

**CONVEX General Maintenance Guide
(C201, C202, C210, C220)**

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CONVEX Computer Corporation
Richardson, Texas USA

CONVEX General Maintenance Guide
(C201, C202, C210, C220)
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(C201, C202, C210, C220)

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FCC NOTICE

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in strict accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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Preface

Purpose and Intended Audience

The *CONVEX General Maintenance Guide* is the fourth of six volumes in the *CONVEX Maintenance Documentation (C201, C202, C210, C220)*. The other volumes include the following:

- *CONVEX Maintenance Documentation Overview (C201, C202, C210, C220)*
- *CONVEX Theory of Operation (C201, C202, C210, C220)*
- *CONVEX Installation Guide (C201, C202, C210, C220)*
- *CONVEX Troubleshooting Guide (C201, C202, C210, C220)*
- *CONVEX Removal/Replacement and IPB Guide (C201, C202, C210, C220)*

The main purpose of this document is to assist the Field Engineer (FE) in providing preventive maintenance on a monthly and quarterly basis. This guide provides background information and procedures for general maintenance. Additionally, this volume may be used as a teaching text by the CONVEX Training department.

Scope

The material in this volume applies to CONVEX C201, C202, C210, and C220 supercomputers.

Outline

The content of each chapter is outlined below:

Chapter 1. Safety—Lists the safety considerations for maintaining a system

Chapter 2. Preventive Maintenance—Discusses the preventive maintenance for the processor, Multibus, VMEbus, system disks, tape drives, and printer

Chapter 3. Software—Outlines the *errlog* and *softlog* formats, system backups and crash dumps, and system generation procedures

Appendix A. Test Equipment and Special Tools—Contains information on special tools or test equipment and any associated special procedures

Appendix B. Problem Reporting—Discusses how to use the *contact* facility to report problems

Notational Conventions

The following notational conventions are used in this document:

- The symbol *M* is the abbreviation for *mega* or 1,048,576.
- **Boldface** type indicates user-entered information for a computer program. Enter these commands sequences exactly as they appear.
- *Italic* type designates filenames, program names, directory paths, and titles of publications. It is also used for emphasis.
- Brackets ([]) designate optional entries.
- All CONVEX illustrations have an illustration catalog number at the bottom right-hand corner that is for CONVEX use only.

The following are examples of warnings, cautions, and notes and their typical content and locations as used in CONVEX documents:

WARNING

Warnings highlight procedures or information necessary to avoid injury to personnel. Warnings immediately precede the critical information and include a description of the hazard.

CAUTION

Cautions highlight procedures or information necessary to avoid damage to equipment, damage to software, or loss of data. Cautions immediately precede the critical information and include a description of the possible damage.

NOTE

Notes highlight information of a supplemental nature. They immediately precede or follow the highlighted information.

Associated Documentation

The following is a partial list of other manuals or books that may provide more detailed information on the topics presented in this manual:

- *CONVEX Diagnostic Documentation (C200 Series)*, Product No. DHW-080
- *CONVEX HIA User's Guide*, Product No. DHW-035
- *CONVEX System Manager's Guide*, Product No. DSW-004
- *CONVEX VIOP/VBCU Service Guide*, Product No. DHW-051
- *FUJITSU M2951A/AF Mini Disk Drive, Customer Engineering Manual*
- *Printronix P6000 Maintenance Manual*, Document No. 900-000328-001
- *STC 1960 Series Tape Drive*, Document No. 900-000253-001
- *STC 2920 Tape Subsystem Maintenance Manual*, Document No. 900-000252-001
- *VIPER Product Manual, SCSI Models 2060S and 2150S*, Document No. 900-000321-001

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- The chapter and page number in question
- The comment

Reader's Forum

If you wish to mail your comments to us, please use the form at the end of this manual and list the document page number with your questions and comments. Thank you.

Acknowledgments

I would like to thank the following people for their contributions to this document:

- Technical contributors and review team members: Art Clark, Don Davis, Ron Engelking, Steve Fieler, and John Rachels
- Hardware Documentation staff: Larry Bonura, Art Fischman, and Jimmie Holman
- Contributing writer: Barbara Morris

Without the efforts of all the aforementioned, this document would not have been possible.

Leigh Ellert, Lead Writer
CONVEX Hardware Documentation

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Chapter 1

Safety Considerations

1.1 Overview

It is important to observe safety when servicing CONVEX computers and their peripheral devices. Some general guidelines are offered in this chapter.

1.2 Electrical Safety Precautions

WARNING

LETHAL VOLTAGE HAZARD. Hazardous voltages are present inside the processor cabinet while the power cord is connected to the AC mains. Failure to remove power from the computer before servicing may result in serious injury to personnel and damage to components and electronic assemblies.

Ensure that the main circuit breakers on the power controller front panel are **OFF** before removing covers from the processor cabinet.

Disconnect the computer AC power cord from the electric service before disassembling the power controller. Hazardous voltages are present inside the power controller anytime the AC power cord is connected to a source of AC power, *even when the main circuit breakers are set to OFF*.

WARNING

Power should be removed from the tape drive prior to servicing. Failure to do so may cause injury to personnel and damage to equipment.

Set the tape-drive main circuit breaker to the **OFF** position prior to servicing. The circuit breaker is located behind the right front cover of the tape drive.

1.3 Electrostatic Discharge Precautions

CAUTION

Observe all Electrostatic Discharge (ESD) precautions during service. Failure to do so may cause damage to equipment.

Electrostatic Discharge (ESD) can damage many of the electronic components in CONVEX computers. High static charge levels often result when various objects are separated or rubbed together. Wear a ground strap and connect it to the equipment being serviced to prevent ESD damage.

1.4 Thermal Safety Precautions

CAUTION

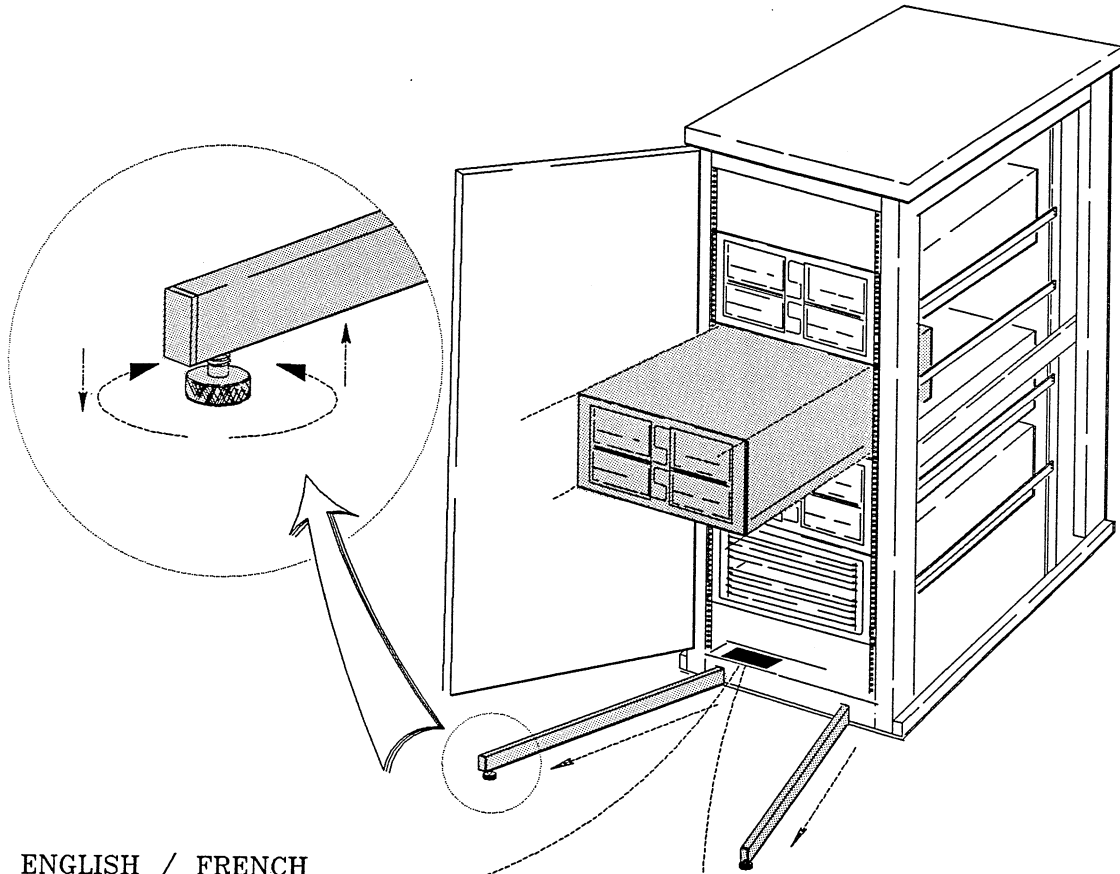
Ensure all cooling components are properly installed before powering up the system. Failure to do so may result in damage to equipment.

Check that the card cage cover, internal air dams, and other cooling components are installed properly. If improperly installed, they may interfere with proper airflow through the processor card cage and cause high temperature warnings, system shutdown, and damage to components and electrical assemblies.

1.5 Mechanical Safety Procedures

CONVEX expansion cabinets have two stabilizer bars to prevent them from tipping forward when peripheral devices are pulled out. The following figure shows the location of the stabilizer bar **CAUTION** label:

Figure 1-1, Stabilizer Bars and Caution Label



ENGLISH / FRENCH

CAUTION	ATTENTION
<p>TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED.</p> <ol style="list-style-type: none"> 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTI-TILT CHANNELS AND LOWER CHANNEL SUPPORT FEET FIRMLY TO THE FLOOR. 2. INSURE THAT LOCKING MECHANISMS ARE INSTALLED IN ALL OTHER EXTENDABLE UNITS. 3. NEVER EXTEND MORE THAN ONE UNIT AT A TIME 	<p>POUR REDUIRE LE RISQUE D'ACCIDENT ATTRIBUABLE A L'INSTABILITE DE L'UNITE, DEPLOYER LES STABILISATEURS AVANT DE SORTIR LES PERIPHERIQUES.</p> <ol style="list-style-type: none"> 1. POUR DEPLOYER LES STABILISATEURS, TIRER COMPLETEMENT LES BRAS ANTI-BASCOULEMENT ET ABAISER LES PATTES DE FACON OÙ ELLES REPOSENT SOLIDEMENT SUR LE SOL. 2. S'ASSURER QUE TOUS LES PERIPHERIQUES SON MUNS DE VIS DE BLOCAGE. 3. NE JAMAIS SORTIR PLUS D'UN PERIPHERIQUE A UN MOMENT DONNE.

ENGLISH / GERMAN

CAUTION	ACHTUNG
<p>TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED.</p> <ol style="list-style-type: none"> 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTI-TILT CHANNELS AND LOWER CHANNEL SUPPORT FEET FIRMLY TO THE FLOOR. 2. INSURE THAT LOCKING MECHANISMS ARE INSTALLED IN ALL OTHER EXTENDABLE UNITS. 3. NEVER EXTEND MORE THAN ONE UNIT AT A TIME 	<p>ZUR VERMEIDUNG VON GEFÄHRDUNG DURCH EIN INSTABILES GERÄT SIND VOR DER HERAUSNAHME VON PERIPHERALS DER STABILISIERUNGSMCHANISMUS BETÄTIGT WERDEN.</p> <ol style="list-style-type: none"> 1. UM DIE STABILISIERUNGSRICHTUNG ZU BETÄTIGEN, SIND DER "ANTI-TILT KANAL" GANZ HERAUS ZU ZIEHEN UND DER UNTERE STÜTZFUSS AUF DEN BODEN ZU FÜHREN. 2. OBERPRÜFEN SIE, OB IN ALLEN ANDEREN VERSCHIEBBAREN GERÄTEN DER SICHERUNGSMCHANISMUS BETÄTIGT IST. 3. ZIEHEN SIE NIE MEHR ALS EIN GERÄT HERAUS.

H004038

WARNING

Do not extend slide-mounted peripheral devices for servicing without first extending cabinet stabilizer bars. When extending a stabilizer bar, adjust the stabilizer pad until it is firmly against the floor.

Never extend more than one peripheral device at a time.

Failure to do so may result in cabinet instability, injury to personnel, and damage to equipment.

WARNING

Use care when handling the tape cleaner block as the blade is sharp. Failure to do so may result in injury to personnel.

CAUTION

Check that the machine reel cover of the tape drive is in place before closing the tape path door. Do not tap or pound on the read/write head assembly. Do not rewind a master alignment tape on high speed. Failure to do so may result in damage to equipment.

Do not touch the outer surface that contacts the capstan with bare hands. Failure to do so may result in damage to equipment.

Always use a cloth when handling the capstan and grip only the hub of the capstan. The surface is sensitive to contamination.

Chapter 2

Preventive Maintenance

2.1 Overview

The processor cabinet and peripheral devices should be tested on a monthly and quarterly basis to identify potential problems. This chapter provides a preventive maintenance schedule that lists weekly, monthly, and quarterly maintenance procedures and discusses the procedures to check the system.

2.2 Periodic Maintenance Schedule

The following table contains a schedule for weekly, monthly, and quarterly hardware maintenance procedures:

Table 2-1, Periodic Hardware Maintenance

MAINTENANCE	W ¹	M ²	Q ³
Processor			
Clean filters		☐	
Check CPU and power supply fans		☐	
Check CPU voltages and indicators		☐	
Multibus			
Check Multibus power supply voltages		☐	
Check Multibus fans and filters		☐	
VMEbus			
Check VMEbus power supply voltages		☐	
Check VMEbus fans and filters		☐	
System Disks			
Check disk drive power supply voltages			☐
Check disk drive fans and filters		☐	
Cipher Cartridge Tape			
Clean cartridge tape head			☐
Tape Drive			
Check the tape drive path	☐		
Beginning of tape/end of tape		☐	
Tape cleaner block		☐	
Read/write head skew		☐	
Supply hub		☐	
Check the reel servo operating levels		☐	
Check the capstan velocity and ramps		☐	
Test the file protect mechanism		☐	
Monitor the read output amplitudes		☐	
Check rewind operations		☐	
Monitor the pneumatics drive belt and vacuum levels		☐	
Check tape drive voltages			☐
Check tape drive fans			☐
Check tape drive indicators and run internal diagnostics		☐	
Printer			
Clean printer assembly			☐
Check printer quality		☐	
Lubricate printer counterweight and cam wick assembly		☐	

¹ Weekly maintenance² Monthly maintenance³ Quarterly maintenance

The following table contains a schedule for monthly and quarterly software maintenance procedures:

Table 2-2, Periodic Software Maintenance

MAINTENANCE	M ¹	Q ²
Check the contents of the <i>errlog</i>	☐	
Check the contents of the <i>softlog</i>	☐	
Back up the SPU tape		☐
Run system exerciser (<i>sysex</i>) program		☐
Run diagnostics	☐	

¹ Monthly maintenance

² Quarterly maintenance

2.3 Processor Cabinet

The periodic maintenance for the processor cabinet includes cleaning or changing the air filters, checking the operation of the fans, and checking the Power Supply (PS) output levels. Refer to Volume II, *CONVEX Theory of Operations*, and Volume VI, *CONVEX Removal/Replacement and IPB Guide*, for more information on the processor.

2.3.1 Fans and Filters

Check that the processor fans and the power supplies fans are operational. The processor fan assembly has six fans and is located at the top front of the cabinet. The power supplies have a fan at the rear of each drive. Remove the rear air plenum to visually inspect the operation of the fans.

CONVEX processor cabinets have filters mounted on the front panel and under the power controller. Remove and clean or replace these filters. The following sections list procedures for removing and replacing the door filters and the floor filter.

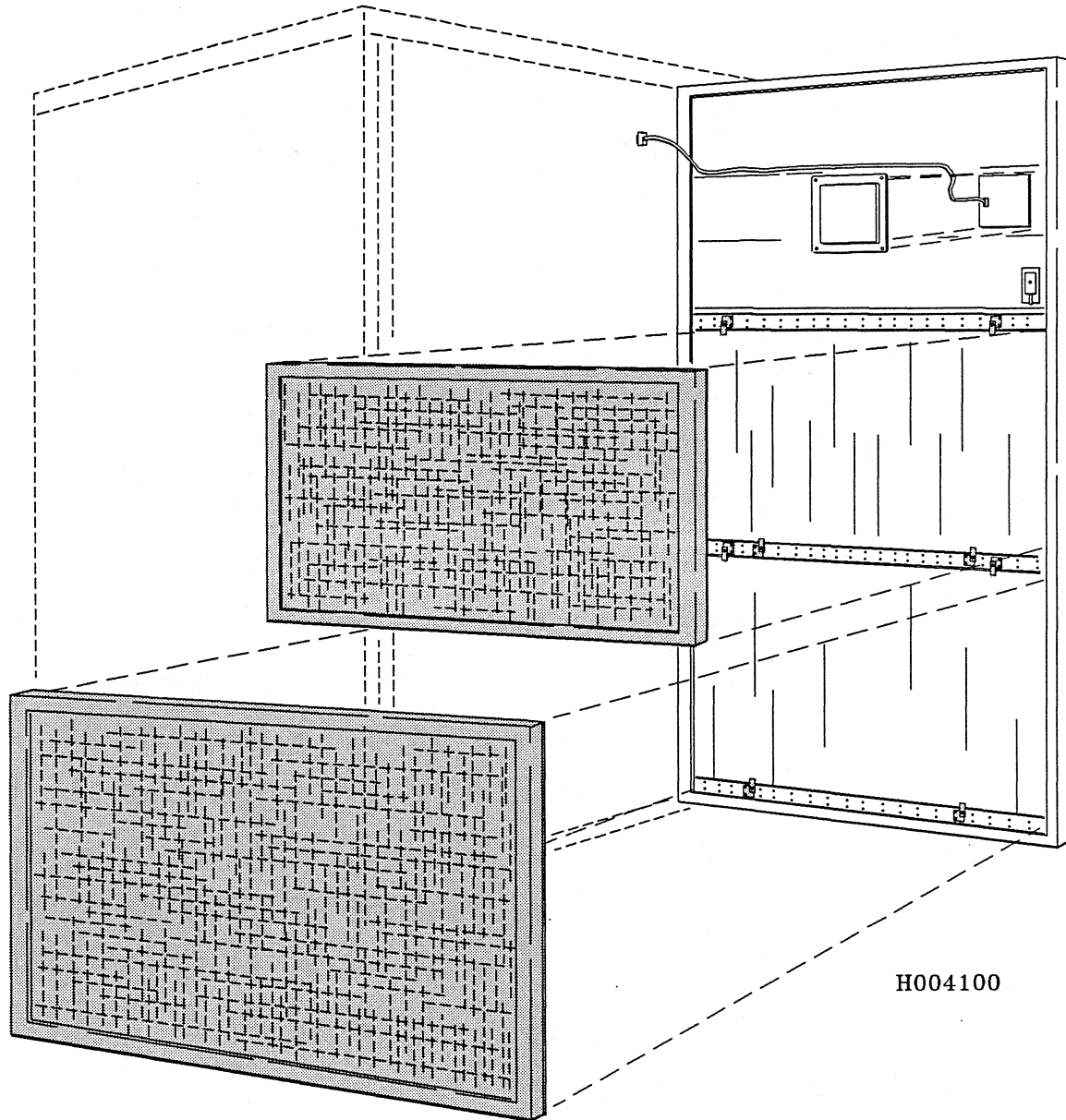
2.3.1.1 Tools

- Screwdriver, slot

2.3.1.2 Door Filters

The following figure shows the door filters and latches in the processor cabinet:

Figure 2-1, Door Filter and Latches



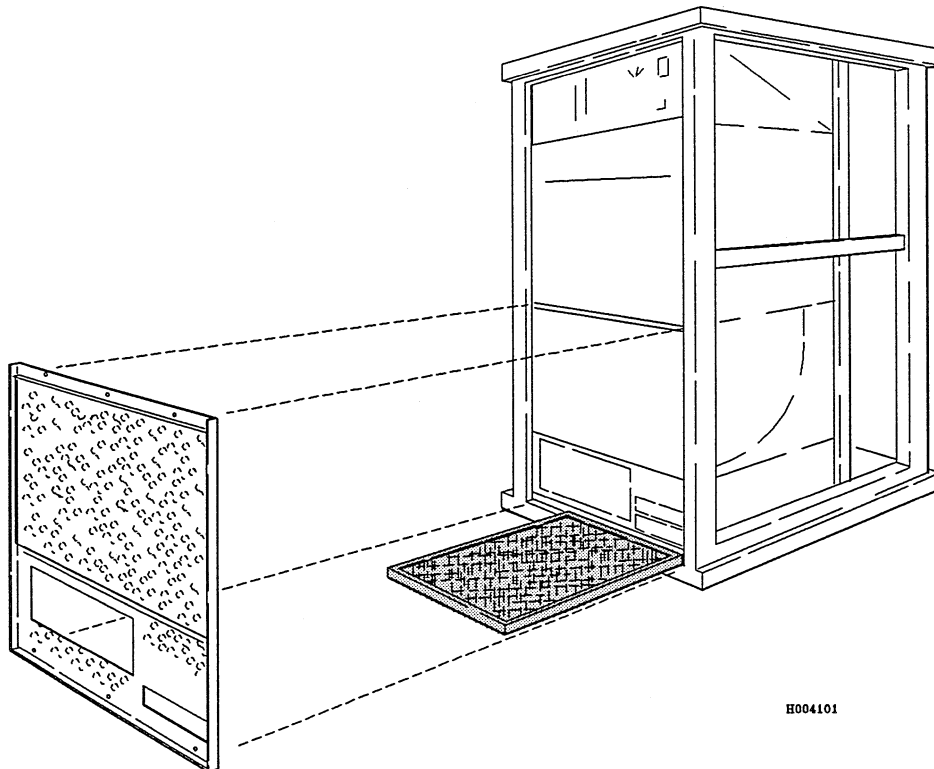
Use the following procedure to clean the two filters mounted on the door of the processor cabinet:

1. Loosen the screw on each of the 4 latches that hold the filter against the door.
2. Rotate the 4 latches 90 degrees to either side.
3. Remove the filter from the door.
4. Vacuum the intake side (facing the cabinet door) of the filter.
5. Install the filter in the door with the intake side facing the cabinet door.
6. Rotate the 4 latches to their proper position over the filter edge.
7. Tighten the screw on each of the 4 latches that hold the filter against the door.

2.3.1.3 Floor Air Filter Location

The floor air filter is located under the power controller tray. Access to the filter is by the removal of the lower bay cover. Removal of the lower bay cover may require removal of the card cage cover. The following figure shows the location of the floor filter in the processor cabinet:

Figure 2-2, Floor Air Filter Location



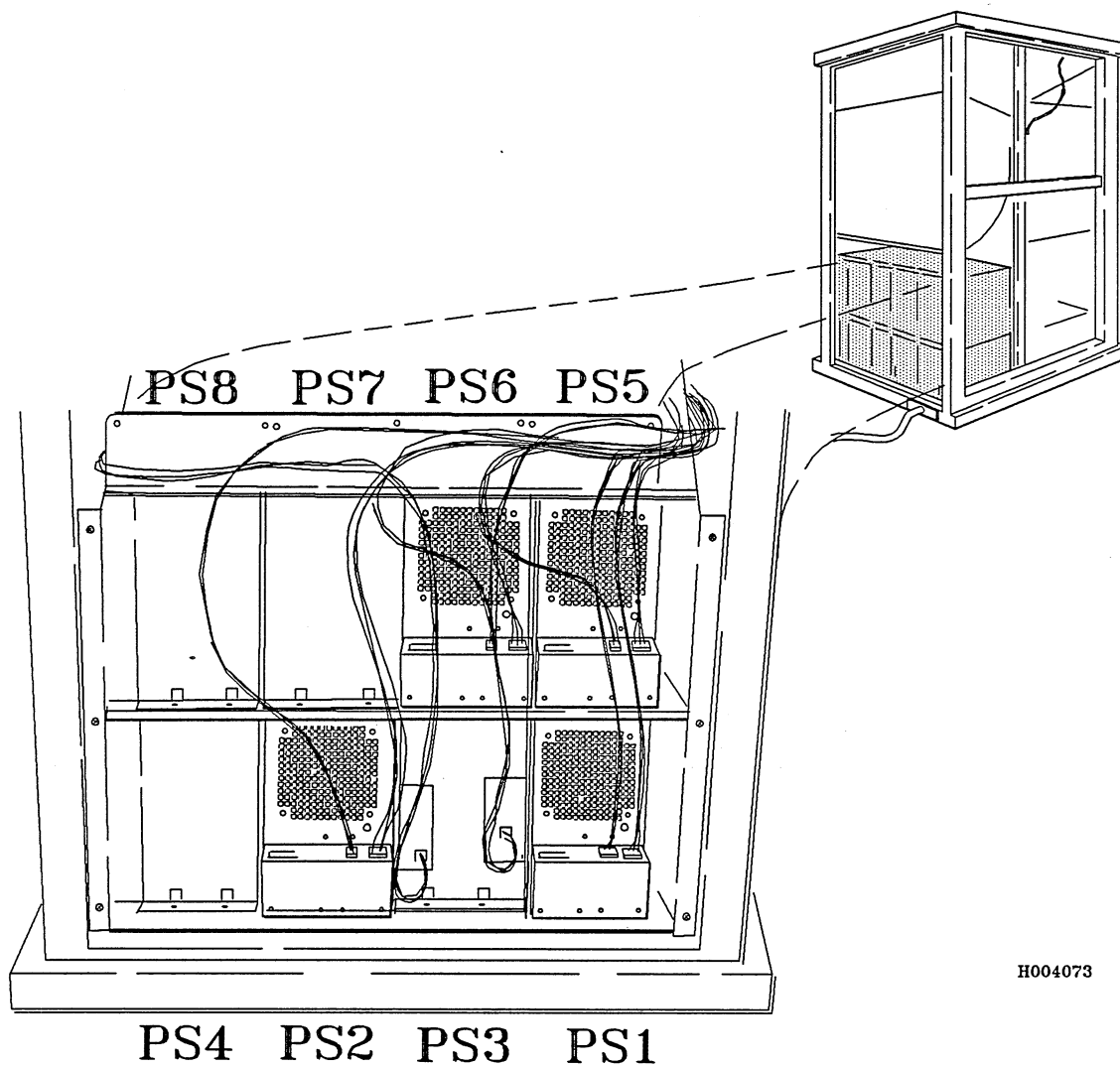
Use the following procedure to clean the floor air filter:

1. Using a slot screwdriver, loosen the 3 screws at the lower edge of the card cage cover sequentially, a few turns at a time, until the retainer strip is loose (no pressure is exerted against the card cage cover). Take care not to remove the screws completely.
2. Using a slot screwdriver, loosen each of the 3 quarter-turn fasteners along the bottom edge of the lower bay cover.
3. Grasp the lower bay cover at one of the large cut-outs (near the tape drive of the circuit breaker), pull the cover loose from the cabinet, and set it aside.
4. Grasp the end of the floor filter and slide the filter out of the processor cabinet.
5. Vacuum the intake side (facing the bottom of the cabinet) of the air filter.
6. Slide the floor air filter into the slot in the front of the lower bay until it stops.
7. Insert the upper edge of the lower bay cover *under* the retainer strip so that the card cage cover is between the card cage lower edge and the retainer strip and push the cover up so the 3 notches along its upper edge engage the 3 screws through the retainer strip.
8. Push the lower edge of the lower bay cover into position; conductive gasketing material along this edge causes a relatively snug friction fit.
9. Using a slot screwdriver, lock each of the 3 quarter-turn fasteners along the lower edge of the lower bay cover.
10. Using a slot screwdriver, tighten the 3 retainer strip screws sequentially, a few turns at a time, until the retainer strip is tight against the card cage cover and the lower bay cover.

2.3.2 Processor Power Supply Voltages

Use the following procedures to check the PS1 and PS4 through PS8 power supplies and to adjust the PS2 power supply. Refer to Volume VI, *CONVEX Removal/Replacement and IPB Guide*, for detailed procedures on removing and installing equipment to reach the power supplies. The following figure shows the positions of the power supplies:

Figure 2-3, Power Supplies Locations

**2.3.2.1 Tools**

- Phillips screwdriver, #2, 4 inches long
- 1/4-inch square drive torque wrench with a 1/2-inch (6-point) socket

2.3.2.2 Processor Power Supplies

NOTE

This procedure may cause the bending of pins in the backplane. Run the following diagnostics to check the status of the system before proceeding with and after completing the adjustments. Refer to Chapter 3, "Software," for a brief description of these tests and to the *CONVEX Diagnostic Documentation* for more information on these diagnostics.

- *pia4000*
- *cpx4000*
- *mem4000*
- *cpu4030*
- *cpu4131*
- *cpu4041*

Use the following procedure to check and adjust the power supply output levels for PS1 and PS4 (-2.02V) and PS5 through PS8 (-4.53V) power supplies:

1. Perform power down and set the processor main circuit breaker on the power controller front panel to **OFF**.
2. Engage the personal grounding system.
3. Remove the front and rear panels.
4. Remove the lower bay cover.
5. Remove the front cover of the logic cage. Remove the lower air plenum.
6. Remove the exhaust plenum.
7. Set the **LOCAL OFF REMOTE** switch on the power controller to **OFF**.
8. Set all circuit breakers on the top of the power controller to the **OFF** position.
9. Back out all the boards so none plug into the backplane.
10. Set the processor main circuit breaker on the PCU front panel to **ON**.

NOTE

Repeat the following five steps, 11 through 15, for each power supply to be tested.

11. Remove the white connector from the power supply being tested.
12. Set the breaker for the power supply on the top of the power controller to **ON**.
13. Set the **LOCAL OFF REMOTE** switch to the **LOCAL** position.
14. Check the voltage on the sense board. The following table lists the points to test, the voltages, and the tolerances for the power supplies:

Table 2-3, Power Supply Voltages

POWER SUPPLY	TEST POINTS	VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE
PS1, PS4	VTT and GND	-2.02	-2.13	-1.92
PS5, PS6 PS7, PS8	VEE and GND	-4.53	-4.78	-4.30

15. Adjust the voltage at the front of the power supply.

NOTE

Use the following seven steps, 16 through 22, to adjust the PS2 (+5) power supply.

16. Set the **LOCAL OFF REMOTE** switch to the **OFF** position.
17. Install all the boards carefully to avoid bending any pins.
18. Install the white connector to each power supply.
19. Ensure the key switch is set to the **OFF** position.
20. Set the circuit breakers on the top of the power controller to **ON**.
21. Set the key switch to the **LOCAL** position.
22. Check PS2 at the stud position and adjust to +5v.

NOTE

Complete the procedure with the following steps.

23. Set the key switch to the **OFF** position.
24. Install all the boards.
25. Install the lower air plenum.
26. Install the front cover of the logic cage.
27. Install the lower bay cover.
28. Install the exhaust plenum.
29. Install the front and rear panels.
30. Power up the system.

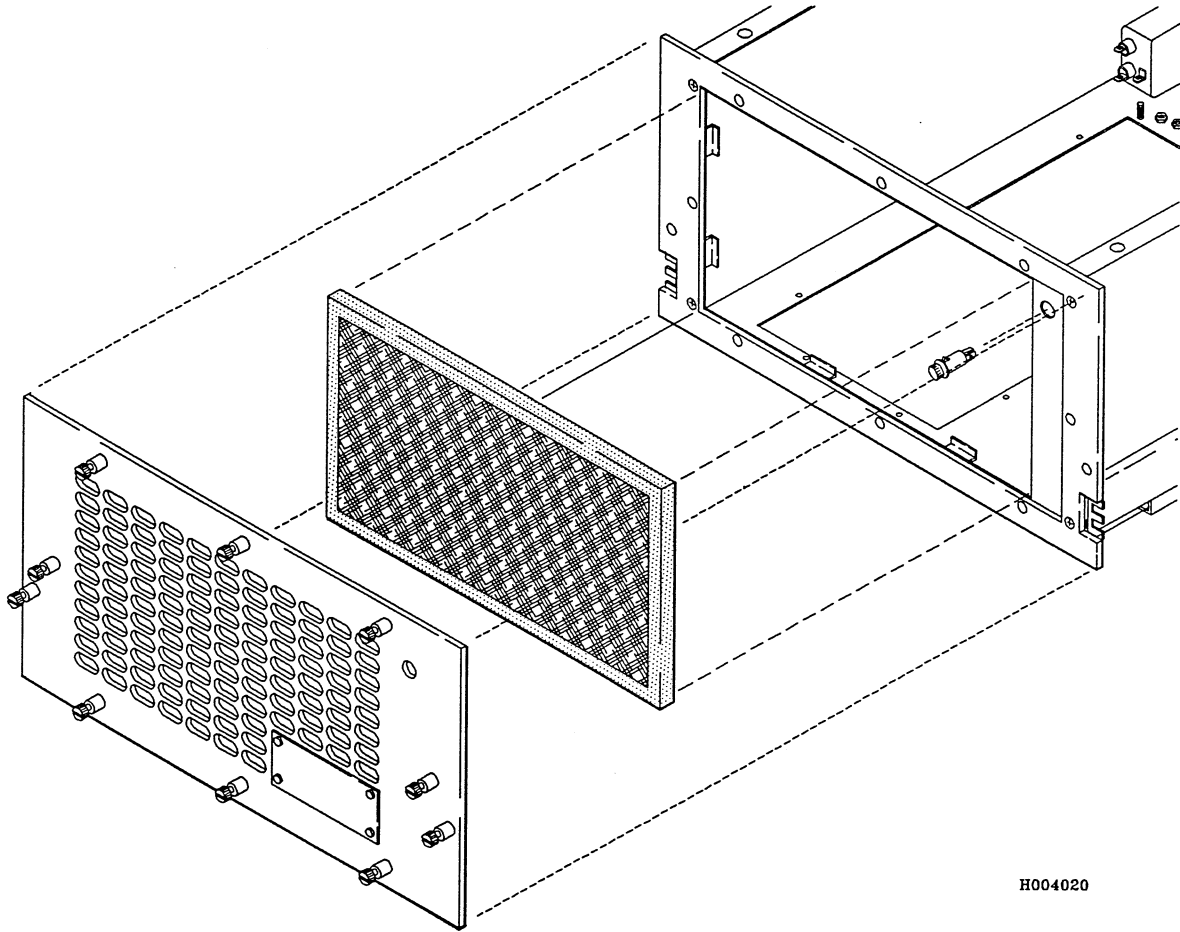
2.4 Multibus Chassis

The periodic maintenance for the Multibus chassis includes cleaning or changing the air filters, checking the operation of the fans, and checking the power supply output levels.

2.4.1 Multibus Fans and Filters

The Multibus chassis has two fans for cooling. These fans are located on the right side in the chassis. They draw air through the front panel of the chassis, across the cardcage and power supply, and direct the air toward the left. Check that the fans are operational. Remove and vacuum the filter behind the front panel. The following figure shows the air filter behind the chassis front panel:

Figure 2-4, Multibus Air Filter



H004020

2.4.2 Multibus Power Supply Voltages

Check that the PS3 power supply is within its tolerance range. It is a nonadjustable power supply and should be replaced if the voltages are not within the range. The following table lists the voltages and tolerances for a Multibus power supply:

Table 2-4, Multibus Chassis Voltages and Tolerances

VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE
+12.00	+11.40	+12.60
+5.00	+4.75	+5.25
-5.00	-5.75	-4.25
-12.00	-12.60	-11.40

2.5 VMEbus Chassis

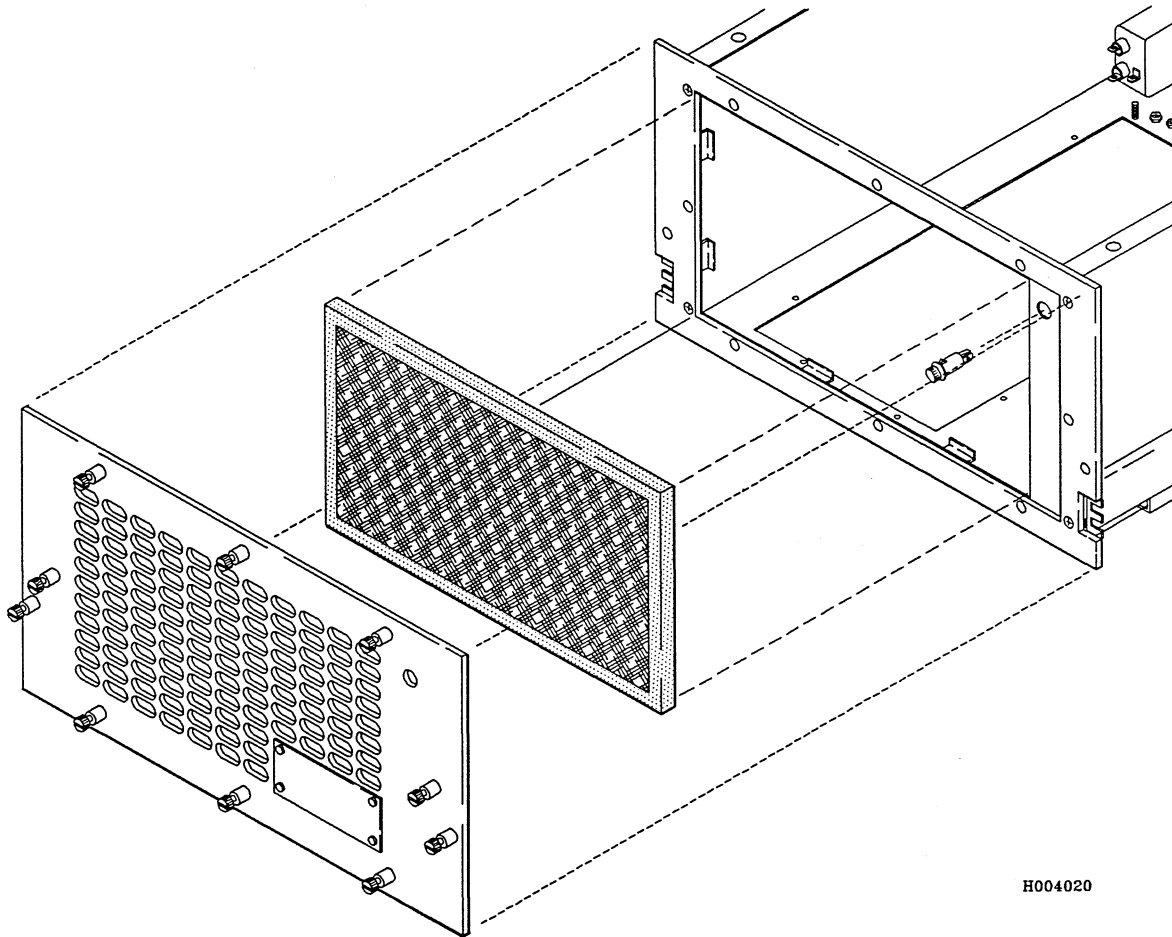
The periodic maintenance for the VMEbus chassis includes cleaning or changing the air filters, checking the operation of the fans, and checking the power supply output levels. Refer to the *CONVEX VIOP/VBCU Service Guide*, for more information on the VMEbus chassis.

2.5.1 VMEbus Fans and Filters

The VMEbus chassis has two fans. The fan that cools the card cage draws air through the front panel, into the card cage, and out the back of the chassis. This fan is located between the rear of the card cage and the back of the chassis. The fan that cools the power supply draws air through the front panel and out through an exhaust duct in the side panel. It is located at the rear of the power supply.

Check that the two fans are operational and clean or replace the air filters located in slots behind each base unit door. A defective fan or dirty air filters cause a low airflow condition. If the power supply fan fails, an airflow sensor trips the low airflow circuit breaker and causes the power supply to shut down. Refer to the *CONVEX VIOP/VBCU Service Guide* for procedures to remove and replace the fans and air filters. The following figure shows the air filter behind the front panel of the chassis:

Figure 2-5, VMEbus Chassis Air Filter



2.5.2 VMEbus Power Supply Voltages

CAUTION

Component damage may occur unless the voltage potentials are within 5% of rated value before installing circuit boards into the VMEbus backplane.

Refer to the *CONVEX VIOP/VBCU Service Guide* for procedures to measure DC voltages on the chassis power supply terminals and to adjust any power supply that is outside the tolerance limit. The following table lists the voltages and tolerances for a VMEbus chassis:

Table 2-5, VMEbus Voltages and Tolerances

VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE
+12.00	+11.40	+12.60
+5.00	+4.75	+5.25
-12.00	-12.60	-11.40

2.6 System Disks

The Eagle disk drive is the only disk drive within the system that needs periodic maintenance. The maintenance for this disk drive includes checking that the fans are operational, cleaning or changing the air filter, and checking the power supply output levels.

2.6.1 Disk Drive Line Blower and Filter

The Eagle disk drive has a line blower that cools the system. The line blower is located behind the front panel below the power amplifier.

The line blower draws filtered air through the front panel. The air flows through the line blower, across the Disk Enclosure (DE), card cage, and interface Printed Circuit Boards (PCBs), and through the rear panel. The air passing over the card cage cools the DC power supply and the air flowing over the DE cools the interface PCBs.

The disk drive has an air filter in the front panel. Use the following procedure to clean the air filter.

1. Remove the front panel of the disk drive.
2. Loosen the screw on the latch that holds the filter in place.
3. Rotate the latch 90 degrees to one side.
4. Slide the filter up from in front of the line blower.
5. Vacuum the intake side (facing the front panel of the disk drive) of the filter.
6. Slide the filter into position with the intake side facing the front panel of the disk drive.
7. Rotate the latch to its proper position over the filter top.
8. Tighten the screw on the latch over the filter.
9. Replace the front panel of the disk drive

2.6.2 Disk Drive Power Supply Voltages

Use a digital multimeter to check the voltage at the check pins of the backpanel . If a voltage is outside the tolerance limits, adjust the variable resistors on the control panel of the power supply unit. The following table lists the voltages and tolerance ranges of an Eagle disk drive:

Table 2-6, Eagle Disk Drive Voltages and Tolerances

VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE
+12.00	+11.40	+12.60
+5.00	+4.75	+5.25
-4.00	-3.80	-4.20
-5.20	-4.94	-5.46
-12.00	-12.60	-11.40

2.7 Cipher Cartridge Tape

The head assembly consists of an upper- and lower-pair of read/write heads and a full-width erase head. The sensor assembly detects the beginning, load point, early warning, and end marks on the tape. The read/write/erase heads and sensor holes of the cartridge tape require periodic cleaning to remove tape residue along the path traveled by the tape. Excessive buildup of the tape residue may cause intermittent reading or writing of the tape.

Inspect the interior of the drive for dust or debris. Clean the read/write/erase heads, sensor openings, and tape cartridge cavity with either a streamer head cleaner kit or cleaning fluid. Refer to the *VIPER Product Manual, SCSI Models 2060S and 2150S*, for procedures to clean the head and sensor holes.

2.8 Tape Drives

This section discusses preventive maintenance for the STC 1960 Series and the STC 2920 tape drives. Tape adjustments are interdependent and need to be done in the sequence referenced by the vendor manuals. Refer to the *STC 2920 Tape Subsystem Maintenance Manual* for more information and for removal/replacement and adjustment/alignment procedures for the 2920 tape drive. Refer to the *STC 1960 Series Tape Drive* for more information and for removal/replacement and adjustment/alignment procedures for the 1960 Series tape drive.

2.8.1 Tape Path

Advise the customer to clean the tape path for reliable tape operation, typically on a weekly basis and more often with heavy tape usage. The tape path of the tape drive requires periodic cleaning to remove tape residue along the path traveled by the magnetic tape. Excessive buildup of the tape residue could cause intermittent reading or writing of the tape.

Clean the following components of the tape path with cleaner fluid:

- Beginning of Tape/End of Tape (BOT/EOT) and leader sensor windows
- Tape cleaner block
- Read/write head
- Capstan assembly
- Tape guides, rollers, and swing arms
- Supply hub

2.8.1.1 Beginning of Tape/End of Tape

Inspect the Beginning of Tape/End of Tape (BOT/EOT) reflector for damage. Ensure that the reflector is not bent, flat, or scratched. Also check that no cables put stress on the BOT/EOT card connector. Clean the reflector mirror and sensor cover glass with transport cleaning fluid.

Monitor the BOT/EOT sensor output levels using an oscilloscope and adjust as necessary. Adjust the leading edges of the pulses to +4 volts for an aluminum reflector or to +3 volts for a stainless steel reflector. Loosen the sensor block mounting screw to optimize the BOT/EOT pulses then re-adjust the pulses.

2.8.1.2 Tape Drive Tape Cleaner Block

Remove and clean the tape cleaner block. Ensure that the block is free of oxide deposits. Inspect the block for damage such as scratches or grooves in the cleaner surface and replace the block if it has any damage. After re-installing the block, check that the vacuum holds the tape against the cleaner block.

2.8.1.3 Tape Drive Read/Write Head Skew

Check whether the tape skew has remained within a ± 2.5 microsecond tolerance. Check the tape tracking and skew alignment after replacing a swing arm, capstan assembly, read/write head, or tape guide. Ensure that the capstan aligns with the tape path and that the read/write head aligns with the tape.

The capstan assembly must be aligned so the tape can track properly across the read/write head. The top edge of the tape should ride at the outside edge of the double hump guide; it should not slide up the outer flanges of the guide. As the tape tracks it should not contact the inner flanges of the double hump guide or the air bearing guide that is above the EOT/BOT sensor.

Adjust the three 7/16-inch mounting nuts of the capstan motor to change the lateral position of the capstan wheel. The tape should not push against the rear flange or hang over the front of the tape guide. If the capstan assembly does not align properly with the tape, the tape path may have a defective component such as a bent swing arm, a defective capstan, or a nicked tape guide or flange.

After checking the capstan alignment check that the read/write head is adjusted so the head reads bits from only one byte at a time. The read/write head must be aligned properly for accurate recording and retrieval of data. To measure the head alignment check the read/write skew alignment. Use an oscilloscope to detect static and dynamic skew variations. Adjust the head alignment screw to adjust the head then readjust the capstan assembly.

Check the read skews with a skew tape that does not have a write enable ring; test the write skews with a skew tape that has a write enable ring. Examine the timing relationship between the slopes of the analog signals at the AC zero voltage reference point to test the skew.

All read/write head alignment measurements involve examining the timing relationship between the slopes of the analog signals at the AC zero voltage reference point. Refer to the *STC 1960 Series Tape Subsystem* or the *STC 2920 Tape Subsystem Maintenance Manual* for skew tolerance levels, procedures to test and adjust the skews, and procedures to replace the head if the skew cannot be adjusted. The following lists the skews to test:

- **Read Forward Static Skew** — The positive slopes of the two outside tracks should coincide. Use the skew block adjustment screw on the read/write head skew block to adjust the read/write head.
- **Read Gap Skatter** — The maximum skew (time difference between the most leading and most lagging positive slopes of phase A of any two tracks) should not exceed the tolerance of the rated drive speed. If the skew exceeds the tolerance limits, the read/write head should be replaced.
- **Read Forward Dynamic Skew** — Measure the dynamic skew on the logical track 5. The forward dynamic skew should be within the tolerance of the rated drive speed.
- **Read Backward Static Skew** — The skew between the two outside tracks should coincide. Adjust the capstan mounting nuts to adjust the tracking.
- **Read Backward Dynamic Skew** — Measure the dynamic skew of the logical track 5. The backward dynamic skew should be within the tolerance of the rated drive speed.
- **Write Static Skew** — The maximum skew (time difference between the most leading and most lagging positive slopes of phase A of any two tracks) should not exceed the tolerance of the rated drive speed. If the skew exceeds the tolerance limits, the read/write head should be replaced.
- **Write Skew for Non-Return-to-Zero-Indicated (NRZI) tape format** — Check the NRZI write skew for only tri-density tapes that have NRZI capability. Adjust the skew of all tracks to coincide with the positive slope of the most lagging track.

2.8.1.4 Tape Drive Supply Hub

Check the file reel hub for free operation. Use a lint-free cloth and cleaner fluid to clean the expansion surface of the file reel hub.

2.8.2 Reel Servo Operating Levels

Monitor and adjust the reel servo system on the 1960 tape drive. Ensure that all vacuum sense pinholes are open before beginning this procedure. The following lists the points of the reel servo assembly to test:

- **Preliminary Reels Null** — Check the preliminary reels null condition with an oscilloscope. Adjust the file null adjustment to obtain a zero-pulse baseline.
- **Column Vacuum Sensors** — Use a voltmeter to check the file reel sensor and the machine reel sensor of the column vacuum. The voltages should be 0.0 ± 0.2 volts. Loosen the null fine locking screw and adjust the null fine adjustment screw as necessary. Loosen the two coarse locking screws and move the sensor end plate to vary the fine adjustment range.
- **File Reel Null/Gain** — Check the file reel null/gain with a voltmeter. The voltage should range between 20.0 and 22.0 volts. Position the file column loop so the bottom of the loop is level with the center dot on the column bar. Measure the null/gain with the file column loop 1.5 inches below the upper loop out sense hole and remeasure the null/gain with the file column loop 1.5 inches above the lower tape out sense hole. Adjust the file column loop to the position where the smaller reading occurred.
- **Machine Reel Null/Gain** — Check the machine reel null/gain with a voltmeter. The voltage should range between 20.0 and 22.0 volts. Position the file column loop so the bottom of the loop is level with the center dot on the column bar. Measure the null/gain with the file column loop 1.5 inches below the upper loop out sense hole and remeasure the null/gain with the file column loop 1.0 inches above the lower tape out sense hole. Adjust the file column loop to the position where the smaller reading occurred.

2.8.3 Capstan Velocity and Ramps

Test the capstan velocity and capstan ramp speed using the internal diagnostics programs with tape loaded. The 1960 tape drive has a nonadjustable capstan velocity and capstan ramp. The 2920 tape drive may have a ramp speed up to 220 inches per second (ips). The internal diagnostic test verifies the initial ramp up speed of 175 ips but does not test the nominal rewind speed.

2.8.4 File Protect Mechanism

The file protect mechanism prevents a write operation if the mounted file reel does not contain a write enable ring. Check the file protect mechanism for proper operation using a work tape, both with and without a write enable ring installed.

2.8.5 Read Output Amplitudes

Measure the read amplitude after completing all other measurements and alignments. Use the internal maintenance routines to read from and write to the tape drive. Refer to the vendor manual for amplitude levels and detailed procedures to measure the levels.

NOTE

The amplitude levels vary, based on whether the lines are connected to the Formatter/Control Unit (FCU). If the lines are not loaded the amplitude levels are about 10% higher.

Load a standard amplitude tape with the write enable installed. Write all 1's on all tracks of the tape. While writing, monitor the phases of each track with an oscilloscope. Execute a read forward operation then a read backward operation. The amplitudes of the read operations should be within 15% of those measured during the write operation.

Write a high/low frequency on the tape then execute three read forward and one read backward operations. Measure the amplitudes of the third read forward and the read backward operations. The amplitude of the read backward operation should be within 20% of the amplitude of the read forward operation.

2.8.6 Rewind Operations

Check the rewind for proper operation. The rewind time for the 2920 tape drive is about 2.5 minutes for 2,400 feet of tape.

2.8.7 Pneumatics

Check the pneumatics drive belt and vacuum levels of the 1960 tape drive. Check the tension of the pneumatics drive belt and adjust as necessary. Adjust the levels of the run pneumatics and the thread pneumatics and check, but do not adjust, the levels of the pneumatics switches.

2.8.7.1 Drive Belts

Use a tension meter to measure the tension of the belts. Place the tension meter on the belt and pull the spring tip to the right side. When the tab on the right of the tension meter touches the belt, read the tension on the left edge of the spring. The tension should be within the range of 14 to 16 pounds. Loosen the capscrews that secure the vacuum blower or the pressure pump and slide the blower or pump to adjust the belt tension.

2.8.7.2 Pneumatics Levels

Use a slack tube manometer or Magnehelic gauge to check and adjust the pneumatics levels. The following table lists the pneumatics and their levels and tolerances:

Table 2-7, Pneumatics Levels

PNEUMATICS	LEVEL (inches)	ADJUSTMENT
Run Pneumatics		
Column Vacuum	37.0 – 43.0	40 ± 1
Air Bearing Pressure	65.0 (min.)	Nonadjustable
Thread Pneumatics		
Threading Pressure and Pressure Available	25.0	25 ± 1
Machine Reel Hub Vacuum with no tape on machine reel	22.5 (min.)	Nonadjustable
with tape on machine reel	40.0 (min.)	Nonadjustable
Switches		
File Protect	0.5	Nonadjustable
Cartridge Present	8.0	
Leader Sense	20.0	
Machine Reel Loaded	38.0	

2.8.8 Tape Drive Fans

The 2920 tape drive has two fans in its fan assembly located on top of the card cage behind the right of the front panel. These fans direct the airflow upward through the card cage.

The 1960 tape drive has three fans located at the bottom of the FCU power supply. The fans draw filtered air through the base of the cabinet, through the power supply of the FCU, and out the top of the unit. The tape drive also has one fan for the power supply located under the transformer at the right rear of the unit. This fan draws filtered air through the top of the transformer, through the transformer, and out the base of the unit.

2.8.9 Tape Drive Indicators

Illuminate each operator panel indicator to verify that the lamps under each lens is operating. Replace defective lamps.

The 1960 tape drive has ten indicators on the operator control panel at the right side of the front door. The control panel contains switches to allow manual operation of the indicators. Verify that both lamps under each lens is operating. Remove the operator panel control logic (JF) card to access the lamps if any are defective.

The 2920 tape drive has twelve indicators and a four-character display on the operator panel. When the tape drive is offline and idle, hold down any key on the diagnostic panel to illuminate all segments of the display. Enter the internal maintenance routine 08 and hold down the reset key to test the LED indicators.

2.8.10 Tape Drive Voltages

Check the nonadjustable power supply voltages for the tape drive. If the tape drive is a 1960 series tape drive, check and adjust the FCU and tape unit power supply output voltages. If the voltages are not within the tolerance range, the power supply or voltage regulator may be defective and need to be replaced. The following sections list the voltage ranges and points to test.

2.8.10.1 2920 Tape Drive

The power supply voltages for the 2920 tape drive are nonadjustable. If a voltage exceeds its tolerance the power supply, the voltage regulator, or a circuit board may be defective.

Test the power supply voltages at the **A1** slot on the motherboard. Use pin **B01** at slot **A3** on the motherboard for ground. The following table lists the voltages, tolerances, and test points for the 2920 tape drive:

Table 2-8, 2920 Tape Drive Voltages and Tolerances

VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE	TEST POINTS
+38.00	+32.00	+40.00	C05
+26.00	+22.00	+30.00	C05
+15.00	+13.50	+16.00	C03
+5.10	+4.85	+5.35	A01
-15.00	-16.50	-13.50	C01
-26.00	-30.00	-22.00	C17
-38.00	-32.00	-40.00	C17

NOTE

The tape must be in rewind mode when checking the \pm 38V levels.

2.8.10.2 1960 Tape Drive

The nonadjustable, unregulated power supply outputs can be tested for troubleshooting purposes. They drive the reel motor, the capstan motor, and the cartridge and transfer valve motors and should be set to 45, 35, and 26 volts, respectively.

Check and adjust the FCU power supply output levels and the tape unit power supply output levels with the AC input voltage level at nominal. The FCU power supply has three voltage output levels that may be adjusted; adjust the +15 voltage output first. The tape unit power supply has four voltage output levels that may be adjusted.

Check the FCU voltages at the test points on the pin side of the FCU logic cage. Test the power supply voltage levels (except -5 volts) at the correct pin of any card slot of the card cage back panel. Check the -5 voltage level at the H2 card slot of the card cage. The following table lists the voltage output ranges for the FCU power supply and the tape unit power supply and the points to test:

Table 2-9, 1960 Tape Drive Voltages

POWER SUPPLY	VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE	TEST POINTS
FCU	+5.00	+4.90	+5.10	Pin D1
	+15.00	+14.70	+15.30	Pin D20
	-15.00	-15.30	-14.70	Pin D22
Tape unit	+15.00	+14.70	+15.30	Pin A20
	+5.00	+4.90	+5.10	Pin A1
	-5.00	-5.10	-4.90	Pin A24
	-15.00	-15.30	-14.70	Pin

2.8.11 Tape Drive Internal Diagnostics

Use the STC diagnostic test system to detect I/O errors, isolate problems, verify repairs and engineering changes, and verify proper operation. The test routines allow fault isolation, parameter measurement, artificial stressing, functional checkout, and reliability testing.

External diagnostics verify the tape drive interface and execute limited online exercises. The internal diagnostics test the following:

- **Power-up** — Power-up tests ensure the basic operation of the microprocessor and control logic of the system.
- **Formatter** — Formatter tests simulate record writing to check the operation of the data path.
- **Transport** — Transport tests check the tape transport including tape handling during a load operation, motion control, and high-speed functions.
- **Read/write** — The read/write tests check the data transfer from the data path card, read backward/forward operations, and tape positioning.

2.9 Printronix Printer

The periodic maintenance for the printer includes cleaning the printer, testing the power supply voltages, fans, and filters, checking the printer quality, and lubricating the printer counterweight and cam wick assembly. Inspect all subassemblies and belts. Refer to the *Printronix P6000 Maintenance Manual* for detailed information on these procedures.

2.9.1 Printer Assemblies

Clean the printer to prevent buildup of paper dust, chaff, ribbon lint, and ink. The following printer assemblies should be checked and cleaned:

- **Printer cabinet** — Clean the printer cabinet with a soft cloth and mild detergent. Use a soft brush to dislodge paper dust and ribbon lint in the interior of the cabinet then vacuum to remove the particles.
- **Ribbon drive assembly** — Adjust the ribbon spool hubs and ribbon guides so the ribbon tracks in the center of the guides. Check the distance between the hub flange surface and the surface of the gear box.
- **Shuttle assembly** — Check the area around the shuttle spring for shims that may have fallen from the shuttle assembly. Adjust the shuttle spring force to improve printer quality and reduce excessive rattle under the cam cover. Adjust the preload of the shuttle and counterweight if the yoke is changed.
- **Hammerbank assembly** — Use a stiff non-metallic brush to remove paper dust and ribbon lint from the hammer springs and hammer tips. Adjust the hammer springs and check the hammer tips for damage. Clean all surfaces and holes of the hammerbank cover with a lint-free cloth. Check the platen-to-hammertip gaps.
- **Shuttle drive mechanism** — Check the counterweight assembly for a worn shaft, bushing, or spring. Lubricate the counterweight and cam wick. Check the flywheel assembly for worn bearings, a worn cam, or a damaged timing disk. Check the tension of the shuttle belt and replace the shuttle belt if it is worn, cracked, broken, or damaged.
- **Paper feed mechanism** — Adjust the tension of the paper feed belt between the paper feed motor pulley and the spline shaft pulley. Check the paper motion detector circuit and sensor for low output. Check the operation of the paper out switch.

2.9.2 Power Supply

Test the voltages of the printer power supply with a digital voltmeter. Attach the common lead to ground on the power supply printed circuit board (PCBA). The following lists the voltages and the tolerances of the power supply:

Table 2-10, Printronix Printer Voltages

POWER SUPPLY	VOLTAGE	MINIMUM TOLERANCE	MAXIMUM TOLERANCE
Logic B PCBA	+5.00	+4.75	+5.25
	+12.00	+10.80	+13.20
Power Supply PCBA	+9.50	+8.50	+10.50
	+36.00	+35.00	+37.00
	-36.00	-37.00	-35.00

2.9.3 Printer Fans and Filters

Check the operation of the rear cooling fan for the printer power supply. The fan is located at the rear center of the card cage and can be reached by removing the rear cover to the printer. The fan draws filtered air through the left side and front cover, through the card cage, and out the right side of the cabinet.

2.9.4 Printer Quality

Run the self-test routine to test the quality of the print. Adjust the hammer springs, platen, and magnetic pickup phasing to improve the printing. Print a file to verify proper operation of the system.

The following items could impair the quality of the printing:

- An incorrect spring force in the shuttle assembly
- A defective, misaligned, or dirty hammer spring
- A damaged hammer tip
- A defective hammer coil
- An unequal gap between the platen and the hammer tips at both ends of the hammerbank

2.9.5 Lubrication

Lubricate the counterweight and cam wick to ensure proper operation of the counterweight cam follower, hammerbank cam follower, and flywheel cam. Use SAE 20 or equivalent oil to lubricate the following parts of the printer:

- **Counterweight assembly** — Remove the two oil port plugs at the top of the counterweight assembly and apply oil to each of the ports.
- **Cam wick assembly** — Saturate the cam wick assembly beneath the flywheel cam and the felt of the shuttle assembly.
- **Shuttle springs** — Apply a light film of oil to the shuttle springs, shims, and yoke bearing.
- **Counterweight shafts** — Apply a light film of oil to the counterweight shafts, spacer, and shims.

Chapter 3

Software

3.1 Overview

This chapter discusses how to read the error log to identify potential problems, how to create a backup of the SPU tape to avoid losing data, how to run the system exerciser routine to simulate stressful load conditions on the system, and how to test the system with diagnostics.

3.2 Error Messages

An error message may list the number of attempts required to successfully execute an operation or show that an operation failed. If the Error Checking and Correction (ECC) error was soft (correctable), the error message is for information only. If the error was hard (uncorrectable) and data was lost, the software attempts a disk operation to isolate the exact sector with an error. For a hard error, the sector number in the last error message is that of the sector with the error.

3.2.1 Error Message Files

The error log maintains a record of all major happenings on the system, e.g., system re-boots and system errors. The soft error log contains a record of soft errors and the number of retries the system makes to execute an operation.

Evaluate these files to determine and identify potential problems. Print the error log and delete the source to limit the size of the file. The soft error log can be viewed but cannot be edited.

The error log is in the *errlog* file of the *mnt* directory. The *softlog* file is also in the *mnt* directory. Enter the error log files directly if the system is in the SPU UNIX operating system. Use the following command to display the complete error logs from CONVEX UNIX:

```
spu -r directory/file
```

The following command copies lines from the end of the error log into a separate file *in the current directory*:

```
spu -r directory/file | tail -[no. of lines] > [file]
```

The following is an example of the previous command. This command copies the last 50 records of the soft error log into a file in the current directory.

```
spu -r /mnt/softlog | tail -50 > [file]
```

3.2.2 Error Message Formats

The *errlog* file receives a copy of hard or soft errors when they first occur. The messages in the *errlog* file list the Channel Control Unit (CCU) that had the failure, the time the error occurred, whether the failure occurred on a magnetic tape, a disk drive, or the Excelan Ethernet.

The *softlog* file contains information about the repetitions to execute an operation successfully. This information includes the number of repetitions the system tried, how many repetitions failed and passed, whether the error was a transient or stuck failure, and the times for the first and last failures.

3.2.2.1 Error Log Messages

The following sections show the formats of the error messages.

Magnetic Tape Error Messages

The following shows the format of a magnetic tape error message:

```
[CCU#@Time] ta#: cmd 000x esb 000x fsb 000x mux0 000x mux1 000x
      mux2 000x mux3 000x
```

where:

ta# is the tape drive number with the error

cmd 000x is the command that was issued to the tape drive, in hex

esb 000x is the error status byte generated by the magnetic tape controller, in hex

fsb 000x is the formatter error status byte generated by the magnetic tape formatter, in hex

mux0 000x is the contents of the dead track register, in hex

mux1 000x is the contents of the read/write error register, in hex

mux2 000x is used by diagnostic routines and includes reject codes, in hex

mux3 000x is the contents of the status lines addressed tape drive

Disk Error Messages

The following shows two formats of a disk error message:

```
[CCU#@Time] aaa: bbb:ccc [ddd]
```

or

```
[CCU#@Time] aaa: ccc [ddd]
```

where:

aaa is the disk drive addressed when the error was detected

bbb is the type of operation, if applicable

ccc is the type of error

[ddd] is the starting cylinder, head and sector addresses, and the number of sectors to be transferred

The following shows two formats of a disk error message that is related to a controller rather than a disk drive:

```
[CCU#@Time] daxxx: dev=yy stat=zz
```

or

```
[CCU#@Time] da:xxx (cntl_r_dev=yy)
```

where:

da means that the type of error is related to the controller and not caused by a specific disk drive
xxxx is the type of error. A **timeout** means that the controller failed to complete an operation in a specified period of time
yy is the controller number
zz is the hexadecimal status from the Control Status Register (CSR) of the controller

The following are examples of errors the log may contain:

```
[CCU7@03:21:07] da4: Read:Soft ECC Error [cyl=368 head=10 sect=32 cnt=6]
[iop7@10:48:18] da0: Disk Sequencer Error [cyl=713 head=3 sect=13 cnt=8]
[iop6@17:39:21] da1: Drive Not Ready [cyl=71 head=15 sect=33 cnt=30]
[iop3@23:56:16] da: double error (cntl_r_dev=2)
[iop3@07:39:35] datimeout: dev=10 stat=01
```

where:

cyl is the cylinder number
head is the head number
sect is the sector number with the error
cnt is the number of sectors remaining to be read after the one in error

Ethernet Error Messages

The following shows the format of an Excelan Ethernet transmit and receive error message:

```
[CCU#@Time] ex: transmit error aax
```

or

```
[CCU#@Time] ex: receive error aax
```

where:

aa is the error code, in hex

3.2.2.2 Soft Error Log Messages

The following shows the format of a *softlog* error:

```
2MB Block Addr: 00000000 Date: FriRepetitions: 201
  Passed: 199 Failed: 2
Failed devices:
T/S: T - Transient fail: S - Stuck fail
```

ADDRESS	SYN	MAU	DEVICE	CPU	SPU	T/S	FIRST FAIL	LAST FAIL
00dcc6b8	b9	0	E4-026	0	1	T	Thu May 8 07:54:35	Thu May 8 07:54:35
026077e8	ce	2	P3-089	0	1	T	Tue May 27 11:35:09	Tue May 27 11:09
02fc9618	70	2	D6-026	0	1	T	Tue Aug 5 18:01:13	Tue Aug 5 18:01:13
007b2168	89	0	S3-107	1	0	T	Wed Aug 13 19:00:06	Wed Aug 13 19:00:06

3.3 SPU Backups and Crash Dumps

Create a backup of the SPU disk and tape at installation and semi-annually afterward. The disk and tape keep track of diagnostics, microcode, and SPU tape. Making a backup of disks and tapes on a regular basis helps prevent the loss of data through any cause of a "disk crash" such as through fire or electrical storms.

3.3.1 SPU Disk File Backups

The *backup* routine executes the command to back up the SPU disk. Use the following command to backup the disk:

```
/etc/backup [-r]
```

This routine calls the *bldboot* command to back up the boot tracks and the root image in binary form, and the mounted file system(s) in single file format. The *-r* option allows the FE to backup only the root partition.

Use the *restore* command to finish the rebuild procedure. It builds the mount file system(s) on the mount partition(s) then restore the mount file system(s). Use the following command to execute the routine:

```
/etc/restore
```

The following files are placed on the cartridge tape during the backup procedure:

- */bt0.cart*
- */stand/spu2000.cart*
- */dev/dk0a*
- */dev/dk0d*
- */dev/rmt1*
- */mnt*
- */hw*
- */dev/dk2a*
- */dev/dk3a*
- */dev/dk2d*

Refer to the man pages on *backup*, *bldboot*, and *restore* for more information on these procedures.

3.3.2 SPU Tape Backups

Make tapes of all mounted file systems at least once a week and create incremental backup tapes each day. Use the *dump* command to make backup tapes. The *dump* command copies any files changed after a certain date from the filesystem to magnetic tape. Refer to the *CONVEX System Manager's Guide* for more information on making backup tapes.

3.3.3 Crash Dumps

When a computer crashes the state of the system must be saved so the cause of the problem can be determined. The information that is saved includes the state of the machine during the crash and is called a crash dump.

A crash dump may be sent to either a tape drive on either the local machine or a remote machine. Remote crash dumps are sent across an Ethernet, received by a server on the remote machine, and written to tape.

CONVEX recommends contacting the Technical Assistance Center (TAC) before attempting to execute the crash dump.

CAUTION

Do not restart the crash dump procedure once it has begun. Failure to do so may result in loss of data.

Refer to the *CONVEX System Manager's Guide* for procedures to execute a crash dump.

3.4 System Exerciser

The System Exerciser (*sysex*) program runs the system with programs similar to those the customer may use. It simulates stressful load conditions on the system. The program generates a system load by running a variety of tasks that are I/O and computation intensive. The *sysex* program should run overnight, or over a weekend, to completely test the system. Refer to the man page for the *sysex* command for more information.

To prepare the system before running the *sysex* program:

- Load the *sysex* program from the system exerciser release tape.
- Check that the following is available before testing the peripherals:
 - Mount a scratch tape on each drive to be tested.
 - A */tmp* partition should have 7 Mbytes before testing a disk.
 - A Farside Echo (FSE) board must be installed in the High-Speed Parallel Interface Adapter (HIA) to test the High-Speed Parallel interface (HSP). Refer to the *CONVEX HIA User's Guide* for information on this functional unit.
- Check that all disk drives to be tested are online.

To invoke the *sysex* program:

- Change the directory to *usr/sys/test/sysex*.
- Enter the command *sysex* to run one pass of all test types. This is the default mode.

To run individual tests on various parts of the system, enter the following:

```
sysex [opt][rep_count]
```

The options include the following parts of the system:

- Memory
- CPU
- TTY
- OS
- Tape[1-16]
- Disk[1-16]
- High-Speed Parallel interface

The *rep_count* is the number of repetitions for the test. This must be included for each option selected.

The following is an example of the command:

```
sysex cpu 20 memory 50 disk1 75
```

This command runs the CPU test 20 times, the memory test 50 times, and the disk1 test 75 times.

3.5 Diagnostics

The following sections discuss the processor, Channel Control Unit (CCU), Multibus Input/Output Processor (MIOP), and VMEbus Input/Output Processor (VIOP) diagnostics. Refer to the *CONVEX Diagnostic Documentation (C200 Series)* for information on the diagnostics.

3.5.1 Processor Diagnostics

The processor diagnostics execute under the Service Processor Unit operating system, SPU UNIX. These operations test the system functions and report any errors they detect. Run the following diagnostics after booting SPU UNIX. Refer to the *CONVEX Diagnostic Documentation (C200 Series)* for information on running the processor diagnostics. The following list describes the function of each test:

- *spu4000* — The *spu4000* test verifies the interface between the Service Processor Unit (SP2) and the functional units or boards.
- *pia4000* — The *pia4000* test checks the functionality of the Peripheral Interface Adapter (PIA) board.
- *cpz4000* — The *cpz4000* test checks the functional blocks of the CPU Utility Unit (CPX), and some associated circuits.
- *mem4000* — The *mem4000* test verifies the control features of the memory system and the memory arrays.
- *cpu4030* — The *cpu4030* test verifies the basic functionality of all nonprivileged scalar instructions.
- *cpu4041* — The *cpu4041* diagnostic is a set of vector instructions that verify the operation of the vector unit and its interfaces to other C200 series subsystems.
- *cpu4010* — The *cpu4010* test exercises the reference and modify (ref/mod) bits to verify their proper operation.
- *cpu4131* — The *cpu4131* diagnostic tests exceptions, privileged instructions, page faulting, interrupts, and all timers that are specific to the architecture of the processor.
- *cpu4040* — The *cpu4040* test verifies the vector processor unit operation under all possible combinations of load/store, add/logical, and multiply/divide vector instructions.
- *cpu4231* — The *cpu4231* test verifies nonvector, single-headed architectural features unique to the C200 Series processors including system exceptions, interrupts, privileged instructions, the various processor caches, remote invalidates, and nonresident memory pages.
- *cpu4232* — The *cpu4232* test is an extension of the building block test *cpu4030* for the CONVEX C200 Series machines and provides exhaustive, single CPU testing of the C200 Series scalar, address, and communication register instructions.

- *cpu4233* — The *cpu4233* test verifies the operation of CPU complex in a multithreaded environment including tests for concurrent access and use of communication registers, memory, thread creation and termination instructions, interrupts, CPU execution timers, privileged instructions, and exceptions.
- *cpu4241* — The *cpu4241* test is a group of vector instruction tests used to verify the operation of C200 Series vector and vector-under-mask instructions along with their interfaces to other C200 Series subsystems.

The following table lists the order to run these diagnostics and an approximate time required for them to execute:

Table 3-1, Processor Diagnostics

ORDER	PROCESSOR DIAGNOSTIC	TIME TO COMPLETE (minutes)
1	<i>spu4000</i>	8
2	<i>pia4000</i>	2
3	<i>cpx4000</i>	37
4	<i>mem4000</i>	102
5	<i>cpu4030</i>	8
6	<i>cpu4041</i>	13
7	<i>cpu4010</i>	4
8	<i>cpu4131</i>	3
9	<i>cpu4040</i>	NA ¹
10	<i>cpu4231</i>	4
11	<i>cpu4232</i>	2
12	<i>cpu4233</i>	5
13	<i>cpu4241</i>	252

¹ The time to execute varies based on the number of instructions and the values of the vector stride and vector length registers.

3.5.2 Channel Control Unit Diagnostics

The Channel Control Unit (CCU) diagnostics include the Multibus Input/Output Processor (MIOP), VMEbus Input/Output Processor (VIOP), and High-Speed Parallel interface (HSP) tests, and CCU tests. If the system has an MIOP, a VIOP, or an HSP, execute *io4000*, *io5000*, and *io4120*, respectively. If the system does not have a particular CCU, the test for that CCU should not be run. These tests must always run before the *dev* diagnostics. Refer to the *CONVEX Diagnostic Documentation (C200 Series)* for information on running the CCU diagnostics. The following list describes the function of each test:

- *io4000* — The *io4000* test verifies the functionality of an MIOP, which the user specifies.
- *io5000* — The *io5000* test verifies the functionality of a VIOP, which the user specifies.
- *io4120* — The *io4120* test checks the operation of an HSP and the HSP Interface Adapter (HIA).

The following table lists the order to run these diagnostics and an approximate time required for them to execute:

Table 3-2, CCU Diagnostics

ORDER	PROCESSOR DIAGNOSTIC	TIME TO COMPLETE (minutes)
1	<i>io4000</i>	17
2	<i>io4120</i>	132
3	<i>io5000</i>	18

3.5.3 Multibus Input/Output Processor Diagnostics

The Multibus Input/Output Processor (MIOP) *dev* diagnostics test the Multibus peripheral devices. Refer to the *CONVEX Diagnostic Documentation (C200 Series)* for information on running the MIOP diagnostics. Run the following tests after running the CCU diagnostics:

- *dev4110* — The *dev4110* test the formats, verifies the format, and interactively tests up to 12 Storage Module Drives (SMDs) at the same time.
- *dev4200* — The *dev4200* test verifies the functionality of the CONVEX Multibus tape controller.
- *dev4300* — The *dev4300* test verifies the functionality of an MTI-800A, MTI-1600A, MTI-850, or MTI-1650 asynchronous communications controller that attaches to an IOP through a Multibus chassis.
- *dev4400* — The *dev4400* test verifies that the Systech MLP-2000 line printer controller and the associated Centronics line printer are online and functional.
- *dev4500* — The *dev4500* test checks the functionality of the CONVEX Multibus tape controller.

The following table lists the order to run these diagnostics and an approximate time for them to execute:

Table 3-3, MIOP Diagnostics

ORDER	PROCESSOR DIAGNOSTIC	TIME TO COMPLETE (minutes)
1	<i>dev4110</i>	149
2	<i>dev4200</i>	24
3	<i>dev4300</i>	12
4	<i>dev4400</i>	1
5	<i>dev4500</i>	24

3.5.4 VMEbus Input/Output Processor Diagnostics

The VMEbus Input/Output Processor (VIOP) *dev* diagnostics test the peripheral devices. Refer to the *CONVEX Diagnostic Documentation (C200 Series)* for information on running the VIOP diagnostics. Run the following tests after running the MIOP diagnostics:

- *dev5130* — The *dev5130* test formats, verifies the format, and interactively tests up to 12 Interphase 4200 VMEbus/Storage Module Devices (V/SMD) or Interphase 4201 VMEbus/Enhanced Small Device Interface (V/ESDI) disk controllers.
- *dev 5500* — The *dev5500* test verifies that the Excelan EXOS/202 Ethernet controller board operates properly. It checks the VIOP-to-controller interface and triggers the controller board's built-in self-test.

The following table lists the order to run these diagnostics and an approximate time required for them to execute:

Table 3-4, VIOP Diagnostics

ORDER	PROCESSOR DIAGNOSTIC	TIME TO COMPLETE (minutes)
1	<i>dev5130</i>	174
2	<i>dev5500</i>	5

Appendix A

Test Equipment and Special Tools

A.1 Overview

This appendix lists special equipment and tools used for general maintenance. It also lists the part numbers for the tools.

A.2 Special Tools

The following tools are necessary for the preventive maintenance procedures:

- **Oscilloscope** — Use the oscilloscope to monitor the beginning of tape/end of tape (BOT/EOT) test points and to check the backward and forward skew of the read/write head on the tape drives.
- **Digital multimeter** — Use the digital multimeter to test the power supply output levels.
- **Belt tension meter** — Measure the pneumatics belt tension with the tension meter.
- **Pressure/Vacuum meter** — Measure the pneumatics vacuum levels with the pressure meter.
- **Tape unit cleaning kit** — The tape unit cleaning kit contains hub/transport cleaning fluid, a lint-free cloth, foam-tipped swabs, and a pneumatic pulley alignment tool.
- **Tape drive master skew tape** — The master skew tape is used to test the alignment of the tape drive read/write head.
- **Tape drive standard amplitude tape** — Use the standard amplitude tape to check the read amplitude.

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Appendix B

Problem Reporting

B.1 Overview

The *contact* utility is the recommended way to report minor hardware deficiencies and technical documentation problems to the Technical Assistance Center (TAC). This utility is an interactive tool that prompts the user for the information to properly file a problem report.

NOTE

The *contact* utility is not intended for requesting customer service for hardware failures. To restore your CONVEX equipment to operational status, faster service can be obtained by directly telephoning the TAC (refer to "Technical Assistance" in the preface).

To use the *contact* utility, there must be a phone connection to the TAC. A UNIX-to-UNIX Communication Protocols (UUCP) allows communication between UNIX systems by either dial-in or hard-wired communication lines. For more information, refer to *uucp(1)* or to the *info(1)* entry in the UNIX man pages.

The name and version number of the product involved is required. Use the *vers* command to ascertain the program or utility name and version. The syntax for the command is *vers filename*, where *filename* is the full pathname of the program. If the full pathname of the program is not known, enter **which program**. For more information, refer to the *vers(1)* and *which(1)* entries in the UNIX man pages.

B.2 Information Required to Report a Problem

The *contact* utility requires the following information:

1. The customer name, title, phone number, and corporate name
2. The hardware nomenclature, part number, and revision level, or the technical manual name, document number, and version

NOTE

Use *vers* and *which* to identify product name and version.

3. A short (one line) summary of the problem
4. The more information provided, the more quickly the problem can be isolated and solved. At a minimum, include a detailed description of the problem (including page references, if applicable), the source code, and a stack backtrace whenever possible.

NOTE

See the *adb(1)* or *csd(1)* man pages for information on obtaining stack backtraces.

5. The priority of the problem, selected from a list of six levels
6. Instructions on how to reproduce the problem, including the command syntax used, any flags invoked, or anything else attempted to make the program run
7. Any other comments about the problem or files to be submitted

The *contact* user has a chance to review and edit the report prior to submitting it. If the user decides to delay submitting the report, the session can be aborted. The report is automatically saved in the user's top-level directory in a file named *dead.report*.

See the following figure for a sample *contact* session. User input is in bold lettering, and the system response is in monospace type.

Figure B-1, Sample *contact* Session

```
%contact (RETURN)
Welcome to contact version 0.11 ()

Enter your name, title, phone number, and corporate name (^D to terminate)
> Margaret Atwood, systems programmer, 814-4444, University r
> of Chicago (RETURN)
> (CTRL-D)

Enter the name of the product involved
> CONVEX UNIX Programmer's Manual, Part I (RETURN)

Enter the version number (in the form X.X or X.X.X.X) of the product
> Revision 4.0 (RETURN)

Enter a short (1 line) summary of the problem
> The finger command manual page lists nonexistent bug (RETURN)

Enter a detailed description of the problem (^D to terminate)
> The finger(1) man page says, under the BUGS section, that "Only the first
line of the .project file is printed." Happily, this is not true! (RETURN)
> (CTRL-D)

Enter a problem priority, based on the following:
1) Critical - work cannot proceed until the problem is resolved.
2) Serious - work can proceed around the problem, with difficulty.
3) Necessary - problem has to be fixed.
4) Annoying - problem is bothersome.
5) Enhancement - requested enhancement.
6) Informative - for informational purposes only.
> 4 (RETURN)

Enter the instructions by which the problem may be reproduced (^D to terminate)
> a) put more than one line in .project (RETURN)
> b) read the man page for finger(1) (RETURN)
> (CTRL-D)

Enter any comments that are applicable (^D to terminate) (RETURN)
> (CTRL-D)

Do you have any suggestions or comments on the documentation that you
referenced when you were trying to resolve your problem (for example,
additions, corrections organization, accessibility)? (^D to terminate)
> The man page should be updated. (RETURN)
> (CTRL-D)

Are there any files that should be included in this report (yes | no)?
> no (RETURN)

Please select one of the following options:
1) Review the problem report.
2) Edit the problem report.
3) Submit the problem report.
4) Abort the problem report.
> 3 (RETURN)

Problem report submitted.
%
```

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You are invited to submit comments concerning the clarity and service of this manual. Constructive critical comments are most welcome, and will help us continue in our efforts to generate quality customer documentation. Please list the document page number with your questions and comments.

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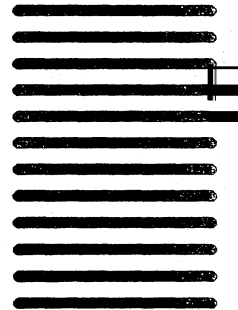
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