

PA-8000 Supplement to FTX Continuum 400 Series Technical Service Guide

(9/11/98)

Revision History

12/15/97 - Revision 0 (GA Version)

2/23/98 - Updated Section 6.1.2

3/19/98 - Updated Section 6.3.2

5/27/98 - Updated Section 3.2.2.

9/11/98 - Updated Section 6.3.2.

Notice

The information contained in this document is subject to change without notice.

STRATUS COMPUTER, INC. MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Stratus Computer, Inc., shall not be liable for errors contained herein or incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Software described in Stratus documents (a) is the property of Stratus Computer, Inc., or the third party, (b) is furnished only under license, and (c) may be copied or used only as expressly permitted under the terms of the license.

This document is protected by copyright. All rights are reserved. No part of this document may be copied, reproduced, or translated, either mechanically or electronically, without the prior written consent of Stratus Computer, Inc.

Stratus, Continuum, Continuous Processing, StrataNET, FTX, and the Stratus logo are registered trademarks of Stratus Computer, Inc.

XA, XA/R, StrataLINK, RSN, SINAP, Isis, Isis Distributed, RADIO, and the SQL/2000 logo are trademarks of Stratus Computer, Inc.

Hewlett-Packard and HP are registered trademarks of Hewlett-Packard.

IBM PC is a registered trademark of International Business Machines Corporation.

Sun is a registered trademark of Sun Microsystems, Inc.

UNIX is a registered trademark of X/Open Company, Ltd., in the U.S.A. and other countries.

PA/RISC is a trademark of Hewlett-Packard.

All trademarks are the property of their respective owners.

Manual Name: *PA-8000 Supplement to FTX Continuum 400 Series Technical Service Guide*

Revision P: November 1997

Stratus Computer, Incorporated

Customer Service Documentation Department

55 Fairbanks Boulevard

Marlboro, MA 01752-1298

Warning

The equipment documented in this manual generates and uses radio frequency energy, which if not installed and

used in strict accordance with the instructions in this manual, may cause harmful interference to radio communications. The equipment 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.

This document contains **Stratus Proprietary and Confidential Information**. It is provided to you and its use is limited by the terms of your contractual arrangement with Stratus regarding maintenance and diagnostic tools.

Copyright© 1997 by Stratus Computer, Inc. All rights reserved.

Preface

The *PA-8000 Supplement to FTX Continuum 400 Series Technical Service Guide* contains technical information pertinent to PA-8000 Continuum Series 400 systems operating under FTX. Differences between PA-8000 systems and PA-7100 systems are described as well as the procedures for upgrading the CPU and memory.

This document is organized as follows:

Section 1 - Overview

Section 2 - Operating System Requirements

Section 3 - Hardware Components

Section 4 - Configurations

Section 5 - Physical Specifications

Section 6 - Upgrades

Section 7 - Part Numbers

Audience

This guide is intended for authorized service personnel who install and maintain Stratus systems, and who have completed Stratus field-service training courses.

Title Page

Notice

Preface

1. Overview

2. Operating System Requirements

3. Hardware Components

Suitcase

CPU-Memory Board

Cooling Fans

Power Supply

System Base

PCI Cards

Peripherals

4. Configurations

System Configurations

PCI Configuration Limits

Disk Configurations

5. System Specifications

Physical

Environmental

Electrical

6. Upgrades

Upgrade Kits

PA-7100 to PA-8000 Upgrade Kits

PA-8000 Upgrade Kits

PA-7100 System to PA-8000 System Upgrade

PA-8000 CPU-Memory Upgrades

ESD Requirements

[Upgrade Procedure](#)

[Burning the Board ID PROM](#)

[Installing CPU/Cache and Memory Modules](#)

[Installing a Memory Module](#)

[Installing a CPU/Cache Module](#)

[Verifying the CPU/Memory Upgrade](#)

[Updating the Suitcase Label](#)

[Returning Parts](#)

7. Related Documentation

8. Part Numbers

1. Overview

This document is a supplement to the [FTX Continuum 400 Series \(PA-7100\) Technical Service Guide](#). It contains information on the PA-8000 FTX Continuum 400 Series system. Since the PA-8000 system is similar in most respects to the PA-7100 system, which is covered in the technical service guide, the focus of this supplement is mainly on the features unique to the PA-8000 system.

The PA-8000 Continuum 400 Series is based on the Hewlett Packard® PA-RISC PA-8000 microprocessor which is available in uni or twin processor designs running at 180 MHz.

The PA-8000 Continuum 400 Series system is customer installable. It must be installed in a computer room environment.

2. Operating System Requirements

The minimum FTX OS release for the PA-8000 Continuum 400 Series systems is FTX 3.3. The 400 Series is software compatible with the Continuum Series 600/1200 systems.

For detailed information on FTX 3.3, refer to the *FTX 3.3 Functional Specification*, which is located on the WWW at <http://www.swdc.stratus.com/ftxdev/3.3/>. The document is in PostScript format.

3. Hardware Components

The major differences between PA-8000 systems and PA-7100 systems are in the suitcase. The system base architecture is the same in both systems. Some of the PCI cards and peripherals currently utilized in the PA-8000 systems differ from those in the PA-7100 systems.

NOTE: PA-8000 systems require 220 VAC input power. The specifications are listed in [Section 5.3](#).

3.1 Suitcase

The following table lists the model numbers and gives a brief description of the PA-8000 suitcases.

NOTE: For current revision requirements and complete revision history, refer to the [HQ Service Support Rev Dir](#).

Model	Description
G211	Suitcase, 180 MHz, Uni processor, 2 MB cache
G221	Suitcase, 180 MHz, Twin processor, 2 MB cache
G805	CPU/Cache module

The PA-8000 suitcase contains the following components:

- CPU-Memory board

- Power supply
- CPU cooling fans

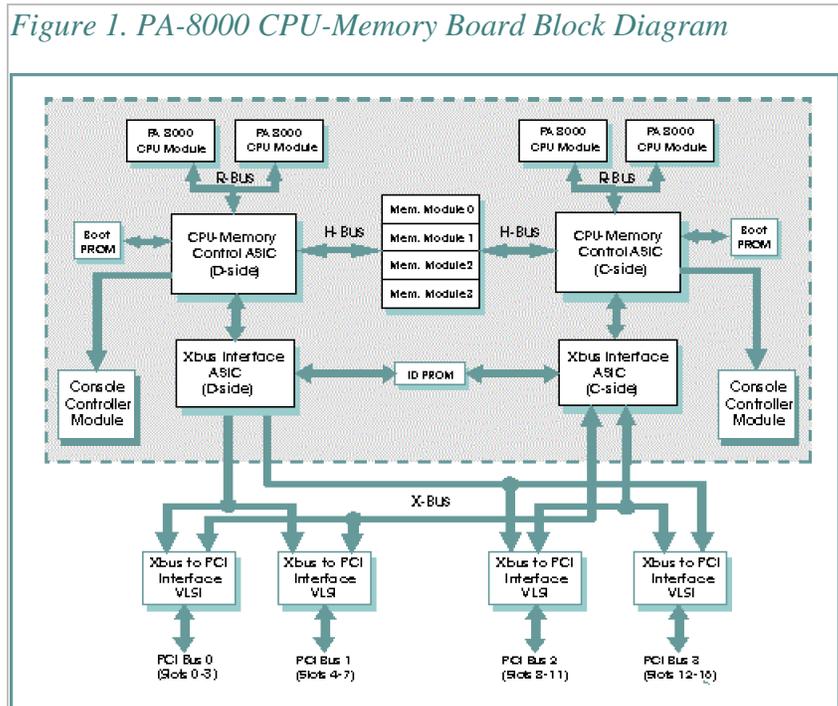
3.1.1 CPU-Memory Board

The CPU-Memory board is actually a motherboard containing the logic section (PA-8000 CPU/cache modules and memory modules), and the Console Controller module (with serial connections for the console, RSN, and UPS). The Console Controller serial connections are cabled to external connections on the rear of the system base.

The following features distinguish the PA-8000 CPU-Memory board from the PA-7100 CPU-Memory board.

- 180 MHz CPU
- 120 MHz, 64-bit processor bus (768 MB/sec.)
- 960 MB/sec. memory subsystem (4, 8, or 16 way interleave)
- 4 K IOVA
- 96 MB/sec duplex bus
- 64-bit wide general purpose registers
- New flavors of arithmetic, logical, and memory reference instructions to operate on 64-bit (double word) signed integers
- PSW W-bit for wide address support
- Larger physical address space
- Wider (64 bits) space, shadow, and control registers
- New TLB management instructions to support larger physical and virtual address spaces
- Longer displacement (16-bit) load and store instructions
- Data can be prefetched into data cache to minimize effects of memory latency
- Variable page sizes
- New variant of the branch instruction with a 22-bit displacement
- Enhancement to static branch prediction conventions
- New cache bring-in rules

Figure 1 is a block diagram of the PA-8000 CPU-Memory board and its interfaces.



As stated previously, the CPU/cache modules in PA-8000 systems are available in uni or twin processor designs running at 180 MHz. The uni processor contains one logical/two physical CPUs and the twin processor has two logical/four physical CPUs. Both the uni and twin designs have 2 MB cache which consists of 1 MB instruction cache (Icache) and 1 MB data cache (Dcache).

Dcache is tags and memory that comprise the external data cache for the PA-8000 chip. All control for the Dcache is incorporated into the chip. The Dcache implementation on the CPU/cache module is a primary (1st level) cache which results in higher cache performance.

Icache is tags and memory that comprise the external instruction cache for the PA-8000 chip. All control for the Icache is incorporated in the chip. The Icache implementation on the CPU/cache module is also a primary (1st level) cache.

Each memory module is organized into four banks of 18 DRAMs (128 bits data, 16 bits ECC). With a maximum of 16 interleaved memory banks, access latencies are minimized even under heavy load. The large number of banks not only performs well for sequential accesses associated with pre-fetching or DMA traffic, but also for random loads since the probability of back-to-back references hitting on the same bank is low.

Memory subsystem performance highlights:

- 964 MB/sec. maximum throughput
- 768 MB/sec. maximum throughput per memory module
- Low order interleaved memory banks (4 per memory module)
- Memory data bus 128 bits wide @ 60 Mhz
- Multiple data and address buses per module to minimize bank contention
- 16 Mbit (or 64 Mbit) DRAMs (60 nsec access)

Memory module components:

- Memory interface ASIC (4) - contains all control, address, and data buffering used to interface between the high-performance memory bus (H-Bus) and the DRAMs on the module. Operates at 60 MHz.
- 128 MB, 512 MB, or 1 GB of ECC protected DRAM.

The following table shows the model numbers for the memory modules and the maximum memory configurations on the CPU-Memory motherboard for each type of memory module. For the most current information on available memory refer to the [Continuum Memory Subsystem Technical Reference](http://www.cac.stratus.com/CSDoc/home/continuum400.htm). The document is also available in PDF format at <http://www.cac.stratus.com/CSDoc/home/continuum400.htm>.

Model Number	Module Type	# Modules on CPU-Memory Board	Maximum Memory Configuration
M706	128-MB	1 to 4	512 MB
M707	512-MB	1 to 4	2 GB
M708	1-GB	1 to 2	2 GB

The boot PROM is the initial boot firmware. Each CPU-Memory board has 512 KB of FLASH RAM space available for the boot PROM. The boot PROM communicates with the operator console through the Console Controller module. This interface is the same as in the PA-7100 systems. The boot PROM supports both manual and automatic boot modes.

The CPU-Memory Control ASIC is the heart of the CPU-Memory board. It interfaces up to four logical CPU modules to high-speed local memory through the H-Bus and to the system bus (X-Bus) through the X-Bus interface

via the I-Bus.

The X-Bus interface ASIC connects the system bus (X-Bus) with the local point-to-point bus (I-Bus) going to the CPU-Memory Control ASIC.

The H-Bus is a high-performance bus that interfaces the CPU/memory control ASIC with the memory modules. It is a 128-bit wide data path with 4 bits of data parity and separate address and control signals. Data/parity is split in half, each provided by their respective memory interface ASIC on the memory modules. H-Bus features include the following:

- Supports up to 32 GB of direct mapped memory
- Transaction-based protocol
- Transfer rate of 960 MB/sec. at 60 MHz.
- Supports block read, block write, I/O read, and I/O write operations

The I-Bus is the primary connection between the CPU-Memory control ASIC and the X-Bus interface ASIC. The I-Bus is a synchronous 32-bit multiplexed split-transaction bus. It runs at 48 MHz and can transfer 32 bytes of data in 10 cycles which provides a maximum bus bandwidth of 153 MB/sec. The I-Bus is a simple point-to-point interconnect.

The R-Bus is a 120-MHz shared signal bus that connects the CPU/Memory control ASIC to the CPU modules.

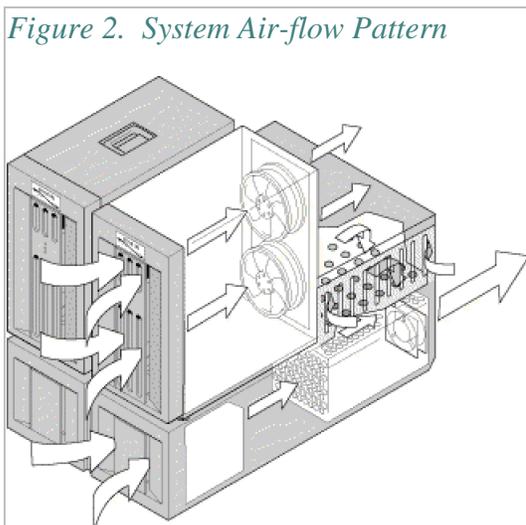
3.1.2 Cooling Fans

The suitcase is cooled by two fans located in the rear. The fans are arranged vertically and evacuate air from the suitcase by creating negative pressure within the enclosure which draws fresh air in the front and discharges heated air out the rear. A suitcase fan failure results in a fault condition bringing down that particular suitcase.

The PCI cards in the system base are cooled by the exhaust air from the lower-most suitcase cooling fan.

Temperature information is acquired by thermal sensors in the suitcase and is used to drive the fan speed. There is no fan speed (high/low) control accessible to the user in 400 Series systems.

Figure 2 shows the air-flow pattern inside the PA-8000 Continuum 400 Series system.



3.1.3 Power Supply

The PA-8000 suitcase power supply is manufactured by Omega Power Systems, Inc. It is a 1750-watt power supply with the following features:

- Constant frequency resonance switching (no switching losses)
- Remote sense on all outputs
- Overload/overvoltage protection on all outputs
- Automatic thermal shutdown
- Margining on all outputs
- Voltage adjustments on all outputs ($\pm 10\%$)
- LED on each module
- Input power fail warning
- EMI filtering (Class A)
- Reverse sense leads protection

The following table shows the specifications for the power supply.

Specification	Minimum	Typical	Maximum	Conditions
AC input voltage	85 V		264 V	
Inrush current			40 A	Hot and cold start
Input frequency	47 Hz		63 Hz	
Power factor	.99	.999		Full load
Efficiency		81% 78%		230 VAC full load 115 VAC full load
Output power			1200 W 1000 W 1750 W	100-264 VAC 85-100 VAC 180-264 VAC
AC leakage current			2 mA	250 VAC, 60 HZ
Operating temperature			50° C 70° C	Full load 50% of full load
Storage temperature	-40° C		85° C	

3.2 System Base

3.2.1 PCI Adapters

The following table lists the PCI adapter cards used in PA-8000 FTX Continuum 400 Series systems.

Note: The PCI cards shown in the following table are based on information available at the time of publication. For current (and more detailed) PCI information refer to the [PCI/PMC Adapter Technical Reference](#). The document is also available in PDF format at <http://www.cac.stratus.com/CSDoc/home/comm.htm>.

Model	Description	Min. FTX Release

U403-01	4-port, 4-MB synchronous adapter (V.36)	3.3
U403-02	4-port, 4-MB synchronous adapter (RS-422)	3.3
U403-03	4-port, 4-MB synchronous adapter (X.21)	3.3
U403-04	4-port, 4-MB synchronous adapter (V.35)	3.3
U404	8-port 4-MB synchronous adapter (RS-232)	3.3
U420	1-port T1/E1/ISDN adapter	3.3
U450	8-port asynchronous adapter	3.3
U501	PCI fast wide single-ended SCSI adapter (1 external port)	3.3
U502	PCI fast wide differential SCSI adapter (3 external ports)	3.3
U512	2-port ethernet adapter (10/100 Mbps)	3.3
U513	1-port ethernet adapter (10/100 Mbps)	3.3
U530	1-port FDDI adapter (100 Mbps)	3.3
U542	1-port ATM adapter (155 Mbps)	3.4

3.2.2 Peripherals

The following table lists the peripherals used in PA-8000 FTX Continuum 400 Series systems.

Note: The disk and tape drives shown in the following table are based on information available at the time of publication. For current (and more detailed) disk information refer to the [Continuum Disk Drives Technical Reference](#). The document is also available in PDF format at <http://www.cac.stratus.com/CSDoc/home/disk.htm>. For more information on tape drives, refer to the [DDS DAT Tape Drive Technical Reference](#). The document is also available in PDF format at <http://www.cac.stratus.com/CSDoc/home/tape.htm>.

Model	Description	Min. FTX Release
D802	2-GB, 3.5", 7200 rpm, SCSI disk drive	3.3
D803	4-GB, 3.5", 7200 rpm, SCSI disk drive	3.3
D804	9-GB, 3.5", 7200 rpm, SCSI disk drive	3.3
T304	160-MB, 6250 bpi, SCSI desktop tape drive (includes standalone SCSI conversion unit, power cord, and cables).	3.3
T403-004	4-GB, IBM 3480/3490 media-compatible, tape drive (10-cartridge)	3.3
T404	4-GB, 3490E media-compatible, tape drive (10-cartridge)	3.4
T801	8-GB, 4-mm DDS2 DAT tape drive (1 cartridge)	3.3
T802	48-GB, 4-mm DDS2 DAT tape drive (6-cartridge autoloader)	3.3
T804	1.2-GB QIC tape drive	3.3
T805	12-GB, DDS3 DAT tape drive (1 cartridge)	3.3
T806	72-GB, DDS3 DAT tape drive (6-cartridge autoloader)	3.3
D855	CD-ROM drive (4x speed)	3.3
D859	CD-ROM drive (15x speed)	3.3

V103	Console Terminal	3.3
V105	Console Terminal (VT320 emulation)	3.3
C419	RSN modem	3.3

4. Configurations

4.1 System Configurations

Currently, PA-8000 FTX Continuum 400 Series systems are available in two models: Model 418 and Model 428. The hardware configuration requirements and restrictions for each model are shown in the following table.

NOTE: The configurations shown in the following table are based on information available at the time of publication. For current (and more detailed) configuration information refer to the *Stratus Configuration Specification Document No. ES-00101* which is located on the WWW at <http://webserv.hw.stratus.com/> (go to **Records**, then **Stratus Configuration Specifications**). The document is available in Word or PDF format.

Component	Model 418	Model 428
CPU-Memory board (suitcase)	G211	G221
CPU module	Uni 180 MHz	Twin 180 MHz
Cache	2 MB	2 MB
No. logical CPUs	1	2
No. memory modules (128-MB or 512-MB or 1-GB)	Min. = 2 Max. = 8	Min. = 2 Max. = 8
Duplexed memory (128-MB memory modules)	Min. = 128 MB Max. = 512 MB	Min. = 128 MB Max. = 512 MB
Duplexed memory (512-MB memory modules)	Min. = 512 MB	Min. = 512 MB

	Max. = 2 GB	Max. = 2 GB
Duplexed memory (1-GB memory modules)	Min. = 1 GB	Min. = 1 GB
	Max. = 4 GB	Max. = 4 GB
No. disk drives (system base)	Min. = 2	Min. = 2
	Max. = 8	Max. = 8
No. disk drives (each expansion tower)	Max. = 5	Max. = 5
No. disk drives (each expansion cabinet)	Max. = 32	Max. = 32
No. tape drives	Min. = 0	Min. = 0
	Max. = 4	Max. = 4
No. expansion towers	Min. = 0	Min. = 0
	Max. = 2	Max. = 2
No. expansion cabinets	Min. = 0	Min. = 0
	Max. = 2	Max. = 2

4.2 PCI Configuration Limits

The following table lists the tested configuration limits for PCI adapters used in PA-8000 FTX Continuum 400 Series systems. A K138 PCIB card is always installed in slot 0 of each card cage and a U501 card is always installed in slot 7 of each card cage. If U502s are present, it is recommended that they be installed in slot 3 of each card cage.

Model	FTX Tested Maximum Limits
U403-01	8
U403-02	8
U403-03	8
U403-04	8
U404	8
U420	4
U450	
U512	4
U513	8

U530	4
U542	

4.3 Disk Configurations

The following table lists the PA-8000 Continuum 400 Series disk configurations.

Configuration	Total # SCSI Conv.Units	Total # Disk Shelves in Expansion Towers/Cabinets (tower/cab 1) + (tower/cab 2)	Total # Disk Drives	Duplexed Disk Storage (GB)		
				2-GB Drives	4-GB Drives	9-GB Drives
System base only	0	0	8	8	16	36
System base + 2 expansion towers	2	(1) + (1) = 2	18	18	36	81
System base + 1 expansion cabinet	2	(4 Front) = 4	30	30	60	135
System base + 1 expansion cabinet	3	(4 Front + 2 Rear) = 6	40	40	80	180
System base + 2 expansion cabinets	4	(4 Front) + (4 Front) = 8	52	52	104	234
System base + 2 expansion cabinets	5	(4 Front + 2 Rear) + (4 Front) = 10	62	62	124	279
System base + 2 expansion cabinets	6	(4 Front + 2 Rear) + (4 Front + 2 Rear) = 12	72	72	144	324

5. System Specifications

The following tables list the physical, environmental, and electrical specifications for PA-8000 systems.

5.1 Physical

Height	78.7 cm (31 inches)

Width	52.1 cm (20.5 inches)
Depth	91.4 cm (36 inches)
Weight	113.6 kg (250 lbs.) maximum configuration
Service clearance	0.6 m (2 ft) around the perimeter of the system base

5.2 Environmental

Operating temperature:	
-200 to 6000 ft	4.5° to 40° C (40° to 104° F)
6000 to 8000 ft	4.5° to 35° C (40° to 95° F)
8000 to 10,000 ft	4.5° to 30° C (40° to 86°F)
Maximum heat dissipation	9600 Btu/hr
Power Consumption	2800 watts = 2.8 KVA
Relative humidity	10% to 80% non-condensing
Max. rate of temp. change	12°/hr C (21.6 °/hr F)
Acoustical noise:	
Normal conditions	55 dbA (max.)
High temp/fault conditions	65 dbA (max.)
Electrostatic discharge:	

Air discharge	8 KV (max.)
Direct-contact discharge	6 KV (max.)

5.3 Electrical

AC service	230 VAC; Two 10A single-phase inputs (both active).
AC input power	1.4 KVA per power supply if power is supplied to both supplies and both supplies are working. 2.8 KVA for both supplies. 1.6 KVA maximum per power supply if no power is available to the other power supply or if the other power supply has failed.
AC input voltage	Nominal: 208 VAC to 243 VAC. Absolute: 170 VAC to 264 VAC.
Input frequency range	47 Hz to 63 Hz
Power factor	0.99 minimum at absolute minimum AC input voltage and maximum configuration load.
AC input current	4.0 A rms at 264 VAC (for minimum configuration load) 9.4 A rms at 170 VAC (for maximum configuration load)
Power Cord	North America: 250V/20A, NEMA 6-20 Continental Europe: 250V/13A, Type VII G Great Britain and India: 250V/13A, Type BS/89/13 Uncommitted or Universal: 250V/20A Australia and New Zealand: 250V/15A, Type SAA/3/15 Denmark and Switzerland: 250V/15A, Type 1302 Italy: 250V/16A, Type I/3/16
Uninterruptable power supply (UPS)	American Power Conversion (APC) Matrix UPS Model 5000

6. Upgrades

6.1 Upgrade Kits

6.1.1 PA-7100 to PA-8000 Upgrade Kits

The following table lists the marketing IDs of the PA-7100 to PA-8000 system upgrades.

Marketing ID	Type	Description	Contents
UPC1812	Suitcase	Upgrade a PA-7100 Model 412 to a PA-8000 Model 418	Two G211 suitcases (no memory)
UPC1813	Suitcase	Upgrade a PA-7100 Model 412 to a PA-8000 Model 428	Two G221 suitcases (no memory)
UPC1815	Suitcase	Upgrade a PA-7100 Model 415 to a PA-8000 Model 418	Two G211 suitcases (no memory)

UPC1816	Suitcase	Upgrade a PA-7100 Model 415 to a PA-8000 Model 428	Two G221 suitcases (no memory)
UPC1822	Suitcase	Upgrade a PA-7100 Model 422 to a PA-8000 Model 428	Two G221 suitcases (no memory)
UPC1825	Suitcase	Upgrade a PA-7100 Model 425 to a PA-8000 Model 428	Two G221 suitcases (no memory)
UPM706-SP	Memory	Special upgrade. Used only to replace one existing PA-7100 M128 memory module (128 MB) with one PA-8000 M706 memory module (128 MB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	One M706 memory module
UPM707-SP	Memory	Special upgrade. Used only to replace one existing PA-7100 M512 memory module (512 MB) with one PA-8000 M707 memory module (512 MB) . Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	One M707 memory module
UPM707-XT1	Memory	Special upgrade. Used only to replace one existing PA-7100 M128 memory module (128 MB) with one PA-8000 M707 memory module (512 MB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	One M707 memory module
UPM707-XT2	Memory	Special upgrade. Used only to replace two existing PA-7100 M128 memory modules (256 MB) with one PA-8000 M707 memory module (512 MB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	One M707 memory module
UPM707-XT3	Memory	Special upgrade. Used only to replace three existing PA-7100 M128 memory modules (384 MB) with one PA-8000 M707 memory module (512 MB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	One M707 memory module
UPM707-XT5	Memory	Special upgrade. Used only to replace one existing PA-7100 M128 memory module (128 MB) with two PA-8000 M707 memory modules (1 GB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	Two M707 memory modules
UPM707-XT6	Memory	Special upgrade. Used only to replace two existing PA-7100 M128 memory modules (256 MB) with two PA-8000 M707 memory modules (1 GB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	Two M707 memory modules
UPM707-XT7	Memory	Special upgrade. Used only to replace three existing PA-7100 M128 memory modules (384 MB) with two PA-8000 M707 memory modules (1 GB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	Two M707 memory modules
UPM707-XT8	Memory	Special upgrade. Used only to replace four existing PA-7100 M128 memory modules (512 MB) with two PA-8000 M707 memory modules (1 GB). Used in conjunction with UPC1812, UPC1813, UPC1815, UPC1816, UPC1822, and UPC1825.	Two M707 memory modules
UPU403-01	PCI	Upgrade a U401-01 PCI card to a U403-01 PCI card. Customer installable.	One U403-01 PCI card
UPU403-02	PCI	Upgrade a U401-02 PCI card to a U403-02 PCI card. Customer installable.	One U403-02 PCI card
UPU403-03	PCI	Upgrade a U401-03 PCI card to a U403-03 PCI card. Customer installable.	One U403-03 PCI card
UPU403-04	PCI	Upgrade a U401-04 PCI card to a U403-04 PCI card. Customer installable.	One U403-04 PCI card

6.1.2 PA-8000 Upgrade Kits

The following table lists the marketing IDs of the PA-8000 CPU/cache and memory upgrade kits.

Marketing ID	Module Type	Description	Contents
UPM706	Memory	Memory upgrade (128-MB memory module)	One M706 memory module
UPM707	Memory	Memory upgrade (512-MB memory module)	One M707 memory module
UPM708	Memory	Memory upgrade (1-GB memory module)	One M708 memory module
UPM7604	Memory	Replace one existing M706 memory module (128 MB) with two M707 memory modules (1 GB).	Two M707 memory modules
UPM7605	Memory	Replace two existing M706 memory modules (256 MB) with two M707 memory modules (1 GB).	Two M707 memory modules
UPM7606	Memory	Replace three existing M706 memory modules (384 MB) with two M707 memory modules (1 GB).	Two M707 memory modules
UPM7607	Memory	Replace four existing M706 memory modules (512 MB) with two M707 memory modules (1 GB).	Two M707 memory modules
UPM7624	Memory	Replace one existing M706 memory module (128 MB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7625	Memory	Replace two existing M706 memory modules (256 MB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7626	Memory	Replace three existing M706 memory modules (384 MB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7627	Memory	Replace four existing M706 memory modules (512 MB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7640	Memory	Replace one existing M707 memory module (512 MB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7641	Memory	Replace two existing M707 memory modules (1 GB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7642	Memory	Replace three existing M707 memory modules (1.5 GB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPM7643	Memory	Replace four existing M707 memory modules (2 GB) with three M708 memory modules (3 GB).	Three M708 memory modules
UPC1808	CPU/cache	Uni processor (Model 418) to twin processor (Model 428) upgrade	Two G805 CPU/cache modules

6.2 PA-7100 System to PA-8000 System Upgrade

A PA-7100 FTX Continuum 400 Series system can be upgraded to a PA-8000 system by replacing the suitcases with PA-8000 suitcases. The PA-8000 system must be located in a computer room environment and have access to 220 VAC power.

NOTE: If the system base has an AA-E78100 backplane, the system base will need to be upgraded to a AA-E78110 backplane at the same time the PA-7100 suitcases are replaced with PA-8000 suitcases. This requires a new AA-E69900 system base assembly (Marketing ID# UPB8000).

Perform the following procedure to upgrade a PA-7100 system to a PA-8000 system.

1. Install Release 3.3 or later of the FTX operating system. Refer to the *FTX System Administrator's Guide: Software Installation* (R454X) for detailed information on upgrading the operating system.
2. Power down the system.
3. Remove the top end caps (Styrofoam) from the PA-8000 suitcase packaging.
4. Remove the two suitcases from the PA-7100 system and place them on the end caps to prevent dirt or other contaminants from getting into the suitcase connectors.
5. Determine the part number of the system base backplane using either of the following methods:
 - (a.) Examine the rework revision label of the AA-E69900 system base. The label is located next to the AA-E69900 label. If the rework revision is 4 or above, it indicates that the base has an AA-E78110 backplane installed.
 - or
 - (b.) Open the door to PCI card cage 3 and look for a white bar coded label located behind PCI card slots 2 and 3. An AA-E78110 backplane is required to support the PA-8000 suitcases.
6. If the system base backplane is an AA-E78110, follow procedure A below. If not, follow procedure B.

Procedure A (use if backplane is AA-E78110):

1. Replace any U401-XX and U402 PCI cards with the appropriate U403-XX (replacements for U401s) and U404 (replacements for U402s) cards.
2. Check the firmware revision of the U501 and U502 cards as follows:
 - (a.) Enter the following command:


```
/sbin/hwmain ls model_number
```


where *model_number* is the model number of the U501/U502 card (**U501** or **U502**).
 - (b.) Check the entry in the `PCRv` field. If it is `0ST5` for each card, go to Step 3. If it is not `0ST5`, continue with Step (c.).
 - (c.) Update the promcode on the U501 cards by entering the following commands:

```
hwmaint burnprom -f /etc/stratus/prom_code/u5010fw0st5raw
2 0 7
hwmaint burnprom -f /etc/stratus/prom_code/u5010fw0st5raw
3 0 7
```

(d.) Update the promcode on the U502 cards by entering the following commands:

```
hwmaint burnprom -f /etc/stratus/prom_code/u5020fw0st5raw
2 0 3
hwmaint burnprom -f /etc/stratus/prom_code/u5020fw0st5raw
3 0 3
```

(e.) Repeat Step a. to verify that the promcodes are correct.

3. Install two PA-8000 suitcases on the system base.

NOTE: To prevent dirt or other other contaminants from getting into the suitcase connectors, do not set the suitcases on the floor when removing them from the packaging.

4. Replace the two AC power cords with 220 VAC power cords.

5. Reboot the system with Release 3.3 or later.

Procedure B (use if backplane is AA-E78100):

1. Remove the following components from the old system base:

- Disk drives
- PCI cards and associated cables (except U501 and K138 cards))

2. Install a new AA-E69900 system base assembly (Marketing ID# UPB8000). This assembly includes the AA-E78110 backplane, power supply, U501 and K138 cards.

3. Install the disk drives and PCI cards (and associated cables) in the new system base (see note).

NOTE: U401-XX and U402 PCI cards are not supported in PA-8000 systems. They must be replaced by the appropriate U403-XX (replacements for U401s) and U404 (replacements for U402s) cards.

4. Check the firmware revision of the U501 and U502 cards as follows:

(a.) Enter the following command:

```
/sbin/hwmaint ls model_number
```

where *model_number* is the model number of the U501/U502 card (**U501** or **U502**).

(b.) Check the entry in the `PcRv` field. If it is `0ST5` for each card, go to Step 5. If it is not `0ST5`, continue with Step (c.).

(c.) Update the promcode on the U501 cards by entering the following commands:

```
hwmaint burnprom -f /etc/stratus/prom_code/u5010fw0st5raw  
2 0 7  
hwmaint burnprom -f /etc/stratus/prom_code/u5010fw0st5raw  
3 0 7
```

(d.) Update the promcode on the U502 cards by entering the following commands:

```
hwmaint burnprom -f /etc/stratus/prom_code/u5020fw0st5raw  
2 0 3  
hwmaint burnprom -f /etc/stratus/prom_code/u5020fw0st5raw  
3 0 3
```

(e.) Repeat Step a. to verify that the promcodes are correct.

5. Install two PA-8000 suitcases on the system base.

NOTE: To prevent dirt or other other contaminants from getting into the suitcase connectors, do not set the suitcases on the floor when removing them from the packaging.

6. Replace the two AC power cords with 220 VAC power cords.

7. Reboot the system with Release 3.3 or later.

6.3 PA-8000 CPU/Memory Upgrades

This section describes how to install CPU/cache and associated memory module upgrades to PA-8000 FTX Continuum 400 Series systems at customer sites. The process consists of three parts:

- Use the CPU/Memory Burn ID-PROM tools to update ID PROM.
- Add CPU/cache and/or memory modules to the suitcase.
- Switch the operational status of the suitcases to update the partner.

6.3.1 ESD Requirements

Since many of the components on the CPU-Memory motherboard are particularly susceptible to ESD (Electro-Static Discharge), the CPU-Memory motherboard must be protected from ESD from the time that the board cover is removed until the cover is securely back in place. ESD protection kits must be employed when doing reconfigurations of Continuum suitcases.

The CPU/cache and memory modules must also be protected from ESD before they are removed from their ESD-protected packaging, and while being handled.

To prevent equipment damage while handling components, take the following ESD precautions:

- A securely fastened ESD wrist strap **MUST** be worn at all times when removing the components.
- Avoid touching a component's leads or contacts.

Set up the ESD protection kit as close to the system as possible. Instructions for setting up the rubberized mat, grounding wrist strap, etc. are supplied with the kit.

6.3.2 Upgrade Procedure

This section describes the steps needed to install a CPU/Cache/Memory upgrade into a customer's system in the field.

The procedure for upgrading suitcases is performed in the following sequence:

- Burn the ID PROM on the CPU-Memory motherboard in the first suitcase.
- Burn the ID PROM on the CPU-Memory motherboard in the second suitcase.
- Install CPU/cache and/or Memory modules on the CPU-Memory motherboard in the first suitcase.
- Switch the operational status of the two suitcases.
- Install CPU/cache and/or Memory modules on the CPU-Memory motherboard in the second suitcase.

CAUTION: ESD protection must be maintained for all parts of this process where the ESD covers have been removed from the suitcase.

Before you begin the procedure, check the CPU/cache and/or memory modules you will be adding to the system. Write down the following information for each component (listed on the bottom of each module) and indicate which suitcase (0 or 1) the component will be installed in. This is important because you need to enter the information in the proper suitcase ID prom and place the correct labels on the suitcase after you have completed the upgrade procedure.

- Subassembly model number
- Sub model number
- Serial number
- Revision number
- Artwork revision number

NOTE: The subassembly model number and sub model number are listed within the part number (e.g., if the part number is AA-G22100, the subassembly model number is G221 and the sub model number is 00).

The following subsections outline the procedure in detail. Be sure to follow the steps in the order they are listed.

6.3.2.1 Burning the Board ID PROM

1. Login as **root**.
2. Use the **update_idprom** command to burn one of the CPU-Memory motherboards with the new ID PROM image.

Sample Command:

```
/sbin/update_idprom -i /dev/idmem/idmem00
```

where **-i** specifies the **idmem** file and **00** is the slot number.

NOTE: The suitcase must be online for **update_idprom** to access the CPU-Memory motherboard ID PROM.

The following screen appears.

```
Show/Add_/Delete_/List__subassembly/Validate/Write/Exit?
```

If you need to remove any memory modules (when upgrading from one memory module type to another) from the CPU-Memory motherboard before upgrading it, go to Step 3. Otherwise, go to Step 6.

3. Enter **d** (for delete). A screen similar to the following appears showing all the subassemblies on the CPU-Memory motherboard.

index	model	serial	submodelx	rev	art
0:	G801	10091	0	31	0
1:	P257	199	0	5	0
2:	E797	231	0	1	0
3:	G805	1814	0	0	0
4:	G805	1832	0	0	0
5:	M706	0	0	0	0
6:	M706	0	0	0	0

M706 is a 128-MB memory module; M707 is a 512-MB memory module.

NOTE: If the E797 subassembly is not recognized, you can add an entry for it using a fake serial number.

4. Enter the number of the index for the first subassembly you want to delete (e.g., **4**). A message similar to the following will appear.

```
Delete: model=M706 serial=0
```

[Delete] correct?

5. If the information is correct, enter **y** and repeat the process for any other subassemblies that need to be deleted.

6. To add subassemblies, enter **a**.

The following screen will be displayed.

[Add] subassembly model?

7. Enter the required information for the CPU/cache or memory module you will be installing on the CPU-Memory motherboard.

The following are the subassembly models for CPU/cache and memory modules:

Memory module = M706 (128-MB), M707 (512-MB), or M708 (1-GB), CPU/cache module (2-MB cache) = G805.

8. After you have entered the subassembly model and pressed the **Return** key, you are prompted for the following information on subsequent screens.

[Add] serial number?

[Add] submodel?

[Add] revision?

[Add] art revision?

Fill in the information as requested. When finished, a screen similar to the following will appear.

Add: model=M706 serial=0 submodel=0 rev=1 art_rev=2

[Add] correct?

9. If the information is correct, enter **y**.

The following screen appears.

Show/Add_subassembly/Delete_subassembly/Validate/Write/Exit?

10. Repeat the process to add the remaining subassemblies.

11. When finished, enter **v** to validate the information.

A screen similar to the following appears.

CPU Board modelx G221, 180MHz Clock, 512MB Memory

Fru ID and Subassembly info validated.

Show/Add_subassembly/Delete_subassembly/Validate/Write/Exit?

NOTE: The validate command reads through the subassembly information, verifies that the information is correct, and updates several fields of the idprom according to the subassembly information. An error message will appear if any of the following are detected:

- CPU/cache modules are not all the same type
- invalid number of CPU/cache modules
- invalid number of memory modules
- memory modules are not all the same type

- G805 subassembly is missing
- P257 subassembly is missing
- subassembly model is unknown

12. If the validation is successful, enter **w** to write the information.

The following screen appears.

```
ID prom written and verified.
```

```
Show/Add_subassembly/Delete_subassembly/Validate/Write/Exit?
```

13. Enter **e** to exit.

14. Repeat this procedure to update the CPU-Memory motherboard in the second suitcase.

15. When both CPU-Memory motherboards have had their ID PROM updated, proceed to the next section.

6.3.2.2 Installing CPU/cache and Memory Modules

NOTE: When performing the following procedures, use care installing or reinstalling screws and covers to maintain FCC compliance.

1. Logically delete the first suitcase to be upgraded. (Omit this step if this is the second suitcase being upgraded, since it is already deleted.)

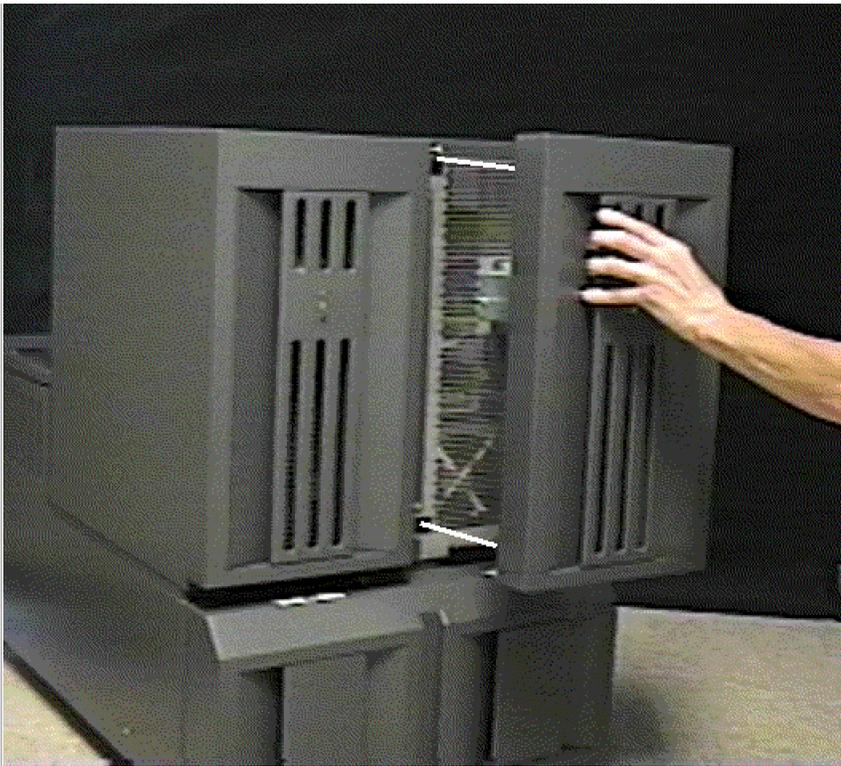
Sample Command:

```
hwmaint delete 0
```

The green LED on the deleted suitcase will go out and its amber LED will come on.

2. Grasp the front cover on the first suitcase and pull it straight out from the chassis as shown in Figure 3.

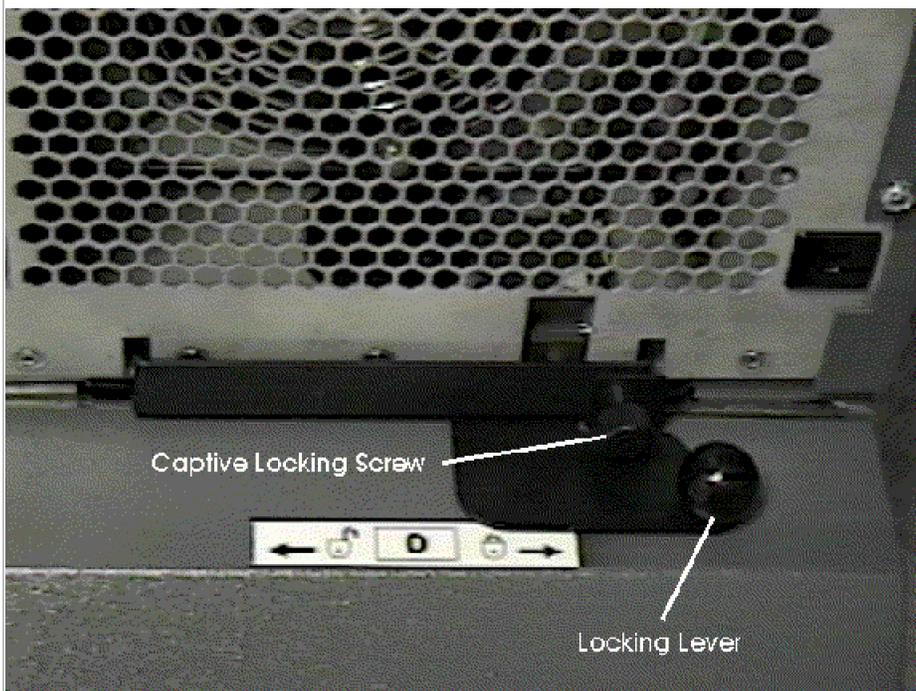
Figure 3. Removing the Suitcase Front Cover



3. Loosen the captive locking screw on the locking lever. (See Figure 4.)

4. Slide the locking lever fully toward the unlock symbol.

Figure 4. Suitcase Locking Lever

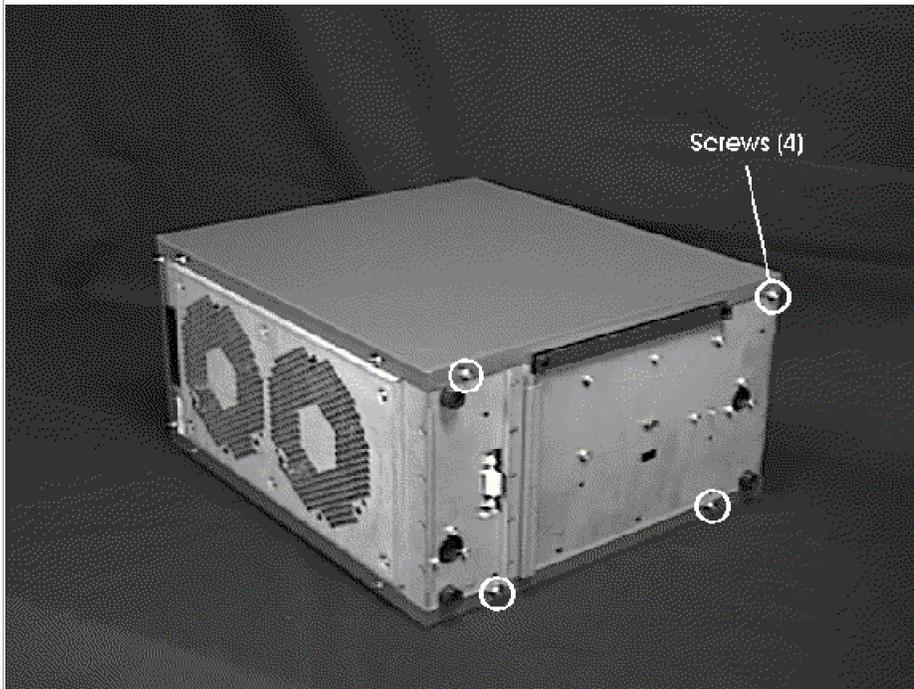


5. Grasp the suitcase handle and lift the suitcase straight up off the system base.

6. Turn the suitcase on its side and remove the four screws securing the suitcase cover to the bottom of

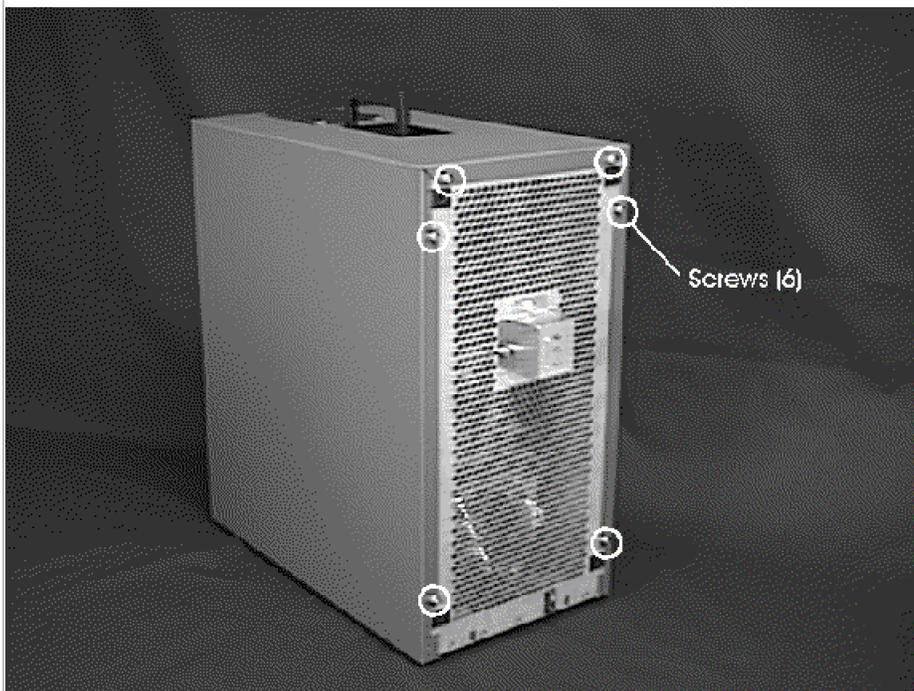
the suitcase. (See Figure 5.)

Figure 5. Removing the Suitcase Cover Bottom Screws



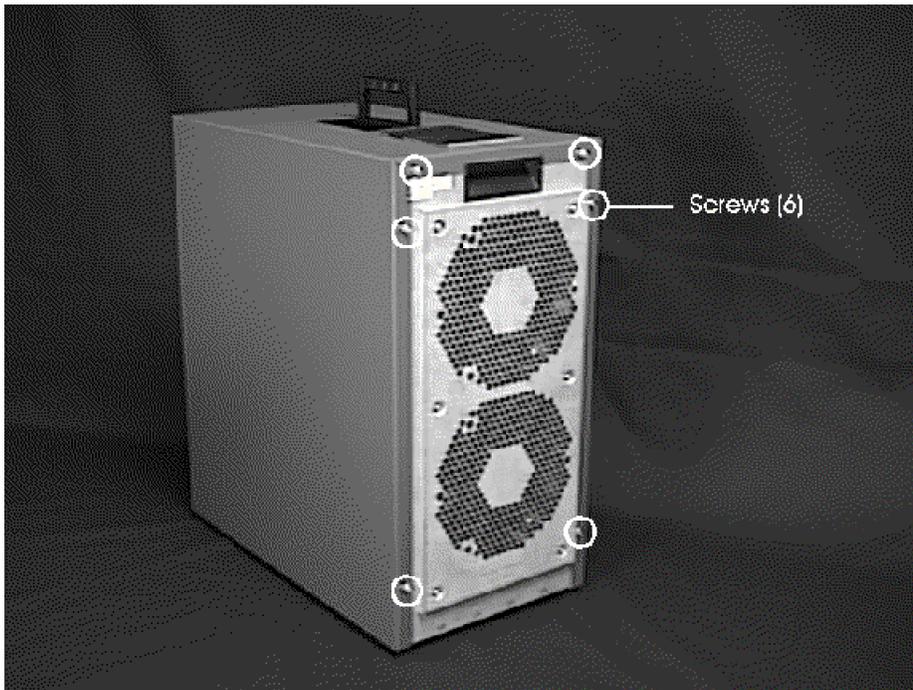
7. Return the suitcase to its upright position and remove the six screws securing the cover to the front of the suitcase. (See Figure 6.)

Figure 6. Removing the Suitcase Cover Front Screws



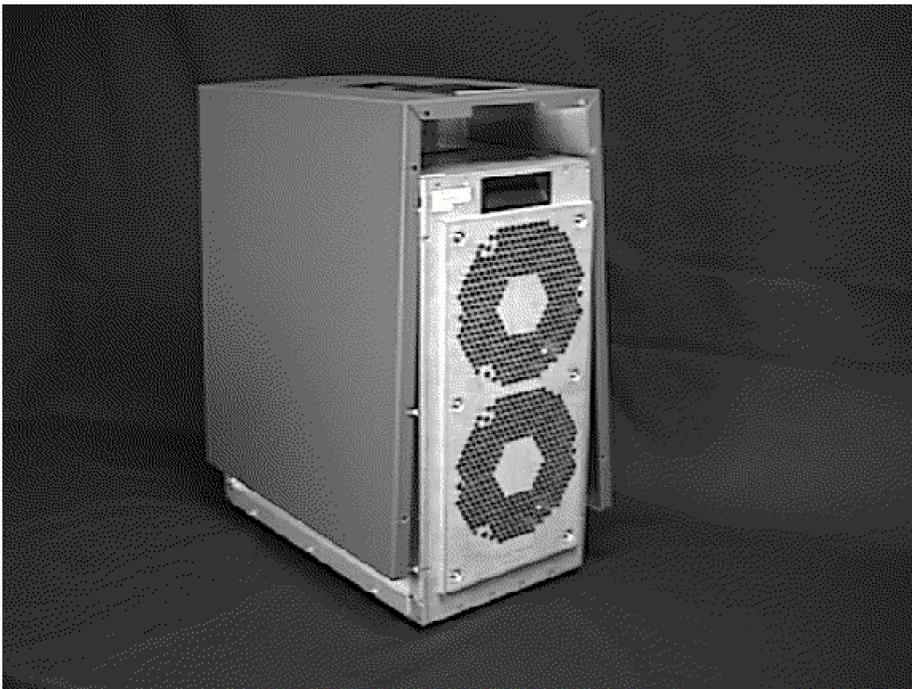
8. Remove the six screws securing the cover to the rear of the suitcase. (See Figure 7.)

Figure 7. Removing the Suitcase Cover Rear Screws



9. Pull outward on the bottom of the sides of the suitcase cover and lift it up and off the suitcase as shown in Figure 8.

Figure 8. Removing the Suitcase Cover



Follow the procedures below to physically configure the motherboard by adding CPU/cache modules and/or memory modules. The following table describes the CPU/cache and memory module upgrade options and their associated procedures. Refer to [Figure 10](#) for the locations of the memory modules on the CPU-Memory motherboard. Refer to [Figure 14](#) for the location of the CPU/cache modules.

CAUTION: Be sure to follow all ESD precautions from this point on.

Module Type	Model Number	Upgrade Option	Procedure
CPU/cache	G805	Uniprocessor to twin processor	Add one pair of G805 CPU/cache modules (pair #2).
Memory	M706	128 MB to 256 MB	Add one M706 memory module (slot #1)
Memory	M706	128 MB to 384 MB	Add two M706 memory modules (slots #1 and #2)
Memory	M706	128 MB to 512 MB	Add three M706 memory modules (slots #1, #2, and #3)
Memory	M706	256 MB to 384 MB	Add one M706 memory module (slot #2)
Memory	M706	256 MB to 512 MB	Add two M706 memory modules (slots #2 and #3)
Memory	M706	384 MB to 512 MB	Add one M706 memory module (slot #3)
Memory	M707	512 MB to 1 GB	Add one M707 memory module (slot #1)
Memory	M707	512 MB to 1.5 GB	Add two M707 memory modules (slots #1 and #2)
Memory	M707	512 MB to 2 GB	Add three M707 memory modules (slots #1, #2, and #3)
Memory	M707	1 GB to 1.5 GB	Add one M707 memory module (slot #2)
Memory	M707	1 GB to 2 GB	Add two M707 memory modules (slots #2 and #3)
Memory	M707	1.5 GB to 2 GB	Add one M707 memory module (slots #3)
Memory	M708	1 GB to 2 GB	Add one M708 memory module (slot #1)

Installing a Memory Module

CAUTION: To prevent damage to the CPU-Memory board, do not place the suitcase on its side during the following procedure.

1. Loosen the two captive screws securing the memory module access cover and remove the cover. (See Figure 9.)

Figure 9. Removing the Memory Module Access Cover

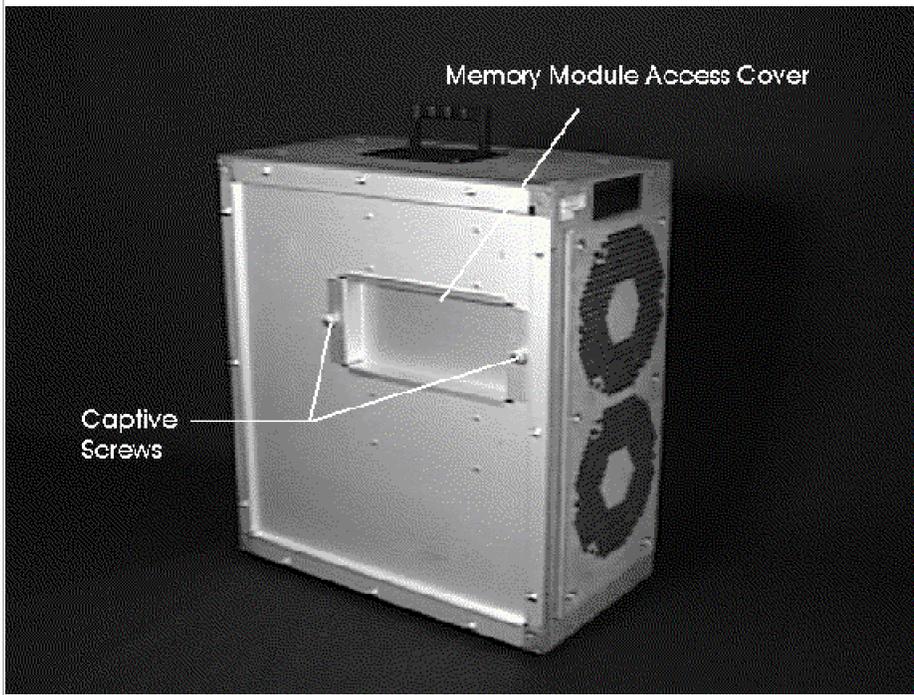
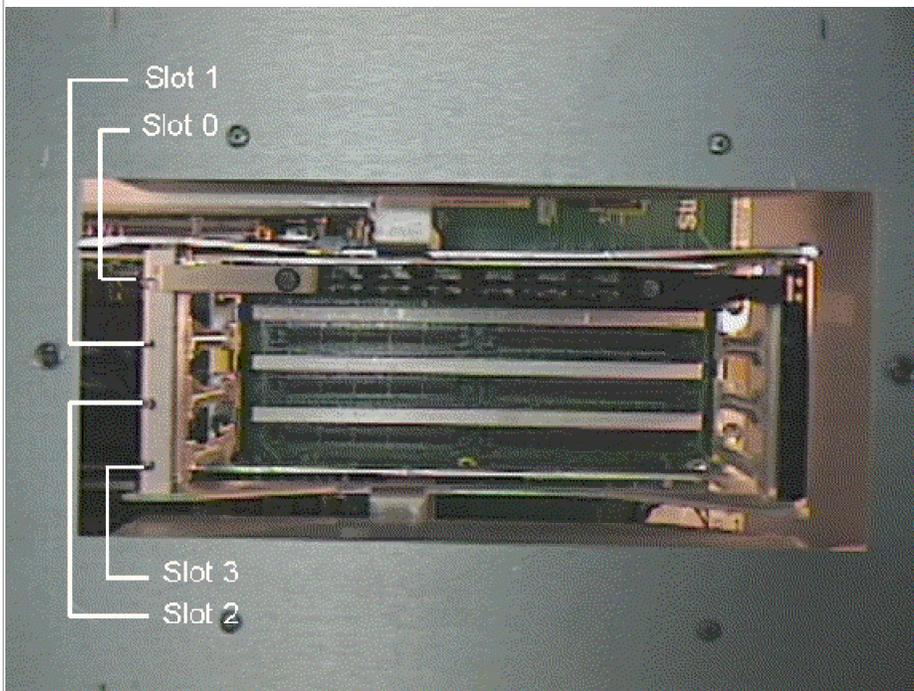


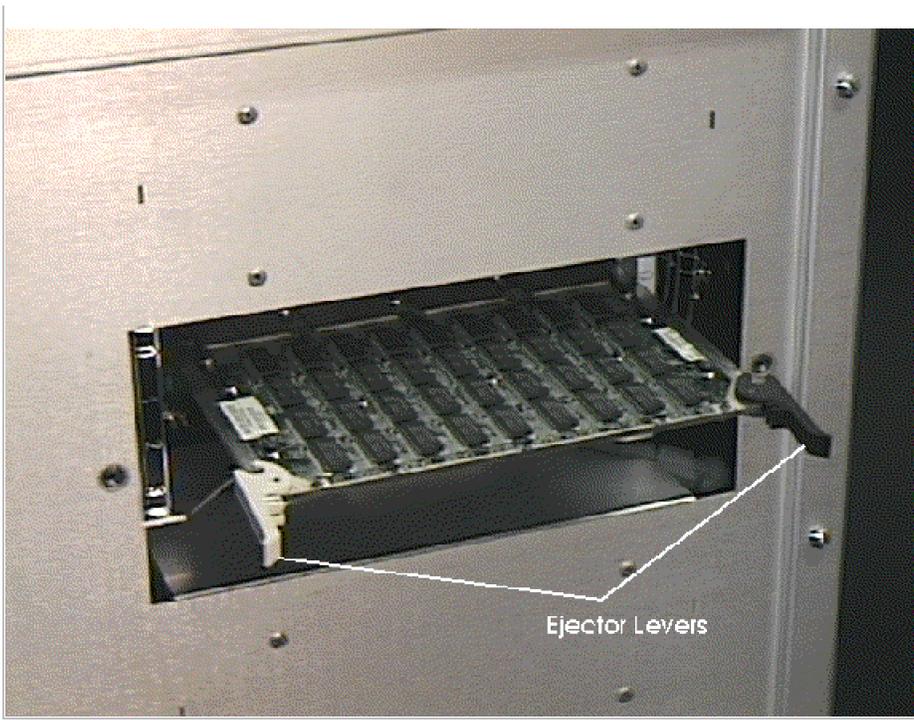
Figure 10 shows the location of the memory modules. The first memory module is in slot #0, the second module in slot #1, the third in slot #2, and the fourth in slot #3.

Figure 10. Memory Module Locations



2. If the memory module(s) being installed is not the same size as the module(s) previously installed, remove the previously installed module(s) by releasing the module's ejector levers and pulling the module straight out from the connector. (See Figure 11.)

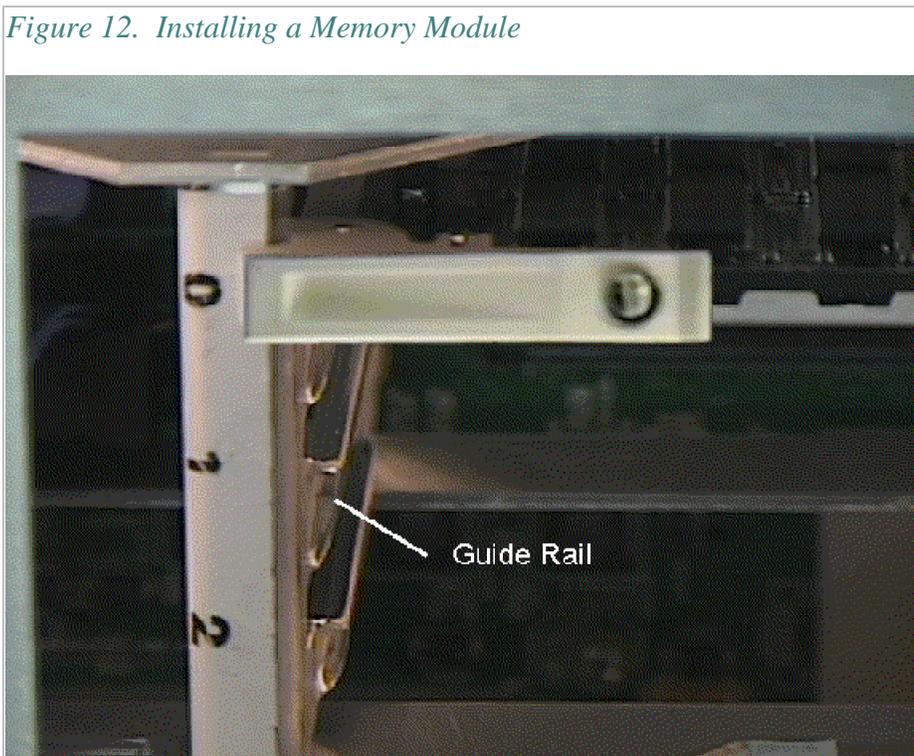
Figure 11. Removing a Memory Module



3. Install each new module by aligning it with the guide rails in the next available slot and sliding it all the way in until it is seated in the connector and then close the levers. (See Figure 12.)

CAUTION: When installing a memory module, make sure its white ejector lever is on the same side as the white stripe on the memory module card cage (the other side has a black stripe). Installing a module upside down can cause damage to the connectors.

Figure 12. Installing a Memory Module



4. When all memory modules have been installed, replace the access cover and tighten the captive screws.

5. Replace the suitcase covers and reinstall the suitcase.

6. Repeat the procedure for the other suitcase.

Installing a CPU/Cache Module

The following procedure describes how to upgrade a uni processor CPU-Memory board to a twin processor board.

CAUTION: To prevent damage to the CPU-Memory board, do not place the suitcase on its side during the following procedure.

1. Remove the 12 screws securing the cover to the CPU-Memory motherboard.
(See Figure 13.)

Figure 13. Removing the Cover from the CPU-Memory Motherboard

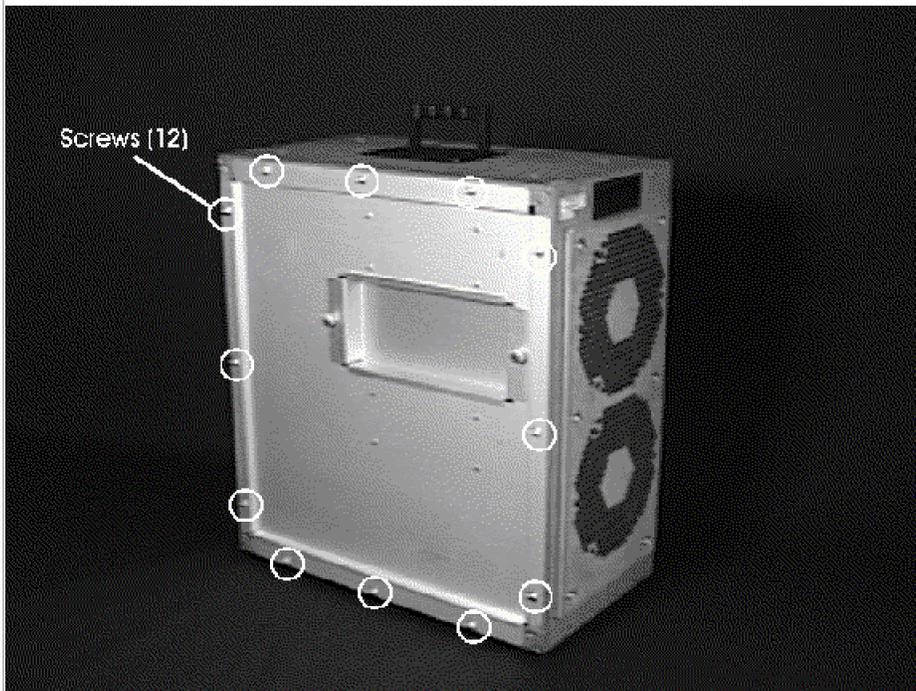


Figure 14 shows the location of the CPU/cache modules.

Figure 14. CPU/Cache Module Locations

4. Pull the module straight out.

5. Reach in and disconnect the two blue AMP wave crimp cables by squeezing the tabs on the sides of their connectors to release them. (See Figure 17.)

Figure 17. Disconnecting the AMP Wave Crimp Cables

The first upgrade CPU/Cache module will be installed in the position shown in Figure 18. Refer to steps 6, 7, and 8 to install it.

Figure 18. Location of First Upgrade CPU/Cache Module

6. Connect the module's fan plug to the CPU-Memory board backplane. (See Figure 19.)
7. Align the module with the locator pins (there are 2 on each side) and insert it all the way into the connector.

Figure 19. CPU/Cache Module Fan Plug and Locator Pins

8. Tighten the captive screws.
9. Reconnect the two blue AMP wave crimp cables.
10. Reinstall the CPU/cache module that was removed in steps 2-4. Be sure to connect the fan plug before inserting the module. Tighten the captive screws.

11. Install the second upgrade CPU/cache module in the position shown in Figure 20. Be sure to connect the fan plug before inserting the module. Tighten the captive screws.

Figure 20. Installing the Second Upgrade CPU/Cache Module

12. Replace the cover on the CPU-Memory motherboard and reinstall the 12 screws.

13. Replace the suitcase cover and reinstall all screws (16).

14. Replace the suitcase on the system base and lock it in place.

Upon replacement of the suitcase, the CPU-Memory motherboard will automatically run the on-board power-up self test. The yellow LEDs on the suitcase will blink during the self test. At the end of the self test, the red LED will be on steady, indicating the self test detected a local ID mismatch and the board will not come into service.

15. If this is the first CPU-Memory motherboard (suitcase) to be updated, proceed to Section 6.3.2.3.

If this is the second motherboard (suitcase), go to Step 16.

16. Bring the suitcase back online using the **hwmaint add** command.

Sample Command:

```
hwmaint add 1
```

The suitcase should now duplex with its partner and they should both become green-lit.

6.3.2.3 Switching the Operational Status of the Boards

1. Use the **hwmaint add -x** command to switch the operational status of the first suitcase with the second suitcase (that is, the upgraded suitcase goes online and the partner suitcase is deleted).

Sample Command:

```
hwmaint add -x 0
```

where **0** is the slot location of the upgraded suitcase.

In a few minutes the suitcase containing the upgraded CPU-Memory motherboard will have its yellow and green LEDs lit (indicating it is online and simplex), and the other suitcase will become amber-lit.

2. Go to Section 6.3.2.2 and follow the procedure (beginning at step 2) to physically upgrade the second board.

6.3.2.4 Updating the Suitcase Label

1. In the spaces provided on the label affixed to the top of the suitcase (see diagram below), write in the part numbers (P/N) and serial numbers (S/N) of the CPU/Cache module(s) and/or memory module(s) that were added to the CPU-Memory motherboard.

2. Install the label insert provided with the upgrade kit as shown in Figure 21.

Figure 21. Suitcase Upgrade Label

6.3.2.5 Returning Parts

If any memory modules were removed, place them in anti-static bags and return them to manufacturing. Indicate on the outside of the bags that they are being returned because they were upgraded.

7. Related Documentation

The following manuals contain additional information on FTX Continuum 400 Series systems.

- [Continuum 400 Series Illustrated Parts Breakdown](#)
- [Continuum Series 400/FTX Product Marketing Guide \(SG115\)](#)
- *System Diagnostic User's Guide (HR065)*
- *FTX Continuum 400 Series: Site Planning Guide (R411)*
- *FTX Continuum 400 Series: Installation Guide (R443X)*
- *FTX Continuum 400 Series: Operation and Maintenance Guide (R442X)*
- *FTX System Administrator's Guide: General Services (R455X)*
- *FTX System Administrator's Guide: Volume Management (R479X)*
- *FTX System Administrator's Guide: File Systems (R456X)*
- *FTX System Messages Manual (R475X)*
- *FTX Commands Reference Manual (R460X)*
- *FTX Continuum 400 Series: U401 PCI Card Installation Guide (R437X)*
- *FTX Continuum 400 Series: U402 PCI Card Installation Guide (R447X)*
- *FTX Continuum 400 Series: U501 PCI Card Installation Guide (R438X)*
- *FTX Continuum 400 Series: U510 PCI Card Installation Guide (R439X)*
- *FTX Continuum 400 Series: U530 PCI Card Installation Guide (R440X)*
- *FTX Continuum 400 Series: U502 PCI Card Installation Guide (R444X)*
- *FTX Continuum 400 Series: U520 PCI Card Installation Guide (R445X)*
- *FTX Continuum 400 Series: U540 PCI Card Installation Guide (R446X)*

8. Part Numbers

The following tables list the part numbers for the Customer Replaceable Units (CRUs), Field Replaceable Units (FRUs), and Distributor Replaceable Units (DRUs) that are unique to the PA-8000 Continuum 400 Series system.

Description	CRU/FRU/DRU	Part Number
CPU-Memory motherboard	DRU	AA-
Suitcase, 180 MHz, Uni processor, 2 MB cache	CRU	AA-G21100
Suitcase, 180 MHz, Twin processor, 2 MB cache	CRU	AA-G22100
CPU/Cache module	FRU	AA-G80500
Memory module (128-MB)	FRU	AA-M70600
Memory module (512-MB)	FRU	AA-M70700
Memory module (1-GB)	FRU	AA-M70800
Suitcase power supply	DRU	AA-P25700
Suitcase power supply interface PCB	DRU	AA-E79700
Suitcase fan	DRU	
Power cord (North America: 250V/20A, NEMA 6-20) 1.8 m (6 ft) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190011 AW-B190012 AW-B190013

Power cord (Continental Europe: 250V/13A, Type VII G) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190014 AW-B190015
Power cord (Great Britain and India: 250V/13A, Type BS/89/13) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190016 AW-B190017
Power cord (Uncommitted or Universal: 250V/20A) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190018 AW-B190019
Power cord (Australia and New Zealand: 250V/15A, Type SAA/3/15) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190020 AW-B190021
Power cord (Denmark and Switzerland: 250V/15A, Type 1302) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190022 AW-B190023
Power cord (Italy: 250V/16A, Type I/3/16) 2.5 m (8.2 ft) 3.7 m (12 ft)	CRU	AW-B190024 AW-B190025
UPS conversion kit (domestic) - contains: 250V/20A 12-ft line cord (2) UL/CSA, RS-232 12-ft cable (1)	CRU	AK-000322 AW-B19013 AW-000974-12
UPS conversion kit (international) - contains: 250V/20A 12-ft line cord (2) UL/CSA, RS-232 12-ft cable (1) UL/CSA 2-meter patch cord (4)	CRU	AK-000323 AW-B19015 AW-000974-12 AW-B19028