RS/6000 7044 Model 270

Technical Overview and Introduction

February 13, 2000

Volker Haug

Jeanine Indest

Scott Vetter

International Technical Support Organization

Austin, TX

IBM

RS/6000 7044 Model 270 Technical Overview

The IBM RS/6000 family is a scalable, software-compatible line of RISC UNIX workstations, servers, and supercomputers powered by IBMs AIX operating system. On February 7, 2000, IBM announced two exciting additions to this family, the 44P Models 170 and 270.

This paper provides a brief history, a general description, and a technical overview of the 44P Model 270 including: the 64-bit copper technology of the POWER3-II processor, the error checking and correcting (ECC) memory subsystem, the advanced packaging design, the built-in service processor, the sophisticated graphics support, and other selected features.

History

The original 43P Model 140 graphics workstation and entry-level workgroup server was introduced on October 8, 1996. This uniprocessor system offered a variety of processing speeds and features. The 43P Model 240 was the first RS/6000 workstation/workgroup server to offer expandability to 2-way symmetric multiprocessing (SMP). The 43P Model 150 offered enhanced performance over the Model 140. The Model 260 is a 1- or 2-way SMP system utilizing the 64-bit 200 MHz POWER3 processor. Both models were introduced on October 5, 1998 and are still available.

General Description

The RS/6000 44P Models 170 and 270 extend the IBM line of powerful and affordable workstation/workgroup servers with state-of-the-art, 64-bit copper POWER3-II processors. The 44P family, manufactured in Rochester, Minnesota, USA and Santa Palomba, Italy, offers ideal solutions for both high-performance 2D or 3D MCAD/CAE users and companies that require a compact system for commercial computing solutions, such as Lotus Notes Server, business intelligence, Web server, software development, firewall, high availability (HACMP), scientific, and technical.

Minimum and Optional Features

The 44P 7044 Model 270 minimum configuration comes with a standard of 256 MB ECC synchronous dynamic random access memory (SDRAM), one 9.1 GB Ultra SCSI disk drive, a 32X max. speed CD-ROM drive, a 1.44 MB 3.5" diskette drive, an integrated 10/100 Ethernet controller (AUI and RJ45), an internal Ultra SCSI controller, an external Ultra2 SCSI controller, a service processor, and an operator panel. The operator panel has a 2 x 16 backlit LCD for system status and diagnostic information. Microphone and headphone jacks are built into the operator panel.

One, two, three, or four 375 MHz POWER3-II 64-bit processors are connected to an IBM-designed high performance memory/system control chip set. Each processor has a 4 MB L2 cache. This is the first IBM implementation of copper technology in an SMP workstation and workgroup server. Refer to "Copper and CMOS Technology" on page 5 for more information.

The memory can be expanded to 8 GB of SDRAM. Two disk bays and three media bays are offered with the system. Five PCI slots and a variety of PCI adapters are available. The Model 270 offers integrated ports for tablet (for use with legacy input devices), keyboard, mouse, two serial (9-pin D-shell), one parallel (includes advanced features such as ECP, and Bi-Di), and a stereo audio connections (16 bit stereo, full duplex. Connectors for line in, line out, microphone, and headphone exist).

The media bay can hold a second CD-ROM drive, a 4 mm or 8 mm tape drive, or a SCSI disk drive. A media bay mounting kit is required to install a SCSI disk drive in the media bay.

A mouse and different national keyboards are used as input devices; both are available in black or ivory. You can also add a Spaceball or a Magellan 3D (Spacemouse) to your system.

Note

The SCSI disks in the disk bays are not hot-swappable. After AIX is quiesced, power may remain on while disks are swapped.

Physical Package

The 44P package is the same as used for the 43P Model 260 which is designed to sit on the floor and out of the way. Figure 1 shows the packaging of the Model 270 without the protective covers.
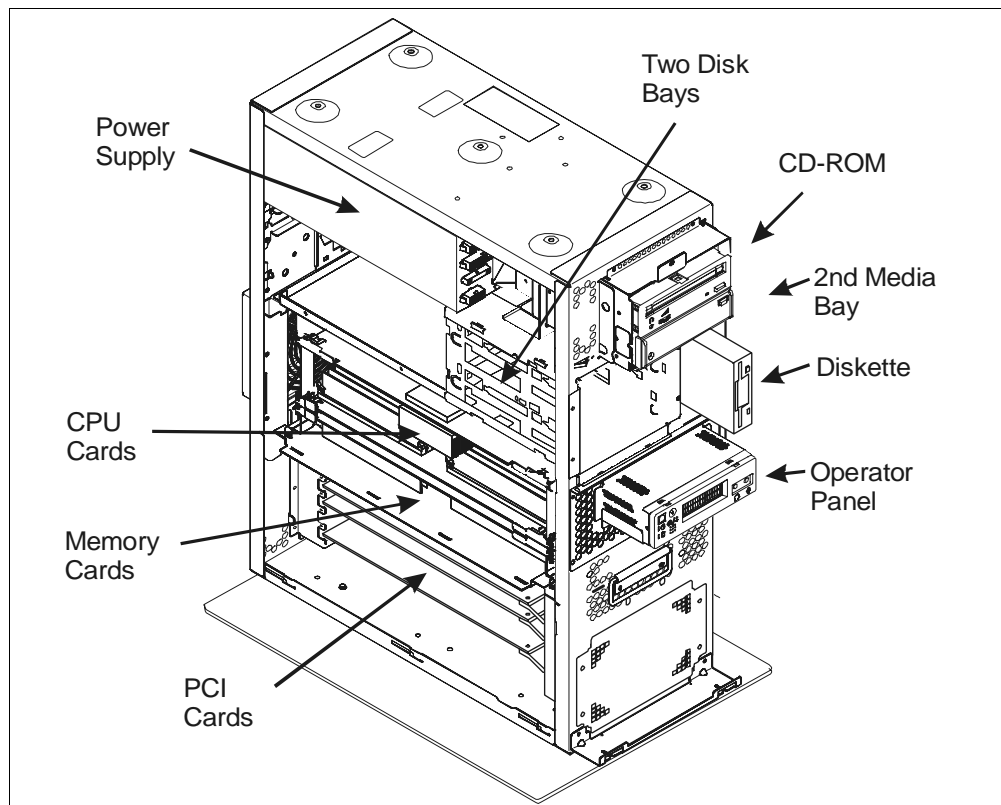

Figure 1. 7044-270 Package Layout

There is no desktop or rack-mounted option available for this model. The deskside package has a size of 340 mm W x 713 mm D x 610 mm H (13.4" W x 28.1" D x 24" H), a maximum weight of 45 kg (99 lbs), and is suitable for a quiet office environment.

The system comes preconfigured with the standard features, leaving one hard disk bay and one media bay available for customer expansion. Any devices in the media bays are connected to the internal Ultra SCSI controller (no additional cable is required).

To connect external SCSI devices to the Ultra2 SCSI adapter's VHDC, order # 2118 (mini-68 pin VHDC to 68 pin). This 0.3 m long cable (P/N 76H0518) is not included with the minimum system configuration.

System Upgrades

The 7044 Model 270 can be upgraded through feature modifications. Additionally, a 7043 Model 260 upgrade Miscellaneous Equipment Specification (MES) is available to upgrade an existing 7043 Model 260 to a 7043 Model 270, preserving the machine type and serial number. The Model 270 is designed for customer setup of the machine and for subsequent addition of most features (adapters and devices). However, the 7043-260 is upgraded by the IBM Customer Engineer (CE).

> **Note**
>
> The 7043 Model 260 to Model 270 upgrade may have limited availability. Check with your IBM representative for the most current information.

To minimize system downtime, a new chassis will be shipped with new (changed) electronic components already installed. The CE will move reusable components from the 260 to the 270. The 260 chassis and replaced parts will be returned to IBM. This upgrade requires that AIX 4.3.3 or higher be installed. Also, the firmware must be upgraded and will automatically change system model type and number to 7043-270 at boot. The upgrade will preserve the customer's existing system serial number.

The MES Upgrade Kit contains a mechanical chassis with associated labels and markings for the 7043-270, processor card, new system planar, new I/O planar, diskette drive, power supply, and all additional internal cables.

> **Note**
>
> The MES Upgrade Kit only includes one 1-way 375 MHz POWER3-II processor card. If an existing Model 260 has two processors, an additional 375 MHz POWER3-II processor card must be ordered to maintain the current processor configuration.

Architecture and Technical Information

The following sections provide more detailed information about the architecture of the Model 270. Figure 2 shows the high level system block diagram of the 44P Model 270 and is the topic of the subsequent discussion.
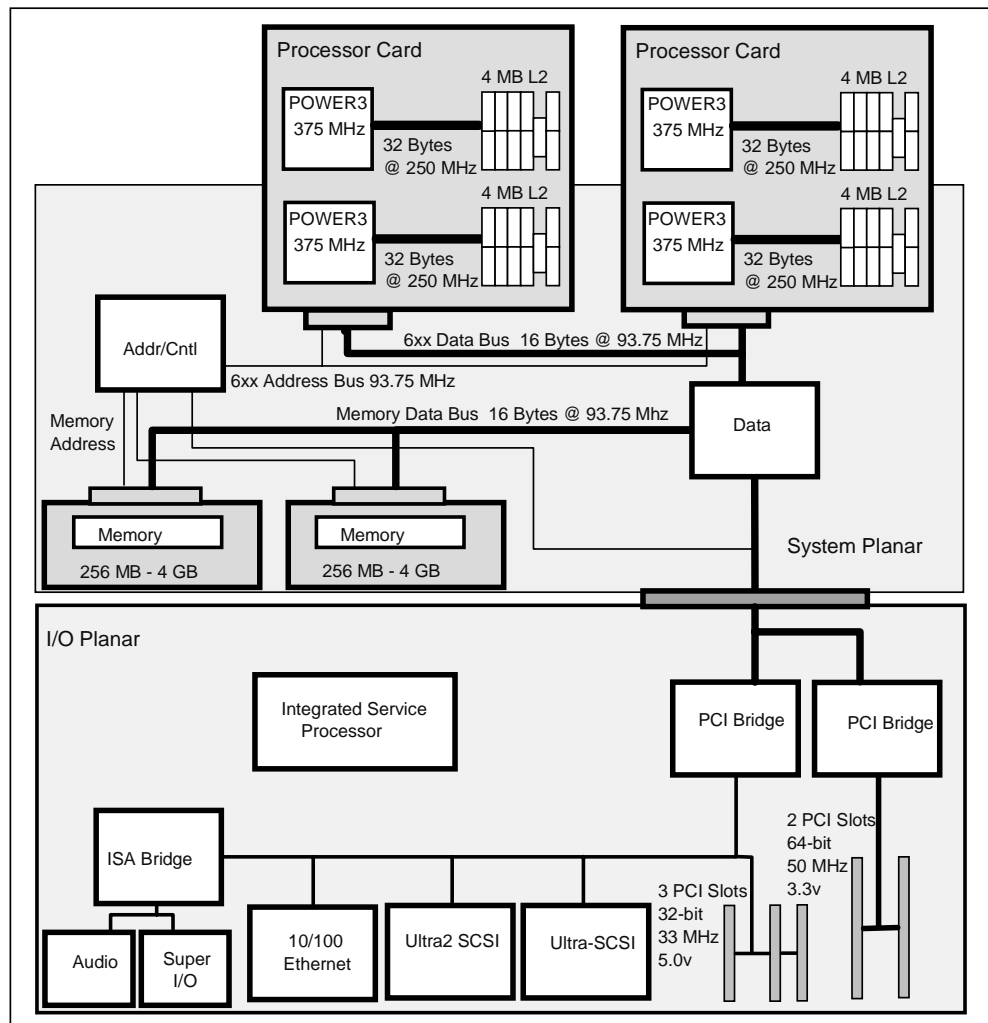
Figure 2. Model 270 - High-Level System Block Diagram

Processor and Cache

The Model 270 has two processor card slots and will accommodate two different processor cards, a 1-way and a 2-way (only a 1-way processor card is available for the 7043-260). Note that slot 1 must have a processor card installed for normal operations.

If your system unit uses two processor cards, both processor cards must be of the same clock speed. You cannot interchange processor cards between a Model 260 and Model 270.

```
┌─ Note ──────────────────────────────────────────────────────────────┐
```

Installing a processor card into your system unit may require updating the firmware. A diskette or CD-ROM is included with your new processor card if that is required. Check also the following Web page for the latest available firmware:

`http://www.rs6000.ibm.com/support/micro/`

The Model 270 uses a 64 KB data and a 32 KB instruction 128-way set associative L1 cache. The L1 cache is effectively supplemented by a 4 MB 4-way set associative L2 cache, which is located on the processor card (the POWER3 architecture used a 4 MB direct mapped L2 cache, operated at 200 MHz). The POWER3-II uses a private 32-byte L2 cache bus, operated at 250 MHz. Both the enhanced clock speed and 4-way set associative L2 cache improve cache efficiency. The L2 controller uses a least recently used (LRU) algorithm to avoid replacing recently used cache data and a set prediction mechanism that helps reduce L2 cache misses.

The current implementation of POWER3-II in the SP node uses 8 MB L2 cache (POWER3-II design allows up to 16 MB of L2 cache, but no RS/6000s currently make use of this limit).

POWER3-II Architecture

The processor functional diagram of the POWER3 and the POWER3-II are similar. However, the use of copper in the POWER3-II represents a new generation of processing power. Table 1 lists some of the differences between the POWER3 and the POWER3-II processors. Also, the chart indicates the direction being taken by this technology. The number of transistors increased in the POWER3-II due to the enhanced L2 cache controller and minor updates to handle different bus requirements.

Table 1. Differences POWER3 vs. POWER3-II

Description	POWER3	POWER3-II
Chip Die Size	270 mm^2	163 mm^2
Transistors	15 million	23 million
Power Avg/Max	39W/46W@200 MHz	26W/33W@375 MHz
CMOS Technology	6S2, 5 layers metal	7S, 6 layers metal, copper interconnect
Lithography	0.25 µm	0.22 µm

Copper and CMOS Technology

Copper is a superior conductor of electricity, making it possible to shrink the electronic devices even further while increasing performance. It has less resistance than aluminum and, therefore, allows designs that transmit electrical signals faster. However, it does not mix as well with silicon, the base material of semiconductor chips. The IBM researchers found a way to put a microscopic barrier between the copper and silicon in a way that actually reduced the number of steps needed to complete a chip. With this development, IBM is able to squeeze down the widths of copper wires to the 0.2-micron range from the current 0.35-micron widths - a reduction far more difficult for aluminum. A single POWER3-II chip contains about 400 meters of copper wiring.

This technology, called CMOS 7S, is the first to use copper instead of aluminum to create the circuitry on silicon wafers. Copper wires conduct electricity with about 40 percent less resistance than aluminum. That translates into a speed up of to 15 percent in processors that contain copper wires.

CPU Deallocation

There are two options available to deallocate a CPU:

1. **Processor Boot Time Deconfiguration**

   Processor boot time deconfiguration is a function implemented in the system and service processor firmware for deallocating processor(s) from the system configuration at boot time. The objective is to minimize system failure or data integrity exposure due to a faulty processor.

   The processors that are deconfigured remain offline for subsequent reboots until the faulty processor hardware is replaced. This function provides the option for a user to manually deconfigure or re-enable a previously deconfigured processor using the Service Processor menu.

   > **Note**
   >
   > Processor cards only can physically be removed when the power is turned off to the entire system.

   How to Disable the 2nd, 3rd, or 4th Processor Manually

   a. The additional processor(s) can be disabled only within the Service Processor menus. There is no need to remove them from the system. The `cpu_state` command, used on the micro-channel SMP servers, is not supported on the PCI-based systems.

      To determine if a processor is enabled or disabled, use the following AIX commands:

      - sar command:

        ```
        # sar -P ALL 2
        AIX volker_270 3 4 00465F2A4C00 02/07/00
        10:54:44 cpu %usr %sys %wio %idle
        10:54:46  0    0    0    0    100
                  1    0    0    0    100
                  -    0    0    0    100
        ```

        In the above example, you can see two configured processors, which are shown in the `cpu` column.

      - lsattr command:

        ```
        # lsattr -E -l proc0
        state enable Processor state False
        type PowerPC_ POWER3 Processor type False
        ```

        `state enable` means that processor #0 is enabled.

        ```
        # lsattr -E -l proc2
        state faulty Processor state False
        type PowerPC_ POWER3 Processor type False
        ```

        `state faulty` means that processor #2 is disabled.

      > **Note**
      >
      > The processor(s) remain deconfigured until manually reconfigured.

   b. There is another option to deconfigure processors manually:

      1. Power on your system or, if it is still running, start a reboot.

2. As soon as the first screen appears and you hear a beep, press the F1 key to invoke the graphical user interface (GUI) of the System Management Services (SMS) menu. (Press the number 1 key, if you have a ASCII terminal attached).

3. The SMS menu displays on your screen. Select the **Multiboot** option.

4. From the System Management Services Multiboot submenu select **OK Prompt**.

5. The Open Firmware prompt appears. At this point, enter the following command: `boot -scpu=X` where `X` can be 1, 2, 3, or 4 and represents the target number processor(s) to configure. This command will cause the system to continue the boot process.

You can check how many processors are configured with the `sar` command. The `lsattr` command does not listen the faulty state entry for any of the deconfigured processor(s).

> **Note**
>
> The processor(s) remain deconfigured until a reboot is invoked.

2. **Processor Run-Time Deconfiguration (Dynamic CPU Deallocation)**

Dynamic CPU Deallocation, or processor run-time deconfiguration, is a RAS (Reliability, Availability, Serviceability) enhancement function implemented in the system firmware, service processor firmware, and AIX operating system (Version 4.3.3 + APAR IY06844, or later) for dynamically removing CPUs from the system configuration during run time.

The objective is to minimize system failures or data integrity exposures due to a faulty processor. The processor to be removed is the one that has experienced repeated run-time recoverable internal errors (over a predefined threshold).

When a processor's internal recoverable error reaches a predefined threshold, the firmware is designed to notify the AIX operating system. The AIX operating system migrates all software processes and interrupts to another processor and puts the faulty processor in *stop state*. CPUs that are deconfigured at run-time remain offline for subsequent reboots via the CPU Boot Time Deconfiguration function until the faulty CPU hardware is replaced. The user can also enable and disable this RAS function via the AIX system management services.

Currently, the Models 270, S80, and the SP 375 MHz POWER3 SMP Thin and Wide nodes support Dynamic CPU Deallocation.

CPU Clock Rate

The different processor cards and the processor speeds can be identified by the SMS Display Configuration menu or by the following AIX command:

```
lscfg -vp | more
```

Page down to the `Processor Card` entry and search for the `Product Specification (ZC)` entry. This gives you detailed information about:

PS   Processor Clock Speed in Hz, ASCII coded hexadecimal

LB   L2 Bus Speed in Hz, ASCII coded hexadecimal

SB   System Bus Speed in Hz, ASCII coded hexadecimal

NP   Number of Processors on Card, ASCII coded hexadecimal

L2   L2 Size in number of Kilobytes, ASCII coded hexadecimal

Following is an example about the processor card information:

```
Processor Card:
    Part Number.................00P2172
    EC Level....................D72830
    Serial Number...............L200016008
    FRU Number..................00P2180
    Manufacture ID..............1980
    Version.....................RS6K
    Product Specific.(ZC).......PS=00165A0BC0,LB=000EE6B280,
                                              SB=00059682F0,NP=02,L2=04096,
                                              PF=764,CL=6,SV=3,VR=3,ER=0000
    Product Specific.(ZB).......BC=30602,SG=
    Physical Location: P1-C1
```

For example: PS shows the processor speed in hex-number digit
(0x00165A0BC0 = 375000000 Hz = 375 MHz).

CPU Part Numbers
Due to manufacturing issues the part number of the processor cards might
change. You can determine the part number of the current used processor cards
by the following method:

1. Enter the AIX command: `lscfg -vp | more`

2. Page down to the `Processor Card` entry and search for the `Product
   Specification (ZC)` entry.

3. Determine the number of processors by searching for the `NP` entry:

   - 01 = 1-way 375 MHz POWER3-II processor card
   - 02 = 2-way 375 MHz POWER3-II processor card

4. Scroll six rows up and determine the appropriate part number.

Memory

The memory subsystem of the Model 270 supports a 128-bit data path to
memory. A minimum of 256 MB of memory is required, and can be expanded to a
maximum of 8 GB SDRAM.

Dual inline memory modules (DIMMs) must be ordered and installed in matched
(size and speed) pairs on the memory cards. Memory cards can be installed in
either slot (or both) on the system board, there is no requirement that one be
installed before the other.

It is recommended that DIMMs be installed starting at the bottom of each card
(card slot J1 and J2) and then moving up. It is also recommended that slots in the
first memory card should be filled before a second memory card is installed.
There is no architectural requirement for this other than to help you organize your
memory. Skipping DIMM slot pairs or partial filling of boards does not enhance or
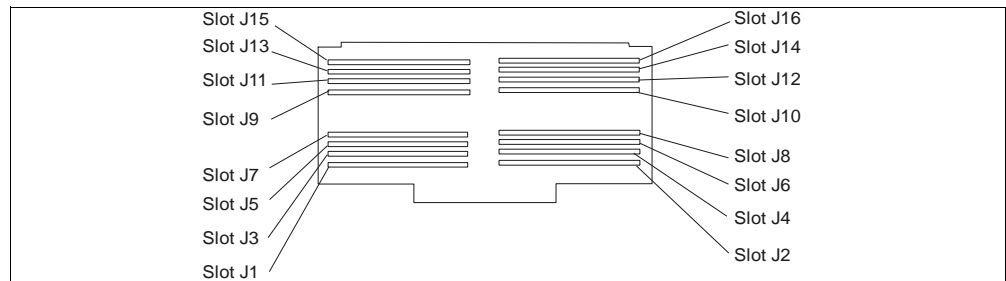degrade performance.

Figure 3. Memory Card

It is recommended that if only one memory card is installed, it should be installed in the primary planar slot J2 with the card *face down*. If a second memory card is installed, it should be installed in the secondary planar slot J3 with the card *face up* (relative to the top of the machine). In reference to memory card planar slots, there are only two slots J2 and J3. In the case of memory card DIMM slots, there are 16, J1 through J16, on each memory card.

Memory Boot Time Deconfiguration

Memory boot time deconfiguration is a function implemented in the service processor firmware for removing a memory segment or DIMM from the system configuration at boot time. The objective is to minimize system failures or data integrity exposure due to faulty memory hardware.

The memory segment or DIMM that are deconfigured remain offline for subsequent reboots until the faulty memory hardware is replaced. The function provides the option for the user to manually deconfigure or re-enable a previously deconfigured memory segment/DIMM via the Service Processor menu.

Memory can also be decreased via AIX using the `rmss` command. This is useful for certain benchmark simulations.

> **Note**
>
> Memory cards can physically be removed only when the power is turned off to the entire system.

Memory Interchange with Other Systems

The following comments apply to the different models:

- The 128 MB DIMMs (# 4110) can be interchanged with the Models 170, 260, 270, and F50.

- The 256 MB DIMMs (# 4119) can be interchanged with the Models 170, 260, and 270.

- The 512 MB DIMMs of the Model 170 (# 4121) can only be used in the Model 170.

- The memory expansion kit of the F50 (# 4093) is different from the one used in the Model 260 and 270 (# 4098).

16 GB Memory for the Model 270

Currently, there is no support for 512 MB DIMMs.

Mixed Sizes of Memory
The system design gives you the flexibility to mix 128 MB and 256 MB SDRAM DIMMs on the Memory Expansion Kit without loosing performance.

System Bus

The 6XX bus or system bus is optimized for high-performance and multiprocessing performance. The bus is fully parity checked and each memory or cache request is range checked and positively acknowledged for error detection. Any error will cause a machine check condition and is logged in the AIX error log. The system bus speed is operated with 93.75 MHz.

PCI-Bus, Slots, and Adapters

The Model 270 is compliant with Revision 2.1 of the peripheral component interconnect (PCI) specifications and implements two peer PCI busses: a 32-bit data bus operating at 33 MHz and a 64-bit bus operating at 50 MHz. There are five PCI slots available. Slots one and two are 64-bit and run at 50 MHz and slots three, four, and five are 32-bit and run at 33 MHz. All slots accept full-sized PCI adapter cards.

The 7043 Model 260 had three 5.0v PCI slots at 33 MHz (32-bit) and two 5.0v PCI slots at 50 MHz (64-bit). The 7044 Model 270 contains three 5.0v PCI slots at 33 MHz (32-bit) and two 3.3v PCI slots at 50 MHz (64-bit).

Because of the change in the voltage specification on the two 64-bit slots, only certain universal PCI adapter cards can be used in these slots. The 64-bit slots are physically keyed to accept either universal or 3.3v cards only. 5.0v cards will not seat in the card slots. If you are migrating cards from an existing Model 260, they must either be placed in the 32-bit slots or in the 64-bit slot if, and only if, they meet the PCI adapter voltage requirements (see the specifications for the particular PCI adapters in question).

A variety of graphics, SCSI, LAN, WAN, asynchronous, and SSA adapter cards can be installed in the 44P Model 270. More specific information about selected adapters is provided in the next sections.

LAN Adapters
The Model 270 can be connected through the LAN. It supports the following types of PCI adapters, which are all supported for NIM installations (use `chrp` as platform type):

- 25/155 Mbps ATM
- Gigabit Ethernet
- 10/100 Mbps Ethernet
- 4/16 Mbps token ring (100 Mbps token ring is not available at time of publication)

Graphics Accelerators
A choice of four graphics accelerators are offered for the Model 270. The GXT130P is an entry-price 2D adapter suitable for business graphics or Internet applications. The GXT300P is a high-performance, 24-bit color, 2D graphics accelerator with 3D capability via Softgraphics functions found in the graPHIGS and OpenGL APIs.

The GXT2000P and GXT3000P are full 24-bit capable accelerators and support the simultaneous execution of both graPHIGS and OpenGL applications. Currently, the GXT3000P is the most powerful graphics accelerator available.

The maximum number of graphics accelerators supported in this system is four (the GXT130P is limited to a maximum of three and the GXT3000P is limited to a maximum of two). Refer to the limitations section of the announcement for details on limitations associated with graphic accelerators for this system.

A graphics accelerator is not required in the minimum configuration. In order to attach an ASCII display, either # 3926 or both # 2934 and # 3925 must be ordered to provide connection. A 9-25 pin serial connector is not included by default. Determine if the ASCII display you wish to install requires an interposer, adapter, or both to avoid installation problems.

SSA Adapters
The Advanced SerialRaid Plus Adapter (# 6230) is available for the Model 270. Optional features include the 128 MB DRAM Option Card (# 6231) and the 32 MB Fast-Write Cache Option Card (# 6235).

Hot Plug PCI Adapters Capabilities
Hot plug capabilities for PCI adapters are not supported on the Model 270.

Hot plug PCI capabilities are, however, available within the RS/6000 product line. The RS/6000 SP Expansion I/O Units support hot plug for selected PCI adapters. This function enables the maintenance of these adapters without powering off the SP Expansion I/O Unit or the associated SP POWER3 SMP High Node. This function requires AIX Version 4.3.3 with APAR IY06844.

Service Processor

The Model 270 has an integrated Service Processor that is designed to provide an immediate means to diagnose, check status, and sense operational conditions of a remote system, even when the main processor is unavailable.

The Service Processor is a Motorola 68307 processor. The flash memory used for the storage of the Service Processor programs has increased to 1 MB, and 512 KB of SRAM memory are used for program execution. The additional memory has allowed enhanced function such as Dynamic CPU Deallocation.

Selected Service Processor Functions
Additional information is provided for the following selected functions:

Fast Boot
Selecting Fast Boot results in several diagnostic tests being skipped and reduces time for booting. This option has to be activated through the Service Processor menu. (The SXX series of enterprise sever uses the operator panel to enable/disable Fast Boot.)

There is a easy way to check Fast Boot enablement without entering the Service Processor menus. If Fast Boot is enabled, no spinner will appear at the Service Processor checkpoint E0B0. With the Slow Boot option enabled a spinner appears at E0B0. A spinner is a single text position on the operator LCD that cycles through the characters |, /, -, and \ symbolically representing the passage of time.

Processor Boot Time Deconfiguration

Processor boot time deconfiguration allows you to deconfigure processor(s) without removing them physically. This could be necessary in a benchmark situation. For more detailed information, refer to "CPU Deallocation" on page 6.

Memory Boot Time Deconfiguration

Memory boot time deconfiguration gives you the option to deconfigure memory without removing it physically. For more detailed information, see "Memory Boot Time Deconfiguration" on page 9.

Boot Mode Menu

The Boot Mode menu allows selection of the following boot options:

- Boot to SMS Menu
- Service Mode Boot from Saved List
- Service Mode Boot from Default List
- Boot to Open Firmware

Miscellaneous

The following selected information for DVD, ISA, USB, and Boot support is given:

DVD Support

Currently, DVD drives are not supported in RS/6000 systems.

ISA Support

The Model 270 does not support industry standard architecture (ISA) adapters.

USB Support

The Model 270 does not have integrated Universal Serial Bus (USB) support and no USB adapters are currently available for use in RS/6000s.

Boot Options and Limitations

Information about boot options is included in the subsequent sections:

Internal Devices

Boot support is available for every internal SCSI disk.

External Devices

Table 2 provides a map that enables you to determine if boot is supported in external storage devices.

Table 2. Boot Support - External Devices

Does the PCI card have RAID functionality?		
yes	no	
Card is seen as a controller **no boot support**	Card is seen as a adapter	
	Does the external device have RAID functionality?	
	yes	no
	no boot support (except Advanced SerialRAID Plus Adapter[1])	**boot support**

Boot Support and Limitations of Storage Adapters for the Model 270

The following adapters support external boot for the Model 270:

- PCI Universal Differential Ultra SCSI Adapter (# 6204)
- PCI Dual Channel Ultra2 SCSI Adapter (# 6205)
- PCI Single-Ended Ultra SCSI Adapter (# 6206)
- Advanced SerialRAID Plus Adapter (# 6230)[1]

The RS/6000 PCI 3-Channel Ultra2 SCSI RAID Adapter (# 2494) does not support boot from external devices.

Fast Boot

The Model 270 offers a Fast Boot option. For more detailed information, refer to "Selected Service Processor Functions" on page 11.

Security

To prevent the system from unauthorized booting from CD-ROM, you can setup a power-on-password (POP) or a privileged-access password (PAP). In order to protect the system from unauthorized users removing the battery to delete POP and PAP, you have to secure the Model 270 with a padlock you provide on the backside of the Model 270.

The disk drives cage can be protected with a separate padlock.

Software Requirements

AIX 4.3.3 plus APAR IY06844 (AIX 4330-02 Recommended Maintenance Level for AIX 4.3.3) is required for the Model 270. The GA date is February 18, 2000.

If you are purchasing new RS/6000 systems, the AIX update phases into new systems starting February 14, and it's available for download at:

`http://techsupport.services.ibm.com/rs6k/fixes.html`

In North America, you can order CDs by calling (800) 879-2755 or by ordering on the Web at `http://service2.boulder.ibm.com/swdelivery/`. In other geographies, ask your IBM Business Partner or IBM Representative to place a single refresh System Program Order for 5692-AIX.

For select customer requirements, there is a limited availability of AIX Version 4.3.2 support on the Model 270: PRPQ P91183, *AIX 4.3.2 Workstation Support*.

---

[1] SSA boot is possible from an Advanced SerialRAID Plus Adapter (# 6230), provided a non-RAID SSA disk is included as part of the configuration. Other disks associated with the adapter can be RAID but at least one disk must be a non-RAID SSA disk. The non-RAID SSA disk can be located under the covers of a processor unit or in an external SSA storage unit. If your system is running with AIX 4.3.3 or later software, native boot capability is supported.

For factory system orders with AIX preload requested, an internal SCSI disk drive will be preloaded as the native boot disk even if internal SSA disk drive(s) are present.

Reference

The following sections list additional materials available for further research.

System Documentation

For more detailed information, refer to the following documents:

- *44P Series Model 270 Setup Instructions*, SA38-0574
- *44P Series Model 270 User's Guide*, SA38-0573
- *44P Series Model 270 Service Guide*, SA38-0572
- *RS/6000 Diagnostics Information for Multiple Bus Systems*, SA38-0509
- *RS/6000 Adapters, Devices and Cables information for Multiple Bus Systems*, SA38-0516
- *PCI Adapter Placement Reference Guide*, SA38-0538

Select IBM Redbooks

The following IBM Redbooks are related to the material discussed in this paper:

- *RS/6000 Systems Handbook*, SG24-5120
- *RS/6000 43P 7043 Models 150 and 260 Handbook*, SG24-5144
- *RS/6000 SMP Enterprise Servers Architecture and Implementation*, SG24-2583
- *AIX 4.3 Differences Guide*, SG24-2014
- *Understanding IBM RS/6000 Performance and Sizing*, SG24-4810

Select Internet Links

For more detailed information see the following Web sites:

```
http://www.rs6000.ibm.com/
http://www.rs6000.ibm.com/hardware/workstations/
http://www.rs6000.ibm.com/resource/hardware_docs/index.html
http://www.rs6000.ibm.com/cgi-bin/ds_form
http://www.rs6000.ibm.com/support/micro/
http://www.ibm.com/servers/aix/
http://www.chips.ibm.com/
http://www.research.ibm.com/topics/serious/chip/
http://www.storage.ibm.com/
http://www.hursley.ibm.com/~ssa/rs6k/
http://www.redbooks.ibm.com/
```

Sources

The following sources were used in the creation of this publication:

- IBM RS/6000 7044 Model 270 - Announcement Letter
- IBM RS/6000 7043 Model 260 to Model 270 Upgrade - Announcement Letter
- IBM RS/6000 44P Model 270 Workstation - Spec Sheet (G221-7127-01)
- IBM RS/6000 44P Model 270 Server - Spec Sheet (G221-7131-01)
- Blue Logic - CMOS 5SF Technology (G522-0269)

- Blue Logic - CMOS 6SF Technology (G522-0261)
- Blue Logic - CMOS 7SF Technology (G522-0357)

Acknowledgements

Assistance creating this white paper came from the following individuals and was appreciated. Thank you!

Arroyo, Ron	IBM Austin
Cocco, Cathy	IBM Austin
King, Ken	IBM Austin
Peter Lenk	IBM Austin
Nguyen, Thoi	IBM Austin
Vaden, Mike	IBM Austin
Walton, Scott D.	IBM Austin

Biographies

Volker Haug is an Advisory I/T Specialist. He has more than 13 years of experience in the I/T industry, the last 10 of which he has devoted to RS/6000 and AIX systems. He holds a degree in Business Management from the Berufsakademie in Stuttgart. Volker is the technical leader supporting IBM sales, Business Partners, and customers with pre-sales consultation and implementation of client/server environments. His areas of expertise include RS/6000 workstations and workgroup servers, graphics, MCAD applications, and AIX systems management. Based in Stuttgart, Germany, he is currently working for the Web Server Sales RS/6000 and NUMA-Q technical support organization covering the IBM Europe, Middle East, and Africa Central Region.

Jeanine Indest is an I/T Specialist with the Techline RS/6000 Sales Support Team, part of the Web Server Sales Americas Organization. She has more than six years of experience in the I/T industry, the last four of which she has devoted to RS/6000 and AIX systems. She holds a B.S. degree and a M.A. degree in Economics from the University of New Orleans. Her current area of expertise is technical marketing support for Business Partners in the United States for RS/6000 and NUMA-Q systems.

Special Notices

This document was produced in the United States. IBM may not offer the products, programs, services or features discussed herein in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the products, programs, services, and features available in your area. Any reference to an IBM product, program, service or feature is not intended to state or imply that only IBMs product, program, service or feature may be used. Any functionally equivalent product, program, service or feature that does not infringe on any of IBMs intellectual property rights may be used instead of the IBM product, program, service or feature.

Information in this document concerning non-IBM products was obtained from the suppliers of these products, published announcement material or other publicly available sources. Sources for non-IBM list prices and performance numbers are taken from publicly available information including D.H. Brown, vendor announcements, vendor WWW Home Pages, SPEC Home Page, GPC (Graphics Processing Council) Home Page and TPC (Transaction Processing Performance Council) Home Page. IBM has not tested these products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. Send license inquires, in writing, to IBM Director of Licensing, IBM Corporation, New Castle Drive, Armonk, NY 10504-1785 USA.

All statements regarding IBMs future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only. Contact your local IBM office or IBM authorized reseller for the full text of a specific Statement of General Direction.

The information contained in this document has not been submitted to any formal IBM test and is distributed "AS IS". While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. The use of this information or the implementation of any techniques described herein is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. Customers attempting to adapt these techniques to their own environments do so at their own risk.

IBM is not responsible for printing errors in this publication that result in pricing or information inaccuracies.

The information contained in this document represents the current views of IBM on the issues discussed as of the date of publication. IBM cannot guarantee the accuracy of any information presented after the date of publication.

All prices shown are IBMs suggested list prices; dealer prices may vary.

IBM products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.