IBM PC Server System/390

Quick Product Guide:

Quick Reference

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IBM PC Server System/390

Quick Product Guide:

Preface

Welcome to the **Quick Product Reference Guide** for the ***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 PC Server S/390. It should be used in conjunction with the **ICPA** or **PSCFG** configurator tools to ensure reasonable and valid configurations.

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 Adapter

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

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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

09/03/96 Additional information on the ServerRAID adapter, PCI LAN adapters, Dial-in support. Updated all configs

12/18/96 Changes to reflect the announcement and availability of the 4.5GB disk drives in slim-line format for the PC Server. Other small updates and corrections.

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.

03/15/97 Minor update to better describe cable configurations and correct SCSI Cable configuration information. Updated list of supported SCSI attached tape drives.

05/20/1997 Updated SCSI cable configuration section with latest information and options. Updated information on PC Configurator tool to cover new configurator (ConfigPro) and how to get it. Minor updates to sample configurations for new SCSI cables and prices. Added change-indicator for changed/added sections.

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Chapter 1. System Units

The PC Server S/390 is built upon the PC Server 330, using the ESS (8640-ESS) or ES2 (8640-ES2) models. 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):

200MHz Pentium Pro Processor
32MB ECC Std Memory 60ns (For Pentium)
16KB L1 Write Back Cache
256KB L2 Write Back Cache
1 dedicated PCI bus slot
4 shared PCI/EISA slots (All PCI slots are capable of 133MB/sec data transfer rates.)
4 dedicated EISA slots
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
ServeRAID RAID Adapter (PCI adapter)
Cable from ServeRAID adapter to Hot/Swap backplane
Ultra-SCSI Adapter integrated on the systemboard (one internal and one external SCSI-2 Fast and wide connector)
SVGA-NI Graphics Adapter (1024/768 max) integrated on systemboard (1MB standard, additional 1MB optional)
3 Year On-Site Warranty
ServerGuide, TME 10 Netfinity
Reference & Diagnostic Diskettes
S/390 MicroProcessor Complex in either 32MB or 128MB versions.
P/390 Licensed Programs
4/10GB 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.)
Communications Manager/2

Specific Configurations

PC Server 330 based PC Server S/390 machines can be based on the 8640-ESS or 8640-ES2. Additional components and features are added to this system to provide the desired configuration.

The Base 8640-ESS includes two 2.25 GB hard drives. Up to a total of 6 slim-height drives (2.25 or 4.5GB) can be added as internal drives. Additional hard drives can be configured in external enclosures.

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Alternate Base System (ES2)

To allow additional configuration flexibility, the 8640-ES2 can be used instead of the -ESS model. The ES2 is a Hot/Swap model but does not include any disk drives, ServeRAID Adapter or RAID to backplane cable. If this ES2 model is used, the ServeRAID adapter **must** be added and at least two IBM disk drives installed and the ServeRAID to Backplane cable added. The primary advantage of using the ES2 is that it can be configured with six internal 4.5GB hard drives without having to remove the two 2.25 drives which are standard in the ESS.

ServeRAID Adapter

All models of the PC Server S/390 provide a ServeRAID Adapter (either standard on the ESS, or a required option on the ES2) 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 ServeRAID adapter provides 3 SCSI channels, each of which supports up to 15 devices. It has three internal connectors and 1 external connector. The first internal channel will normally be used to support the internal disk drives, while the other two channels are available to connect to disk drives housed in external enclosures.

Standard SCSI Cable Configuration

(Section updated 05/21/1997)

The recommended standard configuration of SCSI adapters, devices and cables consists of the following:

The CDROM and 4mm DAT tape should be cabled to the integrated SCSI controller. This requires the following:

- 4MM DAT Tape drive (74G8632) (A 68 - 50 pin converter, 32G3925, is supplied as part of the 4mm DAT product package.)
- 4-drop SCSI F/W cable: 60H7826 (Optional, but recommended)
- 16 bit (SCSI wide) active terminator (32G3918)

There are two ways of recabling the CDROM and DAT to the integrated SCSI adapter:

1. Using 4-Drop F/W SCSI Cable:

A 4-Drop F/W SCSI cable (60H7826) can be used to connect the CDROM and 4mm DAT to the internal port of the integrated SCSI conroller. Follow these steps:

1. Remove the "Backplane to CDROM" cable (it will not be needed any more)
2. Change the dip-switch or jumper settings on the CDROM to set it as non-terminating. (Termination will be provided by the terminator installed in the next step.)
3. Plug in the 4-drop F/W SCSI cable into the integrated SCSI controller, then the 4mm CDROM drive, then the DAT. Then plug a 16-bit active terminator (part number 94G7587) into the last connector of the 4-drop cable. Terminating the 4-drop cable in this manner provides proper termination of all 16 signal lines, rather than the 8 bit termination provided by the DAT or CDROM.

2. Reusing the Supplied Cables:

In order to cable the DAT and CDROM to the integrated SCSI, the cable that normally connects the CDROM to the backplane can be reconfigured and reused:

1. Unlpug the cable from the backplane (lower connector) and from the CDROM. Remove the terminator from the last connector on the cable.
2. Plug the connector that was on the CDROM into the integrated SCSI connector on the systemboard.
3. Plug the next connector into the CDROM drive (68-50 pin converter).
4. Plug the last connector into the DAT drive (68-50 pin converter)
5. Change the SCSI jumpers on the CDROM so that it is not the terminator and the SCSI jumpers on the DAT so that it is the terminator.
6. The end of the cable that was plugged into the backplane should be left unconnected.

Note that reusing the cable in this manner only provides 8-bit (narrow) termination. If, however, any 16 bit internal devices or **any** external devices are to be connected to the integrated SCSI controller, this configuration will cause intermittant SCSI errors.

Recommendation:
If the 4-Drop SCSI cable (60H7826) is available, we recommend it's use (with the 16 bit active terminator, 94G7587). If the 4-drop cable is not available and the system will **only** use the integrated SCSI to control the CDROM and 4mm DAT unit, reusing the supplied cable should be satisfactory. For configurations which will have an external SCSI device, the 4-drop cable approach **must** be used. If the supplied cable is reused and the system experiences intermittant SCSI errors:

- Check and verify the DAT tape is terminated properly
- Ensure that system board jumper J38 (External SCSI termination) is set correctly.
- Replace the supplied cable with a 4-drop SCSI F/W cable as described above.

The external connector of the integrated SCSI can be cabled to the 'knock-out' plug opening in the rear of the PC Server S/390 using the short 'jumper' cable provided with the system unit (in plastic bag of parts). Alternately, a channel of the ServeRAID adapter can be cabled to the knock-out connector opening using a "Bulkhead Cable", part number 76H2675. **Note:** There is only one knock-out plug, so either the ServeRAID or the integrated SCSI adapter can use it at a time, but not both.

The ServeRAID adapter channel 3 will be cabled to the hot/swap backplane to control the internal disk drives. The 'daisy-chain' cable that is also connected from the backplane to the CDROM drive should be removed and used to connect the CDROM and DAT as described above. If starting with a 8640-ES2, a ServeRAID - Backplane cable (94G3988) should be used. (The cable that connects the integrated SCSI to the backplane might be used, but in most installations it will be streched so taut that it would be likely to cause problems later.)

Note:

If any devices are connected to the internal connector of the integrated SCSI controller (both the CDROM and DAT will normally be connected here), a maximum of only **one** SCSI device can be connected to the external port of the integrated SCSI controller.

If is necessary to connect multiple SCSI devices (tapes) to the external connector of the integrated SCSI adapter, one method is to reconnect the supplied cable so that the DAT and CDROM are daisy-chained off the RAID backplane. If this is done and there are six hard drives installed in the system unit backplane, the backplane must be jumpered so that the disk drives use the 'high SCSI' addresses (08 - 15). See the *PC Server 330 Users's Handbook* for information on doing this. *Note:* This configuration (daisy chain DAT and CDROM off the ServeRAID adapter via the Backplane) should only be used when the 4mm DAT tape unit is **not** going to be used as a S/390 device. The SCSI34x0 device managers do not currently support the use of the ServeRAID adapter to control the 4mm DAT tape.

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. (Make sure you order the 5.25" version of the 4mm DAT.)

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

Memory Options

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 (32MB is standard). For systems which are expected to have moderate to high I/O requirements, an additional 32 - 64MB of memory can 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. 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.

Note:

All Pentium/Server memory is provided in DIMM (Dual Inline Memory module) form. Additional DIMMs can be installed, up to a maximum of 1GB (would require 4 256MB DIMMs).

The PC Server S/390 has a total of 4 DIMM memory sockets, with one of these occupied by the standard 32M 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

We recommend configuring PC Server S/390 systems with more S/390 memory than might normally be expected because of the I/O characteristics. Large S/390 memory sizes allow the use of "data in memory" techniques and reduces paging activity, both of which will usually improve system performance significantly.

The S/390 Processor Complex is available with either 32MB or 128MB of S/390 memory capacity. 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. You should order the appropriate model of the processor complex that provides the desired memory capacity.

9662-032 S/390 Microprocessor complex with 32MB of S/390 memory capacity. This document will use a 'value price' of $10,000 for this adapter.

9662-128 S/390 Microprocessor complex with 128MB of S/390 memory capacity. This document will use a 'value price' of $15,000 for this adapter.

The S/390 Microprocessor Complex Adapters (32MB and 128MB) are 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.

Note:

Since all the S/390 memory is contained on the S/390 Microprocessor Complex, the 32MB version of the adapter cannot be upgraded to a 128MB version. It is very important that the memory configuration be sized properly in the initial configuration. When in doubt, use the large (128MB) version.

Chapter 2. Device Manager Overview

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 Pro.

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).

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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 or an external connection of the ServerRAID 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) or 3274s,

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.

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). On a PC Server S/390 this support is provided by device manager AWSPBS controlling a Multi-Port model 2 adapter. This combination provides up to eight BSC or SDLC lines operating at up to 38.4Kbps. A maximum of two Multi-Port adapters can be used in a single PC Server S/390. The Multi-Port Model 2 is an ISA bus adapter and can be used in an EISA slot. *Note: The WAC adapter specifically is* **not** *supported on the PC Server S/390 running VM or VSE.*

OS/390 (MVS): OS/390 does not support the ICA, so different emulation must be used in this environment. SDLC support for OS/390 is provided by the WAC (Wide Area Connector) adapter, supported by the WAN3172 device manager. 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 4 WAC adapters per PC Server S/390, but this will seldom be practical due to slot usage considerations. The WAC and WAN3172 emulate a "3172 SDLC Gateway", using a VTAM XCA definition (BSC is not available). Only ISA bus versions of the WAC are supported. *Note: The Multi-Port model 2 adapter specifically is* **not** *supported on the PC Server S/390 running OS/390.*

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 any non-DASD S/390 device to a PC Server S/390. 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

Notice:

Configuration of PC Server S/390 systems can be confusing and difficult, especially for larger systems with external enclosures. Use of ICPA or PSCFG (where supported) 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 EISA or PCI slot on the system board into which a EISA, 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-ESS) comes standard with a ServeRAID adapter and two 2.25GB Hot/Swap disk drives. The ServeRAID has 3 channels, each of which can control up to 15 devices. The ES2 model comes with no RAID adapter and no disk drives. The ServeRAID adapter, appropriate disk drives, and cable must be added to to the ES2. There is also an integrated "Ultra-SCSI" controller with both internal and external connectors. Normally, the integrated SCSI controller will control the CDROM and 4mm DAT, leaving the ServeRAID to control the disk devices. **Note:** When devices are connected to the internal connector of the integrated SCSI adapter, only one SCSI device may be attached to the external connector.

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.

Hard drives

70G9862 2.25GB SCSI-2 Fast & Wide Hot/Swap III 7ms access, 7200 RPM. This will be the 'standard' drive for customers that do not require large disk storage capacities (less than about 12 GB).

94G6494 4.5 GB SCSI-2 Fast & Wide Hot/Swap III 8ms access, 7200 RPM (1", Slim high form factor). This will generally be the standard drive for larger configurations, providing up to 22GB of useable capacity (RAID-5) using only 6 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.

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There are several approaches to configuring systems with large disk configurations. Using the ServeRAID and two 3518 Enterprise Expansion Enclosures provides a capacity of 30 disk drives. Using 4.5 GB drives and 8 drives per RAID-5 array provides over 110GB of useable disk space. Systems that require more than this should probably consider using the PCI SSA RAID Adapter. SSA subsystems will use the following components:

32H3811 PCI SSA RAID Adapter

05J6413 2.25GB SSA Hot Swap disk drive

05J6414 4.51GB SSA Hot Swap disk drive

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

59H722x SSA Cables (1 to 25 M.)

External Disk Storage Enclosures

(Changed 05/21/1997)

Some users of the PC Server S/390 will find that they need more disk storage capacity than the 22 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 three external expansion units available from IBM

3517 (SCSI Multi-Storage Enclosure)
3518 (Enterprise Expansion Enclosure)
3527 (Entry SSA Storage Enclosure)

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 2.25 GB and 4.5 GB disks, as these are the ones most likely to be used in this environment.

3517, SCSI Multi-Storage Enclosure:

The 3517 is a hot/swap capable expansion that uses the new Tray type III. It will accommodate up to five 2.25GB, 4.5GB, or 9.1GB hot/swap drives. It is very easy to configure and install. The maximum hot/swap storage capacity (effective RAID-5) of a 3517 using 9.1 GB disks is 36.0 GB. 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 4.5 GB disk drives, total useable (RAID-5) capacity can be extended to 27GB. 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:

3517001 The actual floor standing or desk-top enclosure

70G9857 PC Server SCSI F/W connector to SCSI F/W option cable for PCI-BUS and ServerRAID adapters (may require multiple)

74G8631 4MM DAT tape drive

Various Hard disk drives

- **70G9862** 2.25 GB SCSI-II Fast/Wide Hot Swap SL HD-III (max 5)
- **94G6494** 4.5 GB SCSI-II Fast/Wide Hot Swap SL HD-III (max 5)
- **94G7492** 9.1 GB SCSI-II Fast/Wide Hot Swap HH HD-III (max 5)
- **94G3055** 2.25 GB SCSI drive for use in non-Hot/Swap drive bays (max 2)
- **94G3057** 4.5 GB SCSI drive for use in non-Hot/Swap drive bays (max 2)
- **76H2689** 9.1 GB SCSI drive for use in non-Hot/Swap drive bays (max 2)

Sample Configuration

This configuration will provide a total of 22.5 GB useable (RAID-5) disk space plus one 4mm DAT tape drive. One of the 4.5GB drives will not be hot/swap. The 4mm DAT is in addition to the one which comes standard with the PC Server S/390

3517001 Base Multi-SCSI expansion unit
70G9857 PC Server SCSI F/W connector to SCSI F/W option cable for PCI-BUS and ServerRAID adapters
94G6494 4.5GB SCSI-II Fast/Wide HD-III hard disk drive (5 drives)
74G8631 4MM DAT tape drive
94G3057 4.5 GB SCSI drive for use in non-Hot/Swap drive bay

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). This full-height bay would be an excellent location for a 24/48GB 4mm DAT tape autoloader unit. Each hard drive bank can accommodate 6 slim-height drives (1.12GB or 2.25GB, or 4.5GB). 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 4.5GB hard drives, a total of about 65GB of useable (RAID-5) hot/swap disk capacity can be provided. 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

70G9857 PC Server SCSI F/W connector to SCSI F/W option cable for PCI-BUS and ServerRAID adapters (may require multiple)

74G8631 4MM DAT tape drive for use in 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

70G9862 2.25 GB SCSI-II Fast/Wide Hot Swap SL HD-III
94G6494 4.5 GB SCSI-II Fast/Wide Hot Swap SL HD-III

Sample Configuration
This configuration will provide a total of 65GB 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.

3518001 Base Enterprise Expansion Enclosure
70G9857 PC Server SCSI F/W connector to SCSI F/W option cable for PCI-BUS and ServerRAID adapters (2 required)
94G6494 4.5GB SCSI-II Fast/Wide SL HD-III hard disk drive (18 drives) will be used in the hard drive Hot/Swap banks
74G8631 4MM DAT tape drive for use in 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)
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) use a 68-pin external connector, and require a different cable, part number 70G9857.

3527, Entry SSA Storage Enclosure:

The 3527 is a new 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 or 4.5GB hot/swap SSA drives. It is easy to configure and install. The maximum hot/swap storage capacity (effective RAID-5) of a 3527 using 4.5 GB disks is 18.0 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

05J6413 2.25GB SSA Hot Swap high performance (max 5)
05J6414 4.5 GB SSA Hot Swap high performance (max 5)
05J6411 SSA Dummy Disk Drive Module

Sample Configuration

This configuration will provide a total of 18 GB useable (RAID-5) disk space.

3527001 Base SSA Disk Storage Enclosure
59H7223 External SSA cables, pair of 10 meter
05J6414 4.5GB 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

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 support and emulated devices vary by S/390 operating system. 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 adapter.

VM/ESA, VSE/ESA Emulation of Integrated Communications Adapters (ICAs) is provided by the AWSPBS Device Manager using the MultiPort Model 2 adapter.

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 4 WAC cards per system. 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 (packet switched protocol)

The above part numbers are for the ISA versions of the WAC adapter.

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 systems to provide SDLC connectivity. The WAC ports are defined to MVS and VTAM as a SNA XCA port.

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MultiPort Adapter The "ARTIC MultiPort Model 2 Adapter" provides up to 8 SDLC or BSC lines per adapter. For VM and VSE systems it is supported by the AWSPBS device manager and provides Integrated Communications Adapter (ICA) 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 AWSPBS manager (VM and VSE) supports either SDLC or BSC, or a mixture. 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: AWSPBS

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 EISA/ISA slots, some thought should be given to the type of slot to use for the LAN adapter. One of the PCI slots will always be in use by the RAID adapter and another by the P/390 Microprocessor complex. Other adapters, such as the 390 Channel Adapter will use EISA slots. 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

75H9800 IBM PCI Token Ring Adapter: Basic good performance (full duplex) Token Ring adapter.

04H8095 Auto LANStreamer PCI Adapter: A good, all-around, high performance Token Ring adapter. 32 Bit, Streaming BusMaster with speed autodetect. (Note: will be withdrawn effective 5/31/1997, for replacement, see 75H9800.)

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.

72H3482 IBM Turbo 16/4 Token-Ring ISA Adapter: For customers who require Token Ring support in a ISA bus.

Ethernet LAN Adapters

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

13H9237 PCI Ethernet Adapter: A good general purpose Ethernet adapter for PCI bus systems (10 Mbs)

25H4374 Ethernet PCI Adapter 100/10: High performance Ethernet adapter capable of running at either 10 or 100 Megabits per second. (Note: will be withdrawn form marketing on June 12, 1997; replacement is 86H2432. Also see 85H9921)

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.

25H3501 ISA Bus Ethernet 100/10 Adapter: For users who need 100 Mbs performance on a ISA bus adapter. (Note: will be withdrawn from marketing as of August 29, 1997, no replacement announced.)

07H0450 Quad-BT PeerMaster PCI Adapter: One PCI adapter with four Ethernet ports (RJ-45). Just the adapter for systems which need multiple Ethernet ports, but which have a limited number of PCI slots available.

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 4 - 10 GB capacity of the DAT. Only a single 4mm DAT may be mounted within the &p333. itself. If desired, additional DAT drives may be installed in external enclosures such as the 3517, 3518, or 3510.

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. If the integrated SCSI adapter is used to control the CD Drive and/or 4mm DAT tape drive, the SCSI F/W connector for the integrated SCSI controller can be used to connect only one external SCSI tape device. (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.

The following information has been provided by various sources. While we believe the information to be accurate, IBM has not conducted compatibility tests for these tape drives and IBM makes no support statements for any particular SCSI tape model or vendor.

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Table 2. 3480 18 Track Media Compatible SCSI tape drives

Model	IDRC	Read BLOCK ID	Load Display
Fujitsu M2485B/B1	No	Full(1)	Yes
Fujitsu M2485H/H1	Yes	Full(1)	Yes
Overland C480 / T480	No	Partial(2)	No
Overland C490 / T490	Yes	Partial(2)	No

Table 3. 3490 36 Track Media Compatible SCSI tape drives

Model	Type	IDRC	Read BLOCK ID	Load Display
Fujitsu M2488C1, M2488CA1, M2488CF1	3490-E	Yes	Full(1)	Yes

Table 4. 3420 9 Track Media Compatible SCSI tape drives

Model	Type	Density	SCSI34x0
M4 9914S	3420	800/1600/6250	Yes
M4 9906G: Firmware rev 12 or later	3420	1600/6250	Yes
Qualstar 3414S	3420	1600/6250	Yes

Table 5. 3420/3480 Emulation on other media

Manufacturer - Model	SCSI34x0
IBM 4mm (4/10GB)	Yes

Notes: (1) FULL includes format mode bit, (2) Partial does not include format mode bit. LOAD DISPLAY refers to displaying the volser (or other message) in a display that is part of the tape drive, indicating to the operator which volser to load. IDRC refers to standard 3480 compression. READ BLOCK ID refers to the read/search BLOCKID functions discussed below.

It is worthwhile noting that the IBM Brand 3490 and 3590 SCSI models **cannot** be used on the PC Server S/390. The IBM 3490 requires a 'differential' SCSI interface while the PC Server S/390 provides a 'single-ended' SCSI interface.

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" display is highly recommended.

6553-503 (P50) 15" "Professional" series. 1280x1024, Non Interlaced, Multi-Frequency .26mm dot pitch. DDC1 and DDC2B compliant.

6554-673 (P70) 17" "Professional" series. 1600x1200, Non Interlaced, Multi-Frequency .26mm dot pitch. Recommended best all-around display for use with the PC Server S/390.

6555-773 (P200) 20" "Professional" series. 1600x1200, Non Interlaced, Multi-Frequency .31mm dot pitch. A VERY nice display.

6542-103 (G40) 14" Entry "Genral Purpose" series. 1024x768, Multi-Frequency .28mm dot pitch.

6542-301 (G41) 14" "Genral Purpose" series. 1024x768 Non-Interlaced, Multi-Frequency .28mm dot pitch. Reduced EMF Emissions,

6543-301 (G50) 15" "General Purpose series. 1024x768 Non Interlaced, Multi-Frequency .28mm dot pitch.

6544-403 (G70) 17" "General Purpose" series. 1280x1024 Non Interlaced, Multi-Frequency .28mm dot pitch,. reduced EMF emissions.

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 at about 20 minutes. For larger configurations (with external disk encolosure), a 1000 or 1400 watt UPS may be appropriate. 20 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 SCSI F/W adapter with internal and external connectors.
Note: If this SCSI adapter is used, the integrated SCSI controller must be disabled (System board Jumper J26). This implies that the CDROM and DAT Tape must be cabled so as to be connected to the hot/swap backplane (and thus to the ServeRAID adapter) or to the internal connector of this RAID adapter.

70G8489 ServeRAID: High Performance/Capacity PCI Raid Adapter, provides three SCSI channels and can support up to 15 devices per channel. This is the standard RAID adapter provided on the PC Server 330 RAID models. Up to a maximum of 4 ServeRAID adapters can be installed in a PC Server 330 in order to support multiple external disk enclosures. (Consider SSA RAID adapter for large disk configurations, rather than multiple ServeRAID adapters.)

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). 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 TME-10 NetFinity software, this adapter can monitor many system measurement points, such as temperature, power, error conditions, and even provide remote control functions. (May also require Power Unit: 94G5571.)

Chapter 6. Dial-In Access

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, most 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 two types of products to accomplish this full dial-in LAN connection while allowing 3270 emulation access to the PC Server S/390. Both solutions also allow full-function LAN access (such as file and print serving) as well as the 3270 access.

1. LAN Distance is primarily a 'software' solution that can run on the PC Server S/390 or any other suitable system on the LAN. LAN Distance is provided as a component of the WARP Server product.
2. 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.

Both products have corresponding programs that run in the remote workstations to provide the dial-in and connection capabilities. A more detailed description of each product and the specific hardware and software products required follows.

LAN Distance

The LAN Distance Server component runs on the PC Server S/390 or other suitable PC on the LAN. Remote users dial into modems connected to either the standard PC serial ports or to multi-port adapters such as the 'Artic Multiport/2'. It provides extensive security protection and supports all popular communication protocols and connectivities. Once connected to the LAN Distance server, remote users have all the facilities of the LAN, as though locally connected to the LAN (except, of course, for the difference in communication speeds). Many different configurations are possible, with up to 128 concurrent users. Here is a somewhat typical 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	8 Connection LAN Distance Server for OS/2. (Included with WARP Server)	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.

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Each remote user must also install and use a copy of LAN Distance Remote, at a cost of $69. per remote workstation. LAN Distance Remote is available for OS/2 and Windows 3.1 users.

While this configuration is believed to be correct, all customers should verify that any configuration ordered will operate correctly. If you plan to run the LAN Distance Server on a PC Server S/390, we recommend using a separate LAN Adapter port for LAN Distance. A Dual or triple-ported LAN adapter works well for this purpose.

Minimal Configuration:
For users who only need one or two dial in ports, LAN Distance can be configured to use the standard COM1 and COM2 Async ports which come standard on the PC Server S/390 Using this approach, the only expense to implement a dial-in system is the modems at the PC Server S/390.

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 7. 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	$ 5,739.	$ 5.739.
38H5575	28.8 V.34 internal modem unit for 8235	8	$ 699.	$ 5,592.
	Total Cost			$ 11,331.

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:

compact

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

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.

Chapter 7. Obtaining additional information 'On-Line'

(Updated 5/12/1997)

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 Software and Configurator Updates

Updated versions of the PC Configurator (Config-Pro) will periodically be made available for use by authorized PC resellers. These updates will usually be distributed 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.

Note.

The ICPA configurator tool has been withdrawn by the IBM PC Company. It is no longer being maintained or updated. All future PC based configurations must be done via Config-Pro.

The PC Company also maintains a 'public' World-Wide-Web (WWW) page, and "File Transfer Protocol" (FTP) site. The public access web page is at: *http://www.pc.ibm.com*. Files of interest to PC Server S/390 users will generally be available from the **PC Server** and **OS/2 Drivers** sections of the **Files** area.

'Sites' of interest

IBM PC Company BBS

The Bulletin Board System can be accessed by calling (919) 517-0001.

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PC Company Web Page

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

File Transfer Protocol Site

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.

Configurator Updates

Config-Pro

Config-Pro is available from the Business Partner Home Page described above. The home page will contain a link or pointer to the latest version of Config-Pro and instructions for installing it. It is available in OS/2 and Windows versions. (The OS/2 version is actually the Windows version installed to run in a WINOS2 session.) Use of Config-Pro 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.

Other Files

A number of other files will be maintained on the BBS, ftp server, and Web page. Some of the ones of interest include:

QREF390.ZIP The most current version of the PC Server S/390 Quick Product Reference (PKZipped file containing PostScript and LIST3820 formats). Now, also includes the *PC Server S/390 Hints and Tips / FAQ* document.

WARP390.ZIP A unique and special 'Boot Logo' for the PC Server S/390, with instructions for installing. Also includes a .BMP (Bitmap) version for use as a background.

Individual Temporary Fixes

Temporary fixes to correct specific problems may sometimes be made available. Users should only install these fixes under the specific direction of IBM Support, or P/390 developers. Such fixes may be available via diskette from IBM Support or via FTP from:

LSCFTP.POK.IBM.COM
login in as user anonymous, password=your_net_id
cd /pub/p390
review the 'read.me' file

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

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.

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Chapter 9. Sample Configurations

(Changed 05/21/1997)

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.

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'.

The prices listed below are US list or value prices (in US dollars) and are intended for comparision purposes only. Please check with IBM or your preferred reseller for current price information."

VSE Small Application Server

Part Number	Quantity	Part Name or Description	Unit Price	Extended Cost
864 ESS	1	PC Server 33 Model ESS ServeRAID & 3 2.25GB disks PC Server 33 High performance Hot/Swap server with: Pentium Pro 2 MHz processor, with 256K L2 cache, 32MB ECC RAM (expandable to 1G) 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 ServeRaid adapter and 2 2.25GB Hot/Swap drives 3 year limited warranty (5x8 standard, 7x24 available)	8425	8425
94G6474	1	64MB ECC 6 NS memory DIMM	679	679
7 G9862	4	2.25GB F/W SCSI-2 Hot/Swap SL disk drive	85	34
74G8632	1	4/1 GB 4mm DAT Tape drive (3.5" Mounting for 33)	1115	1115
9662128	1	128MB PCI S/39 Processor Adapter	15	15
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
79G 257	1	Com Mgr/2 1.11	369	369
6 H7826	1	4-Drop Internal SCSI F/W cable, 68 pin connectors	39	39
94G7587	1	PC Server Wide SCSI terminator	53	53
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
94G3135	1	APC Smart-UPS 1 : for medium size systems	679	679
6554673	1	P7 17" SVGA 'Professional' Series Display	919	919
			Total cost of this Configuration:	33513

End of report

Rationale:

1. Distributed system, small local S/390 workload.
2. Use 128MB version of PCI S/390 adapter
3. Include additional 64MB PC memory for large HPFS cache.
4. Local network is Ethernet based, use integrated 10Mb 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.

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Disk Cofiguration: System will not require large disk storage. Start with 8640-ESS and add additional four 2.25 GB drives for total of six 2.25GB hard drives, all internal, providing over 10GB capacity in a RAID-5 configuration.

VSE 'Old Iron Replace'

Part Number	Quantity	Part Name or Description	Unit Price	Extended Cost
864 ES2	1	PC Server 33 Model ES2 Hot/Swap, no Disks or RAID PC Server 33 High performance Hot/Swap server with: Pentium Pro 2 MHz processor, with 256K L2 cache, 32MB ECC RAM (expandable to 1G) 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 (No hard drives or RAID adapter) 3 year limited warranty (5x8 standard, 7x24 available)	489	489
94G6474	1	64MB ECC 6 NS memory DIMM	679	679
7 G8489	1	ServeRAID PCI RAID Controller	195	195
94G6494	6	4.51GB F/W SCSI-2 Hot/Swap SL disk drive	1264	7584
74G8632	1	4/1 GB 4mm DAT Tape drive (3.5" Mounting for 33)	1115	1115
9662128	1	128MB PCI S/39 Processor Adapter	15	15
9662 5	1	S/39 Parallel Channel Adapter	36	36
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
79G 257	1	Com Mgr/2 1.11	369	369
94G3988	1	ServeRAID to Backplane Cable	49	49
6 H7826	1	4-Drop Internal SCSI F/W cable, 68 pin connectors	39	39
94G7587	1	PC Server Wide SCSI terminator	53	53
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	919	919
94G3135	1	APC Smart-UPS 1 : for medium size systems	679	679
			Total cost of this Configuration:	39761

End of report

Rationale:

1. Replacing old 4361 system
2. Use 128MB version for performance, data in memory.
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 HPFS cache.
6. Local network is Ethernet based, use integrated 10Mb 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 20 GB of disk storage required for VSE workload. Using ES2 base model and six 4.5GB disk drives will provide over 20 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 ES2	1	PC Server 33 Model ES2 Hot/Swap, no Disks or RAID PC Server 33 High performance Hot/Swap server with: Pentium Pro 2 MHz processor, with 256K L2 cache, 32MB ECC RAM (expandable to 1G) 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 (No hard drives or RAID adapter) 3 year limited warranty (5x8 standard, 7x24 available)	489	489
94G6474	1	64MB ECC 6 NS memory DIMM	679	679
7 G8489	1	ServeRAID PCI RAID Controller	195	195
94G6494	6	4.51GB F/W SCSI-2 Hot/Swap SL disk drive	1264	7584
74G8632	1	4/1 GB 4mm DAT Tape drive (3.5" Mounting for 33)	1115	1115
9662128	1	128MB PCI S/39 Processor Adapter	15	15
9662 5	1	S/39 Parallel Channel Adapter	36	36
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
79G 257	1	Com Mgr/2 1.11	369	369
94G3988	1	ServeRAID to Backplane Cable	49	49
6 H7826	1	4-Drop Internal SCSI F/W cable, 68 pin connectors	39	39
94G7587	1	PC Server Wide SCSI terminator	53	53
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
25H63 4	1	PCI Triple Auto Lanstreamer Token Ring Adapter	1115	1115
3518 1	1	3518 Enterprise Expansion Enclosure (18 SL H/S bay	2239	2239
7 G9739	1	Power Supply Upgrade for 3518	189	189
76H367	1	H/S Backplane type III for 3518 bays D & E	184	184
94G4 7	1	Backplane to Backplane cable: internal to 3518	49	49
7 G9857	1	PC Server F/W SCSI cable (33 to 3517/3518/3519)	79	79
94G6494	1	4.51GB F/W SCSI-2 Hot/Swap SL disk drive	1264	1264
6554673	1	P7 17" SVGA 'Professional' Series Display	919	919
94G3136	1	APC Smart-UPS 14 : for larger systems	839	839
			Total cost of this Configuration:	56416

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 least 2 Token Ring ports, use Triple LanStreamer.)
5. Additional 64MB PC Memory DIMM to allow large cache.
6. External SCSI attached 3480 to be obtained separately and attached to external port of integrated Ultra-SCSI controller.
7. Use 128MB version of P390 to support many users with little paging.
8. MultiPort adapter to provide 8 lines (up to 38.4 Kbs) to connect to other systems.

Disk Cofiguration: Start with 8640-ES2; add required ServeRAID adapter. Fill internal H/S bays with six 4.5GB drives. For additional disk space, add a 3518 Enterprise Expansion with ten additional 4.5 GB drives. With a total of 16 4.5GB drives configured as two arrays of eight drives each, total useable space (RAID-5) is over 60GB.

OS/390 Large 'Data Mining' Application Server

Part Number	Quantity	Part Name or Description	Unit Price	Extended Cost
864 ESS	1	PC Server 33 Model ESS ServeRAID & 3 2.25GB disks PC Server 33 High performance Hot/Swap server with: Pentium Pro 2 MHz processor, with 256K L2 cache, 32MB ECC RAM (expandable to 1G) 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 ServeRaid adapter and 2 2.25GB Hot/Swap drives 3 year limited warranty (5x8 standard, 7x24 available)	8425	8425
94G6474	1	64MB ECC 6 NS memory DIMM	679	679
7 G9862	4	2.25GB F/W SCSI-2 Hot/Swap SL disk drive	85	34
74G8632	1	4/1 GB 4mm DAT Tape drive (3.5" Mounting for 33)	1115	1115
9662128	1	128MB PCI S/39 Processor Adapter	15	15
25H8 3	1	OS/2 WARP Server Advanced	1299	1299
79G 257	1	Com Mgr/2 1.11	369	369
6 H7826	1	4-Drop Internal SCSI F/W cable, 68 pin connectors	39	39
94G7587	1	PC Server Wide SCSI terminator	53	53
33G8469	1	Wide Area Connector: RS232D Base adapter	599	599
33G8462	1	WAC: V.35 Expansion interface and Cable	175	175
6554673	1	P7 17" SVGA 'Professional' Series Display	919	919
94G3136	1	APC Smart-UPS 14 : for larger systems	839	839
3527 1	3	3527 SSA Entry Storage Subsystem (5 SSA H/S bays)	1495	4485
5J6414	15	4.51 GB SSA H/S Disk drive	2 59	3 885
59H7221	3	SSA External Cable set, 2.5 M.	58	174

Total cost of this Configuration: 68455

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 128MB version of the P390 Microprocessor adapter 64MB PC DIMM to allow large OS/2 Cache.
2. S/390 Parallel Channel Adapter to connect local non-SNA 3174 and tapes
3. Integrated Ethernet LAN adapter sufficient for needs.
4. Large DASD config is needed to provide storage of data mining data base and access tools.

Disk Cofiguration: Start with 8640-ESS; use the standard internal two 2.25 GB drives in RAID-1 array for OS/2 and other 'server' files. Additional disk storage is via SSA RAID adapter and multiple 3527 (Entry SSA Enclosure) external units. Each 3527 will contain five 4.5GB drives. Configuration shown has three 3527 with a total of 15 4.5 GB drives. Assuming arrays of seven and eight drives, this provides a total internal+external capacity of about 60GB. 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.

VM/ESA: 2.2

Table 8. 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 2.1

Table 9. VSE/ESA Ver 2.1 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 Rel 2

Table 10. OS/390 Rel 2 (5645-001) Base	
Product Name	**Ver/Rel ***
MVS SP, (BCP, IPCP), JES2, HCD, MICR/OCR, Open Edition Sys Svcs, OE Utilities, OE Debugger	V5R2.2
Bulk Data Transfer base	V2
BookManager Read	R3
OpenEdition DCE Base Svcs OpenEdition DCE Dist File Svcs	R1.1
DFDSMdfp	V1R3 +
DFSMS/MVS NFS Feature	V1R3 +
ESCON Dir. Support	R1
EREP MVS	V3R5
GDDM, GDDM-PCLK, GDDM-OS2	V3R2
High Level Assembler	V1R2
ICKDSF	R16
ISPF	V4R2 +
Lang Env for MVS	V1R5 +
LANRES/MVS	V1R3 +
LAN Server for MVS	V1.1 +
LAN Services	
OSA Support Facility	R1.2
SMP/E	V1R8.1+
SystemView for MVS base	V1R0
SOMobject for MVS Runtime lib, SOMobject for MVS Service Classes	V1R1
TCP/IP	V3R1
TIOC	R1
TSO/E	V2R5
VTAM with AnyNet/MVS	V4R3
VisualLift RTE	V1R1
3270 PC File Transfer Program	
HCD	
FFST/ESA	V1R2
Softcopy Print	
Internet Secure Server	V2R1
Total OS/390 Base	$ 28,640.

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 11. OS/390 Rel 2 Optional Features

Product Name	**Ver/Rel ***
JES3	
Bulk Data Transfer base: File to file	V2
Bulk Data Transfer base: JSE3 SNA NJE	V2
DFSMSdss (TM)	V1R3
DFSMShsm (TM)	V1R3
DFSMSrmm (TM)	V1R3
RMF	
SDSF	
Security Server	
C/C++ (with debug)	
DFSORT	R13
GDDM-PGF	V2R1.3
GDDM-REXX	V3R2
HLASM Toolkit	V1R2
Language Env. Data Encryption	
SOMobjects for MVS App. Dev. Env.	
VisualLift App. Dev. Env.	
OpenEdition Data Privacy: CMDF	
OpenEdition Data Privacy: CMDF and DES	
TCP/IP with: CICS Sockets, IMS Sockets, Kerberos DES, Kerberos non-DES, Network Print Facility, OpenEdition Applications, Offload to OS/2	V3R1
BookManager Build	R3

* The Version / Release information indicated will generally represent the minimum level provided. Some additional enhancements will be provided as part of the OS/390 system but may not be reflected by new Version / Release levels.

Typical Configuration Costs

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

Table 12. VM/ESA Minimum System	
VM/ESA V 2.1 Base Pre-Config Software	$ 14,528.
PC Server S/390 (32MB S/390 memory, 11 GB useable disk capacity, Display, LAN Adapter, UPS, RAID, Multiport)	$ 31,000.
Total	$ 45,528

Table 13. Medium VM/ESA system	
VM/ESA V 2.1 Base Pre-Config Software	$ 13,205.
Additional VM Software (VTAM.TCPIP, OV, compilers, etc.)	$ 20,000.
PC Server S/390: (128MB S/390 memory, 96MB PC memory, UPS, 22GB Disk, 390 Chan, PortMaster, display)	$ 45,000.
Total	$ 79,528

Table 14. VSE/ESA Minimum System	
VSE/ESA 2.1 Base Software	$ 21,556.
PC Server S/390 (32MB S/390 memory, 11 GB RAID useable, Display, LAN Adapter, UPS)	$ 31,000.
Total	$ 52,556.

Table 15. Large VSE/ESA System	
VSE/ESA 2.1 Base Software	$ 21,156.
Additional VSE Software (COBOL, SQL, etc.)	$ 10,000.
PC Server S/390: (128MB S/390, 96MB PC memory, UPS, 60GB Disk, 390 Chan, PortMaster, display)	$ 58,000.
Total	$ 89,156.

Table 16. OS/390 Minimum System	
OS/390 Base Software	$ 28,640.
PC Server S/390 (128MB S/390 memory, 22 GB RAID useable, S/390 Parallel Channel, 2 line WAC, Display, 96MB PC memory, LAN Adapter, UPS)	$ 45,000.
Total	$ 73,640

Table 17. OS/390 Typical System	
OS/390 Base Software	$ 28,640.
Additional MVS Software (COBOL, CICS, DB2, etc)	$ 15,000.
PC Server S/390: (128MB S/390 memory, 96MB PC memory, UPS, 60GB Disk, 390 Chan, 2 line WAC, display, Token Ring Triple)	$ 58,000.
Total	$101,640.

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 18. 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

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-ES2: Base system with no RAID Adapter or hard drives
__ – 8640-ESS: System with ServeRAID and two 2.25 GB drives

General Config:

__ Order 4mm DAT drive
__ If 2nd external RAID channel required, order bulkhead cable
__ If using ES2, order ServeRAID, at least two internal disk drives and ServeRAID to Backplane cable

S/390 Memory: Choose total S/390 memory size: Select S/390 memory required: 32MB or 128MB versions

__ 9662-032: 32MB: Many VSE, small VM
__ 9662-128: 128MB: Memory intensive VSE, most VM, all OS/390

Server Memory: Choose total PC Memory size:

__ 32MB (base): Sufficient for "S/390 only" systems with light I/O.
__ Additional 32MB - 64MB to allow large (48-64MB) HPFS386 cache
__ 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. If using DataBase oriented applications such as DB2/2, consider 128 - 256 MB total PC memory.

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

I/O Devices

DASD:

Most customers will use additional 2.25GB or 4.5GB drives.

__ 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)? Consider SSA RAID as option when total disk requirements approach 100GB.
__ SSA RAID adapter
__ External Enclosures (3517, 3518, 3527) as required
  __ – 3517 Multi-SCSI enclosure
  __ – 3618 Enterprise Expansion Enclosure
  __ – 3527 SSA Enclosure

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__ – 7133 for large SSA storage requirements

LAN Adapters

__ Token Ring:? Auto LANStreamer PCI, Triple LANStreamer PCI
__ Ethernet:? PCI Ethernet and PCI 10/100 Ethernet adapters
  – 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.

WAN Adapters:
For SDLC / BSC communications via VTAM, etc.

Wide Area Connector(WAC) RS-232, V.35, up to 2 lines (OS/390)
MultiPort model 2: RS-232, up to 8 lines per adapter (VM, VSE) (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 20 minutes run battery time:
  – APC Smart-UPS 700: Smaller systems, up to 6 drives
  – APC Smart-UPS 1000: Medium systems, (one expansion unit)
  – APC Smart-UPS 1400: Larger systems, or longer battery run time.
__ PC Server Advanced Systems Management Adapter

Displays

__ Size: 14", 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 2.25 GB or 4.5GB Drives only (Type III backplane/tray).
RAID configurations assume RAID-5
Configurations are for maximum capacity, not maximum performance
External enclosure configurations not shown
CDROM and 4mm DAT are connected to integrated SCSI adapter, allowing use of all 6 internal Hot/Swap bays.

RAID System Internal Capacity

Use this chart to help configure Array systems

Table 19. PC Server S/390 Internal RAID Capacity		
# Drives	**Total Capacity, 2.25GB / 4.5GB**	**Data Capacity, 2.25GB / 4.5GB**
3	6.7/13.5	4.5/9.0
4	9.0/18.0	6.7/13.5
5	11.2/22.5	9.0/18.0
6	13.5/27.0	11.2/22.5

Using 3517

Each 3517 can hold 5 Hot/Swap drives and 2 non-Hot/Swap, of either 2.25 or 4.5GB capacity per drive. Assuming 4.5GB hard drives, a 5 drive configuration provides 18GB useable, or 27GB useable in a 7 drive configuration.

Using 3518

Each 3518 can hold up to 18 hot/Swap hard drives of either 2.25 or 4.5 GB each. Twelve drives can be connected to a single channel of the ServeRAID adapter. Use of 13-18 drives requires the connection of a second RAID/SCSI channel. An 18 drive 3518 by itself can provide 67.5 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 94GB.

Using 3527

Each 3527 SSA Expansion Enclosure provides up to 5 hard drives (2.25 or 4.5 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.

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