CONVEX Processor Operation Guide (C100 Series, C200 Series)

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Second Edition
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CONVEX Computer Corporation
Richardson, Texas USA

CONVEX Processor Operation Guide
(C100 Series, C200 Series)
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Revision Sheet

CONVEX Processor Operation Guide
(C100 Series, C200 Series)

Edition	Document No.	Date	Description
Second	081-000040-200	August 1988	Updated release to include French and German translations of the Safety appendix as well as revisions to include the C201 and C202 machines.
1.0	081-000040-000	April 1988	First release, Version 1.0.

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.

Do not connect external equipment to the utility outlets in CONVEX equipment cabinets. Unauthorized connection voids all agencies' emissions certifications.

Table of Contents

Appendixes

List of Tables

List of Figures

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Preface

Purpose and Audience

This guide provides information and instructions on the routine operation of CONVEX supercomputer hardware. The guide is intended for use by system managers and computer operations personnel responsible for the following functions:

- Safety considerations
- Powering up the hardware
- Booting the SPU UNIX operating system
- Booting the CONVEX UNIX operating system
- Powering down the hardware
- Routine maintenance

Hardware and Software Considerations

The information presented in this guide applies to CONVEX C100 Series and C200 Series computers running CONVEX UNIX Version 6.2 and/or CONVEX UNIX 7.0.

Organization

The content of each chapter is outlined below:

Chapter 1. Introduction — General operation information on CONVEX supercomputer hardware

Chapter 2. Power-Up and Power-Down Procedures — Information and procedures for powering up the hardware, booting the SPU UNIX operating system, booting (and rebooting) the CONVEX UNIX operating system, and powering down the CONVEX supercomputers under normal operating conditions

Chapter 3. Routine Maintenance — Routine maintenance of CONVEX supercomputers

Appendix A. Glossary — A list of CONVEX-preferred technical nomenclature and terminology including standard abbreviations used in this guide

Appendix B. Safety Considerations — Safety information and procedures on installing and servicing CONVEX supercomputers

Appendix C. System Monitor Board Indicators — A table containing descriptions of the 16 LED indicators that appear on the C120 System Monitor Board (SMB)

Appendix D. SCM Status Codes — A table containing descriptions of the hexadecimal System Control Module (SCM) status codes that appear on the system status display

Appendix E. Environmental Specifications — The environmental specifications for CONVEX supercomputers

Appendix F. Problem Reporting — How to use the *contact* facility to report problems

Appendix G. Emergency Power Down Procedures — A table with power-down procedures in case of emergencies

Appendix H. French translation of Appendix B — Safety Considerations

Appendix I. German translation of Appendix B — Safety Considerations

Notational Conventions

The notational conventions used in this text are listed below:

- ASCII non-printable characters are designated by their mnemonic enclosed between less than (<) and greater than (>) signs. For example, **<CR>** stands for "carriage return."
- Control characters are designated by an up arrow symbol and the appropriate character. For example, (**^d**), indicates the control key and the letter "d" are pressed simultaneously.
- User-entered commands are shown in **boldface** type.
- The stick (|) symbol separate options in user-entered commands. For example, *yes* | *no* indicates the option choices are "yes" or "no."
- Brackets ([ ]) designate options in user-entered commands. For example, [*n*[ormal] | *d*[*iagnostic*]] indicates that *normal*, *diagnostic*, *n*, or *d* can be entered as a command option.
- A horizontal ellipsis (...) shows repetition of the previous items.
- TBD is an abbreviation for *To Be Determined.*
- *Italics* are used to indicate emphasis and names of commands.

Cautions

The following is an example of a CAUTION's typical content and location as used in only this CONVEX document:

> **CAUTION**
>
> Cautions highlight procedures or information necessary to avoid injury to personnel, damage to equipment, loss of data, or invalid test results. A caution immediately precedes the critical information and includes a description of the possible damage.

The use of a **CAUTION** notation to highlight potential physical injuries in not typical of other CONVEX documentation. CONVEX documents normally use **WARNING** notations to highlight risks of physical injury. The nonstandard use of **CAUTION** in this document reflects the requirements of various safety organizations.

Notes

The following is an example of a note and its typical content and location as used in CONVEX documents:

> **NOTE**
>
> Notes highlight information that is supplemental in nature. A note may immediately precede or follow the information that is being highlighted.

Associated Documents

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

- *CIT 101XL Video Display Terminal User's Guide*
- *CONVEX C1 Diagnostic Reference Manual*, Order No. DHW-072
- *CONVEX Computer Site Preparation Guide (C130, C210, C220, C230, C240)*, Order No. DHW-009
- *CONVEX Diagnostic Utilities Manual (C130, C210, C220)*, Order No. DHW-082
- *CONVEX SPU UNIX Utilities Manual*, Order No. DHW-007
- *CONVEX System Manager's Guide*, Order No. DSW-004
- *CONVEX UNIX Primer*, Order No. DSW-133
- *CONVEX UNIX Programmer's Manual*, Order No. DSW-003
- *CONVEX UNIX Tutorial Papers*, Order No. DSW-002
- *National Fire Protection Association (NFPA) Standard 75, 12A, and 12B*
- *Viper Product Manual*

Ordering Documentation

To order the most current version of this or any other CONVEX document, use the 6-digit order number. If the product number is not known, order by the exact title. In some situations, the most current version may not be desired. To receive a specific version of a manual, order the manual by its 12-digit document, or part, number, which can be provided by CONVEX.

The order number for this manual is DHW-015.
The document number for this manual is 081-000040-200.

CONVEX documents can be ordered by mail by sending a request to:

CONVEX Computer Corporation
Customer Service
PO Box 833851
Richardson TX 75083-3851 USA

Technical Assistance

Hardware and software support can be obtained through the CONVEX Technical Assistance Center (TAC). The TAC can be reached from within Texas by calling (214)952-0379, or by calling 1(800)952-0379 from other locations in the continental United States. Customers outside the United States should contact their local CONVEX office.

Chapter 1
Introduction

1.1 Overview

This chapter contains descriptions of the CONVEX hardware. The chapter is divided into two sections:

- "System Descriptions" describes the contents of CONVEX cabinets and illustrates their physical locations.
- "Control Switches and Indicators" describes the control switches and indicators used in operations procedures.

1.2 System Descriptions

This section contains descriptions of the CONVEX supercomputer cabinets. Environmental specification tables for each CONVEX machine are listed in Appendix E. See the *CONVEX Computer Site Preparation Guide (C130, C210, C220, C230, C240)* for additional information on CONVEX equipment.

Figure 1-1 shows the basic hardware components of the CONVEX C100 Series models. Figure 1-2 shows the basic hardware components of the CONVEX C200 Series models.

> **NOTE**
>
> All information and procedures for C201 and C202 computers are not specifically addressed in this manual; however, they are the same as those for the C210 and C220 computers respectively.

1.2.1 CONVEX Cabinets

Basic CONVEX supercomputer cabinet configurations consist of a single *processor* cabinet and one or more *expansion* cabinets. The contents of both cabinet types are described below.

1.2.1.1 Processor Cabinets

Most CONVEX processor cabinets contain the following hardware components:

- Processor board(s)
- Memory board(s)

- Service Processor Unit (SPU) board
- Channel Control Unit(s) CCUs
- SPU UNIX cartridge tape drive and hard disk (if the Removable Disk System (RDS) has been installed, the removable SPU hard disk is located in the expansion cabinet.)
- Power supplies and power supply control panel (AC power-controller panel)
- Operator control panel (front control panel)
- Multibus or VME bus chassis
- System Monitor Board (on C100 Series)
- System Control Monitor (on C200 Series)

1.2.1.2 Expansion Cabinets

CONVEX expansion cabinets provide the physical means to increase peripheral and I/O capacity. Additional expansion cabinets may be added to CONVEX systems as required. The first (or primary) expansion cabinet usually contains the following hardware components:

- Single tape drive
- One or more disk drives
- Modem
- Peripheral controllers
- RS-232-C interface panel

Figure 1–1, CONVEX C100 Series Hardware Components

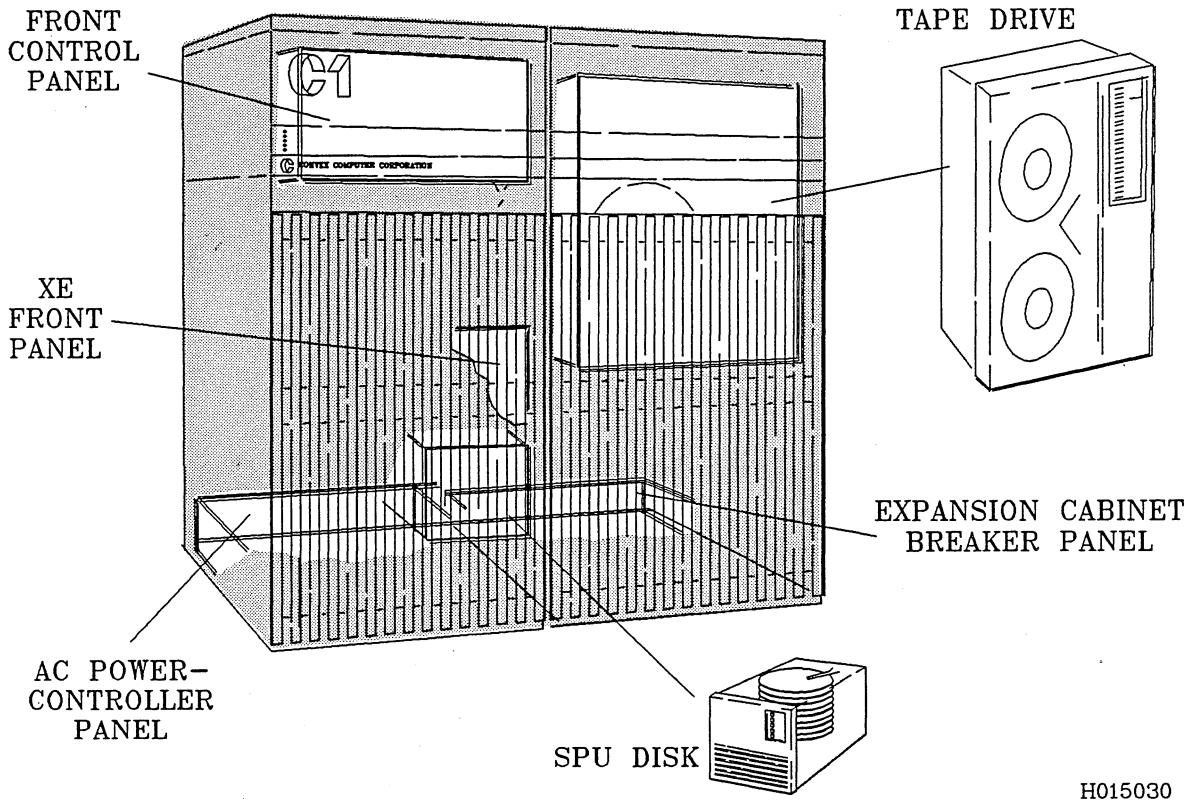
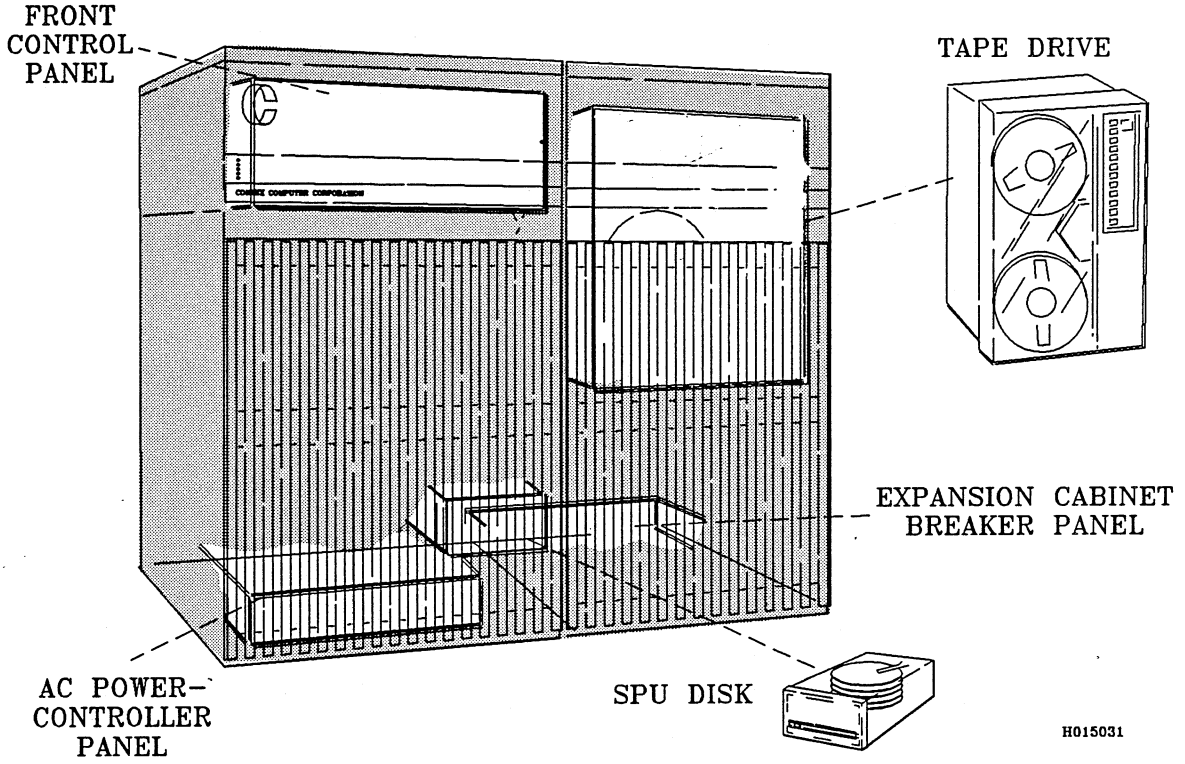


Figure 1–2, CONVEX C200 Series Hardware Components



1.2.2 CONVEX Power Requirements

The various models of CONVEX supercomputers have different AC power requirements and consumption levels. It is critical that proper power supplies be used to avoid damage to the equipment. Additional information on power requirements is provided in Appendixes B and E, and in the *CONVEX Computer Site Preparation Guide (C130, C210, C220, C230, and C240).*

1.3 Control Switches and Indicators

This section describes the control switches and indicators on the CONVEX supercomputers from an operations perspective. The control switches and indicators used in CONVEX supercomputers are standardized. Exceptions or variations from the standard control switches and indicator designs are noted for each CONVEX model.

1.3.1 Front Control Panel

The front control panel is located at the top front of the CONVEX processor cabinets. Figure 1-3 shows the position of the keyswitch, system-monitor LED indicators, and the **SYSTEM RESET**

switch located on C100 Series front control panels. Figure 1-3 also shows the position of the keyswitch, system-monitor LED indicators, the **SYSTEM RESET** switch, and the **SYSTEM-STATUS** display located on the C200 Series front control panels.

Figure 1-4 shows the position of the keyswitch, system monitor LED indicators, **SYSTEM RESET** switch, and System Monitor Board LED indicators located on the CONVEX XE front control panel.

1.3.1.1 Keyswitch

The keyswitch cycles power to the CPU, CCU(s), and SPU. On C100 Series models the keyswitch is located directly under the **SYSTEM RESET** switch on the front control panel. On C200 Series models the keyswitch is located between the **SYSTEM RESET** switch and the system-monitor LED indicators on the front control panel. There are four keyswitch positions:

> **NOTE**
>
> To have control over the boot mode, turn the keyswitch to the **OFF** position *before* turning the processor cabinet circuit breaker **ON** or beginning the power-up procedure.
>
> The keyswitch may be turned back to the **OFF** position *after* the system has gone through a normal *power-down* procedure. Failure to follow the above procedures may cause damage to equipment or loss of data.

- **OFF** — There is no power to the CPU chassis when the keyswitch is in the **OFF** position.
- **LOCAL MAINTENANCE** — This keyswitch position initializes (boots) the system to the soft front panel (firmware level).

  When the keyswitch is in this position, the system does not automatically boot SPU UNIX or CONVEX UNIX operating systems. The system can be manually booted to SPU UNIX or CONVEX UNIX using commands entered on the system console.

  The **SYSTEM RESET** switch is *enabled* when the keyswitch is in this position.
- **REMOTE MAINTENANCE** — This keyswitch position allows modem communication from a remote location. This allows the CONVEX Technical Assistance Center to perform diagnostics remotely.

  When the keyswitch is in the **REMOTE MAINTENANCE** position the system boots respond as if the keyswitch were turned to **LOCAL MAINTENANCE**. However, in **REMOTE MAINTENANCE** the system accepts commands only from a modem connection over telecommunication media. Commands cannot be entered from the system console, but all remote communications are displayed *(echoed)* to the system console.

If the keyswitch is *not* in the **REMOTE MAINTENANCE** position, the system console cannot be accessed remotely. Remote communication is completely disabled when the keyswitch is *not* in the **REMOTE MAINTENANCE** position.

The **SYSTEM RESET** switch is *enabled* when the keyswitch is in this position.

- **SECURE EXECUTION** — When the keyswitch is in this position, the default boot procedure is activated. Under normal operating conditions the system boots *directly* to the CONVEX UNIX multi-user mode when the keyswitch is turned from the **OFF** position to the **SECURE EXECUTION** position.

  The **SYSTEM RESET** switch is *disabled* when the keyswitch is in this position.

1.3.1.2 System-Monitor LED Indicators

Three system-monitor LED indicators are located to the left of the keyswitch, near the center of the front control panel. These indicators inform the system manager of the system's condition at any particular time. The three indicators are described below:

- **ATTENTION** — The **ATTENTION** LED flashes when an *abnormal* condition occurs; the system has either been powered down with the keyswitch, or it has failed in some way. This LED is controlled by the SMB (on C100 Series models) or the SCM (on C200 Series models) and flashes if any of the following conditions occur:
  - Improperly installed printed circuit boards (on C200 Series models only)
  - Power supply margining (normal occurrence in some diagnostic modes)
  - Ambient temperature higher than 104° F. (The SCM shuts down the system if the temperature increases.)
  - Cooling fan failure
  - Weakening of current from any of the main CPU power supplies, or a short-circuit in any of the power supplies

  If the system shuts down for any of these reasons, take the following action:

  1. Read and record any messages and codes that appear on the system console, the **SYSTEM STATUS** display (on C200 Series models), the System Monitor Board (on C100 Series models) and record the state of the system-monitor LED indicators. (See the section on "**SYSTEM STATUS** display" in this chapter and Appendix D.)
  2. Call the CONVEX Technical Assistance Center (TAC) with a trouble report. Depending upon the TAC's instructions, either wait for assistance or start-up and reboot the system according to standard procedures.
- **POWER** — When the main circuit breaker is in the **ON** position, and the **POWER** LED remains lit, power has been applied to the system. (The keyswitch is turned to the **LOCAL MAINTENANCE, SECURE EXECUTION,** or **REMOTE MAINTENANCE** positions.)

- **RUN** — The **RUN** LED remains lit when the system is running properly. The **RUN** LED is controlled by the SPU and lights once the system is booted and the CONVEX UNIX operating system is running.

1.3.1.3 SYSTEM RESET Switch

The **SYSTEM RESET** switch forces a hardware reset on the SPU, initiating the reboot sequence according to how the soft front panel is currently programmed. The **SYSTEM RESET** switch is located in the upper right corner of the front control panel and is enabled *only* when the keyswitch is in the **LOCAL MAINTENANCE** or **REMOTE MAINTENANCE** positions. The **SYSTEM RESET** switch is disabled when the keyswitch is in the **SECURE EXECUTION** position.

1.3.1.4 SYSTEM STATUS Display

CONVEX C200 Series computers have a **SYSTEM STATUS** display located on the front control panel below the system-monitor LED indicators. Status codes are sent by the System Control Monitor (SCM) and displayed in hexadecimal format on this two-digit LED display. The **SYSTEM STATUS** display shows an **FF** status code when the system is operating normally.

The SCM continually checks the system for abnormal or dangerous conditions. The SCM attempts to notify the system manager of marginal operating conditions by flashing the **ATTENTION** indicator, displaying hexadecimal status codes to the **SYSTEM STATUS** display, and sending a message to the system console.

The SCM shuts off power to the system under particularly dangerous conditions. If power is turned off by the SCM, messages cannot be read at the system console. However, the **ATTENTION** LED does flash to indicate system failure and one or more **SYSTEM STATUS** codes are displayed. See Appendix D for definitions of the SCM hexadecimal status codes.

CONVEX C100 Series models do not have a **SYSTEM STATUS** display on the front control panel. See the section on the "System Monitor Board (SMB)" in Chapter 2 and Appendix C for additional information on error conditions and how the C100 Series models display system status information.

Figure 1–3, CONVEX Front Control Panels

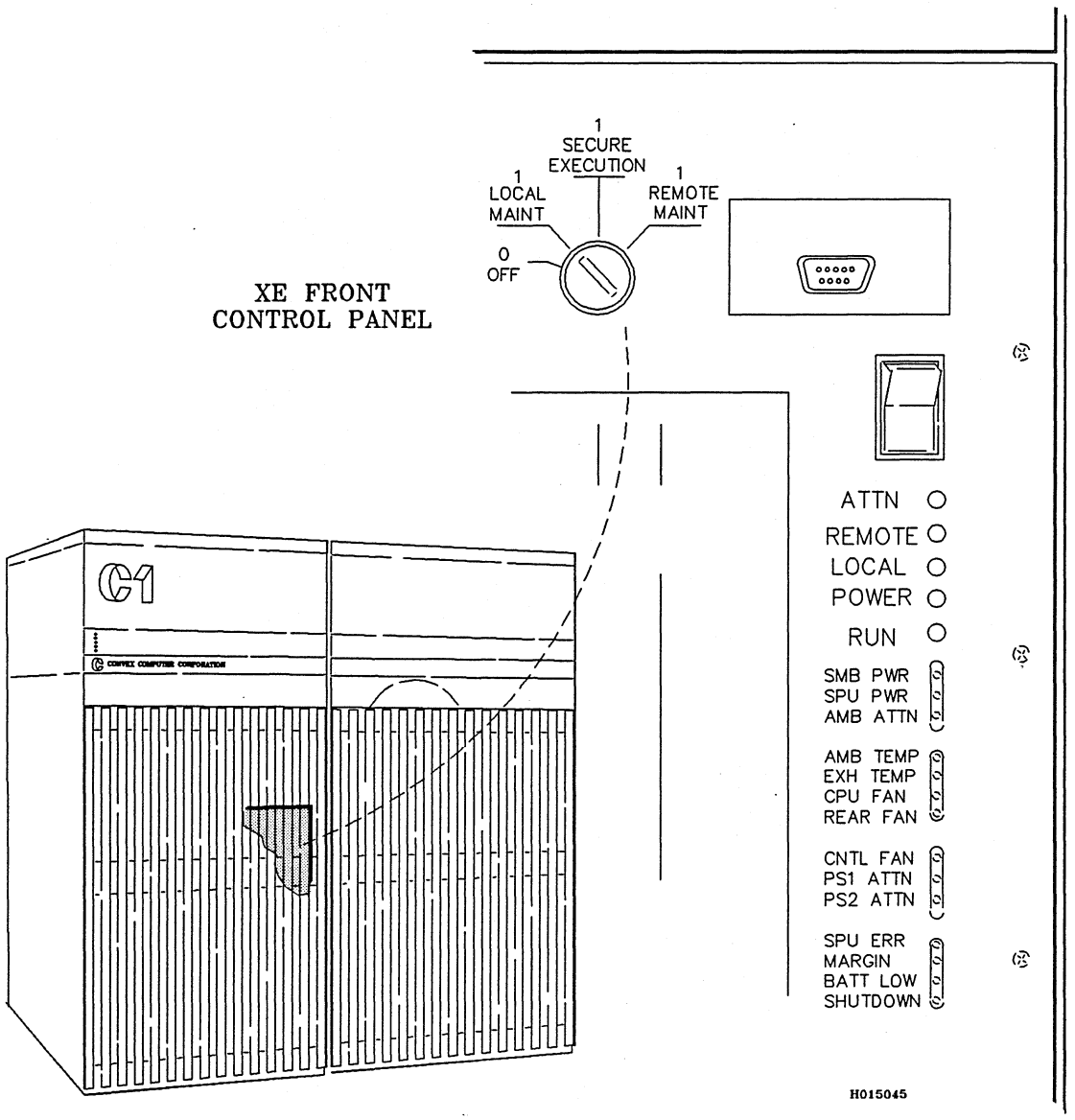
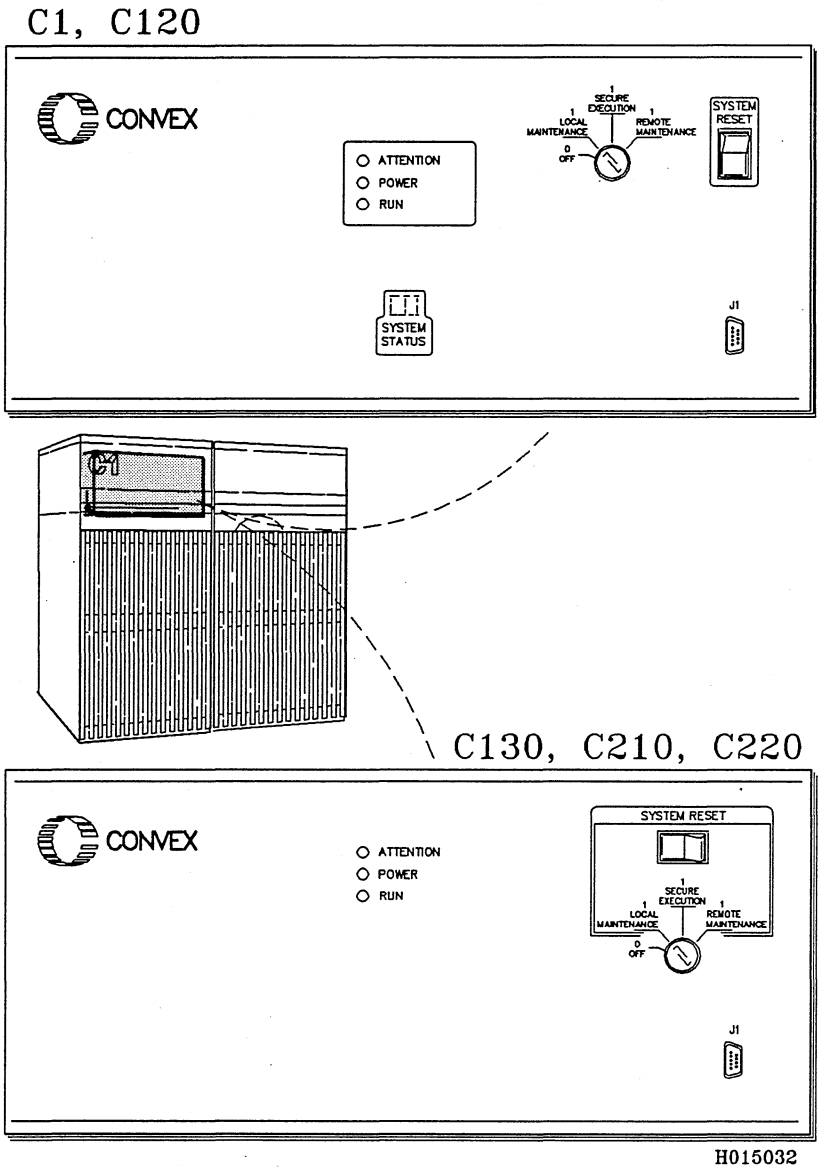


Figure 1–4, CONVEX XE Front Control Panel



1.3.2 AC Power-Controller Panel

The AC power-controller panel on CONVEX C100 Series model machines is located on the lower back side of the processor cabinet. Figures 1-5 and 1-6 illustrate the position of the main circuit breaker, mode switch, and power-controller indicator lights located on the C100 Series power-controller panels. Note that there are five AC power-controller panel designs for the C100 Series models.

The AC power-controller panel on CONVEX C200 Series model machines is located on the lower front side of the processor cabinet. Figure 1-7 illustrates the position of the main circuit breaker, mode switch, and power-controller indicator lights located on C200 Series power-controller panels.

Note that there are two AC power-controller panel designs for the C200 Series models.

Expansion cabinet AC power-controllers are located on the lower back side of the expansion cabinet. Figure 1-8 illustrate the position of the main circuit breaker, mode switch, and power-controller indicator lights located on CONVEX expansion cabinet power-controller panels. Note that there are four AC power-controller panel designs used on CONVEX expansion cabinets.

1.3.2.1 Main Circuit Breaker

The main circuit-breaker switch is located on the AC power-controller panel. The main circuit breaker is the master power switch and can remove power from the entire system in emergencies or in anticipation of severe line voltage fluctuations, e.g., electrical system maintenance or severe weather.

There are three indicator lights that correspond to each phase in the CONVEX 3-phase power system. When lit, the indicator points to the phases that are currently receiving power. On domestic systems each indicator light covers *two* phases. On international systems, each indicator light covers a *single* phase. See Appendix B for additional information on CONVEX equipment circuit breakers.

1.3.2.2 AC Power-Controller Status Indicators

CONVEX C200 Series supercomputers have a bank of eight AC power status (P/S) indicators. A maximum of eight power supplies can be configured, each with its own circuit breaker. When lit, these lights indicate AC power has passed through the circuit breaker to the power supply; it does not indicate that the power supply is operational. If a specific indicator light is not lit, it indicates that there is no corresponding power supply installed in the system, or that the power supply's circuit breaker has tripped.

1.3.2.3 Mode Switch

All CONVEX cabinets have a three-position mode switch on the AC power-controller panel. The three-mode switch positions are described below:

- **LOCAL** — When the AC power-controller mode switch is in the **LOCAL** position, the power-controller ignores input from the SCM (C200 Series models) or the SMB (C100 Series models) and stays on.

> CAUTION
>
> The **LOCAL** mode switch position is used for *maintenance only.* This mode switch position should only be used by authorized CONVEX personnel. Since this mode switch position defeats SCM and SMB environmental safety checks, running in this mode may cause undetected equipment damage.

- **OFF** — When the AC power-controller mode switch is in the **OFF** position, the internal DC power supplies are **OFF**, regardless of input from the SCM.

- **REMOTE** — When the AC power-controller mode switch is in the **REMOTE** position, the AC power-controller accepts commands from the SCM (on C200 Series models) or the SMB (on C100 Series models). The mode switch should be in the **REMOTE** position under normal operating conditions.

> **NOTE**
>
> Check the mode switch if the power-up procedure is not successful. The *mode switch* should be in the **REMOTE** position.

1.3.3 System Console

CONVEX supercomputers are normally configured with a single system console. The system console is used to issue operating commands to the system and is a necessary component for the functions described in this guide. The system console also displays system-generated messages to inform and assist system management. CONVEX currently uses a VT100 compatible CRT terminal as the system console for its supercomputers.

See the *CIT 101XL Video Display Terminal User's Guide* for information on the operation of the system console.

1.3.4 SPU Tape Drive

CONVEX supercomputers use a vendor-supplied, 0.25-inch cartridge streaming tape drive to load the SPU UNIX operating system onto the SPU hard disk. On C200 Series models the tape drive is located on the bottom of the leftmost bay of the processor cabinet (see Figure 1-2).

Refer to the *Viper Product Manual* or other vendor-supplied documentation for information on the SPU drive.

1.3.5 SPU Tape Cartridge

The SPU tape drive reads and records on industry-standard 0.25-inch tape cartridges. Refer to the *Viper Product Manual* or other vendor-supplied documentation for information on the SPU drive tape cartridges.

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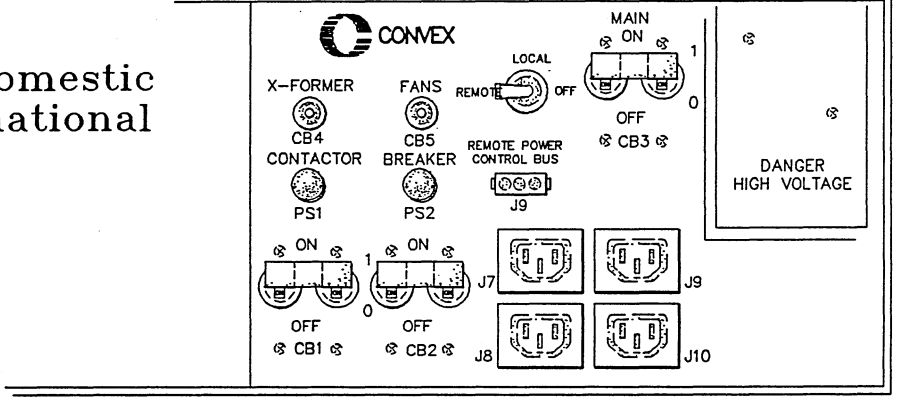
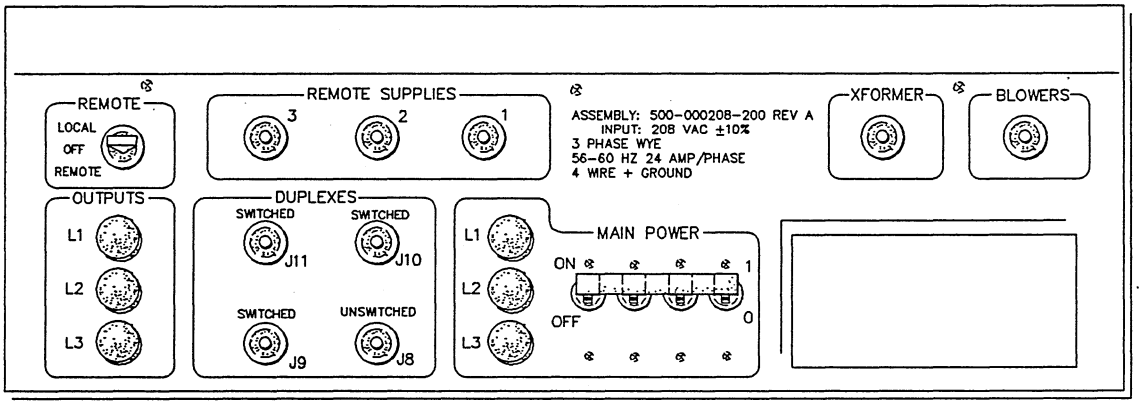
Figure 1–5, CONVEX C100 Series AC Power-Controller Panels

XE/XL Domestic & International



XP Domestic (Style A)



XP International (Style A)

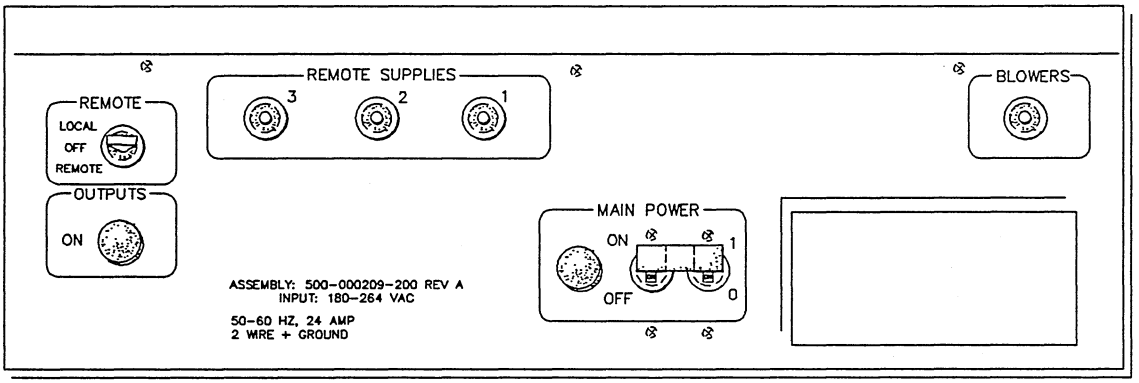


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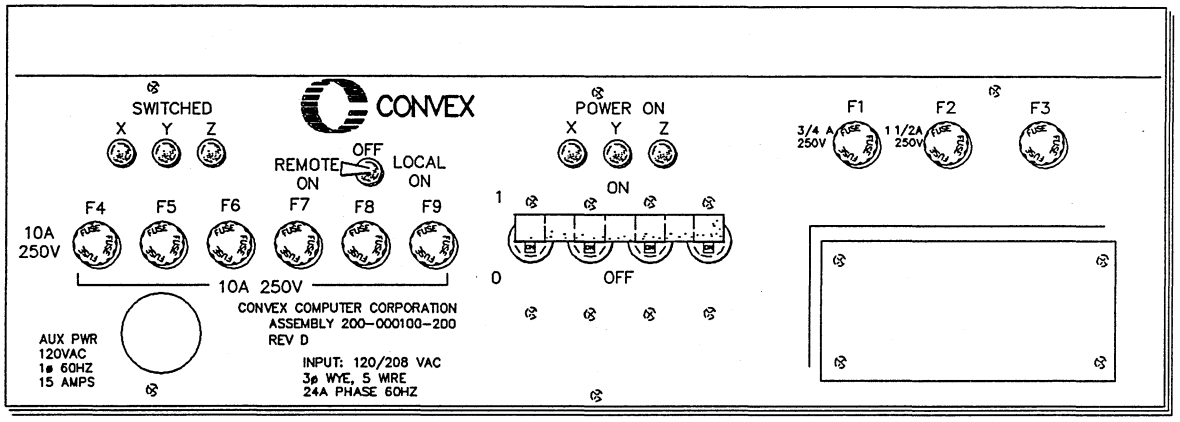
Figure 1–6, CONVEX C100 Series AC Power-Controller Panels

XP Domestic (Style B)



XP International (Style B)

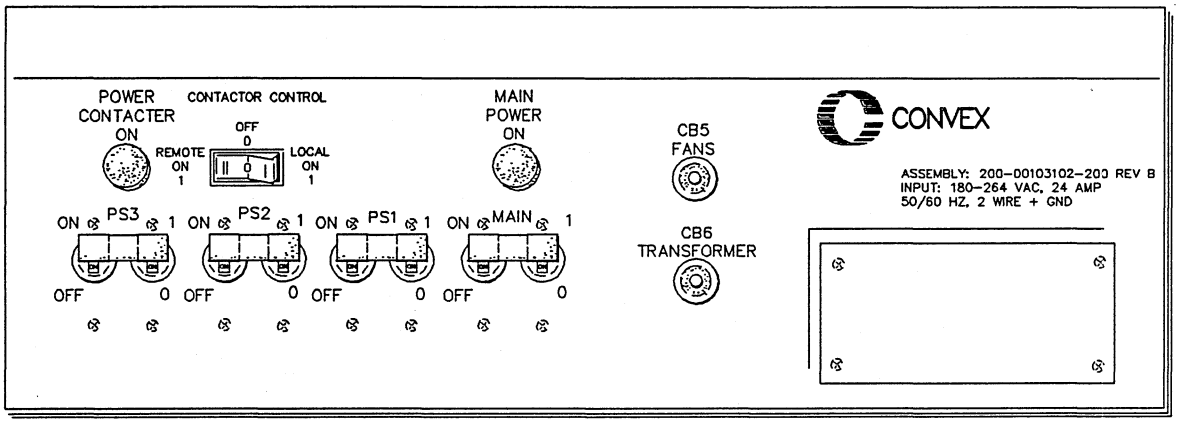


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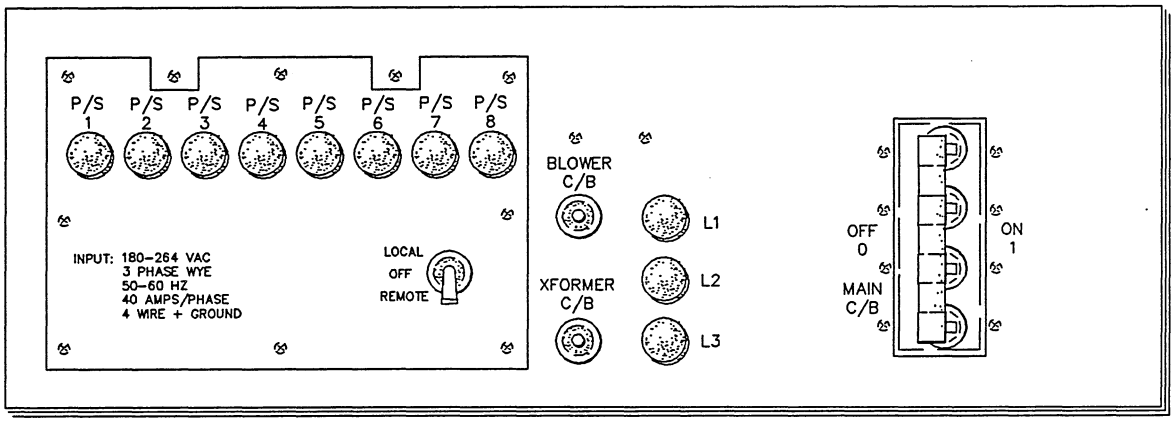
Figure 1–7, CONVEX C200 Series AC Power-Controller Panels

International



Domestic

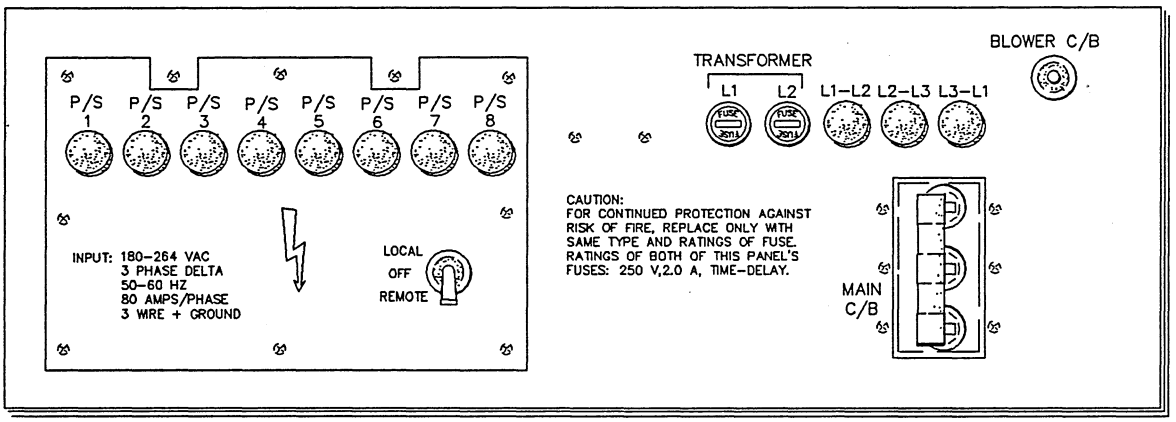


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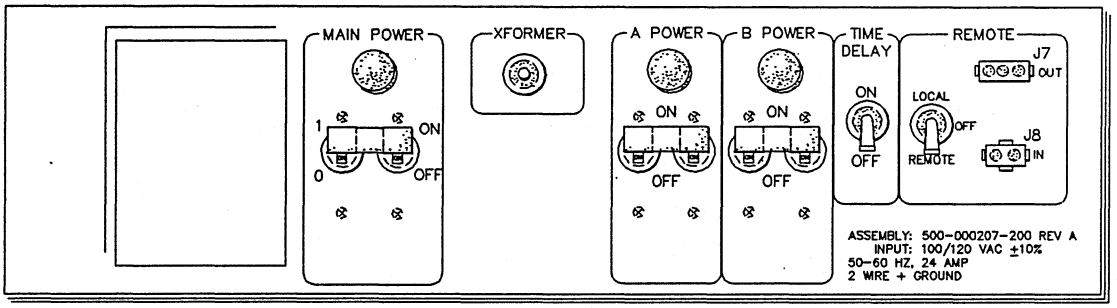
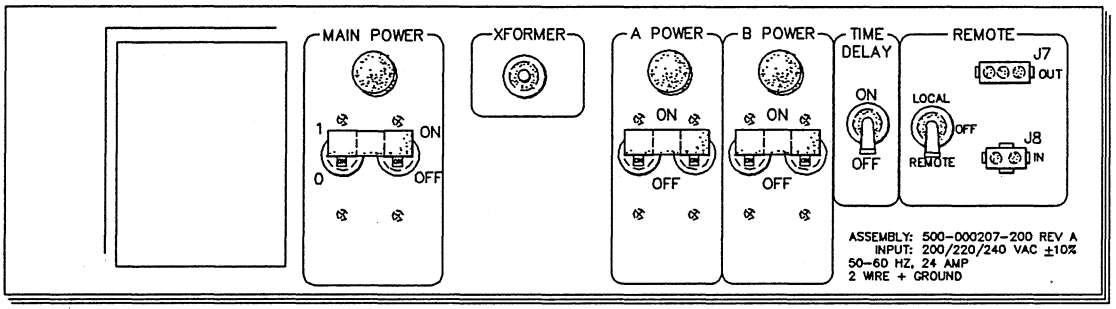
Figure 1–8, CONVEX Expansion Cabinet AC Power-Controller Panels

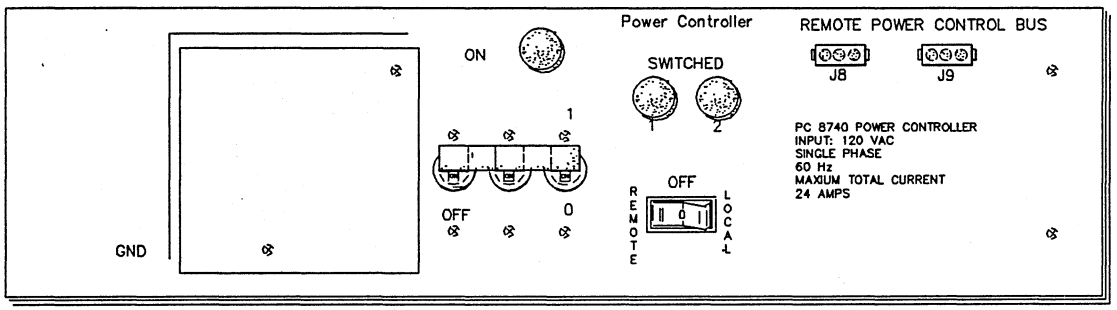
Domestic (Style A)



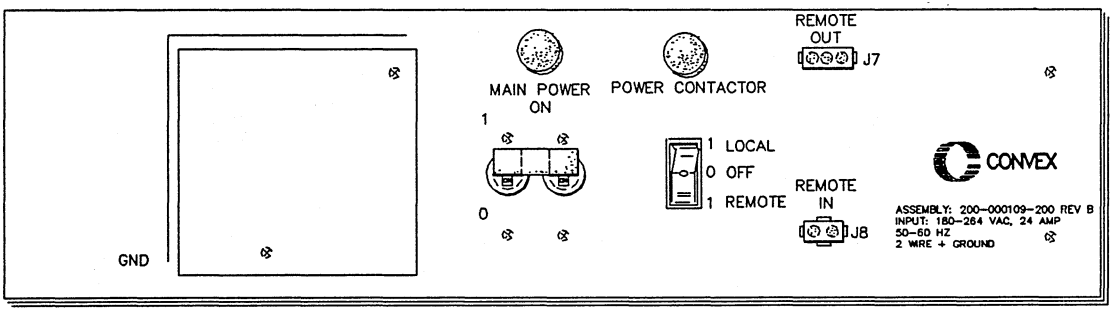
International (Style A)



Domestic (Style B)



International (Style B)



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Chapter 2
Power-Up and Power-Down Procedures

2.1 Overview

This chapter describes the key elements of the CONVEX operation environment and the commands used to power up, power down, and move between the five operation states found in CONVEX supercomputers. The chapter is divided into two sections:

- "Processor Operation Environment" describes the five CONVEX operation states and other key elements used to operate CONVEX supercomputers.
- "Procedures" contains step-by-step procedures for powering up, powering down, and moving between the five CONVEX operation states.

2.2 Processor Operation Environment

There are *five* operation states (modes) in CONVEX supercomputers:

- Power-up / power-down
- Soft front panel (firmware)
- Service Processor Unit (SPU) UNIX
- CONVEX UNIX single-user
- CONVEX UNIX multi-user

These five CONVEX operation states are described below. See the *CONVEX System Manager's Guide* for additional information on these operation states. This section also contains descriptions of the System Monitor Board (SMB), System Control Module (SCM), system prompts, the *fsck* filesystem check program, and SPU self-test diagnostics.

2.2.1 Power-Up / Power-Down

The *power-up* operation state occurs when the front control panel keyswitch is in the **LOCAL MAINTENANCE, SECURE EXECUTION,** or **REMOTE MAINTENANCE** positions and the processor cabinet's main circuit breaker is in the **ON** position. CONVEX supercomputer processing is enabled in the power-up state.

The *power-down* operation state occurs when the front control panel keyswitch is in the **OFF** position or the processor cabinet's main circuit breaker is in the **OFF** position. CONVEX supercomputer processing is disabled in the power-down state.

2.2.2 Soft Front Panel (Firmware)

The soft front panel is an interactive program stored in Erasable Programmable Read-Only Memory (EPROM) on the SPU circuit board. The soft front panel is accessed primarily to modify the settings of the firmware switches (options) used to configure the system. The SPU stores the settings of the firmware options in nonvolatile EPROM memory; the settings are preserved even when the system is powered off.

The soft front panel program executes whenever the power-up procedure is completed and the keyswitch is turned from **OFF** to the **LOCAL MAINTENANCE, SECURE EXECUTION**, or **REMOTE MAINTENANCE** positions. The soft front panel is the first level of software executed as the system boots from a power-down state.

> **NOTE**
>
> The soft front panel program is executed when the keyswitch is turned from the **OFF** position to **SECURE EXECUTION** position. However, the system boots directly to CONVEX UNIX multi-user mode and does *not* stop at the soft front panel prompt.

Entering commands into the soft front panel program on the system console allows the system manager to examine and modify system operation. For example, the soft front panel can be programmed to automatically boot to a specific level of software or to boot to the SPU UNIX or CONVEX UNIX operating systems.

Once the soft front panel program begins, a display similar to Figure 2-1 appears on the system console:

Figure 2–1, Soft Front Panel Default Settings Display

```
123456789ABCDE
Convex-1 Front Panel / Module Rev: 1.7, Version: 1 / CPU SN 9
mode of operation = normal_os boot-device = disk
location-of-bootstrap = default       power-up-reboot = enable
automatic-reboot = enable             spu-self-test = enable
os-flags = 0                          remote-port-BPS = 1200
(fp)>
```

2.2.3 Soft Front Panel Commands

When the soft front panel initializes, it displays the current settings of the firmware options and the `(fp)>` prompt. Entering **help** in response to the `(fp)>` prompt displays a list of the soft front panel commands. The soft front panel commands are described below:

NOTE

To save key strokes, enter the first letter of the command that uniquely identifies the command string—enter the most significant characters. For example, the command:

```
(fp)> s m=n
```

is the same as:

```
(fp)> set mode of operation=normal-os
```

1. **s[et]**

The *set* command sets a series of firmware options that modify the soft front panel settings. The *set* command options include:

- **s[et] m[ode of operation]** = *n[ormal-os]* | *a[lternate-os]* | *d[iagnostic]*

  This command controls the level of operation the system achieves at power-up. The *sm* options are:

  - *normal-os* — System starts with the standard version of multi-user CONVEX UNIX operating system enabled.
  - *alternate-os* — System prompts the system manager to select from alternate power-up modes, then boots according to instructions.
  - *diagnostic* — System boots SPU UNIX operating system or an alternate diagnostic mode at power-up.

- **s[et] b[oot-device]** = *d[isk]* | *t[ape]* | *i[omega]* | *o[ther2]*

  This command selects the location of the boot device. If *t[ape]* is selected, mount a copy of the SPU UNIX boot image tape in the SPU tape drive before booting the system. The *o[ther2]* option is currently undefined.

- **s[et] l[ocation-of-bootstrap]** = *d[efault]* | *1[-copy]* | *2[-copy]* | *3[-copy]*

  This command selects one of four redundant (duplicate) copies of the boot program used by the system. Use the copies as needed if errors are discovered in the default boot program. (In effect, this option provides access to three backup copies of the boot program.)

- **s[et] p[ower-up-reboot]** = *d[isable]* | *e[nable]*

  Enabling this switch allows the system to reboot to timesharing mode (CONVEX UNIX multi-user mode) after any type of interruption in the power supplied to the system.

- **s[et] a[utomatic-reboot]** = *d[isable]* | *e[nable]*

  This command enables the reboot option in **SECURE EXECUTION** mode. Entering the SPU reboot command:

  ```
  (spu)> /etc/reboot  <CR>
  ```

  boots the system to the CONVEX UNIX multi-user mode.

- **s[et] s[pu-self-test]** = *d[isable | e[nable]*

  This command enables or disables the SPU self-test. The self-test takes about a minute to complete.

- **s[et] o[s-options]** = *number*

  This command is currently used only by CONVEX staff. It has no application in released software.

- **s[et] r[emote-port-BPS]** = *1200 | 110 | 300 | 600 | 2400 | 4800 | 9600 | 19200*

  This command selects the default baud rate for the SPU remote port. The SPU revision must be F or higher for this command to be recognized.

2. **p[reset]** *number | s[tandard] | a[lternate] | d[iagnostic] | i[nstall]*

   The *preset* command enables the group set options rather than the individual options used with the *set* command. Each of the available modes (*standard, alternate, diagnostic,* and *install*), represents a default configuration for a group of soft front panel options.

   The *number* option is reserved for diagnostic use. Do not change the value of this field without instructions from the CONVEX Technical Assistance Center. Table 2-1 summarizes the settings of the four preset modes:

Table 2–1, Preset Mode Settings

Mode	Self-Test Enabled?	Power-up Reboot Enabled?	Auto-Boot Enabled?	Boot Device	Boot Mode
Standard	Yes	Yes	Yes	Disk	Normal-os
Alternate	Yes	Yes	Yes	Disk	Alternate-os
Diagnostic	Yes	No	No	Disk	Diagnostic-os
Install	Yes	No	No	Tape	Install

3. **b[oot]**

   This command terminates the soft front panel program and boots SPU UNIX operating system.

4. **d[isplay]**

   This command displays all soft front panel settings.

5. **de[bug]**

   This command is used only by CONVEX staff.

6. **h[elp]**

   This command displays a one-page listing of available soft front panel commands.

2.2.4 SPU UNIX Operating System

The Service Processor Unit (SPU) UNIX operating system is based on AT&T's Version 7 UNIX operating system, an early version of the UNIX operating system designed for smaller applications. Unlike 4.2 BSD, Version 7 is not a virtual-memory system.

The SPU UNIX operating system controls CONVEX diagnostic software, coordinates error logging, and boots the CPU. See the *CONVEX SPU UNIX Utilities Manual* and the *CONVEX Diagnostic Utilities Manual (C130, C210, C220)* for a complete description of SPU UNIX functions and related utilities.

2.2.5 CONVEX UNIX Operating System

CONVEX UNIX is a demand-paged, virtual-memory operating system derived from Berkeley UNIX 4.2 BSD. The system consists of the following:

- Command interpreters (shells)
- Utilities
- A filesystem
- A "kernel" that manages all system resources, including some interrupts, memory management, process control, and I/O.

Like all operating systems, CONVEX UNIX acts primarily as a coordinator and scheduler of system resources. CONVEX UNIX supports three command interpreters (also called shells), the Bourne, C, and COVUE shells. (See the *CONVEX UNIX Primer* for additional information on the COVUE shell.) These shells enable users to issue commands to the system and to combine commands together.

Two modes of operation exist within the CONVEX UNIX computing environment: *single-user mode* and *multi-user mode*. In CONVEX UNIX *single-user mode*, the system manager runs maintenance software, performs filesystem checks, and mounts and unmounts filesystems. In CONVEX UNIX *multi-user mode*, the system manager performs periodic system checks, such as monitoring user file space, number of users, and amount of user processing time.

2.2.6 CONVEX UNIX Single-User and Multi-User Modes

The single-user and multi-user prompts for CONVEX UNIX superusers (*root*) are both pound signs (#).

Users with a user ID of 0 are superusers; the accounts are referred to as *root* accounts. To become superuser, log in as user *root* or execute the *su* command and enter the appropriate password.

Only superusers can execute commands from within the single-user mode. The multi-user mode accepts input from all users, including the superuser; however, certain commands are restricted and can only be executed by the superuser. See the *CONVEX System Manager's Guide* for additional information on superusers and root accounts.

The *init* program executes in the boot procedure. It has a Process Identification (PID) equal to 1 (PID=1) and it is the *parent* process for all other system processes. The */etc/init* program executes a start-up script, */etc/rc*, which starts various system processes and prepares the system for multi-user operation.

The *ps* command prints information about UNIX processes to the system console.

To distinguish one mode from the other, look for the following:

- Single-user mode — In CONVEX UNIX single-user mode, enter the command:

  # ps -axl <CR>

  This command displays an */etc/init* program with PID=1, an absence of child processes (local multi-user daemons) with PPID=1 spawned by the */etc/init* and */etc/rc* files, and a Bourne shell (*sh(1)*) running with PPID=1.

  If the */etc/init* program is running (and no other daemon processes with a parent process ID equal to one (PPID=1) are running), except for a single Bourne shell, it is probable that the mode is single-user. When the single-user mode takes over, it kills child processes of */etc/init* and starts a Bourne shell on the system console.

  Multi-user daemons and multi-user logins are inactive in CONVEX UNIX single-user mode.

- Multi-user mode — In CONVEX UNIX multi-user mode, enter the command:

  # ps -axl <CR>

  This command displays an */etc/init* program with PID=1, a presence of child processes (local multi-user daemons) with PPID=1 spawned by */etc/init* and */etc/rc*, a C shell running with PPID=1, and other processes.

  Executing a **CNTRL d** (**^d**) causes the single-user CONVEX UNIX Bourne shell to exit and returns control to */etc/init.* The */etc/init* program restarts the multi-user daemons, returns to multi-user mode, and enables logins to all configured terminals.

2.2.7 CONVEX System Prompts

System prompts indicate which CONVEX computing environment is currently running. The soft front panel prompt, `(fp)>`, and the SPU UNIX prompt, `(spu)>`, appear *only* on the system console. All other prompts can appear on either the system console or a user terminal. The following table lists default system prompts for CONVEX supercomputers:

Table 2–2, CONVEX System Prompts

OPERATION STATE	PROMPT
Soft Front Panel	`(fp)>`
SPU UNIX dshell	`(spu)>` :
CONVEX UNIX login single-user mode multi-user mode multi-user mode (csh)	 `login:` # # (as root) %(as user)

2.2.8 System Monitor Board (SMB)

CONVEX C100 Series models have a built-in diagnostic indicator mechanism called the System Monitor Board (SMB). The SMB uses 16 LED indicators, located at the front of the processor cabinet and behind the internal cover, to display the status of various hardware and environmental conditions. See Figure 1-4 and Appendix C for descriptions of the 16 SMB LED indicators. Under normal operating conditions, only the top SMB LED indicator (AC power on) will be lit.

The SMB continually checks the system for abnormal or dangerous conditions, and may cut power automatically if an environmental error condition is detected.

2.2.9 System Control Module (SCM)

CONVEX C200 Series models have a built-in safety mechanism called the System Control Module (SCM). The SCM's primary function is to monitor various elements of CONVEX hardware and its environment, preventing operation under improper conditions. When an error condition is detected by the SCM during the power-up check, power-up is inhibited and an error code(s) is displayed on the hexadecimal **SYSTEM STATUS** display. See Appendix D for definitions of the SCM hexadecimal status codes.

If an error is detected while the system is running, the SCM may shut down the system and display an error code. SCM errors are classified into two types: *warning* and *fatal.* Warning errors generally indicate a potential problem has been detected, while fatal errors cause the SCM to power down the system.

The following conditions cause the SCM to inhibit power up or power down CONVEX systems:

- Improperly installed Printed Circuit Boards (PCBs) — If the SCM determines that a PCB has been installed incorrectly, the SCM prevents the machine from powering up, regardless of the keyswitch position.
- Power supply margining (normal in some diagnostic modes) — If the SCM detects voltage levels outside specific tolerances, the SCM prevents the machine from powering up.

- An excessive ambient temperature — If the SCM detects temperatures above specified levels, the SCM will power down the machine and display an error code on the **SYSTEM STATUS** display. There are several temperature sensors placed throughout the processor cabinet.
- Cooling fan failure — If the SCM detects a single cooling fan malfunction, an error code appears on the **SYSTEM STATUS** display. If more than one cooling fan malfunction is detected, the SCM will power down the machine.
- Power supply malfunction — The SCM continually polls the power supplies and will power down the machine if an error condition is detected.

The SCM circuit board is located in the processor cabinet and is enabled when the main circuit breaker is in the **ON** position.

2.2.10 Using the *fsck* Program to Repair Damaged Files

This section contains basic information on the use of the UNIX Filesystem Check Program *(fsck)* from an operations perspective. See the *CONVEX System Manager's Guide* for more detailed information on the *fsck* program.

The online manual facility also contains information on the use of the *fsck* program. Enter the following command in CONVEX UNIX multi-user mode to display the "man pages" on *fsck*:

 # man fsck

The *fsck* program runs filesystem checks. If a problem is detected while running integrity checks on the filesystems, the system manager may have to run the *fsck* program manually to correct the problem:

> **CAUTION**
>
> It is critical to the disk-file integrity to correct any errors detected by *fsck* before attempting to modify the disks in any other way. Failure to heed this caution may lead to serious disk-file damage
>
> The *fsck* program should never be run on a mounted filesystem. The only exception applies to the root (/) filesystem, which is mounted by the UNIX kernel.

The examples used in this section show the *fsck* program being used to correct problems on SPU disk filesystems. Filesystem integrity problems can be caused by a hardware or software failure, or by a previous system shutdown performed incorrectly. Messages similar to those shown in Figure 2-2 may be displayed on the system console when *fsck* detects a filesystem problem:

Figure 2–2, Sample Filesystem Check Messages

```
SPU filesystem check in progress...
/dev/rdk0b: UNALLOCATED I=173 OWNER=root MODE=0
/dev/rdk0b: SIZE=0 MTIME=Jun 25 14:48 1985
/dev/rdk0b: NAME=/a.out
/dev/rdk0b: UNEXPECTED INCONSISTENCY; RUN fsck MANUALLY
(spu)>
```

The RUN `fsck` MANUALLY message indicates that the *fsck* program was unable to repair the problems detected on the disk. In this case, the *fsck* program must be run manually by the system manager or operator; the problem is too difficult for *fsck* to repair without operator assistance.

If the RUN `fsck` MANUALLY message is displayed, invoke the *fsck* program by entering the following command on the system console:

(spu)> /etc/fsck *file_system*

The variable *file_system* is the name of the partition on which the filesystem is mounted (it appears to the left of the unexpected inconsistency message).

Except for the root filesystem, *fsck* should be run on the "raw" device of an unmounted filesystem, e.g., */dev/rdk0d.* For the root (/) filesystem, run *fsck* on the "block" device */dev/dk0d.* In this example, enter the command:

(spu)> /etc/fsck /dev/dk0d

Once the *fsck* program is invoked, messages similar to those in Figure 2-3 appear on the system console:

Figure 2–3, Sample Filesystem Check Messages

```
/dev/rdk0b
filesystem: (unknown)

** Checking /dev/rdk0b
** Phase 1 - Check Blocks and Sizes
** Phase 2 - Check Pathnames
UNALLOCATED I=173 OWNER=ROOT MODE=0
SIZE=0 MTIME=Jun 25 14:48 1985
NAME=/a.out
REMOVE ? y    <CR>
```

In the above example, entering **y** in response to the REMOVE ? query removes the bad file: *a.out.* The file must be removed to restore the filesystem to a consistent state. Entering **y** in response to the REMOVE? query displays messages on the system console similar to those in Figure 2-4:

Figure 2–4, Sample Filesystem Check Messages

```
** Phase 3 - Check Connectivity
** Phase 4 - Check Reference Counts
** Phase 5 - Check Free List
131 files 1170 blocks 808 free
***** filesystem WAS MODIFIED *****
***** REBOOT UNIX *****
```

These messages indicate that *fsck* was able to restore the disk to a consistent state. However, note that the data on the disk may not match the copy of the data in SPU UNIX memory.

If *fsck* modifies the root filesystem, it may request a reboot. Use the following command to reboot to CONVEX UNIX multi-user mode from the SPU prompt:

(spu)> /etc/reboot

> **NOTE**
>
> The */etc/reboot* command returns control back to the soft front panel (in the **LOCAL MAINTENANCE** or **REMOTE MAINTENANCE** keyswitch positions). Reboot the SPU UNIX operating system using the procedures in "Booting To SPU UNIX From the Soft Front Panel".

The *fsck* program can usually repair filesystem problems without manual intervention. After repairing root filesystems, *fsck* attempts to automatically reboot the operating system.

The simplest method for running *fsck* is to use the *-p* option. Use this option unless *fsck* explicitly indicates that it needs to be run manually. If the *fsck* program is being run manually, an improper response by the system manager to the *fsck* generated questions may result in an incompletely repaired filesystem. To ensure the problems have been repaired, run *fsck* again with the *-p* option (*/etc/fsck-p*) enabled. When *fsck* has corrected the disk problems, this second pass of *fsck* completes with no errors.

If filesystem errors continue, the disk is still in an inconsistent state. Continue to run *fsck* manually until all errors are corrected. Contact the CONVEX Technical Assistance Center if *fsck* problems cannot be resolved.

2.2.11 SPU Self-Test Diagnostics

CONVEX systems run SPU self-test diagnostics during the power-up process. The self-test is an initial hardware check that verifies that all boot devices are installed (connected) properly. The SPU self-test can be enabled or disabled by entering the following command on the system console:

(fp)> s[et] s[pu-self-test]=e[nable] | d[isable]

Once the soft front panel program begins, a display similar to Figure 2-5 appears on the system console:

Figure 2–5, Soft Front Panel Default Settings Display

```
123456789ABCDE
Convex-1 Front Panel / Module Rev: 1.7, Version: 1 / CPU SN 9
mode of operation = normal_os          boot-device = disk
location-of-bootstrap = default        power-up-reboot = enable
automatic-reboot = enable              spu-self-test = enable
os-flags = 0                           remote-port-BPS = 1200
(fp)>
```

Each of the hexadecimal digits (123456789ABCDE) in the first line of Figure 2-5 represents successive phases in the SPU self-test procedure. If the SPU self-test completes properly, the other lines shown in Figure 2-5 are displayed on the system console, along with the soft front panel prompt, `(fp)>`.

The SPU self-test takes about a minute to complete and fails only if a hardware failure is detected. If a failure is detected during the self-test, the booting processes will halt and an error message may be displayed on the system console.

The last hexadecimal digit displayed on the system console indicates the self-test phase where the error was detected. For example, if the SPU self-test failed at phase six of the test, the system console would display `123456` (see Figure 2-6). See the *CONVEX Diagnostic Utilities Manual (C130, C210, C220)* for additional information on the SPU self-test.

Figure 2–6, Sample SPU Self-Test Error Display

```
123456

********** Error message(s) **********
```

2.2.12 Basic Booting Procedures

Booting CONVEX supercomputers by turning the keyswitch to the **LOCAL MAINTENANCE** or **REMOTE MAINTENANCE** positions displays the soft front panel prompt, `(fp)>`. From the `(fp)>` prompt the system can be booted to any other environment by entering the desired mode of operation command (**sm=n**[*ormal*], **sm=d**[*iagnostic*], or **sm=a**[*lternate*]) followed by the **b**[*oot*] command:

```
(fp)> sm=n

(fp)> b
```

CONVEX supercomputers can also be booted directly to CONVEX UNIX multi-user mode by turning the keyswitch to the **SECURE EXECUTION** position. Refer to "Path 2 - Booting From Power-Up To CONVEX UNIX Multi-User Mode" in this chapter for additional information on the **SECURE EXECUTION** boot procedures.

2.2.13 Booting in Diagnostic Mode

> **NOTE**
>
> When the mode of operation is set to diagnostic (**sm=d**), the *boot* command invokes a limited-diagnostics mode. This limited-diagnostics mode allows the system manager to execute utilities that manipulate the SPU peripherals without having to boot SPU UNIX. Entering a **<CR>** at the limited-diagnostics colon prompt (:) brings the system up to SPU UNIX.

To access the diagnostics mode, boot to the soft front panel and then to the SPU UNIX prompt, `(spu)>`. Execute the *dshell* command to access the diagnostic shell; the diagnostic shell prompt is a colon (:). This power-up procedure requires that the keyswitch be turned to **LOCAL MAINTENANCE** or **REMOTE MAINTENANCE**. See the *CONVEX Diagnostic Utilities Manual (C130, C210, C220)* for information on diagnostics mode operations.

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2.3 Procedures

There are 13 unique paths available between the five basic operations states described in the beginning of this chapter. The five basic operational states and the paths between them are illustrated in Figure 2-7. The paths described in this section are:

- Path 1 — Power-Up Procedures
- Path 2 — Booting From Power-up To CONVEX UNIX Multi-User Mode
- Path 3 — Booting From Power-up To the Soft Front Panel
- Path 4 — Booting From the Soft Front Panel To SPU UNIX
- Path 5 — Booting From SPU UNIX To CONVEX UNIX Multi-User Mode
- Path 6 — Booting From SPU UNIX To CONVEX UNIX Single-User Mode
- Path 7 — Rebooting the CONVEX UNIX Operating System
- Path 8 — Booting From CONVEX UNIX Single-User To Multi-User Mode
- Path 9 — Moving From CONVEX UNIX Multi-User To Single-User Mode
- Path 10 — Moving From CONVEX UNIX Multi-User Mode To SPU UNIX
- Path 11 — Moving From CONVEX UNIX Single-User Mode To SPU UNIX
- Path 12 — Moving From SPU UNIX To the Soft Front Panel
- Path 13 — Powering Down the System

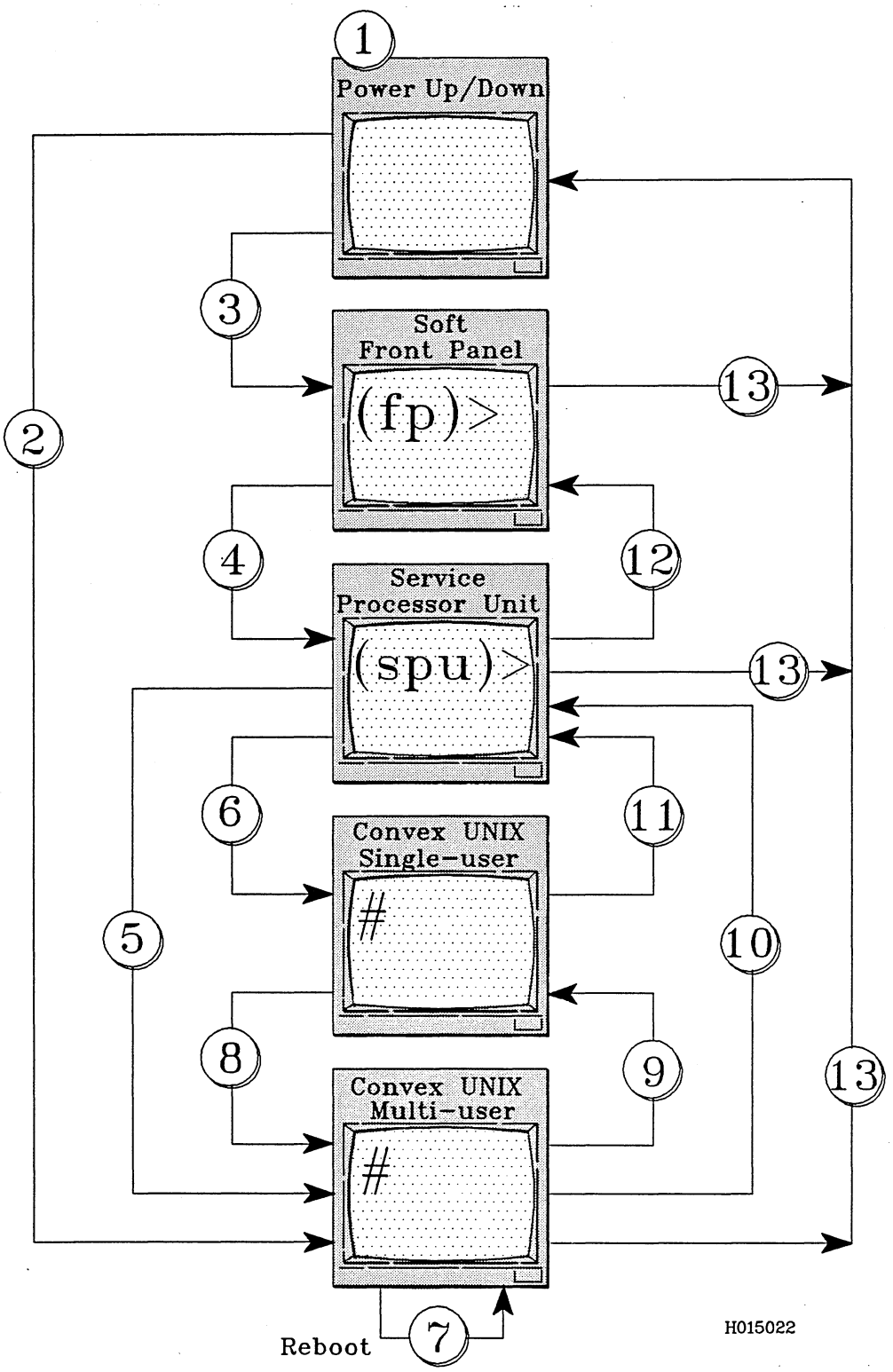
Note that each path shown on Figure 2-7 is numbered. This section contains a description of each path that corresponds to the path number. For example, path number 1 is described in subsection 2.3.1, path number 2 in subsection 2.3.2, etc. The path descriptions are divided into three areas:

- **Reasons for using this procedure** — Describes why and when the procedure should be performed
- **Procedure description** — Contains a brief description of the procedure
- **Additional considerations** — Describes any special conditions that should be considered when performing the procedure

A table of step-by-step procedures is included with each path description.

> NOTE
>
> The operations procedures described in this section assume that the system has been set to the **normal** mode of operation.

Figure 2–7, CONVEX Operation Paths



2.3.1 Path 1 - Power-Up Procedures

Reasons for Using This Procedure

To power up the machine.

Procedure Description

This procedure describes the steps required to power up CONVEX supercomputers from a power-down state. The procedures described in this section assume that all system components, e.g., hard disks and tape drives, have been powered down normally.

> **CAUTION**
>
> Power up the disk drives *last*. Powering up the disk drives last ensures that disk files are not corrupted by power fluctuations during the power-up sequence.

The power-up procedure shown in Table 2-3 consists of nine steps. Follow each step *in sequence*. Any attempt at short-cuts may result in serious damage to the system. The easiest way to make sure the various breakers and switches are in the right position is to turn them all *off* as a preliminary step. Then, follow the steps of the power-up procedure. User terminals can be turned on (or off) at any stage in the procedure.

The power-up procedure should successfully complete if the keyswitch is turned to any position except **OFF** (step 8). If the machine fails to power up, check the following:

- The **POWER** LED (on the front control panel) and the appropriate AC power status LED indicators should be lit (one for each power supply configured).
- The power lights on all peripherals should be lit, and the disk drives should spin up.
- The mode switch on the AC power-controller panel should be in the **REMOTE** position.
- The system status code **FF** should appear on the **SYSTEM STATUS** display on C200 Series models. Any other status code indicates the system has a problem.

If the system still fails to power up, turn the keyswitch to the **OFF** position and repeat the power-up procedure from step 1. Contact the CONVEX Technical Assistance Center (TAC) if the system does not power-up properly.

Additional Considerations

None

Table 2–3, Power-Up Procedures

STEP	PROCEDURE
1	This procedure begins from a power down state. Remove the SPU tape cartridge from the SPU tape drive.
2	Turn the front control panel keyswitch to the **OFF** position.
3	Turn the AC power-controller mode switch to the **REMOTE** position.
4	Turn the main circuit breaker on the processor cabinet's AC power-controller panel to the **ON** position.
5	If there are additional AC power-controller panels in expansion cabinets, turn the mode switches to the **REMOTE** position and turn the circuit breaker switches to the **ON** position.
6	Apply power to the tape drive(s).
7	Apply power to the disk drive(s).
8	Turn the front control panel keyswitch to the **LOCAL MAINTENANCE, SECURE EXECUTION,** or **REMOTE MAINTENANCE** position.
9	Turn the system console power switch to the **ON** position. The soft front panel prompt (`(fp)>`) should display on the system console.

NOTE

If the keyswitch is turned to the **SECURE EXECUTION** position in step 8, the system boots directly to CONVEX UNIX multi-user mode and displays the login prompt.

NOTE

If the system is down and the *power on-reboot* option is disabled, the system will not boot to CONVEX UNIX when the keyswitch is turned to the **SECURE EXECUTION** position. Enable the *power on-reboot* option by entering the following command at the soft front panel prompt:

```
(fp)> set power on-reboot=enable
```

If the *automatic-reboot* option is disabled, the system does not automatically reboot when the **SYSTEM RESET** switch pressed, nor does it automatically reboot after a system crash. Enable the *automatic-reboot* option by entering the following command at the soft front panel prompt:

```
(fp)> set automatic-reboot=enable
```

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2.3.2 Path 2 - Booting From Power-Up To CONVEX UNIX Multi-User Mode

Reasons for Using This Procedure

The CONVEX UNIX operating system in multi-user mode is used for general timesharing. Invoking the multi-user system mounts all filesystems, starts the daemons, and runs *init* to enable logins on all terminals.

The system displays the CONVEX UNIX login prompts (`login:` and `Password:`) if the keyswitch is turned directly to **SECURE EXECUTION**. After logging in, a prompt is displayed on the system console that corresponds to the shell environment that is currently running. For example, the default C Shell (`csh`) prompt is **%**; the default Bourne Shell (sh) prompt is **$**.

The system manager sets a default shell environment in the */etc/passwd* file for each user. To execute a shell environment of choice, the shell's executable binary must be available and the system manager must list the desired shell in that user's entry in the */etc/passwd* file.

Procedure Description

This procedure describes the steps required to boot directly to CONVEX UNIX multi-user mode at power-up.

From a power-down state, the system goes directly from the soft front panel to CONVEX UNIX multi-user mode when *all* the following conditions apply:

- The keyswitch is turned to the **SECURE EXECUTION** position.
- The mode of operation is preprogrammed to *normal-os*.
- The *power-up-reboot* is preprogrammed to *enable*.

Additional Considerations

None

Table 2–4, Booting From Power-Up To CONVEX UNIX Multi-User

STEP	PROCEDURE
1	Follow steps 1 through 7 of the power-up procedures in Table 2-3.
2	Turn the keyswitch to the **SECURE EXECUTION** position. The system performs SPU UNIX and CONVEX UNIX file checks (fsck), and memory initialization. A variety of information reflecting these processes is displayed on the system console.
3	The system automatically boots to the CONVEX UNIX multi-user mode and displays the CONVEX UNIX multi-user login and password prompts. Enter the login ID and password: `login:` **(login ID) <CR>** `Password:` **(valid password) <CR>**

2.3.3 Path 3 - Booting From Power-Up To the Soft Front Panel

Reasons for Using This Procedure

The soft front panel is accessed to modify the firmware switch settings used to configure the system and to gain access to SPU UNIX and CONVEX UNIX.

The system manager examines and modifies system operation by entering commands to the soft front panel program on the system console. For example, the soft front panel can be programmed to automatically boot to a specific level of software or to boot to SPU UNIX or CONVEX UNIX operating systems.

Procedure Description

This procedure describes the steps required to boot to the soft front panel from power-up.

The soft front panel is an interactive program stored in Erasable Programmable Read-Only Memory (EPROM) on the SPU circuit board. The soft front panel is accessed primarily to modify the settings of the firmware switches used to configure the system. It is the first level of software executed as the system boots from a power-down state.

The soft front panel program executes whenever the power-up sequence is completed and the keyswitch is turned to the **LOCAL MAINTENANCE** or **REMOTE MAINTENANCE** position. In the **REMOTE MAINTENANCE** position, the soft front panel can be only be accessed via the SPU modem.

SPU UNIX stores the firmware settings in nonvolatile memory; they are preserved even when the system is powered down. The current firmware settings are displayed when the soft front panel program begins:

Figure 2–8, Soft Front Panel Settings Display

```
123456789ABC
CONVEX-1 Front Panel / Module Rev: 1.x, Version: 1 / CPU SN 9
mode of operation = normal_os                boot-device = disk
location-of-bootstrap = default              power-up-reboot = enable
automatic-reboot = enable                    spu-self-test = enable
os-flags = 0                                 remote-port-BPS = 1200
(fp)>
```

The hexadecimal digits in the first line represent successive phases in the SPU self-test procedure. If the self-test completes properly, the remainder of the above settings are displayed, and commands can be entered at the `(fp)>` prompt. The SPU self-test takes about a minute to complete and fails only if there has been a hardware failure.

Additional Considerations

The soft front panel can only be accessed by powering up with the keyswitch in the **LOCAL EXECUTION** position, or by entering the **/etc/reboot** command from the SPU UNIX prompt `(spu)>`.

Table 2–5, Booting From Power-Up To the Soft Front Panel

STEP	PROCEDURE
1	Follow steps 1 through 7 of the power-up procedures in Table 2-3. Turn the keyswitch to the **LOCAL MAINTENANCE** position. The soft front panel prompt `(fp)>` is displayed on the system console.
2	If the soft front panel does not execute when the CPU is first powered up, turn the keyswitch to the **LOCAL MAINTENANCE** position and press the red **SYSTEM RESET** switch on the front control panel. The soft front panel program is invoked and the `(fp)>` prompt is displayed on the system console. If the soft front panel program still does not execute, a hardware problem is indicated. Verify that the system console is properly connected and that the console printer is not out of paper. If necessary, contact the CONVEX Technical Assistance Center.

2.3.4 Path 4 - Booting From the Soft Front Panel To SPU UNIX

Reasons for Using This Procedure

The SPU UNIX operating system runs on the Service Processor Unit (SPU). SPU UNIX is based on AT&T Version 7 UNIX and is used to drive the system console, log system errors, perform system diagnostics, and boot CONVEX UNIX.

When CONVEX UNIX is not running, SPU UNIX runs CONVEX diagnostic software and boots CONVEX UNIX. The SPU UNIX operating system displays the `(spu)>` prompt. See the *CONVEX SPU UNIX Utilities Manual* and the *CONVEX Diagnostic Utilities Manual (C130, C210, C220)* for a complete description of SPU UNIX.

Procedure Description

This procedure describes the steps required to boot to the SPU UNIX operating system from the soft front panel.

Additional Considerations

None

Table 2–6, Booting SPU UNIX From the Soft Front Panel

STEP	PROCEDURE

1	This procedure begins from the soft front panel. Enter the following command at the `(fp)>` prompt on the system console:
	`(fp)> b <CR>`
	After this command is entered, the soft front panel transfers control to a boot program read from the SPU disk. If the system is booted immediately after power-up, the following message is displayed on the system console:
	`Waiting for disk ready.`
	Within a few seconds, the SPU UNIX operating system banner is displayed:
	`SPU UNIX boot (Generated Wed Jun 5 18:34:16 CDT 1987)`
	If the banner does not appear on the system console within two minutes, press the **SYSTEM RESET** switch and repeat the boot command.

2	Once booted, the SPU runs integrity checks on the SPU UNIX filesystems as a first step. Usually, these integrity checks complete with no errors, and a message similar to the following is displayed:
	`/dev/rdk0b: 131 files 1r170 blocks 808 free`
	`/dev/rdk0d: 354 files 12480 blocks 468 free`
	If errors are detected by the file integrity checks, the following error message may be displayed:
	`RUN fsck MANUALLY`
	Basic procedures for running *fsck* (8) are outlined in "Using the *fsck* Program To Repair Damaged Files". Additional information on *fsck* is available from the online manual. The filesystems may be irreparably damaged if *fsck* is not run.

3	Once the filesystems are checked, the following messages are displayed on the system console:
	`SPU filesystem verified`
	`Mounted /mnt on /dev/dk0d`
	If the *fsck* program failed at this point, mount the SPU UNIX filesystems manually or reboot SPU UNIX.

4	The system prints the file */.news* on the system console; if */.news* does not appear, it is because it does not exist on the system. This file, like the CONVEX UNIX operating system file */etc/motd*, contains informative messages relating to system management. The system manager may modify this file as desired. After the contents of */.news* appears on the console, the system date is displayed: `Wed Jun 26 20:40:58 CDT 1985`

Table 2–6, Booting SPU UNIX From the Soft Front Panel (continued)

STEP	PROCEDURE

5	If power has been cycled or a hardware error is detected, the SPU performs diagnostic initialization checks and displays the following messages:
	`Scan ring files initialization`
	`  Checking for board changes ...`
	`  No changes.`
	If the system failed at this point, perform the SPU UNIX diagnostic checks manually or reboot SPU UNIX.
	
	Scan ring files are used to help the hardware diagnostics work properly with the particular hardware configuration of the machine. In most cases, only the "No changes" message prints. This phase of the boot process takes only a few seconds.

6	If the CPU hardware was changed since the last time SPU UNIX was booted, the following messages are displayed:
	
	`Scan ring files initialization`
	`  Checking for board changes ...`
	`  Rebuilding cpu and io scan ring descriptions`
	
	These messages are normal and may be ignored. The rebuilding process takes about three minutes and is performed only if the hardware was changed since the last power-up. Do not interrupt this re-building process or the process will have to be re-started manually using the **.diaginit -f** command.
	
	If the system failed at this point, reboot SPU UNIX or rebuild the CPU and I/O scan ring descriptions manually by entering the following command on the system console:
	`(spu)> .diaginit -f  <CR>`

7	The SPU UNIX prompt `(spu)>` is displayed.

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2.3.5 Path 5 - Booting From SPU UNIX To CONVEX UNIX Multi-User Mode

Reasons for Using This Procedure

This procedure is used to boot to CONVEX UNIX multi-user mode from SPU UNIX.

Procedure Description

This procedure describes the steps required to boot to CONVEX UNIX multi-user mode from the SPU UNIX prompt `(spu)>`.

The CONVEX UNIX operating system in multi-user mode is used for general timesharing. Invoking the multi-user system mounts all filesystems, starts the daemons, and runs *init* to enable logins on all terminals.

> **NOTE**
>
> Use the procedure in Table 2-4 to boot to CONVEX UNIX multi-user mode directly from the power-up procedure.

Additional Considerations

None

Table 2–7, Booting From SPU UNIX To CONVEX UNIX Multi-User Mode

STEP	PROCEDURE
1	This procedure begins from the SPU prompt `(spu)>`.
2	Enter the following command on the system console: `(spu)> boot` **<CR>**
3	The system automatically boots to the CONVEX UNIX multi-user mode and display the CONVEX UNIX multi-user login prompt. Enter the login ID and password: `login:` **(login ID) <CR>** `Password:` **(valid password) <CR>**
4	The system displays the CONVEX UNIX multi-user prompt (#). When CONVEX UNIX boots, the system will attempt to *preen* all filesystems listed in */etc/fstab*. If *fsck* detects an error in the root filesystem, the system will halt.
5	The system will not go multi-user in CONVEX UNIX single-user mode if filesystems *other than the root filesystem* are corrupted. Run *fsck(8)* manually on the corrupted files and enter control-d (**^d**) to move to multi-user mode.

2.3.6 Path 6 - Booting From SPU UNIX To CONVEX UNIX Single-User Mode

Reasons for Using This Procedure

Booting to the CONVEX UNIX single-user mode disables all user logins and all terminal processing except the system console. Booting to CONVEX UNIX in multi-user mode allows users to login.

Because users are unable to use the system while in single-user mode, it is considered safer and more effective than using multi-user mode to perform administrative tasks such as:

- Software installation
- Filesystem checks
- Recovery from crashes
- Mounting filesystems
- Running system checks
- Disk striping

Procedure Description

This procedure describes the steps required to boot CONVEX UNIX single-user mode from SPU UNIX.

Additional Considerations

CAUTION

Do not write-protect disk(s) and then boot or run CONVEX UNIX. If this should occur, do not write-enable the disk(s) until *after* the system has been completely shut down and the *sysreset* program has been run.

Failure to observe this **CAUTION** may result in corrupted files.

If CONVEX UNIX is booted manually to single-user mode, enter the *preen* command on the system console:

 # /etc/preen

The *preen* command invokes the *fsck* program for each file system listed in the */etc/fstab* file. The */etc/fstab* file contains descriptions of filesystem layouts.

After checking each filesystem, *fsck* prints a line that lists the device name and the number of files found in that filesystem and displays a message for each inconsistency it discovers.

When errors are found in the root filesystem (usually */dev/da0a*), the *preen* program reboots the system. If such errors are detected, repair the root filesystem by running *fsck* manually and reboot CONVEX UNIX using the following command:

 # /etc/reboot -n

The */etc/reboot* command reboots the system to CONVEX UNIX multi-user mode.

There is no need to reboot if errors are found in filesystems other than the root filesystem (*/dev/da0a*). If the *fsck* program says to `RUN fsck MANUALLY`, follow the procedures in "Using the *fsck* Program To Repair Damaged Files."

Table 2–8, Booting From SPU UNIX To CONVEX UNIX Single-User Mode

STEP	PROCEDURE
1	This procedure begins from the SPU prompt: `(spu)>`

2	Enter the following command at the `(spu)>` prompt:
	`(spu)> boot single`
	
	The CONVEX UNIX operating system begins to boot normally, but the system console displays the following:
	`erase ^H, kill ^U, intr ^C`
	`#`
	
	This message indicates that CONVEX UNIX operating system is now running in single-user mode. The first line shows the console settings for the character erase, line erase, and interrupt characters, respectively. The "#"is the root prompt from the CONVEX UNIX command interpreter, *sh*(1). It differs from the standard *sh* prompt "$" that is displayed for nonsuperusers. (See the *CONVEX System Manager's Guide* for an explanation of superuser accounts.)

3	Use the *preen* command to manually perform consistency checks on the disks.

NOTE

See the *CONVEX UNIX Programmer's Manual* for additional information on the *preen* command.

2.3.7 Path 7 - Rebooting the CONVEX UNIX Operating System

Reasons for Using This Procedure

This procedure is typically used to recover from partial CONVEX UNIX crashes.

Procedure Description

This procedure describes the steps required to reboot CONVEX UNIX.

Shut down the CONVEX UNIX operating system to the soft front panel and execute either the multi-user or single-user boot procedures.

From the soft front panel, use the *preset s[tandard]* and **b** commands to set the automatic reboot to CONVEX UNIX multi-user mode. Reboot procedures are described in detail in Table 2-9. An example of typical output displayed on the system console during the reboot procedure is shown in Figure 2-9:

Figure 2–9, Sample Output from System Console During Reboot

```
[SPU  17:52:24] Errlog started:  -t 3600 -l /mnt/errlog
[SPU  17:52:39] <Fri Mar 21 1988>
[CPU  17:52:41] CONVEX UNIX Version X.X.X.X Mon Mar 17 20:15:46 CST 1988
[CPU  17:52:44] memory: physical=66576384, maximum=1073737728
[CPU  17:52:44] using 812 buffers containing 6656000 bytes of memory
[CPU  17:52:44] Available user memory is 56815616 bytes.
[CPU  17:52:45] Device "MTC-001" (7/0/0xc0 int 4)
[CPU  17:52:45] Unit   "MTD-001" unit number 0
[CPU  17:52:45] Device "LAN-001" (7/0/0x4c0 int 1)
[CPU  17:52:46] exprobe: NX201 Version 5.3 EXOS201 Version 0.0
[CPU  17:52:46] Unit   "ex" unit number 0
[CPU  17:52:47] ex0: addr=8:0:14:10:85:47
[CPU  17:52:47] Device "DKC-001" (7/0/0x3f0 int 2)
[CPU  17:52:47] Unit   "DKD-003" unit number 0
[CPU  17:52:47] Unit   "DKD-003" unit number 1
[CPU  17:52:47] Device "ACM-001" (7/0/0x3c0 int 7)
[CPU  17:52:52] Device "DKC-001" (7/1/0x3f0 int 2)
[CPU  17:52:52] Unit   "DKD-003" unit number 2
[CPU  17:52:52] Unit   "DKD-003" unit number 3
[CPU  17:52:52] Device "ACM-001" (7/1/0x3c0 int 7)
```

Additional Considerations

None

Table 2–9, Rebooting the CONVEX UNIX Operating System

STEP	PROCEDURE
1	Enter the following command to sync the disks: **# sync;sync** **If the** `(spu)>` prompt appears, shut down SPU UNIX operating system before continuing. Before shutting down the SPU, use *ps*(1) command to ensure that no processes are still running. (You can kill processes with the */mnt/os/osclean* or *kill*(1) commands)
2	Turn the front control panel keyswitch to the **LOCAL MAINTENANCE** position and enter the following command: `(spu)>` **/etc/reboot <CR>** This command shuts down SPU UNIX operating system and restarts the soft front panel program. If the soft front panel prompt "(fp)>" appears, proceed with the boot procedure described below. If "(fp)>" does not appear, enter the *power down* command and press the **SYSTEM RESET** switch. The soft front panel prompt is displayed.
3	To boot CONVEX UNIX multi-user mode, enter the following commands at the soft front panel prompt: `(fp)>` **preset s[tandard] <CR>** `(fp)>` **b <CR>** These commands initiate an **automatic reboot**; the boot device is automatically set to be **disk** (**s[et] b[oot_device] = d[disk]**).
4	Once the reboot starts, the system console displays output similar to that shown in Figure 2-9. All system console output generated by the CPU or a CCU is preceded by the source of the message and a time stamp (e.g., `[CCU05@10:12:24]`). These messages are also recorded in a text file on the SPU disk(s), normally called */mnt/errlog*.
5	The system console should now display the following message: `Automatic reboot in progress...` This message should be followed by messages produced by the CONVEX UNIX filesystem check program *fsck*(8). If *fsck* finds any errors in the root filesystem, CONVEX UNIX operating system automatically shuts down and reboots after the corrections have been made.

Table 2–9, Rebooting the CONVEX UNIX Operating System (continued)

STEP	PROCEDURE
6	To execute SPU UNIX commands after CONVEX UNIX operating system boots, turn the keyswitch to **LOCAL MAINTENANCE** mode and execute the control-p (**^p**) command. A SPU UNIX shell process should start up after a few seconds.
7	To return control to CONVEX UNIX multi-user mode, enter control-d (**^d**) and turn the keyswitch to the **SECURE EXECUTION** position.

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2.3.8 Path 8 - Booting From CONVEX UNIX Single-User To Multi-User Mode

Reasons for Using This Procedure

This procedure is used to boot to CONVEX UNIX multi-user mode from CONVEX UNIX single-user mode.

Procedure Description

This procedure describes the steps required to boot to CONVEX UNIX multi-user mode from CONVEX UNIX single-user mode.

To boot to multi-user mode from single-user mode, enter **CNTRL d** (**^d**) on the system console at the single-user prompt:

```
# ^d
```

Entering **CNTRL d** at the single-user mode prompt causes the single-user CONVEX UNIX shell to exit and returns control to the *init* procedure. This command also executes a new shell, and runs the */etc/rc* procedure, which starts various system processes.

After a few minutes, the CONVEX UNIX login prompt appears on terminals connected to the communications controller(s) and on the system console.

> **NOTE**
>
> Site-dependent modifications to the power-up process can be made by modifying the */etc/rc.local* file.
>
> Do not modify the */etc/rc* file without assistance from the CONVEX Technical Assistance Center.

The system must be in multi-user mode before nonroot users can access the system.

Additional Considerations

None

Table 2–10, Booting From CONVEX UNIX Single-User Mode To Multi-User Mode

STEP	PROCEDURE
1	This procedure begins from the CONVEX UNIX single-user mode. Unmount all filesystems by entering the following command on the system console: **# umount -a <CR>** Enter control-d (**^d**) at the CONVEX UNIX single-user prompt: **# ^d**
2	The system automatically boots to the CONVEX UNIX multi-user mode and displays the CONVEX UNIX multi-user login prompt. Enter the login ID and password: `login:` **(login ID) <CR>** `Password:` **(valid password) <CR>**

2.3.9 Path 9 - Moving From CONVEX UNIX Multi-User Mode To Single-User Mode

Reasons for Using This Procedure

This procedure is typically used when mounting a new filesystem. It can also be used to *unhang* a system.

Procedure Description

This procedure describes the steps required to move to CONVEX UNIX single-user to CONVEX UNIX multi-user mode.

Additional Considerations

Moving to CONVEX UNIX single-user mode from multi-user mode terminates all multi-user processing. Warn users via the *shutdown* command.

Table 2–11, Moving From CONVEX UNIX Multi-User Mode To Single-User Mode

STEP	PROCEDURE
1	This procedure begins from CONVEX UNIX multi-user mode. To return to CONVEX UNIX single-user operation, enter the *shutdown* command without the *-h* (halt) or *-r* (reboot) options. The following example command sequence restores single-user operation after 2 minutes and displays the message "time for dumps": **# /etc/shutdown +2 "time for dumps" <CR>** The *kill* command sequence shown below can also be used as an alternative to the *shutdown* command: **# kill 1 <CR>** The *kill* command immediately terminates CONVEX UNIX multi-user mode and all user processing without warning users and moves the system to CONVEX UNIX single-user mode. Either method shown above terminates all user processing and displays a single-user shell prompt on the console. Filesystems remain mounted after single-user operation is restored.
2	Once the system has moved to CONVEX UNIX single-user mode, enter the following commands to ensure that the information on the disks is up-to-date by typing: **# sync; sync <CR>**

NOTE

Be careful when using the *kill* command to terminate CONVEX UNIX multi-user mode. This command terminates all user processing without warning.

2.3.10 Path 10 - Moving From CONVEX UNIX Multi-User Mode To SPU UNIX

Reasons for Using This Procedure

This procedure describes how to move to the SPU UNIX operation state from CONVEX UNIX multi-user mode.

Use the *shutdown* command with the *-h* (halt) switch enabled to gracefully shut down CONVEX UNIX multi-user mode and move to SPU UNIX. The user must also include in the command an amount of time before shutdown occurs. (Note that only superusers can use the *shutdown* command.)

The *shutdown* command generates periodic messages informing users to log out, terminates active processes, and then halts the CONVEX UNIX operating system. For example:

 # /etc/shutdown -h +10 "down to install new memory board"

This example command sequence causes the CONVEX UNIX operating system to shut down after broadcasting the warning "`down to install new memory board`" for 10 minutes. Once the CONVEX UNIX operating system is halted, 10 minutes after the *shutdown* command was initiated (in this example), messages similar to those in Figure 2-10 are displayed on the system console:

Figure 2–10, Shutdown Messages

```
[CPU  hh:mm:ss] syncing disks...
[CPU  hh:mm:ss] done
[CPU  hh:mm:ss] halting in tight loop; type "sysreset" to halt
(spu)>
```

Procedure Description

This procedure describes the steps required to move from CONVEX UNIX multi-user mode to SPU UNIX.

Additional Considerations

None

Table 2–12, Moving From CONVEX UNIX Multi-User Mode To SPU UNIX

STEP	PROCEDURE
1	This procedure begins from CONVEX UNIX multi-user mode. Enter the *shutdown*(8) command with the *-h* (halt) switch enabled to properly shut down from CONVEX UNIX multi-user to SPU UNIX: **# shutdown -h [time] <CR>**

2	Once CONVEX the CONVEX UNIX operating system is halted by the *shutdown* command, the following messages should appear on the system console:
	
	`[CPU hh:mm:ss] syncing disks...`
	`[CPU hh:mm:ss] done`
	`[CPU hh:mm:ss] halting in tight loop; type ''sysreset''`
	`to halt`
	`(spu)>`

2.3.11 Path 11 - Moving From CONVEX UNIX Single-User Mode To SPU UNIX

Reasons for Using This Procedure

Use the *shutdown* command with the *-h* (halt) switch enabled to gracefully shut down CONVEX UNIX and boot to SPU UNIX. The user must also include in the *shutdown* command an amount of time before shutdown occurs.

The *shutdown* command terminates active processes and halts the CONVEX UNIX operating system. For example:

 # /etc/shutdown -h [time]

Once CONVEX UNIX is halted, messages similar to those in Figure 2-11 are displayed on the system console:

Figure 2–11, Shutdown Messages

```
(spu)> [CPU  hh:mm:ss] syncing disks...
(spu)> [CPU  hh:mm:ss] done
(spu)> [CPU  hh:mm:ss] halting in tight loop; type "sysreset" to halt
(spu)>
```

Procedure Description

This procedure describes the steps required to move from CONVEX UNIX single-user mode to SPU UNIX.

Additional Considerations

None

Table 2–13, Moving From CONVEX UNIX Single-User Mode To SPU UNIX

STEP	PROCEDURE
1	This procedure begins from CONVEX UNIX single-user mode. Enter one of the following commands to move from CONVEX UNIX single-user to SPU UNIX: **# shutdown -h [time] <CR>** **# /etc/halt <CR>**

2	Once the CONVEX UNIX operating system is halted by the *shutdown* command, the following messages should appear on the system console:
	
	`(spu)> [CPU hh:mm:ss] syncing disks...`
	`(spu)> [CPU hh:mm:ss] done`
	`(spu)> [CPU hh:mm:ss] halting in tight loop; type "sysreset" to halt`
	(spu)>

2.3.12 Path 12 - Moving From SPU UNIX To the Soft Front Panel

Reasons for Using This Procedure

Normal CONVEX system recovery procedures require the system manager to shut down the system gracefully (*shutdown -h* [*time*]) to a known state, e.g., SPU UNIX, and boot to multi-user using the *boot* command, or to single-user using the *boot single* command. If this cannot be accomplished, move to the soft front panel and reboot the system using the */etc/reboot* command.

Procedure Description

This procedure describes the steps required to move to the soft front panel from SPU UNIX.

Additional Considerations

None

Table 2–14, Moving From SPU UNIX To the Soft Front Panel

STEP	PROCEDURE
1	This procedure begins from the SPU UNIX prompt `(spu)>`. The keyswitch must be in the **LOCAL MAINTENANCE** position. Remove the SPU tape cartridge from the SPU tape drive.
2	Enter the following commands on the system console: `(spu)> /etc/reboot` <CR> The soft front panel prompt `(fp)>` is displayed.

2.3.13 Path 13 - Powering Down the System

Reasons for Using This Procedure

To power down the system.

Procedure Description

This procedure describes the steps required to power down the system from the following operation states:

- From the CONVEX UNIX multi-user mode (Table 2-15)
- From the CONVEX UNIX single-user mode (Table 2-16)
- From the SPU UNIX operating system (Table 2-17)
- From the soft front panel (Table 2-18)

Additional Considerations

> **NOTE**
>
> Moving to CONVEX UNIX single-user mode from multi-user mode terminates all multi-user processing, warn users via the *shutdown* command.

Table 2–15, Power Down From CONVEX UNIX Multi-User Mode

STEP	PROCEDURE
1	From CONVEX UNIX multi-user mode, enter the following command on the system console: **# /etc/shutdown -h +10 "down to install new memory board"** This example command sequence terminates all user processing after broadcasting the warning "`down to install new memory board`" for 10 minutes. The SPU prompt `(spu)>` is displayed.
2	Turn the keyswitch to the **LOCAL MAINTENANCE** position and enter the following command on the system console: `(spu)>` **pwrdwn <CR>** The *pwrdwn* command terminates SPU UNIX operating system. The soft front panel begins execution once SPU UNIX operating system has terminated.
3	The following message is displayed on the system console: `pwrdwn: Ready for power down. ^D to abort.` When the "*Ready for power down*" message appears on the system console, the front panel keyswitch can be turned safely to the **OFF** position.

4	Press control-d (`^d`) to abort the power down procedure. The system displays the following message and returns to the `(spu)>` prompt.
	`pwrdwn: Power down aborted.`
	`(spu)>`

Table 2–16, Power Down From CONVEX UNIX Single-User Mode

STEP	PROCEDURE
1	From CONVEX UNIX single-user mode, enter the following command on the system console: **# shutdown -h [time] <CR>** The SPU prompt `(spu)>` is displayed.
2	Turn the keyswitch to the **LOCAL MAINTENANCE** position and enter the following command on the system console: `(spu)>` **pwrdwn <CR>** The *pwrdwn* command terminates SPU UNIX operating system. The soft front panel begins execution once SPU UNIX operating system has terminated.
3	The following message is displayed on the system console: `pwrdwn: Ready for power down. ^D to abort.` When the "*Ready for power down*" message appears on the system console, the front control panel keyswitch can be safely turned to the **OFF** position.

4	To abort the power down press control-d (**^d**). The system displays the following message and returns to the `(spu)>` prompt.
	`pwrdwn: Power down aborted.`
	`(spu)>`

Table 2–17, Power Down From SPU UNIX

STEP	PROCEDURE
1	Ensure that CONVEX UNIX has been halted.
2	Turn the keyswitch to the **LOCAL MAINTENANCE** position and enter the following command on the system console: **(spu)> pwrdwn <CR>** The *pwrdwn* command terminates SPU UNIX operating system. The soft front panel begins execution once SPU UNIX operating system has terminated.
3	The following message is displayed on the system console: `pwrdwn: Ready for power down. ^D to abort.` When the "*Ready for power down*" message appears on the system console, the front control panel keyswitch can be safely turned to the **OFF** position.

4	To abort the power down press control-d (**^d**). The system displays the following message and return to the `(spu)>` prompt.
	`pwrdwn: Power down aborted.`
	`(spu)>`

Table 2–18, Power Down From the Soft Front Panel

STEP	PROCEDURE
1	Turn the front control panel keyswitch to the **OFF** position.

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Chapter 3
Routine Maintenance

3.1 Overview

This chapter contains general maintenance and emergency procedures guidelines for CONVEX C100 Series and C200 Series model supercomputers.

3.2 General Guidelines for Maintaining Hardware

Serious hardware problems can often be minimized or averted through routine preventive maintenance. The system manager should ensure that in-house inspection and maintenance are performed according to the schedules suggested in the appropriate hardware manuals. In addition to the scheduled maintenance performed by the vendor, system management can perform the following general maintenance tasks:

1. Clean tape drives according to their frequency of use (i.e., the heavier the use, the more frequent the cleaning).
2. Vacuum the printers to remove accumulated paper dust.
3. Change machine-room air-conditioner filters as needed. The procedure to be used depends on the type of installation.
4. Check the temperature, humidity, and line voltage in the machine room at regular intervals to make sure they are within the specified limits.
5. Store tapes in the environment specified by the tape manufacturer.
6. Inspect the machine room frequently for cleanliness and to make sure that nothing is blocking air vents.
7. Make sure that supplies (printer paper, ribbons, magnetic tapes, etc.) are adequately stocked.
8. Communicate to all visitors not to smoke or consume food in the computer room.

Power surges or dips, or problems (such as crashes) that defy analysis, might be an incoming-power problem. Check with the electric company to have them install line voltage monitors for at least a week. If a problem is detected with incoming power, it may be advisable to install a power conditioner.

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Appendix A
Glossary

A.1 Overview

The following terms are defined as they are used at CONVEX. These terms must be used in CONVEX documentation only as defined in this glossary. Standard acronyms are also included.

A.2 Terms

AC power-controller. In CONVEX supercomputers, the AC power-controller is the device that regulates AC power from the cabinet circuit breaker to the computers' internal electronic and electromechanical components.

boot. The procedure by which a program is initiated the first time. Typically, a boot is performed when power is first applied to the processor.

C. The systems programming language of the UNIX operating system.

C shell. The standard shell provided with Berkeley Standard versions of UNIX.

central processing unit (CPU). The central processing unit is the portion of a CONVEX machine that recognizes and executes the instruction set.

chassis. The physical structure where the computer is housed.

CONVEX UNIX. The CONVEX version of the UNIX operating system.

electrostatic discharge. The release of static electricity from a charged object to a grounded object.

ESD. *See* electrostatic discharge.

expansion cabinet. A secondary cabinet designed to house peripheral computer equipment, e.g., tape drives, disk drives, controllers, etc. *See also* processor cabinet.

firmware. Computer programs that are embodied in a physical device that can form part of a machine. Also, software that resides in ROM.

***fsck* utility.** A file systems check program used for maintenance or repair of data stored on disk.

interrupt. An occurrence, other than an exception, that changes the normal flow of instruction execution. An interrupt originates from hardware, such as an I/O device.

kernel. A part of the UNIX operating system that resides in ring 0. The kernel typically manages process creation and deletion, scheduling, and other high-level, system-wide features.

keyswitch. On CONVEX supercomputers, a four-way electrical keyswitch that controls the application of electricity to the CPU boards.

mode switch. On CONVEX supercomputers, a three-way electrical switch that controls power to the System Monitor Board (on C120 models) or the System Control Monitor (on C210 and C220 models). The mode switch is located on the AC power-controller.

Multibus. An industry-standard I/O bus.

multi-user mode. In CONVEX UNIX, the mode of operation where the supercomputer is being run in a general timesharing environment with multiple users. This is the normal operating mode for CONVEX UNIX. *See also* single-user mode.

prompt. A character or character string sent from a computer system to a terminal to indicate to the user that the system is ready to accept input. Typical CONVEX prompts are `(fp)>`, `#`, `%`, `:`, and `(spu)>`.

processor cabinet. A cabinet designed to hold a central processing unit. On CONVEX equipment, a processor cabinet also houses AC and DC electrical devices, a System Monitor Board (on C1 and C120 models), and a System Control Module (on C210 and C220 models).

ring. A ring is the unit of logical memory used for protection purposes. There are five rings in CONVEX machines: four for system level usage and one for users. The system rings (Ring0-Ring3) each correspond to one segment of logical memory, while the user ring (Ring4) contains four segments.

root directory. The base directory in UNIX from which all other directories stem, directly or indirectly.

root filesystem. The filesystem containing the root directory and the commands subset required to run UNIX in single-user mode.

SCM. *See* System Control Module.

service processor unit (SPU). In CONVEX supercomputers, a separate processor that controls operations such as booting and diagnostics.

single-user mode. In CONVEX UNIX, the mode of operation where the supercomputer is being controlled by a single system manager or operator. This mode is used primarily for maintenance and system administrative functions. *See also* multi-user mode.

SMB. *See* System Monitor Board.

soft front panel. EPROM-based software that controls certain booting, internal testing, and communications functions in CONVEX supercomputers.

SPU. *See* service processor unit.

SPU tape cartridge. The magnetic tape cartridge containing the SPU programs, files, and utilities.

SPU tape drive. The tape drive that reads data from the SPU tape cartridge.

SPU UNIX. CONVEX-developed software on the SPU that directs certain supervisory functions on CONVEX supercomputers.

superuser. The UNIX term for the system manager.

system console. The CRT, printer or terminal that serves as a communication device between the system manager and CONVEX supercomputers.

System Control Module. An electronic safety mechanism that monitors hardware and environmental conditions on CONVEX C210 and C220 supercomputers. When an error condition is detected, the System Control Module transmits a hexadecimal status code to the **SYSTEM STATUS** display on the processor cabinet front panel.

system manager. The person responsible for the management and operation of a CONVEX supercomputer.

System Monitor Board. An electronic safety mechanism that monitors hardware and environmental conditions on CONVEX C120 supercomputers. When an error condition is detected, one of the 16 LED indicators on the System Monitor Board is lit.

SYSTEM RESET switch. On CONVEX supercomputers, a manually operated switch used to force a hardware reset on the Service Processor Unit.

SYSTEM STATUS display. A two-digit, LED display located on the front panel of CONVEX C210 and C220 supercomputers. It is used to display hexadecimal status codes transmitted by the SCM.

UNIX. An operating system developed by AT&T Laboratories.

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Appendix B
Safety Considerations

B.1 Overview

This appendix describes various safety considerations for CONVEX supercomputers and associated peripheral equipment. The safety precautions presented here should not be considered all inclusive, as it is impossible to predict every hazard under all possible conditions.

This appendix is divided into four sections:

- "Emergency Preparations" contains a list of recommended emergency preparations
- "Safety Considerations During Servicing" contains safety procedures to follow when servicing CONVEX hardware. The following topics are covered:
  - Electrostatic discharge (ESD) precautions
  - Stabilizing the cabinets
  - Power off procedures
- "Safety Considerations During Installation" contains safety procedures to follow when installing CONVEX hardware. The following topics are covered:
  - Moving equipment
  - Assuring proper input power ratings
  - Changing cabinet power wiring
  - Connecting AC power
  - Cooling and ventilation considerations
- "Fire Control" contains fire safety considerations

B.2 Emergency Preparations

System management should develop a comprehensive set of emergency procedures immediately after system installation. It is also advisable to discuss the procedures with system users at regular intervals. Some basic preparations include:

- Post a list of organizations to call during a failure or emergency for each of piece of equipment installed.
- Determine and publicize procedures for responding to emergencies. Be sure to develop procedures for dealing with fires, power failures, lightning, air-conditioning failures, and security violations.
- Study the problem reporting procedures in Appendix F to learn what to look for when filing a trouble report.
- Keep a log of all hardware (and software) changes or problems; include the device name, the problem, the corrective action taken, and diagnostics. Make sure to include revision and serial numbers in the log.

B.3 Safety Considerations During Servicing

This section presents safety guidelines that must be followed when servicing a CONVEX supercomputer or its peripheral equipment.

B.3.1 Electrostatic Discharge (ESD) Precautions

> **CAUTION**
>
> ESD may damage electronic components in a CONVEX computer or its peripheral devices.

Many of the electronic components used in the CONVEX computers can be damaged by an electrostatic discharge (ESD). High static charge levels often result when various objects are separated or rubbed together. The following factors determine static charge levels:

- Conductivity rating of material
- Humidity level
- Rate of separation or change

Table B-1 lists charge levels based on various personnel activities and humidity levels:

Table B–1, Static Charge Levels and Relative Humidity

Personnel Activity	Humidity[1] & Charge Levels (Volts)			
	26%	32%	40%	50%
Person walking across linoleum floor	6,150V	5,750V	4,625V	3,700V
Person walking across carpet	18,450V	17,250V	13,875V	11,100V
Person getting up from plastic type chair	24,600V	23,000V	18,500V	14,800V

[1] A high rate of air flow produces a higher static charges than a low air flow rate, for the same relative humidity level.
[2] Some data in this table has been extrapolated.
[3] Source: B. A. Unger *Electrostatic Discharge Failures of Semiconductor Devices* (Bell Laboratories, 1981).

Electronic components in CONVEX supercomputers and peripheral equipment can be damaged by ESD during maintenance procedures. Table B-2 lists various electronic components and their level of susceptibility to electrostatic damage:

Table B–2, Component Susceptibility to Static Damage

Susceptibility Ranges of Various Devices Exposed to Electrostatic Discharge (Human Body Model)	
Device Type	**Level of ESD Susceptibility (Volts)**
MOSFET	>10
JFET	> 140
CMOS	> 250
Schottky Diodes, TTL	> 300
Bi-polar Transistors	> 380
ECL (For Hybrid use, PC Board level)	> 500
SCR	> 680

[1] Source: B. A. Unger *Electrostatic Discharge Failures of Semiconductor Devices* (Bell Laboratories, 1981).

All circuit boards should be considered static sensitive. The following precautions must be used when handling circuit boards to avoid possible equipment damage:

- Wear an approved ESD grounding device and ground it to equipment that is being serviced
- Keep all circuit boards not in use in an approved conductive container
- Return all circuit boards to CONVEX Computer Corporation in approved conductive containers

B.3.2 Stabilizing the Cabinets During Servicing

> **CAUTION**
>
> Expansion cabinets may tip over when a slide mounted peripheral device is pulled out for servicing.

CONVEX expansion cabinets are equipped with two stabilizer bars used to prevent them from tipping over when peripheral devices are extended for servicing. Figure B-1 shows the location of the stabilizer bar **CAUTION** label.

To prevent expansion cabinets from tipping over, observe the following precautions:

- Never extend more than one peripheral device at a time
- When a stabilizer bar is fully extended, adjust the stabilizer pad until it is firmly against the floor (refer to Figure B-1)
- When a peripheral device is not being serviced, it must be secured in the expansion cabinet by its locking mechanism

B.3.3 Power-Off Procedures

CAUTION

Unplug the cabinet's AC power supply cord or turn off the customer-provided branch circuit breaker before removing or replacing electronic components.

Note the warning on the power cord caution label specifying the number of power cords to be disconnected (in parenthesis):

THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. TO REDUCE THE RISK OF SHOCK DISCONNECT (#) POWER SUPPLY CORDS BEFORE SERVICING.

For CONVEX cabinet circuit breaker locations, see Figures B-9, B-10, and B-11 for C100 Series processor cabinets, Figure B-12 for C200 Series processor cabinets, and Figures B-13 and B-14 for expansion cabinets.

Turning the cabinet circuit breaker switch to the **OFF** position removes all power to the cabinet equipment, but *not* to the cabinet AC distribution panel. The customer-provided branch circuit breaker(s) must be turned **OFF**, or the cabinet power cord(s) removed, before **all** power is disconnected.

Expansion cabinets in some CONVEX system configurations have their own circuit breakers and power cords. These configurations are identified by a power cord **CAUTION** label installed on the rear door of each cabinet. Refer to Figure B-6 for the location of the power cord **CAUTION** label. Refer to Figure B-12 for the location of the expansion cabinet circuit breakers.

B.4 Safety Considerations During Installation

This section presents safety considerations and guidelines during installation of a CONVEX supercomputer and its peripheral devices.

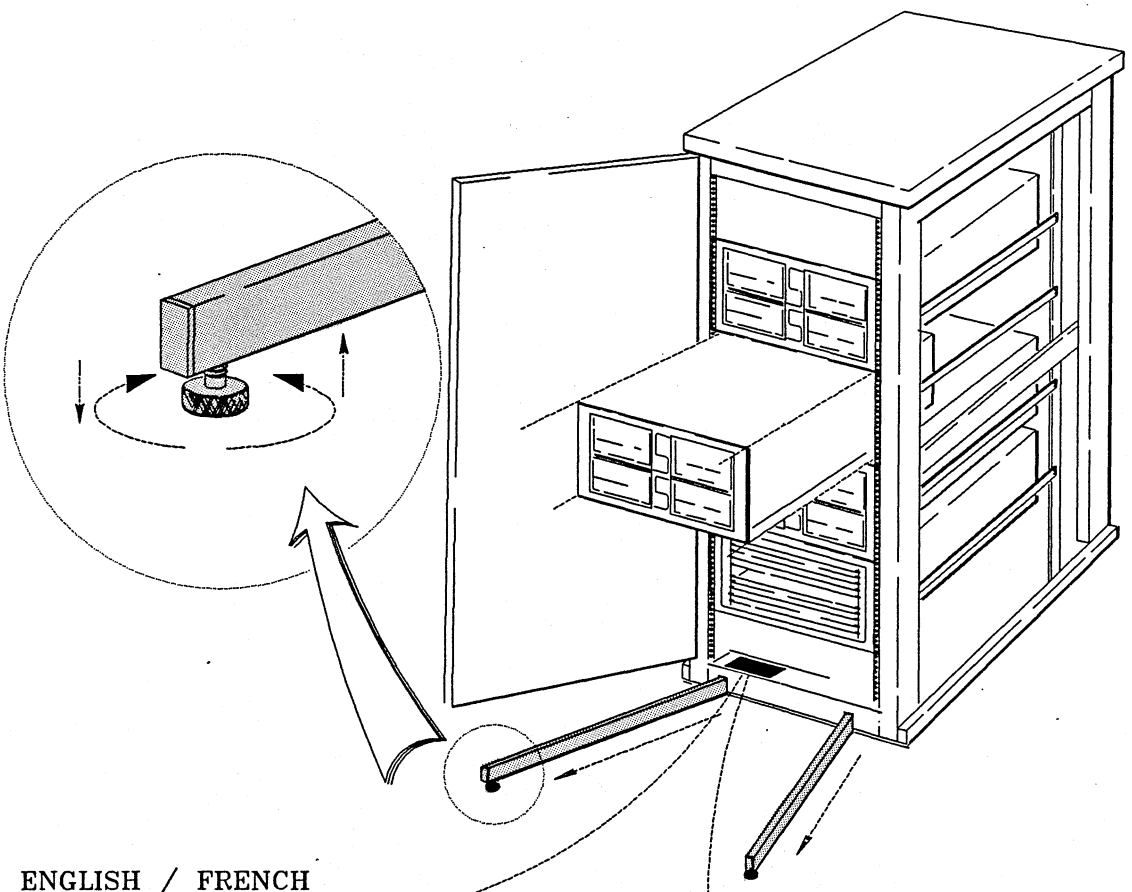
B.4.1 Moving Equipment

CAUTION

Personal injury or equipment damage may occur if a CONVEX cabinet tips over.

CONVEX cabinets are not top-heavy, but may tip over if the cabinets are not moved with care. To prevent personal injury or equipment damage, at least *two* people must be available to move equipment.

Figure B–1, Stabilizer Bar Caution Label



ENGLISH / FRENCH

CAUTION	ATTENTION
TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED. 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT 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	POUR REDUIRE LE RISQUE D'ACCIDENT ATTRIBUABLE A L'INSTABILITE DE L'UNITE, DEPLOYER LES STABILISATEURS AVANT DE SORTIR LES PERIPHERIQUES. 1. POUR DEPLOYER LES STABILISATEURS, TIRER COMPLETEMENT LES BRAS ANTI-BASCULEMENT ET ABAISER LES PATTES DE FACON QU'ELLES REPOSENT SOLIDEMENT SUR LE SOL. 2. S'ASSURER QUE TOUS LES PERIPHERIQUES SON MUNIS DE VIS DE BLOCAGE. 3. NE JAMAIS SORTIR PLUS D'UN PERIPHERIQUE A UN MOMMENT DONNE.

ENGLISH / GERMAN

CAUTION	ACHTUNG
TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED. 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT 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	ZUR VERMEIDUNG VON GEFAHRDUNG DURCH EIN INSTABILES GERAT SIND VOR DER HERAUSNAHME VON PERIPHERALS DER STABILISIERUNGSMECHANISMUS BETATIGT WERDEN. 1. UM DIE STABILISIERUNGSEINRICHTUNG ZU BETATIGEN, SIND DER "ANTITILT KANAL" GANZ HERAUS ZU ZIEHEN UND DER UNTERE STUTZFUSS AUF DEN BODEN ZU FUHREN. 2. OBERPRUFEN SIE, OB IN ALLEN ANDEREN VERSCHIEBBAREN GERATEN DER SICHERUNGSMECHANISMUS BETATIGT IST. 3. ZIEHEN SIE NIE MEHR ALS EIN GERAT HERAUS.

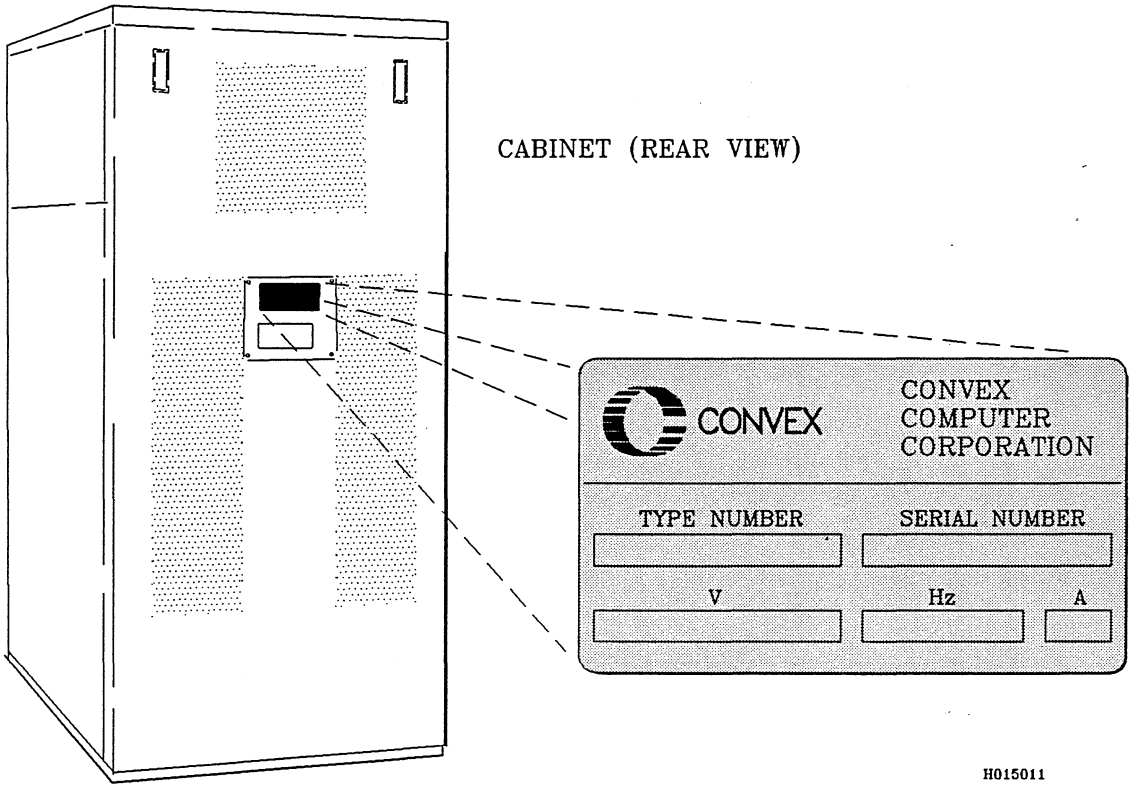
H015020

B.4.2 Assuring Proper Input Power Rating

> **CAUTION**
>
> Personal injury or equipment damage may occur if AC input power does not comply with the specifications on the CONVEX cabinet power label.

Each CONVEX cabinet has a label mounted on its rear door that lists its input power rating. Figure B-2 shows the cabinet power label used on all CONVEX cabinets and the label location. The input power ratings for all CONVEX computers and peripheral equipment are listed in Appendix E.

Figure B–2, Cabinet Power Label Location



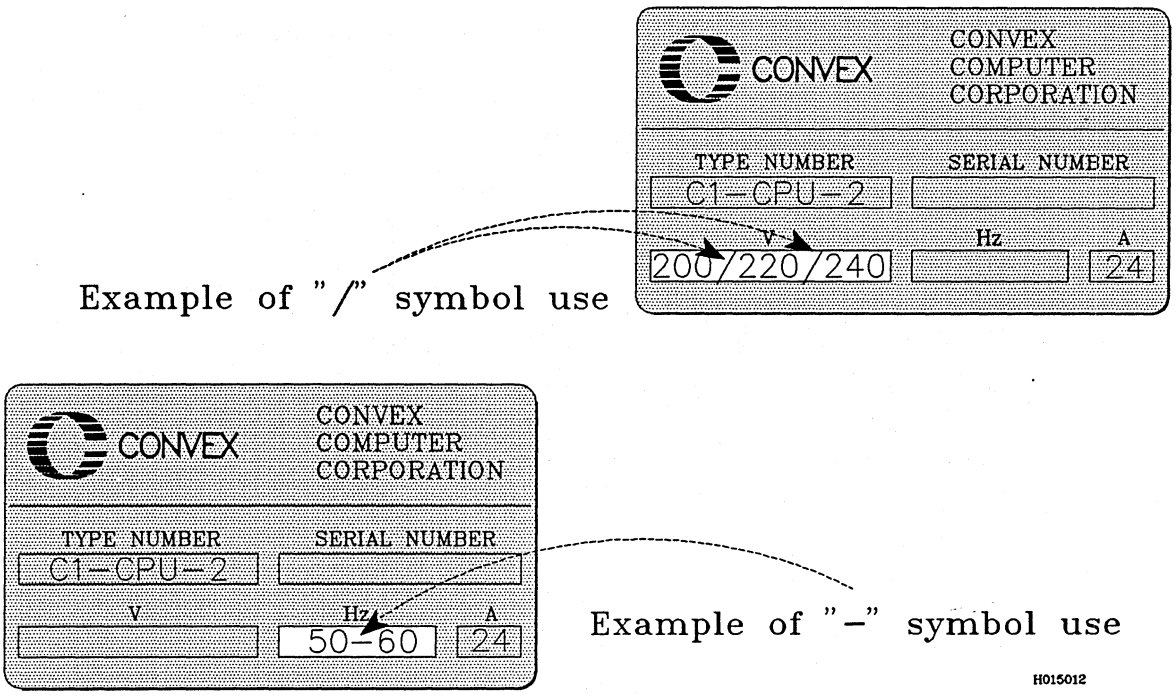
B.4.2.1 Power Label Description

Each power label provides power rating information for its corresponding cabinet. The "-" and "/" symbols on the power labels designate a specific operating power value or range for the equipment:

- The "-" symbol implies that the equipment operates properly between the values listed. An example is shown in Figure B-3.
- The "/" symbol implies that a *specific* voltage or frequency is *required*, and that internal adjustments must be made by *authorized personnel only*. An example is shown in Figure B-3.

  When the "/" symbol is used, the specific voltage or frequency is also listed on the cabinet's power cord **CAUTION** label. The power cord **CAUTION** label is mounted next to the cabinet power label. An illustration of the power cord **CAUTION** label is shown in Figure B-6.

Figure B–3, Cabinet Power Labels with "-" and "/" Symbols



B.4.2.2 Input Power Inspection Check List

The following installation site power supply information should be verified before connecting a cabinet to the input AC power:

- The installation site's AC voltage range and the cabinet voltage requirements are the same
- The installation site's AC power phases match the cabinet input power configuration
- The installation site's AC input frequency range correspond to cabinet frequency range
- The installation site's circuit breakers are adequate for specified cabinet current loads

B.4.2.3 Power Cord Caution Labels

CONVEX cabinets produced for North America are equipped with power cords and connectors and are ready for installation.

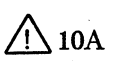
> **NOTE**
>
> CONVEX equipment shipped to international locations does not have a power connector installed. Refer to the *CONVEX Computer Site Preparation Guide (C130, C210, C220, C230, C240)* for a listing of power connectors for domestic and international installation.

On some CONVEX computer system configurations, several cabinets may have their own power cord. However, there is a maximum of *one* external power cord per cabinet. A **CAUTION** label is attached to the rear door of *all* cabinets to indicate that there are multiple cabinets with power cords. Figure B-6 illustrates the two types of power cord **CAUTION** labels and their locations.

> **CAUTION**
>
> The four IEC outlets on the C120 **model XE** outlet panel have a combined rating of **10** amps. Failure to follow the model XE outlet panel **CAUTION LABEL** instructions may result in personal injury or equipment damage.

Figure B-4 shows an example of the model XE outlet panel caution label.

Figure B–4, Model XE Outlet Panel Caution Label



CAUTION:
NOT FOR EXTERNAL USE

ATTENTION:
NE PAS UTILISER A
L'EXTERIEUR DE L'EQUIPMENT

CAUTION

The internal NEMA outlets on all CONVEX cabinet power control panels (other than model XE) are rated at **12** amps per outlet. Internal IEC outlets are rated at 6 amps per outlet. Equipment damage may occur if these ratings are exceeded.

Connecting *external* equipment to the utility outlets in CONVEX cabinets voids all agencies certifications.

Figure B-5 shows an example of the CONVEX cabinet outlet panel caution label (except model XE).

Figure B–5, Outlet Panel Caution Label

CAUTION:
NOT FOR EXTERNAL USE

ATTENTION:
NE PAS UTILISER A
L'EXTERIEUR DE L'EQUIPMENT

B.4.2.4 Power Cord Voltage Labels

Each power cord has a color-coded label that matches the power configuration of its corresponding cabinet. Figure B-7 shows the power cord labels for a CONVEX processor cabinet. Figure B-8 illustrates the CONVEX expansion cabinet power cord label.

Figure B–6, Power Cord Caution Label

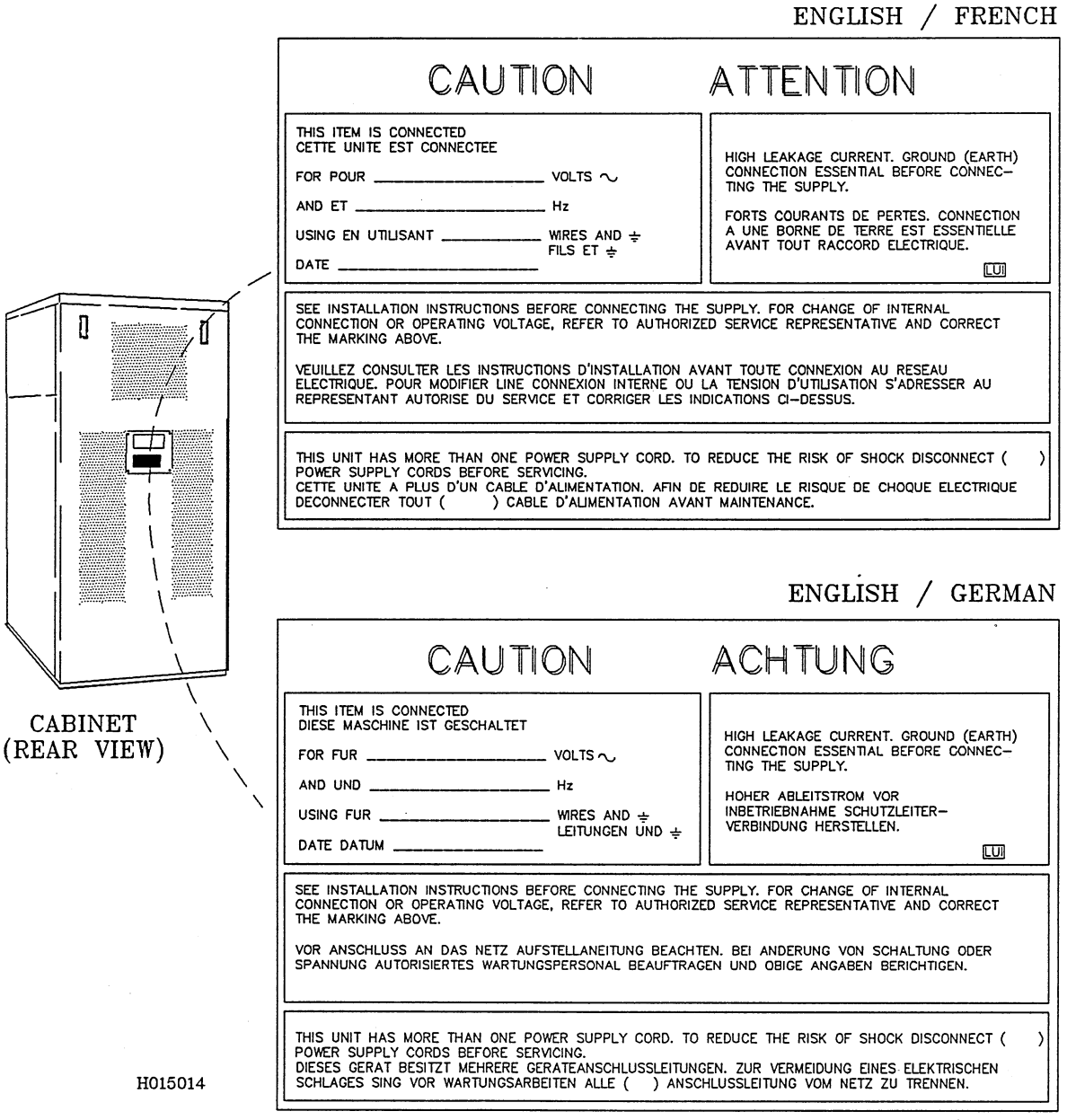
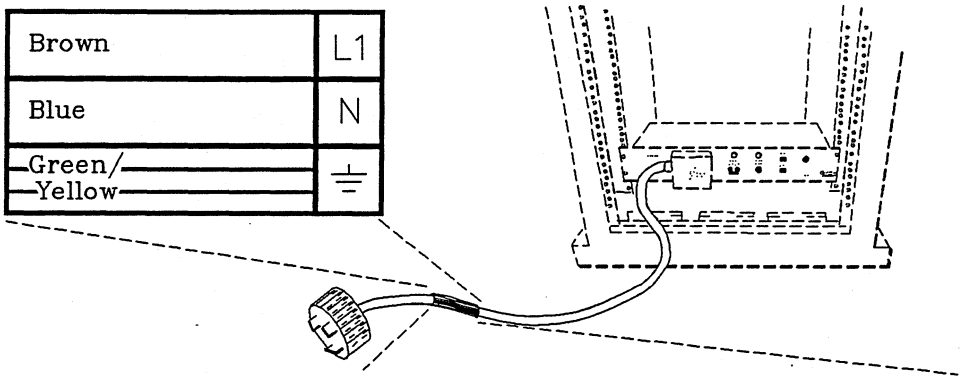


Figure B–7, Processor Cabinet Power Cord Labels

220 V 1ø
IEC & INTERNATIONAL

Brown	L1
Blue	N
Green/Yellow	⏚



C1, C120

120 V 1ø
UL/CSA

Black	L1
Red	L2
Orange	L3
White	N
Green	⏚

Black	L1
Brown	L2
Black	L3
Blue	N
Green/Yellow	⏚

220 V 1ø
IEC & INTERNATIONAL

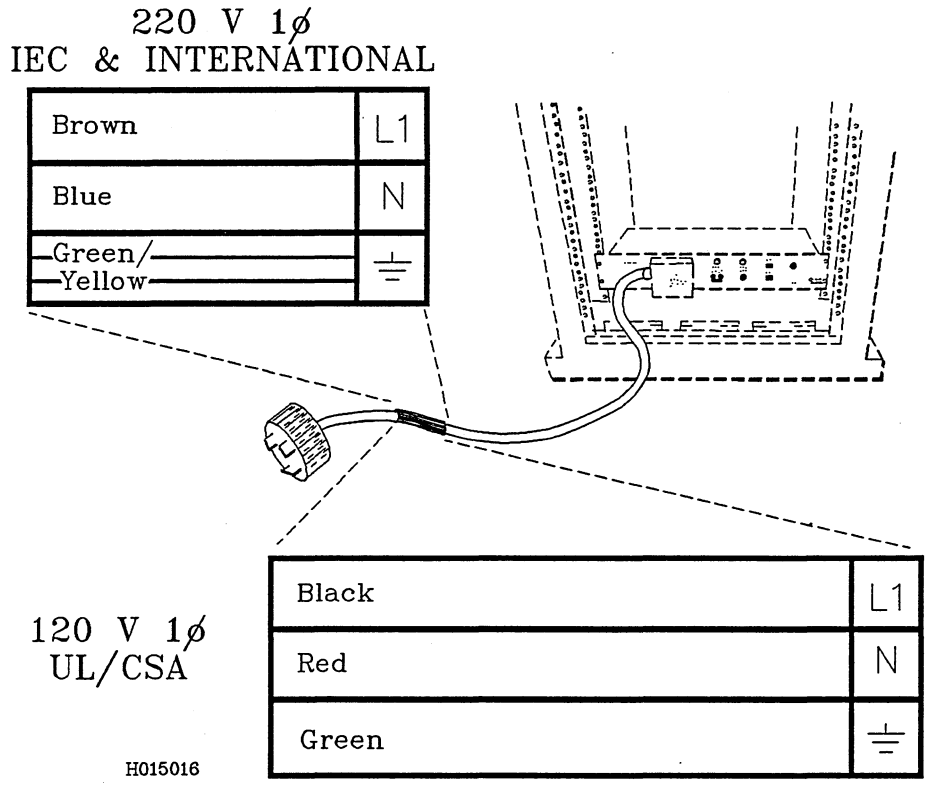
C210,
C220

120 V 1ø
UL/CSA

Red	L1
Orange	L2
Black	L3
Green	⏚

H015015

Figure B–8, Expansion Cabinet Power Cord Labels



B.4.3 Changing Cabinet Power Wiring

> **CAUTION**
>
> **FOR CHANGE OF INTERNAL CONNECTION OR OPERATING VOLTAGE, REFER TO AUTHORIZED SERVICE REPRESENTATIVE.**
>
> Equipment damage can occur if cabinet power wiring changes are done improperly. Wiring changes must be done by authorized personnel only.

It may be necessary to change a cabinet input power configuration to compensate for new voltage requirements. The proper technical documentation must be used when a cabinet's AC input configuration is changed. Wiring changes must be made only by CONVEX authorized personnel.

B.4.4 Connecting AC Power

> **CAUTION**
>
> Personal injury may occur if all AC input circuit breakers are not set to the **OFF** position before connecting a power cord plug to the facility's AC power.

B.4.4.1 Location of Main Circuit Breaker

Figures B-9 through B-14 show the locations of the main circuit breakers for the CONVEX processor and expansion cabinets:

Figure B–9, Location of C100 Series Cabinet Circuit Breaker

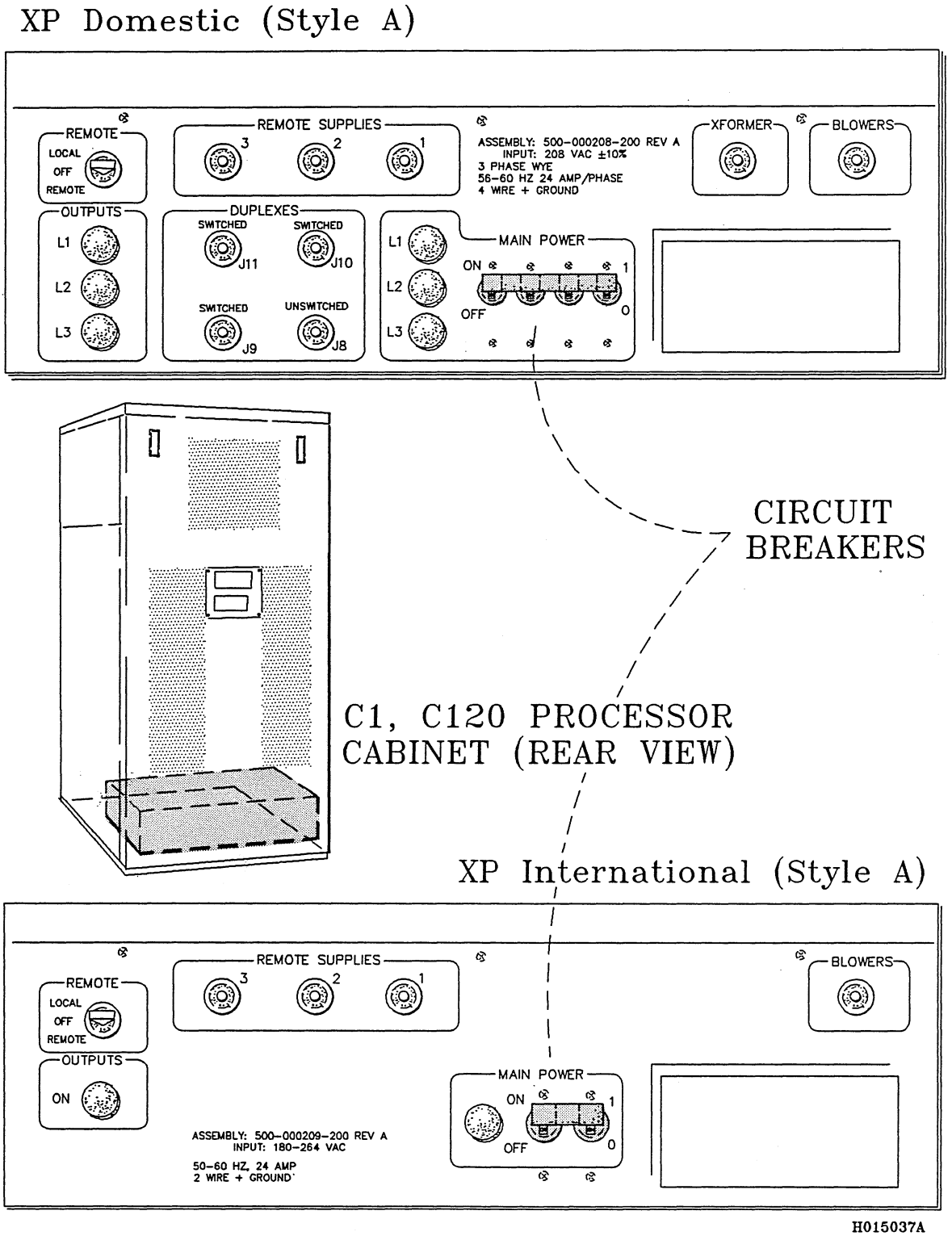
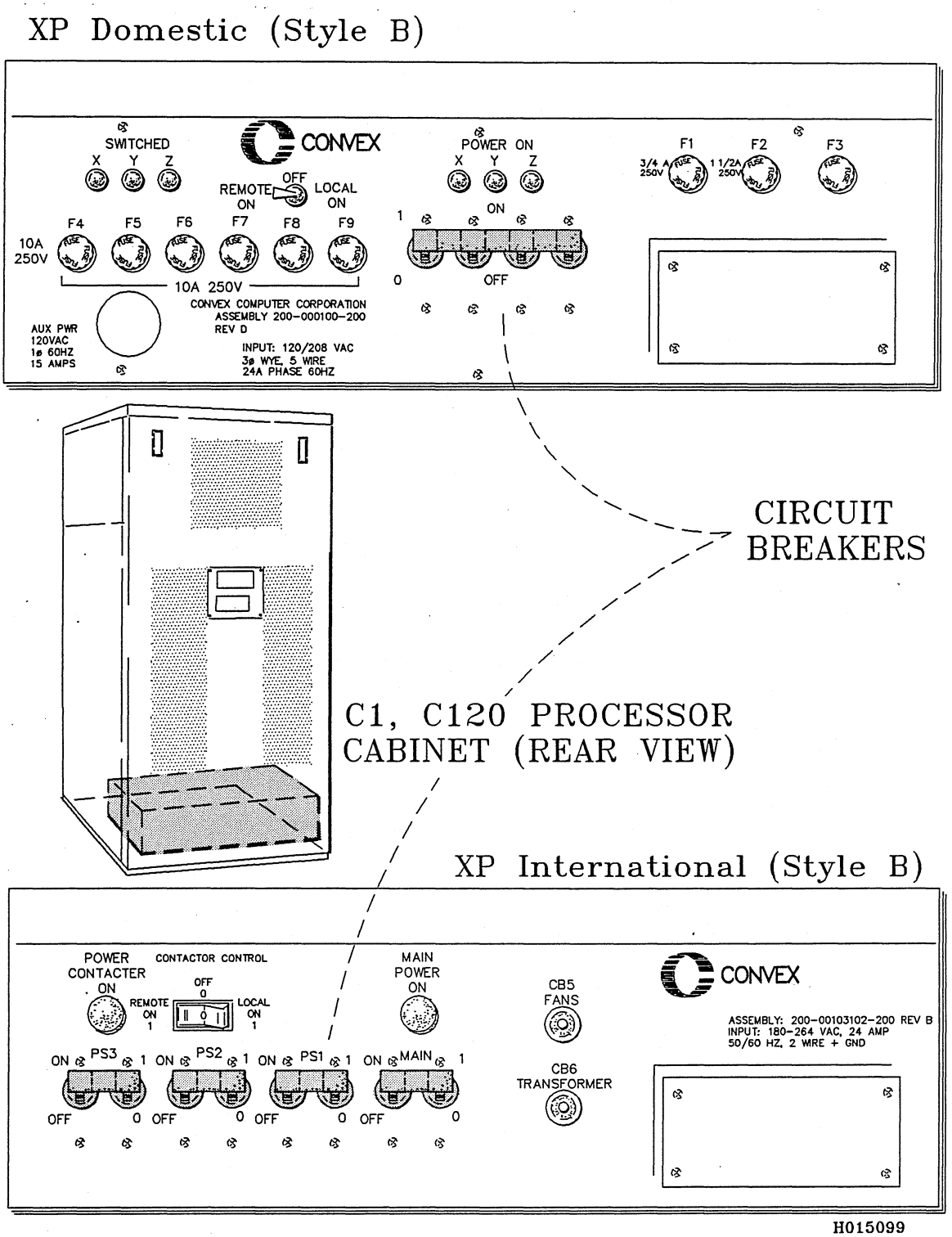


Figure B–10, Location of C100 Series Cabinet Circuit Breaker



B.4.5 Cooling and Ventilation Considerations

Computer room air conditioning systems should be designed to ensure optimal cooling efficiency. Capacity, air flow rates, and heat dissipation values are the primary factors in calculating computer room cooling requirements. Heat generated by computer room lighting and personnel must also be included when calculating cooling requirements. For example, a person performing light work dissipates about 450 BTUs per hour.

The power dissipation figures for CONVEX equipment are listed in the specification tables in Appendix E. The recommended operating temperature and humidity figures are for CONVEX equipment installed below 3,280 ft (1,000 m). At altitudes above 3,280 ft (1,000 m) lower air densities affect air conditioning. If a facility is located above this altitude, lower the recommended temperature range in Appendix E by 1 °F per 1,000 ft or (2 °C per 1,000 m).

B.4.5.1 Humidity Level

High humidity levels can cause galvanic actions to occur between some dissimilar metals. These actions can eventually cause a high resistance between connections and lead to equipment failures. High humidity levels may also adversely affect some magnetic tapes and paper media.

Low humidity levels allow high levels of static charges to exist and can lead to component damage during an Electrostatic Discharge (ESD). Paper feed problems, particularly on high-speed printers, are frequently encountered in low humidity environments. The recommended humidity levels for CONVEX equipment are defined in Appendix E.

B.4.5.2 Air Conditioning Ducts

Duct placement is generally defined by space availability. However, if a false floor is installed, use the area under it as a plenum. Properly placed vents provide efficient cooling for CONVEX processors and expansion cabinets. The air intake vents on CONVEX cabinets are near the bottom front of the cabinets. The exhaust vents are at the rear or the top of the cabinet.

It may be difficult to control cooling and pressure levels if the computer room duct-work is separate from the rest of the building. The ducts should not be exposed to warm air, as this may cause humidity levels to increase.

Duct work seals play a vital part in maintaining a balanced air conditioning system and high static air pressure in the computer room. Adequate cooling capacity may be ineffective if the air flow's direction and rate cannot be controlled because of inadequate duct sealing.

B.4.5.3 Dust and Pollution Control

Disk, tape drives, and some other mechanical devices require a dust-free environment for trouble-free operation. CONVEX tape and disk drives are protected from dust particles by mechanical air filters designed to trap large dust particles. Smaller particles, however, may go through these filters and cause problems in the equipment's mechanical parts over time. Small dust particles can be prevented from entering the computer room by maintaining the computer room's air conditioning system at a high static air pressure level.

The computer room should be kept as clean as possible. The following policies are recommended:

- **No smoking** — Cigarette smoke particles are eight times larger than the clearance between a disk drive head and the disk's surface. Smoke particles also cause air filters to clog up at a faster rate.
- **No eating or drinking** — Spilled liquids may cause shorts in equipment such as keyboards.
- **Cleaning rugs** — Use a tightly sealed vacuum cleaner.
- **Cleaning tile floors** — A dust absorbent cloth mop is preferable to a dry mop.

Special precautions are required if the computer facility is near a source of air pollution. Some air pollutants, especially hydrogen sulfide, can cause corrosion damage to wiring and delicate electronic equipment. The use of activated charcoal filters reduces this form of air pollution.

B.5 Fire Control

System managers and computer operators should view fire control of computer equipment as a top priority. CONVEX strongly recommends compliance with all prevailing federal, state, and local fire codes and computer equipment related fire control practices.

CONVEX also urges compliance with the following National Fire Protection Association (NFPA) standards:

- NFPA 75 — Standard for the Protection of Electronic Computer/Data Processing Equipment
- NFPA 12A — Standard on Halon 1301 Fire Extinguishing Systems
- NFPA 12B — Standard on Halon 1211 Fire Extinguishing Systems

System managers, computer operators, and other computer room personnel should be familiar with, and practiced in, the proper use of computer room equipment and fire protection equipment and procedures.

Appendix C
System Monitor Board Indicators

C.1 Overview

CONVEX C1, C120, and XE models have a System Monitor Board (SMB) that monitors internal components and environmental conditions. Under hazardous conditions the SMB lights one or more of the 16 red LEDs on the SMB display. Evaluate SMB LED indicators by looking up their definition in Table C-1 and in the text below.

C.2 SMB Indicator Table

Table C–1, SMB Indicator Descriptions

LED #	SMB INDICATOR NAME	SYSTEM RESPONSE
1	AC Power On	
2	SMB Power Failure	ATTENTION light blinks
3	SPU Power Failure	ATTENTION light blinks
4	Ambient Temperature Warning	ATTENTION light blinks
5	Ambient Temperature Failure	ATTENTION light blinks System shuts down
6	Exhaust Failure (behind front panel)	ATTENTION light blinks System shuts down
7	CPU Fan Failure (fan above CPU boards)	ATTENTION light blinks System shuts down
8	I/O Fan Failure (fan above I/O boards)	ATTENTION light blinks System shuts down
9	Multibus Fan Failure	ATTENTION light blinks System shuts down
10	Power Supply #1 Warning	ATTENTION light blinks System shuts down
11	Power Supply #2 Warning	ATTENTION light blinks System shuts down
12	Power Supply #3 Warning	ATTENTION light blinks System shuts down
13	SPU Error	ATTENTION light blinks
14	Power Supply Margining	ATTENTION light blinks
15	Battery Low	(not in use)
16	AC Power Shutdown	

The following list describes the SMB LED indicators in the order of their position (from top to bottom):

- LED 1 — The AC Power On LED lights when the SMB determines that conditions are correct for system power-on
- LED 2 — The SMB Power Failure LED lights if the SMB detects DC power to the SMB is outside of acceptable tolerances
- LED 3 — The SPU Power Failure LED lights if the SMB detects DC power to the SPU is outside acceptable tolerances
- LED 4 — The Ambient Temperature Warning LED lights if the CPU inlet temperature exceeds 104 ° F
- LED 5 — The Ambient Temperature Failure LED lights if the CPU inlet temperature exceeds 122 ° F
- LED 6 — The Exhaust Failure LED lights if the CPU exhaust outlet temperature exceeds 140 ° F
- LED 7 — The CPU Fan Failure LED lights if the SMB detects insufficient airflow from the CPU cooling fan. Under this condition, the SMB shuts down the system.
- LED 8 — The I/O Fan Failure LED lights if the SMB detects insufficient airflow from the I/O cooling fan. Under this condition, the SMB shuts down the system.
- LED 9 — The Multibus Fan Failure LED lights if the SMB detects insufficient airflow from the Multibus cooling fan. Under this condition, the SMB shuts down the system.
- LED 10 — The Power Supply #1 LED lights if the SMB detects low DC voltage from power supply #1. Under this condition, the SMB shuts down the system.
- LED 11 — The Power Supply #2 LED lights if the SMB detects low DC voltage from power supply #2. Under this condition, the SMB shuts down the system.
- LED 12 — The Power Supply #3 LED lights if the SMB detects low DC voltage from power supply #3. Under this condition, the SMB shuts down the system.
- LED 13 — The SPU Error LED lights when a SPU error is detected
- LED 14 — The Power Supply Margin LED lights when the SPU software margins the system power supplies during diagnostics
- LED 15 — The Battery Low LED is not currently in use
- LED 16 — The AC Shutdown LED lights when the SMB has removed power from the system due to a detected failure or dangerous condition

Appendix D
SCM Status Codes

D.1 Overview

CONVEX C200 Series supercomputers have a built-in safety mechanism called the System Control Module (SCM). The primary function of the SCM is to monitor the CONVEX hardware and environment to prevent damage under hazardous conditions. If an error condition is detected by the SCM during the power-up check, power-up is inhibited and an error code is displayed on the hexadecimal **SYSTEM STATUS** display.

If an error is detected while the system is running, the SCM may shut down the system and display an error code. SCM errors are classified into two types: *warning* and *fatal*. Warning errors generally indicate a potential problem has been detected, while fatal errors cause the SCM to shut down the system.

Evaluate the system status codes by reading the hexadecimal **SYSTEM STATUS** display and looking up the code definition and affected equipment in Table D-1. The **FF** status code is displayed when the system is operating normally.

D.2 SCM Code Tables

Table D–1, SCM Status Codes

CODE	CODE DEFINITION	EQUIPMENT
00	DEADMAN TIMER STOP	SCM
02	SP2 interrupt acknowledge not returned.	SP2 or SCM
04	SCM to SP2 data bus failure.	SP2 or SCM
07	SM.SPUDCOK failure	SCM
08	SCM A/D timeout	SCM
0B	invalid command	SP2
10	These codes indicate the slot listed in the EQUIPMENT slot column has the wrong board installed.	ME0 slot
11		MO0 slot
12		ME1 slot
13		MO1 slot
14		ME2 slot
15		MO2 slot
16		ME3 slot
17		MO3 slot
18		CPX slot
19		VPDA slot
1A		VPDB slot
1B		PIA slot
1C		SP2 slot
1D		SFUA slot
1E		SFUB slot
1F		ASPA slot
20		ASPB slot
21		IPPA slot
22		IPPB slot
23		VPCA slot
24		VPCB slot
25		DCUA slot
26		DCUB slot

Table D–1, SCM Status Codes (continued)

CODE	CODE DEFINITION	EQUIPMENT
81	These status codes indicate the power supply listed to the right is not receiving AC input power.	PS1
82		PS2
84		PS4
85		PS5
86		PS6
87		PS7
88		PS8
89	These status codes indicate the DC power value listed in the column to the right is not present.	+5V PS2
8A		+12V PS3
8B		-12V PS3
8C		-5V PS3
8D		-4.5V, PS5, 6[1]
8E		-2V PS1[2]
91	These status codes indicate the power supply listed to the right is +/-10% of the average of all current sharing power supplies.	PS1
94		PS4
95		PS5
96		PS6
97		PS7
98		PS8
A9	These status codes indicate the power labels being read by the SCM are +/-10% of the nominal values listed in the column to the right.	+5V PS2
AA		+12V PS3
AB		-12V PS3
AC		-5V PS3
AD		-4.5V PS5, 6[1]
AE		-2V PS1[2]
B0	Indicates the air temperature is above 38 degrees C. The CONVEX system shuts down if the input air sensor ≥ 45 degrees.	Input air thermistor
B1	Indicates the air temperature is above 55 degrees C. The CONVEX system shuts down if the exhaust air sensor ≥ 62 degrees.	Exhaust air thermistor
B6	Indicates the air temperature is above 55 degrees C. The CONVEX system shuts down if the SCM on board sensor ≥ 62 degrees.	SCM on board thermistor
B4	These status codes indicate restricted not enough air flow.	CPX on board sensor
B5		PIA on board sensor

[1] On C220 models, includes PS7 and PS8
[2] On C220 Models, includes PS4

Table D–1, SCM Status Codes (continued)

CODE	CODE DEFINITION	EQUIPMENT
C0	This status code indicates there are not enough power supplies for the configuration.	
F0 F1 F2 F3 F4 F5	These status codes indicate not enough air flow the fan listed in the column to the right.	FN0 FN1 FN2 FN3 FN4 FN5
FF	This code indicates normal operation.	

Appendix E
Environmental Specifications

This appendix contains basic environmental specifications for CONVEX supercomputers.

Table E–1, C1, C120 Environmental Specifications

Environmental	Domestic	International
AC Power Requirements	208 V ± 10% 60 Hz ± 1 Hz 3Ø 60 A 30 amps Service	220 V ± 10% 50 Hz ± 1 Hz 1Ø 60 A 30 amps Service
Power Consumption		
Standard	2,400 W	2,400 W
Maximum	3,400 W	3,400 W
Cooling	Forced Air Front Intake, Rear Exhaust	
Operating Temperature Range	60 ° F – 90 ° F	15 ° C – 32 ° C
Rate of change	3.5 ° F/hour	
Operating Humidity Range	40% – 60% (no condensation)	
Rate of change	2%/hour	
Power Dissipation (in BTUs/Kcals)		
Processor Cabinet	10,880 BTUs	2,960 Kcals
DKD-001,-101 Disk Drive	2,000 BTUs	540 Kcals
DKD-005,-006, -105, -106 Disk Drive	830 BTUs	225 Kcals
MTD-001, -101 Tape Drive	1,224 BTUs	350 Kcals
MTD-102 Tape Drive	7,600 BTUs	2,200 Kcals
MTD-002 Tape Drive	6,120 BTUs	1,650 Kcals
PRT-001 Printer or Plotter	1,600 BTUs	430 Kcals
Cabinet Dimensions		
Width	25.9 in	65.8 cm
Height	62.5 in	158.8 cm
Depth	39.5 in	100.3 cm
Cabinet Weight	700 lbs	320 Kg
International Standards Compliance		
FCC	Class A, Subpart J of Part 15	
UL	UL478	
CSA	C22.2 No. 154	
VDE (Emissions)	VDE871 Class A	
TUV (Safety)	IEC435	

Table E–2, C200 Series Environmental Specifications

Environmental	Domestic	International
AC Power Requirements	208 V ± 10% 60 Hz ± 1 Hz 3Ø 100 amp Service Delta	220/380 V ± 10%, +16% 50 Hz ± 1 Hz 3Ø 100 amp Service WYE
Power Consumption		
C210	9.3 KW	9.3 KW
C220	12.4 KW	12.4 KW
Cooling	Forced Air Front Intake, Rear Exhaust	
Operating Temperature Range	60 ° F – 90 ° F	15 ° C – 32 ° C
Rate of change	3.5 ° F/hour	
Operating Humidity Range	40% – 60% (no condensation)	
Rate of change	2%/hour	
Power Dissipation (in BTUs/Kcals)		
Processor Cabinet	10,880 BTUs	2,960 Kcals
DKD-001,-101 Disk Drive	2,000 BTUs	540 Kcals
DKD-005,-006, -105, -106 Disk Drive	830 BTUs	225 Kcals
MTD-001, -101 Tape Drive	1,224 BTUs	350 Kcals
MTD-102 Tape Drive	7,600 BTUs	2,200 Kcals
MTD-002 Tape Drive	6,120 BTUs	1,650 Kcals
PRT-001 Printer or Plotter	1,600 BTUs	430 Kcals
Cabinet Dimensions		
Width	30.5 in	77.4 cm
Height	62.5 in	158.8 cm
Depth	39.5 in	100.3 cm
Cabinet Weight		
C210	1000 lbs	455 Kg
C220	1200 lbs	540 Kg
International Standards Compliance		
FCC	Class A, Subpart J of Part 15	
UL	UL478	
CSA	C22.2 No. 154	
VDE (Emissions)	VDE871 Class A	
TUV (Safety)	IEC435	

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Appendix F
Problem Reporting

F.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.

F.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 F–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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Appendix G
Emergency Power Down Procedures

Table G–1, Emergency Power Down Procedures

STEP	PROCEDURE
1	In case of fire or other extreme danger, switch the main circuit breaker to **OFF**.
2	If time allows, attempt to login as *root* user. If unable to login as *root* user, enter control-p (^p) to transfer to SPU operating system, then follow the instructions in step 4 below.
3	Attempt to enter the **shutdown -h now** command. If unable to run *shutdown*, enter control-p (^p) to transfer to the SPU operating system, then follow the instructions in step 4 below.
4	When the SPU prompt `(sp2)>` appears, attempt to run *osclean*. If unable to run *osclean*, follow the instructions in step **6** below.
5	Attempt to run *pwrdwn*. If unable to run *pwrdwn*, follow the instructions in step **6** below.
6	Turn all power switches and breakers to **OFF**.
7	Turn the main circuit breaker to **OFF**.

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Annexe H
Matières Relatives à la Sécurité

H.1 Généralités

La présente annexe décrit un certain nombre de conditions relatives à la sécurité des super-ordinateurs CONVEX et de leurs équipements périphériques auxiliaires ou annexes. Les précautions concernant la sécurité présentées ici ne doivent pas être considérées comme exhaustives car il est impossible de prévoir chaque accident possible dans toutes les circonstances imaginables.

La présente annexe est divisée en quatre sections:

- "Préparations d'urgence" est la section contenant la liste des mesures préparatoires d'urgence recommandées.
- "Considérations relatives à la sécurité pendant l'entretien" est la section contenant les consignes de sécurité à suivre lors de l'entretien et des réparations du matériel CONVEX. Les matières suivantes sont couvertes:
  - Précautions à prendre contre les décharges électrostatiques (ESD)
  - Stabilisation des armoires
  - Méthodes à suivre pour déconnecter la tension
- "Considérations relatives à la sécurité pendant l'installation" est la section contenant les mesures de sécurité à observer pendant l'installation du matériel CONVEX. Les matières suivantes sont couvertes:
  - Déménagement ou déplacement de l'équipement
  - Installation avec les spécifications de l'alimentation électrique correctes
  - Modification du câblage de tension des armoires
  - Branchement sur le réseau courant alternatif
  - Propos relatifs à la climatisation et à la ventilation
- "Lutte contre l'incendie" est la section contenant les mesures de précaution et de lutte contre l'incendie.

H.2 Préparations d'urgence

Le service de gestion du système doit mettre au point un ensemble de procédures d'urgence complètes immédiatement après l'installation du système. Il est également recommandé de discuter ces procédures périodiquement avec les utilisateurs du système. Parmi les préparations fondamentales, il faut inclure:

- Affichage de la liste des organisations à appeler au téléphone au cours d'une panne ou d'une situation d'urgence pour chaque pièce d'équipement installée.

- Sélection et publication des mesures à prendre en réponse à une urgence. Veiller à mettre au point des consignes à suivre en cas d'incendie, de panne de courant, d'orage avec foudre, de pannes de climatisation et d'infractions aux règlements de sécurité.
- L'étude des procédures de rapport d'incidents et de problèmes à l'Annexe F, pour apprendre à déceler ce qu'il faut rechercher quand on fait un rapport de malfonctionnement.
- La liste de toutes les modifications et de tous les problèmes de matériels et de logiciels: mentionner le nom de l'appareil, le problème, la mesure correctrice prise et le diagnostic. S'assurer que l'on mentionne le numéro de la révision et les numéros de série sur cette liste.

H.3 Considérations relatives à la sécurité pendant l'entretien

Cette section présente les consignes de sécurité à suivre lors de l'entretien d'un super-ordinateur CONVEX ou de son équipement périphérique.

H.3.1 Précautions à prendre contre les décharges électrostatiques (ESD)

ATTENTION

Les décharges électrostatiques (ESD) peuvent endommager les composants électroniques d'un ordinateur CONVEX ou de ses appareils périphériques.

Plusieurs des composants électroniques des ordinateurs CONVEX peuvent être endommagés par une décharge électrostatique (ESD). Lorsque plusieurs objets sont séparés ou frottés les uns contre les autres, cela provoque souvent de hauts niveaux d'électricité statique. Les facteurs suivants déterminent les niveaux d'électricité statique:

- la spécification de conductivité d'un matériel
- le niveau d'humidité
- la vitesse de séparation ou de changement

Le tableau B-1 donne une liste des niveaux d'électricité statique en fonction des activités du personnel et du niveau d'humidité:

Tableau H–1, Niveaux d'électricité statique et taux d'humidité correspondants

Activités du personnel	Humidité[1] & électricité statique (Volts)			
	26%	32%	40%	50%
Personne marchant sur un sol en linoléum	6 150 V	5 750 V	4 625 V	3 700 V
Personne marchant sur un tapis	18 450 V	17 250 V	13 875 V	11 100 V
Personne se levant d'une chaise en plastique	24 600 V	23 000 V	18 500 V	14 800 V

1 Un flux d'air à vitesse élevée produit plus d'électricité statique qu'un flux d'air à basse vitesse, pour un même taux d'humidité.
2 Certaines données de ce tableau ont été extrapolées.
3 Source: B.A. Unger: *Electrostatic Discharge Failures of Semiconductor Devices* (Laboratoires Bell, 1981).

Les composants électroniques des super-ordinateurs CONVEX et de leur équipement périphérique peuvent être endommagés par des décharges électrostatiques (ESD) pendant les opérations d'entretien. Le tableau B-2 donne une liste des différents composants électroniques et de leur niveau de risque de dommage dû aux décharges électrostatiques:

Tableau H–2, Composants susceptibles d'endommagement par l'électricité statique

Marges de tolérance des divers équipements exposés aux décharges électrostatiques (Modèle du corps humain)	
Type d'appareil	**Seuils de réaction aux décharges électrostatiques (Volts)**
MOSFET	>10
JFET	>140
CMOS	>250
Diodes Schottky, TTL	>300
Transistors bipolaires	>380
ECL (Pour usage hybride, niveau de la carte PC)	>500
SCR	>680

1 Source: B. A. Unger: *Electrostatic Discharge Failures of Semiconductor Devices* (Laboratoires Bell, 1981)

Toutes les cartes de circuits doivent être considérées comme étant sensibles à l'électricité statique. Les précautions suivantes doivent être prises pendant la manutention des cartes de circuits afin d'éviter d'endommager l'équipement:

- Porter un appareil agréé de mise à la terre des décharges électrostatiques et le raccorder à l'équipement soumis à l'entretien
- Conserver toutes les cartes de circuits inutilisées dans un conteneur conducteur de type agréé
- Retourner toutes les cartes de circuits à CONVEX Computer Corporation dans des conteneurs conducteurs approuvés

H.3.2 Stabilisation des armoires pendant l'entretien

ATTENTION

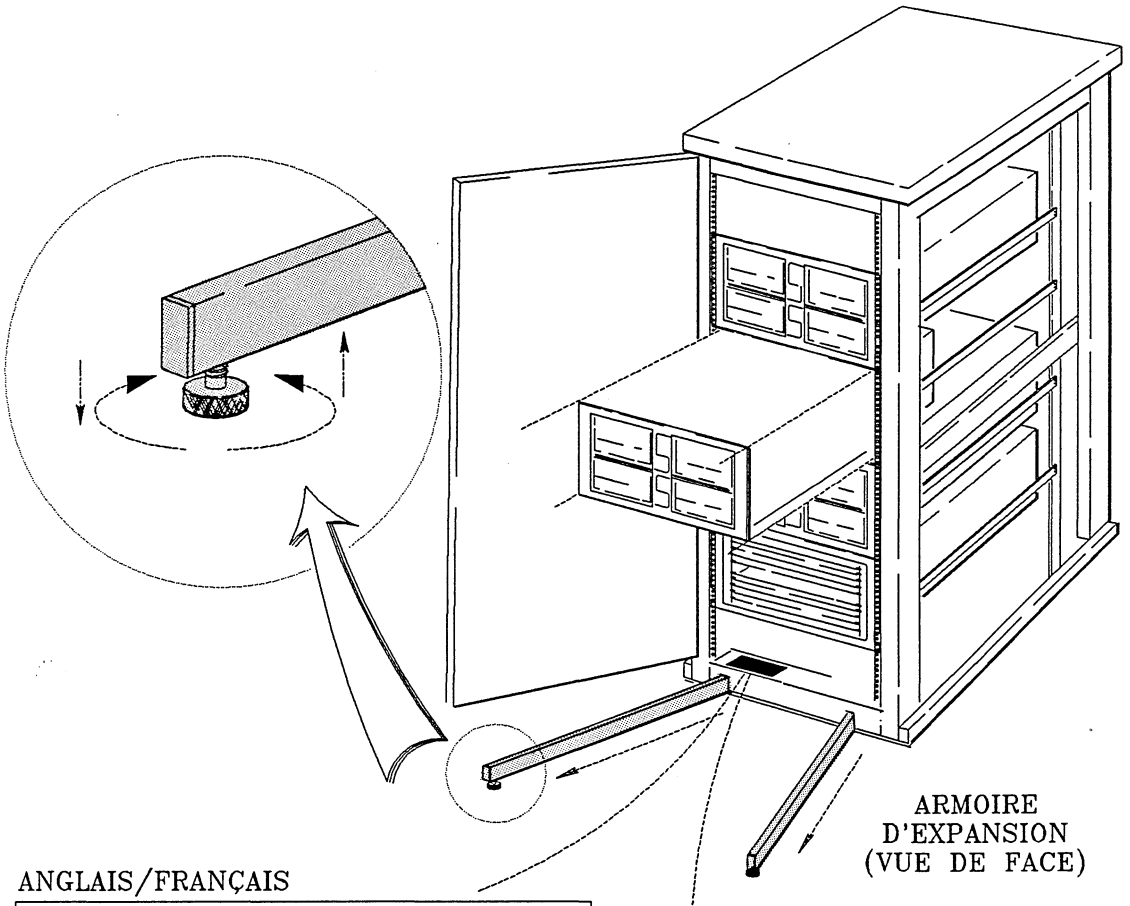
Les armoires d'expansion risquent de basculer lorsqu'on retire un appareil périphérique monté sur glissières pour en effectuer l'entretien.

Les armoires d'expansion CONVEX sont équipées de deux barres stabilisatrices empêchant les armoires de basculer lorsqu'on retire les appareils périphériques au moment de leur entretien. La Figure B-1 indique l'emplacement de l'étiquette d'avertissement ATTENTION concernant les barres stabilisatrices.

Pour empêcher les armoires d'expansion de basculer, observer les précautions suivantes:

- Ne jamais retirer plus d'un appareil périphérique à la fois;
- Lorsqu'une barre stabilisatrice est complètement déployée, ajuster le pied stabilisateur jusqu'à ce qu'il repose fermement sur le sol (voir Figure B-1);
- Lorsqu'un appareil périphérique n'est pas soumis à entretien il doit rester bien fixé dans l'armoire d'expansion au moyen de son mécanisme de blocage.

Figure H–1, Etiquette d'avertissement des barres stabilisatrices



ARMOIRE
D'EXPANSION
(VUE DE FACE)

ANGLAIS/FRANÇAIS

CAUTION	ATTENTION
TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED. 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT 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	POUR REDUIRE LE RISQUE D'ACCIDENT ATTRIBUABLE A L'INSTABILITE DE L'UNITE, DEPLOYER LES STABILISATEURS AVANT DE SORTIR LES PERIPHERIQUES. 1. POUR DEPLOYER LES STABILISATEURS, TIRER COMPLETEMENT LES BRAS ANTI-BASCULEMENT ET ABAISER LES PATTES DE FACON QU'ELLES REPOSENT SOLIDEMENT SUR LE SOL. 2. S'ASSURER QUE TOUS LES PERIPHERIQUES SON MUNIS DE VIS DE BLOCAGE. 3. NE JAMAIS SORTIR PLUS D'UN PERIPHERIQUE A UN MOMMENT DONNE.

ANGALAIS/ALLEMAND

CAUTION	ACHTUNG
TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED. 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT 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	ZUR VERMEIDUNG VON GEFAHRDUNG DURCH EIN INSTABILES GERAT SIND VOR DER HERAUSNAHME VON PERIPHERALS DER STABILISIERUNGSMECHANISMUS BETATIGT WERDEN. 1. UM DIE STABILISIERUNGSEINRICHTUNG ZU BETATIGEN, SIND DER "ANTITILT KANAL" GANZ HERAUS ZU ZIEHEN UND DER UNTERE STUTZFUSS AUF DEN BODEN ZU FUHREN. 2. OBERPRUFEN SIE, OB IN ALLEN ANDEREN VERSCHIEBBAREN GERATEN DER SICHERUNGSMECHANISMUS BETATIGT IST. 3. ZIEHEN SIE NIE MEHR ALS EIN GERAT HERAUS.

HF015020

H.3.3 Méthodes de déconnexion de la tension

ATTENTION

Débrancher le câble d'alimentation en courant alternatif de l'armoire ou ouvrir le disjoncteur du circuit installé par le client avant d'enlever ou de remettre en place les composant électroniques.

Noter l'avertissement sur l'étiquette du câble d'alimentation spécifiant le nombre de câbles d'alimentation à débrancher (entre parenthèses):

CETTE UNITE POSSEDE PLUS D'UN CABLE D'ALIMENTATION. POUR REDUIRE LE RISQUE DE CHOCS ELECTRIQUES, DEBRANCHER (X) CABLES D'ALIMENTATION AVANT DE PROCEDER A L'ENTRETIEN.

Pour localiser les disjoncteurs des armoires CONVEX, se reporter aux Figures B-9, B-10 et B-11 pour les armoires de processeurs C120, à la Figure B-12 pour les armoires de processeurs C210, C220 et, aux Figures B-13 et B-14 pour les armoires d'expansion.

Lorsqu'on tourne le bouton du disjoncteur de l'armoire sur la position ouverture (OFF), on coupe toute l'alimentation de l'équipement de l'armoire mais **non** celle du tableau de distribution en courant alternatif de l'armoire. Il faut ouvrir (OFF) les disjoncteurs installés par le client pour les dérivations ou débrancher le(s) câble(s) d'alimentation de l'armoire avant de déconnecter la tension.

Dans certaines configurations de systèmes CONVEX, les armoires d'expansion ont leurs propres disjoncteurs et câbles d'alimentation. Ces configurations sont identifiées par une étiquette d'avertissement **ATTENTION** fixée sur la porte arrière de chaque armoire. Se reporter à la Figure B-6 pour localiser l'étiquette d'avertissement **ATTENTION** du câble d'alimentation. Se reporter à la Figure B-12 pour localiser les disjoncteurs de l'armoire d'expansion.

H.4 Considérations relatives à la sécurité au cours de l'installation

Cette section présente les lignes directrices/sujets à prendre en considération au cours de l'installation d'un super-ordinateur CONVEX et de ses appareils périphériques.

H.4.1 Déménagement/déplacement de l'équipement

ATTENTION

Le basculement d'une armoire CONVEX risque de provoquer des accidents corporels ou d'endommager l'équipement.

Les armoires CONVEX n'ont pas un centre de gravité haut placé mais elles risquent de basculer si on ne les déplace pas avec soin. Pour éviter tout accident corporel ou tout dommage à l'équipement, il est nécessaire que deux personnes au moins aident à déplacer l'équipement.

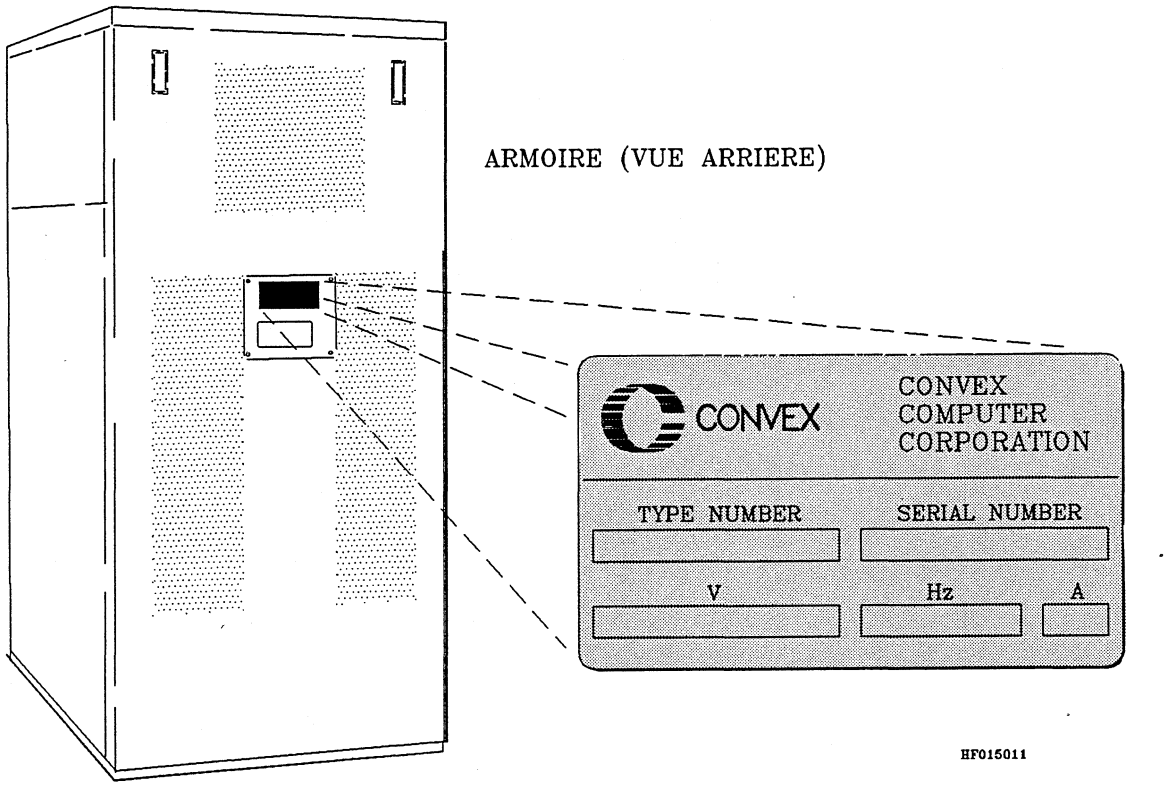
H.4.2 Veiller à ce que la tension d'alimentation corresponde aux spécifications correctes

ATTENTION

Des accidents corporels ou des dommages à l'équipement risquent de survenir si la tension d'alimentation en courant alternatif ne répond pas aux spécifications de l'étiquette située sur l'armoire CONVEX.

Chaque armoire CONVEX possède une étiquette fixée sur la porte arrière comprenant la liste des spécifications de la tension d'alimentation lui correspondant. La Figure B-2 illustre l'étiquette utilisée sur toutes les armoires CONVEX et son emplacement sur l'armoire. Les spécifications de la tension d'alimentation de tous les ordinateurs CONVEX et de leurs appareils périphériques sont indiquées à l'Annexe E.

Figure H–2, Emplacement de l'étiquette des spécifications de la tension d'alimentation de l'arm



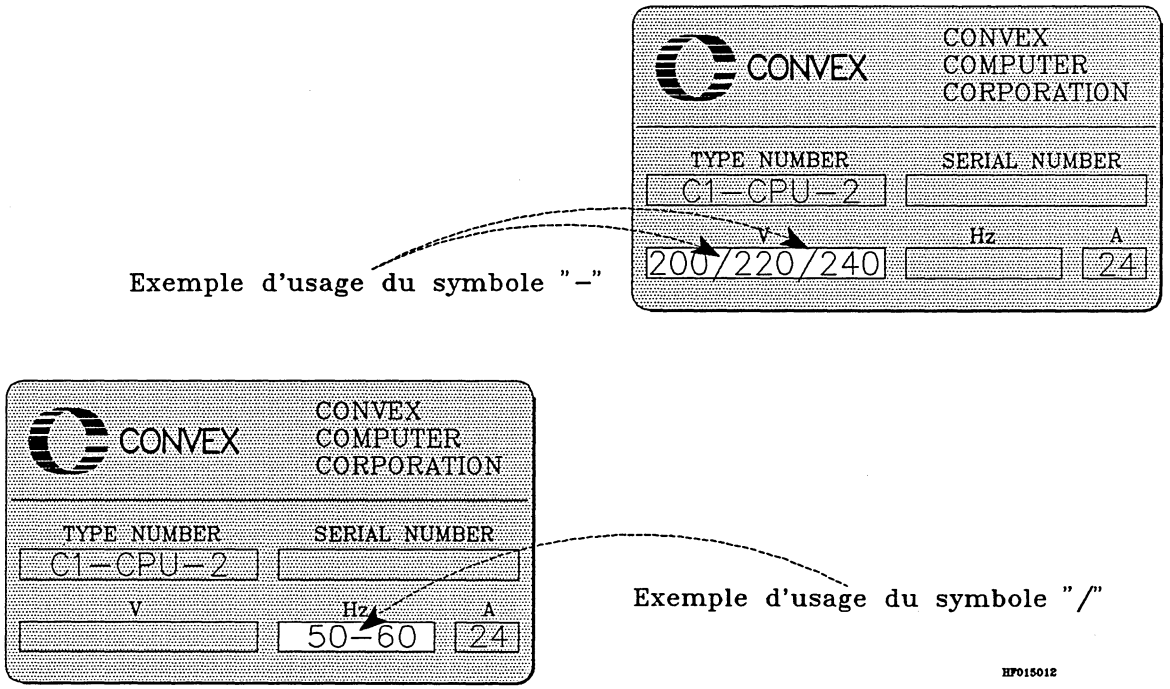
H.4.2.1 Description de l'étiquette des spécifications de la tension

Chaque étiquette relative à la tension fournit les spécifications de la tension d'alimentation correspondant à son armoire propre. Les symboles "-" et "/" sur ces étiquettes désignent, soit une valeur spécifique, soit un intervalle donné de la tension de service pour l'équipement:

- Le symbole "-" implique que l'équipement fonctionne correctement dans l'intervalle des valeurs indiquées. Voir l'exemple de la Figure B-3.
- Le symbole "/" implique qu'un voltage spécifique ou une fréquence particulière sont exigés et que des réglages internes doivent être effectués uniquement par du personnel autorisé. Voir l'exemple de la Figure B-3.

Lorsque les symboles "/" sont utilisés, le voltage ou la fréquence spécifiques sont également indiqués sur l'étiquette d'avertissement ATTENTION du câble d'alimentation de l'armoire. L'étiquette d'avertissement **ATTENTION** du câble d'alimentation est fixée à côté de l'étiquette relative à la tension. La Figure B-6 illustre l'étiquette d'avertissement **ATTENTION** du câble d'alimentation.

Figure H–3, Etiquettes concernant la tension de l'armoire avec les symboles "-" et "/"



H.4.2.2 Liste de contrôle pour inspection des spécifications relatives à la tension d'alimentation

Les renseignements suivants concernant la tension d'alimentation du site de l'installation doivent être vérifiés avant de brancher l'armoire sur le courant alternatif d'alimentation:

- L'intervalle toléré de la tension du courant alternatif du site de l'installation et celui qui est exigé pour l'armoire sont les mêmes;
- Les phases de l'alimentation en courant alternatif du site de l'installation s'accordent avec la configuration de la tension d'alimentation de l'armoire;
- L'intervalle de fréquences toléré pour l'alimentation en courant alternatif du site de l'installation correspond à l'intervalle de fréquences de l'armoire;
- Les disjoncteurs du site de l'installation sont adéquats pour les spécifications relatives aux charges des courants de l'armoire.

H.4.2.3 Etiquettes d'avertissement du câble d'alimentation

Les armoires CONVEX fabriquées pour l'Amérique du Nord sont équipées de câbles d'alimentation et de connecteurs et sont prêtes à être installées.

REMARQUE

L'équipement CONVEX expédié à l'étranger n'est pas muni d'un connecteur d'alimentation. Se reporter au Manuel de Préparation du Site pour Equipement CONVEX C130, C210, C220 pour obtenir la liste des connecteurs d'alimentation correspondant aux installations nationales et internationales.

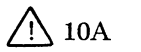
Dans certaines configurations de systèmes d'ordinateurs CONVEX, il est possible que plusieurs armoires aient leur propre câble de tension d'alimentation. Cependant, il existe au maximum un seul câble de branchement externe par armoire. Une étiquette d'avertissement **ATTENTION** est fixée sur la porte arrière de toutes les armoires pour indiquer qu'il existe une multiplicité d'armoires avec câbles d'alimentation. La Figure B-6 illustre les deux types d'étiquettes d'avertissement **ATTENTION** pour câbles d'alimentation et leur emplacement.

ATTENTION

Les quatre prises IEC sur le tableau de branchements du modèle C120 XE ont une puissance combinée de **10** ampères. L'inobservation des consignes imprimées sur l'ETIQUETTE ATTENTION du tableau de branchements du modèle XE peut entraîner un risque d'accident corporel ou de dommages à l'équipement.

La Figure B-4 illustre un exemple d'étiquette d'avertissement pour le tableau de branchements du modèle XE.

Figure H–4, Etiquette d'avertissement du tableau de branchements du modèle XE



CAUTION:
NOT FOR EXTERNAL USE

ATTENTION:
NE PAS UTILISER A
L'EXTERIEUR DE L'EQUIPMENT

ATTENTION

Les prises internes NEMA sur tous les tableaux de contrôle d'alimentation des armoires CONVEX (autres que le modèle XE) ont comme spécification **12** ampères par prise. Les prises internes IEC ont pour spécification 6 ampères par prise. Il faut s'attendre à endommager l'équipement si ces spécifications sont dépassées.

Le branchement d'équipement externe aux prises de service dans les armoires CONVEX annule toutes les garanties de tous les organismes.

La Figure B-5 illustre un exemple d'étiquette d'avertissement pour le tableau de contrôle d'une armoire CONVEX (à l'exception du modèle XE).

Figure H–5, Etiquette d'avertissement pour un tableau de branchements

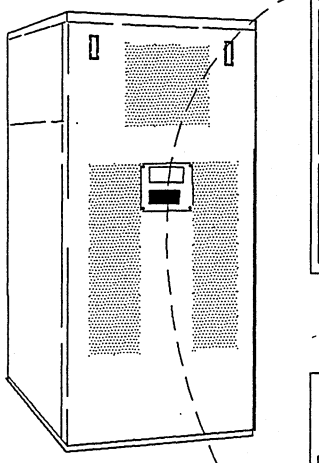
CAUTION:
NOT FOR EXTERNAL USE

ATTENTION:
NE PAS UTILISER A
L'EXTERIEUR DE L'EQUIPMENT

H.4.2.4 Etiquettes pour la tension du câble d'alimentation

Chaque câble d'alimentation a une étiquette avec un code couleur qui correspond à la configuration de la tension de son armoire propre. La Figure B-7 illustre les étiquettes de câbles d'alimentation pour une armoire de processeur CONVEX. La Figure B-8 illustre l'étiquette du câble d'alimentation d'une armoire d'expansion CONVEX.

Figure H–6, Etiquette d'avertissement de câble d'alimentation



ARMOIRE
(VUE ARRIERE)

HF015014

ANGLAIS/FRANÇAIS

CAUTION ATTENTION

THIS ITEM IS CONNECTED
CETTE UNITE EST CONNECTEE

FOR POUR _____ VOLTS ~

AND ET _____ Hz

USING EN UTILISANT _____ WIRES AND ⏚
FILS ET ⏚

DATE _____

HIGH LEAKAGE CURRENT. GROUND (EARTH) CONNECTION ESSENTIAL BEFORE CONNECTING THE SUPPLY.

FORTS COURANTS DE PERTES. CONNECTION A UNE BORNE DE TERRE EST ESSENTIELLE AVANT TOUT RACCORD ELECTRIQUE.

LUI

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING THE SUPPLY. FOR CHANGE OF INTERNAL CONNECTION OR OPERATING VOLTAGE, REFER TO AUTHORIZED SERVICE REPRESENTATIVE AND CORRECT THE MARKING ABOVE.

VEUILLEZ CONSULTER LES INSTRUCTIONS D'INSTALLATION AVANT TOUTE CONNEXION AU RESEAU ELECTRIQUE. POUR MODIFIER LINE CONNEXION INTERNE OU LA TENSION D'UTILISATION S'ADRESSER AU REPRESENTANT AUTORISE DU SERVICE ET CORRIGER LES INDICATIONS CI–DESSUS.

THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. TO REDUCE THE RISK OF SHOCK DISCONNECT ( ) POWER SUPPLY CORDS BEFORE SERVICING.
CETTE UNITE A PLUS D'UN CABLE D'ALIMENTATION. AFIN DE REDUIRE LE RISQUE DE CHOQUE ELECTRIQUE DECONNECTER TOUT ( ) CABLE D'ALIMENTATION AVANT MAINTENANCE.

ANGLAIS/ALLEMAND

CAUTION ACHTUNG

THIS ITEM IS CONNECTED
DIESE MASCHINE IST GESCHALTET

FOR FUR _____ VOLTS ~

AND UND _____ Hz

USING FUR _____ WIRES AND ⏚
LEITUNGEN UND ⏚

DATE DATUM _____

HIGH LEAKAGE CURRENT. GROUND (EARTH) CONNECTION ESSENTIAL BEFORE CONNECTING THE SUPPLY.

HOHER ABLEITSTROM VOR INBETRIEBNAHME SCHUTZLEITER–VERBINDUNG HERSTELLEN.

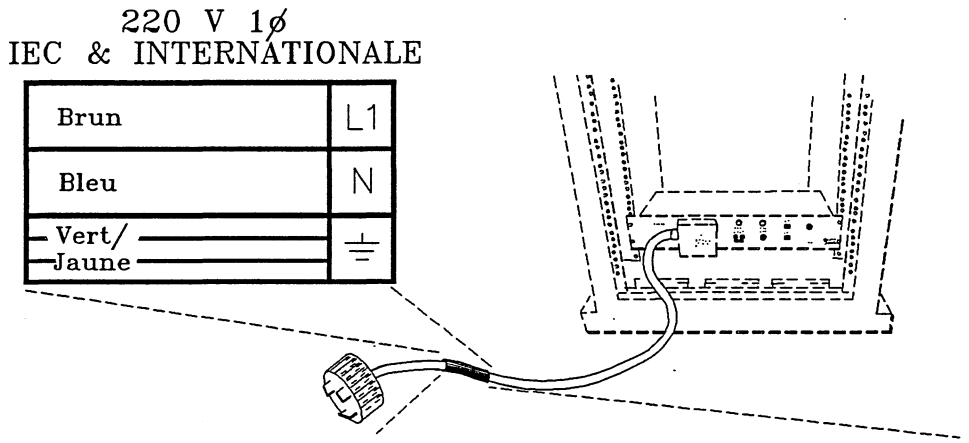
LUI

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING THE SUPPLY. FOR CHANGE OF INTERNAL CONNECTION OR OPERATING VOLTAGE, REFER TO AUTHORIZED SERVICE REPRESENTATIVE AND CORRECT THE MARKING ABOVE.

VOR ANSCHLUSS AN DAS NETZ AUFSTELLANEITUNG BEACHTEN. BEI ANDERUNG VON SCHALTUNG ODER SPANNUNG AUTORISIERTES WARTUNGSPERSONAL BEAUFTRAGEN UND OBIGE ANGABEN BERICHTIGEN.

THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. TO REDUCE THE RISK OF SHOCK DISCONNECT ( ) POWER SUPPLY CORDS BEFORE SERVICING.
DIESES GERAT BESITZT MEHRERE GERATEANSCHLUSSLEITUNGEN. ZUR VERMEIDUNG EINES ELEKTRISCHEN SCHLAGES SING VOR WARTUNGSARBEITEN ALLE ( ) ANSCHLUSSLEITUNG VOM NETZ ZU TRENNEN.

Figure H–7, Etiquettes de câbles d'alimentation pour armoires de processeur



C1, C120

120 V 1ø
UL/CSA

Noir	L1
Rouge	L2
Orange	L3
Blanc	N
Vert	⏚

Noir	L1
Brun	L2
Noir	L3
Bleu	N
Vert/ Jaune	⏚

220 V 1ø
IEC & INTERNATIONALE

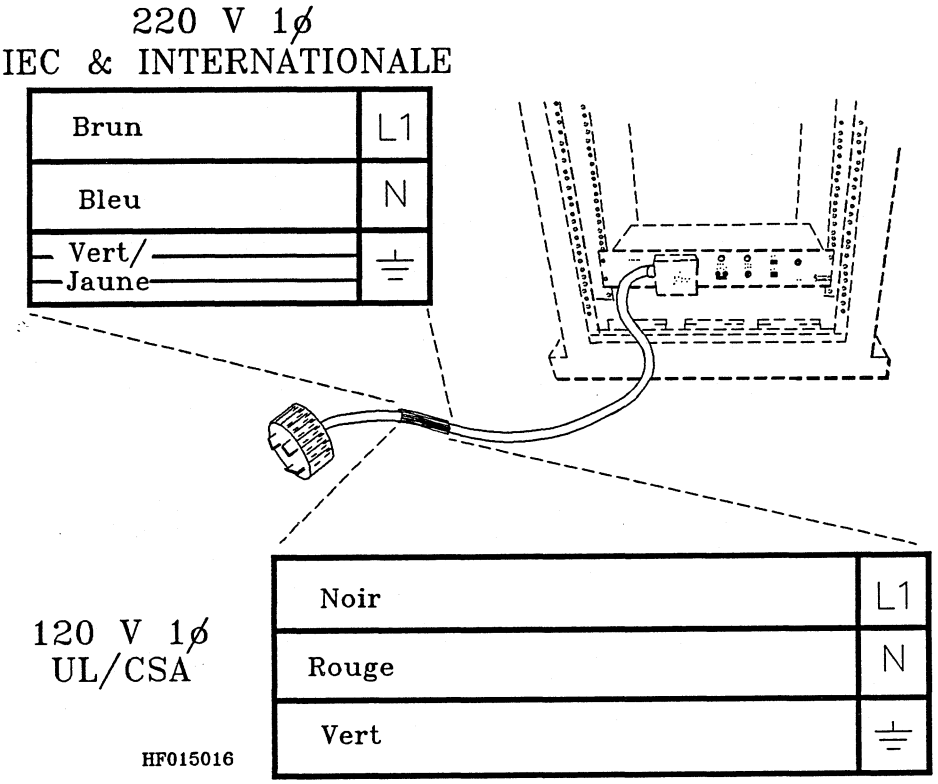
C210,
C220

120 V 1ø
UL/CSA

Rouge	L1
Orange	L2
Noir	L3
Vert	⏚

HF015015

Figure H–8, Etiquettes de câbles d'alimentation pour armoires d'expansion



H.4.3 Modification du câblage d'alimentation de l'armoire

ATTENTION

POUR MODIFIER LES RACCORDEMENTS INTERNES OU LA TENSION DE SERVICE, SE REFERER AU REPRESENTANT AGREE POUR EFFECTUER L'ENTRETIEN.

L'équipement risque d'être endommagé si le câblage d'alimentation de l'armoire n'est pas convenablement effectué. Les changements dans le câblage doivent être effectués uniquement par le personnel autorisé.

Il se peut qu'il soit nécessaire de modifier la configuration de la puissance d'alimentation d'une armoire pour balancer les effets de spécifications de tension nouvellement exigées. Il faut utiliser la documentation technique appropriée lorsqu'on change la configuration de l'alimentation en courant alternatif d'une armoire. Les modifications du câblage doivent être effectuées uniquement

par le personnel autorisé par CONVEX.

H.4.4 Raccordement au courant alternatif

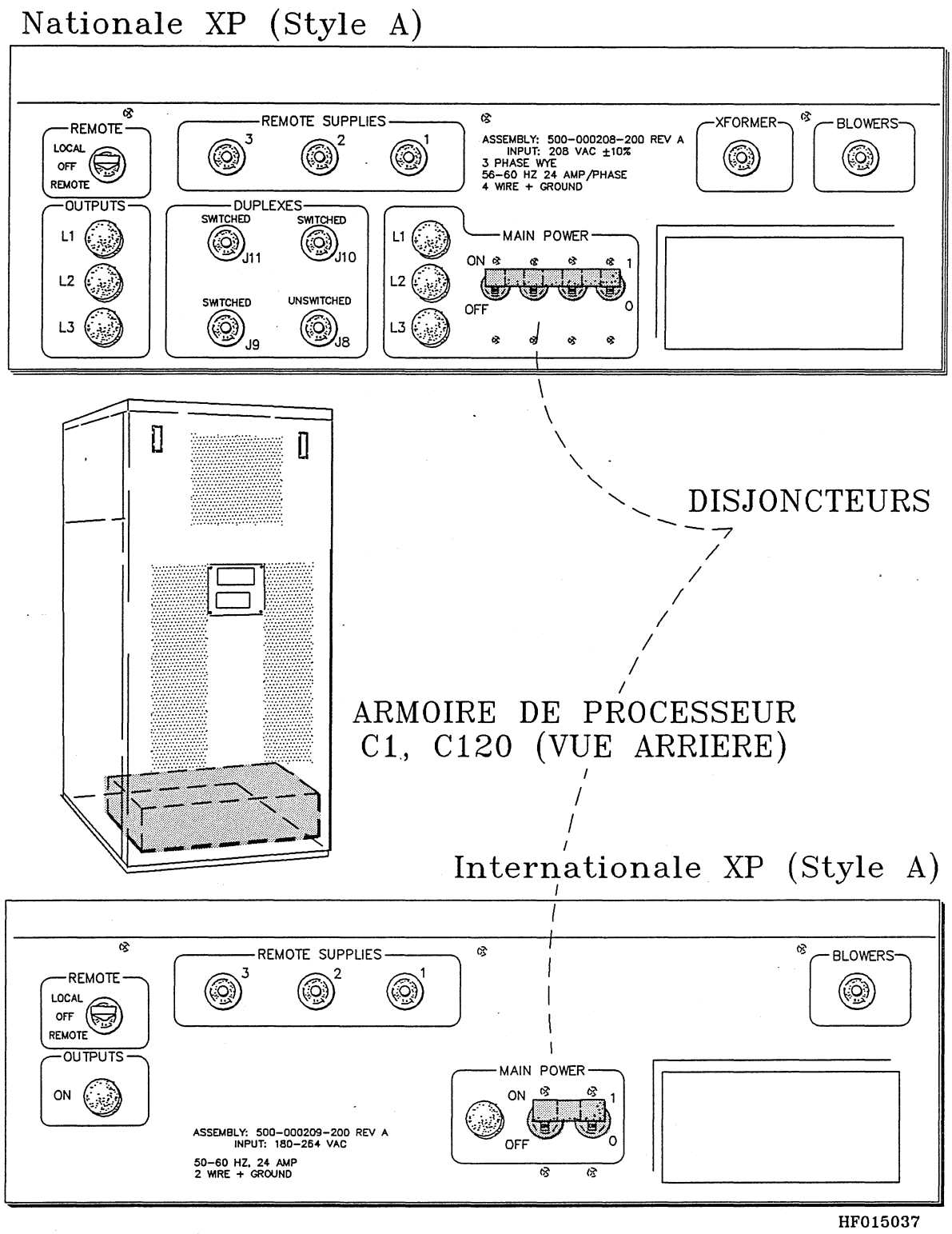
ATTENTION

Des accidents corporels risquent de se produire si tous les disjoncteurs du circuit d'alimentation en courant alternatif ne sont pas ouverts (OFF) avant le branchement d'un câble d'alimentation au réseau de courant alternatif de l'établissement.

H.4.4.1 Emplacement du disjoncteur principal

Les Figures B-9 à B-14 indiquent l'emplacement des disjoncteurs principaux pour les armoires de processeur et d'expansion CONVEX:

Figure H–9, Emplacement du disjoncteur de l'armoire C120



HF015037

Figure H–10, Emplacement du disjoncteur de l'armoire C120

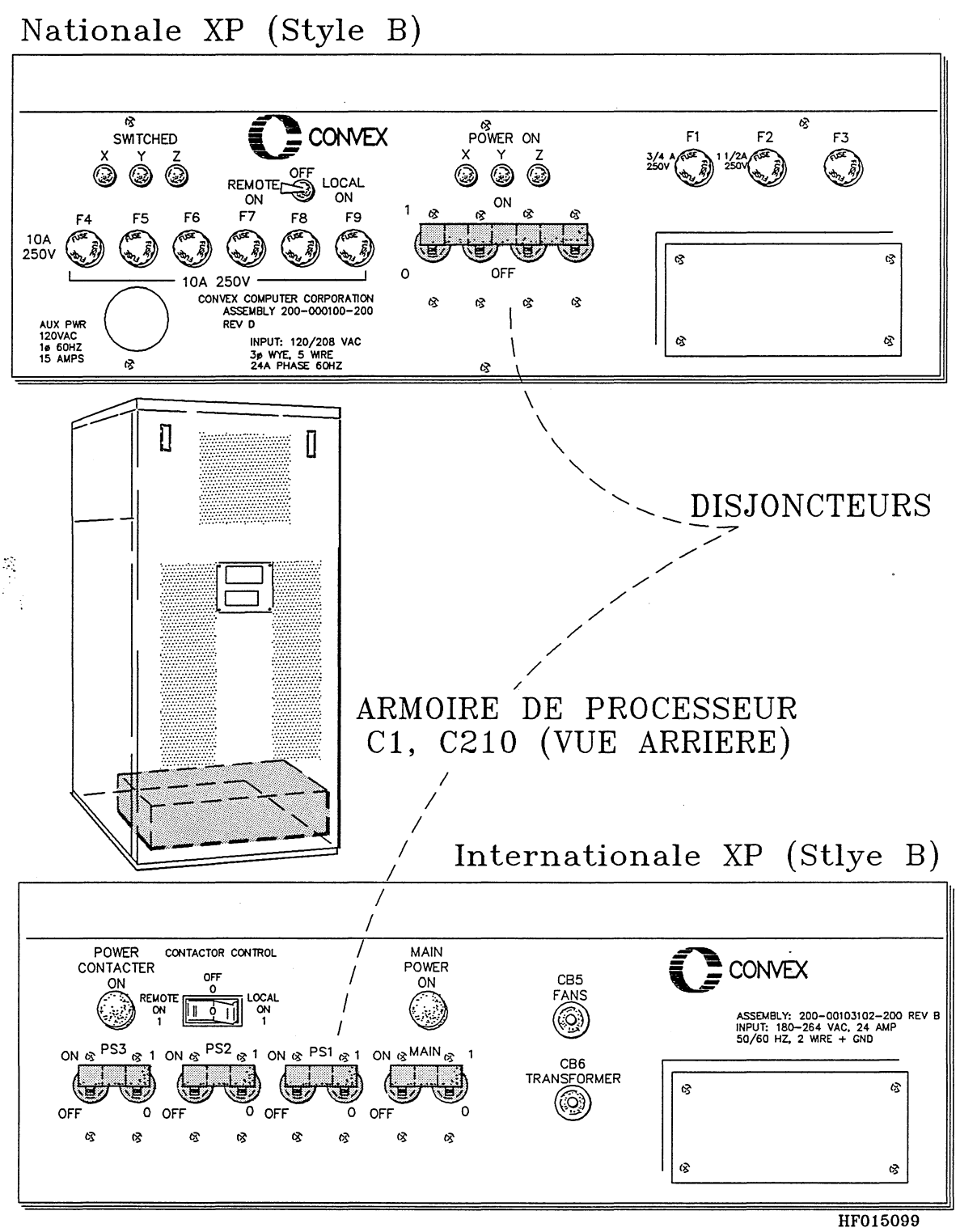


Figure H–11, Emplacement du disjoncteur de l'armoire XE

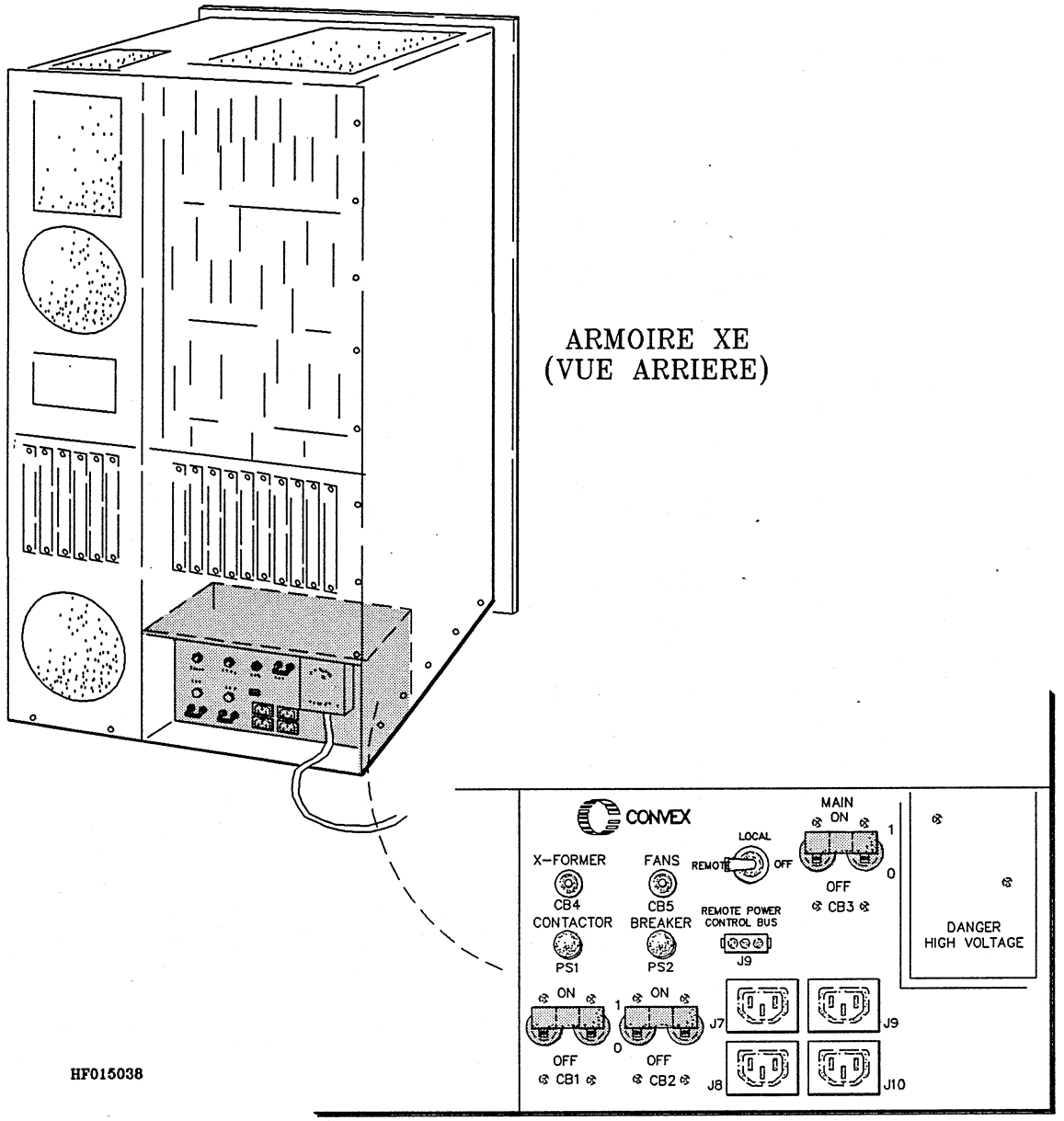


Figure H–12, Emplacement du disjoncteur de l'armoire C210, C220

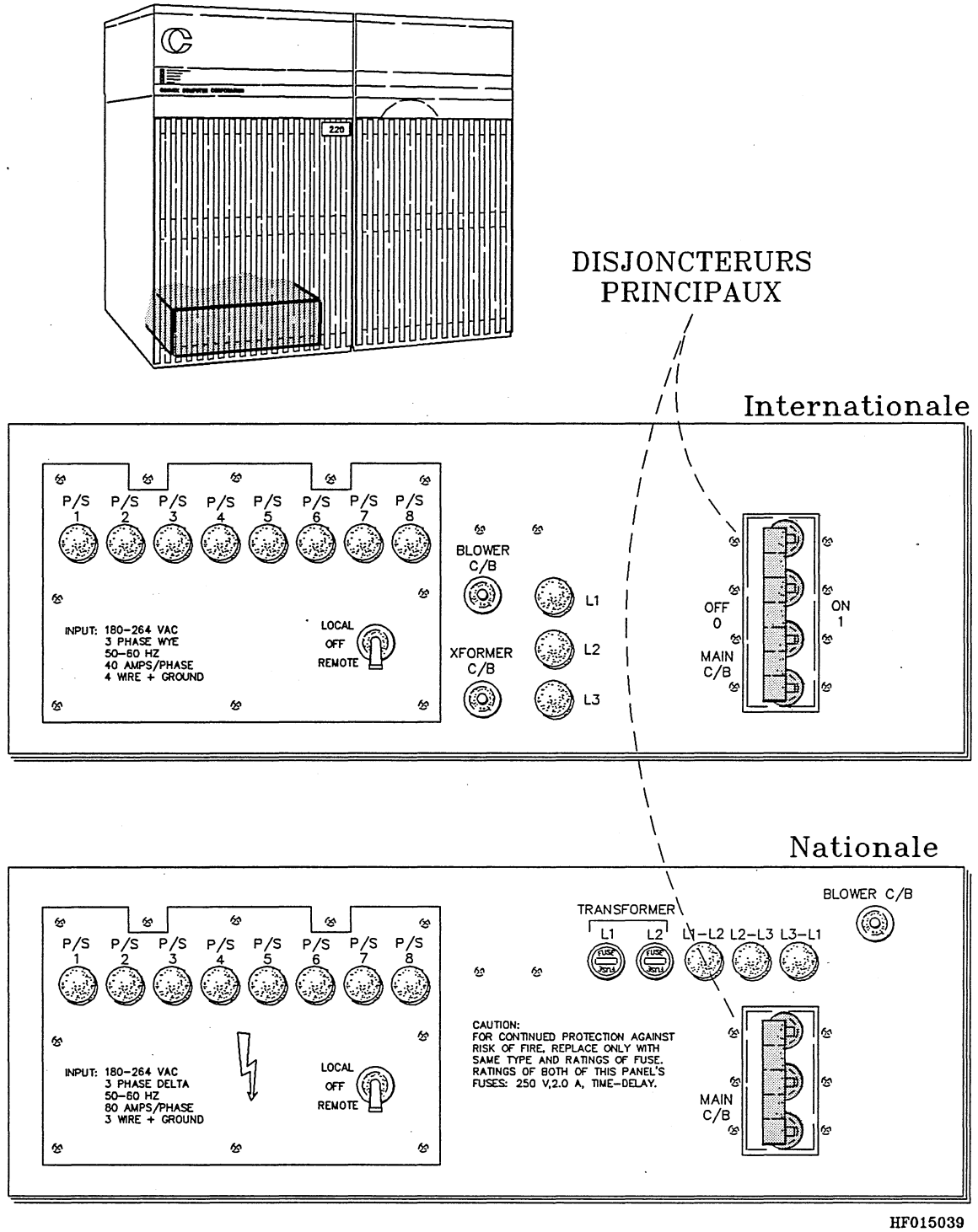


Figure H–13, Emplacement du disjoncteur de l'armoire d'expansion

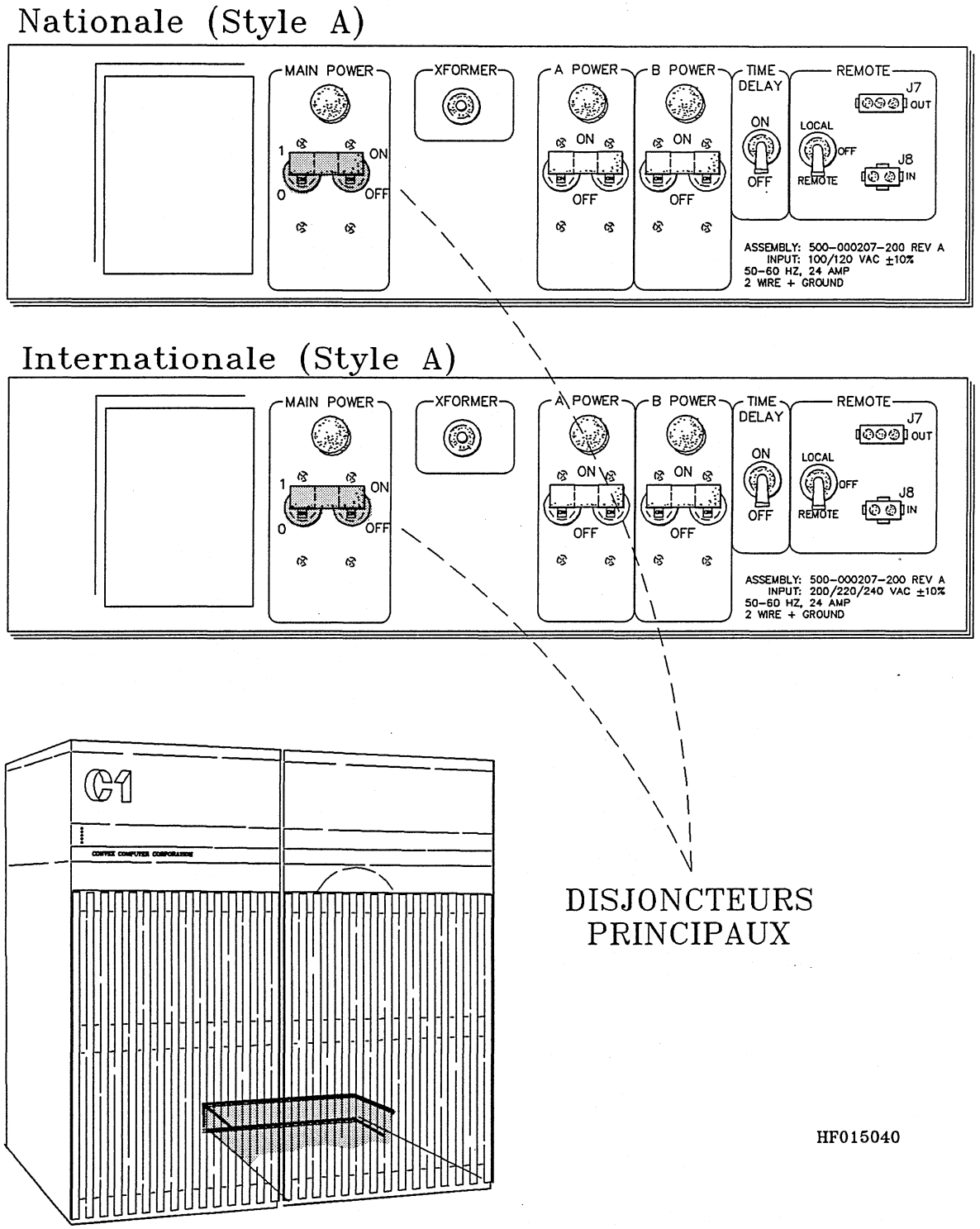
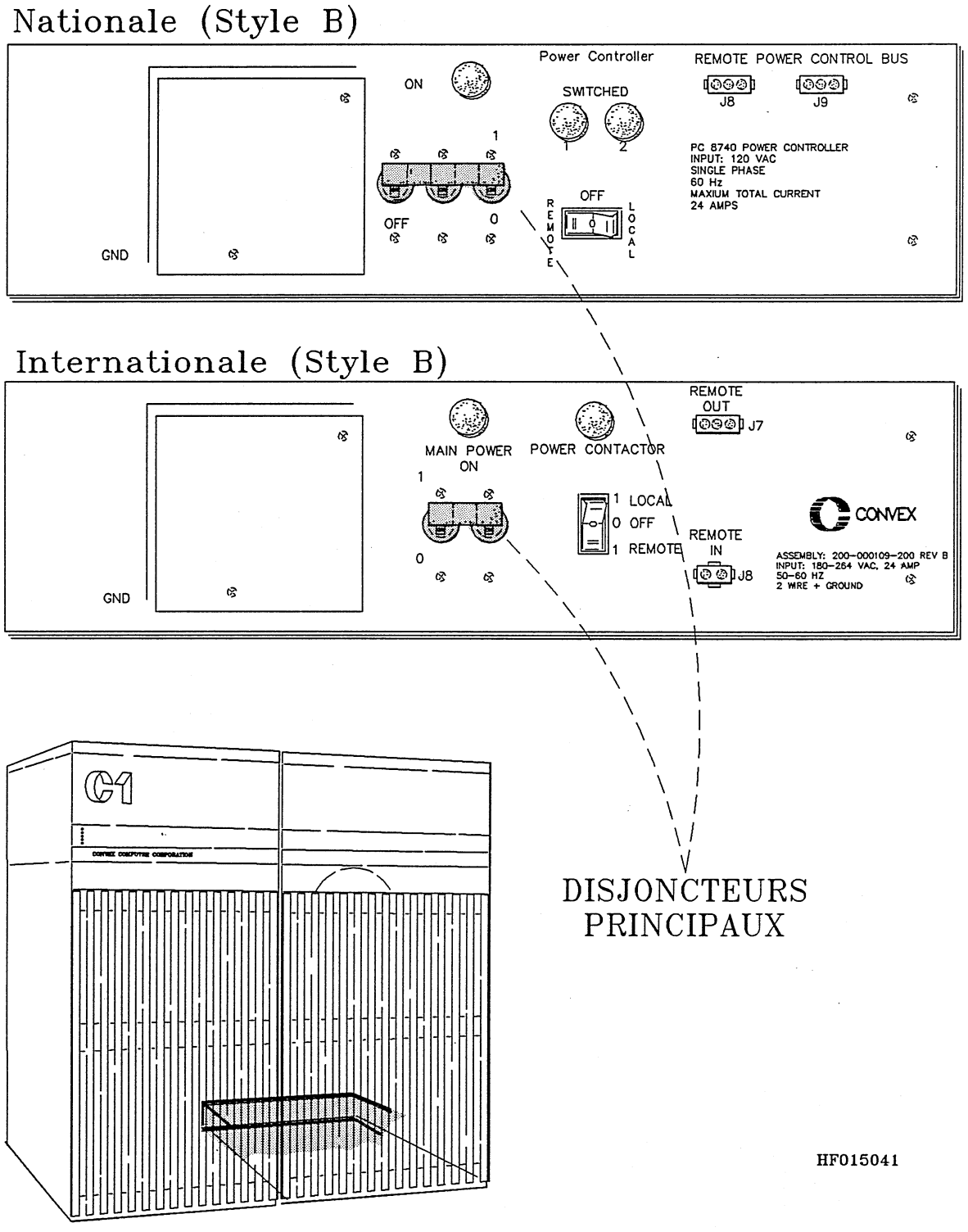


Figure H–14, Emplacement du disjoncteur de l'armoire d'expansion



H.4.5 Propos relatifs à la climatisation et à la ventilation

Les systèmes de climatisation des salles d'ordinateurs devraient être conçus pour assurer l'efficacité optimale de la climatisation. La capacité, la vitesse des flux d'air et le taux de dissipation de la chaleur sont les facteurs principaux à prendre en compte pour calculer les spécifications exigées pour la climatisation des salles d'ordinateurs. La chaleur dégagée par la lumière et le personnel de la salle d'ordinateurs doit aussi être prise en compte dans les calculs. Par exemple, une personne accomplissant un travail léger dégage environ 450 BTU par heure.

Les chiffres relatifs à la dissipation de puissance de l'équipement CONVEX sont indiqués dans les tableaux de spécifications de l'Annexe E. La température et l'humidité de fonctionnement recommandées s'appliquent à l'équipement CONVEX installé à une altitude inférieure à 3280 ft (1000 m). Aux altitudes supérieures à 3280 ft (1000 m) la densité inférieure de l'air affecte l'air conditionné. Si un établissememt est situé à cette altitude, abaisser les gammes de température recommandées dans l'Annexe E d'un degré Farenheit par 1000 ft ou de deux degrés Celsius par 1000 m.

H.4.5.1 Niveau d'humidité

Des niveaux d'humidité élevés risquent d'entraîner des effets de galvanisation entre certains métaux dissemblables. Ces effets peuvent éventuellement créer une grande résistance entre les connexions et provoquer des pannes d'équipement. Des niveaux d'humidité élevés peuvent également détériorer certaines bandes magnétiques et des supports en papier.

Des niveaux d'humidité faibles permettent l'existence de niveaux de charges statiques élevés et risquent d'endommager les composants au cours d'une décharge e(aa'lectrostatique. Les problèmes d'alimentation en papier, surtout avec les imprimantes grande vitesse, se manifestent souvent dans les atmosphères à humidité faible. Les niveaux d'humidité recommandés pour l'équipement CONVEX sont définis à l'Annexe E.

H.4.5.2 Conduits d'air conditionné

L'emplacement des conduits est généralement déterminé par la quantité d'espace disponible. Cependant, si l'on installe un faux plancher, il faut considérer l'espace qui se trouve en-dessous comme un vide. Des évents placés aux endroits appropriés assurent une ventilation efficace pour les armoires de processeur et d'expansion CONVEX. Les prises d'air sur les armoires CONVEX se situent près de la base, à l'avant des armoires. Les bouches de refoulement se trouvent à l'arrière ou vers le haut des armoires.

Il peut s'avérer difficile de contrôler les niveaux de climatisation et de pression si le réseau des conduits de la salle d'ordinateurs est séparé du reste du bâtiment. Les conduits ne doivent pas être exposés à l'air chaud, car cela risquerait d'augmenter les niveaux d'humidité.

L'isolation des conduits joue un rôle vital dans l'équilibre du système d'air conditionné et de la haute pression d'air statique dans la salle d'ordinateurs. La capacité de refroidissement risque de se trouver inefficace si la direction et la vitesse des flux d'air ne peuvent être contrôlées en raison du manque d'isolation des conduits.

H.4.5.3 Contrôle de la poussière et de la pollution

Les disques, les lecteurs de bandes et un certain nombre d'autres appareils mécaniques exigent un environnement sans poussière pour fonctionner sans problèmes. Les lecteurs de bandes et de disques CONVEX sont protégés de la poussière par des filtres à air mécaniques conçus pour arrêter les grosses particules. Les particules plus petites risquent cependant de passer à travers ces filtres et de créer des problèmes dans les parties mécaniques de l'équipement au bout d'un certain temps. On peut éviter l'entrée des petites particules de poussière dans la salle d'ordinateurs en maintenant le système d'air conditionné de la salle d'ordinateurs à un niveau de haute pression statique de l'air.

La salle d'ordinateurs doit être maintenue dans un grand état de propreté. Il est recommandé d'adopter les consignes suivantes:

- **Interdiction de fumer.** Les particules de fumée de cigarette sont huit fois plus grandes que le jeu existant entre la tête d'un lecteur de disque et la surface du disque. Les particules de fumée encrassent aussi les filtres à air plus rapidement.
- **Interdiction de boire ou de manger.** Les déversements de liquides peuvent provoquer des court-circuits dans l'équipement, par exemple dans les claviers.
- **Nettoyage des tapis et moquettes.** Utiliser un aspirateur très hermétiquement isolé.
- **Nettoyage des carrelages.** Un balai-éponge recouvert d'un chiffon absorbant la poussière est préférable à un balai sec.

Des précautions spéciales sont requises si le bâtiment abritant les ordinateurs se trouve près d'une source de pollution. Certains polluants de l'air, particulièrement le sulfure d'hydrogène, peuvent corroder le câblage et l'équipement électronique délicat. L'usage de filtres au carbone actif réduit cette forme de pollution de l'air.

H.5 Lutte et contrôle de l'incendie

Les directeurs de gestion de systèmes et les opérateurs d'ordinateurs devraient considérer le contrôle et la lutte contre l'incendie comme un sujet à placer en tête de liste de leurs priorités. CONVEX recommande fortement l'observation de toutes les réglementations nationales et locales en vigueur et toutes les méthodes de lutte contre l'incendie applicables aux équipements d'ordinateurs.

CONVEX souligne aussi l'importance de se conformer aux normes suivantes de l'Association Nationale de Protection contre l'Incendie (NFPA):

- NFPA 75—Norme pour la protection des équipements d'ordinateurs/traitement de données électroniques
- NFPA 12A—Norme relative aux systèmes d'extinction au Halon 1301
- NFPA 12B—Norme relative aux systèmes d'extinction au Halon 1211

Les directeurs de gestion de systèmes, les opérateurs d'ordinateurs et tout le personnel de la salle d'ordinateurs doivent se familiariser avec l'équipement et les méthodes de lutte contre l'incendie propres à la salle d'ordinateurs pour en connaître la manipulation et l'usage approprié.

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Anhang I
Sicherheitsvorkehrungen

I.1 Übersicht

In diesem Anhang werden diverse Sicherheitsmaßnahmen für CONVEX Supercomputer und dazugehörige Peripheriegeräte beschrieben. Die hier dargelegten Vorkehrungen sollten aber keinesfalls als vollständig betrachtet werden, denn es ist unmöglich, alle Situationen vorauszusagen, die gefährlich sind oder Gefahren zur Folge haben können.

Dieser Anhang besteht aus vier Abschnitten:

- "Vorkehrungen für den Notfall" ist eine Liste empfohlener Vorkehrungen für den Notfall
- "Sicherheitsvorkehrungen während der Wartung" befaßt sich mit Sicherheitsmaßnahmen, die bei der Wartung von CONVEX Hardware zu treffen sind. Dabei werden folgende Themen behandelt:
  - Vorkehrungen gegen Entladung statischer Elektrizität (ESD)
  - Abstützen der Schränke
  - Maßnahmen zum Ausschalten der Stromversorgung
- "Sicherheitsvorkehrungen während der Installierung" behandelt die Sicherheitmaßnahmen, die u.a. bei folgenden Installierungs- bzw. Montage-Situationen von CONVEX Hardware zu treffen sind:
  - Verlegen von Anlagen, Umzüge
  - Bestimmung der richtigen Stromversorgung
  - Neuverkabelung der Schränke
  - Anschluß an das Wechselstromnetz
  - Kühlung und Ventilation
- Unter "Feuerbekämpfung" finden Sie Anweisungen, wie und mit welchen Mitteln man sich auf Feuerbekämpfung vorbereiten sollte.

I.2 Vorkehrungen für den Notfall

Die Manager eines Computer-Systems sollten sofort nach Einbau des Systems umfassende Vorkehrungen für den Notfall treffen. Diese Vorkehrungen sollten den Anwendern des Systems ausführlich dargelegt werden und, soweit möglich, regelmäßig mit ihnen geprobt werden. Folgende Mindestvorkehrungen sollten getroffen werden:

- An jedem installierten Gerät sollte sich eine Liste aller Organisationen und Instanzen befinden, die im Falle eines Versagens bzw. einer Notsituation zu informieren sind.
- Legen Sie fest, welche Maßnahmen im Notfall zu treffen sind, und sorgen Sie dafür, daß sie allen Mitarbeitern bekannt sind. Verhaltensrichtlinien für Situationen wie Feuer, Stromausfall, Blitzschlag, Ausfall der Klimaanlage und Verletzung von

Sicherheitsvorschriften sind dabei unerläßlich.

- Lesen Sie bitte die in Anhang F beschriebenen Melderichtlinien, die Ihnen vermitteln werden, worauf beim Melden einer Störung zu achten ist.
- Halten Sie alle hardware- bzw. softwarebezogenen Änderungen u. Probleme in einem Protokoll fest. Folgende Angaben sind dabei unerläßlich: Name des Gerätes, Beschreibung der Störung, Beschreibung der Korrekturmaßnahmen und Diagnose. Vergessen Sie bitte nie die jeweiligen Revisions- und Seriennummern.

I.3 Sicherheitsvorkehrungen während der Wartung

Dieser Abschnitt befaßt sich mit Sicherheitsmaßnahmen, die bei der Wartung eines CONVEX Supercomputers oder seiner Peripheriegeräte zu treffen sind.

I.3.1 Vorkehrungen gegen Entladung statischer Elektrizität (ESD)

VORSICHT

Entladung statischer Elektrizität könnte elektronische Komponenten in CONVEX Computern oder deren Peripheriegeräte beschädigen.

Die Mehrzahl der in CONVEX Computern verwendeten elektronischen Komponenten können durch Entladung statischer Elektrizität (ESD) beschädigt werden. Hohe statische Elektrizität entsteht oft durch die Trennung bzw. das Aneinanderreiben bestimmter Objekte. Die Stärke der statischen Ladung wird von folgenden Faktoren bestimmt:

- Leitfähigkeit des Materials
- Luftfeuchtigkeit
- Geschwindigkeit der Trennung oder Veränderung

Tabelle B-1 zeigt, welche Ladungen aus verschiedenen Tätigkeiten unter bestimmten Luftfeuchtigkeitsbedingungen resultieren:

Tabelle I–1, Statische Elektrizität und relative Luftfeuchtigkeit

Tätigkeit	Luftfeuchtigkeit[1] & Ladung (Volt)			
	26%	32%	40%	50%
Gehen auf Linoleumbelag	6.150V	5.750V	4.625V	3.700V
Gehen auf Teppichboden	18.450V	17.250V	13.875V	11.100V
Aufstehen aus Kunststoff-Stuhl	24.600V	23.000V	18.500V	14.800V

[1] Bei gleicher Luftfeuchtigkeit verursacht höhere Geschwindigkeit der Luftbewegung höhere Ladung als niedrige Geschwindigkeit.
[2] Manche Daten der Tabelle sind durch Extrapolation errechnet.
[3] Quelle: B.A. Unger: *Electrostatic Discharge Failures of Semiconductor Devices* (Bell Laboratories, 1981)

Die in CONVEX Computern und deren Peripheriegeräten verwendeten elektronischen Komponenten können auch bei der Wartung durch Entladung statischer Elektrizität (ESD) beschädigt werden. Tabelle B-2 verdeutlicht die Suszeptibilität verschiedener elektronischer Komponenten bei statischer Elektrizität:

Tabelle I–2, Komponentensuszeptibilität bei statischer Elektrizität

Suszeptibilitätsbereiche diverser Geräte bei Entladung statischer Elektrizität (Human Body Model)	
Gerätetyp	**ESD-Suszeptibilität (Volt)**
MOSFET	> 10
JFET	> 140
CMOS	> 250
Schottky-Dioden, TTL	> 300
Zweipolige Transistoren	> 380
ECL (Hybridverwendung auf Plattenebene)	> 500
SCR	> 680

[1] Quelle: B.A. Unger: *Electrostatic Discharge Failures of Semiconductor Devices* (Bell Laboratories, 1981)

Ungeachtet der hier angegebenen Werte, sollten jegliche Schaltplatten als höchst empfindlich gegen statische Elektrizität betrachtet werden. Deshalb gelten zur Vermeidung von Schäden beim Handhaben von Schaltplatinen folgende Vorsichtsmaßregeln:

- Immer eine zugelassene ESD-Erdungsvorrichtung tragen und während der Wartung an das jeweilige Gerät anschließen.
- Alle nicht verwendeten Schaltplatten in zugelassenen, leitungsfähigen Behältern aufbewahren.
- Alle Schaltplatten in zugelassenen, leitungsfähigen Behältern an die CONVEX Computer Corporation zurücksenden.

I.3.2 Abstützen der Schränke während der Wartung

VORSICHT

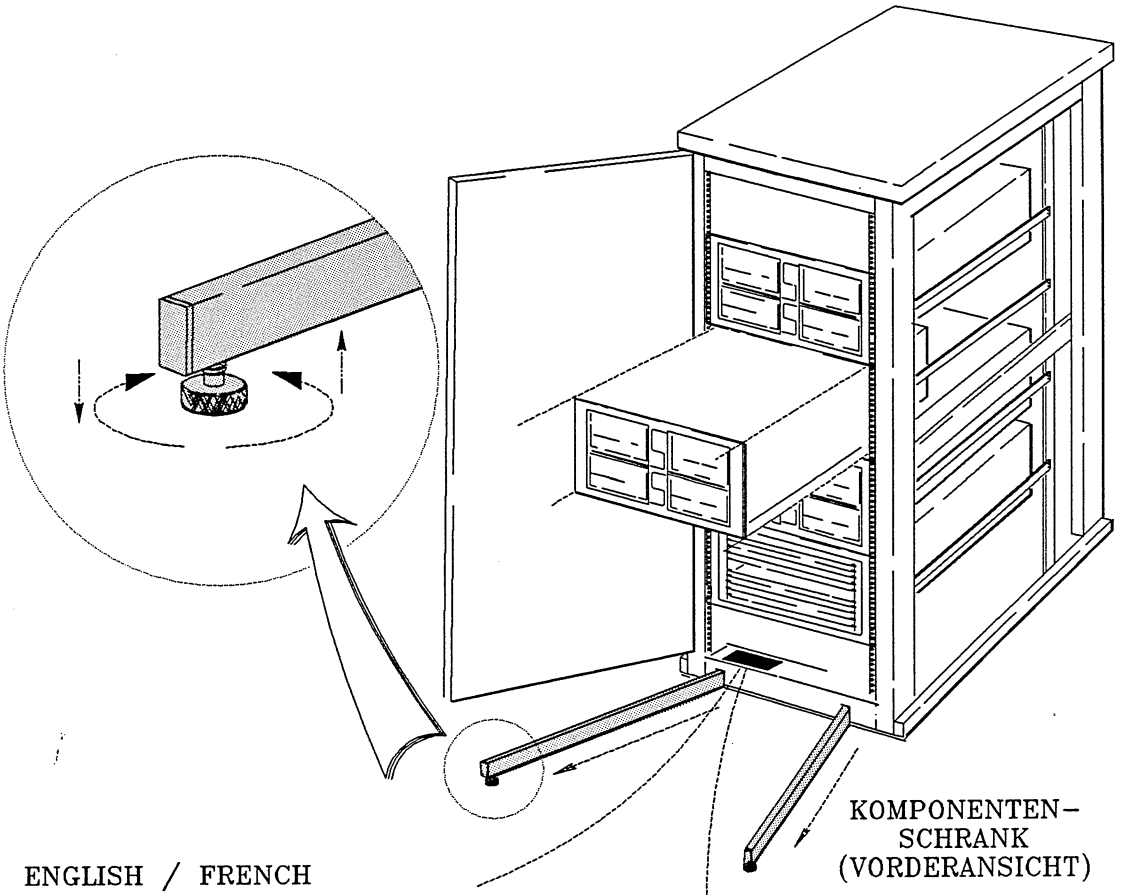
Komponentenschränke können nach vorne kippen, wenn ein auf einem Führungsschlitten montiertes Peripheriegerät zur Wartung herausgezogen wird.

Die CONVEX Komponentenschränke sind mit nach vorn ausziehbaren Stützvorrichtungen versehen, damit sie bei der Wartung nicht nach vorne kippen, wenn die auf Führungsschlitten montierten Geräte herausgezogen werden. Auf Abbildung B-1 sehen Sie sowohl die Position der Stützvorrichtungen als auch das dazugehörige Warnungsschild.

Das Vorwärtskippen der Komponentenschränke läßt sich folgendermaßen vermeiden:

- Nie mehr als ein Peripheriegerät herausziehen
- Nachdem die Stütze herausgezogen ist, bitte das drehbare Füßchen so anpassen, daß es fest auf dem Boden sitzt (siehe Abbildung B-1)
- Wird ein Peripheriegerät nicht gewartet, so muß dessen Verriegelungsmechanismus immer fest im Schrank eingerastet sein

Abbildung I–1, Warnschild bei der Schrankstütze



ENGLISH / FRENCH

CAUTION	ATTENTION
TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED. 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT 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	POUR REDUIRE LE RISQUE D'ACCIDENT ATTRIBUABLE A L'INSTABILITE DE L'UNITE, DEPLOYER LES STABILISATEURS AVANT DE SORTIR LES PERIPHERIQUES. 1. POUR DEPLOYER LES STABILISATEURS, TIRER COMPLETEMENT LES BRAS ANTI–BASCULEMENT ET ABAISER LES PATTES DE FACON QU'ELLES REPOSENT SOLIDEMENT SUR LE SOL. 2. S'ASSURER QUE TOUS LES PERIPHERIQUES SON MUNIS DE VIS DE BLOCAGE. 3. NE JAMAIS SORTIR PLUS D'UN PERIPHERIQUE A UN MOMMENT DONNE.

ENGLISH / GERMAN

CAUTION	ACHTUNG
TO REDUCE RISK OF POSSIBLE INJURY DUE TO UNSTABLE UNIT, ACTUATE STABILIZER BEFORE ANY PERIPHERAL IS EXTENDED. 1. TO ACTUATE STABILIZER, FULLY EXTEND ANTITILT 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	ZUR VERMEIDUNG VON GEFAHRDUNG DURCH EIN INSTABILES GERAT SIND VOR DER HERAUSNAHME VON PERIPHERALS DER STABILISIERUNGSMECHANISMUS BETATIGT WERDEN. 1. UM DIE STABILISIERUNGSEINRICHTUNG ZU BETATIGEN, SIND DER "ANTITILT KANAL" GANZ HERAUS ZU ZIEHEN UND DER UNTERE STUTZFUSS AUF DEN BODEN ZU FUHREN. 2. OBERPRUFEN SIE, OB IN ALLEN ANDEREN VERSCHIEBBAREN GERATEN DER SICHERUNGSMECHANISMUS BETATIGT IST. 3. ZIEHEN SIE NIE MEHR ALS EIN GERAT HERAUS.

HG015020

I.3.3 Maßnahmen zum Ausschalten der Stromversorgung

VORSICHT

Vor Entfernen oder Ersetzen jeglicher elektronischer Komponenten, das Netzkabel des Komponentenschranks herausziehen oder über kundeneigene Schutzschalter die Stromversorgung unterbrechen.

Beachten Sie das Warnschild auf dem Netzkabel, das (in Klammern) die Anzahl der herauszuziehenden Netzkabel angibt:

DIESES GERÄT HAT MEHRERE NETZKABEL. UM EINEN ELEKTRISCHEN SCHLAG ZU VERMEIDEN, ZIEHEN SIE BITTE VOR BEGINN JEGLICHER WARTUNGSARBEITEN (#) NETZKABEL HERAUS.

Die Lage der Schutzschalter für CONVEX-Komponentenschränke ist den Abbildungen B-9, B- 10 und für C120-Prozessorschränke der Abbildung B-11 zu entnehmen. Für C210- und C220-Prozessorschränke gilt Abbildung B-12, und für Erweiterungsschränke gelten die Abbildungen B-13 und B-14.

Indem die Schutzschalter der Schränke auf **OFF** gestellt werden, wird die Stromversorgung zu den Komponenten unterbrochen, aber *nicht* zur Netzstrom-Schaltplatte selbst. Dazu müssen entweder die kundeneigenen Ausschaltvorrichtungen betätigt oder das/die Netzkabel herausgezogen werden.

In manchen CONVEX Systemkonfigurationen haben die Erweiterungsschränke ihre eigenen Schutzschalter. Diese Konfigurationen sind durch ein Netzkabel-Warnschild an jeder Geräterückwand zu erkennen. In Abbildung B-6 können Sie sehen, wo solche Netzkabel-Warnschilder angebracht sind. Die Schutzschalter der Erweiterungsschränke sind auf Abbildung B-12 zu finden.

I.4 Sicherheitsvorkehrungen während der Installierung

In diesem Abschnitt werden Sicherheitmaßnahmen und Überlegungen zur Installierung von CONVEX Supercomputern bzw. deren Peripheriegeräten behandelt.

I.4.1 Verlegen von Anlagen, Umzüge

VORSICHT

Das Umkippen von CONVEX-Komponentenschränken kann zu Verletzungen und/oder Geräteschaden führen.

CONVEX-Komponentenschränken sind zwar nicht ausgesprochen kopflastig, können aber dennoch umkippen, wenn sie nicht vorsichtig bewegt werden. Um die Verletzungsgefahr zu verringern und/oder Geräteschaden zu vermeiden, sollten deshalb immer *zwei* Personen zum Bewegen der Geräte zur Verfügung stehen.

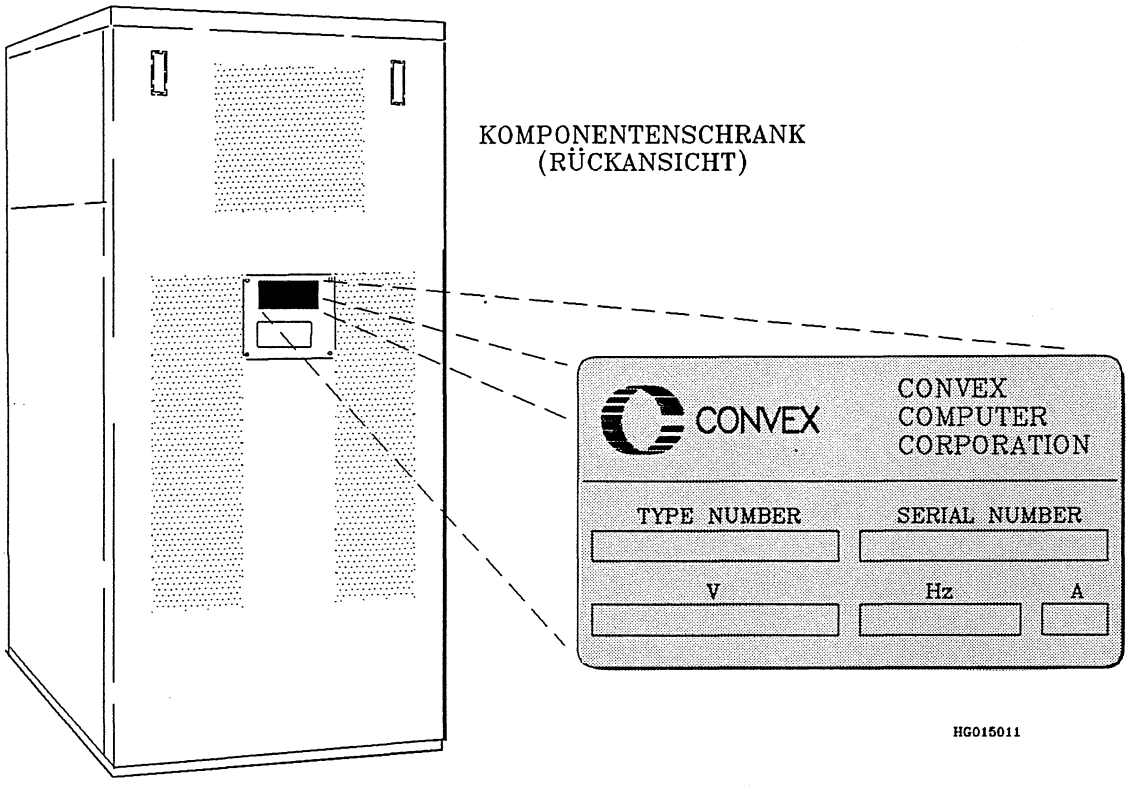
I.4.2 Bestimmung der richtigen Stromversorgung

VORSICHT

Netzstromversorgung, die nicht den Angaben des Etiketts auf dem CONVEX-Komponentenschrank entspricht, kann zu Verletzungen bzw. Geräteschaden führen.

Alle CONVEX-Komponentenschränke tragen auf der Rückwand ein Etikett, auf dem die erforderliche Stromversorgung angegeben ist. Auf Abbildung B-2 sehen Sie das auf allen CONVEX-Komponentenschränken verwendete Etikett und dessen Position auf der Rückwand. In Anhang E finden Sie Angaben über die nötige Stromversorgung für alle CONVEX Computer und Peripheriegeräte.

Abbildung I–2, Typenschild mit Netzstromangaben



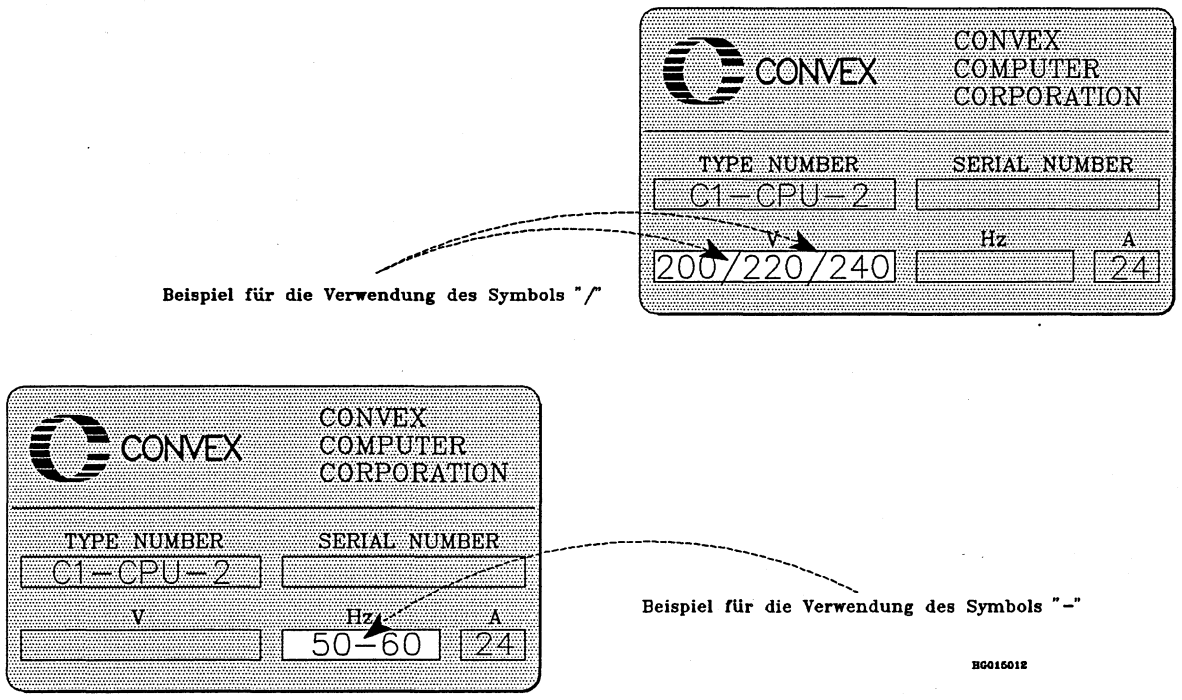
I.4.2.1 Erklärung der Angaben auf dem Typenschild

Auf jedem Typenschild finden Sie die Angaben über die nötige Netzstromversorgung des betreffenden Komponentenschranks. Dabei werden zur Angabe bestimmter Werte oder Wertbereiche des betreffenden Gerätes die Symbole "-" und "/" verwendet, und zwar mit folgender Bedeutung:

- Das Symbol "-" bedeutet, daß das Gerät zwischen den angegebenen Werten einwandfrei funktioniert. Beispiel in Abbildung B-3.
- Das Symbol "/" gibt an, daß ein *bestimmter* Volt- oder Spannungswert *erforderlich* ist und daß die internen Einstellungen dazu nur von autorisiertem Fachpersonal durchgeführt werden dürfen. Auch für dieses Symbol finden Sie ein Beispiel in Abbildung B-3.

Wird das Symbol "/" verwendet, werden Sie die betreffende Volt- oder Spannungszahl auch auf dem Netzstromkabel-Warnschild des Schrankes finden, das neben dem Typenschild angebracht ist. Ein Beispiel eines Netzstromkabel-Warnschilds finden Sie in Abbildung B-6.

Abbildung I–3, Typenschilder mit den Symbolen "-" und "/"



I.4.2.2 Prüfliste vor Anschluß an das Stromnetz

Bevor ein Komponentenschrank an das Stromnetz angeschlossen wird, sollte unbedingt geprüft werden, ob folgende Bedingungen gegeben sind:

- Der Voltbereich am Ort der Installation und der Spannungsbedarf des Komponentenschrankes stimmen überein
- Die Phasen der Stromversorgung am Ort der Installation stimmen mit denen des Komponentenschrankes überein
- Der Frequenzbereich der Stromversorgung am Ort der Installation entspricht dem des Komponentenschrankes
- Die Schutzschalter am Ort der Installation entsprechen spezifizierten Strombelastungen des Schrankes

I.4.2.3 Warnschilder für Netzstromkabel

Die für Nord-Amerika hergestellten CONVEX-Komponentenschränke sind mit Netzkabeln und Anschlüssen ausgestattet und sind zur Installierung bereit.

HINWEIS

CONVEX-Geräte für Gebiete außerhalb Nord-Amerikas haben kein Netzkabel eingebaut. Genaue Angaben über Stecker für US- bzw. internationale Einrichtungen finden Sie im *CONVEX C130, · C210, C220 Site Preparation Guide.*

Bei manchen CONVEX Systemkonfigurationen können mehrere Komponentenschränke ihre eigenen Netzkabel haben, doch niemals mehr als *ein* Netzkabel pro Komponentenschrank. Auf der Rückwand *aller* Komponentenschränke sind Warnschilder angebracht, die darauf hinweisen, daß es sich um eine Anlage mit mehreren Komponentenschränken und Netzkabeln handelt. Abbildung B-6 zeigt die zwei Arten von Warnschildern und wo sie zu finden sind.

VORSICHT

Die vier IEC-Ausgänge auf der XE-Ausgangstafel von Modell C120 haben insgesamt eine Ladung von 10 Ampere. Um Verletzungen oder Geräteschaden zu vermeiden, bitte unbedingt den Anweisungen auf dem WARNSCHILD der XE-Ausgangstafel folgen.

Abbildung B-4 zeigt ein Beispiel eines WARNSCHILDES der XE-Ausgangstafel.

Abbildung I–4, Warnschild auf der Ausgangstafel für das Modell XE

⚠ 10A

CAUTION:
NOT FOR EXTERNAL USE

ATTENTION:
NE PAS UTILISER A
L'EXTERIEUR DE L'EQUIPMENT

VORSICHT

Die internen NEMA-Ausgänge auf den Strom-Schalttafeln aller CONVEX-Komponentenschränke (Modell XE ausgen.) haben pro Ausgang eine Nennleistung von 12 Ampere. Die internen IEC-Ausgänge haben pro Ausgang eine Nennleistung von 12 Ampere. Werden diese Werte überschritten, kann es zur Beschädigung von Komponenten kommen.

Anschluß jeglicher externer Geräte an die eingebauten Zusatzsteckdosen von CONVEX-Komponentenschränken macht die behördlichen Abnahmebestätigungen ungültig.

Abbildung B-5 zeigt ein Warnschild an der Ausgangstafel von CONVEX-Komponentenschränken (Modell XE ausgenommen).

Abbildung I–5, Warnschild auf der Ausgangstafel

CAUTION:
NOT FOR EXTERNAL USE

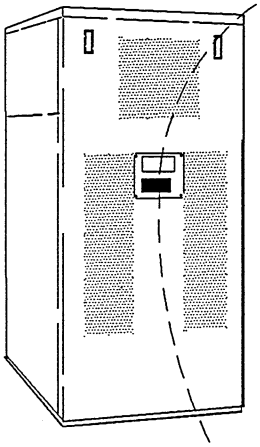
ATTENTION:
NE PAS UTILISER A
L'EXTERIEUR DE L'EQUIPMENT

I.4.2.4 Netzkabel-Spannungsetiketten

Jedes Netzkabel ist mit einem Farbcode-Etikett versehen, das mit der Leistungkonfiguration des entsprechenden Komponentenschrankes übereinstimmt. In Abbildung B-7 sind die Netzkabel-Etiketten für einen CONVEX-Prozessorschrank dargestellt und auf Abbildung B-8 das Netzkabel-Etikett für einen CONVEX-Komponentenschrank.

Abbildung I–6, Netzkabel-Warnschild

KOMPONENTENSCHRANK
(RÜCKANSICHT)



HG015014

ENGLISH / FRENCH

CAUTION **ATTENTION**

THIS ITEM IS CONNECTED
CETTE UNITE EST CONNECTEE

FOR POUR _____ VOLTS ~

AND ET _____ Hz

USING EN UTILISANT _____ WIRES AND ⏚
FILS ET ⏚

DATE _____

HIGH LEAKAGE CURRENT. GROUND (EARTH) CONNECTION ESSENTIAL BEFORE CONNECTING THE SUPPLY.

FORTS COURANTS DE PERTES. CONNECTION A UNE BORNE DE TERRE EST ESSENTIELLE AVANT TOUT RACCORD ELECTRIQUE.

LU

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING THE SUPPLY. FOR CHANGE OF INTERNAL CONNECTION OR OPERATING VOLTAGE, REFER TO AUTHORIZED SERVICE REPRESENTATIVE AND CORRECT THE MARKING ABOVE.

VEUILLEZ CONSULTER LES INSTRUCTIONS D'INSTALLATION AVANT TOUTE CONNEXION AU RESEAU ELECTRIQUE. POUR MODIFIER LINE CONNEXION INTERNE OU LA TENSION D'UTILISATION S'ADRESSER AU REPRESENTANT AUTORISE DU SERVICE ET CORRIGER LES INDICATIONS CI–DESSUS.

THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. TO REDUCE THE RISK OF SHOCK DISCONNECT ( ) POWER SUPPLY CORDS BEFORE SERVICING.
CETTE UNITE A PLUS D'UN CABLE D'ALIMENTATION. AFIN DE REDUIRE LE RISQUE DE CHOQUE ELECTRIQUE DECONNECTER TOUT ( ) CABLE D'ALIMENTATION AVANT MAINTENANCE.

ENGLISH / GERMAN

CAUTION **ACHTUNG**

THIS ITEM IS CONNECTED
DIESE MASCHINE IST GESCHALTET

FOR FUR _____ VOLTS ~

AND UND _____ Hz

USING FUR _____ WIRES AND ⏚
LEITUNGEN UND ⏚

DATE DATUM _____

HIGH LEAKAGE CURRENT. GROUND (EARTH) CONNECTION ESSENTIAL BEFORE CONNECTING THE SUPPLY.

HOHER ABLEITSTROM VOR INBETRIEBNAHME SCHUTZLEITER–VERBINDUNG HERSTELLEN.

LU

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING THE SUPPLY. FOR CHANGE OF INTERNAL CONNECTION OR OPERATING VOLTAGE, REFER TO AUTHORIZED SERVICE REPRESENTATIVE AND CORRECT THE MARKING ABOVE.

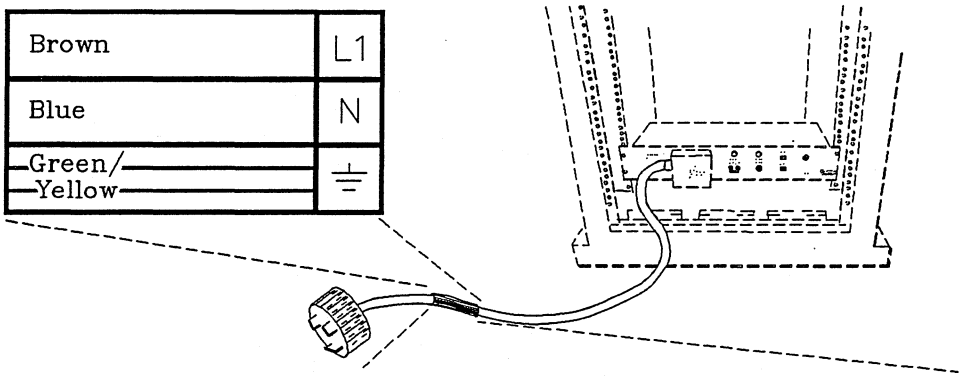
VOR ANSCHLUSS AN DAS NETZ AUFSTELLANEITUNG BEACHTEN. BEI ANDERUNG VON SCHALTUNG ODER SPANNUNG AUTORISIERTES WARTUNGSPERSONAL BEAUFTRAGEN UND OBIGE ANGABEN BERICHTIGEN.

THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. TO REDUCE THE RISK OF SHOCK DISCONNECT ( ) POWER SUPPLY CORDS BEFORE SERVICING.
DIESES GERAT BESITZT MEHRERE GERATEANSCHLUSSLEITUNGEN. ZUR VERMEIDUNG EINES ELEKTRISCHEN SCHLAGES SING VOR WARTUNGSARBEITEN ALLE ( ) ANSCHLUSSLEITUNG VOM NETZ ZU TRENNEN.

Abbildung I–7, Netzkabeletiketten für Prozessorenschränke

220 V 1ø
IEC & INTERNATIONAL

Brown	L1
Blue	N
Green/Yellow	⏚



C1, C120

120 V 1ø
UL/CSA

Black	L1
Red	L2
Orange	L3
White	N
Green	⏚

Black	L1
Brown	L2
Black	L3
Blue	N
Green/Yellow	⏚

220 V 1ø
IEC & INTERNATIONAL

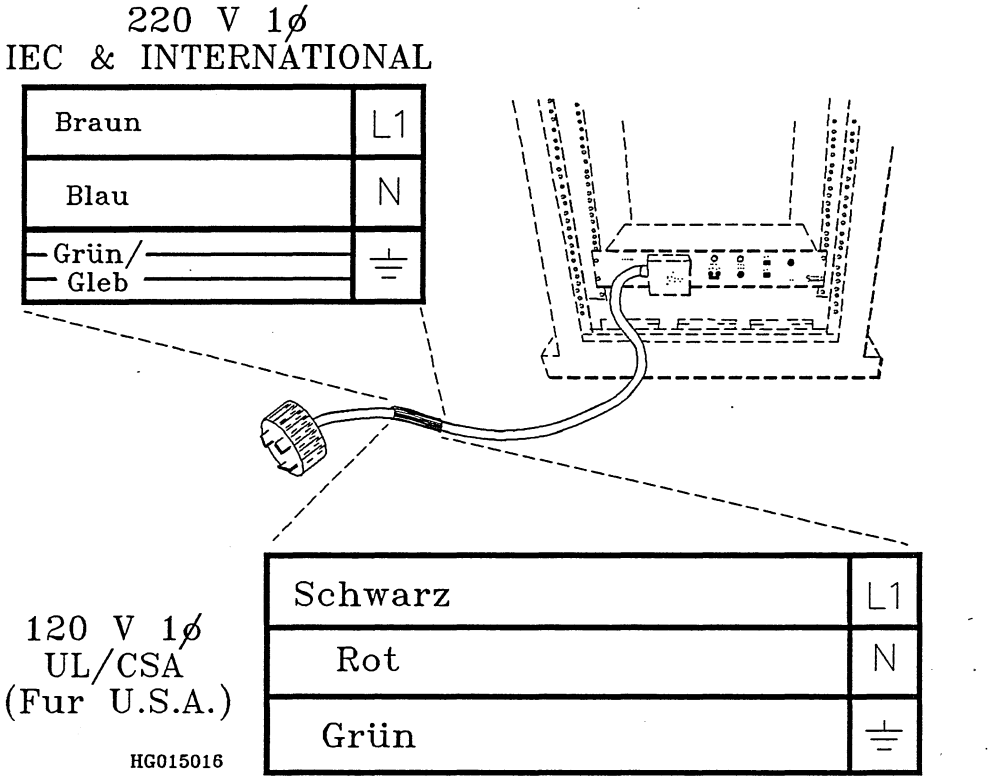
C210,
C220

120 V 1ø
UL/CSA

Red	L1
Orange	L2
Black	L3
Green	⏚

H015015

Abbildung I–8, Netzkabeletiketten für Komponentenschränke



I.4.3 Neuverkabelung der Schränke

VORSICHT

ÄNDERUNGEN DER INTERNEN SCHALTUNG ODER DER BETRIEBSSPANNUNG DURFEN NUR VON AUTORISIERTEN FACHKRÄFTEN VORGENOMMEN WERDEN.

Unsachgemäß vorgenommene Änderungen an der Stromversorgungsverkabelung kann zur Beschädigung von Komponenten führen. Deshalb dürfen Neuverkabelungen nur von autorisiertem Fachpersonal durchgeführt werden.

Manchmal ist es nötig, die Stromversorgungsanlage eines Komponentenschrankes neuen Spannungsbedürfnissen anzupassen. Dazu muß in allen Fällen den Angaben der entsprechenden Begleitliteratur gefolgt werden. Ferner dürfen solche Neuverkabelungen nur von autorisiertem

CONVEX-Fachpersonal durchgeführt werden.

I.4.4 Anschluß an das Wechselstromnetz

VORSICHT

Um Verletzungen zu vermeiden, vor Anschluß des Netzkabels eines Gerätes an das Stromnetz der Anlage unbedingt alle Schutzschalter des Gerätes auf **OFF** schalten.

I.4.4.1 Wo die Netzstrom-Schutzschalter zu finden sind

Den Abbildungen B-9 bis einschließlich B-14 können Sie entnehmen, wo die Netzstrom-Schutzschalter der CONVEX Prozessor- und Komponentenschränke zu finden sind.

Abbildung I–9, Position der Netzstrom-Schutzschalter für Modell C120

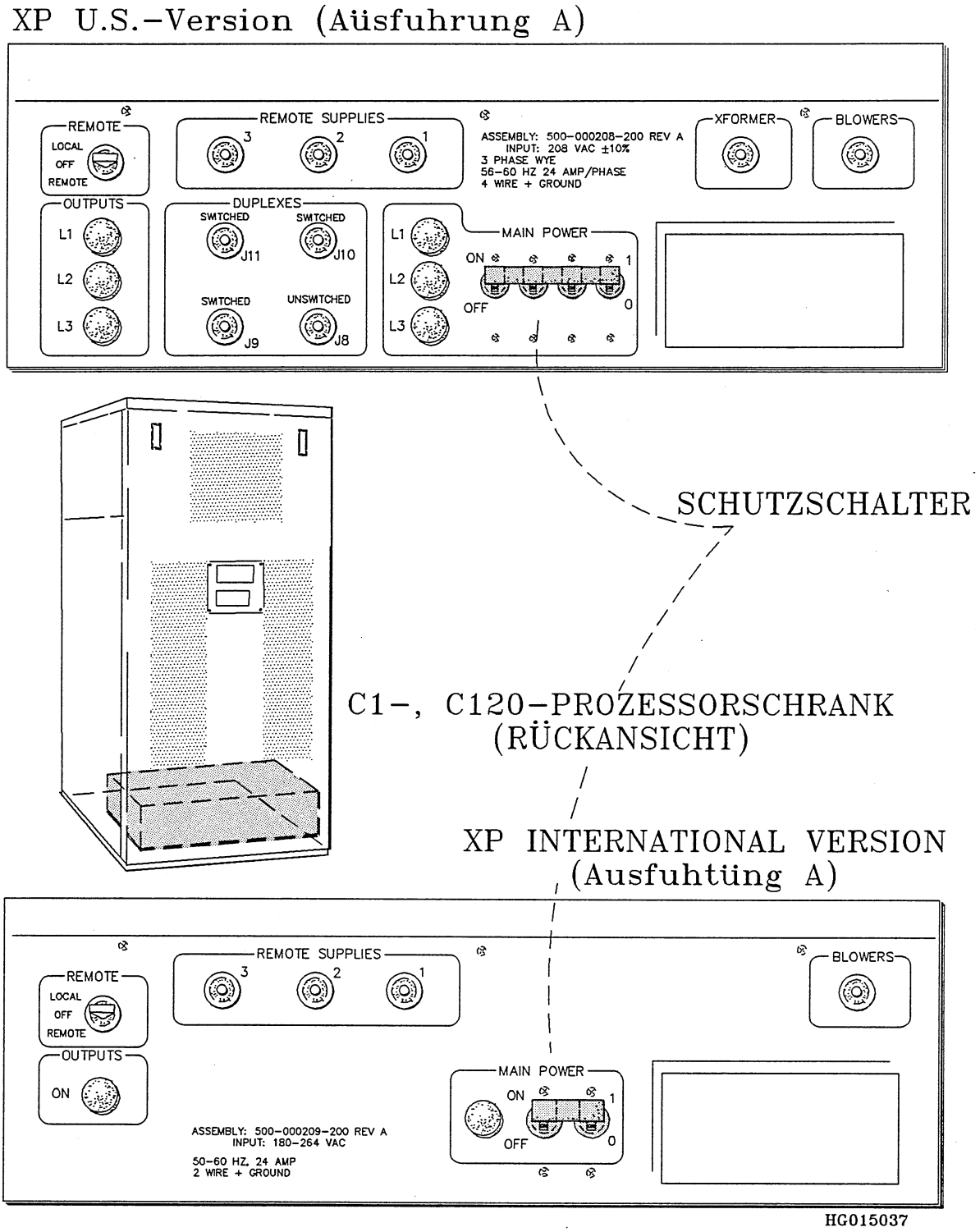


Abbildung I–10, Position der Netzstrom-Schutzschalter für Modell C120

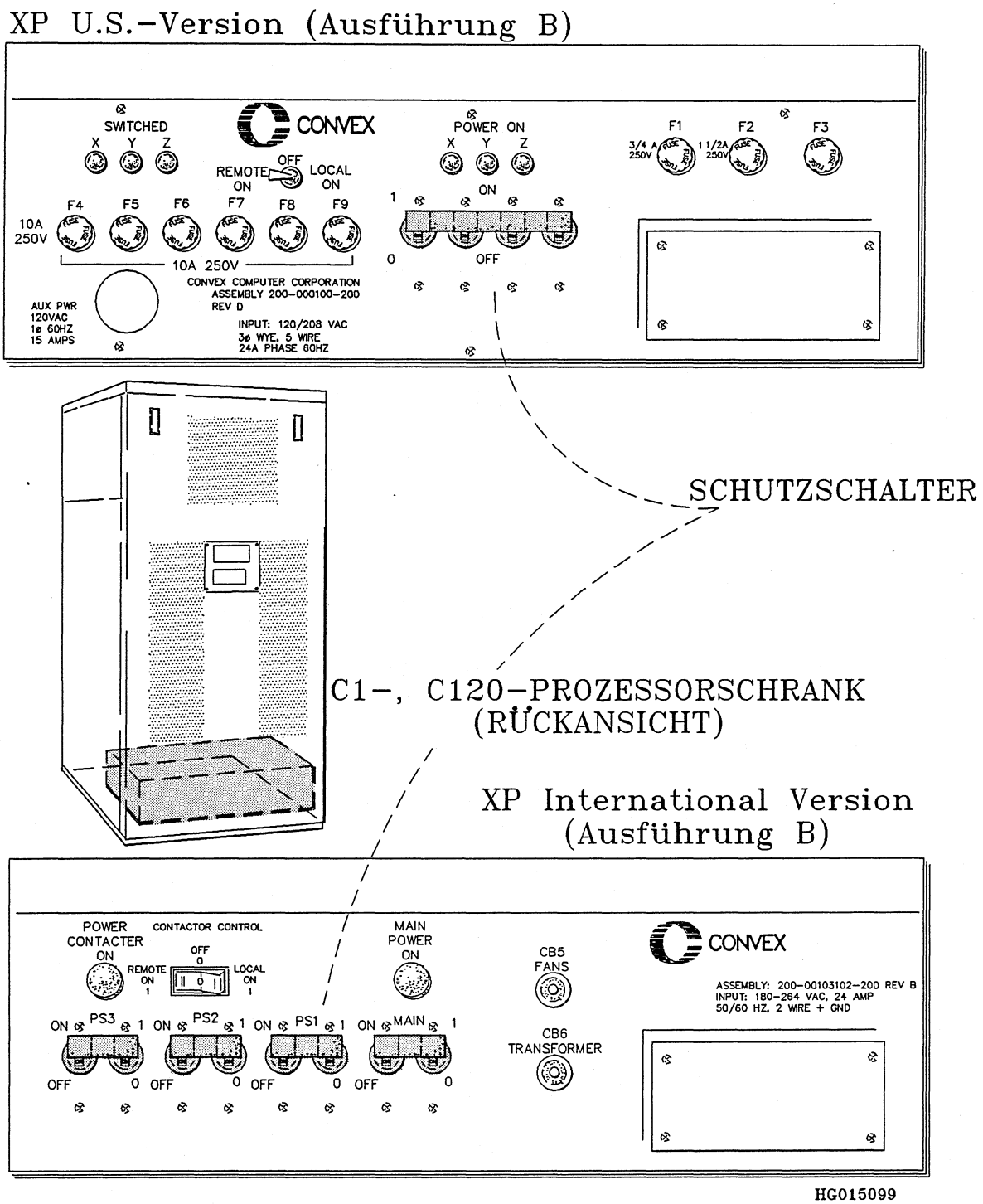


Abbildung I–11, Position der Netzstrom-Schutzschalter für den XE-Schrank

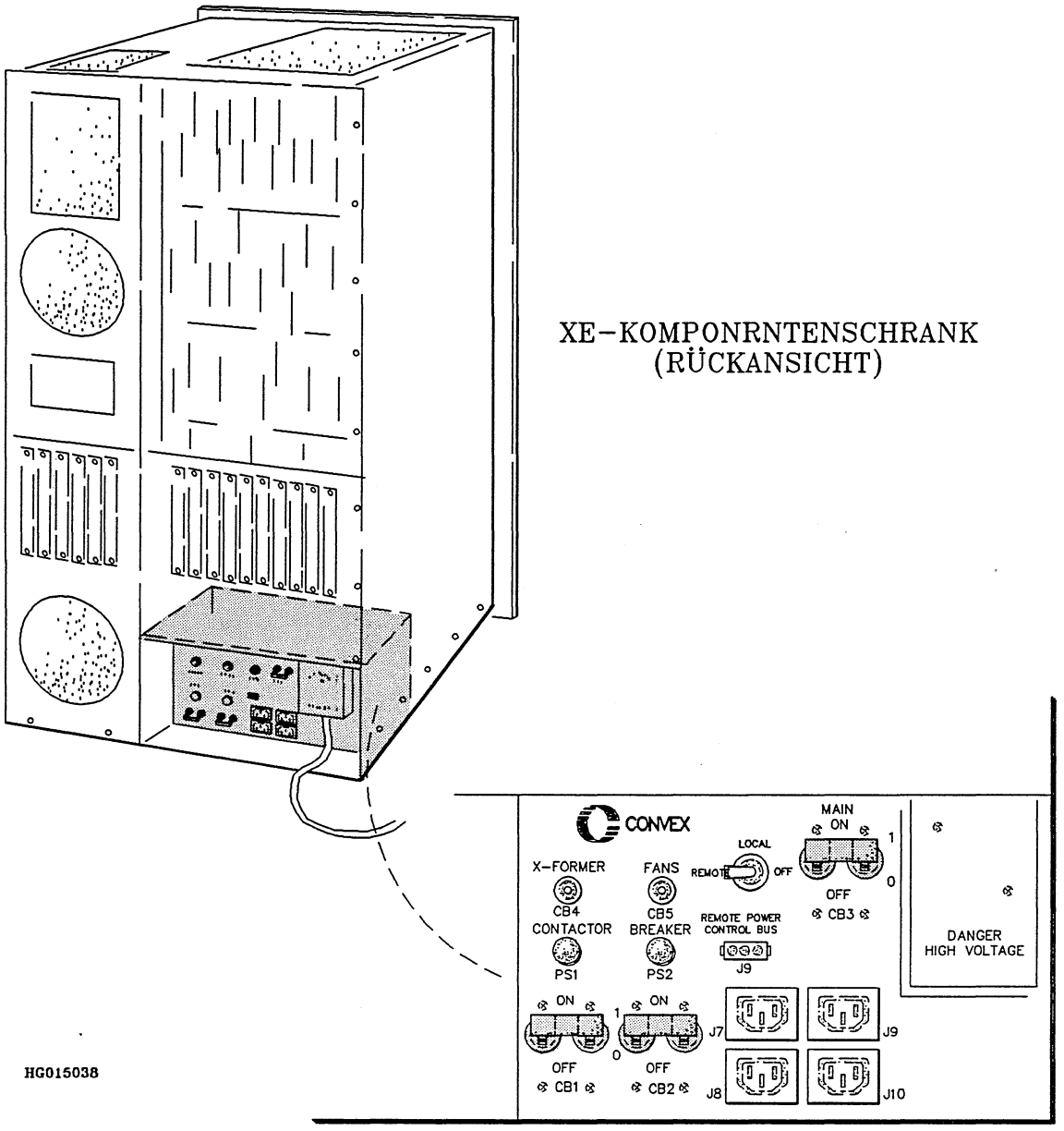


Abbildung I–12, Position der Netzstrom-Schutzschalter für die Modelle C210, C220

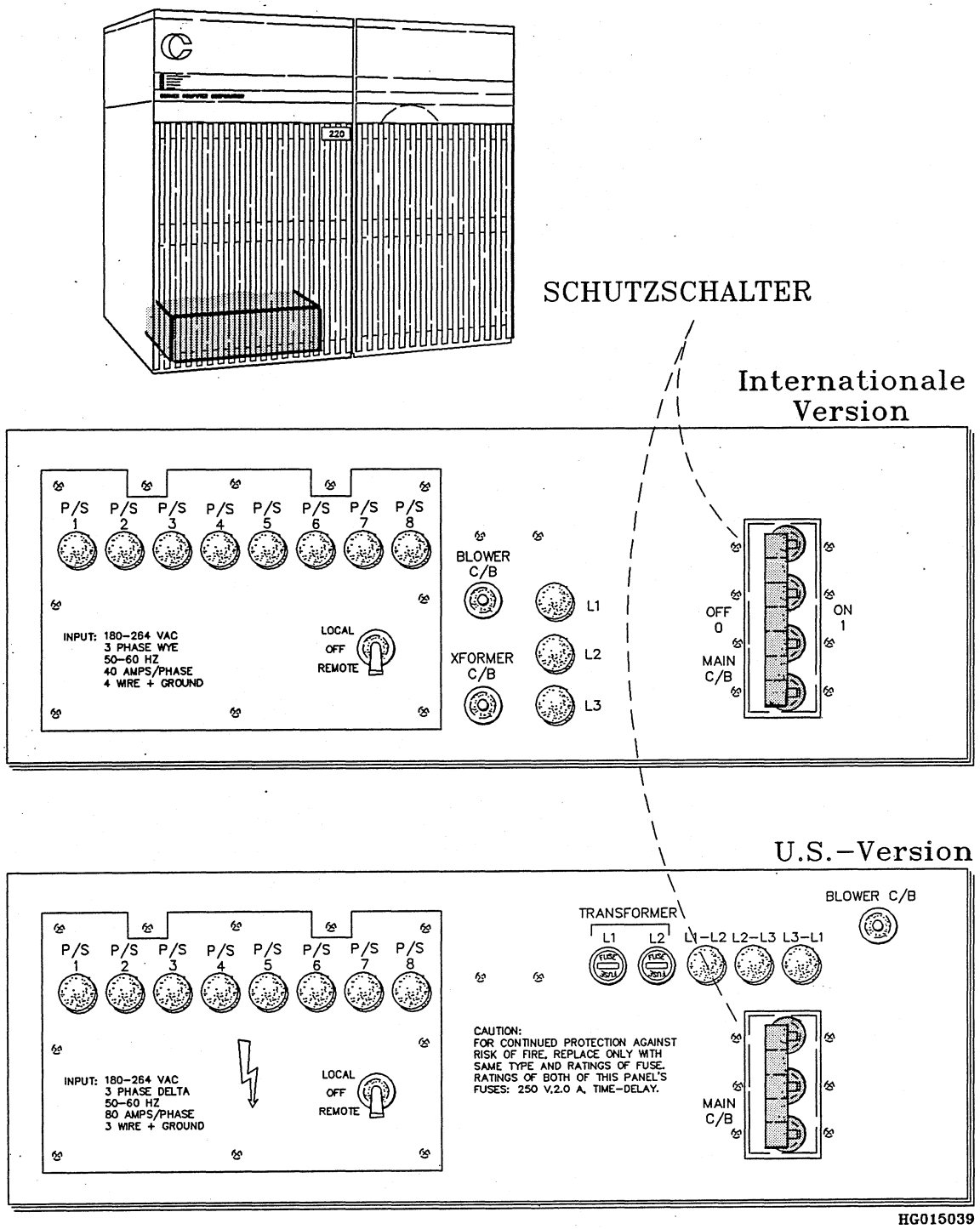


Abbildung I–13, Position der Netzstrom-Schutzschalter bei Erweiterungsschränken

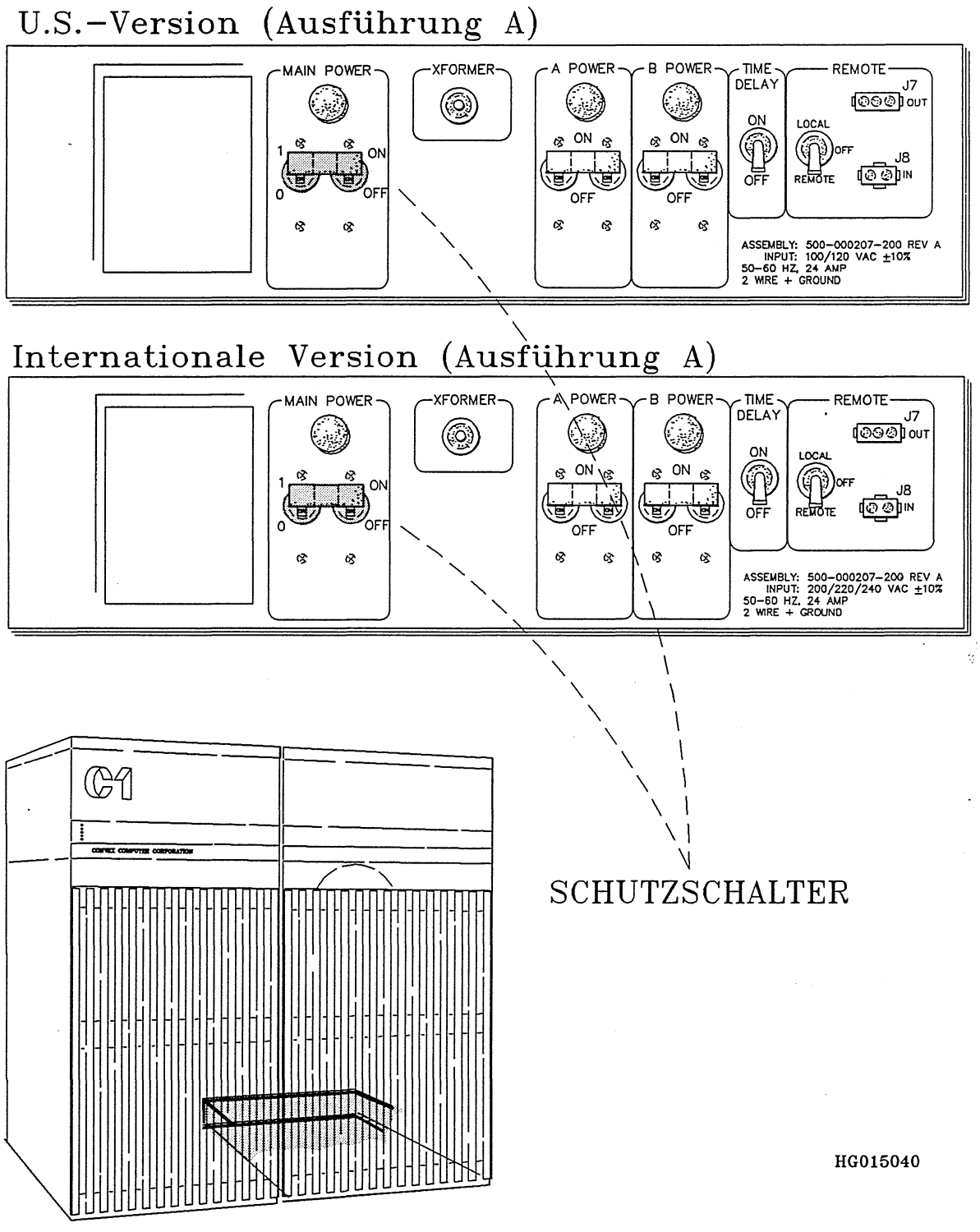
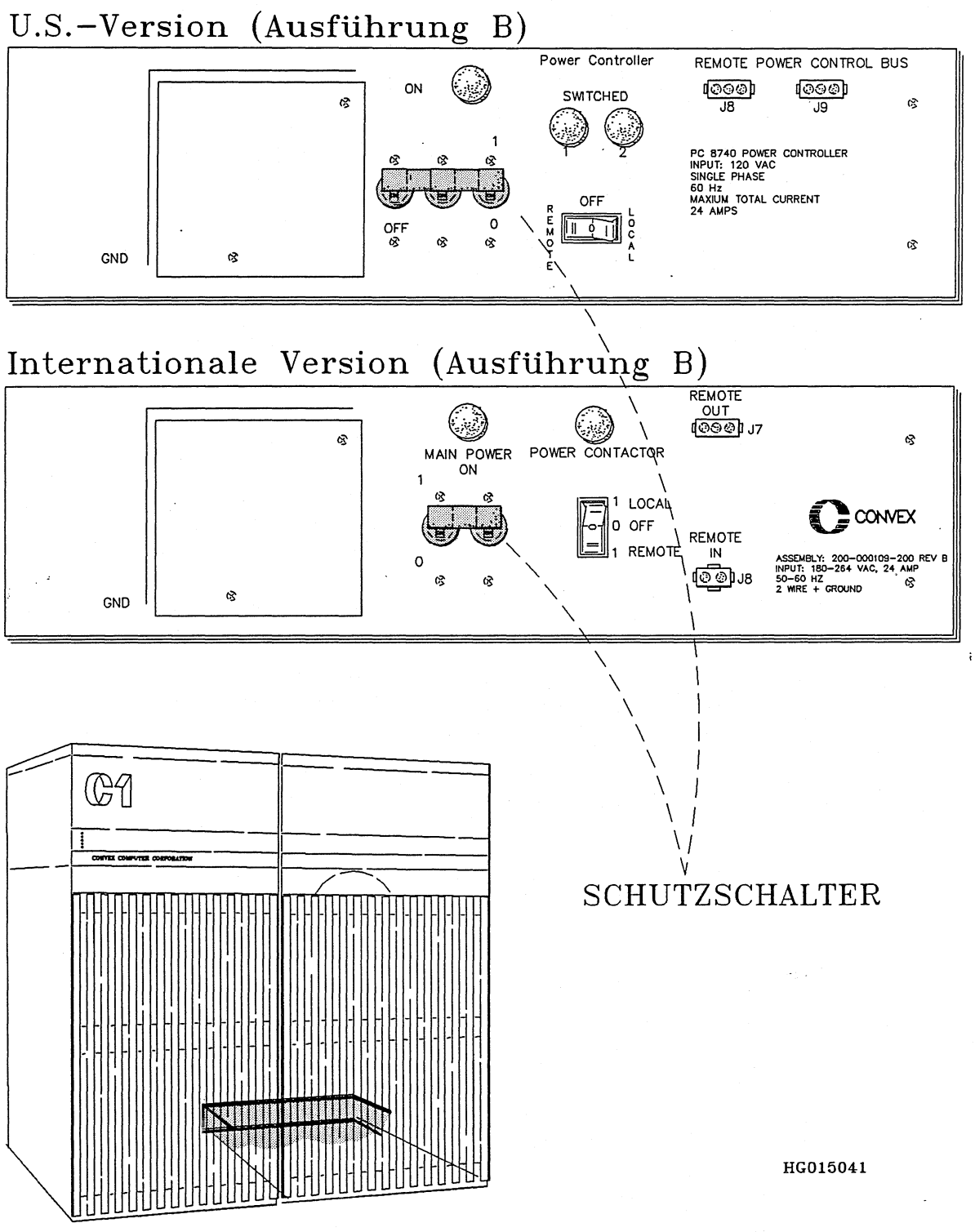


Abbildung I–14, Position der Netzstrom-Schutzschalter bei Erweiterungsschränken



I.4.5 Kühlung und Ventilation

Klimaanlagen für Computerräume sollten eine optimale Kühlung gewährleisten. Dabei sind Luftflußgeschwindigkeit und Wärmeabgabewerte die für die Berechnung von Kühlungserfordernissen für Computerräume primären Faktoren. In diesem Zusammenhang muß u.a. auch die Wärme berücksichtigt werden, die von Beleuchtung und von Arbeitskräften abgegeben wird. Eine Person gibt z.B. bei Durchführung leichter Arbeit 450 BTU pro Stunde ab.

Die Wärmeabgabewerte für CONVEX-Geräte sind unter den technischen Daten in Anhang E angeführt. Die empfohlenen Werte für Betriebstemperatur und Luftfeuchtigkeit beziehen sich auf Höhen bis zu 1000 m über Normalnull. Oberhalb von 1000 m wirkt sich die geringere Luftdichte auf die Klimaanlage aus; deshalb sollte für Anlagen, die über 1000 m betrieben werden, der in Anhang E empfohlene Temperaturbereich um zwei Grad Celsius pro 1000 m gesenkt werden.

I.4.5.1 Luftfeuchtigkeit

Hohe Luftfeuchtigkeit kann zwischen verschiedenen Metallen zu galvanischen Reaktionen führen, die langsam aber sicher steigenden Widerstand und schließlich Geräteausfall nach sich ziehen. Auch Magnetbänder und Papiermaterial können unter hoher Luftfeuchtigkeit leiden.

Niedrige Luftfeuchtigkeit läßt höhere statische Elektrizität zu und kann bei Entladung statischer Elektrizität (ESD) zur Beschädigung von Komponenten führen. Auch kann es bei zu niedriger Luftfeuchtigkeit - besonders bei Hochgeschwindigkeitsdruckern - zu Problemen bei der Papierzufuhr kommen. Die empfohlenen Luftfeuchtigkeitswerte für CONVEX Geräte sind unter den technischen Daten in Anhang 20 E angeführt.

I.4.5.2 Schächte für Klimaanlagen

Wo die Schächte, Rohre und Leitungen für Klimaanlagen verlegt werden, hängt zumeist von den Raumbedingungen ab. Sofern aber ein schwebender Boden gelegt ist, sollte der Raum darunter als Überdruckkammer verwendet werden. Richtig positionierte Belüftungslöcher gewährleisten für CONVEX Prozessor- und Erweiterungsschränke eine ausreichende Kühlung. Lufteinlaßöffnungen der CONVEX-Schränke befinden sich unten an deren Vorderseite. Die Auslaßöffnungen befinden sich oben an der Rückwand.

Manchmal ist es schwierig, die Kühlung und den Druck von Schächten zu steuern, wenn die Schächte des Computerraums von denen des restlichen Gebäudes getrennt sind. Die Schächte sollten jedoch keinesfalls Warmluft ausgesetzt werden, da sich sonst die Luftfeuchtigkeit erhöhen könnte.

Die Abdichtung der Schächte ist selbstverständlich von höchster Bedeutung zur Aufrechterhaltung einer ausgewogenen Kühlung und eines hohen, statischen Luftdrucks im Computerraum. Auch die Kühlung selbst kann leiden, wenn aufgrund mangelnder Abdichtung die Richtung und Geschwindigkeit des Luftflusses nicht kontrolliert werden kann.

I.4.5.3 Schutz gegen Staub u. Luftverschmutzung

Festplatten, Disketten und Magnetbänder und besonders deren Laufwerke werden nur in staubfreier Umgebung einwandfrei funktionieren. Daher sind CONVEX-Magnetband- und

Plattenlaufwerke mit mechanischen Luftfiltern ausgestattet, durch die größere Staubkörper abgefangen werden. Kleinere Partikel dagegen werden mit solchen Filtern nicht immer herausgefiltert und führen im Laufe der Zeit bei den mechanischen Komponenten der Geräte zu kostspieligen Störungen. Diese kleinen Staubpartikel können jedoch aus dem Computerraum ferngehalten werden, indem innerhalb der Klimaanlage ein relativ hoher statischer Druck aufrechterhalten wird.

Reinlichkeit ist in Computerräumen natürlich selbstverständlich. Folgende Regeln sollten festgelegt werden:

- **Nicht Rauchen**—die Partikel in Zigarettenrauch sind acht Mal so groß wie der Abstand zwischen der Oberfläche einer Festplatte und dem Schreibkopf. Außerdem werden die Filter durch die Rauchpartikel auch schneller verstopft.
- **Nicht Essen oder Trinken**—wenn Flüssigkeiten in das Innere von Geräten wie z.B. Tastaturen gelangen, ist die Wahrscheinlichkeit von Kurzschlüssen groß.
- **Staubsauger**—nur hermetisch abgedichtete Staubsauger verwenden.
- **Reinigen von Linoleum**—oder Kachelböden—am besten mit staubfangendem Mop.

Sollte die Computeranlage in der Nähe einer ausgesprochenen Luftverschmutzungsquelle liegen, sind besondere Vorkehrungen zu treffen, denn besonders Chemikalien wie Schwefelwasserstoff können an feinen Kabeln und Mikroelektronik Korrosion hervorrufen. Bei einer derartigen chemischen Verschmutzung sind Aktivkohlefilter als Gegenmaßnahme am besten geeignet.

I.5 Feuerbekämpfung

Systemmanager und das Computerbedienpersonal sollten den Brandschutz in Zusammenhang mit Computereinrichtungen als oberste Priorität betrachten. CONVEX empfiehlt nachdrücklich die Einhaltung aller gültigen staatlichen, bundesstaatlichen und örtlichen Brandbestimmungen sowie computerbezogener Brandschutzregeln.

Insbesondere empfehlen wir die Einhaltung der folgenden Normen des U.S.- Brandschutzverbandes NFPA:

- NFPA 75—Norm zum Schutz von Computern und EDV-Geräten
- NFPA 12A—Norm für Halon 1301 Feuerlöscher
- NFPA 12B—Norm für Halon 1211 Feuerlöscher

Systemmanager, Computerbedienpersonal und andere Mitarbeiter im Computerraum sollten in der richtigen Anwendung von Hilfsmitteln zur Feuerbekämpfung im Computerraum geübt sein und die entsprechenden Richtlinien für den Feuerfall kennen.

Index

O

P

R

S

T

U

V

W

CONVEX Processor Operation Guide
(C100 Series, C200 Series)
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CONVEX Computer Corporation
Customer Service
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Richardson TX 75083-3851 USA

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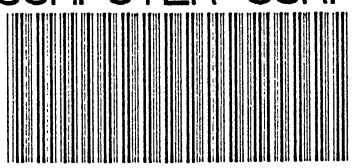

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