IBM PC Server System/390

Quick Product Guide:

Quick Reference

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Preface

Welcome to the **Quick Product Reference Guide** for the ***Enhanced PC Server S/390***.

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Introduction and Overview

This guide can be used to help you determine a correct and reasonable configuration for a Enhanced PC Server S/390. It should be used in conjunction with the **ConfigXprt, PSCFG,** or **QEDCONF** configurator tools to ensure reasonable and valid configurations.

This edition of the Quick Reference provides information on the Enhanced PC Server S/390 which utilizes the new Enhanced P/390 Microprocessor adapter. In general, the term PC Server S/390 will be used throughout this document to refer to either the standard (origional) P/390 or the new enhanced model. When referring specifically to the enhanced model, the term Enhanced PC Server S/390 will be used.

This guide contains the following sections:

Standard and optional sysem unit components: Lists of the machines and components likely to be ordered as a PC Server S/390 system, including

1. System Unit
2. System Unit Memory (PC Server & S/390)
3. RAID Controller

Device Manager Overview A brief introduction to Device managers and what PC Server S/390 components they use.

Additional Components Some of the more frequently used PC Server S/390 components, such as:

LAN Adapters
- Token Ring
- Ethernet

Disk Storage
- Internal disk systems
- External enclosure configurations
- Disk drives
- RAID, SCSI, and SSA Adapters

Other
- Tapes
- Displays
- UPS
- Other / Misc.

Useful Information:

1. Configuring for dial-in access to the PC Server S/390
2. Getting updates for PC Server S/390 software, configurators (and this document).
3. Information on how to get in contact with PC Server S/390 certified resellers

Sample/Typical Configurations: Some sample or typical configurations for several various uses of the PC Server S/390.

Checklist: A short summary in a checklist format to aid in determining a proper configuration.

Change Log

Changes implemented in each version are noted here.

05/10/96 Last version of the Quick Reference for the PC Server 500 based version of the PC Server S/390

08/15/96 First draft version of the Quick Reference for the PC Server 520 based version of the PC Server S/390

02/01/97 Major update to reflect the announcement and availability of the PC Server 330 as the base server for the PC Server S/390. Also includes recent and accompanying features such as SSA adapers and enclosures. All sample configurations are changed or updated.

11/17/97 Changes to support the adoption of the PC Server 330 model PB0 as the standard base system model. Updates to the S/390 software lists. Numerous minor updates for changed disks, tapes, and other minor changes. Updates to reflect enhancements in P390 code level 2.4 (fixpack 2.3.3).

05/07/98 Description and support for the "Enhanced" P/390 Microprocessor Adapter. Various other changes corresponding to the latest P/390 code level (2.5). Added availability of 9.1 (SL) and 18.2 (HH) disk drives, changing configurations accordingly. Dropped requirement for CM/2 and added PCOM 4.21 as replacement. Updated list of electronic information sources.

Contents

Chapter 1. System Units

The PC Server S/390 is now built upon the PC Server 330, using the PB0 (8640-PB0) model. This system features the following features and components (Note that some of these components are standard on the PC Server 330, while some are additional parts added to provide S/390 capabilities):

266MHz Pentium II Processor
64MB ECC Std Memory 60ns (For Pentium)
32KB L1 Write Back Cache
512KB L2 Write Back Cache
4 dedicated PCI bus slots
2 shared PCI/ISA slots (All PCI slots are capable of 133MB/sec data transfer rates.)
6 Hot/Swap bays for internal slim-height (1") hard drives
1.44MB Diskette
8X CD-ROM Drive & ServerGuide
PC Server Reference manuals
Certified FCC 'Class B'
Parallel port & 2 Serial ports
Mouse port and mouse
IBM Keyboard
Integrated single channel ServeRAID II RAID controller (on system board)
Cable from ServeRAID controller to Hot/Swap backplane
Ultra-SCSI Adapter integrated on the systemboard (intended for support of external SCSI devices)
SVGA-NI Graphics Adapter (1024/768 max) integrated on systemboard (1MB standard, additional 1MB optional)
3 Year On-Site Warranty (5x8 standard, 7x24 optional)
ServerGuide, TME 10 Netfinity
Reference & Diagnostic Diskettes
Enhanced S/390 MicroProcessor Complex with 256MB ECC S/390 memory
P/390 Licensed Programs
12/24GB DDS-3 4mm DAT tape drive (required PC Server option)
PC Server S/390 specific Reference Manuals
OS/2 Warp Server Advanced (For those who prefer it, Warp Server Basic is also available and supported.)
"IBM eNetwork Personal Communications Version 4.21 for DOS, Windows, Windows/95, Windows/NT, and OS/2". (Will be referred to as PCOM in this document.) This product replaces Communications Manager/2.

Specific Configurations

Additional components and features are added to this system to provide the desired configuration.

The Base 8640-PB0 includes no hard drives. The desired number of internal hard disks must be added to the base model. Up to a total of 6 slim-height drives (4.5 or 9.1 GB) can be added as internal drives. Additional hard drives can be configured in external enclosures.

ServeRAID Adapter

The 8640-PB0 provides an integrated ServeRAID II Controller which includes 4 MB of RAM, of which more than 3M is available for caching. The user can configure this cache to provide either 'write-through' mode (writes are not cached) or 'write-back' mode (writes are cached). The integrated ServeRaid controller provides one channel (Ultra-SCSI) which will normally be used to support the internal hard drives, the CD-ROM, and the 4mm DAT tape drive. When additional disk capacity is required, external enclosures can be supported by adding either a ServeRaid II adapter (three channels of up to 15 devices each) or an SSA RAID adapter (two SSA loops of up to 48 devices each). More information about these adapters is provided later in this document.

SCSI Configuration

(Updated/replaced 10/30/97)

The PC Server 330 provides a very powerful and flexible base for a broard range of high speed I/O devices. This very flexibility, however, causes some complications which must be considered when configuring the PC Server 330 I/O subsystem, especially for use as a System/390. This section will address some of these considerations and suggest some alternatives to best meet most common objectives.

PB0 SCSI Configuration Alternatives

With the introduction of the PB0 model of the PC Server 330, the possible SCSI configurations have changed. These changes are due to the addition of the integrated ServeRAID controller and the elimination of the integrated SCSI controller's internal connector. Since the Integrated SCSI controller on the PB0 now has only a single connector and is stated/supported for controlling external devices only, we can no longer use it to support both internal and external devices. There are several possible alternative configurations which can be used. These will be described bridfly here, then additional information will be provided for some of these configurations.

Note that the standard, default, configuration has the CDROM addressed as SCSI device 6, the internal Hot/Swap drives addressed as 0 - 5, and the controller as 7. This does not leave any address available for the 4mm DAT tape unit.

Replug H/S backplane to High-SCSI (Preferred)

The Hot/Swap backplane can be jumpered to use 'high-SCSI' addresses (08-14). This eliminates any SCSI addressing conflicts between the disks and the CDROM/DAT.
Disadvantages:

Jumper is a bit difficult / tedious to get to.
Option and process is not documented in PC Server 330 manuals
Is not recommended by PC Server technical support

This is the default configuration **recommended by P390 Development**. They have tested this configuration extensively and feel it meets the requirements of most customers. Detailed instructions for this process is included later in this section

Limit Internal Diskdrives to 5

If the internal disk drive configuration is limited to a maximum of 5 drives, the DAT can be addressed as 0 and there should be no conflicts.
Disadvantages:

Limits internal capacity to 5 drives
Performance: CD and DAT are same SCSI channel as disks

Add SCSI adapter:

If a SCSI adapter is added, it can be used to control the CDROM and DAT. Or, the adapter could control external devices and the CDROM and DAT could be connected to the integrated SCSI controller.
Disadvantages:

Cost of SCSI adapter
Uses up a potentially valuable and scarce PCI slot

This would be the preferred option for customers wishing to use an IBM 3490-Fxx as it requires a OEM Differential SCSI controller such as the Adaptec 2944.

Use Integrated Controller for CDROM & DAT

Use an internal 4-drop cable and 16bit active terminator to cable the CDROM and DAT to the integrated SCSI controller.
Disadvantages:

SCSI adapter is no longer available for external devices
Is not recommended or supported by PC Server Technical support

Do not include / use 4mm DAT

For systems which will include and use a SCSI attached 3480 type tape drive, the 4mm DAT is no longer required to be included. Cable the CDROM to the backplane/ServeRAID and the external 3480 tape drive to the integrated SCSI or to a "Differential SCSI Adapter" (if a IBM 3490 Fxx is used).
Disadvantages:

Unable to make use of 4mm DAT flexibility and capabilities
Cost of SCSI 3480 tape drive (eliminating the requirement for, and cost of, the DAT does offset this cost, however.)

Use external enclosure for DAT

Mount the 4mm DAT in an external SCSI enclosure (3510) and cable to the integrated SCSI controller. If a SCSI attached 3480 is to be included, the 4mm DAT can daisy-chain to/from the 3480 tape.
Disadvantages:

Expense and space requirements for external enclosure.
Some exposures created by additional SCSI cables (connections, cable length, etc.)

Jumpering Backplane for "High-SCSI"

If the integrated SCSI controller is to be reserved for external devices only, the CDROM and DAT will need to be cabled to the hot/swap backplane, using the integrated ServeRAID adapter. If all 6 hot/swap disk drive bays are being used, this would normally result in a duplicate SCSI address. The DAT is normally plugged as SCSI address 0, and one of the hot/swap positions is also SCSI address 0. This can be resolved by jumpering the backplane to "adjust" the

backplane addresses to be "High-SCSI" (8 - 14) so they do not conflict with the CDROM and DAT.

To set the backplane to "High-SCSI" addresses:

1. Remove the PC Server 330 cover (observe all power-off and static-electricity cautions).
2. Provide some additional light (flashlight, desklamp, etc.) to the very upper portion of the backplane.
3. Locate the jumpers at the very top of the backplane. There will be several sets of jumpers. We're looking for four sets of jumpers (two pins each) in a vertical orientation in about the middle of the backplane and the jumper block is labeled **J12**. The bottom two jumpers should already be jumpered.
   (If you find it a bit difficult to see and get to this jumper, the Power Supply can be temporarily removed by removing only four screws and dropping it out of position. Place the server flat on it's back, remove 4 screws at the back of the PC Server, slide the power supply up, then lift out.)
4. Get a suitable additional jumper. Using "long nosed pliers" or equivalent, place the jumper over the second set of pins, which is labeled **HI_ID_N**. The bottom three sets of pins should now be jumpered, and the top set open.

If you have previously set up the RAID configuration, you have now changed it. (The ServeRAID will think you moved the drives from the low-SCSI positions to an external enclosure with High-SCSI.) The next time you boot the system, the ServeRAID will see the change and allow you to accept the new configuration. Just read the messages and options carefully and take the appropriate choice and your system will make the adjustments automatically. To avoid even this issue, set the jumper prior to defining your RAID configuration.

Miscellaneous SCSI Suggestions and Warnings

Here are some miscellaneous suggestions and warnings which will apply to many PC Server S/390 systems. Review them carefully!

Installing a ServeRAID II

For systems which require a ServeRAID II adapter in addition to the integrated ServeRAID, additional considerations may apply.

It may be desireable to use the ServeRAID II to control the internal disks (to take advantage of the battery backed-up cache and 'Data Scrubbing'). If so, we recommend using a different cable (P/N 94G3988) to connect the backplane to the ServeRaid II rather than reusing the integrated controller to backplane cable. (In most installations, reusing the standard cable results in a very tight or 'streched' fit which could cause problems later.) A new/different "drive Sense Cable" (76H5399) is also usually a good idea.
If the integrated controller is not used for the internal disks, it can still be effectively used for the CDROM and DAT.

Using 3518 External Disk Enclosures

The 3518 "Enterprise External Disk Enclosure" is used primarily to contain additional disk drives which will be connected to external connecters of the ServeRAID II adapter. Since the ServeRAID is an "Ultra-SCSI" adapter, the resulting combination frequently exceeds allowable cable lengths, causing miscellaneous and confusing SCSI errors. To avoid these problems, use a "PC Server Enhanced SCSI-2 F/W repeater" (P/N 94G7585) in the 3518. This repeater receives and amplifies the SCSI signals, allowing significantly longer cable lengths

to be be used. If two banks of drives are daisy-chained inside the 3518, the repeater is an absolute necessity. We highly recommend a repeater on each channel going into a 3518 to protect against marginal or slightly long cables.

Other Notes

Second 4mm DAT tape drive

In the PC Server 500 and 520 based systems, it was possible to install a second 4mm DAT tape drive within the PC Server system unit. With the PC Server 330, this is not possible. (The PC Server 330 has two 1 inch 'slim-high' mounting positions, but the 4mm DATs are 1.6 inch 'half-high' so only one can be mounted in the available space.) If a second 4mm DAT must be used, there are several options:

1. If an external disk enclosure (3517, 3518) is being used, they have provisions for mounting additional tape units.
2. If no external unit is planned, a 4mm DAT can be mounted in a 3510 external device enclosure. The 3510 houses a single SCSI device in a 5.25" mounting area. (The new 12/24 DDS3 DAT includes both 3.5" and 5.25" mounts.)

FCC Classification

The PC Server 330 is certified as meeting **FCC Class B** requirements. The addition of options and adapters may affect the level of electronic emissions produced by the PC Server S/390

8640-PB0 Restrictions and Considerations

(Added 11/17/1997updated 2/28/98)

With the introduction of the 8640-PB0 as the PC Server base for the PC Server S/390, there are several considerations and restrictions which must be observed.

System BIOS Levels

Early 8640-PB0s were shipped with BIOS levels 15a or earlier which were unsuitable for the PC Server S/390. The miminum level for proper operation is BIOS level 16a and level 18a has significant additional improvements for specific configurations. As of this date (5/07/98) the latest BIOS level is 21a. We recommend updating any Server 330 to at least level 18a, and preferably 21a, or other, more current, level.

What PCI slots to use

Allowable slots for the P/390 adapter are slots 4 and 5. Allowable slots for the S/390 Channel Adapter are slots 4, 5, and 6.

The PC server 330 numbers it's slots from the bottom up. SLots 1, 2, and 3 are the "Primary" PCI slots while slots 4, 5, and 6 are the "Secondary" PCI slots. **The P/390 adapter and the S/390 Channel Adapter must be plugged into the Secondary PCI slots only.**

A further, physical, restriction is that the P/390 Adapter cannot fit in slot 6 because it interferes with the PC Server diskette cage. A S/390 Channel Adapter will "just" fit in this slot, but avoid it unless you have two S/390 Channel Adapters.

Integrated ServeRAID Diskette Level

The new PC Server 330, 8640-PB0, uses a new integrated ServeRAID controller and a new ServeRAID II adapter. New levels of RAID controller diskettes are required to support these. The current (4/02/1998) version for the integrated (Onboard) ServeRAID controller and the ServeRAID II Adapter is 2.70. (The 2.70 level supports all versions of the ServeRAID controllers.) If a Server 330 comes with an earlier level installed, the most current level should be downloaded from the Web (PC Server file area) and installed.

P/390 Program Level

A new driver level, 2.5, is now available. This new level is required to support the Enhanced P/390 Microprocessor. It also has other enhancements (such as support for PCOMOS2). Anyone running P/390 code level 2.4 (or equivalent fixpack level 2.3.3) can upgrade to this latest level by applying Fixpack 2.4.1.

Memory Options

Updated 05/07/1998

PC Server / Pentium Memory:

For PC Server S/390 systems running light workloads with light I/O requirements, no additional PC memory should be required (64MB is standard). For systems which are expected to have moderate to high I/O requirements, an additional 32 - 64MB of memory may be used to enable a large (48-64MB) HPFS386 cache, thereby providing improved I/O performance. The enhanced HPFS386 file system is provided as part of "File and Print Server" in the WARP Server Advanced product. **Note:** Use of HPFS386 is officially *Not Supported* by P/390 support. If you do chose to use HPFS386 anyway, you should install the current Warp Server Advanced Fixpack, currently IP_8508, and Warp Ver 3 Fixpack 35 (or later) to miminize any problems. For systems which are expected to also provide PC Server functions (such as a LAN File Server), additional PC memory may be required to support that workload.

Memory for S/390 Expanded Storage:
Since the availability of P390 FixPack 2.3.3, PC memory can be used to emulate S/390 Expanded Storage. For systems which can take advantage of Expanded Storage (such as VM/ESA and OS/390) it may be appropriate to include an additional 64 to 256MB of PC memory to be used as expanded storage. With the availability of 256MB of S/390 memory on the Enhanced S/390 Microprocessor, emulated expanded storage may not be as important as with smaller S/390 memory sizes.

Note:

All Pentium/Server memory is provided in DIMM (Dual Inline Memory module) form. Additional DIMMs can be installed, up to a maximum of 512MB in increments of 32, 64, 128, or 258MB.

The PC Server S/390 has a total of 4 DIMM memory sockets, with one of these occupied by the standard 64M of memory (1 x 32MB). DIMM sizes can be mixed in a PC Server 330.

94G6473 32MB 70ns ECC DIMM
94G6474 64MB 70ns ECC DIMM
94G6475 128MB 70ns ECC DIMM
94G6476 256MB 70ns ECC DIMM

S/390 Processor Memory

The Enhanced S/390 Microprocessor comes in only one memory size, 256MB. It cannot be expanded. You should be certain that the 256MB of central memory, plus emulated Expanded Storage, will provide sufficient storage for the probably useful life of the system. All S/390 memory is contained on the processor complex; there is no separate memory 'daughter cards' as existed on the MicroChannel versions of the P/390 processor complexes. There is currently only one version of the P/390 Microprocessor adapter available:

9662-256 Enhanced S/390 Microprocessor complex with 256MB of S/390 memory capacity.

The Enhanced S/390 Microprocessor Complex Adapter is only available via certified Solution Provider-Distributors (SP-Ds) as part of a complete PC Server S/390 system. Actual selling prices are determined by the certified resellers. The S/390 processor adapters and the S/390 Parallel Channel Adapter are products of the S/390 product group. As such, they are ordered via the AAS system, rather than the PC Company's GEMS ordering system.

Chapter 2. Device Manager Overview

(Updated 5/07/1998) Device Managers play a critical part in the operation of the PC Server S/390. These device managers provide the link between the PC Server devices and the S/390 environment. Without them, the PC Server S/390 could not be possible. This section will provide an overview of the various device managers which are available and which PC Server devices should be used to provide which mainframe equivalent functions. This will be organized by the type of I/O device to be emulated or connected:

Disks
Tapes
Printers
Terminal devices
Communications
Channel Connection

Disk Drives

S/390 disk drives are emulated using OS/2 files. Each S/390 disk volume is emulated by an OS/2 file. There are two managers available:

AWSFBA: Emulates FBA (Fixed Block Architecture) disk devices (3370, 9332, 9336, etc.). Either VM/ESA or VSE/ESA can use emulated FBA devices; OS/390 (MVS/ESA) does not support FBA.

AWSCKD Emulates (E)CKD ((Extended) Count Key Data) devices such as 3380, 3390, and 9345. OS/390 (MVS), VM/ESA, and VSE/ESA can use emulated CKD devices.

The only configuration requirement for using these device managers is to include sufficient disk storage capacity to accomodate the required volumes of S/390 data. Customers migrating from old mainframes will probably elect to emulate the same device type and architecture as the old system. When it is possible, however, to choose the type of disk emulation, use of FBA emulation will usually perform better with less emulation 'overhead' in the Pentium II.

Tape

There are three ways of providing tape capabilities for a PC Server S/390.

1. Attach 'real' mainframe tapes drives via a S/390 Parallel Channel Adapter (using device manager AWSICE).
2. Attach media compatible tape drives or another 4mm DAT drive using a SCSI controller using device managers AWS3420, AWS3480).
3. Emulate the tape drives using disk (OS/2) files (using device manager AWSTAPE).

Each of these requires different configuration considerations:

Channel Attach: To attach a real (mainfame) tapedrive such as a 3480, you must of course have the actual tape drive (3480) and you will need the appropriate channel adapter (S/390 Parallel Channel Adapter (9662005) for the the PC Server 330).

SCSI Attach: In addition to a compatible SCSI tape drive, a suitable SCSI channel with an available SCSI address is required. On the PC Server 330, this can be provided by the external connection of the integrated SCSI controller, an external connection of a ServerRAID II adapter, or other suitable SCSI adapter.

Emulated on DISK: When using AWSTAPE to emulate tape drives on disk, the only configuration consideration is to ensure there is sufficient OS/2 disk space available to contain the emulated disk files. Use of emulated tape files on disk can drastically reduce the number of physical tapes and tape mounts. With the relatively low cost of today's disk storage devices and the data integrity protection provided by RAID-5, replacement of tapes by disk devices has become very attractive

Printers

There are two possible ways to generate printed output from a PC Server S/390. Regular 'mainframe' printers can be attached to a channel adapter or a PC printer can be used to emulate a mainframe printer.

Channel Attached: To attach any channel attached printer, you only need a S/390 Parallel Channel Adapter and device manager AWSICE. 'Page Mode' printers should be used whenever possible as they will generally perform much better than line mode printers in the PC Server S/390 environment

PC Printer: Using device manager AWS2821, any PC compatible printer can be used to print the S/390 system output. All print output is processed out through the OS/2 print queue manager. Since this output is processed as normal OS/2 output, it can also be redirected to any accessible printer, whether directly connected or across a lan connection. Using a PC type laser printer connected to the parallel port and controlled by AWS2821 will provide an excellent way to print 'standard forms' output, replacing old line mode printers.

Terminal Devices:

There are many different ways to connect terminal devices to a PC Server S/390. They can, however, generally be catagoritized into one of three types:

1. Connection of devices to channel attached control units
2. Connection of terminal devices via LAN attachment
3. Connection of terminal devices via some form of remote communications line.

Channel Attached: In addition to the actual terminals and control units (3174s), the only PC Server S/390 requirement is for a S/390 Parallel Channel Adapter. Terminals can be connected via 3174s (SNA or non-SNA).

LAN Connection: The most common approach will be for VTAM connections between workstations doing 3270 emulation and the S/390 system. One alternative is to use TCP/IP with emulators such as TN3270 to provide the connectivity across the LAN. In any of these cases, the only requirement for the PC Server S/390 is an appropriate LAN adapter (Ethernet or Token Ring). VTAM connected workstations will use the LAN3172 device driver while TCP/IP connected workstations will use LCS3172. In either case, the device manager emulates a 3172 by using the LAN adapter. Another option for proiding terminal support across a LAN is to use the LAN3274 device manager. Users at TCP/IP connected workstations can connect to the LAN3274 device manager in the PC Server S/390

and LAN3274 will function as a kind of protocol converter. The terminal sessions will appear to the S/390 operating system as non-SNA local 3270 terinals.

Remotely connected terminals: There are many different ways to connect remote termials of various types across communications lines. The remote terminal configuration may consist of a SDLC connected 3174 using coax or LAN attached terminals, or there could be some form of SDLC or TCP/IP connected machine providing a gateway function for workstations on the LAN. In each of these scenarios, the PC Server S/390 has to provide some form of communications line/facility, typically an SDLC or TCP/IP link. There are several ways to provide this link, depending on S/390 operating system and required link characteristics. See the next section for information on configuring a PC Server S/390 to provide these links.

Communications

Wide Area Networking support, referred to as 'Communications' in this document, can be categorized in any of several ways:

By 'protocol', with BSC, SDLC, and TCP/IP being the most popular.
By operating system, with VSE/ESA, VM/ESA, and OS/390 (MVS) each having different characteristics.
By emulated device type, and each device type has different capabilities and restrictions.
By what PC device is used to emulate the 'mainframe device'
By Device Manager used to provide the emulation services.

In this document, the primary categorization will be by operating system. Then we will consider what protocols are supported, what PC devices are used by what device manager to provide what emulated device.

VM/ESA and VSE/ESA: Both VM and VSE provide the same support for the same protocols and devices, so they will be considered together.
The primary support for VM and VSE communications will be for BSC and SDLC protocols, emulating an Integrated Communications Adapter (ICA) or VTAM External Communications Adapter (XCA), such as the 3172 SDLC Gateway. On a PC Server S/390, ICA emulation is provided by device manager AWSICA controlling one or two WAC (Wide Area Connector) adapters. The WAC adapter and AWSICA provides SDLC and BSC on RS-232, V.35 and X.21 interfaces and support to allow a wide range of line types and speeds. Up to two ports per WAC are provided, with a maximum of two WAC adapters on a PB0 (since the WAC is an ISA adapter). If more than 4 ports are required, WAN3172 can be used with a Portmaster 2 adapter to provide XCA emulation. This combination can provide up to 8 ports per adapter (two adapters per system) but it is limited to SDLC only and RS-232 interfaces with a maximum speed of 38.4Kbs. (Users planning to migrate from a older system with ICA adapters to a PC Server S/390 emulating XCA should verify the planned VTAM level will support XCA nodes.)

OS/390 (MVS): OS/390 does not support the ICA so AWSICA cannot be used and BSC line support is not provided. SDLC support for OS/390 is provided by the WAC (Wide Area Connector) and MultiPort Model 2 adapters by using the WAN3172 device manager, emulating a VTAM XCA node ("3172 SDLC Gateway"). The WAC can be configured for either RS232, V.35, or X.21 interfaces. (RS232 typically runs up to 19.2Kbps, V.35 is used for 56Kbps and higher, with X.21 being used for very high speed, such as T1 connections.) Each WAC has one line

interface and one additional interface can be added (interface types can be mixed). There is a maximum of 2 WAC adapters per system since the PB0 only has two ISA slots. The MultiPort model 2 provides up to 8 RS-232 ports per adapter, with a maximum of two adapters. Only ISA bus versions of the WAC and MultiPort model 2 are supported. *CHECK: IS WAN3172 plus Portmaster 2 supported on OS/390*

All (OS/390, VM/ESA, VSE/ESA) All operating systems can support and use channel attached communication controllers and external controllers such as Boundry Node Converters.

Any supported Communications Controller, such as a 3745, 3720, or equivlent OEM unit can be connected via the S/390 Parallel Channel Adapter. These systems will normally require NCP support and services. See the discussion of channel connected devices and AWSICE below.

Boundry Node Converters are members of the Frame Relay family of communications devices. IBM markets the 2218 in various models which can be connected via a LAN and provide various communications facilities.

Channel Connection

The S/390 Parallel Channel Adapter can be used to connect almost any standard 'mainframe' device to a PC Server S/390. When using a channel adapter, the AWSICE device driver is used. This combination allows the connection and use of most non-DASD S/390 devices to a PC Server S/390. (Specifically, attachment of 3274, 5088, and 6098 control units are not supported.) A maximum of 2 channel adapters can be used on a single PC Server S/390. Although the channel adapter will allow up to eight control units to be connected, a maximum of four control units per card is recommended in order to maintain reasonable performance levels. While connection to standard 'mainframe' disk drives is not supported, many users will find that the connection works well enough to allow initial migration of data from a mainfame disk system to the PC Server S/390.

Chapter 3. DASD and Adapters

(Updated 2/28/1998 for PB0+)

Notice:

Configuration of PC Server S/390 systems can be confusing and difficult, especially for larger systems with external enclosures. Use of ConfigXprt, PSCFG (where supported), or QEDCONF is highly recommended. Consult with a PC Server Specialist if you have any doubts or questions.

Terminology

This document will use the following terminology when referring to the PC Server S/390 configuration:

Slot A ISA or PCI slot on the system board into which an ISA or PCI adapter is inserted.

Bay A position in the front of the system into which a single device (hard drive, tape unit, CDROM, etc.) can be inserted.

Bank A group of similar 'Bays'.

Standard Features

The PC Server 330 (8640-PB0) comes standard with a integrated single channel wide-ULTRA SCSI RAID Adapter (on system board). The base system does not have any hard drives included but does have bays for up to six slim-high hot/swap drives internally. When expansion beyond the base system is required, both SCSI and SSA RAID adapters are available. There is also an integrated "Ultra-SCSI" controller with a single external connector. This integrated SCSI controller is intended to support the attachment of external devices. Normally, the integrated ServeRAID controller will control the CDROM, 4mm DAT, and internal disk drives. **Note:** Other configurations are possible for specific uses. Check the section on SCSI Configuration for additional information.

Internal Disk Drives

Maximum of 6 internal hard drives (with 1 inch form factor) can be installed in the PC Server 330. Expanding beyond 6 drives requires use of an external expansion enclosure. Half-high (1.6") form factor drives can be used, but each drive will occupy two bays, so only three such drives can be used internally.

Hard drives

02K0477 9.1 GB Ultra-SCSI How/Swap III 8ms access, 7200 RPM. (1", Slim-High form factor) This will be the preferred hard drive for customers who require larger internal disk capacity. Six 9.1 GB drives in a RAID-5 configuration will provide approximately 45 GB usable disk space.

94G7491 4.5 GB Ultra-SCSI Hot/Swap III 8ms access, 7200 RPM (1", Slim high form factor). This will generally be the standard drive for smaller configurations, providing up to 22GB of useable capacity (RAID-5) using six internal disk drives.

Disk drives of different capacities can be used in the same system, and even on the same RAID controller. Different capacity drives should **not** be used within the same 'array'. Doing this would result in effectively reducing the capacity of all drives in the array to the size of the smallest drive.

There are several approaches to configuring systems with large disk configurations. For a large SCSI based configuration, consider using the integrated ServeRAID controller, a ServeRAID II adapter, and a 3518 Enterprise Expansion Enclosure to provide a capacity of 24 disk drives. With 9.1 GB drives and 8 drives per RAID-5 array this provides over 180GB of useable disk space. (At least one "Hot Spare" drive should be specified in large configurations such as this, reducing the total capacity accordingly.)

Systems that require more than about 150GB should probably consider using the PCI SSA RAID Adapter. SSA subsystems will use the following components:

32H3811 PCI SSA RAID Adapter

21H8734 9.1 GB SSA Hot Swap disk drive

27H1062 4.51GB SSA Hot Swap disk drive

05J6411 Dummy SSA Module (required for empty SSA bays)

59H722x SSA Cables (1 to 25 M.)

3527001 External SSA Disk enclosure (five half-high hot-swap bays)

7133 Family of SSA Disk enclosures, with over 800GB available in a single rack based system.

External Disk Storage Enclosures

(Changed 5/07/1998)

Some users of the PC Server S/390 will find that they need more disk storage capacity than the 45 Gigabytes (useable, RAID-5) which is available within the system unit. For these users, the solution may be an external expansion enclosure. This section will provide an introduction to the available expansion enclosures and show some sample configurations.

Note:

Configuration of external expansion units in conjunction with PC Server S/390 systems in optimal combinations can be difficult and confusing. Persons not very familiar with these units are encouraged to get assistance from a Server Specialist or other appropriately trained personnel.

There are currently five PC Server based external expansion units available from IBM.

3517 (SCSI Multi-Storage Enclosure)

3518 (Enterprise Expansion Enclosure)
3519 (Rack mount version of 3517)
3520 (Netfinity EXP10: Rack mount system)
3527 (Entry SSA Storage Enclosure)

In addition, the 7133 family of SSA enclosures can also be used when connected to the SSA RAID Adapter. The 7133 is considered a member of the RS/6000 family of products and should be configured using the appropriate tools.

All the expansion units and configurations discussed below will assume the appropriate number of external SCSI (RAID) or SSA connectors are available on the main system unit to support the expansion configurations. Each configuration will include the appropriate number of SCSI cables to connect the external unit to the system unit. Although all of these enclosures can accept multiple disk types, we will only discuss 4.5 GB, 9.1 GB and 18.2 GB disks, as these are the ones most likely to be used in this environment. (Note: 2.25GB disks are generally being dropped from the standard product lists, in favor of 4.5GB disks. When available, the appropriate 2.25GB disks are still supported and may be suitable for some smaller systems.)

3520: Netfinity EXP10

The 3520 (EXP10) is a very flexible and expandable rack mounted storage system. A single EXP10 can contain up to ten half-high disk drives, providing up to about 160GB per unit. A maximum of 14 EXP10 units can be installed into a single Netfinity Rack system (IBM 9306-900). Normally, each EXP10 unit would use a channel on a SCSI-RAID controller such as the ServeRAID II. Using all three channels of a ServeRAID II connected to EXP10 units would provide over 480 GB of useable RAID-5 capacity, in addition to the internal server disk. The EXP10 and Rack system is a very capable and expandable combination, but it is also relatively complex. Additional detailed description or configuration is beyond the scope of this document.

3517, SCSI Multi-Storage Enclosure:

The 3517 is a hot/swap capable expansion that uses the Type III hot/swap drive trays. A unique feature of the 3517 is that it can accomodate "half-high" (1.6 inch) form factor disk drives as well as the "slim-high" drives used in the system unit and other expansion enclosures. This allows the 3517 to utilize larger capacity drives, such as the 18.2 GB drive. It will accommodate up to five 4.5 GB, 9.1 GB, or 18.2 GB hot/swap drives. It is very easy to configure and install. The maximum hot/swap storage capacity (effective RAID-5) of a 3517 using 18.2 GB disks is about 70GB. In addition to the Hot/Swap hard drives, up to two additional SCSI devices can be installed in the 3517. This can be used for additional 4mm DAT tape drives or non-Hot/Swap hard drives. (These non-hot/swap bays would be a good place to put a 'hot-spare' drive; it would be available, but the lack of hot/swap would not be a problem.) By using these non-hot/swap drive bays for additional 18.2 GB disk drives, total useable (RAID-5) capacity can be extended to 100GB. Note that the 3517 uses the "Type-III" backplane and harddrive tray. These are **not** interchangeable with the Type I and II backplanes used in the PC Server 500 and 520 system units. They are the same units as are used on the PC Server 330. Components of the 3517 might typically include:

3517002 The actual floor standing or desk-top enclosure

01K8027 2 meter external .8mm SCSI connector for connecting a 3517 to an external connector of a ServeRAID II adapter.

01K1282 4MM DDS3 (12/24GB) DAT tape drive

Various Hard disk drives

- **94G7491** 4.5 GB Ultra-SCSI Hot Swap SL HD-III (max 5)
- **94G7492** 9.1 GB Ultra-SCSI Hot Swap HH HD-III (max 5)
- **02K0477** 9.1 GB Ultra-SCSI Hot/Swap SL DD-III (max 5)
- **02K0478** 18.2 GB Ultra-SCSI Hot/Swap SL DD-III (max 5)
- **76H2687** 4.5 GB SCSI drive for use in non-Hot/Swap drive bays (max 2)
- **76G2689** 9.1 GB SCSI drive for use in non-Hot/Swap drive bays (max 2)

Sample Configuration

This configuration will provide a total of 45 GB useable (RAID-5) disk space plus one 4mm DAT tape drive. One of the 9.1GB drives will not be hot/swap. The 4mm DAT is in addition to the one which comes standard with the PC Server S/390

3517002 Base Multi-SCSI expansion unit
01K8027 2 meter external .8mm SCSI connector for connecting a 3517 to an external connector of a ServeRAID II adapter.
02K4077 9.1GB Ultra-SCSI HD-III SL hard disk drive (5 drives) (Note: The Slim-High 9.1 GB drives were specified so that they can be interchanged with the internal PC Server 9.1 GB drives.)
01K1282 4MM DDS3 (12/24GB) DAT tape drive
76G2689 9.1 GB Ultra-SCSI drive for use in non-Hot/Swap drive bay

3519 Rack Mounted SCSI Multi-Storage

The 3519 is essentially a rack mountable version of the 3517 and has similar capabilities and limitations. It will not be discussed in any detail.

3518, Enterprise Expansion Enclosure

The 3518 is a new enclosure which uses the same frame and layout as the PC Server 500/520 family. In addition to the three banks of hot/swap hard drive bays, it can also accommodate two half-high or one full-height 5.25" drive (such as CD-ROM drives or Tape drives). Each hard drive bank can accommodate 6 slim-height drives (4.51GB or 9.1GB). Two of the banks can be 'daisy-chained' to provide up to 12 slim-height drives on a single SCSI channel. Using a combination of two SCSI channels and 18 9.1GB hard drives, a total of about 130GB of useable (RAID-5) hot/swap disk capacity can be provided. To insure adaquate SCSI signal across the required cable lenghts, a SCSI repeater is available. The repeater is absolutely required for any channel that daisy-chains two banks together and is highly recommended for all SCSI channels coming into a 3518. Between the PC Server S/390 unit itself, the 3518, RAID/SCSI Adapter considerations, internal/external SCSI connectors, DASD Array layouts, disk sizes and capacities, and system performance, configuration of this unit must consider many different aspects. Anyone not very familiar with these systems are urged to seek trained server personnel for assistance. Note that the 3518 uses the "Type-III" backplane and harddrive tray. These are **not** interchangeable with the Type I and II backplanes used in the PC Server 500 and 520 system units. They are the same type as used with the PC Server 330. Some of the components of the Enterprise Expansion Enclosure:

3518001 The actual floor standing enclosure

01K8027 2 meter external .8mm SCSI connector for connecting a 3517 to an external connector of a ServeRAID II adapter.

01K1282 4MM DDS3 (12/24GB) DAT tape drive (non-hot/swap bays)

70G9864 Backplane to media bay cable: connects devices in top 'media bay' to the first H/S backplane.

94G4070 Backplane to backplane cable (to "daisy-chain" two backplanes into one SCSI channel)

70G9876 Cable to connect 2nd or 3rd backplane to external SCSI port

94G7585 Enhanced PC Server SCSI Repeater. Allows longer SCSI cable lengths when connecting 3518 to server.

76H2670 Hot/Swap Backplane III (required when using hard drives in the 2nd and 3rd banks) Not interchangeable with PC Server 500 backplanes.

70G9739 Power Supply upgrade: required when expanding beyond the top bank of hard drives

Various Hard disk drives

02K4077 9.1 GB Ultra-SCSI Hot Swap SL HD-III
94G7491 4.5 GB Ultra-SCSI Hot Swap SL HD-III

Sample Configuration
This configuration will provide a total of 130GB useable (RAID-5) disk space plus one 4mm DAT tape drive. All hard drives will be hot/swap. Two SCSI (RAID) channels will be required to support this configuration (assumes a ServeRAID II adapter in PC Server 330).

3518001 Base Enterprise Expansion Enclosure
01K8027 2 meter external .8mm SCSI connector for connecting a 3517 to an external connector of a ServeRAID II adapter (2 required).
02K4077 9.1GB SCSI-II Fast/Wide SL HD-III hard disk drive (18 drives) will be used in the hard drive Hot/Swap banks
01K1282 4MM DDS3 (12/24GB) DAT tape drive (non-hot/swap bays)
70G9864 Backplane to media bay cable: required to connect the tape drive to the backplane and SCSI channel
94G4070 Backplane to backplane cable (to "daisy-chain" banks 2 and 3 into one SCSI channel with 12 4.5GB drives)
94G7585 Enhanced SCSI repeater. (2, one for each incoming SCSI channel)
70G9876 Cable to connect 2nd backplane to external SCSI port
76H2670 Hot/Swap Backplane III (2 required for the 2nd and 3rd banks).
70G9739 Power Supply upgrade: required since we are using 2nd and 3rd bank of hard drives

A Note on External SCSI Cables

With any External enclosure, some form of SCSI cable is required to connect the external enclosure to the SCSI/RAID adapter. Different adapters may have different external connectors and may therefore require different cables. For example, on the PC Server 500 models which used the "IBM Fast and Wide Streaming Raid Adapter/A", the external connector is a 'miniature centronics' style connector and requires cable part number 06H3231. The PC Server 520, PC Server 330 and either the PCI Bus RAID adapter or the ServeRAID Adapter (as on the PC Server 330-ESx models) use a 68-pin external connector, and require a

different cable, part number 70G9857. The ServeRAID II adapter (typically used with the PC Server 330-PB0) requires the use of cables with a new .8mm SCSI connector. These cables are available in lengths of 1, 2, 3 and 4.3 meters, part numbers 76H3589, 01K8027, 01K8028, and 01K8029.

3527, Entry SSA Storage Enclosure:

The 3527 is a hot/swap capable expansion unit which uses the new SSA channel connectors and the SSA interface disk drives. It will accommodate up to five 2.25GB, 4.5GB, or 9.1GB hot/swap SSA drives. It is easy to configure and install. The maximum hot/swap storage capacity (effective RAID-5) of a 3527 using 9.1 GB disks is 36 GB. SSA Drives use a specific SSA interface and are **not** interchangeable with the SCSI / RAID Hot/Swap disks and trays. Note that any unused drive bays must be filled by a 'dummy' SSA module to maintain the SSA loop. Components of the 3527 might typically include:

3527001 The actual floor standing or desk-top enclosure

59H7223 SSA External Cables, pair 10 meter. (SSA cables are available in varions lengths, from 1.5M to 25M)

Various Hard disk drives

27H1062 4.51GB SSA Hot Swap high performance (max 5)
21H8734 9.1 GB SSA Hot Swap high performance (max 5)
05J6411 SSA Dummy Disk Drive Module

Note that as of this date, a 18.2 GB SSA Half-High drive has not been announced. Anyone who requires this capacity level should check the latest announcements.

Sample Configuration

This configuration will provide a total of 36 GB useable (RAID-5) disk space.

3527001 Base SSA Disk Storage Enclosure
59H7223 External SSA cables, pair of 10 meter
21H8734 9.1GB SSA Fast/Wide hard disk drive (5 drives)

Use of the 3527 assumes the presense of a PCI SSA RAID adapter (3283811). A single SSA adapter can control up to 96 disk drives (which would fill 19 3527 enclosures).

Use of SSA 7133:

The IBM 7133 SSA Enclosure has also been certified for use when the PC Server 330 is equipped with an SSA RAID Adapter. The 7133 is a member of the RS/6000 family of devices, and can be configured to include hundreds of gigabytes of disk storage.

Chapter 4. Communications

(Updated 05/07/1998)

Wide Area Network (WAN) Adapters

PC Networking adapters are used to emulate typical mainframe communications devices such as Integrated Communications Adapters, 3745s and 3172-XCA. The current support includes:

OS/390 - MVS Emulation of 3172-XCA (SDLC lines) is provided by the WAN3172 Device Manager using the Wide Area Connector (WAC) adapter and/or MultiPort model 2 adapter.

VM/ESA, VSE/ESA Emulation of Integrated Communications Adapters (ICAs) is provided by the AWSICA Device Manager using the WAC adapter, providing both SDLC and BSC line types. In addition, with P390 program support level 2.5 and later, the MultiPort 2 adapter is supported as an emulated XCA by the WAN3172 device manager, providing SDLC line facilities.

More information about these adapters follows.

WAC Wide Area Connector: One card with multiple 'personalities' to support up to two communications lines at up to 2.048M bps. Only the ISA bus versions of the WAC adapter is supported on the PC Server S/390. Max of 2 WAC cards per system since the 8640-PB0 only has two ISA slots. Can support: RS-232, V.35, X.21, interfaces and can connect to various services such as DDS, SW-56, ISDN Basic, T-1, E-1, and Fractional T-1. (Part numbers vary depending on type of interface required:)

33G8469 = EIA RS232 (up to 19,200 bps)
33G8470 = V.35 (typically 56Kb)
33G8471 = X.21

The above part numbers are for the ISA versions of the WAC adapter. The PCI version of the WAC adapter is not supported in the P/390.

The base adapter (part numbers just above) provides one communications port or line. An additional interface and connecting cable is required to provide the second line. The part numbers for this interface/connector are:

33G8461 = EIA RS232 Interface & connector
33G8462 = V.35 Interface & connector
33G8463 = X.21 Interface & connector

The base adapter and expansion interface can be mixed types. For example, you can use a 33G6470 (V.35) base adapter with a 33G8461 (RS-232) expansion interface.

Note:

Please note that the PC Server S/390 only provides support for RS-232 and V.35 (switched or non-switched) and X.21 (non-switched only).

The WAC adapter is used in conjunction with WAN3172 on OS/390 VM/ESA, and VSE/ESA systems to provide SDLC connectivity. The WAC ports are defined to the operating system and VTAM as a SNA XCA port. For VM/ESA and VSE/ESA systems, the AWSICA device manager can be used to provide ICA emulation including either SDLC or BSC facilities.

MultiPort model 2 Adapter The "ARTIC MultiPort Model 2 Adapter" provides up to 8 SDLC lines per adapter. For VM, VSE, and OS/390 systems it is supported by the WAN3172 device and provides External Communications Adapter (XCA) emulation. In these systems, each MultiPort adapter can support up to 8 lines (each line up to 38.4 Kbps) with a maximum of 2 MultiPort adapters per system. The WAN3172 manager supports only SDLC lines. Multiple parts are required for each MultiPort installation. The following is a typical configuration for the PC Server S/390

Table 1. Typical MultiPort Configuration: WAN3172

Part Number	Description	Quantity	Price
33F8791	ARTIC MultiPort model 2 coprocessor adapter for ISA: 1MB	1	$ 995.
53F2610	8 Port RS-232 interface	1	$ 295.
53F2619	8 connection cable	1	$ 246.
	Total		$ 1,536

LAN Adapters

There are many LAN Adapter types offered by IBM, and even more from other manufacturers. For use on a PC Server S/390, there are typically two issues which must be considered:

1. **Ethernet or Token Ring:** This issue will usually be determined by the current operating environment. While most PC Based LANs use Ethernet, many 'mainframe' environments use Token Ring.
2. **ISA or PCI:** Since the PC Server 330 includes both PCI and ISA slots, some thought should be given to the type of slot to use for the LAN adapter. On the PC Server 330-ESx models, ISA-only slots are available and can be used by ISA LAN adapters if necessary. On the PC Server 330-PB0, the two ISA slots are shared with PCI slots, so using a ISA adapter/slot effectively "uses up" the corresponding PCI slot. In these systems (PB0), there is really no reason to use an ISA LAN adapter. For performance reasons, PCI LAN adapters are preferred, but ISA adapters may be used if the configuration so dictates.

Note:

Remember that the PC Server 330 does not support EISA bus LAN Adapters. Only PCI and ISA LAN adapters may be used.

Token Ring Adapters

PCI

41H8900 IBM PCI Token Ring Adapter: Basic good performance (full duplex) Token Ring adapter.

25H6304 Triple LANStreamer PCI: Essentially three LAN Streamers on a single adapter. Just the thing for 'heavy duty' LAN traffic, for connecting to multiple rings, or for concurrent S/390 and workstation TCP/IP connectivity. This adapter was officially withdrawn in August, 1997. While potentially very useful, the Triple LanStreamer is officially *Not Supported* by P/390 development. This is because of some configuration issues caused by the Triple LanStreamer's internal PCI bus. It will generally work if it is not on the same PCI bus as the S/390 adapter (such as slots 1,2, or 3) but it's use is not recommended unless absolutely required by slot shortages.

Ethernet LAN Adapters

Note that there is a standard Ethernet (10/100Mb FDX) integrated into the PC Server 330-PB0 system board.

86H2432 EtherJet PCI Adapter 100/10: High performance Ethernet adapter capable of running at either 10 or 100 Megabits per second.

85H9221 IBM 100/10 EtherJet PCI Adapter with Wake on Lan. Includes 'Wake on LAN' technology with 100/10 performance.

04H6650 IBM Etherjet ISA Adapter: For users who need Ethernet on a ISA bus adapter.

Chapter 5. Other Components

Some other components that may be needed or useful.

Tapes

There are several forms of tape support for the PC Server S/390:

4mm DAT: The 4mm DAT drive is included with every PC Server S/390. It can be used by OS/2 using normal device drivers. Or, it can be used by the S/390 operating system using the SCSI34x0 device manager. The SCSI3480 driver makes the 4mm DAT appear to the S/390 system as a 3480 device, with the added benefit of the 12-24 GB capacity of the DAT. Only a single 4mm DAT may be mounted within the PC Server 330 itself. If desired, additional DAT drives may be installed in external enclosures such as the 3517, 3518, or 3510.

Please note, however, that the 4mm devices are classed as "Convenience Backup Devices" and are not intended to be used for intensive "production" type workloads. If you anticipate frequent tape use, more than an average of an hour or two per day, we recommend you consider the use of either SCSI or channel attached 3480 tape drives.

S/390 Channel Adapter Attached Tape Drives: The S/390 Parallel Channel Adapter can be used to attach 'real' 34x0 tape devices, such as 3420, 3480 and 3490. In this manner, the tape drives can be used by the S/390 system just as on a ES/9000 system using "Bus and Tag" cables. The S/390 Parallel Channel Adapter is part number 9662005.

SCSI Attached (OEM) tape drives: Another alternative is to attach OEM produced 3420/3480/3490 media compatible tape drives via the SCSI channel on the PC Server S/390. These devices are typically 'desktop' sized and range in price from about $3000 (3420) to $14000 (3490E). The performance levels will also vary considerably, with the higher cost models providing very good performance (comparable to parallel channel on a ES/9000). One of these devices will require a SCSI address on an external SCSI channel/connection. The integreated SCSI controller with it's external SCSI F/W connector is a good way of controlling such external SCSI tape drives. (Make sure you get SCSI cables with the correct connectors for the specific tape drive and SCSI controller you are using.)

The 3490 (and 3490E) compatible SCSI tape drives must be defined to the S/390 Operating System running on the PC Server S/390 as a 3480 with IDRC (compaction). In this manner they will provide most of the 3490E capabilities, but some of the extended functions may be limited or not available.

You should review the following lists carefully; there are several changes from prior lists of 'supported tape drives'.

Additional tape drives may be supported by ISITAPE.SYS. (Check the P390 DOC file **XTAPELO.DOC** for additional information.)

3480 18 Track Media Compatible SCSI drives: IBM does not endorse or support any SCSI attachable 3480 (18 track) media compatible tape drive units.

3490 36 Track Media Compatible SCSI drives: The only supported SCSI attachable 3490 36 track media compatible tape drive is the IBM 3490 Models F00 and F01. Note that this is a *Differential* device, so it requires the use of a differential SCSI adapter, such as the Adaptec AHA2944UW.

3420 9 track Media Compatible SCSI drives

Table 2. 3420 9 Track Media Compatible SCSI drives

Model	Type	Density	SCSI34x0
M4 9914S	3420	800/1600/6250	Yes
M4 9906G: Firmware rev 12 or later	3420	1600/6250	Yes

3420/3480 emulation on other media

Table 3. 3420/3480 Emulation on other media

Manufacturer - Model	SCSI34x0	Part Number
IBM 4mm (4/10GB) DDS-2	Yes	74G8631 74G8632
IBM 4mm (12/24GB) DDS-3	Yes	01K1282

Note:

When purchasing a SCSI attached OEM tape drive through a vendor, you should make sure the vendor understands and has experience with the PC Server S/390 and that the specific device manufacturer, model, and version has been shown to work with the PC Server S/390

Displays

IBM markets two lines of quality color displays suitable for use with the PC Server S/390 The Professional ('P') series is a very high quality line which is recommended when the system display is going to be used extensively. The General Purpose ('G') series is a quality line of displays.

Because of the high use of 'windows' and the GUI, we recommend at least a 15" display. If the display is going to be used extensively, a 17" or even 20" display is highly recommended.

6556-03N (P72) 17" "Professional" series. 1280x1224 Non Interlaced, 16" viewable area, Multi-Frequency .25mm dot pitch. Recommended best all-around display for use with the PC Server S/390.

6557-03N (P92) 19" "Professional" series. 1600x1200, Non Interlaced, 17.9" viewable area, Multi-Frequency .25mm dot pitch. A VERY nice display.

6541-02N (G51) 15" "General Purpose series. 1024x768 Non Interlaced, 13.6" viewable area, Multi-Frequency .28mm dot pitch.

6546-00N (G52) 15" "General Purpose series. 1024x768 Non Interlaced, 13.6" viewable, Multi-Frequency .28mm dot pitch. NUTEK & MPR-II complient

6547-00N (G72) 17" "General Purpose" series. 1280x1024 Non Interlaced, 15.7" viewable area, Multi-Frequency .28mm dot pitch

Uninterruptible Power Supplies (UPS)

Every PC Server S/390 should have a UPS. Period. At these price points, a UPS has to be one of the best "values" in the industry. For base servers, a 700 watt UPS will provide power for about 15 minutes. For larger configurations (with external disk encolosure), a 1000 or 1400 watt UPS may be appropriate. 15 minutes of protection will be sufficient to cover most power outages and allow time for a clean shutdown, if necessary. If you are using multiple external disk enclosures, remember to configure sufficient UPS capacity to power these enclosures.

94G3134 APC Smart-UPS 700. 4 outlets

94G3135 APC Smart-UPS 1000. 6 outlets

94G3136 APC Smart-UPS 1400. 6 outlets

The following table is summarized from APC's marketing material for their Smart-UPS UPS models when used with IBM PC Servers.

PC Server Model	Watts	VA	Runtime in minutes			
			700-VA	1000-VA	1400-VA	2200-VA
PC Server S/390 330	434	434	6.4	13	21	57

Miscellaneous Options

While most of these adapters can also be used with other systems, they tend to be especially useful and appropriate on the PC Server S/390.

9662005 S/390 Parallel Channel Adapter: Provides Parallel "Bus and Tag" connection to traditional S/390 I/O Devices (tape, printers, Comm.) Maximum 2 per PC Server S/390. It is based on "Artic Coprocessor" adapters, and provides better performance than the old S/370 Channel Emulator/A.

76H5407 IBM PCI Ultra-SCSI Adapter: For systems that require additional SCSI channel capacity. But remember, the base PC Server 330 provides an integrated ULTRA-SCSI adapter with an external connector.

32H3811 PCI SSA RAID Adapter A PCI bus adapter that supports RAID functions using SSA connected disk drives. The SSA drives will normally be contained in external SSA enclosures (such as IBM 3527 or 7133). Each SSA RAID adapter can support up to 96 attached devices, in multiple external enclosures.

94G5570 IBM PC Server Advanced Systems Management Adapter:
When combined with NetFinity software, this adapter can monitor many system measurement points, such as temperature, power, error conditions, and even provide remote control functions.

ServeRAID II Adapter

While the ServeRAID II is "just another adapter", it has enough interesting and useful capabilities to justify some special coverage. There are two primary parts of interest.

76H3584 ServeRAID II: High Performance/Capacity PCI RAID Adapter; provides three SCSI channels and can support up to 15 devices per channel. Includes 4 MB of memory on-board, of which about 3MB are available for data caching.

76G5401 8 MB battery backed-up cache. Provides a total of 8 MB of non-volatile memory for data caching on the ServeRAID II.

The new ServeRAID II by itself has several interesting improvements:

Faster on-board RISC processors, to handle the RAID functions faster.
"One-Step" Initialize/Synchronize function to simplify and speed up RAID configuration activities.
"Background Data Scrubbing" effectively provides continuous RAID resynchronization. This eliminates the need to do periodic "resyncs" while guaranteeing data redundancy.

With the addition of the 8MB Battery Backed-up cache, additional capabilities are provided:

More than twice as much memory (8MB) is available for caching data on the RAID adapter.
The 8MB is backed up via an on-board battery, thus insuring data integrity through almost any kind of problem, including power outages, operating system 'hangs', accidential cable disconnections, and even failure of the ServeRAID II itself. (The memory/battery module can be placed on a replacement adapter and the data in the non-volatile memory will be written to disk when the system is first brought up.)
This effectively eliminates data integrity concerns, so users can specify using 'Write-Back' caching on the adapter for maximum performance with excellent data integrity.

Configuration Suggestions:

If an external expansion unit (and supporting ServeRAID II) is required, consider using one channel of the ServeRAID II to control the internal drives, rather than using the integrated RAID controller. This will provide the non-volatile cache to the internal drives and allow the CDROM and DAT to be on a completely separate channel and controller.
For maximum performance and data integrity, it may sometimes be appropriate to use a ServeRAID II (with expanded cache) to conrol only the internal disk drives.
If required disk capacity exceeds one ServeRAID II, consider using SSA RAID adapter and devices rather than multiple ServeRAID IIs.

Chapter 6. Dial-In Access

(Updated 5/07/1998) Many customers have asked how to configure the PC Server S/390 to support dial-in access via phone lines. Typical uses would include 'work-at-home', mobile users, and off-site demo capabilities. While there are a number of ways to accomplish the dial-in objective, many users will also want full LAN connectivity to allow access to other resources on the LAN which the PC Server S/390 is connected to. IBM offers several ways to accomplish this dial-in requirement and one of them also provides full LAN connectivity and function.

1. The 8235/DIALs product is primarily a 'hardware' solution that attaches to the LAN with little or no impact on the PC Server S/390 or other systems on the LAN. There is a corresponding component which runs in the 'remote' PC.
2. The WAN3172 Device manager, running with a MultiPort model 2 adapter, will accept dial-in connections and act as an ASYNC-SDLC protocol converter. The remote workstation requires appropriate communications software, such as PCCOM.
3. The LAN3274 Device Manager, combined with the systems TCP/IP support, will allow a inbound SLIP connection to appear to the S/390 operating system as a non-SNA 3270 device.

8235 'Dial In Access to Lans' (DIALs)

The 8235 product offers a independent unit that has it's own built-in LAN adapter connection and supports either internal or external modems for remote users to dial into. A full range of security features are available, including support for dialback and a TACAS client for DCE Kerberos users. Once connected to the 8235, remote users have full use of the LAN environment which the 8235 is a part of. A Wide range of configurations are possible, for both Ethernet and Token Ring LANs, supporting many different protocols and connection methods. Using the internal modems, multiple 8235 units can be stacked together, providing a very compact installation.

A typical configuration to support up to 8 concurrent dial in 28.8 kbps connections would be:

Table 4. Sample 8 user 8235 DIALs Configuration

Part Number	Description	Quantity	Price (each)	Total cost
38H5600	8235-031 8 port unit with Token Ring LAN connection	1	$ 3,359.	$ 3,359.
38H5575	28.8 V.34 internal modem unit for 8235	8	$ 449.	$ 3,592.
	Total Cost			$ 7,151.

A smaller configuration to only support 2 concurrent dial in 28.8 kbps connections would be:

Table 5. Sample 2 user 8235 DIALs Configuration				
Part Number	**Description**	**Quantity**	**Price (each)**	**Total cost**
55H8540	8235-051 2 port unit with Token Ring LAN connection	1	$ 1,960.	$ 1,960.
92G7449	28.8 DataFAX External Modem, V.34	2	$ 249.	$ 598.
	Total Cost			$ 2,558.

Each remote user must also install and use a copy of the DIALs remote client program. There is no charge for using as many copies of the client program as needed. Remote users connect to the host network and work in their OS/2, Windows, Windows 95, DOS, Macintosh, or UNIX environment with no retraining or changes to their applications

While this configuration is believed to be correct, all customers should verify that any configuration ordered will operate correctly.

In addition...

Both products offer multiple other features and capabilities, such as WAN and inter-LAN connections, Dial-out, remote administration, and choice of protocols (IPX, TCP/IP, SNA, X.25, NetBIOS, 802.2, NetBEUI). Since these products supply only the 'connection services', each remote workstation must have it's own application programs such as:

1. Communications Manager/2 for 3270 connection/emulation for OS/2
2. PC/3270 for 3270 connection/emulation for DOS/Windows
3. LAN Requestor to be a user/requestor on a LAN Server network

WAN3172 Device Manager

The MultiPort model 2 communications adapter includes support to do a a form of ASYNC to SDLC protocol conversion. A PC dialing into the MultiPort-2 can use Async communications but will appear to the S/390 system as a SDLC connected 3270 terminal. THis option does not provide full LAN connectivity/function, but is is relatively easy to set up and configure. See the WAN3172.DOC file for additional information. Here is a simple configuration that would support up to 8 concurrent users at speeds up to 28,800 bps.

Table 6. Sample 8 line LAN Distance Configuration

Part Number	Description	Quantity	Price (each)	Total cost
N/A	WAN3172 Device Manager	1	$ 0.	$ 0.
33F8791	ARTIC MultiPort coprocessor adapter for ISA	1	$ 995.	$ 995.
53F2610	8 Port RS-232 interface	1	$ 249.	$ 249.
53F2619	8 connection cable	1	$ 246.	$ 246.
92G7449	28.8 DataFAX External Modem, V.34	8	$ 249.	$ 1,992.
	Total			$ 3,472.

Each remote user must also install and use a copy of appropriate communications support, such as eNetwork Personal Communications (PCOM).

Connecting Via SLIP

Another way to get 3270 dial connection to your PC Server S/390 without any additional equipment (other than modems) is to use the OS/2 TCP/IP SLIP support together with LAN3274's TN3270 datastream support.

This document cannot provide full details, but in general:

1. Configure the PC Server S/390 with 3270 sessions using LAN3274 (Specify "/PORT=7490" on the **dmstart aws3274** in **IPL.CMD**
2. IPL the 390 system and vary on/enable the 3270 address(es).
3. Enable the SLIP line by issueing the following 2 commands from an OS/2 window.

   compact

   MODE COM3:19200

   SLIP -COM3 -connect "ATANS.CMD"
4. Configure a SLIP connection on the client TCP/IP workstation
5. Dial/Connect from the client to the PC Server S/390, establishing the SLIP connection.
6. Open a TN3270 window and connect to the host, specifying port 7490.
7. The PC Server S/390 S/390 Logo should appear.

The LAN3274.DOC file has additional information for setting up this support.

Chapter 7. Obtaining additional information 'On-Line'

(Updated 10/31/1997)

S/390 Web Page

The "Home Page" for the PC Server S/390 is linked off the S/390 home page:
http://www.s390.ibm.com
From there, choose **Gateway** , then **Products and Services**, then **Hardware**
You may also be able to reach it directly via:
http://www.s390.ibm.com/products/p390/p390hp.html
This page will contain various kinds of information, such as performance reports and recent changes/enhancements to the P390 device managers. This Quick Reference document is available from this home page in both "browseable" (HTML) form as well as downloadable (PostScript) form. The *Technical Application Guide (TAB)* is also available in HTML and PostScript forms from this page. Other sites will be linked off of this page for easy access to updated code or announcements.

Obtaining Configurator Updates

The IBM PC Company in the US provides a configurator tool, **ConfigXprt** to assist in configuring and pricing PC based systems. There are two versions of ConfigXprt (differing only in the pricing information included).

Reseller Version:
The Business Partner version of ConfigXprt is available via the IBM PC Company "Business Partner Home Page". The Business Partner Home Page is at *http://www.partner.us.pc.ibm.com* . Access to this material requires a "userid and password" which any business partner can obtain. Information on obtaining the userid/password is included on the Business Partner Home Page. Other information, such as product specifications, and marketing and promotional programs is also available at this site.

Public Version:
A version of ConfigXprt for use by the general public is available at *http://www.us.pc.ibm.com/configxprt* .

Both Versions:
Both versions are available for either Windows or OS/2. (The OS/2 version runs in a WIN-OS/2 session.) Updates are made available at the above listed web sites on approximately a weekly basis. ConfigXprt does not include the S/390 specific parts (S/390 Processor or S/390 Parallel Channel Adapter), so these components must be added 'manually'. Also, since ConfigXprt does not include software products, Warp Server and Communications Manager must be added manually. Based on past experience, I also recommend users carefully review any Multi-Port configurations. Use of ConfigXprt requires an appropriately configured OS/2, Windows 3.1, Windows 95, or Windows NT system with at least 15MB of disk space available. The installation process also places about five MB of files in the Windows system directory.

Note.

The ICPA configurator tool has been withdrawn by the IBM PC Company. It is no longer being maintained or updated. (The current configurator supported by the PC Company is ConfigXprt.) An alternate configurator, (QED-Configurator) is available from the P390 Technologies Competency Center. QEDCONF was written specifically to support the PC Server S/390 and is available in both OS/2 and Windows/95 versions. If you want a copy of QEDCONF, send a note to PCSVR390@vnet.ibm.com. Indicate which version (OS/2 or Windows/95) is desired.

Obtaining Software Updates

PC Company Web Page

The IBM PC Company "file download area" has many files which can be downloaded via the Internet. Some of the files which are available include:

Firmware (BIOS) updates for Servers and intelligent adapters
New / updated Device Drivers
Utility / Configuration program updates
OS/2 and PC Server S/390 software updates

The PC Company Web page is **http://www.us.pc.ibm.com** . To directly access the "Files" section, use **http://www.us.pc.ibm.com/files.html**
You can select the "PC Servers" or "OS/2 Drivers" links to view and download the available software.

PC Company File Transfer Protocol Site

For people who prefer to use FTP rather than a Web Browser, you can directly access the PC Company file download area via FTP. The FTP site is **ftp.pc.ibm.com** (all files are in the **/pub** directory). Logon as user **anonymous**. To go direct to the "PC Servers" directory, use **ftp.pc.ibm.com/pub/pc_servers** and to access the OS/2 Drivers directory, use **ftp.pc.ibm.com/pub/os2_drivers** Remember to transfer any program files in "Binary" mode and file names are case sensitive. The file **allfiles.txt** in the **pub** directory contains a complete listing of all files available and a brief description of each.

P390 Support Information and Fixes

The P390 Development and Support group maintaines a FTP site which has numerous files of interest to PC Server S/390 resellers and users.

Documentation and related files, such as this document and the "Hints & Tips" document. (In the **/doc** directory)
Currently available Fixpacks
"Incoming" area, to allow users to send files or data to the developers.
Fixes which have been tested, but which have not yet been incorporated into a Fixpack. (Use with caution!)
Fixes undergoing test and/or "BETA" level code. These temporary fixes are to correct specific problems. Users should only install these fixes under the specific direction of IBM Support, or P/390 developers.

The P390 FTP site can be accessed as:
p390.ibm.com

login in as user anonymous, password=your_net_id
review the 'read.me' file

Over time, we expect to enhance this site with additional files and documents.

Publications of Interest

There are a number of publications that may be of interest to anyone interested in learning more more about the PC Server S/390 and what it is capable of doing.

Redbooks:

GG24-2538: *MVS and the IBM PC Server 500 System/390*
SG24-4679: *VSE and the IBM PC Server 500 System/390*
SG24-4624: *Connectivity on a PC Server System/390*
SG24-4612: *Printing with MVS and the PC Server System/390*
SG24-4847: *P/390 and R/390 with OS/390: An Introduction*

Technical Application Brief

The "TAB' (subtitled: *"The PC Server S/390, is it Right for You?"*) is available as a publication (GK20-2763) or as a viewable and printable document linked off the PC Server S/390 home page (noted above).

Users Guide and Reference

The *PC Server S/390 User's Guide and Reference* is available as publication SA22-7249.

Online Discussions

The resources noted below are very informative and participants can be very helpful. These resources are, however, informal and "unofficial"; information from these sources should not be considered as formal IBM support or statements.

There is a **"PC500390 CFORUM"** available on IBM's **"TALKLINK / DIAL IBM"**. (IBM employees can access this CFORUM on either IBMPC or IBMVM conference disks.)

There is an Internet P/370 - P/390 Discussion group:
P370-L @ PUCC.PRINCETON.EDU
Send 'SUBSCRIBE' request to listserve@pucc.princeton.edu

Chapter 8. Solution Providers - Distributors

In the USA the PC Server S/390 is sold through a group of resellers known as "Solution Providers - Distributors" or SP-Ds (formerly known as "Managing Industry Resellers" or MIRs). These SP-Ds and their affiliates (IRAs) have been through education and training specific to the PC Server S/390. Customers who want more information about the PC Server S/390 contact one of the IRAs directly or they can call IBM at 1-800-IBM-4YOU and a reseller will respond, normally within 48 hours. A list of the current resellers is available from the P390 home page on the internet:
http://www.s390.ibm.com/products/p390/p390hp.html
and follow the "for additional information" link.

Outside of the USA, the PC Server S/390 is sold via the Value Added Remarketer (VAR) channel. Normally, each VAR is authorized to sell the PC Server S/390 within a specific country. For a list of certified VARS, follow the same link (above) and select the list of international resellers.

Post Install Support

In addition to having marketing responsibility for the PC Server S/390, the SP-Ds and their affiliates are also the primary contact point for getting support and assistance after installation. The SP-Ds and their IRAs will configure and install the system, including the basic S/390 operating system. For any questions or problems during or after installation, customers should contact their IRA, who can then contact IBM support when necessary.

Chapter 9. Sample Configurations

(Changed 05/07/1998)

Typical Hardware Configurations

The configurations below are intended to demonstrate various options. They are not necessarily the best configuration in order to achieve a specific requirement. As an example, for consistancy and simplicity, none of these configurations will include disks allocated as 'Hot-Spare' drives, which is normally a very good practice, especially in large disk configurations.

Notice:

IBM has not established 'suggested list prices' for the S/390 Processor Adapters; prices are set by the resellers. For the purpose of comparing configurations this document will use approximate 'value prices'.

Warning!

The prices listed below are US list or value prices (in US dollars) and are intended for comparision purposes only. Prices for both hardware and software will vary signifncantly in other countries. You must check with IBM or your preferred reseller for current local price information."

VSE Small Application Server

Part Number	Quantity	Part Name or Description	Unit Price	Extended Cost
864 PB	1	PC Server 33 Model PB Hot/Swap, 266MHz, Integ Se PC Server 33 High performance Hot/Swap server with: Pentium II 266 MHz processor, 32KB L1 cache, 512K L2 cache, 64MB ECC RAM (expandable to 512MB) six hot/swap Slim High disk bays, 3 media bays 3.5" Diskette, 8X CDROM drive, keyboard, mouse Integrated Ultra-SCSI controller and SVGA adapter, Integrated 1 channel ServRaid conroller, 1 /1 Ethernet, 3 year limited warranty (5x8 standard, 7x24 available)	3649	3649
94G6474	1	64MB ECC 6 NS memory DIMM	389	389
1K1282	1	12/24 GB 4mm DDS3 DAT Tape drive	1265	1265
94G7491	6	4.51GB Ultra-SCSI Hot/Swap SL disk drive	799	4794
9662256	1	256MB PCI Enhanced S/39 Processor Adapter IBM does not set a suggested retail price for this part. This price should be used for reference or comparsion purposes only.	2	2
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
4 74548	1	eNetwork Personal Comm. 4.21 for OS/2	329	329
76H 238	1	1MB Video memory upgrade	15	15
33F8791	1	Artic Multi-Port Mdl-2 Base adapter	995	995
53F261	1	Artic Multiport RS-232 PIB card	295	295
53F2619	1	8 port RS232 cable for Multiport	246	246
6547 N	1	G72 17" SVGA high-performance series display	499	499
94G3135	1	APC Smart-UPS 1 : for medium size systems	516	516
			Total cost of this Configuration:	34291

```
End of report
```

Rationale:

1. Distributed system, small local S/390 workload.
2. Standard 256MB Enhanced S/390 Microprocessor adapter
3. Include additional 64MB PC memory for large HPFS cache.
4. Local network is Ethernet based, use integrated 10/100Mb Ethernet
5. Remote locations do not have power protection, so include UPS
6. Inter-connected to central host and other remotes via 38.4KB lines using MultiPort-2 adapter.

Disk Cofiguration: System will not require large disk storage. Start with 8640-PB0 with integrated RAID adapter then add six 4.51GB hard drives, providing approximately 22 GB capacity in a RAID-5 configuration.

VSE 'Old Iron Replace'

```
  Part  Quantity    Part Name  or                          Unit   Extended
 Number            Description                           Price    Cost
_______  ____  ____________________________________________  _______  _______

864 PB    1 PC Server 33  Model PB  Hot/Swap, 266MHz, Integ Se   3649    3649
            PC Server 33  High performance Hot/Swap server with:
              Pentium II 266 MHz processor, 32KB L1 cache,
              512K L2 cache, 64MB ECC RAM (expandable to 512MB)
              six hot/swap Slim High disk bays, 3 media bays
              3.5" Diskette, 8X CDROM drive, keyboard, mouse
              Integrated Ultra-SCSI controller and SVGA adapter,
              Integrated 1 channel ServRaid conroller, 1  /1  Ethernet,
              3 year limited warranty (5x8 standard, 7x24 available)
94G6474   1 64MB ECC 6 NS memory DIMM                        389     389
 1K1282   1 12/24 GB 4mm DDS3 DAT Tape drive                1265    1265
 2K 477   6 9.1 GB Ultra SCSI Hot/Swap SL disk drive         1185     711
9662256   1 256MB PCI Enhanced S/39  Processor Adapter       2        2
            IBM does not set a suggested retail price for this part.
            This price should be used for reference or comparsion
            purposes only.
25H8 3    1 OS/2 WARP Server Advanced                      1299    1299
4 74548   1 eNetwork Personal Comm. 4.21 for OS/2           329     329
76H 238   1 1MB Video memory upgrade                        15      15
9662  5   1 S/39  Parallel Channel Adapter                  36      36
33F8791   1 Artic Multi-Port Mdl-2 Base adapter             995     995
53F261    1 Artic Multiport RS-232 PIB card                 295     295
53F2619   1 8 port RS232 cable for Multiport                246     246
6554673   1 P7  17" SVGA 'Professional' Series Display      589     589
94G3135   1 APC Smart-UPS 1    : for medium size systems    516     516
_____________________________________________________________________  _______

                                Total cost of this Configuration:   4 297
  End of report
```

Rationale:

1. Replacing old 4361 system
2. Standard 256MB Enhanced S/390 Microprocessor adapter
3. Include S/390 Parallel Channel Adapter to allow connection of printer and 3174 control unit.
4. SCSI 3480 will be obtained separately
5. Include additional PC memory for large data cache in emulated Expanded Storage.
6. Local network is Ethernet based, use integrated 10/100Mb Ethernet
7. Building does not have UPS power protection, so include UPS.

8. Inter-connected to central host and other remotes via 38.4KB lines using MultiPort-2 adapter.

Disk Configuration: Approximate 30 GB of disk storage required for VSE workload, plus some room for migration activities and later expansion. Using PB0 base model and six 9.1GB disk drives will provide about 45 GB of useable space in a RAID-5 configuration resulting in a system which requires minimun space and low purchase price.

VM Development system

Part Number	Quantity	Part Name or Description	Unit Price	Extended Cost
864 PB	1	PC Server 33 Model PB Hot/Swap, 266MHz, Integ Se PC Server 33 High performance Hot/Swap server with: Pentium II 266 MHz processor, 32KB L1 cache, 512K L2 cache, 64MB ECC RAM (expandable to 512MB) six hot/swap Slim High disk bays, 3 media bays 3.5" Diskette, 8X CDROM drive, keyboard, mouse Integrated Ultra-SCSI controller and SVGA adapter, Integrated 1 channel ServRaid conroller, 1 /1 Ethernet, 3 year limited warranty (5x8 standard, 7x24 available)	3649	3649
94G6474	1	64MB ECC 6 NS memory DIMM	389	389
1K1282	1	12/24 GB 4mm DDS3 DAT Tape drive	1265	1265
2K 477	6	9.1 GB Ultra SCSI Hot/Swap SL disk drive	1185	711
9662256	1	256MB PCI Enhanced S/39 Processor Adapter IBM does not set a suggested retail price for this part. This price should be used for reference or comparsion purposes only.	2	2
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
4 74548	1	eNetwork Personal Comm. 4.21 for OS/2	329	329
94G6475	1	128MB ECC 6 NS memory DIMM	879	879
76H 238	1	1MB Video memory upgrade	15	15
33F8791	1	Artic Multi-Port Mdl-2 Base adapter	995	995
53F261	1	Artic Multiport RS-232 PIB card	295	295
53F2619	1	8 port RS232 cable for Multiport	246	246
76H3584	1	ServeRAID II PCI RAID Controller	1949	1949
76H54 1	1	ServeRAID II 8MB Battery cache upgrade	328	328
76H5399	1	ServeRAID II Drive Status Cable	17	17
76H3589	1	1 Meter ext. .8mm SCSI cable for ServeRAID II	44	44
3517 2	1	3517 Multi-SCSI Expansion Encl. Mdl 2 (5 HH H/S ba	1269	1269
2K 478	5	18.2GB Ultra-SCSI Hot/Swap HH disk drive NOTE: 18.2 GB drive is Half-High (1.6") form factor Each drive occupies two SL Hot/Swap positions Only 3 will fit into Server 33 or 3518 Hot/Swap bays. 3517 will accomodate 5 HH drives.	2325	11625
6554673	1	P7 17" SVGA 'Professional' Series Display	589	589
94G3136	1	APC Smart-UPS 14 : for larger systems	676	676
41H89	2	PCI Token-Ring adapter	275	55
			Total cost of this Configuration:	53518

End of report

Rationale:

1. VM System used for development and Office System support
2. large disk capacity required for running multiple types and levels of guest operating systems
3. Critical data, protected via RAID and UPS
4. Token Ring LAN Supports S/390 and LAN server for both VM and OS/2 TCPIP (requires at 2 Token Ring ports, use two PCI Token Ring adapters).
5. Total of 256MB PC Memory to allow large cache and 128MB of S/390 Expanded Storage.

6. External SCSI attached 3480 to be obtained separately and attached to external port of integrated Ultra-SCSI controller.
7. Standard 256MB Enhanced S/390 Microprocessor adapter
8. MultiPort adapter to provide 8 lines (up to 38.4 Kbs) to connect to other systems.

Disk Configuration: Start with 8640-PB0; internal disk will not be sufficient, so add a ServeRAID II with 8MB battery backed up cache. User ServeRAID II to control internal and external drives. Can place up to six 9.1GB drives internally, then put five 18.2GB drives in a 3517 enclosure. With six 9.1 GB drives in one RAID-5 array and five 18.2 GB drives in the second array, a total of 115GB would be available.

OS/390 Large 'Data Mining' Application Server

Part Number	Quantity	Part Name or Description	Unit Price	Extended Cost
864 PB	1	PC Server 33 Model PB Hot/Swap, 266MHz, Integ Se PC Server 33 High performance Hot/Swap server with: Pentium II 266 MHz processor, 32KB L1 cache, 512K L2 cache, 64MB ECC RAM (expandable to 512MB) six hot/swap Slim High disk bays, 3 media bays 3.5" Diskette, 8X CDROM drive, keyboard, mouse Integrated Ultra-SCSI controller and SVGA adapter, Integrated 1 channel ServRaid conroller, 1 /1 Ethernet, 3 year limited warranty (5x8 standard, 7x24 available)	3649	3649
1K1282	1	12/24 GB 4mm DDS3 DAT Tape drive	1265	1265
9662256	1	256MB PCI Enhanced S/39 Processor Adapter IBM does not set a suggested retail price for this part. This price should be used for reference or comparsion purposes only.	2	2
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
4 74548	1	eNetwork Personal Comm. 4.21 for OS/2	329	329
94G7 79	1	256MB ECC 6 NS memory DIMM	1869	1869
76H 238	1	1MB Video memory upgrade	15	15
33G8469	1	Wide Area Connector: RS232D Base adapter	599	599
33G847	1	Wide Area Connector: V.35 Base adapter	639	639
32H3811	1	PC Server SSA RAID Adapter (PCI)	2 13	2 13
3527 1	2	3527 SSA Entry Storage Subsystem (5 SSA H/S bays)	1495	299
21H8734	1	9.1 GB SSA H/S Disk drive (half high)	3899	3899
59H7221	4	SSA External Cable set, 2.5 M.	58	232
2K 477	6	9.1 GB Ultra SCSI Hot/Swap SL disk drive	1185	711
6554673	1	P7 17" SVGA 'Professional' Series Display	589	589
94G3136	1	APC Smart-UPS 14 : for larger systems	676	676
9662 5	1	S/39 Parallel Channel Adapter	36	36
			Total cost of this Configuration:	85864

End of report

Rationale:

1. OS/390 Generally requires 128MB of S/390 RAM and at least 10GB useable DASD space for base system. PC Server 330 System unit would include the 256MB Enhanced P390 Microprocessor adapter and a total of 256MB of PC memory to allow both a large data cache and 128MB of emulated S/390 Expanded Storage.
2. I/O performance, expecially read, is critical to application
3. S/390 Parallel Channel Adapter to connect local 3174 and tapes
4. Integrated Ethernet LAN adapter sufficient for needs.

5. Large DASD config is needed to provide storage of data mining data base and access tools.
6. WAC Adapter with RS-232 and V.35 interfaces for communications to other sites.

Disk Cofiguration: Start with 8640-PB0; add six internal 9.1GB drives to contain all OS/2, communications, P390 support, and basic OS/390 operating system and related subsystems. These disks are configured as RAID-1 for maximum Read/Write performance and this provides 27GB of useable disk space. Additional disk storage for the 'Data Mine' is via SSA RAID adapter and multiple 3527 (Entry SSA Enclosure) external units. Each 3527 will contain five 9.5GB drives. Configuration shown has two 3527 with a total of 10 9.1 GB drives. Assuming two arrays of five drives each, this provides a total external capacity of about 72GB. (The SSA drives are configured as RAID-5 for good capacity while providing the good read perfromance required for data-mining.) Additional 3527 units can be easily added as data base expands.

Base Software Packages

ESL Prices for basic software stacks for each operating system platform. Use these for 'ballpark' estimates only. Exact price estimates must be done via HONE/CFPROGS to ensure a proper configuration and current prices.

The tables below describe the software contained on the standard "Pre-Configured CDROMs". These normally represent a miminal or "starting-point" configuration, not a full, useable, production system.

VM/ESA: 2.3

Table 7. VMESA Software ESL Prices

Product Name	Program ID	Ver/Rel	ESL Price (OTC)
VM/ESA Ver 2 with CMS GUI, CMS utilities, 3800-3 Image library, and restricted source.	5654-030	2.2	$ 11,500.
ICKDSF/VM	5684-042	1.16.0	NC
EREP	5654-260	3.5.0	NC
HLASM	5696-234	1.2.0	$ 2,120.
3270 PC File xfer	5664-281	1.1.1	$ 908.
Total	VM-Base	1.2.2	$14,528.

VSE/ESA 2.3

Table 8. VSE/ESA Ver 2.2 ESL Prices

Product Name	Program ID	Ver/Rel	ESL Price (OTC)
VSE Central Fun.	5686-066	6.1.0	$ 9,615.
Unique Code VSE/OLTEP REXX/VSE LANRES/VSE VSE/AF VSE/POWER FastCopy VSE/ICCF VSE/VSAM VSAM Space Mgt VSAM Back/Rest			
VSE/EREP	5656-260	3.5.0	NC
ICKDSF/VSE	5747-DS2	1.16.0	NC
ACF/VTAM(r)	5686-065	4.2.0	$ 4,095.
CICS/VSE	5686-026	2.3.0	5,880.
DITTO	5688-052	3.2.0	623.
BTAM	5746-RC5	1.1.0	398.
HLASM for VSE	5696-234	1.1.0	545.
Total	Base VSE	2.1	$ 21,156.

OS/390 Ver 2, Rel 4

Table 9. OS/390 (5647-A01) Version2, Release 4, Base Components

Product/Component name
MVS SP, (BCP, IPCP), JES2, HCD, MICR/OCR, UNIX System Svcs,
Bulk Data Transfer base
BookManager Read
UNIX Shell, Services, Utility and Application Services
DCE Base Svcs, DFS, Go Webserver OS/390 NetQuestion and ICSS 2.1. Encina Toolkit Executive and DCS Application Services
DFDSMS/MVS dfp, DFSMS/NFS
ACF/VTAM, TCP/IP, FFST/MVS
ESCON Dir. Support, BDT
EREP MVS, ICKDSF/MVS, HCD, ESCON Dir. Support
GDDM, GDDM-PCLK, GDDM-OS2, TSO/E, ISPF V4, SMP/E
High Level Assembler, Language Envir./370. VisualLift RTE
BookManager Read, OS/390 Softcopy Print, MICR/OCR
OS/390 Application Enabling Technology
LANRES/MVS, LAN Server, OSA Support Facility
Internet Bonus Pak II, with Secure Server
SOMobject Runtime lib, SOMobject Service Classes
TIOC
Total ESL OTC 32,930

OS/390 Optional Features

The following additional features are shipped integrated with OS/390 on the preconfigured CDROM. These features are available at an additional charge and they can easily be enabled on the OS/390 system.

Table 10. OS/390 Ver 2 Rel4 Optional Features

Product Name
JES3
Bulk Data Transfer base: File to file
Bulk Data Transfer base: JSE3 SNA NJE
DFSMSdss (TM)
DFSMShsm (TM)
DFSMSrmm (TM)
RMF
SDSF
Security Server
C/C++ (with debug)
DFSORT
GDDM-PGF GDDM-REXX
HLASM Toolkit
Language Env. Data Encryption
SOMobjects for MVS App. Dev. Env. (CORBA 2.0)
VisualLift App. Dev. Env.
OpenEdition Data Privacy: CMDF
OpenEdition Data Privacy: CMDF and DES
TCP/IP CICS Sockets, and IMS Sockets:
BookManager Build
IP Printway/NetSpool
TME Netview OS/390

Typical Configuration Costs

These configurations and costs are for 'ballpark' purposes only.

Table 11. VM/ESA Minimum System	
VM/ESA V 2.1 Base Pre-Config Software	$ 14,528.
PC Server S/390 (256MB S/390 memory, 22 GB useable disk capacity, Display, LAN Adapter, UPS, RAID, Multiport)	$ 34,300.
Total	$ 48,828

Table 12. Medium VM/ESA system	
VM/ESA V 2.1 Base Pre-Config Software	$ 14,528.
Additional VM Software (VTAM.TCPIP, OV, compilers, etc.)	$ 20,000.
PC Server S/390: (256MB S/390 memory, 128MB PC memory, UPS, 44GB Disk, 390 Chan, PortMaster, display)	$ 40,300.
Total	$ 74,828

Table 13. VSE/ESA Minimum System	
VSE/ESA 2.1 Base Software	$ 21,556.
PC Server S/390 (256MB S/390 memory, 22 GB RAID useable, 128MB PC Memory, Display, LAN Adapter, UPS)	$ 34,300.
Total	$ 55,856.

Table 14. Large VSE/ESA System	
VSE/ESA 2.1 Base Software	$ 21,156.
Additional VSE Software (COBOL, SQL, etc.)	$ 10,000.
PC Server S/390: (256MB S/390, 96MB PC memory, UPS, 45GB Disk, 390 Chan, PortMaster, display)	$ 40,300.
Total	$ 71,456.

Table 15. OS/390 Minimum System	
OS/390 Base Software	$ 32,930.
PC Server S/390 (256MB S/390 memory, 45 GB RAID useable, S/390 Parallel Channel, 2 line WAC, 256MB PC Memory, Display, 96MB PC memory, LAN Adapter, UPS)	$ 42,000.
Total	$ 74,930

Table 16. OS/390 Typical System	
OS/390 Base Software	$ 28,640.
Additional MVS Software (COBOL, CICS, DB2, etc)	$ 15,000.
PC Server S/390: (256MB S/390 memory, 256MB PC memory, UPS, 110GB Disk, 390 Chan, 2 line WAC, display, Token Ring adapter)	$ 53,500.
Total	$ 97,430.

Preconfigured Software Stacks

Software stacks are available for each of the s/390 operating systems on a pre-configured CD-ROM. Each software component on the CD must be separately licensed. These pre-configured CDs are available as the following features.

Table 17. Preconfigured CD Software Stacks

Product Name	**Program ID**	**Feature**
OS/390	5645-001	5819
MVS/ESA V5R2	5655-068	5809
MVS/ESA V4R3	5695-047	5809
VM/ESA V2R1	5654-030	5899
VM/ESA SD0 V2	5684-026	5899
VSE/ESA V2R1	5690-VSE	2000

Chapter 10. PC Server S/390 Order Checklist

(Updated 5/07/1998) Use this simple checklist to help order a system and make sure all needed components are included in the order. This is not intended to cover all possible systems and there may be good reasons to differ from the sequence and suggestions herein.

System Unit

Choose model:

Start with base system, PC Server 330:

__ – 8640-PB0: Base system unit with no disks and Integrated 1 channel RAID

Basic Configuration: Here are the components almost always required.
For the 8640-PB0:

8640PB0 Base system unit (Hot/Swap, integrated RAID, no hard drives)
01K1282 4mm DAT DDS-3 12/24GB Tape unit
25H8030 OS/2 WARP Server Advanced
4074548 Personal Communications (PCOMM) Ver 4.21

S/390 Adapter / Memory: Enhanced P/390 Microprocessor adapter only comes in 256MB size.

__ 9662-256: 256MB:

Server Memory: Choose total PC Memory size:

__ 64MB (base): Sufficient for "S/390 only" systems with light to moderate I/O. Will allow a 20MB HPFS386 cache.
__ Additional 32MB - 64MB to allow larger (48-64MB) HPFS386 cache
__ Additional 64MB - 256MB to allow some PC memory to be defined as S/390 Expanded Storage
__ Additional: Add additional PC Memory to support PC Server functions. For light LAN Server workload, add 32MB; for moderate to heavy LAN workload, add 64MB or more.

You should normally select DIMM configuration that miminizes the total number of DIMMs.

I/O Devices

DASD:

Most customers will use additional 4.5 GB or 9.1 GB drives. Remember that the -PB0 does not come with any hard drives standard.

__ Determine total actual data GB required
__ For RAID: adjust for redundant data 'overhead'
__ Use Disk Configuration Aid at end of this checklist for assistance
__ For Array: 'over-configure' to allow capacity for growth without disrupting ARRAYs.
__ Order hard drives/enclosures to meet GB requirements
__ Additional RAID Controller(s)? If External Enclosures are required, use either ServeRAID II or SSA RAID conrtollers.
  __ – ServeRAID: Provides three Ultra-SCSI channels and has option of 8MB battery backed-up write-back cache.

__ – SSA RAID adapter: Consider when reliability and performance are very important, or when capacity requirements exceed about 150 GB.

__ External Enclosures (3517, 3518, 3527) as required
- __ – 3517 Multi-SCSI enclosure
- __ – 3618 Enterprise Expansion Enclosure (remember to order appropriate SCSI repeaters)
- __ – 3527 SSA Enclosure
- __ – 7133 for large SSA storage requirements

LAN Adapters

__ Token Ring:? PCI Token Ring, Triple LANStreamer PCI

__ Ethernet:? EtherJet PCI 100/10
- – Media: 10-Base-T (unshielded twisted pair) or 10-Base-2 (thin Coax)?

__ ATM, FDDI, etc?

__ LAN Cables / connectors?

One LAN-adapter / port will be sufficient for most S/390 only usage. For LAN based workload, add sufficient TokenRing or Ethernet ports to process that workload. System comes with integrated 10/100 Ethernet. Consider need for S/390 based TCP/IP (separate LAN port required).

WAN Adapters:

For SDLC / BSC communications via VTAM, etc.

Wide Area Connector(WAC) RS-232, V.35, up to 2 lines (OS/390 as XCA, and VM/ESA, VSE/ESA as ICA)

MultiPort model 2: RS-232, up to 8 lines per adapter: VM, VSE, OS/39 (Carefully review supported interfaces, speeds, and protocols before ordering a specific configuration.)

Other I/O

__ S/390 Parallel Channel Adapter ? (attach S/390 type I/O Devices)

Availability

__ UPS: Every PC Server S/390 should have a UPS. Should size UPS to provide approximately 15 minutes run battery time:
- – APC Smart-UPS 700: Smaller systems, up to 6 drives
- – APC Smart-UPS 1000: Medium systems, (one small expansion unit)
- – APC Smart-UPS 1400: Larger systems, or longer battery run time.

__ PC Server Advanced Systems Management Adapter

Displays

__ Size: 15", 17", 20"

__ General ('G') or Pro ('P') series

Disk Configuration Aid

The following table is intended to assist in determining Hard Drive configurations. It is based on following assumptions:

Uses 4.5 GB or 9.1 GB Drives only (Type III backplane/tray).
RAID configurations assume RAID-5
Configurations are for maximum capacity, not maximum performance
External enclosure configurations not shown

All six internal drive bays are available for hard disks (high-SCSI jumper is used, or CDROM and 4mm DAT are connected to another SCSI controller).

RAID System Internal Capacity

Use this chart to help configure Array systems

Table 18. PC Server S/390 Internal RAID Capacity

# Drives	Total Capacity, 4.5GB	Data Capacity, 4.5GB	Total Capacity, 9.1GB	Data Capacity, 9.1GB
3	13.5	9.0	27.0	18.0
4	18.0	13.5	36.0	27.0
5	22.5	18.0	45.0	36.0
6	27.0	22.5	54.0	45.0

Using 3517

Each 3517 can hold 5 Hot/Swap drives and 2 non-Hot/Swap, of either 4.5, 9.1GB, or 18GB capacity per drive. Assuming 18 GB hard drives, a 5 drive configuration provides 72GB useable, or 100GB useable in a 7 drive configuration.

Using 3518

Each 3518 can hold up to 18 hot/Swap hard drives of either 4.5 or 9.1 GB each. Twelve drives can be connected to a single channel of the ServeRAID II adapter. Use of 13-18 drives requires the connection of a second RAID/SCSI channel. An 18 drive 3518 by itself can provide 130 GB of RAID 5 disk capacity. Combining this with the 6 internal drives of a PC Server 330 (3 arrays of 8 drives each) provides a total of about 185GB. Use one SCSI Repeater for each SCSI channel coming into the 3518.

Using 3527

Each 3527 SSA Expansion Enclosure provides up to 5 hard drives (2.25, 4.5 or 9.1 GB) per enclosure. Multiple 3527 units can be connected to a single SSA RAID adapter, with up to 96 active disk drives per adapter. Configurations providing over 200GB RAID-5 useable disk space are possible with a single SSA RAID adapter.

IBM

Part Number: 050798
File Number: S/390

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