**.-o eof [-w w][-v] -c **c**
Erase Tape	tapeutil -f **f**.-o era [-w w][-v]
Rewind	tapeutil -f **f**.-o rew [-w w][-v]
Retension	tapeutil -f **f**.-o ret [-w w][-v]
Offline	tapeutil -f **f**.-o off [-w w][-v]
Load/Unload Tape	tapeutil -f **f**.-o lod [-w w][-v] -x **x**
Forward Space File	tapeutil -f **f**.-o fsf [-w w][-v] -c **c**
Backward Space File	tapeutil -f **f**.-o bsf [-w w][-v] -c **c**
Forward Space Record	tapeutil -f **f**.-o fsr [-w w][-v] -c **c**
Backward Space Record	tapeutil -f **f**.-o bsr [-w w][-v] -c **c**
Locate End of Data	tapeutil -f **f**.-o eod [-w w][-v]
Get Record Size	tapeutil -f **f**.-o grs [-w w][-v]
Set Record Size	tapeutil -f **f**.-o srs [-w w][-v]
Get Device Status	tapeutil -f **f**.-o gds [-w w][-v]
Get Device Information	tapeutil -f **f**.-o gdi [-w w][-v]
Get Media Information	tapeutil -f **f**.-o gmi [-w w][-v]
Get Position	tapeutil -f **f**.-o gpo [-w w][-v] -t **t**
Set Position	tapeutil -f **f**.-o spo [-w w][-v] -t **t** -x **x**
Get Parameter	tapeutil -f **f**.-o gpa [-w w][-v] -t **t**
Set Parameter	tapeutil -f **f**.-o spa [-w w][-v] -t **t** -x **x**
Sync Buffer	tapeutil -f **f**.-o syn [-w w][-v]
Display Message	tapeutil -f **f**.-o msg [-w w][-v] -t **t** -y **y1,y1**

Note: Invoking the *tapeutil* program with the **-h** flag (for example, **tapeutil -h**) or the **-?** flag (for example, **tapeutil -?**) will display the usage help information.

Flag Descriptions

The supported flags, their meanings, their associated operations, and their acceptable ranges are as follows:

Flag **Description**

-? Usage Help (stand-alone flag) {no value required}

-b Block Size (rea, wri) {0 < (block size x blocking factor) <2097152}

-c Operation Count (eof, fsf, fsr, bsf, bsr) {0 - 65535}

-d Destination Address (mov) {device specific, determine range from Element Info}

-f Device Special File Name (always required) {/dev/rmt/0mn or similar}

-h Usage Help (stand-alone flag) {no value required}

-m Multiples to Read or Write (rea, wri) {0 - 2097152}

-n Blocking Factor (rea, wri) {0 > (block size x blocking factor) <2097152}

-o Operation (always required) {refer to previous list}

-r Random Seed (wri) {0 - 65535}

-s Source Address (mov, pos) {device specific, determine range from Element Info}

-t Type of Parameter Value

- (gpo) {1=logical block, 2=physical block}
- (spo) {1=logical block, 2=physical block}
- (gpa) {1=block size, 2=compression, 3=buffering, 4=immediate, 5=trailer, 6=write protect, 7=acf mode, 8=capacity, 9=sili}
- (spa) {1=block size, 2=compression, 3=buffering, 4=immediate, 5=trailer, 6=write protect, 8=capacity, 9=sili}
- (msg) {1=display msg0, 2=display msg1, 3=flash msg0, 4=flash msg1, 5=alternate msg1/msg2}

-v Verbose Mode (optional for all commands, stand-alone flag) {no value required, absence of flag means quiet mode}

-w Open Mode (optional for all commands) {1=read/write, 2=read only (default), 3=write only, 4=append}

-x Parameter Value

- (lck) {1=lock, 2=unlock}
- (lod) {1=load, 2=unload}
- (spo) {0 - 65535}
- (spa) {0 - 65535}

-y Messages (msg) {message1,message2}

-z Input/Output File Name

- (sdp) {path and name of the file in which to store dump}
- (dmc) {path and name of the microcode image file}
- (wri) {path and name of the file containing write data pattern}

Notes:

1. For read and write operations, the size of one buffer of data transferred during a single SCSI read or write command is determined by the product of the *Block Size* value and the *B Factor* value. The number of these buffers transferred is determined by *Multiplier* value. The actual total number of bytes transferred is then (Block Size) x (Blocking Factor) x (Multiplier). If the device is set to fixed block mode (block size not equal to zero), the product of *Block Size* and *Blocking Factor* must be a multiple of the device block size setting.
2. For further information on the Get Parameter (gpa) and Set Parameter (spa) operations, refer to the STIOC_GET_PARM and STIOC_SET_PARM ioctl commands described in the *Programming Reference*.

Examples

The following examples should help to demonstrate and clarify the command-line usage of the *tapeutil* program. For all examples, substitute the actual value of the special file associated with the target device.

- To query the serial number of the device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0m -o qsn -v
```

- To request inquiry data from the device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0m -o inq -v
```

- To move a cartridge from cell 32 to the tape drive (16):

```
/opt/IBMtape/tapeutil -f /dev/rmt/0smc -o mov -s 32 -d 16 -v
```

- To write 100 64K blocks of data to the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0mn -w 1 -o wri -b 65535
-n 1 -m 100 -v
```

- To write two file marks to the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0mn -w 1 -o eof -c 2 -v
```

- To rewind the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0mn -o rew -v
```

- To read 100 64K blocks of data from the tape device:

```
/opt/IBMtape/tapeutil -f /dev/rmt/0mn -o rea -b 65535
-n 1 -m 100  -v
```

TAPEUTIL in Windows NT or Windows 2000 System Environment

NT Utility Program

The Magstar device is supported on Intel-based processors with a minimum processor level of Intel 486DX or Pentium with sufficient RAM and disk space for operation of the Microsoft Windows NT or Windows 2000 operating system.

The utility has these general characteristics:

- Can be driven interactively or from a file (batch mode).
- Allows specification of desired results from each step of the test so that the test can be self-checking.
- Allows testing of all device driver interfaces with both valid and invalid parameters.

Invoking NTUTIL

The tool can be invoked as a command from the command line or from within a shell script:

```
ntutil <-f input-file> <-o output-file> <-t tape-path-special-file-name>
       <-c changer-path-special-file-name> <-l library-mode-on>
       <-d debug-trace-on>
```

The options are:

```
-f input-file       Specifies the input file for batch mode.
                    If a file is specified, NTUTIL will execute in
                    batch mode and read input from this file.
                    The default for this file is NTUTIL.in.

-o output-file      Specifies the output file.
                    The default for this file is NTUTIL.out.

-t tape-path-special-file-name
                    Specifies the special file value
                    (for example, tape0) to substitute on the
                    "open" statement in the input file.

-c changer-path-special-file-name
                    Specifies the changer device special file value
                    (for example, 1b0.1.2.3) to substitute when
                    executing an open (for both batch and
                    interactive mode). The special value
                    def_lun_1 specifies that an open uses the
                    default lun associated with the
                    tape-special-file-name.

-l library-mode-on  Specifies that an ope will open both the tape
                    path special file and the changer path special
                    file (for both batch and interactive mode).

-d debug-trace-on   Turns on internal tracing printouts in the
                    output file. Used only to debug the tool
                    itself.
```

Note: If no parameters are specified, NTUTIL will operate in interactive mode.

Interactive Mode

When NTUTIL is invoked without the *-f* flag, it defaults to running in interactive or manual mode. This mode allows a developer to interactively determine the kind of testing to be done. When in interactive mode, NTUTIL provides a menu of functions that can be performed.

For a description of interactive modes, see “Interactive Mode”.

The two modes are:

- Base mode (LUN0) commands such as open/close/read/write

- Library mode (LUN0 and LUN1) that supports open/close/read/write plus media mover commands such as read element status and move media.

The 3590 must be in Random 2 LUN mode and the other devices must be in Random mode both when booted and to operate NTUTIL in library mode.

Base mode (only LUN 0 is accessed) is shown in Figure B-3

Library mode (LUN 0 and LUN 1 are accessed) is shown in Figure B-4 on page B-15

Base Mode

The Base Mode menu follows:

```
MANUAL TEST MENU:
+-----------------------------------------------------------------+
| 1: set device special file            2: display symbols        |
| 3: set block size R/W (now !0 fixed)  4: set block count (R/W)  |
| 5: set return error when fail         6: set/reset trace        |
| 7: set exit on unexpected result      8: Library Mode           |
+-----------------------------------------------------------------+
|20: open                             21: close                   |
|22: read                             23: write                   |
|24: read and display block           25: flush (buffer->media)   |
|26: read block id                    27: erase                   |
|28: locate block id                  29: display block data      |
+-----------------------------------------------------------------+
|30: write filemark(s)                31: rewind                  |
|32: forward space filemark(s)        33: unload                  |
|34: reverse space filemark(s)        35: load (3590 Sys Mode)    |
|36: forward space record(s)          37: return error            |
|38: reverse space record(s)          39: test unit ready         |
|43: set media parms (block size)     44: set dev parms (comp.    |
|46: get device information                                       |
|48: get medium information           49: inquiry                 |
|53: space EOD                        54: display message         |
+-----------------------------------------------------------------+
|70: system command                                               |
|                                                                 |
+-----------------------------------------------------------------+
|80: Force Dump                       81: Read Dump               |
|82: Update Code                      83: Log Sense               |
|84: Get Last Sense                   85: Get Version             |
|86: Associative/Persistant WProtect  87: Read/Write Test         |
|88: Find Devices                     89: Get MTDevice info       |
+-----------------------------------------------------------------+
|99: return to main menu                                          |
|                                                                 |
+-----------------------------------------------------------------+
enter selection:
```

Figure B-3. Base Mode

Library Mode

The Library Mode menu follows:

```
MANUAL TEST MENU:
+-----------------------------------------------------------------+
| 1: set device special file            2: display symbols        |
| 3: set block size R/W (now !0 fixed)  4: set block count (R/W)  |
| 5: set return error when fail         6: set/reset trace        |
| 7: set exit on unexpected result      8: Base Mode              |
+-----------------------------------------------------------------+
|10: ioctl return library inventory     11: ioctl move medium     |
|12: ioctl initialize element status                              |
+-----------------------------------------------------------------+
|20: open                               21: close                 |
|22: read                               23: write                 |
|24: read and display block             25: flush (buffer->media) |
|26: read block id                      27: erase                 |
|28: locate block id                    29: display block data    |
+-----------------------------------------------------------------+
|30: write filemark(s)                  31: rewind                |
|32: forward space filemark(s)          33: unload                |
|34: reverse space filemark(s)          35: load (3590 Sys Mode)  |
|36: forward space record(s)            37: return error          |
|38: reverse space record(s)            39: test unit ready       |
|43: set media parms (block size)       44: set dev parms (comp.) |
|46: get device information                                       |
|48: get medium information             49: inquiry               |
|53: space EOD                          54: display message       |
+-----------------------------------------------------------------+
|70: system command                                               |
|                                                                 |
+-----------------------------------------------------------------+
|80: Force Dump                         81: Read Dump             |
|82: Update Code                        83: Log Sense             |
|84: Get Last Sense                     85: Get Version           |
|86: Associative/Persistant WProtect    87: Read/Write Test       |
|88: Find Devices                       89: Get MTDevice info     |
+-----------------------------------------------------------------+
|99: return to main menu                                          |
|                                                                 |
+-----------------------------------------------------------------+
enter selection:
```

Figure B-4. Library Mode

TAPEUTIL in Linux System Environment

The 3590 device is supported on Linux operating system. See “LINUX System Attachment” on page 8-51.

Appendix B

Notices

References in this publication to IBM programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program, or service. Evaluation and verification of operation in conjunction with other products, except those expressly designed by IBM, is the user's responsibility.

This publication could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the products and/or programs described in this publication at any time.

This document contains general information, as well as requirements, for use on IBM and third-party products. IBM makes no warranty, express or implied, as to its completeness or accuracy, and the data contained herein is current only as of the date of publication. It assumes that the user understands the relationship among any affected systems, machines, programs, and media.

IBM or third parties may have patents or pending patent applications covering subject matter described in this document, including appearance design patents or applications. The furnishing of this document does not constitute or imply a grant of any license under any patents, patent applications, trademarks, copyright, or other rights of IBM or of any third party, or any right to refer to IBM in any advertising or other promotional or marketing activities. IBM assumes no responsibility for any infringement of patents or other rights that may result from use of this document or from the manufacture, use, lease, or sale of apparatus described herein.

Licenses under IBM's utility patents are available on reasonable and non-discriminatory terms and conditions. IBM does not grant licenses under its appearance design patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood NY 10594, U.S.A.

For online versions of this book, we authorize you to:

- Copy, modify, and print the documentation contained on the media, for use within your enterprise, provided you reproduce the copyright notice, all warning statements, and other required statements on each copy or partial copy.
- Transfer the original unaltered copy of the documentation when you transfer the related IBM product (which may be either machines you own, or programs, if the program's license terms permit a transfer). You must, at the same time, destroy all other copies of the documentation.

You are responsible for payment of any taxes, including personal property taxes, resulting from this authorization.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Some jurisdictions do not allow the exclusion of implied warranties, so the above exclusion may not apply to you.

Your failure to comply with the terms above terminates this authorization. Upon termination, you must destroy your machine readable documentation.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries, or both:

9076 SP2	AIX®	AIX 6000	Application System/400
iSeries/AS400 (OS/400) System	Enterprise System/9000®	ES/9000®	ESCON
IBM	POWERparallel	RISC System/6000	pSeries/RS6000 (AIX) System
pSeries/RS6000 (AIX) System	Scalable POWERparallel Systems	SP2	zSeries (S/390)®

The following terms are trademarks of other companies:

StorageTek is a registered trademark of Storage Technology Corporation.

Sun, Solaris, and SunOS are registered trademarks of Sun Microsystems, Inc.

Pentium® is a registered trademark of Intel Corporation.

TDS is a registered trademark of Texas Digital Systems, Inc.

3M is a registered trademark of Minnesota Mining and Manufacturing Co.

UNIX® is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Windows, Windows NT, and Windows 2000 are trademarks of Microsoft Corporation.

HP/UX is a registered trademark of Hewlett Packard Corporation.

Symbols

The following symbols are used in this manual:

Symbol	Description
	Imprinted on the panel to indicate that the device requires service if the Processor Check LED is on. Also imprinted on the Change Mode switch to allow the CE to change between the operator menus and the CE menus.
	Displayed on the panel to indicate that trace data is stored in the device. Also printed in text as an *attention* notice.
	Printed in text and in figures to indicate an ESD-sensitive part.
	Printed in text and in figures to indicate a Class I Laser device is installed.
	Displayed on the panel to indicate that the thumbwheel on the cartridge is set to the file-protected position. Also imprinted on the magazine of the ACF to indicate the position where the magazine door is locked.
	Displayed on the panel to indicate that the host file-protected the volume.
	Displayed on the panel to indicate that the thumbwheel on the cartridge is set to the not file-protected position. Also imprinted on the magazine of the ACF to indicate the position where the magazine door is unlocked.

Communication Statements

Federal Communications Commission (FCC) Statement

Federal Communications Commission (FCC) Class A Statement: **Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Union (EU) Electromagnetic Compatibility Directive: This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

Industry Canada Class A Emission Compliance Statement: This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada: Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

Japan VCCI Class A ITE Electronic Emission Statement:

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

vcci

Laser Information

These products comply with the performance standards set by the U.S. Food and Drug Administration for a Class I laser product.

Figure C-1. Laser Safety Label – Class I

This means that these products belong to a class of laser products that do not emit hazardous laser radiation. This classification was accomplished by providing the necessary protective housings and scanning safeguards to ensure that laser radiation is inaccessible during operation or is within Class I limits. These products have been reviewed by external safety agencies and have obtained approvals to the latest standards as they apply to this product type.

Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication. If you do not find the term you are looking for, refer to the index or to the *Dictionary of Computing,*ZC20-1699.

Italicized text indicates terms found elsewhere in this glossary.

A

ac. Alternating current

access method. A technique for moving data between main storage and input or output devices

ACF. Automatic cartridge facility

adj. Adjustment

AEN. Asynchronous event notification

AIX. Advanced Interactive Executive. IBM's implementation of the UNIX operating system. The RS/6000 system, among others, runs the AIX operating system

AL_PA. Arbitrated Loop Physical Address

alter. To change

ANSI. American National Standards Institute

ARTIC. A real time interface processor. In a tape library, the RS-422 communication path between the 3590 and the library manager

ASCII. American National Standard Code for Information Interchange. A 7-bit coded character set (8 bits including parity check) that consists of control characters and graphic characters

asm. Assembly

assigning a device. The establishing of the relationship of a device to a running task, process, job, or program

assignment. The naming of a specific device to perform a function

assistance. Aid

asynchronous. Pertaining to two or more processes that do not depend upon the occurrence of specific events such as common timing signals

attention (notice). A word for calling attention to the possibility of danger to a program, device, or system, or to data. Contrast with *caution* and *danger*

ATTN. Attention

B

backhitch. Magnetic tape that makes a slight backward motion just prior to moving forward

backup. To make additional copies of documents or software for safekeeping

BCR. Buffer channel remainder register

BCSE. Buffer channel status/error register

BDSE. Buffer device status/error register

beginning-of-tape (BOT). The location on a magnetic tape that indicates the start of the permissible recording area

bezel. Decorative and safety cover

bicolored. Having two colors

BM or bill of materials. A list of specific types and amounts of direct materials expected to be used to produce a given job or quantity of output

BOB. Beginning-of-block

BOT. Beginning-of-tape

buffer. A routine or storage used to compensate for a difference in rate of flow of data or time of occurrence of events, when transferring data from one device to another

bus . A facility for transferring data between several devices located between two end points, only one device being able to transmit at a given moment

C

caution (notice). A word to call attention to possible personal harm to people. Contrast with *attention* and *danger*

CCW. Channel command word

CCW chain. A list of channel command words to be performed in sequence

CE. Customer engineer; field engineer; service representative

CEM. customer engineering memorandum

CER. Channel error register

cfgmgr. Configuration manager

channel command. An instruction that directs a data channel, control unit, or device to perform an operation or set of operations

char. Character

CHK. Check

CICS. Customer information control system

command. A control signal that initiates an action or the start of a sequence of actions

concurrent. Refers to diagnostic procedures that can be run on one control unit while the rest of the subsystem remains available for customer applications

contingent connection. A connection between a channel path and a drive caused when a unit check occurs during an I/O operation

controller. A device that provides the interface between a system and one or more tape drives

cm . Centimeter

CP. Circuit protector

CRC. Cyclic redundancy check

CRR. Channel request register

CSU. Customer set-up

ctrl. Control

CU. Control unit

CUM. Cumulative fix tape

CWS. Control work station

D

danger (notice). A word to call attention to possible lethal harm to people. Contrast with *attention* and *caution*

data . Any representations such as characters or analog quantities to which meaning is or might be assigned

data buffer. The storage buffer in the control unit. This buffer is used to increase the data transfer rate between the control unit and the channel

data check. A synchronous or asynchronous indication of a condition caused by invalid data or incorrect positioning of data

dc. Direct current

degradation. A decrease in quality of output or throughput or an increase in machine error rate

degraded. Decreased in quality of output or throughput or increased machine error rate

deserialize. To change from serial-by-bit to parallel-by-byte

detented. A part being held in position with a catch or lever

DEV. Device

DIAG. (1) Diagnostics (2) Diagnostic section of maintenance information manual

direct access storage. A storage device in which the access time is independent of the location of the data

DLR. Device level register

DLX. Device configuration register (hexadecimal 13)

DRAM. Dynamic random-access memory

drive (magnetic tape). A mechanism for moving magnetic tape and controlling its movement

DRV. Drive

DSE. (1) Data security erase (2) Device status and error register

DSH. Control unit serial high register

DSL. Control unit serial low register

DSP. Digital signal processor

E

EBCDIC. Extended binary-coded decimal interchange code

EC. (1) Edge connector (2) Engineering change

ECA. Engineering change announcement

ECC. Error correction code

errpt. error report

EEPROM. Electrically erasable programmable read-only memory

EIA. Electronics Industries Association

EIA unit. A unit of measure, established by the Electronic Industries Association, equal to 44.45 mm (1.75 in.)

electrostatic discharge. An undesirable discharge of static electricity that can damage equipment and degrade electrical circuitry

end-of-block (EOB). A code that marks the end of a block of data

end-of-file (EOF). A code that marks the end of a file of data

end-of-tape (EOT). The end of the recording area on a tape

Enterprise Systems Connection (ESCON) . A set of IBM products and services that provide a dynamically connected environment within an enterprise. The ESCON channel connection allows the 3590 Model A00 to communicate directly with a System/390

EOB. End-of-block

EOD. End-of-data

EOF. End-of-file

EOT. End-of-tape

EPO. Emergency power off

EPROM. Erasable programmable read only memory

EQC. *Equipment check*

equipment check. An asynchronous indication of a malfunction

EREP. Environmental recording, editing, and printing

Error log. A dataset or file in a product or system where error information is stored for later access

ESCON. *Enterprise Systems Connection*

ESD . *Electrostatic discharge*

F

fabric . The term used to describe a routing structure that receives addressed information and routes it to its appropriate destination. The set of cascaded switches is commonly called a fabric

fault symptom code (FSC). A hexadecimal code generated by the drive or the control unit microcode in response to a detected subsystem error

FC. (1) Feature code (2) Fibre channel

FCAL. Fibre channel arbitrated loop

FCC. Federal communications commission

FCP. fibre channel for SCSI protocol

FE. Field engineer, customer engineer, or service representative

fibre channel (FC). A communications system characterized by a large bandwidth, shared bus and optical fibre connections

fibre channel arbitrated loop (FCAL). A type of FC network in which the hosts and devices are in a loop configuration, with each node communicating with the next node and messages being passed along to the target

fibre channel for SCSI protocol (FCP). An implementation of the SCSI interface command set for FC networks

FID. FRU identifier (may be more than one FRU)

fiducial. A target used for teaching a physical location to a robot

field replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails

file. A named set of records stored or processed as a unit. Also referred to as a dataset

file protection. The processes and procedures established in an information system that are designed to inhibit unauthorized access to, contamination of, or deletion of a file

flash EEPROM. An electrically erasable programmable read-only memory (EEPROM) that can be updated

FM . Field mark

FMR . Field microcode replacement

format . The arrangement or layout of data on a data medium

formatter. Part of a magnetic tape subsystem that performs data conversion, speed matching, encoding, first level error recovery, and interfaces to one or more tape drives

FP . File protect.

frayed . Damaged, as if by an abrasive substance

FRU . Field replaceable unit

FSC . *Fault symptom code*

FSI . Fault symptom index

full-duplex . Communications mode that allows transmission or reception of data blocks at the same time

functional microcode . Microcode that is resident in the machine during normal customer operation

G

g . Gram

gnd . Ground

H

half-duplex . Communications mode that allows transmission or reception of data blocks but not at the same time

hard address . A physical address assigned through arbitration to the fibre card by the loop initialization sequence

hertz (Hz) . Unit of frequency. One hertz equals one cycle-per-second

hex. Hexadecimal

HGA. Head guide assembly

HSARS. Hardware statistical analysis and reporting system

HSGC. High speed generic component tester

Hz . Hertz (cycles-per-second)

I

IBMLZ1 . The 3590 improved compression algorithm, which furnishes hardware execution efficiency by using as few machine cycles as possible to compress or decompress a byte. The algorithm achieves good coding efficiency for broad applications and provides data compression with less performance loss.

ID . Identifier

identifier (ID) . (1) In programming languages, a lexical unit that names a language object; for example, the names of variables, arrays, records, labels, or procedures. An identifier usually consists of a letter optionally followed by letters, digits, or other characters. (2) One or more characters used to identify or name data element and possibly to indicate certain properties of that data element. (3) A sequence of bits or characters that identifies a program, device, or system to another program, device, or system

IDRC . Improved Data Recording Capability

IML . Initial microprogram load

Improved Data Recording Format . An improved data recording mode that can increase the effective data capacity and the effective data rate when enabled and invoked

initial microprogram load (IML) . The action of loading a microprogram from an external storage to writable control storage

initiator . The component that executes a command. The initiator can be the host system or the tape control unit

INST . Installation

interblock gap (IBG) . An area on a data medium to indicate the end of a block or physical record

interface . A shared boundary. An interface might be a hardware component to link two devices or it might be a portion of storage or registers accessed by two or more computer programs

interposer . The part used to convert a 68-pin connector to a 50-pin D-shell connector

intervention required . Manual action is needed

INTRO . Introduction

I/O . Input/output

IOP . Input/output processor

IPL . Initial program load

iSeries. IBM term for OS/400 products

ITST . Idle-time self-test

K

km . kilometer

L

LAN . Local area network. A computer network within a limited area

LED . Light-emitting diode

LIC . Library interface card

LIP . Loop initiated primitive

loadable . Having the ability to be loaded

LUN . Logical Unit

LZ-1 . Lempel-Ziv electronic data compactor

M

magnetic tape . A tape with a magnetical surface layer on which data can be stored by magnetic recording

MAP . Maintenance analysis procedure

MAQ . Maintenance agreement qualification

mask . A pattern of characters that controls the retention or elimination of portions of another pattern of characters. To use a pattern of characters to control the retention or elimination of portions of another pattern of characters

master file . A file used as an authority in a given job and that is relatively permanent, even though its contents may change. Synonymous with main file

MB . Mega Byte (usually expressed as data rate in MB/s or MB/second)

media capacity . The amount of data that can be contained on a storage medium, expressed in bytes of data

mega . Prefix for 'million'

MES . Miscellaneous equipment specification

MI . Maintenance information

micro . Prefix for 'millionth of'

microcode . (1) One or more micro instructions. (2) A code, representing the instructions of an instruction set, implemented in a part of storage that is not program-addressable. (3) To design, write, and test one or more micro instructions. (4) See also *microprogram*

microdiagnostic routine . A program that runs under the control of a supervisor, usually to identify field replaceable units

microdiagnostic utility . A program that is run by the customer engineer to test the machine

microinstruction . A basic or elementary machine instruction

microprogram . A group of microinstructions that, when executed, performs a preplanned function.

The term microprogram represents a dynamic arrangement or selection of one or more groups of microinstructions for execution to perform a particular function. The term microcode represents microinstructions used in a product as an alternative to hard-wired circuitry to implement certain functions of a processor or other system component.

MI . Maintenance information

MIM . Media information message

mm . Millimeter

modifier . That which changes the meaning

mount a device . To assign an I/O device with a request to the operator

MP . (1) Microprocessor (2) Metal particle

ms . Millisecond

MSG . Message

MTM . Media test mode

multipath . Pertaining to using more than one path

N

N/A . Not applicable.

NDF. No defect found

node . In a network, a point at which one or more functional units connect channels or data circuits

NVS . Nonvolatile storage. A storage device whose contents are not lost when power is removed

O

offline . Pertaining to the operation of a functional unit without the continual control of a computer. Contrast with *online*

online . Pertaining to the operation of a functional unit that is under the continual control of a computer. Contrast with *offline*

OPER . Operation

ov . Over voltage

overrun . Loss of data because a receiving device is unable to accept data at the rate it is transmitted

overtightening . To tighten too much

P

p bit . Parity bit

parameter . A variable that is given a constant value for a specified application and that may denote the application

PC . Parity check

PCC . Power control compartment

PE . Parity error. Product engineer

PGID . Path group identification

PM . Preventive maintenance

PNEU . Pneumatics

pneumatic . The parts of the subsystem that control the pressurized air and vacuum

POR . Power-on reset

port . A physical connection for communication between the 3590 and the host processor. The 3590 has two SCSI ports

POST . Power-on self-test

power-on self-test (POST) . A series of diagnostic tests that are run automatically by a device when the power is turned on

PROC. Shortened term for the Procedures section of a service manual like Maintenance Information

PROM . Programmable read only memory

PS . Power supply

pSeries. IBM term for AIX-type (RS6000) products

PTF . Program temporary fix

PVPD . Privileged vital product data. The data contained within the tape drive that requires special passwords to access

PWR . Power

R

RAM . Random access memory

Random access memory . A storage device into which data is entered and from which data is retrieved in a nonsequential manner

RAS . Reliability, availability, and serviceability

record . A collection of related data or words, treated as a unit

recording density . The number of bits in a single linear track measured per unit of length of the recording medium

recoverable error . An error condition that allows continued execution of a program

ref . Reference

reg . Register

reinventory . To inventory again

retension . The process or function of tightening the tape onto the cartridge, if it is sensed that the tape has a loose wrap on the cartridge

RISC. Reduced instruction-set computer

ROM . Read-only memory

RPQ . Request for price quotation

R/W . Read/write

S

s . Seconds of time

SAN . Storage Area Networks. A SAN permits information to be accessed, managed, and shared among various storage devices and servers over a network

SARS . Statistical analysis and reporting system. The microcode in the drive that assists in determining if read and write errors are caused by the tape or the hardware

SCSI . Small computer system interface

segment . A part

sel . Select

serialize . To change from parallel-by-byte to serial-by-bit

serializer . A device that converts a space distribution of simultaneous states representing data into a corresponding time sequence of states

servo. A shortened form of the term *servomechanism*

servomechanism . A feedback control system in which at least one of the system signals represents mechanical motion

SIM . Service information message

SLIC . System licensed internal code

SM . Service memorandum

small computer system interface (SCSI) . An input and output bus that provides a standard interface between the host system and the 3590

smit. System management interface tool

SNS . Sense

soft address . A physical address assigned to the fibre card by the loop initilazation sequence

special feature . A feature that can be ordered to enhance the capability, storage capacity, or performance of a product, but is not essential for its basic work

SR . Service representative. See also *CE*

SRAM . Static random access memory

SS . Status store

ST . Store

standard feature . The significant design elements of a product that are included as part of the fundamental product

START . Start maintenance

stoplock . A position-hold mode used when the tape is in a stopped position and under tension

subsystem . A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system

SUPP . Support

sync . Synchronous, synchronize. Occurring with a regular or predictable time relationship

T

TAC . Technical area code

tachometer, tach . A device that emits pulses that are used to measure/check speed or distance

tape cartridge . A container holding magnetic tape that can be processed without separating it from the container

tape void . An area in the tape in which no signal can be detected

TCP/IP . Transmission Control Protocol/Internet Protocol. When in a tape library, the LAN communication path between the host and the library manager. This communication path is used for *tape library* commands that do not require the 3590, while the SCSI bus is used for commands, data, and responses that require the 3590. All SCSI-attached processors require an RS-232 or a LAN attachment for library control.

TCU . Tape control unit

TH . Thermal

thread/load operation . A procedure that places tape along the tape path

TM . (1) Tapemark (2) Trademark

topology . The spacial arrangement of communication nodes in a distributed computing environment

tty . When in a tape library, the RS-232 communication path between the host and the library manager. This communication path is used for *tape library* commands that do not require the 3590, while the SCSI bus is used for commands, data, and responses that require the 3590. All SCSI-attached processors require an RS-232 or a LAN attachment for library control.

U

UART . Universal asynchronous receiver/transmitter

unload . Prepare the tape cartridge for removal from the drive

utilities . Utility programs

utility programs . A computer program in general support of the processes of a computer; for instance, a diagnostic program

uv . Under voltage

V

vary. To change the status of a device, as from online to offline, or offline to online. This action makes the device available to systems or other using devices.

VCR. Volume control region

VOLSER . Volume serial number

volume . A certain portion of data, together with its data carrier, that can be handled conveniently as a unit

VPD . Vital product data. The information contained within the tape drive that requires nonvolatile storage used by functional areas of the drive, and information required for manufacturing, RAS, and engineering

VSARS. Volume statistical analysis and reporting system

VTS. Virtual tape server

W

word . A character string that is convenient for some purpose to consider as an entity

WORM. Write-once read-many

Write . Write command

WT . World Trade

WTC . World Trade Corporation. An indication of a segment of the IBM Corporation

X

XR . External register

XRA . External register address register

xSeries. IBM term for Linux-type products

Index

Numerics

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

Y

Readers' Comments — We'd Like to Hear from You

IBM TotalStorage Enterprise Tape Drive 3590
Maintenance Information
Model B11/B1A, E11/E1A, and H11/H1A

Publication No. SA37-0301-05

Overall, how satisfied are you with the information in this book?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall satisfaction	☐	☐	☐	☐	☐

How satisfied are you that the information in this book is:

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Accurate	☐	☐	☐	☐	☐
Complete	☐	☐	☐	☐	☐
Easy to find	☐	☐	☐	☐	☐
Easy to understand	☐	☐	☐	☐	☐
Well organized	☐	☐	☐	☐	☐
Applicable to your tasks	☐	☐	☐	☐	☐

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? ☐ Yes ☐ No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name _____ Address _____

Company or Organization _____

Phone No. _____

Readers' Comments — We'd Like to Hear from You
SA37-0301-05

IBM®

Cut or Fold
Along Line

Fold and Tape | **Please do not staple** | Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
RAS Package Development
Department 4WUA
9000 South Rita Road
Tucson, AZ 85744-0001

Fold and Tape | **Please do not staple** | Fold and Tape

SA37-0301-05

Cut or Fold
Along Line

Part Number: 19P5395

Printed in U.S.A.

EC H28177

(1P) P/N: 19P5395

SA37-0301-05

Spine information:

IBM TotalStorage Enterprise Tape Drive 3590

IBM 3590 MI

Model B11/B1A, E11/E1A, and H11/H1A