

AS/400e series System Handbook

Document Number GA19-5486-17

September 1, 1998

Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page xix.

Eighteenth Edition (September 1998)

The information contained in this edition is correct at the time of going to press.

Readers' comments may be addressed to:

IBM United States
Attention: Ms. Susan Powers
Telephone: (507) 253-5203
Facsimile: (507) 253-6408
Internal ID: Susan Powers/US/IBM (SUSAN2@IBMUS)
External ID: SUSAN2 at IBMUSM07
Internet: SUSAN2@us.ibm.com

IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.

Copyright International Business Machines Corporation 1988, 1994, 1995, 1996, 1997, 1998. All rights reserved.

Note to U.S. Government Users — Documentation related to restricted rights — Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

Contents

Notices	xix
Trademarks and Service Marks	xix
How to use this Handbook	xx
Key to Abbreviations	xxi
Acknowledgements	xxii
Introduction	1
AS/400 System Concepts and Architecture	3
System Concepts	4
AS/400 Advanced Application Architecture	5
Technology-Independent Machine Interface	5
Operating System, OS/400, is a Single Entity	6
Hierarchy of Microprocessors	8
Single-Level Storage	9
Object-Based	10
Summary	11
Commercial Processing Workload	12
AS/400 Advanced Technology	14
Java	14
Web Serving	17
Lotus Domino	22
Domino for AS/400	23
AS/400 Integration with Windows NT Server	26
AS/400 Business Intelligence Solutions	27
Product Previews	31
IBM AS/400e series	33
Table 1: Summary of the 9401 Model 150	35
Table 2: Summary of the 9406 Model 170	37
Table 3: Summary of the 9406 Model 600	39

Table 4: Summary of the 9406 Model 620	41
Table 5: Summary of the 9406 Model 640	43
Table 6: Summary of the 9406 Model 650	45
Table 7: Summary of the 9406 Model S10	47
Table 8: Summary of the 9406 Model S20	49
Table 9: Summary of the 9406 Model S30	52
Table 10: Summary of the 9406 Model S40	54
Table 11: Summary of the 9406 Model S20 Custom Mixed-Mode e-Server	56
Table 12: Summary of the 9406 Model S30 and S40 Custom Mixed-Mode e-Servers	58
Table 13: Summary of the 9406 Model SB1 Custom Mixed-Mode e-Servers	60
AS/400e server Model 170	63
Card Technology	65
Main Storage for 9406 Model 170	67
Workstation Controllers for Model 170	68
PCI Twinaxial Workstation IOA #2722	68
Base PCI WAN/Twinaxial IOA #9720	68
Multi-Function I/O Processor (MFIOP) on Model 170	69
PCI Base Multi-Function IOP	69
PCI LAN/WAN/Workstation IOP #2809	70
Communications for 9406 Model 170	73
PCI Two-Line WAN IOA #2721	73
Base PCI WAN/Twinaxial IOA #9720	74
Base PCI Two-Line WAN IOA #9721	74
Communication Restrictions	74
Local Area Networks and Asynchronous Transfer Mode for 9406 Model 170	76
PCI 100/10 Mbps Ethernet IOA #2838/#9738	77
PCI 16/4 Mbps Token-Ring IOA #2724/#9724	77
PCI Ethernet IOA #2723/#9723	78
PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811	78
PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812	78
PCI 155 Mbps Unshielded Twisted Pair OC3 ATM #2815	79
PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816	79
PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818	79
PCI 34 Mbps Coaxial E3 ATM IOA #2819	80
PCI Integrated PC Server #2857	80

Power and Packaging for the 9406 Model 170	82
9406 Model 170 #7101 System Expansion Unit	83
Base System Unit	84
Internal Expansion Features	85
System Expansion Unit #7101	85
Continuously Powered Main-Store (CPM)	86
Internal Disk Units for 9406 Model 170	87
Internal Tape, CD-ROM, and Diskette Units for Model 170	88
Base CD-ROM Drive	88
2.5G Quarter-Inch Cartridge (QIC) #6381	89
4G Quarter-Inch Cartridge (QIC) #6382	89
13G Quarter-Inch Cartridge (QIC) #6385	90
Diskette Drive Support	91
AS/400e systems Models 600, 620	93
Card Technology	95
Main Storage for 9406 Models 600, 620	97
Model 600 Main Storage	97
Model 620 Main Storage	98
Workstation Controllers for Models 600 and 620	99
Base PCI WAN/Twinaxial IOA #9720	99
PCI Twinaxial Workstation IOA #2722	100
SPD ASCII Workstation Controller #6141	100
SPD ASCII 12-Port Attachment #6142	100
SPD Twinaxial Workstation IOA #6180	100
Multi-Function I/O Processor (MFIOP) on Models 600 and 620	101
PCI Base Multi-Function IOP (MFIOP)	101
SPD LAN/WAN/Workstation IOP #2629	102
PCI LAN/WAN/Workstation IOP #2809	102
Communications for 9406 Models 600 and 620	106
SPD Two-Line WAN IOA #2699	106
PCI Two-Line WAN IOA #2721	107
Base PCI WAN/Twinaxial IOA #9720	107
Base PCI Two-Line WAN IOA #9721	108
Communication Restrictions	108
Six-Line Communications Controller #2623	109
Other Communications Adapters Available	109
Local Area Networks and Asynchronous Transfer Mode for	
9406 Models 600, 620	110
PCI Ethernet IOA #2723	111

PCI 16/4 Mbps Token-Ring IOA #2724	111
PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811	112
PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812	112
PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA #2815	112
PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816	112
PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818	113
PCI 34 Mbps Coaxial E3 ATM IOA #2819	113
PCI 100/10 Mbps Ethernet IOA #2838	113
PCI Integrated PC Server #2851	114
PCI Integrated PC Server #2854	115
SPD LAN Features for Attachment to the Model 620	116
Power and Packaging for the 9406 Models 600, 620	118
9406 Model 600 System Unit	118
9406 Model 620 System Unit #2175, #2179, #2180	119
9406 Model 620 System Unit #2181, #2182	120
PCI Expansion Unit #9364 Layout with #9329	121
SPD Expansion Unit #9364 Layout with #9331	122
Base System Unit	123
Internal Expansion Features	123
External Towers	126
Expansion Tower I/O Features	127
Internal Disk Units for 9406 Models 600, 620	127
Disk Feature Conversion/Kits for Upgrades	129
Internal Tape, CD-ROM, and Diskette Units for Models 600, 620	130
Base CD-ROM Drive	131
2.5G ¼" Cartridge Tape Unit #6381/#6481	132
4G ¼" Cartridge Tape Unit #6382/#6482	132
13G ¼" Cartridge Tape Unit #6385/#6485	132
AS/400e systems Models 640, 650	133
Card Technology	136
Main Storage for 9406 Models 640, 650	137
Model 640 Main Storage	137
Model 650 Main Storage	137
Continuously Powered Main Storage (CPM)	138
Multi-Function I/O Processor #9754 for 9406 Models 640, 650	139
LAN/WAN/Workstation IOP #2629	141
Workstation Controllers for 9406 Models 640, 650	142
ASCII Workstation Controller #6141/#9141	144

ASCII 12-Port Attachment #6142	144
Twinaxial Workstation IOA #6180/#9280	144
Communications for 9406 Models 640, 650	146
Six-Line Communications Controller #2623	146
Communications Adapters Attaching to #2623	147
Two-Line WAN IOA #2699/#9699	149
Communications Restrictions	150
Cryptographic Processor #2620	150
Cryptographic Processor-Commercial #2628	151
Integrated Fax Adapter #2664	151
Local Area Networks and Asynchronous Transfer Mode for	
9406 Models 640, 650	152
PCI Ethernet IOA #2723	152
PCI 16/4 Mbps Token-Ring IOA #2724	153
LAN/WAN IOP #2810	153
PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811	153
PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812	154
PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA	
#2815	154
PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816	154
PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818	154
PCI 34 Mbps Coaxial E3 ATM IOA #2819	155
PCI 100/10 Mbps Ethernet IOA #2838	155
16/4 Mbps Token-Ring IOA #6149	155
Ethernet/IEEE 802.3 IOA #6181	155
Integrated PC Server #6616	156
Integrated PC Server #6617	156
Power and Packaging for 9406 Models 640, 650	159
9406 Model 640 System Unit	159
9406 Model 650 System Unit	160
9406 System Unit Expansion Tower #5073	161
9406 Storage Expansion Tower #5083	165
Internal Disk Units for 9406 Models 640, 650	168
RAID-5 for 9406 Models 640 and 650	170
Internal Tape, CD-ROM, and Diskette Units for 9406 Models	
640, 650	172
Base CD-ROM Drive	173
2.5G ¼" Cartridge Tape Unit #6381/#6481	173
4G ¼" Cartridge Tape Unit #6382/#6482	174
13G ¼" Cartridge Tape Unit #6385/#6485	174

AS/400e servers	177
AS/400e server Model 150	179
Main Storage for 9401 Model 150	181
Workstation Controllers for 9401 Model 150	182
Workstation/Communications Adapter #2720	182
Multi-Function I/O Processor	182
Communications for 9401 Model 150	183
Workstation/Communications Adapter #2720	183
Multi-Protocol Communications Adapter #2721	184
Local Area Networks for 9401 Model 150	184
Ethernet/IEEE 802.3 Adapter #2723/#9723	184
16/4 Mbps Token-Ring Adapter #2724/#9724	185
100/10 Mbps Ethernet Adapter #2838/#9738	185
Integrated PC Server #2852	185
Power and Packaging for 9401 Model 150	187
Internal Disk Units for 9401 Model 150	187
Internal Tape, CD-ROM, and Diskette Units for 9401 Model 150	188
2.5G ¼" Cartridge Tape Unit #6381	188
Diskette Tape Unit	188
9401 Model 150 Software	189
AS/400e servers Models S10, S20	191
Card Technology	193
Main Storage for 9406 Models S10, S20	195
Model S10 Main Storage	195
Model S20 Main Storage	196
Workstation Controllers for Models S10 and S20	197
Base PCI WAN/Twinaxial IOA #9720	198
PCI WAN/Twinaxial IOA #2720	198
SPD ASCII Workstation Controller #6141	198
SPD ASCII 12-Port Attachment #6142	198
SPD Twinaxial Workstation IOA #6180	199
Multi-Function I/O Processor (MFIOP) on Models S10 and S20	200
PCI Base Multi-Function IOP (MFIOP)	200
SPD LAN/WAN/Workstation IOP #2629	201
PCI LAN/WAN/Workstation IOP #2809	201
Communications for 9406 Models S10 and S20	205
SPD Two-Line WAN IOA #2699	205
PCI WAN/Twinaxial IOA #2720	206

PCI Two-Line WAN IOA #2721	206
Base PCI WAN/Twinaxial IOA #9720	207
Base PCI Two-Line WAN IOA #9721	207
Communication Restrictions	207
Six-Line Communications Controller #2623	208
Other Communications Adapters Available	209
Local Area Networks and Asynchronous Transfer Mode for	
9406 Models S10, S20	210
PCI Ethernet IOA #2723/#9723	211
PCI 16/4 Mbps Token-Ring IOA #2724/#9724	211
PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811	212
PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812	212
PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA #2815	212
PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816	213
PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818	213
PCI 34 Mbps Coaxial E3 ATM IOA #2819	213
PCI 100/10 Mbps Ethernet IOA #2838/#9738	214
PCI Integrated PC Server #2851	214
PCI Integrated PC Server #2854	215
SPD LAN Features for Attachment to the Model S20	216
Power and Packaging for the 9406 Models S10, S20	218
9406 Model S10 System Unit	218
9406 Model S20 System Unit #2161	219
9406 Model S20 System Unit #2163, #2165, #2166	220
PCI Expansion Unit #5064 Layout with #9329	221
SPD Expansion Unit #5064 Layout with #9331	222
Base System Unit	223
Internal Expansion Features	223
External Towers	226
Expansion Tower I/O Features	226
Internal Disk Units for 9406 Models S10, S20	226
Disk Feature Conversion/Kits for Upgrades	229
Internal Tape, CD-ROM, and Diskette Units for Models S10, S20	230
Base CD-ROM Drive	231
2.5G ¼" Cartridge Tape Unit #6381/#6481	231
4G ¼" Cartridge Tape Unit #6382/#6482	231
13G ¼" Cartridge Tape Unit #6385/#6485	231

AS/400e servers Models S30, S40	233
Card Technology	237
Main Storage for 9406 Models S30 and S40	238
Model S30 Main Storage	238
Model S40 Main Storage	239
Continuously Powered Main Storage (CPM)	239
Multi-Function I/O Processor #9754 for 9406 Models S30, S40	240
LAN/WAN/Workstation IOP #2629	242
Workstation Controllers for 9406 Models S30, S40	243
Communications for 9406 Models S30, S40	247
Six-Line Communications Controller #2623	247
Two-Line WAN IOA #2699/#9699	248
Communications Restrictions	249
Local Area Networks and Asynchronous Transfer Mode for 9406 Models S30, S40	250
Integrated PC Server #6616	253
Integrated PC Server #6617	253
Power and Packaging for 9406 Models S30, S40	256
9406 Model S30 System Unit #2257, #2258, #2259	256
9406 Model S30 System Unit #2260	257
9406 Model S40 System Unit	258
9406 System Unit Expansion Tower #5073	259
9406 Storage Expansion Tower #5083	263
Internal Disk Units for 9406 Models S30, S40	266
RAID-5 for 9406 Models S30 and S40	268
Internal Tape, CD-ROM, and Diskette Units for 9406 Models S30, S40	270
 AS/400e custom e-servers	 272
9406 Model S20, S30, S40 Custom Mixed-Mode e-Servers	272
AS/400e 9406 Model SB1 custom e-server	275
 Conversion to AS/400e series 6xx and Sxx Models	 279
PowerPC to PowerPC Upgrades	284
 Migrated Disk Units for AS/400e series 6xx and Sxx Models	 294
 Migrated Tape Units for AS/400e series 6xx and Sxx Models	 298
Migrating Internal Tapes to 600, 620, S10, S20 Models	299
Migrating Internal Tapes to 640, 650, S30, S40 Models	300

IBM 9337 Disk Array Subsystem Models	301
RAID-5 and the 9337 Disk Array Subsystem	305
Dynamic RAID Spare Function	307
2105 Versatile Storage Server	308
IBM Disk Storage Specifications Comparison Charts	310
External Disk Subsystems	310
Advanced Series Imbedded Disks	311
IBM 9309 Rack Enclosures	312
Bus Extension Unit (#5040)	313
System Unit Expansion Rack (#5042 and #5044)	313
Removable Storage Media Devices	316
IBM 7208 External 8mm Tape Drive Model 342	316
IBM 9427 8mm Tape Cartridge Library Models 210 and 211	318
IBM 3490E Magnetic Tape Subsystem Enhanced Capability Models F00, F01, F11 & Library Model F1A	321
IBM 3494 Tape Library Dataserver Model	324
IBM Magstar MP 3570 Tape Cassette Subsystem, Cxx Models	329
IBM Magstar 3570 MP Tape Cassette Subsystem, Bxx Models	333
Magstar MP (Multipurpose) 3575 Tape Library Dataserver	335
IBM 3590 High Performance Tape Subsystem Models B1A and B11	339
IBM 3995 Optical Library C-Models	342
IBM 9348 Magnetic Tape Unit	346
Magnetic Media Controllers	348
Removable Media Device Attachment SPD #2621	353
Storage Device Controller SPD #2624	354
34XX Magnetic Tape Subsystem Attachment SPD #2644	355
Tape/Disk Device Controller SPD #6501	356
High Performance Controller (2M Cache) SPD #6502/#6522	357
High Performance Controller (4M Cache) SPD #6512	358
Internal Tape Device Controller SPD #6513	359
Disk Unit Controller (No Cache) SPD #6530/#6523	361
RAID Disk Unit Controller (4M Cache) Ultra SCSI SPD #6532	362

RAID Disk Unit Controller (4M Cache) Ultra SCSI Compression SPD #6533	363
Magnetic Media Controller Ultra SCSI SPD #6534	364
MFIOP with RAID Ultra SCSI #9751	366
MFIOP With RAID Ultra SCSI Compression #9754	367
PCI RAID Disk Unit Controller Ultra SCSI #2726	368
PCI Magnetic Media Controller Ultra SCSI #2729	369
PCI RAID Disk Unit Controller #2740	370
PCI RAID Disk Unit Controller Compression #2741	371
Base PCI Disk Unit Controller Ultra SCSI #9728	372

Peripherals	375
IBM Network Station	375
IBM InfoWindow II Displays	378
IBM 2480 AS/400 Wireless Access Point	380
IBM 248X Portable Transaction Computers for AS/400 Wireless Networks	382
IBM 5308 ASCII to 5250 Connection	384
IBM 5494-EXT Remote Control Unit	386
IBM 6299 Midrange Hub	390
IBM 7299 Express Hub for AS/400	392
IBM 5250 Express Network Kit	393
IBM 7852 Model 400 Modem	395
IBM InfoPrint and Network Printer Families	397
IBM Network Printer 12	399
IBM Network Printer 17	399
IBM InfoPrint 20 Printer	399
IBM InfoPrint 32 Printer	401
IBM 3130 Advanced Function Printer	403
IBM InfoPrint 60 Advanced Function Printer and 3160 Advanced Function Printer	405
IBM InfoPrint 62 Continuous Forms Printer	407
IBM InfoPrint 3000 Advanced Function Printing System	408
IBM InfoPrint 4000 Advanced Function Printing Systems	410
IBM InfoPrint 4000 Hi-Lite Color Printing System	412
IBM InfoPrint 4005 Hi-Lite Color Printer	412
IBM InfoColor 70 Full-Color Digital Printer	413
IBM 4230 Impact Matrix Printer	414
IBM 4232 Impact Dot Matrix Printer	415
IBM 4247 MultiForm Matrix Printer	416

IBM 6262 Impact Line Printer	417
IBM 6400 Line Matrix Printer	418
Operating System/400, 5769-SS1	421
OS/400 Version 4 Change of Terms and Conditions	422
What's New in Version 4 Release 2	424
What's new in Version 4 Release 3	433
Operations Console	437
AS/400 Toolbox for Java	437
AS/400 Developer Kit for Java	438
Windows NT IPCS Server Support	438
e-Jump	439
Lightweight Directory Access Protocol (LDAP) on the AS/400	440
Euro Currency	440
TCP/IP	441
Availability Improvements - Concurrent Maintenance of Expansion Towers	442
Integrated Hardware Disk Compression	442
Database Enhancements	443
AS/400 NetServer	444
AS/400e Information Center	444
PTHREAD (POSIX-Based) APIs	445
Internet PTFs	446
New Support for AFP Printers and Applications	447
Miscellaneous	448
Operating System/400 Capabilities	449
Nonchargeable Features of OS/400	463
Chargeable Features of OS/400	467
Programs Within OS/400	472
AS/400 Toolbox for Java	472
IBM VisualAge for Java	474
Enterprise Toolkit for AS/400 (ET/400)	474
Integration for Novell NetWare	475
Performance Management/400	476
IBM TCP/IP Connectivity Utilities for AS/400	477
AS/400 Software Packages	479
IBM Licensed Programs–Database Products	481
IBM Intelligent Miner for AS/400 Version 1, 5733-IM1	481

IBM Cryptographic Support for AS/400 Version 4 Release 2, 5769-CR1	482
IBM System/38 Utilities for AS/400 Version 4 Release 2, 5769-DB1	482
IBM DataPropagator Relational 5.1 for AS/400 5769-DP2	483
IBM Query for AS/400 Version 4 Release 3, 5769-QU1	484
IBM DB2 Query Manager and SQL Development Kit for AS/400 Version 4 Release 3, 5769-ST1	485
Query Manager	485
SQL Development Kit	485
Interactive SQL	486
IBM Licensed Programs—Networking Products	487
IBM Network Station Manager, Release 3, 5648-C05	487
New in Network Station Manager Release 3	489
Navio NC Navigator for IBM Network Station (128-Bit), 5648-C20	491
Cryptographic Access Provider 40-bit for AS/400 Version 4 Release 3, 5769-AC1	491
Cryptographic Access Provider 56-bit for AS/400 Version 4 Release 3, 5769-AC2	491
Cryptographic Access Provider 128-bit for AS/400 Version 4 Release 3, 5769-AC3	491
IBM CallPath Server for AS/400 Version 2 Release 2, 5769-CP4	493
IBM Point-of-Sale Communications Utility for AS/400 Version 4 Release 3, 5769-CF1	494
IBM Communications Utilities for AS/400 Version 4 Release 3, 5769-CM1	494
IBM Distributed Computing Environment (DCE) Base Services for AS/400 Version 4 Release 3, 5769-DC1	496
IBM Distributed Computing Environment (DCE) DES Library Routine Version 4 Release 3, 5769-DC3	496
IBM Firewall for AS/400 Version 4 Release 3, 5769-FW1	497
Enhancements in Version 4 Release 3	499
IBM MQSeries for AS/400 Version 4 Release 2 Modification 1, 5769-MQ2	499
IBM AS/400 Client Access Family for Windows Version 4 Release 3, 5769-XW1	502
Enhancements in Version 4 Release 3	512

IBM AS/400 Client Access Family Version 4 Release 3, 5769-XY1	515
IBM OS/2 Warp Server for AS/400 Version 4 Release 3, 5769-XZ1	516
IBM Wireless Connection for AS/400 Version 4 Release 3, 5798-TBW	517
IBM Licensed Programs—Systems Management Products	519
IBM SystemView Base for OS/400	519
IBM Netfinity Server for AS/400 Version 4 Release 3, 5769-SVA	520
IBM Netfinity AS/400 Manager for OS/2 Version 4 Release 3, 5769-SVD	520
IBM Netfinity AS/400 Manager for Windows 95 Version 4 Release 3, 5769-SVE	520
ADSTAR Distributed Storage Manager for AS/400 Version 3 Release 1, 5769-SV3	521
Enhancements in Version 3 Release 1	523
IBM Backup Recovery and Media Services for AS/400 Version 4 Release 3, 5769-BR1	525
Enhancements for Version 4 Release 3	527
IBM Job Scheduler for AS/400 Version 4 Release 2, 5769-JS1	528
IBM SystemView Managed System Services for AS/400 Version 4 Release 2, 5769-MG1	529
IBM Performance Tools for AS/400 Version 4 Release 2, 5769-PT1	530
IBM EDMSuite OnDemand for AS/400 Version 4 Release 3, 5769-RD1	531
Enhancements in Version 4 Release 3	536
IBM SystemView System Manager for AS/400 Version 4 Release 3, 5769-SM1	536
Enhancements in Version 4 Release 3	538
IBM Licensed Programs—Application Development Products	539
IBM AS/400 BASIC	539
IBM AS/400 Pascal	539
IBM AS/400 PL/I	539
System/38 Migration Aid, 5714-MG1	540
IBM VisualAge C++ for AS/400 Version 3 Release 6, 5716-CX4; Version 3 Release 7, 5716-CX5	540

IBM VisualGen Host Services for OS/400 Version 3 Release 6, 5716-VG1	543
System/36 Migration Aid, 5727-MG1	543
IBM Integrated Language Environment COBOL for AS/400 Version 4 Release 2, 5769-CB1	544
IBM Application Development ToolSet Client Server for AS/400 Version 4 Release 2, 5769-CL3	547
IBM Integrated Language Environment C for AS/400 Version 4 Release 3, 5769-CX2	551
IBM CICS for AS/400 Version 4 Release 3, 5769-DFH	553
IBM Application Program Driver for AS/400 Version 4 Release 3, 5769-PD1	555
Version 4 Release 3 Enhancements	555
IBM Application Development ToolSet for AS/400 Version 4 Release 2, 5769-PW1	556
ADT: Programming Development Manager (PDM)	556
ADT: Source Entry Utility (SEU)	557
ADT: Screen Design Aid (SDA)	558
ADT: Report Layout Utility (RLU)	559
ADT: Data File Utility/Application Development (DFU/AD)	559
File Compose and Merge Utility (FCMU)	560
Interactive Source Debugger (ISDB)	560
Application Dictionary Services	560
Application Development Manager	561
IBM Integrated Languages Environment RPG for AS/400 Version 4 Release 2, 5769-RG1	562
IBM SEARCH2000 for AS/400 Version 3, Release 1, 5697-C72	566
IBM BYPASS2000 for AS/400 Version 3, 5697-D11	567
IBM Net.Commerce for AS/400 Version 2, 5798-NC2	568
IBM KnowledgeTool Runtime for OS/400 Version 3 Release 6, 5798-TAT; and IBM KnowledgeTool Development Toolkit for OS/400 Version 3 Release 6, 5798-TAW	569
IBM Licensed Programs—Office Products	571
IBM AFP Font Collection for IBM Operating Systems Version 1 Release 1, 5648-113	571
IBM ImagePlus (VI) VisualInfo for AS/400 Version 4 Release 3, 5769-VI1	571
IBM Advanced Function Printing Utilities for AS/400 Version 4 Release 3, 5769-AF1	573

IBM Advanced Function Printing (AFP) PrintSuite for OS/400, 5798-AF2 (V3R2 Mod 1), 5798-AF3 (V3R7 Mod 1)	574
Advanced Print Utility (APU)	575
Pager Printer Formatting Aid (PPFA)	575
AFP Toolbox for OS/400	576
SAP R/3 AFP Print	576
IBM Advanced DBCS Printer Support for AS/400 Version 4 Release 3, 5769-AP1	576
IBM Business Graphics Utility for AS/400 Version 4 Release 3, 5769-DS1	577
IBM Advanced Function Printing Fonts for AS/400 Version 4 Release 3, 5769-FNT	577
IBM Advanced Function Printing DBCS Fonts for AS/400 Version 4 Release 3, 5769-FN1	577
IBM OfficeVision for AS/400 Version 4 Release 3, 5769-WP1	578
IBM OfficeVision JustMail for OS/400 Version 4 Release 3, 5798-TBT	583
IBM Facsimile Support for AS/400 Version 4 Release 3, 5798-TBY	584
 AS/400 Client Series	 587
 AS/400 Softcopy Library	 588
 The Application Development Program	 589
 AS/400 Rochester Redbooks	 592
 Summary of All Earlier AS/400 Models	 594
9401 Models P01, P02	594
9401 Model P03 and 10S	595
9402 Models C04, C06	596
9402 Models D02, D04, D06	596
9402 Models E02, E04, E06	597
9402 Models F02, F04, F06	597
9402 Model 200	598
9402 Model 236	598
9402 Model 400	599
9402 Model 436	600
9404 Models B10, B20	601

9404 Models C10, C20, C25	601
9404 Models D10, D20, D25	602
9404 Models E10, E20, E25	602
9404 Models F10, F20, F25	603
9406 Models B30, B35, B40, B45, B50, B60, B70	604
9406 Models D35, D45, D50, D60, D70, D80	605
9406 Models E35, E45, E50, E60, E70, E80, E90, E95	606
9406 Models F35, F45, F50, F60, F70, F80, F90, F95, F97	607
9406 Models 300, 310, 320	608
9406 Models 500, 510, 530	609
9402 Server Model 100 and 9404 Server Models 135 and 140	610
9402 Server Model 20S and 9406 Server Model 30S	611
9402 Model 40S	612
9406 Models 50S and 53S	613
9406 Model 170	614
9402 2XX Packages	615
9402 Model 400 Packages	616
9402 Model 436 Packages	617
9402 Model 40S Packages	618
9402 Model 40S Packages	619
Index	621

Notices

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe upon any of IBM's intellectual property rights may be used instead of the IBM product, program, or service. Evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, is the user's responsibility.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Commercial Relations, IBM Corporation, Purchase, NY 10577.

Trademarks and Service Marks

Microsoft, Windows, Windows 95, and the Windows NT logo are trademarks or registered trademarks of Microsoft Corporation.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Java and HotJava are trademarks of Sun Microsystems, Inc.

Other company, product, and service names, which may be denoted by a double asterisk (**), may be trademarks or service marks of others.

How to use this Handbook

This Handbook is intended for use by IBM Systems Specialists and Sales Representatives, by IBM Business Partners and by our customers.

It is designed for **guidance** only. It is **not** a detailed configurator. It therefore does not contain full lists of any prerequisites that a feature **may** need; nor does it always list any features that **may** be mutually exclusive.

Use this Handbook to give you a good idea as to what is possible; then refer to the **online IBM systems** for final confirmation.

It is possible that this publication may contain reference to, or information about, IBM products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that IBM intends to announce such IBM products, programming, or services in your country.

Key to Abbreviations

K = 1,024 bytes
M = 1,000,000 bytes
M = 1,048,576 bytes
G = 1,000M bytes
T = 1,000G bytes

DASD = Direct Access Storage Device
RAID = Redundant Array of Independent Disks
SCSI = Small Computer System Interface
RSP = Relative System Performance
MES = Miscellaneous Equipment Specification
CPW = Commercial Processing Workload
IOA = Input/Output Adapter
IOP = Input/Output Processor
PCI = Peripheral Component Interconnect
SPD = System Product Division
LAN = Local Area Network
WAN = Wide Area Network
ISV = Independent Software Vendors

bps = bits per second
Kbps = 1024 bps
Mbps = 1,048,576 bps

lpm = lines per minute
lpi = lines per inch
cps = characters per second
cpi = characters per inch
bpi = bits per inch
cpl = characters per line
ips = inches per second
dpi = dots per inch

Acknowledgements

In this eighteenth edition of the AS/400 Handbook we have again tried to provide a comprehensive guide to the AS/400 hardware and software that is currently available. This has been updated to reflect the September 1998 announcements.

We would like to thank all those who sent us comments on the last edition of the Handbook. Any comments or suggestions on the content, layout, etc., of this book are very welcome and we would encourage any user of this book who has any such input to pass it on to us.

Many people have contributed to the production of this book and we would like to thank all those who have helped. We would particularly like to thank the following:

Kendall Kinnear of Techline in Dallas and Mark Huntley of Midrange Systems Sales, IBM UK, who have worked extremely hard to write the updated material for this new edition.

Many developers and others have assisted in answering questions and providing input. Among those who have helped in this way are Jerry Allen, Teresa Barre, Michael Faunce, Steve Hanks, Pundi Madhavan, Denis Nizinski, Ron Peterson, Bill Shaffer, and Dave Wells.

Kari Hall and Terri Dudek and their colleagues of Site Operations Administration in Rochester whose BookMaster skills and hard work were vital in the production of this new edition.

Susan Powers, Project Manager,
ITSO Rochester, MN

Nigel Adams, Editor, Basingstoke,
England

Introduction

The first AS/400 models based on the 64-bit RISC PowerPC AS processors were announced over three years ago in June 1995. The ease with which customers have migrated to these powerful new systems is a testament to the fundamental strength of the AS/400 architecture.

With the September 1998 announcement, the AS/400 range was again enhanced in both hardware and software. The introduction of OS/400 Version 4 Release 3 and other system software on the AS/400 offers enhanced function in the important areas of secure network computing, web serving, and support for Java. The AS/400 is a system that with its key continuing strength of being an integrated system offers great strength in the network computing area. The main thrust of the latest software announcement is in the important and growing area of network computing and web serving.

The top of the range offers a number of 12-way processors which offer nearly twice the power of the top of the 12-way processor range that was previously available. Substantial increases in memory and DASD capacity in the high-end AS/400e series models mean that the model range offers substantial power and capacity increases over what was previously available. The 9406 170 server models have also been significantly enhanced with new, faster processors, whilst the maximum memory has more than tripled and DASD capacity has doubled.

With the industry-standard Peripheral Component Interconnect (PCI) card technology in the low end AS/400 models, the price performance offered by the AS/400e series improves dramatically.

This Handbook aims to give an overview of both the hardware and software for the current AS/400e series. This means the 9406 Models 170, 600, 620, 640, 650, S10, S20, S30, S40, and SB1; the 9401 Model 150; and Version 4 Release 3 of the AS/400 software that runs on these models.

This AS/400 Handbook is aimed at answering the first-level questions that IBM employees, our Business Partners, and our

Introduction

customers ask about the AS/400. It is impossible for this book to go into considerable detail on the subjects addressed without becoming unmanageably large. Therefore anyone needing a greater depth of information than is given here should contact their IBM sales representative or refer to the IBM online systems and publications.

AS/400 System Concepts and Architecture

Why are System Concepts and Architecture important to a business person?

Businesses don't start by choosing a computer system. They start by choosing an application that fits their needs. AS/400 has over 25,000 good business applications worldwide, and, because of that, is very often the computer system that businesses consider first.

Why should AS/400's architecture matter to a business person?

This section will help you understand why. If you saw the identical application, running on AS/400 and running on a different system, you should always choose AS/400. Why? Because, even though the two systems may appear to be identical today, the accelerating rate of change of both hardware and software technologies necessitates the system that you have purchased has been designed with the future in mind. The AS/400 can accommodate the inevitable, rapid, and dramatic technology changes with minimum relative effort. Ask any system manufacturer, *What is there about your system that is future-oriented?* and *What has your record been in the past few years, as technologies changed?* We believe the IBM AS/400 will be the number one choice.

Paradoxically, the characteristic of the most advanced design and technology is that you don't notice it... you are not meant to. It is meant to accommodate the rapidly-changing hardware and software technologies in its stride - permitting you to fully exploit those latest technologies, while causing negligible disruption to your work.

System Concepts and Architecture

System Concepts

The AS/400 is designed and built as a *total system*, fully integrating all the hardware and software components that a business needs. As a general-purpose business computer it is optimized for that environment. It brings the following unique benefits to that environment:

Its architecture, the AS/400 Advanced Application Architecture (discussed in the next section), is a brilliant, technology-neutral architecture, which enables businesses to readily exploit the latest hardware and software technologies without causing disruption to their existing application software.

The single thought that pervades every aspect of AS/400's architecture is to *empower a business with the most advanced technology available, without encumbering it with the complexities that such technologies inevitably contain*. In other words, AS/400 allows you to deploy advanced business applications extremely rapidly.

Customers typically decide on the application software first, then choose an environment to run it on. The AS/400 has over 25,000 business applications worldwide of which around 3,000 are Client/Server applications. These 25,000 applications are written by our 8,000 Business Partners. In addition, the AS/400 provides an excellent platform for Windows NT and Lotus Domino applications. AS/400 has national language support for over 50 languages, and is available in 140 countries. Support across the world is provided by an impressive network of global partners.

A clear and fuller explanation of AS/400's architecture is contained in an outstanding book written by the AS/400's Chief Architect, Frank Soltis. *Inside the AS/400* is in its second edition, published by Duke Communications International.

AS/400 Advanced Application Architecture

Technology-Independent Machine Interface

The AS/400 is atypical in that it is defined by software not by hardware. In other words, when a program presents instructions to the machine interface for execution, it "thinks" that the interface is the AS/400 hardware. But it is not! The instructions, presented to that interface, have to pass through a layer of microcode before they can be understood by the hardware itself. This design insulates application programs and their users from changing hardware characteristics through this large layer of microcode. When a different hardware technology is to be deployed, IBM rewrites sections of the microcode to absorb the fluctuations in hardware characteristics, so that the interface presented to the customer *remains the same*.

This interface is known as the Technology-Independent Machine Interface, or TIMI. The microcode layer is known as the System Licensed Internal Code, or SLIC. The brilliance of this design was dramatically illustrated when AS/400 changed its processor technology from CISC (Complex Instruction Set Computing) processors to 64-bit RISC (Reduced Instruction Set Computing) processors in 1995. With any other system, the move from CISC to RISC would involve recompiling (and possibly some rewriting) of programs. And, even then, they would run in 32-bit mode on the new 64-bit hardware. But not so with AS/400, because of TIMI. Customers were able to *save* programs off their CISC AS/400s, *restore* them on their new RISC AS/400s, and *they would run*. Not only did they run, but they were fully 64-bit programs.

As soon as they had made the transition, customers had *64-bit application programs* that ran on a *64-bit operating system* that contained a *64-bit relational database* that fully exploited the *64-bit RISC hardware*.

TIMI and SLIC have just taken 64-bit RISC processor technology in their stride; these same architectural features will be exploited to fully accommodate post-RISC technologies, which could have 96-bit or 128-bit processors.

System Concepts and Architecture

Many of the frequently-executed routines that, on an ordinary system reside in the operating system, have been moved to the SLIC. Because the SLIC is closer to the silicon, routines placed there will run faster than routines placed "higher" in the machine. Thus there is an important performance gain. Examples of some basic supervisory and resource management functions that are in SLIC are validity and authorization checks.

Operating System, OS/400, is a Single Entity

One of the single, most dramatic things about AS/400 is that its operating system, OS/400, is a single entity. What this means is as follows.

Once you have bought an AS/400, you do not have to continue to go shopping for system software components before it is ready to run your business. All those software components - such software for relational database, software for comprehensive security, software for communications with a broad range of diverse systems, including Internet capabilities - and many more - are already there.

They are all fully integrated into OS/400 (AS/400's operating system). And by "fully integrated", we mean fully tested, too. All those components, prerequisites for running business applications in the 1990s, work together and are fully tested together, so that OS/400 operates as a single entity.

An ordinary machine does not have this approach to its operating system design. An ordinary operating system, which does the basic system housekeeping, would need to have a range of software products added to it before the environment is ready to support modern business applications. Examples of this further software are: software for the relational database, support for various communications environments, software for security, support for an interactive environment, for multimedia, for availability, and recoverability, etc. On an ordinary machine these software modules are provided by third parties. A customer would have to make sure that someone has integrated all these modules, and performed the tests necessary to make sure that they all function together. And, when one of the software components has a new release, a

System Concepts and Architecture

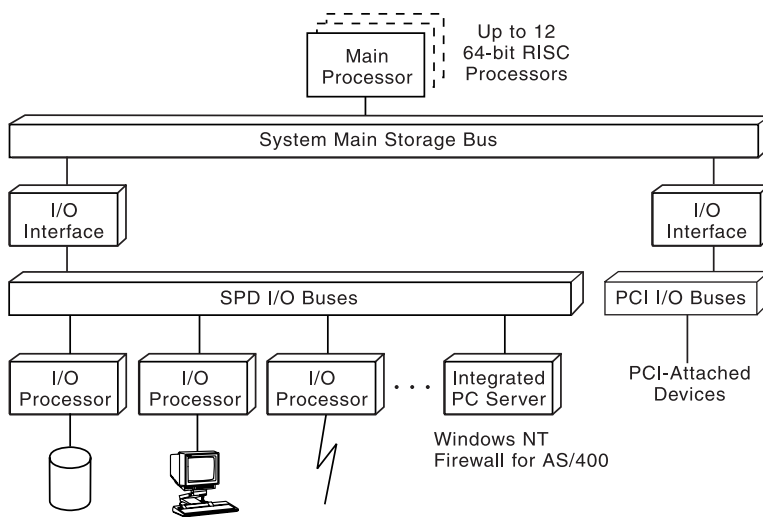
customer needs to make sure that not only is that software replaced, but any other software modules that it depends on, and that need to be at a compatible release level, are also replaced. Also, should a software malfunction occur, how do you establish precisely which modules are causing it? And can you be certain that multiple third-party software vendors will agree with your diagnosis when you blame their software?

There are none of these problems with OS/400. To achieve the functionality that is standard in OS/400, a customer would need to integrate, typically, between 10 and 25 different modules of software. OS/400 is installed with all that capability as standard. When software is updated, a new release of OS/400 is made available - customers do not have to install individual system software components, nor do they have to check that new releases can co-exist.

More detail on OS/400 is provided on page 421.

System Concepts and Architecture

Hierarchy of Microprocessors



The above, simplified, figure shows that, as well as its main system processor, AS/400 has a range of other processors, each dedicated to a particular I/O (Input/Output) device type. A single large AS/400 configuration can have well over 200 processors.

When the main system processor (which itself can actually comprise 12 separate processors on the latest AS/400s) encounters a request for data to be read to or written from, any I/O device (an operation whose duration is measured in milliseconds (10^{-3} second), rather than nanoseconds (10^{-9} second) - the unit of time used to measure main storage access times), that request for data is delegated to the particular microprocessor dedicated to that I/O device. Meanwhile, the main system processor continues with executing another application program.

This design provides AS/400 with its outstanding performance in the commercial, transaction-based, environment. AS/400 is designed for business computing, and one of the main characteristics of that environment is that it is I/O-intensive, rather than compute-intensive.

System Concepts and Architecture

As well as the benefit of outstanding performance in the business environment, this design gives AS/400 an elegant method of integrating diverse environments into a single, harmonious customer solution. The microprocessors that look after a particular I/O device are accommodated on I/O cards that fit into slots on AS/400's system bus. One of these cards could be the Integrated PC Server (see page 156). This is a PC on a card, and enables AS/400 to run, for example, Windows NT server. The AS/400's Internet firewall capability also exploits the Integrated PC Server (see page 497).

Single-Level Storage

Just as application programs on an AS/400 are unaware of underlying hardware characteristics because of the TIMI (Technology-Independent Machine Interface, see page 5), so also are they unaware of the characteristics of any storage devices on AS/400 - because of Single-Level Storage.

And, as with TIMI, the concept of Single-Level Storage means that the knowledge of the underlying characteristics of hardware devices (in this case, the hardware storage devices - main storage and disk storage) reside in the SLIC (System Licensed Internal Code). All of the storage is automatically managed by the system. Programs work with objects (see next section), and objects are accessed by name, never by address. No user intervention is ever needed in order to take full advantage of any storage technologies.

AS/400's address size is vast - AS/400 can address the number of bytes that 64 bits will allow it to address. 2^{64} is 18,446,744,073,709,551,616; AS/400 can thus address 18,446,744,073,709,551,616 bytes, or 18.4 quintillion bytes. To put this into more meaningful terms, it is twice the number of millimeters in a light-year. (Light travels approximately 6,000,000,000,000 miles in one year).

Single-Level Storage enables another extremely important AS/400 benefit which is that of *object persistence*. Objects are discussed in the next section of this introduction. Object persistence means that the object continues to exist in the memory system forever. An ordinary machine requires that information be stored in a separate

System Concepts and Architecture

file system if the information is to be shared or if it is to be retained for a long time. Persistence of objects is extremely important for future support of object-oriented databases. Objects need to continue to exist even after their creator goes away. The AS/400 is uniquely positioned to exploit this characteristic of object persistence, leaving the ordinary systems with having the less-elegant mechanism of having to store their persistent objects in a separate file system, with all its attendant performance implications.

Object-Based

An object is a container. Everything the system uses - user and system data structures - is packaged in one of these containers. The objects are encapsulated, which means that you can't see inside. Inseparable from an object is the list of valid ways in which that object can be used. The Create Object SLIC instruction establishes the object's name and its type. All objects are structured with a common object header, and a type-dependent functional portion.

Thus, on AS/400, instructions can only work on what they are supposed to work on. You can't have data being treated as executable code (so that the processor tries, for example, to execute someone's shoe-size), or executable code being treated as data, (by having something written into the middle of it). Certain instructions apply to all objects, others work only on specific types of objects. It is not possible to misuse an object, unlike the situation that exists on an ordinary system that does not have an object-based approach.

There are two important consequences of an object-based design. The first is that a system built around an object model supports machine independence, meaning that technology changes can be made in the environment without affecting application programs. Secondly, an object-based design delivers a high level of system integrity.

System Concepts and Architecture

Summary

AS/400 has the most brilliant architecture found on any business computing system. There are many examples of where AS/400's architecture has delivered on its promise of making the most advanced technology readily and continuously available to its customers. Here are some. AS/400 has enabled its customers to:

Move from CISC processor technology to RISC processor technology without the need to recompile programs. Programs would be saved off the CISC systems, restored on the RISC systems, and they would run as fully 64-bit applications. On ordinary machines, recompilation is necessary (sometimes some rewriting), and the resulting programs would not be fully exploiting the 64-bit hardware.

Integrate diverse environments (such as Microsoft Windows NT**, Firewall, and Lotus Notes**/Domino) into AS/400. All customer solutions require a range of hardware and software products from a variety of vendors. AS/400, through integrating these mixed environments, simplifies the task of managing them.

Give Internet access to existing AS/400 applications. Through a product, known as HTML Gateway, that resides within AS/400's operating system, Internet users can access and run AS/400 applications.

AS/400's future-oriented architecture has enabled us to take rapidly-changing hardware and software technologies in our stride. This same, flexible architecture will continue to serve us well in enabling our customers to continue to deploy the very latest technologies while causing the minimum possible disruption to their work.

Commercial Processing Workload

Commercial Processing Workload

Since the AS/400 was announced in 1988, the Relative Performance Rating (RPR) or Relative System Performance (RSP) of different models has been determined by measurement using the RAMP-C workload. This workload is representative of general commercial processing. RPR figures for AS/400 models have been expressed relative to a B10 which was the initial entry model for the AS/400 range and which had a RPR rating of 1.0.

The AS/400 range has grown so substantially in processing power and capacity over the last ten years that the point was reached when RAMP-C was no longer valid as a means of measuring relative performance. Therefore, in the second half of 1996, RAMP-C was replaced by a workload called Commercial Processing Workload (CPW). CPW contains a number of enhancements that make it much more appropriate than RAMP-C for measuring AS/400 performance as the AS/400 product line continues to grow in power with the PowerPC RISC processors and the 12-way processors and as more and more applications utilize vital technologies such as web serving, client/server, object-oriented, and multimedia.

Among the enhancements offered by CPW are:

- Inclusion of a batch component
- Increased numbers of transaction types
- Support for journaling and commitment control
- Increased path lengths
- More complex file and terminal I/O

These enhancements mean that CPW exercises hardware and software paths that more closely match the paths exercised by our customers' current AS/400 installations.

CPW values have been calculated for all previous AS/400 models. The summary table for most of the models that are shown on page 594 show CPW figures as well as RAMP-C figures. The summary tables for the current PowerPC based models 600, 620, 640, 650,

Commercial Processing Workload

150, 170, S10, S20, S30, S40, and SB1 which are shown on pages 35 through 56 show CPW figures for all the processors. For processors announced in August 1997 and subsequently only CPW values are issued. No further RAMP-C figures will be provided.

Throughout this document both RAMP-C and CPW performance figures have been described as Relative System Performance (RSP). This has been done to ensure consistency and to identify what is being referred to. RAMP-C or CPW is then used to identify which RSP the figures apply to.

CPW figures are not based relative to a single model as was the case with RAMP-C, for which the 9404 Model B10 had a value of 1.0. The CPW values do though give a relative performance rating of all AS/400 processors. It clearly is important to use the CPW values as a means of comparing the relative performance rating of different AS/400 processors—particularly when customers are considering RISC models, as the CPW value will more accurately reflect the relative performance of these models. CPW can be used as a quick means of comparing performance. However, more detailed analysis should always be done using BEST/1** for OS/400. This is because the performance that a customer will see from his AS/400 will depend upon many factors such as the type and number of disk devices, the number of workstation controllers, the amount of memory, the system model and processor, the application being run and other factors.

This Commercial Processing Workload section is designed as a short introduction to the CPW performance metric. Two additional documents are available which contain further information on CPW. A White Paper is available called *IBM AS/400 System Performance Transition to Commercial Processing Workload (CPW) Value for AS/400 Performance Positioning*. This document goes into considerable detail on CPW. The second document is a two-sided flyer on CPW which gives an overview of it. Both documents are available on Marketing Tools. The former is in AS4CPW PACKAGE, the latter is in G3256329 PACKAGE. Customers should be able to obtain these documents from their local IBM Sales Office.

AS/400 Advanced Technology

With the announcement of Version 4 Release 2 and the additional functions provided by Version 4 Release 3, the AS/400 offers important new capabilities in key areas such as Lotus Domino, Java**, web serving, and integration with Windows NT. The AS/400 also continues to be a strong performer in growing areas such as data warehousing and the Internet. In order to gain an appreciation of these technologies on the AS/400 and of the particular strength of AS/400 in delivering them, we added this Advanced Technology chapter which gives a summary on each of the application segments mentioned above.

Java

Java is a key application development environment for the AS/400. As Java technology evolves from Sun, the AS/400 system takes advantage of the new functions and features of this environment.

There is an exciting future for Java on the AS/400. Announced in February 1998 and enhanced in September 1998, the AS/400 Developer Kit for Java supports Sun's JDK 1.1.6 version of Java. A Java Virtual Machine which resides below the Technology Independent Machine Interface (TIMI) was also announced to enable fast interpretation and execution of Java code on the AS/400. In addition, a type of static compiler is available called a class transformer, which generates RISC machine code from Java bytecodes. This Java transformer enables the direct execution of Java on the AS/400 without the overhead of interpretation.

High-performance Garbage Collection is also included beginning in OS/400 Version 4 Release 2 to improve the performance and the scalability of Java. This advanced garbage collection algorithm allows Java to scale to the large numbers of objects expected when running enterprise applications on the server. Over time, Java will become even more integrated with and tuned for OS/400 to meet the requirements of performance and scalability on the server without compromising the cross-platform portability of the language.

AS/400 Advanced Technology

Other technology included in the AS/400 Developer Kit for Java allows GUI applications to run on the AS/400 system without modification. This support is called Remote AWT (Abstract Windowing Toolkit). It intercepts GUI requests coming from a Java program and re-routes the requests to an attached workstation running its own JVM. The workstation then interprets and displays the java.awt graphical components. This allows server programs which have graphical interfaces for configuration or tuning to run on the AS/400 without modification.

OS/400's unique single-level-store architecture is also exploited to give Java objects on the AS/400 an advantage not available on any other platform. Java objects on the AS/400 system can be full-fledged system objects allowing them to be persistent, shared, secure, backed up, and restored. This allows the AS/400 to offer persistent Java objects with performance and support that is unparalleled in the industry. The AS/400 single-level-store technology permits Java objects to be stored in their object form without the performance and maintenance overhead of two-level-store operating systems.

The AS/400 Toolbox for Java is available. Java applets and applications that access AS/400 programs and data from client workstations (or a Java-enabled server) can be written using the AS/400 Toolbox for Java. Java classes on the client can be used to access existing AS/400 applications and data using low-level APIs, providing easy entry into Java development while leveraging what already exists on the AS/400 today. A socket is used to connect to OS/400 servers which provide access to AS/400 resources including:

- Remote commands
- Distributed program calls
- Data queues
- Integrated file system data
- Print
- Record-level access
- Database access via JDBC on the client
- User spaces
- Digital certificates
- Jobs
- Message queues

AS/400 Advanced Technology

Users

With the introduction of OS/400 Version 4 Release 3, the AS/400 Toolbox for Java is enhanced to provide a set of GUI classes. These classes use the access classes discussed earlier to retrieve data for the user. The classes use Java's Swing 1.0 (JFC 1. 1) framework. When invoked, the graphical APIs can display AS/400 data in the following formats:

List panel presents a list of AS/400 resources and allows selections of one or more resources.

Details pane presents a list of AS/400 resources in a table where each row displays various details about a single resource. The table allows selection of one or more resources.

Tree pane presents a tree hierarchy of AS/400 resources and allows selection of one or more resources.

Explorer pane combines a tree pane and details pane so that the resource selected in the tree is presented in the details.

The following AS/400 resources are available through the graphical APIs:

- Database data using the JDBC driver
- Database data using the record-level database access classes
- AS/400 command call
- AS/400 program call
- AS/400 data queues
- Files in the AS/400 Integrated File System
- AS/400 print resources
- Active jobs on the AS/400
- AS/400 messages and messages queues
- AS/400 users and groups

The classes are written entirely in Java and can be run on any platform that supports JDK 1.1 or later. The AS/400 Toolbox for Java can be used on a client to access AS/400s running OS/400 Version 3 Release 2, Version 3 Release 7, or Version 4 Release 1 and later. The ability to run Java applications on the AS/400 requires Version 4 Release 2 or later.

AS/400 Advanced Technology

The AS/400 system is uniquely positioned to leverage Java as it evolves from its current web focus to a full commercial application environment. The strengths of the AS/400 will be combined with Java's object-oriented, network computing technology to provide solutions for the new millennium.

Summary

Java is the environment of choice for programming in today's network computing environment. It allows true portability of applications between platforms without modification or recompilation. It is an open, cross-platform, industry standard that is being supported by all the major players in the computer industry today.

The AS/400 Developer Kit for Java makes Java available for application deployment on the server. It is developed with a focus on scalability to support objects in the enterprise.

The AS/400 Toolbox for Java enables Java clients to access programs, commands, and data on the AS/400 system today. It provides an easy entry into the Java world by leveraging applications and data that already exist on the AS/400.

Web Servicing

The IBM HTTP Server for AS/400 makes participating in the world of the Internet and intranets easy. This product combines the basic functions of a Web server with expanded functionality that allows for greater flexibility in establishing a Web presence. HTTP Server performs a variety of functions:

- Acts as a repository for web pages created with HTML

- Handles the transfer of documents requested from a browser with HTTP

- Supports SSL security protocols for data encryption and server certificate authorization (HTTPS) when combined with one of the Cryptographic Access Provider Licensed Programs

- Allows web serving from multiple IP addresses on a single HTTP Server

AS/400 Advanced Technology

Provides an application interface with Common Gateway Interface (CGI)

Allows control of access and error logs

Provides easy-to-use HTML forms for configuring and administering the server

Allows multiple servers within the same AS/400 to balance workload, content, production and test

Allows you to restrict access based on user name and password, or the address of the requester

Integrates AS/400 security into the web

Add performance enhancements, and you have the functionality and security that your business needs

With the announcement of Version 4 Release 3, many enhancements have been made to the HTTP Server. Some of these enhancements are:

Client authentication using SSL Version 3 through the support of digital certificates

Socks support and SSL Tunneling to improve performance when a proxy server is used

Implementation of the WebSphere Application Server which transforms the HTTP Server into a Java web application server using Java Beans and Java server pages

Support for server APIs that allow the user to extend or customize how the HTTP Server handles client requests

The ability to recognize and present different documents based on the web browser used through automatic browser detection

IBM Net.Data allows the creation of interactive Web applications with "macros" to add logic, variables, program calls, and report writing to HTML. These macros combine the simplicity of HTML with the dynamic functionality of CGI programs, which makes it easy to add live data to static Web pages. Live data includes information stored in DB2 for AS/400 (locally or remotely), databases on other systems,

AS/400 Advanced Technology

REXX programs, C and C++ programs, programs in other AS/400 languages (such as CL, RPG, and COBOL), and other sources.

The Web serving capabilities of the AS/400 have also been extended with a powerful, full-text search engine through the implementation of NetQuestion in OS/400 Version 4 Release 3. NetQuestion provides the tools to build a centralized intranet search service. NetQuestion can index both plain text and text with HTML markup and provides CGI scripts and HTML forms for searching and administration. Some of the functions NetQuestion provides are:

- Boolean queries for phrase and proximity searches as well as front-, middle-, and end-masking using wildcards

- Precise term searches optimized for Web applications in both Internet and intranet environments

- High speed indexing and retrieval where one precise index is built

- An optimized and reduced index to about 35% to 40% of the document

- Sophisticated lexical affinities-based ranking for free-text and hybrid queries

- Advanced relevance ranking

- Detection of misspellings in documents and expanding the search requests accordingly

The AS/400 web serving capabilities allow businesses such as a shop, a service, or a distributor, to open an electronic storefront on the Web with Net.Commerce for AS/400. With Net.Commerce it is possible to build a single store or a mall that contains several stores, or even multiple malls or stores. In an electronic mall, the site and some of its functions are shared with other stores while maintaining individual identity and separate data. Net.Commerce also provides templates to create or customize your store while incorporating legacy systems.

Net.Commerce provides an easy-to-use design tool to help create appealing screens or pages to showcase a store and its products. it

AS/400 Advanced Technology

is even possible to include special effects such as three-dimensional graphics, animation, sound, and Java applets.

Net.Commerce also contains task macros and application program interface (API) functions that manage shopping tasks automatically. Net.Commerce supplies Web pages for a shopping cart, registration forms, and order forms that can be customized to create a unique look and feel for each business.

It is also possible to implement simple or complex pricing schedules with ease by assigning priority values and effective dates. Several product prices for sales and for preferred shoppers can also be assigned.

With the sophisticated shipping functions of Net.Commerce, a wide variety of carriers and cost calculations can be defined. To switch shipping carriers or to apply a new rate is as simple as changing a shipping code in the database. The entire inventory is updated. Shoppers can also be allowed to choose different shipping methods and rates for items they order. The API functions in Net.Commerce can be used to define and apply various tax rates.

Other features of Net.Commerce include the ability to lock the database from unauthorized tampering and provide a password to only selected individuals.

Shoppers protect their information by using a logon ID and password when they register. User data, such as credit card information, is protected through Secure Sockets Layer (SSL) encryption.

Net.Commerce provides an administrator function to build and manage an electronic store or mall. The Administrator can easily enter store and product information and tailor product displays to suit merchandising requirements. Changes appear automatically on the Web.

The Net.Commerce administrator contains two data management applications: Site Manager and Store Manager. It also contains a Web page design tool called Template Designer.

Site Manager creates and manages commercial Web sites.

AS/400 Advanced Technology

Store Manager develops and manages an on-line catalog. The Store Manager uses simple on-line forms to manage such information as shipping options, shopper groups, and customer numbers.

Some of the information kept in the database and available in the electronic store includes:

- The store or mall name
- The logo location
- Contact information
- The mission statement
- Policies
- Types of services and products
- The currency used
- Merchandise offered (including descriptions, product number or stock keeping unit, images, prices, availability dates, dimensions, weight, and so on)
- Product categories
- Shipping options and services
- Shopper groups
- Information about the people who have access to the store's database

The Java-based Template Designer in Net.Commerce is used to design Web pages. It is possible to create static or dynamic Web pages that display up-to-date data which is linked to a DB2/400 database. Template Designer's graphic look, drag-and-drop capabilities and quick testing functionality help create and test your pages. The design is laid out on a reusable template. Different templates can be created for different types of pages (for example, one template for regularly priced products, and another for products on sale).

Template Designer can also be used to create a home page for a store or mall, category pages, product pages, and unique pages for members of shopper groups.

IBM has also issued a Statement of Direction regarding its intent to support an IBM Logoed Payment Server in a future OS/400 release.

Lotus Domino

Lotus Domino is the world's leading workflow, messaging, groupware, and Web software. Lotus Domino enables you to communicate with colleagues, collaborate in teams, and coordinate strategic business processes on and off the Web.

Powerful, flexible communications

Lotus Domino gives you the power you need to communicate within and beyond your organization. If you need to communicate with suppliers, customers, and partners at other companies that use different e-mail systems, or reach them using the Internet, Lotus Domino makes it easy. Mobile Notes users can take their desktop along with them, transforming airports, hotels, and cars into work spaces complete with up-to-the-minute information. The Lotus Domino family also includes sophisticated client-server e-mail based on the market leading cc:Mail user interface. Lotus Domino applications can be accessed from any Web browser, which extends the openness and flexibility of your network.

World-class collaboration and coordination

Lotus Domino goes beyond traditional e-mail and groupware. With Lotus Domino, you can collaborate with team members using a local area network, wide area network, or the Internet. With the unique ability of Lotus Domino to integrate structured and unstructured information into coherent databases, you can organize and coordinate the most complex business processes.

Rapid application development

Lotus Domino allows you to create custom business applications that coordinate everyday business processes from start to finish to achieve results such as improved customer service, improved sales force productivity, and faster time-to-market for products. Lotus Domino customers consistently find significant payback on their Lotus Notes investment, whether or not they enable their Lotus Domino applications for the Web. According to an independent

AS/400 Advanced Technology

study, Lotus Notes users have achieved an average of 179% annual return on their investment.¹

Portability and interoperability

Lotus Domino is a server product that runs on a variety of platforms, providing easy-to-manage interoperability in a heterogeneous network. With the sophisticated replication capability of Domino, applications are easily distributed to multiple Domino servers in your enterprise, and just as easily deployed to end users. Replication also simplifies the job of deploying application changes. Lotus Domino applications are also available to any Notes client (such as WIN95, Windows 3.1, OS/2, Windows NT, and Macintosh). Lotus Domino version 4.5 and later releases are fully Internet-ready. You can access Lotus Domino server functions from either a Lotus Notes client on your workstation or a browser (including a browser on a Network Station).

Domino for AS/400

Domino for AS/400 is the Lotus Domino server product running on a 64-bit AS/400 RISC processor. It requires OS/400 Version 4 Release 2 or later. Domino for AS/400 provides all the functionality of the Lotus Domino server that runs on other platforms, and more.

Domino for AS/400 is an application that is packaged, distributed, and supported by Lotus Development Corporation. You purchase Domino for AS/400 from a Lotus distributor, just like you buy the Domino server product for any other platform. AS/400 continues to be purchased through IBM's AS/400 channels.

Unmatched scalability

Within a single architecture, AS/400 spans a vast performance spectrum. The smallest Domino for AS/400 server might have less than a dozen users. The largest AS/400 is capable of

¹ IDC, Lotus Notes Agent of Change, The Financial Impact of Lotus Notes on Business

AS/400 Advanced Technology

accommodating more than 10,000 mail users on a single footprint.² The breakthrough price performance of the AS/400e series and OS/400 Version 4 Release 2 or later means that AS/400 configurations can support this broad range of Lotus Domino users in a cost effective manner.

World-class reliability and availability

With more than 500,000 systems shipped worldwide, AS/400 has earned a reputation as a reliable, undemanding workhorse. AS/400 users expect their system to be consistently available, night and day, and AS/400 does not disappoint. Domino for AS/400 takes advantage of the reliability and availability features of AS/400, such as RAID5, mirrored disk units, and integrated backup capability. Each Lotus Domino server runs as an OS/400 application in its own subsystem. The unique architecture of OS/400 makes it safe to run your Lotus Domino server and your mission-critical business applications on the same AS/400.

Powerful integration

Domino for AS/400 includes integration between Lotus Domino databases and DB2/400 databases. Both real-time and scheduled integration of databases is available to meet a variety of application needs.

Automatic synchronization between the Domino Public Address Book and the AS/400 System Distribution Directory provides a powerful, integrated mail server for organizations with multiple e-mail products, including OfficeVision/400, POP3, JustMail, and Internet mail.

² In a simple mail workload, each active user performs the following operations over a 15-minute period of time: reads 5 documents, updates 2 documents, deletes 2 documents, views 1 document and scrolls through it, opens and closes 1 database, opens and closes 1 view. Additionally, each user sends a mail message to an average of 3 people no more frequently than every 90 minutes. The 10,000 users result is based on informal tests. Actual customer results may vary.

AS/400 Advanced Technology

The NotesPump option to synchronize authorizations between DB2/400 databases and Domino databases is a platform exclusive.

Proven security

Integrated, flexible security is a long-standing strength of both Domino and AS/400. Recently, AS/400's reputation for security has been enhanced with the introduction of Firewall for AS/400, which runs on an AS/400 Integrated PC Server. When you consider connecting to the Internet, Domino for AS/400 and the Firewall for AS/400 combine function, reliability, and value.

AS/400 Integration with Windows NT Server

Consolidating servers inside an AS/400

Currently, most companies deploy PC servers by function or service, with each server dedicated and tuned to an individual application such as file, print, or Web serving.

Consolidating multiple Windows NT Servers inside an AS/400e series keeps each of your Intel-based servers separate, but houses and manages them together in a single system.

Advantages of server consolidation on AS/400

Consolidate PC server hardware and operations. Run up to 16 NT servers in a single AS/400.

Increase business recovery protection with high-speed backup of the combined AS/400e series and NT systems.

Improve server uptime and error recovery using highly reliable AS/400 disk drives with RAID-5 and mirroring options. Use a spare Integrated PC Server to replace a failed server without reloading NT.

Maximize I/O investments by balancing AS/400e series and NT disk resources from a single pool. Switch user data disks between servers. Share the AS/400 tape and CD-ROM drives.

AS/400 Integration with Windows NT Server

AS/400 Integration with Windows NT Server is a nonchargeable feature of OS/400. This feature provides the device drivers to enable Windows NT Server to run on the AS/400 Integrated PC Server and to share AS/400 disk, tape, and CD-ROM drives. It also provides a variety of utilities, including integrated user administration.

Windows NT Server requirements

The AS/400 Integrated PC Server is certified to run Microsoft Windows NT Server 4.0. A standard CD-ROM licensed copy should be purchased separately (with the required client licenses) from any Microsoft reseller.

AS/400 Advanced Technology

AS/400 Integrated PC Server

The AS/400 Integrated PC Server combines the power of an Intel Pentium Pro processor with the high reliability and availability of AS/400e series.

The AS/400 Integrated PC Server is available on all AS/400 64-bit RISC models in either PCI bus or SPD bus versions. Integrated PC Servers are considered features of the AS/400 system and are covered by the AS/400 system warranty and maintenance contract.

A standard PC display, keyboard, and mouse must be attached to the AS/400 Integrated PC Server.

AS/400 Business Intelligence Solutions

What is Business Intelligence?

Business Intelligence turns corporate data into meaningful business information. It can help you understand business trends and make better forecasting decisions. It can be used to bring better products to market in a more timely manner. It can be used to analyze daily sales information and make snap decisions that can significantly impact your company's performance, and provide a means to get to know who your customers are.

One recent study showed that increasing customer retention rates by as little as 5% can increase profits from 25 to 150%. An IDC study of 62 companies implementing data warehouse/business intelligence applications achieved an average of 401% return on their investment.

Business Intelligence (BI) is taking corporate data and turning it into decision support information. Business Intelligence solutions have become much more affordable due to new innovations in software and hardware. One of these key technologies is data warehousing. Data warehouses provide the plumbing for Business Intelligence applications and the advent of data warehouse technology and industry specific Business Intelligence applications have made implementations meaningful and cost effective.

AS/400 Advanced Technology

AS/400 Enabling Technology

The AS/400 is the only hardware and software enabled for 64-bit relational database processing. The AS/400 has been optimized for a business intelligence environment with customized hardware (AS/400 servers), and optimized software (DB2/400, SMP for DB2/400, DB2 Multi-System, and Data Propagator Relational). These hardware and software functions combine to make a powerful business intelligence server which is easy to install, manage, and use.

With the AS/400's open interfaces, hundreds of tools can be used to provide Business Intelligence solutions accessing DB2/400 data transparently. From desktop analysis tools such as Business Objects to sophisticated multi-dimensional analysis (commonly referred to as OLAP) tools like Essbase/400, with no special programming required.

SMP for DB2/400 provides parallel query processing. This allows multiple processors in a single AS/400 system to collectively work on a single query and can improve query performance by as much as 400%. *DB2 Multi-System* support provides clustering for the AS/400 and allows up to 32 AS/400s to be "clustered" together into a single system. This clustering provides almost unlimited scalability and unparalleled performance for AS/400 customers. The combination of all of these advanced features have dramatically improved AS/400 performance so much that customers using Unix systems, PC Servers and even large specialized parallel servers have converted off of these machines to the AS/400 for a fraction of the cost.

Data Replication is an important technology to facilitate the automated loading of data warehouses while cleaning up or summarizing data for integrity and performance purposes. DataPropagator/400 provides asynchronous data movement between OLTP systems and Business Intelligence systems. Data Propagator allows fields to be summarized, derived, or aggregated into the data elements necessary in your data warehouse.

Data Mining is a Business Intelligence application that utilizes mathematical algorithms to scan potentially large amounts of data to find the golden nuggets of information. Intelligent Miner for AS/400

AS/400 Advanced Technology

provides the most advanced data mining application for AS/400 customers. Intelligent Miner provides advanced computer models to "discover" data relationships previously unknown. The models include algorithms for clustering, information classification, predictions, associations, sequential pattern recognition, and time sequence patterns. This analysis provides executives with insight which truly can be a competitive advantage.

Business Intelligence Solutions

Industry specific Business Intelligence solutions allow customers to implement off-the-shelf industry applications that are specific to their business. These applications provide a range of functions specific to an industry and generally provide users with instant functional application templates which can be customized to meet each businesses specific needs.

Business Intelligence Tools and Applications

Virtually every major Business Intelligence tool is supported on the AS/400. That includes tools for moving and cleansing data like Data Mirror and ETI Extract. Tools for organizing data in multi-dimensional and relational format like Essbase/400 and DataTracker, and multi-dimensional analysis tools like Analyzer, Business Objects, and Cognos Powerplay. These tools allow customers unlimited flexibility in building their own Business Intelligence applications. They also allow applications to utilize AS/400 data and non-AS/400 data.

While there are many technical advantages of utilizing the AS/400 for your Business Intelligence server, the overwhelming reason why customers utilize the AS/400 is the combination of its power and simplicity. The AS/400 provides a full range of tools, applications, and hardware in single integrated platform, helping to make rapid implementation a reality. Large and small businesses alike agree, this is the ideal Business Intelligence server.

The AS/400 provides outstanding database technology which supports rapid access to large amounts of data. The AS/400 supports a wide range of Business Intelligence solutions including small departmental applications, and very large Business Intelligence

AS/400 Advanced Technology

environments. The benefits of this application are measured by the better decisions which can be made as a result of having better information, and information in a format to support the decision-making processes of a company.

Product Previews

Product Previews

As part of the OS/400 Version 4 Release 2 announcement made in February 1998, and Version 4 Release 3 announcement made in September 1998, IBM announced that it intends to provide an update of OS/400 that will:

Enhance the application development environments to improve programmer productivity using San Francisco and Java enhancements.

Simplify management of the AS/400 in an Internet environment using enhancements to Operations Navigator.

Maintain currency with the Net.Commerce product and deliver a secure payment server for AS/400 e-business.

Support future releases of the Java development and execution environments. OS/400 Version 4 Release 2 or a later release will be required for these enhancements.

IBM intends to support future releases of Lotus Domino on the AS/400 platform. The availability of new Domino applications and functions will be controlled by Lotus and may not match the schedules for future releases of OS/400.

In future releases IBM intends to continue to enhance both the Intel processor and memory capabilities of the AS/400 Integrated PC Server.

Customers running OS/2 Warp Server for AS/400 and Novell NetWare 4.11 on the AS/400 IPCS will be supported with their current capabilities until 1/31/2001, however, these products will not be functionally enhanced. It is also recommended that customers running Domino on the OS/2 based AS/400 IPCS plan to migrate to the Domino for AS/400 product, which provides enhanced scalability, reliability, and integration. V4R3 is the last release of OS/400 which will support Lotus Domino running on the OS/2 based AS/400 IPCS. Future releases of OS/400 will not be capable of running Lotus Domino on the OS/2 based AS/400 IPCS.

IBM continues to invest in the AS/400 Integrated PC Server (IPCS) line of products for Windows NT Server and a fully

Product Previews

integrated AS/400 Firewall, both of which are enhanced in V4R3. OS/400 Integration with Windows NT Server is enhanced with V4R3 to provide support of multiple Windows NT Server releases. This enhancement prepares the AS/400 IPCS to run Windows NT Server 5.0 which is expected to be made available by Microsoft in 1999. IBM's support for Windows 5.0 on the AS/400 IPCS is subject to completion of Microsoft's product certification.

IBM intends to provide double-byte character support for AS/400 web site search and index capability.

OS/400 will be enabled with Integrated Hardware Disk Compression, for 17.5G disk unit in a future release of OS/400.

IBM intends to provide an IBM logoed Payment Server on the AS/400.

Summary

IBM AS/400e series

The AS/400 range currently consists of 10 models. They can be divided into two different groups.

AS/400e systems provide an ever widening range in performance and capacity, and now offers further function for e-commerce opportunities to add to the existing ease-of-use, high availability, and the large application portfolio that the AS/400 is well known for. The top-end systems can provide extremely powerful systems with substantial processing power, memory, and disk storage.

AS/400e servers offer a number of models that are specifically aimed at Client/Server solutions including Application Development and Data Warehousing. The 9401 Model 150, provides the power and function of OS/400 running in a small package, offering a full complement of AS/400 application support and PC file serving for small businesses and departments of larger companies.

All AS/400e series are managed by the same operating system: OS/400. OS/400 Version 4 offers a wide range of facilities that support e-business, groupware, Client/Server computing, Relational Database, an increasing conformance to Open Standards, many advanced Application Development Tools, and a variety of System Management functions. The combination of all these capabilities makes the AS/400 the most powerful to use and the easiest to manage business computing system available on the market today.

The 9401 Model 150 has limited configurability—particularly in terms of controllers and external storage devices that are not supported by the 9401 Model 150. The chapter on this model summarizes its capabilities. However, the other hardware sections of this book generally refer to the 6xx, Sxx, and 170 Models and not to the 9401 Model 150.

Some of the capabilities of the AS/400e series are summarized in tables 1-13 on pages 35 to 60. The earlier PowerPC-based models of AS/400—the 4xx and 5xx Models—are summarized in the section

Summary

beginning on page 594, as are the processor that were initially offered on the Model 170.

Summary

Table 1: Summary of the 9401 Model 150

Package	Twinax Entry	Twinax Growth	Server Entry	Server Growth
Package ID	#0391	#0392	#0393	#0394
SYSTEM PERFORMANCE METRIC (CPW)				
Client/Server Environment	20.2	20.2	20.2	20.2
Interactive Environment	13.8	20.2	13.8	20.2
NUMBER OF N-WAY PROCESSORS	1	1	1	1
MAIN STORAGE (M) Min/Max	64-192	128-192	64-192	128-192
Software Charge Group	P05	P05	P05	P05
DISK UNIT CAPACITY (G)				
Base	4.19	4.19	4.19	4.19
Total Disk	29.9	29.9	29.9	29.9
Disk Controllers	0	0	0	0
DISKETTE	0	0	0	0
TAPE ATTACHMENT				
¼" Internal	1	1	1	1
External & Tape Libraries	0	0	0	0
PHYSICAL PACKAGING				
SPD I/O Bus	0	0	0	0
SPD I/O Card Slots	0	0	0	0
PCI I/O Card Slots	5	5	5	5
Int PC Server & Bridge Card Slots	2	2	2	2
WORKSTATION ATTACHMENT				
Controllers Min/Max	1	1	0-1	0-1
Twinax Devices	1-7	1-28	0-7	0-28
ASCII Devices	0	0	0	0
LocalTalk Devices	0	0	0	0
Communications Lines	1-5	1-5	1-5	1-5
Cryptographic Processors	0	0	0	0
Fax Adapters	0	0	0	0
LAN Ports	0-2	0-2	1-2	1-2
Wireless Adapters	0	0	0	0
Integrated PC Servers	0-1	0-1	0-1	1
100/10 Mbps Ethernet Adapters	0-1	0-1	0-1	0-1
ATM Adapters	0	0	0	0

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

On the 9401-150, the processor is the same on both the Twinaxial and Server models, hence the performance figures are the same.

The performance figures shown are for a "constrained" workload due to memory and disk limitations on the 9401 Model 150. If these limitations were lifted, the following "unconstrained" CPW measurements apply:

<u>Processor</u>	<u>Interactive</u>	<u>Client/Server</u>
#0391 and #0393	13.8	27.0
#0392 and #0394	20.6	35.0

System also includes CD-ROM for IBM software.

Two of these slots are reserved for the Integrated PC Server. Three are driven by the Multi-Function I/O Processor.

Six lines in total but one is reserved for Operations Console.

Maximum of one LAN can be driven off the Multi-Function I/O Processor; none if Integrated PC Server is installed.

The 9401-150 includes BasePak software in the hardware cost. This includes OS/400, Client Access Family for Windows, Query, SQL, Facsimile Support, and PSF/400 (1-19 IPM Print Support). Additional programs have to be purchased.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 2: Summary of the 9406 Model 170

Processor Features	#2290	#2291	#2292	#2385	#2386
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)					
Processor Capacity	73.0	115.0	220.0	460.0	460.0
Interactive Capacity	20.0	25.0	30.0	50.0	70.0
NUMBER OF N-WAY MULTIPROCESSORS	1	1	1	1	1
MAIN STORAGE (M) Min/Max	64-832	64-832	256-1024	256-3584	256-3584
Software Charge Group	P05	P05	P10	P10	P20
SUMMARY FOR ALL PROCESSORS	Base System	#7101 Expansion Unit	System Maximum		
DISK UNIT CAPACITY (G)					
Base	4.19	--			4.19
Maximum Internal	70.16	105.24			175.4
Maximum External	--	--			--
Disk Controllers	1	--			1
DISKETTE (8 or 5¼ inch)	0	0			0
TAPE ATTACHMENT					
¼" Cartridge (Internal)	1	0			1
8mm Cartridge (External)	0	2			2
½" Reel 9348	0	2			2
½" Cartridge 34XX, 35XX	0	2			2
PHYSICAL PACKAGING					
SPD I/O Bus	0	0			0
I/O Card Slots--SPD	0	0			0
I/O Card Slots--PCI	6	9			15
WORKSTATION ATTACHMENT					
Controllers Min/Max	0-2	0-4			6
Twinax Devices	68	160			228
ASCII Devices	0	0			0
LocalTalk Devices	0	0			0
Communications Lines	1-4	0-8			12
FAX Adapters	0	0			0
Cryptographic Processor	0	0			0
LAN Ports	1-3	0-3			6
Integrated PC Servers	0-1	0-1			2
100/10 Mbps Ethernet Adapters	0-1	0-2			3
ATM Adapters	0-1	0-2			3

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

Processor Capacity represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when not constrained by main storage or DASD. This value was rated as "Unconstrained Client/Server CPW" for the Model 170 processors in Version 4 Release 2. Interactive Capacity represents the relative performance available to reform host-centric workloads. The amount of interactive capacity consumed will reduce the available processor capacity by the same amount.

The PCI card slots do not all have the same capability. Some are low speed slots, some are high speed slots, and some slots are reserved for specific cards such as Disk Controller, Tape Controller, or Integrated PC Server. For details refer to the main 9406 Model 170 section.

One Communication Line is used by the Operations Console (if installed). If there is a Twinax Console, the total number of communications lines is reduced by two.

Integrated PC Server is mutually exclusive with the high speed slot for LAN and ATM. Each Integrated PC Server can support two LANs.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 3: Summary of the 9406 Model 600

Processor Features	#2129	#2134	#2135	#2136
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)	22.7	32.5	45.4	73.1
NUMBER OF N-WAY MULTIPROCESSORS	1	1	1	1
MAIN STORAGE (M) Min/Max	64-384	64-384	64-384	128-512
Software Charge Group	P05	P10	P10	P20
DISK UNIT CAPACITY (G)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
Version 4 Release 1	85.8	85.8	85.8	85.8
Version 4 Release 2/3	175.4	175.4	175.4	175.4
Maximum External	--	--	--	--
Total Maximum				
Version 4 Release 1	85.8	85.8	85.8	85.8
Version 4 Release 2/3	175.4	175.4	175.4	175.4
Disk Controllers	1	1	1	1
DISKETTE (8 or 5¼ inch)	0	0	0	0
TAPE ATTACHMENT				
¼" and/or 8mm Cartridge (Internal)	0-1	0-1	0-1	0-1
8mm Cartridge (External)	0-1	0-1	0-1	0-1
½" Reel 9348	0-1	0-1	0-1	0-1
½" Cartridge 34XX, 35XX	0-1	0-1	0-1	0-1
PHYSICAL PACKAGING				
SPD I/O Bus	0	0	0	0
I/O Card Slots--SPD	0	0	0	0
I/O Card Slots--PCI	8	8	8	8
WORKSTATION ATTACHMENT				
Controllers Min/Max	0-5	0-5	0-5	0-5
Twinax Devices	188	188	188	188
ASCII Devices	0	0	0	0
LocalTalk Devices	0	0	0	0
Communications Lines	1-9	1-9	1-9	1-9
FAX Adapters	0	0	0	0
Cryptographic Processor	0	0	0	0
LAN Ports	0-3	0-3	0-3	0-3
ATM Ports	0-1	0-1	0-1	0-1
Integrated PC Servers	0-1	0-1	0-1	0-1
PCI LAN/ATM Adapters	0-3	0-3	0-3	0-3
Optical Libraries	0-1	0-1	0-1	0-1

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

One tape is required.

Does not include Operations Console.

These cards may have one or two LAN ports.

Version 4 Release 2 or later is a prerequisite for Optical Library support.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 4: Summary of the 9406 Model 620

Processor Features	#2175	#2179	#2180	#2181	#2182
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)	50.0	85.6	113.8	210.0	464.3
NUMBER OF N-WAY MULTIPROCESSORS	1	1	1	1	2
MAIN STORAGE (M) Min/Max	64-1856	256-2048	256-2048	256-2048	256-4096
Software Charge Group	P20	P20	P30	P30	P40
SUMMARY FOR ALL PROCESSORS	Base System	#9364 with #9329 (PCI Card Expansion)	#9364 with #9331 (SPD Card Expansion)	#507x, #508x (External Tower)	System Maximum
DISK UNIT CAPACITY (G)					
Base	4.19	--	--	--	4.19
Maximum Internal					
Version 4 Release 1	85.8/128.8	128.8	128.8	274.8	704.3
Version 4 Release 2/3	175.4/263.2	263.2	263.2	561.5	944.8
Maximum External					
Version 4 Release 1	--	--	()	()	652.8
Version 4 Release 2/3	--	--	()	()	893.3
Total Maximum					
Version 4 Release 1					704.3
Version 4 Release 2/3					944.8
Disk Controllers	1	1	()	()	20
DISKETTE (8 or 5¼ inch)	0	0	0-2	0-2	2
TAPE ATTACHMENT					
½" and/or 8mm Cartridge (Internal)	0-1	0-3	0-3	0-4	17
8mm Cartridge (External)	0-1	0-2	0-4	0-4	4
½" Reel 9348	0-1	0-2	0-4	0-4	4
½" Reel 2440	0	0	0-4	0-4	4
½" Reel 9347	0	0	0-2	0-2	2
½" Cartridge 34XX, 35XX	0-1	0-2	0-4	0-4	4
PHYSICAL PACKAGING					
SPD I/O Bus	0	0-4	0-4	0	4
I/O Card Slots--SPD	0	0	6	13	58
I/O Card Slots--PCI	8	14	0	0	22
WORKSTATION ATTACHMENT					
Controllers Min/Max	0-5	0-9	0-6	0-13	60
Twinax Devices	188	360	240	520	2392
ASCII Devices	0	0	108	234	1044
LocalTalk Devices	0	0	0	0	0
Communications Lines	1-9	0-18	0-36	0-78	96
FAX Adapters	0	0	0-6	0-13	32
Cryptographic Processor	0	0	0-1	0-1	1
LAN Ports	0-3	0-5	0-6	0-13	16
ATM Ports	0-1	0-3	0-6	0-6	16
Integrated PC Server (SPD)	0	0	0-3	0	16
Integrated PC Server (PCI)	0-1	0-1	0	0	2
PCI LAN/ATM Adapters	0-3	0-5	0	0-14	8
Optical Libraries	0-1	0-2	0-12		14

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

Either #9329 (PCI cards) or #9331 (SPD cards) must be chosen on a #9364. Therefore, columns two and three below this point are mutually exclusive.

Lower figure is for #2175, #2179, and #2180 processors, higher figure is for #2181 and #2182 processors.

External DASD can be attached via an SPD disk controller in this unit.

Maximums are:

12 of #6500

20 of #6501

9 of #6502, #6512, #6530, #6532, #6533

These maximums may be limited when used in combination with other disk controllers.

One tape is required.

Does not include Operations Console.

These may have one or two LAN ports. The #6617 SPD Integrated PC Server can have up to 3 ports.

Version 4 Release 2 or later is a prerequisite for Optical Library support with PCI cards or #6534.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 5: Summary of the 9406 Model 640

Processor Features	#2237	#2238	#2239
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)	319.0	583.3	998.6
NUMBER OF N-WAY MULTIPROCESSORS	1	2	4
MAIN STORAGE (M) Min/Max Version 4 Release 1/2 Version 4 Release 3	512-12288 512-12288	512-12288 512-16384	512-12288 512-16384
Software Charge Group	P40	P40	P40
DISK UNIT CAPACITY (G) Base Maximum Internal Version 4 Release 1 Version 4 Release 2/3 Maximum External Version 4 Release 1 Version 4 Release 2/3 Total Maximum Version 4 Release 1 Version 4 Release 2/3 Disk Controllers	4.19 927.7 1340.0 893.3 1305.6 927.7 1340.0 1-37	4.19 927.7 1340.0 893.3 1305.6 927.7 1340.0 1-37	4.19 927.7 1340.0 893.3 1305.6 927.7 1340.0 1-37
DISKETTE (8 or 5¼ inch)	0-2	0-2	0-2
TAPE ATTACHMENT ¼" and/or 8mm Cartridge (Internal) 8mm Cartridge (External) ½" Reel 9348, 2440 ½" Reel 9347 ½" Cartridge 34XX, 35XX	0-17 0-4 0-4 0-2 0-8	0-17 0-4 0-4 0-2 0-8	0-17 0-4 0-4 0-2 0-8
PHYSICAL PACKAGING SPD I/O Bus I/O Card Slots--SPD I/O Card Slots--PCI System Expansion (#5072/#5073/#5082/#5083) Bus Expansion (#5044) Storage Expansion (#5055) Storage Expansion (#5052/#5058)	1-19 3-235 0 0-18 0-9 0-1 0-18	1-19 3-235 0 0-18 0-9 0-1 0-18	1-19 3-235 0 0-18 0-9 0-1 0-18
WORKSTATION ATTACHMENT Controllers Min/Max Twinax Devices ASCII Devices LocalTalk Devices	1-175 7000 3150 0	1-175 7000 3150 0	1-175 7000 3150 0
Communications Lines FAX Adapters Cryptographic Processor LAN/ATM Ports Integrated PC Servers Optical Libraries	1-200 0-32 0-1 0-32 0-16 0-22	1-200 0-32 0-1 0-32 0-16 0-22	1-200 0-32 0-1 0-32 0-16 0-22

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

Summary

One tape is required.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 6: Summary of the 9406 Model 650

Processor Features	#2240	#2243	#2188	#2189
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)	1794.0	2340.0	3660.0	4550.0
NUMBER OF N-WAY MULTIPROCESSORS	8	12	8	12
MAIN STORAGE (M) Min/Max Version 4 Release 1/2 Version 4 Release 3	1024-20480 1024-32768	1024-20480 1024-32768	-- 1024-40960	-- 1024-40960
Software Charge Group	P40	P40	P50	P50
DISK UNIT CAPACITY (G) Base Maximum Internal Version 4 Release 1 Version 4 Release 2 Version 4 Release 3 Maximum External Version 4 Release 1 Version 4 Release 2 Version 4 Release 3 Total Maximum Version 4 Release 1 Version 4 Release 2 Version 4 Release 3 Disk Controllers	4.19 996.4 1546.1 2095.9 962.0 1511.8 2061.3 996.4 1546.1 2095.9 1-37	4.19 996.4 1546.1 2095.9 962.0 1511.8 2061.3 996.4 1546.1 2095.9 1-37	4.19 -- -- 2095.9 -- -- 2061.3 -- -- 2095.9 1-37	4.19 -- -- 2095.9 -- -- 2061.3 -- -- 2095.9 1-37
DISKETTE (8 or 5¼ inch)	0-2	0-2	0-2	0-2
TAPE ATTACHMENT ¼" and/or 8mm Cartridge (Internal) 8mm Cartridge (External) ½" Reel 9348, 2440 ½" Reel 9347 ½" Cartridge 34XX, 35XX	0-17 0-4 0-4 0-2 0-8	0-17 0-4 0-4 0-2 0-8	0-17 0-4 0-4 0-2 0-8	0-17 0-4 0-4 0-2 0-8
PHYSICAL PACKAGING SPD I/O Bus I/O Card Slots--SPD I/O Card Slots--PCI System Expansion (#5072/#5073/#5082/#5083) Bus Expansion (#5044) Storage Expansion (#5057) Storage Expansion (#5052/#5058)	1-19 3-237 0 0-18 0-9 0-1 0-18	1-19 3-237 0 0-18 0-9 0-1 0-18	1-19 3-237 0 0-18 0-9 0-1 0-18	1-19 3-237 0 0-18 0-9 0-1 0-18
WORKSTATION ATTACHMENT Controllers Min/Max Twinax Devices ASCII Devices LocalTalk Devices	1-175 7000 3150 0	1-175 7000 3150 0	1-175 7000 3150 0	1-175 7000 3150 0
Communications Lines (Version 4 Release 1.2) (Version 4 Release 3) FAX Adapters Cryptographic Processor LAN/ATM Ports (Version 4 Release 1/2) (Version 4 Release 3) Wireless LANs Integrated PC Servers Optical Libraries	1-250 1-300 0-32 0-1 0-48 0-72 0-3 0-16 0-22	1-250 1-300 0-32 0-1 0-48 0-72 0-3 0-16 0-22	- 1-300 0-32 0-1 -- 0-72 0-3 0-16 0-22	- 1-300 0-32 0-1 -- 0-72 0-3 0-16 0-22

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

One tape is required.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 7: Summary of the 9406 Model S10

Processor Features	#2118	#2119
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)		
Client/Server Environment	45.4	73.1
Interactive Environment	16.2	24.4
NUMBER OF N-WAY MULTIPROCESSORS	1	1
MAIN STORAGE (M) Min/Max	64-384	128-512
Software Charge Group	P05	P05
DISK UNIT CAPACITY (G)		
Base	4.19	4.19
Maximum Internal		
Version 4 Release 1	85.8	85.8
Version 4 Release 2/3	175.4	175.4
Maximum External	--	--
Total Maximum		
Version 4 Release 1	85.8	85.8
Version 4 Release 2/3	175.4	175.4
Disk Controllers	1	1
DISKETTE (8 or 5¼ inch)	0	0
TAPE ATTACHMENT		
¼" and/or 8mm Cartridge (Internal)	0-1	0-1
8mm Cartridge (External)	0-1	0-1
½" Reel 9348	0-1	0-1
½" Cartridge 34XX, 35XX	0-1	0-1
PHYSICAL PACKAGING		
SPD I/O Bus	0	0
I/O Card Slots--SPD	0	0
I/O Card Slots--PCI	8	8
WORKSTATION ATTACHMENT		
Controllers Min/Max	0-1	0-1
Twinax Devices		
Version 4 Release 1	7	7
Version 4 Release 2/3	28	28
ASCII Devices	0	0
LocalTalk Devices	0	0
Communications Lines	1-10	1-10
FAX Adapters	0	0
Cryptographic Processor	0	0
LAN Ports	1-3	1-3
ATM Ports	0-1	0-1
Integrated PC Servers	0-1	0-1
PCI LAN/ATM Adapters	1-3	1-3
Optical Libraries	0-1	0-1

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

It is a requirement to have a minimum of one tape.

If there is no workstation controller specified, then the console must be specified by #9721.

One line is used for Client Operations Console. Maximum is 9 if there is a Twinaxial System Console.

These cards may have one or two LAN ports.

Version 4 Release 2 or later is a prerequisite for Optical Library support.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 8: Summary of the 9406 Model S20

Processor Features	#2161	#2163	#2165	#2166	
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)					
Client/Server Environment	113.8	210.0	464.3	759.0	
Interactive Environment	31.0	35.8	49.7	56.9	
NUMBER OF N-WAY MULTIPROCESSORS	1	1	2	4	
MAIN STORAGE (M) Min/Max	256-2048	256-2048	256-4096	256-4096	
Software Charge Group	P05	P10	P10	P20	
SUMMARY FOR ALL PROCESSORS	Base System	#5064 with #9329 (PCI Card Expansion)	#5064 with #9331 (SPD Card Expansion)	#507x, #508x (External Tower)	System Maximum
DISK UNIT CAPACITY (G)					
Base	4.19	--	--	--	4.19
Internal					
Version 4 Release 1	85.8/128.8	128.8	128.8	274.8	704.3
Version 4 Release 2/3	175.4/263.2	263.2	263.2	561.5	944.8
Maximum External					
Version 4 Release 1	--	--	()	()	652.8
Version 4 Release 2/3	--	--	()	()	893.3
Total Maximum					
Version 4 Release 1					704.3
Version 4 Release 2/3					944.8
Disk Controllers	1	1	()	()	20
DISKETTE (8 or 5 1/4 inch)	0	0	0-2	0-2	2
TAPE ATTACHMENT					
1/4" and/or 8mm Cartridge (Internal)	0-1	0-3	0-3	0-4	17
8mm Cartridge (External)	0-1	0-2	0-4	0-4	4
1/2" Reel 9348	0-1	0-2	0-4	0-4	4
1/2" Reel 2440	0	0	0-4	0-4	4
1/2" Reel 9347	0	0	0	0	0
1/2" Cartridge 34XX, 35XX	0-1	0-2	0-4	0-4	4
PHYSICAL PACKAGING					
SPD I/O Bus	0	0-4	0-4	0	4
I/O Card Slots--SPD	0	0	6	13	58
I/O Card Slots--PCI	8	14	0	0	22
WORKSTATION ATTACHMENT					
Controllers Min/Max	0-1	0-1	0-1	0-1	1
Twinax Devices					
Version 4 Release 1	7	0	7	7	7
Version 4 Release 2/3	28	0	28	28	28
ASCII Devices					
Version 4 Release 1	0	0	6	6	6
Version 4 Release 2/3	0	0	28	28	28
LocalTalk Devices	0	0	0	0	0

Summary

SUMMARY FOR ALL PROCESSORS	Base System	#5064 with #9329 (PCI Card Expansion)	#5064 with #9331 (SPD Card Expansion)	#507x, #508x (External Tower)	System Maximum
Communications Lines	1-10	0-18	0-36	0-78	96
FAX Adapters	0	0	0-6	0-13	32
Cryptographic Processor	0	0	0-1	0-1	1
LAN Ports	1-3	0-5	0-6	0-13	16
ATM Ports	0-1	0-3	0-6	0-13	16
Integrated PC Server (SPD)	0-1	0	0-3	0-6	16
Integrated PC Server (PCI)	1-3	0-1	0	0	2
PCI LAN/ATM Adapters	0-1	0-5	0	0	8
Optical Libraries	0-1	0-1	0-12	0-14	14

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

Either #9329 (PCI cards) or #9331 (SPD cards) must be chosen on a #5064 System Unit Expansion. Therefore, columns two and three are mutually exclusive below this point.

External DASD can be attached via an SPD disk controller in this unit.

One tape is required.

Lower figure is for #2161 processor, higher figure is for #2163, #2165, and #2166 processors.

If there is no workstation controller specified, then the console must be specified by #9721.

One line is used for Operations Console. Maximum is 9 if there is a Twinaxial System Console.

These may have one or two LAN ports. The #6617 SPD Integrated PC Server can have up to 3 ports.

Maximums are:

12 of #6500

20 of #6501

9 of #6502, #6512, #6530, #6532, #6533

Summary

Version 4 Release 2 or later is a prerequisite for Optical Library support with PCI cards or #6534.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 9: Summary of the 9406 Model S30

Processor Features	#2257	#2258	#2259	#2260
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)				
Client/Server Environment	319.0	583.3	998.6	1794.0
Interactive Environment	51.5	64.0	64.0	64.0
NUMBER OF N-WAY MULTIPROCESSORS	1	2	4	8
MAIN STORAGE (M) Min/Max				
Version 4 Release 1/2	512-12288	512-12288	512-12288	1024-12288
Version 4 Release 3	512-12288	512-12288	512-16384	512-16384
Software Charge Group	P20	P20	P20	P30
DISK UNIT CAPACITY (G)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
Version 4 Release 1	927.7	927.7	927.7	927.7
Version 4 Release 2/3	1340.0	1340.0	1340.0	1340.0
Maximum External				
Version 4 Release 1	893.3	893.3	893.3	893.3
Version 4 Release 2/3	1305.6	1305.6	1305.6	1305.6
Total Maximum				
Version 4 Release 1	927.7	927.7	927.7	927.7
Version 4 Release 2/3	1340.0	1340.0	1340.0	1340.0
Disk Controllers	1-37	1-37	1-37	1-37
DISKETTE (8 or 5¼ inch)	0-2	0-2	0-2	0-2
TAPE ATTACHMENT				
¼" and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½" Reel 9348, 2440	0-4	0-4	0-4	0-4
½" Cartridge 34XX, 35XX	0-8	0-8	0-8	0-8
PHYSICAL PACKAGING				
SPD I/O Bus	1-19	1-19	1-19	1-19
I/O Card Slots--SPD	3-235	3-235	3-235	3-235
I/O Card Slots--PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18
Storage Expansion (#5055/#5057)	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18
WORKSTATION ATTACHMENT				
Controllers Min/Max	3	3	3	3
Twinax Devices				
Version 4 Release 1	7	7	7	7
Version 4 Release 2/3	28	28	28	28
ASCII Devices				
Version 4 Release 1	6	6	6	6
Version 4 Release 2/3	28	28	28	28
LocalTalk Devices	0	0	0	0
Communications Lines	1-200	1-200	1-200	1-200
FAX Adapters	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports	1-32	1-32	1-32	1-32
Integrated PC Servers	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

One tape is required.

With Version 4 Release 1, a maximum of two workstation controllers is supported.

The combined maximum of local and remote displays attached to ASCII and Twinax is seven with Version 4 Release 1 and 28 with Version 4 Releases 2 and 3.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 10: Summary of the 9406 Model S40

Processor Features	#2256	#2261	#2207	#2208
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)				
Client/Server Environment	1794.0	2340.0	3660.0	4550.0
Interactive Environment	64.0	64.0	120.0	120.0
NUMBER OF N-WAY MULTIPROCESSORS	8	12	8	12
MAIN STORAGE (M) Min/Max				
Version 4 Release 1/2	1024-20480	1024-20480	--	--
Version 4 Release 3	1024-32768	1024-32768	1024-40960	1024-40960
Software Charge Group	P30	P40	P40	P40
DISK UNIT CAPACITY (G)				
Base	4.19	4.19	4.19	4.19
Maximum Internal				
Version 4 Release 1	--	996.4	--	--
Version 4 Release 2	1546.1	1546.1	--	--
Version 4 Release 3	2095.9	2095.9	2095.9	2095.9
Maximum External				
Version 4 Release 1	--	962.0	--	--
Version 4 Release 2	1511.8	1511.8	--	--
Version 4 Release 3	2061.3	2061.3	2061.3	2061.3
Total Maximum				
Version 4 Release 1	--	996.4	--	--
Version 4 Release 2	1546.1	1546.1	--	--
Version 4 Release 3	2095.9	2095.9	2095.9	2095.9
Disk Controllers	1-37	1-37	1-37	1-37
DISKETTE (8 or 5¼ inch)	0-2	0-2	0-2	0-2
TAPE ATTACHMENT				
¼" and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½" Reel 9348, 2440	0-4	0-4	0-4	0-4
½" Cartridge 34XX, 35XX	0-8	0-8	0-8	0-8
PHYSICAL PACKAGING				
SPD I/O Bus	1-19	1-19	1-19	1-19
I/O Card Slots--SPD	3-237	3-237	3-237	3-237
I/O Card Slots--PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18
Storage Expansion (#5055/#5057)	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18
WORKSTATION ATTACHMENT				
Controllers Min/Max	3	3	3	
Twinax Devices				
Version 4 Release 1	--	7	--	
Version 4 Release 2/3	28	28	28	28
ASCII Devices				
Version 4 Release 1	--	6	--	
Version 4 Release 2/3	28	28	28	28
LocalTalk Devices	0	0	0	0

Summary

Processor Features	#2256	#2261	#2207	#2208
Communications Lines				
Version 4 Release 1/2	1-250	1-250	1-250	1-250
Version 4 Release 3	1-300	1-300	1-300	1-300
FAX Adapters	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports				
Version 4 Release 1/2	1-48	1-48	1-48	1-48
Version 4 Release 3	1-72	1-72	1-72	1-72
Integrated PC Servers	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

One tape is required.

With Version 4 Release 1, a maximum of two workstation controllers is supported.

The combined maximum of local and remote displays attached to ASCII and Twinax is seven with Version 4 Releases 1 and 28 with Version 4 Releases 2 and 3.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 11: Summary of the 9406 Model S20 Custom Mixed-Mode e-Server

Model	S20				
	#2170	#2177	#2178		
RELATIVE SYSTEM PERFORMANCE METRIC (CPW) Client/Server Environment	464.3	759.0	759.0		
Interactive Environment	759.0	110.7	221.4		
NUMBER OF N-WAY MULTIPROCESSORS	2	4	4		
MAIN STORAGE (M) Min/Max	256-4096	256-4096	256-4096		
Software Charge Group	P20	P20	P20		
SUMMARY FOR ALL PROCESSORS	Base System	#5064 with #9329 (PCI Card Expansion)	#5064 with #9331 (SPD Card Expansion)	#5073, #5083 (External Tower)	System Maximum
DISK UNIT CAPACITY (G) Base	4.19	--	--	--	4.19
Maximum Internal Version 4 Release 1	85.8/128.8	128.8	128.8	274.8	704.3
Version 4 Release 2/3	175.4/263.2	263.2	263.2	561.5	944.8
Maximum External Version 4 Release 1	--	--	()	()	652.8
Version 4 Release 2/3	--	--	()	()	893.3
Total System Version 4 Release 1					704.3
Version 4 Release 2/3					944.8
Disk Controllers	1	1	()	()	20
DISKETTE (8 or 5¼ inch)	0	0	2	2	2
TAPE ATTACHMENT ¼" and/or 8mm Cartridge (Internal)	0-1	0-3	0-3	0-4	17
8mm Cartridge (External)	0-1	0-2	0-4	0-4	4
½" Reel 9348	0-1	0-2	0-4	0-4	4
½" Reel 2440	0	0	0-4	0-4	4
½" Reel 9347	0	0	0	0	0
½" Cartridge 34XX, 35XX	0-1	0-2	0-4	0-4	4
PHYSICAL PACKAGING SPD I/O Bus	0	0-4	0-4	0	4
I/O Card Slots--SPD	0	0	6	13	58
I/O Card Slots--PCI	8	14	0	0	22
WORKSTATION ATTACHMENT Controllers Min/Max	1-5	0-9	0-6	0-13	60
Twinax Devices	188	360	240	520	2392
ASCII Devices	0	0	108	234	1044
LocalTalk Devices	0	0	0	0	0
Communications Lines	1-10	0-18	0-36	0-78	96
FAX Adapters	0	0	0-6	0-13	32
Cryptographic Processor	0	0	0-1	0-1	1
LAN Ports	1-3	0-5	0-6	0-13	16
ATM Ports	0-1	0-3	0-6	0-13	16
Integrated PC Server (SPD)	0	0	0-3	0-6	16
Integrated PC Server (PCI)	0-1	0-1	0	0	2
PCI LAN/ATM Adapters	1-3	0-5	0	0	8
Optical Libraries	0-1	0-1	0-12	0-14	14

Summary

Notes on Table:

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

One line is used for Operations Console. Maximum is 9 if there is a Twinaxial System Console.

It is a requirement to have one tape.

External DASD can be attached via an SPD disk controller in this unit.

Maximums are:

12 of #6500

20 of #6501

9 of #6532, #6533

Version 4 Release 2 or later is a prerequisite for Optical Library support with PCI cards or #6534.

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

Table 12: Summary of the 9406 Model S30 and S40 Custom Mixed-Mode e-Servers

Processor Model	S30			S40	
	#2320	#2321	#2322	#2340	#2341
RELATIVE SYSTEM PERFORMANCE METRIC (CPW)					
Client/Server Environment	998.6	1794.0	1794.0	3660.0	4550.0
Interactive Environment	215.1	386.4	579.6	1050.0	2050.0
NUMBER OF N-WAY MULTIPROCESSORS	4	8	8	8	12
MAIN STORAGE (M) Min/Max	512-12288	1024-12288	1024-12288	1024-40960	1024-40960
Software Charge Group	P20	P30	P30	P40	P40
DISK UNIT CAPACITY (G)					
Base	4.19	4.19	4.19	4.19	4.19
Maximum Internal					
Version 4 Release 1	927.7	927.7	927.7	--	--
Version 4 Release 2	1340.0	1340.0	1340.0	--	--
Version 4 Release 3	1340.0	1340.0	1340.0	2095.9	2095.9
Maximum External					
Version 4 Release 1	893.3	893.3	893.3	--	--
Version 4 Release 2	1305.6	1305.6	1305.6	--	--
Version 4 Release 3	1305.6	1305.6	1305.6	2061.3	2061.3
Total Maximum					
Version 4 Release 1	927.7	927.7	927.7	--	--
Version 4 Release 2	1340.0	1340.0	1340.0	--	--
Version 4 Release 3	1340.0	1340.0	1340.0	2095.9	2095.9
Disk Controllers	1-37	1-37	1-37	1-37	1-37
DISKETTE (8 or 5¼ inch)	0-2	0-2	0-2	0-2	0-2
TAPE ATTACHMENT					
¼" and/or 8mm Cartridge (Internal)	0-17	0-17	0-17	0-17	0-17
8mm Cartridge (External)	0-4	0-4	0-4	0-4	0-4
½" Reel 9348, 2440	0-4	0-4	0-4	0-4	0-4
½" Cartridge 34XX, 35XX	0-8	0-8	0-8	0-8	0-8
PHYSICAL PACKAGING					
SPD I/O Bus	1-19	1-19	1-19	1-19	1-19
I/O Card Slots--SPD	3-235	3-235	3-235	3-235	3-235
I/O Card Slots--PCI	0	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-18	0-18	0-18	0-18	0-18
Storage Expansion (#5055/#5057)	0-1	0-1	0-1	0-1	0-1
Storage Expansion (#5052/#5058)	0-18	0-18	0-18	0-18	0-18
WORKSTATION ATTACHMENT					
Controllers Min/Max	1-175	1-175	1-175	1-175	1-175
Twinax Devices	7000	7000	7000	7000	7000
ASCII Devices	3150	3150	3150	3150	3150
LocalTalk Devices	0	0	0	0	0
Communications Lines					
(Version 4, Releases 1/2)	1-200	1-200	1-200	--	--
(Version 4, Release 3)	1-300	1-300	1-300	1-300	1-300
FAX Adapters	0-32	0-32	0-32	0-32	0-32
Cryptographic Processor	0-1	0-1	0-1	0-1	0-1
LAN/ATM Ports					
(Version 4 Releases 1/2)	1-32	1-32	1-32	--	--
(Version 4 Release 3)	1-72	1-72	1-72	1-72	1-72

Summary

Processor Model	S30			S40	
	#2320	#2321	#2322	#2340	#2341
Integrated PC Servers	0-16	0-16	0-16	0-16	0-16
Optical Libraries	0-22	0-22	0-22	0-22	0-22

Summary

Table 13: Summary of the 9406 Model SB1 Custom Mixed-Mode e-Servers

Processor Model	SB1			
	#2310	#2311	#2312	#2313
RELATIVE SYSTEM PERFORMANCE METRIC (FI)	125,888	185,533	†	†
NUMBER OF N-WAY MULTIPROCESSORS	8	12	8	12
MAIN STORAGE (M) Min/Max	4096	4096	8192	8192
Software Charge Group	P30	P40	P40	P40
DISK UNIT CAPACITY (G)				
Base	16.77	16.77	16.77	16.77
Maximum Internal	34.35	34.35	34.35	34.35
Maximum External	--	--	--	--
Total Maximum	34.35	34.35	34.35	34.35
Disk Controllers	1	1	1	1
DISKETTE (8 or 5¼ inch)	0-2	0-2	0-2	0-2
TAPE ATTACHMENT				
¼" and/or 8mm Cartridge (Internal)	0-3	0-3	0-3	0-3
8mm Cartridge (External)	0-4	0-4	0-4	0-4
½" Reel 9348, 2440	0-4	0-4	0-4	0-4
½" Cartridge 34XX, 35XX	0-4	0-4	0-4	0-4
PHYSICAL PACKAGING				
SPD I/O Bus	1-5	1-5	1-5	1-5
I/O Card Slots--SPD	3-29	3-29	3-29	3-29
I/O Card Slots--PCI	0	0	0	0
System Expansion (#5072/#5073/#5082/#5083)	0-2(#5073)	0-2(#5073)	0-2(#5073)	0-2 (#5073)
Storage Expansion (#5055/#5057)	0	0	0	0
Storage Expansion (#5052/#5058)	0	0	0	0
WORKSTATION ATTACHMENT				
Controllers Min/Max	1-3	1-3	1-3	1-3
Twinax Devices				
Version 4 Release 1	7	7	7	7
Version 4 Release 2/3	28	28	28	28
ASCII Devices				
Version 4 Release 1	6	6	--	--
Version 4 Release 2/3	28	28	28	28
LocalTalk Devices	0	0	0	0
Communications Lines	1-200	1-200	1-200	1-16
FAX Adapters	0-2	0-2	0-2	0-2
Cryptographic Processor	0-1	0-1	0-1	0-1
LAN/ATM Ports	1-5	1-5	1-5	1-5
Wireless LANs	0-2	0-2	0-2	0-2
Integrated PC Servers	0-2	0-2	0-2	0-2
Optical Libraries	0-2	0-2	0-2	0-2

Summary

Notes on Table:

There is a logical limit of 17.16GB if mirrored or 25.76GB if RAID is used.

It is a requirement to have one tape.

Two logical features are supported on the base system.

With Version 4 Release 1, a maximum of two workstation controllers is supported.

† The performance of the 9406 Model SB1 is measured using it as a SAP R/3 application server, FI (Financial) Dialog Steps per hour at 65% CPU utilization. Information for Processors #2312 and #2313 was not available at the time of writing. FI dialog steps for these processors will be made available on the internet at:

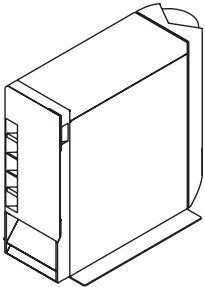
[http.softmall.ibm.com/as400/isvsol](http://softmall.ibm.com/as400/isvsol)

General Note: Capacities shown may require prerequisites and some combinations may not be valid.

Summary

AS/400e server Model 170

AS/400e server Model 170



9406 Model 170 System Unit

The 9406 Model 170 System Unit has a base configuration of:

Model 170 Processor (one must be specified):

Version 4 Release 3 is required for the following processors, processor performance CPW is provided.

- #2290 73/20 CPW Processor with 64M memory
- #2291 115/25 CPW Processor with 64M memory
- #2292 220/30 CPW Processor with 256M memory
- #2385 460/50 CPW Processor with 256M memory
- #2386 460/70 CPW Processor with 256M memory

The following original Model 170s require Version 4 Release 2 or above. Processor performance is provided.

- #2159 73.0/16.0 CPW Processor with 64M memory
- #2160 114.0/23.0 CPW Processor with 64M memory
- #2164 210.0/29.0 CPW Processor with 256M memory
- #2176 319.0/40.0 CPW Processor with 256M memory
- #2183 319.0/67.0 CPW Processor with 256M memory

Performance figures shown are for Client/Server and Interactive in an unconstrained environment. Memory and disk I/O constraints may limit the performance of some applications, in which case, the following constrained CPW performance numbers are provided for Version 4 Release 2 hardware only.

#2159 73/16

AS/400e server Model 170

#2160 114/23
#2164 125.0/29.0
#2176 125.0/40.0
#2183 125.0/67.0

Multi-function I/O Processor (MFIOP)

One 4.19G Disk Unit

Three additional internal disk slots

LAN Adapter

One CD-ROM unit

Console attachment (one must be specified)

- #9720 (Twinax/WAN) for Twinax Console and ECS
- #9721 (WAN) for Operations Console or Client Access Console and ECS

Six additional PCI card slots

No Battery Backup. Optional Uninterruptible Power Supply (UPS).

Card Technology

The use in the AS/400e series of Peripheral Component Interconnect (known as PCI) cards continues in the 9406 Module 170. Cards from previous generations' models of the AS/400, known as SPD cards, can not attach to the 9406 Model 170.

The fundamental bus architecture of the AS/400 has remained unchanged with this move to PCI adapters. The AS/400 IOP architecture continues to offload cycles from the main processor, isolate the host from adapter and network errors, and to manage, configure, and service the adapters. This continues to offer advantages over other system structures.

There are several types of PCI cards, each of which require a specialized slot on the AS/400 backplane.

PCI Adapter Cards

These require a PCI card slot and require a PCI controller to drive them. This PCI controller can either be included on the backplane or be a separate PCI card that attaches to the backplane.

High-Speed PCI Adapter Cards

High-Speed PCI cards require a higher bandwidth connection to the PCI controllers than a PCI card does. The PCI controller can either be included on the backplane or be a separate PCI card that attaches to the backplane.

PCI Controller Cards

PCI controller cards support a number of PCI card slots and a number of high-speed card slots depending on how the backplane is wired. They require a controller position on the backplane.

Integrated PC Server (IPCS) Controller Cards

A variant of the PCI controller cards, IPCS controller cards support a number of PCI card slots and require a PCI controller to drive them. They occupy a special reserved two-slot controller

AS/400e server Model 170

position on the backplane, one for the IPCS processor card and one for an IPCS Bridge card.

The introduction of PCI cards has allowed the implementation of Customer Installable Features (CIF). On the Model 170, this means that main storage, disk units, PCI features, removable media devices, and external cables are all customer installable. Orders for these devices alone will be installable by the customer. Orders for non-CIF features, such as upgrades and the #7101 system expansion unit, will still be installable by an IBM Customer Engineer (CE). With orders that contain a mix of CIF and non-CIF, the customer has the choice of installing the CIF products themselves or to let the IBM CE install them when the CE installs non-CIF features.

Non-CIF features include:

- #2740 PCI Raid Disk Controller
- #2741 PCI Raid Disk Controller
- #7101 System Expansion Unit
- #8813 Optional Base 8.58G Disk Unit
- #8824 Optional Base 17.54GB Disk Unit
- #9707 Base 4.19G Disk Unit
- #9720/#9721 Base ECS/Console Options
- #9723/#9724/#9738 Base LAN Options
- #9728 Base Disk Controller
- Processor Upgrades

AS/400e server Model 170

Main Storage for 9406 Model 170

The 9406 Model 170 #2159, #2160, #2290, and #2291 processors ship with 64M of base main storage. The #2164, #2176, #2183, #2292, #2385, and #2386 processors ship with 256M of base main storage. There are six additional slots available for cards of either 32M or 128M, or on the #2385 and #2386 only, 256M up to a maximum of 832M for the #2159, #2160, #2290, and #2291 processors, a maximum of 1024M for the #2164, #2176, #2183 and #2292 processors and a maximum of 3584m for the #2385 and #2386 processors. All memory on all processors on the Model 170 must be added in pairs. Therefore additional memory options are either 64M (2 x 32M cards) or 256M (2 x 128M cards or 512M (2x256M cards)). There are no features to specify the base Main Storage.

There are no feature exchanges when swapping memory cards.

The following lists the main storage options for the Model 170:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2159/#2160/ #2290/#2291 (64-832)	64M	#3001 32M #3002 128M
#2164/#2176/ #2183/#2292 (256-1024)	256M	#3001 32M #3002 128M
#2385/#2386 (256-3584)	256M	#3001 32M #3002 128M #3003 256M

Workstation Controllers for Model 170

The 9406 Model 170 supports only 5250-type workstations (excluding LAN attachments). See Summary Table section starting on page 35 for maximums.

The Multifunction I/O Processor, when ordered, has a choice of features that determine whether a 5250-type device (#9720) or a PC (#9721) will be used as a console.

The following workstation controllers can be attached to the Model 170:

- #2722 PCI Twinaxial Workstation IOA
- #9720 Base PCI WAN/Twinaxial IOA

PCI Twinaxial Workstation IOA #2722

This twinaxial workstation IOA provides support for up to 40 5250-type displays or printers. It ships with a cable and an 8-port expansion box. Each port supports seven devices, which allows a total of 56 attached devices, of which only 40 can be active.

Base PCI WAN/Twinaxial IOA #9720

This combined twinax and communications adapter is a base option on the Model 170. A cable with a 4-port expansion box comes with this adapter. Each port supports seven attached devices to support up to a total of 28 attached devices. This adapter also supports a single communication line. See Communications on page 205.

Multi-Function I/O Processor (MFIOP) on Model 170

A base MFIOP comes standard on all 9406 Model 170s. As with other AS/400e series systems however, other IOP cards do now support several functions, so the term MFIOP is not now limited to the base MFIOP as previously.

PCI Base Multi-Function IOP

This MFIOP provides support for two low-speed PCI card slots, one high-speed PCI card slot, and also drives one additional card--either an Integrated PC Server or an additional high-speed slot.

PCI slot (C09)	Supports #2721 PCI Two-Line WAN IOA or #2722 PCI Twinaxial Workstation IOA or #9720 Base PCI WAN/Twinaxial IOA. If slot C03 is empty, it can also support #2723/#9723 PCI Ethernet IOA or #2724/#9724 PCI Token Ring IOA
PCI slot (C08)	Supports #9720 Base PCI WAN/Twinaxial IOA or #9721 Base PCI Two-Line WAN IOA.
High-speed slot (C07)	Supports #9728 Base PCI Disk Unit controller, #2740 PCI RAID Disk Unit controller, or #2741 PCI RAID Disk Controller
High-speed slot (C03)	If no #2857 Integrated PC Server is installed in slots C02/C04, then C03 may be used for #2723/#9723 PCI Ethernet IOA, #2724/#9724 PCI Token-Ring IOA, #2838/#9738 100/10 Mbps Ethernet IOA, or the Low-speed ATM adapters #2811 (25 Mbps UTP), #2812 (45 Mbps Coax T3/DS3), or #2819 (34 Mbps Coax E3)
IPCS slots (C02/C04)	The MFIOP supports #2857 Integrated PC Server in slots C02/C04 only if no card is installed in high-speed slot C03

AS/400e server Model 170

PCI LAN/WAN/Workstation IOP #2809

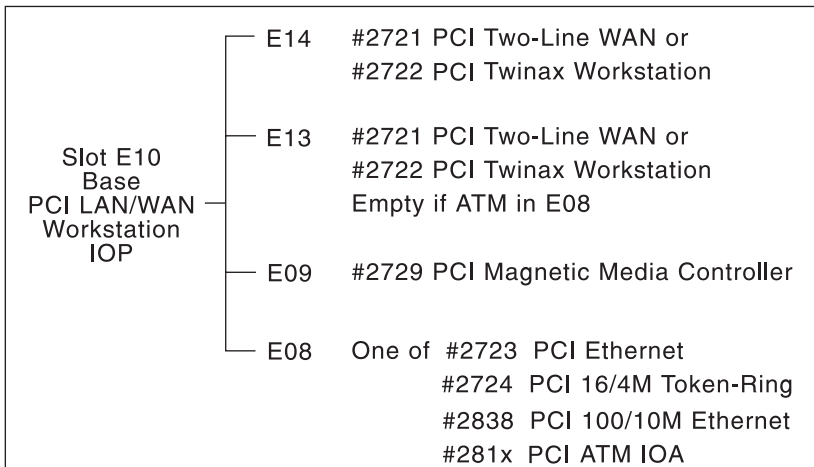
This multifunction IOP can support LAN, WAN, and Twinax IOAs. It can only be installed in the #7101 System Expansion Unit. One Base PCI LAN/WAN/Workstation IOP (with no feature required) comes standard in the #7101 installed in slot E10, while a further PCI LAN/WAN/Workstation IOP #2809 can be purchased if needed for installation in slot E07 of the #7101 System Expansion Unit.

Expansion Unit Slot E10

The base controller provides support for two PCI card slots (E13 and E14) and two high-speed PCI card slots (E08 and E09). In high-speed PCI card slots, E08 support is provided for #2723 PCI Ethernet IOA, #2724 16/4 Mbps Token-Ring IOA, #2838 100/10 Mbps Ethernet IOA or any of the #281n PCI ATM cards. High-speed slot E09 will support the #2729 PCI Magnetic Media Controller for the attachment of external tape and optical devices.

In the two PCI slots, E13 and E14, #2721 PCI Two-line WAN IOA and #2722 PCI Twinaxial WS IOA can be installed. However, if any #281n ATM card is installed in E03, then E13 must remain empty.

This can be illustrated by:



AS/400e server Model 170

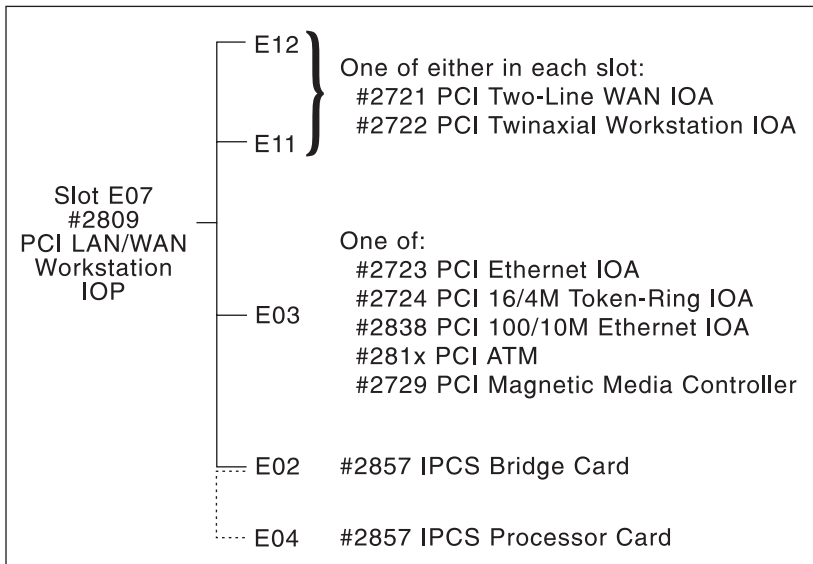
Expansion Unit Slot E07

The #2809 provides support for two PCI card slots and one high-speed PCI card slot. The high-speed PCI card can either be slot E03 or can be the Integrated PC Server (IPCS) Bridge card in E02, but it is not possible to have a card in both.

Slot E02 can, therefore, take the #2857 IPCS Bridge Card, and E04 then takes the #2857 IPCS Processor Card. If E02 is not used, then E03 can take one of the #2723 PCI Ethernet IOA, the #2724 PCI 16/4M Token-Ring IOA, the #2838 100/10M PCI Ethernet IOA, any of the #281n ATM adapters, or the #2729 PCI Magnetic Media Controller.

Slots E11 and E12 each support the #2721 PCI Two-Line WAN IOA and the #2722 PCI Twinax Workstation IOA.

The #2809 in slot E07 can be illustrated by:



It should be noted that for best performance, no other features should be intermixed with a #2838 PCI 100/10M Ethernet IOA on a #2809 PCI LAN/WAN/Workstation IOP.

AS/400e server Model 170

The number of PCI cards that can be supported in a Model 170 system is dependent upon the number of controllers in the system. Care must be taken in the selection of the controllers and the configuration rules should always be followed.

AS/400e server Model 170

Communications for 9406 Model 170

Model	Total Communications Lines
170	10*

Note:

* This total does not include ECS, Operations Console, or Client Access Console.

The following adapters support communications on the Model 170:

- #2721 PCI Two-Line WAN IOA
- #9720 Base PCI WAN/Twinaxial IOA
- #9721 Base PCI Two-Line WAN IOA

PCI Two-Line WAN IOA #2721

Supports up to two multiple protocol communications ports when one or two (in any combination) of the following cables are attached:

- #0348 V.24/EIA232 20ft/6m PCI Cable
- #0349 V.24/EIA232 50ft/15m PCI Cable
- #0353 V.35 20ft/6m PCI Cable
- #0354 V.35 50ft/15m PCI Cable
- #0355 V.35 80ft/24m PCI Cable
- #0356 V.36 20ft/6m PCI Cable
- #0358 V.36 150ft/45m PCI Cable
- #0359 X.21 20ft/6m PCI Cable
- #0360 X.21 50ft/15m PCI Cable
- #0362 20ft/6m Comms Console Cable
- #0367 Operations Console Cable
- #0365 V.24/EIA232 80ft/24m PCI Cable

AS/400e server Model 170

Base PCI WAN/Twinaxial IOA #9720

Feature provided on base MFIOP to support ECS on communications adapter. The following cable is required for ECS:

#0348 V.24/EIA232 20ft/6m PCI Cable

This feature also supports Twinaxial Workstation Controllers (see Workstation Controller section). The #9720 is mutually exclusive with the #9721.

Base PCI Two-Line WAN IOA #9721

This feature attaches to the MFIOP and supports up to two multiple protocol communication ports for ECS and a PC Console. Two cables must be specified for these functions:

#0348 V.24/EIA232 20ft/6m PCI and either:

- #0367 Operations Console PCI Cable 20ft/6m (Version 4 Release 3 required) OR
- #0362 Communication Console PCI Cable 20ft/6m

#9721 is mutually exclusive with #9720.

Communication Restrictions

If using any of the following communications functions, restrictions may apply. In particular, this applies when using PCI Two-Line WAN IOA #2721 or the IPX protocol. (IPX is used over LAN adapters, ATM adapters, or over frame relay.)

Frame relay protocol

IPX protocol

X.25 with more than 16 virtual circuits per line

SDLC protocol if used to connect to more than 64 remote sites

Communications line speeds greater than 64 Kbps for the synchronous PPP, X.25, SDLC, or frame relay protocols (Bisync is always limited to a maximum of 64 Kbps)

Non-async communications line speeds greater than 64 Kbps and up to 640 Kbps for X.25

AS/400e server Model 170

Additional information is available in the file called AS4CNFG PACKAGE on Marketing Tools. This is a comprehensive document with details on communications restrictions which apply in a number of different circumstances. This document should be consulted for full details on what these restrictions are. Customers should be able to obtain this document from their local IBM sales office.

AS/400e server Model 170

Local Area Networks and Asynchronous Transfer Mode for 9406 Model 170

The following adapters and controllers support LAN attachment on the 9406 Model 170. It includes one of the following base LAN adapters at no charge:

- #9723 PCI Ethernet IOA
- #9724 PCI 16/4 Mbps Token-Ring IOA
- #9738 PCI 100/10 Mbps Ethernet IOA

Other adapters supporting LAN attachment are:

- #2723 PCI Ethernet IOA
- #2724 PCI 16/4 Mbps Token-Ring IOA
- #2838 PCI 100/10 Mbps Ethernet IOA
- #2811 PCI 25 Mbps UTP ATM IOA
- #2812 PCI 45 Mbps Coax T3/DS3 ATM IOA
- #2815 PCI 155 Mbps UTP OC3 ATM IOA
- #2816 PCI 155 Mbps MMF ATM IOA
- #2818 PCI 155 Mbps SMF OC3 ATM IOA
- #2819 PCI 34 Mbps Coax E3 ATM IOA
- #2857 PCI Integrated PC Server

The following table identifies the maximum number of LAN ports allowed. This table does not define the maximum number of the individual features allowed by the model. The individual LAN card description should be viewed for that information.

The ATM adapters are not available in all countries and are also subject to country homologation requirements which may also limit availability.

Model	System Maximum of LAN Ports
170	6

AS/400e server Model 170

PCI 100/10 Mbps Ethernet IOA #2838/#9738

The 100 Base-X Ethernet PCI adapter feature allows the AS/400 to attach to standardized 100 Mbps high-speed Ethernet LANs and also allows attachment to existing 10 Mbps Ethernet LANs. The adapter comes with an RJ45 connector for attachment to UTP-5 media. It requires one high-speed PCI card slot. If placed in the system unit, it can either be supported from the MFIOP in slot C03 or be supported from the IPCS in slot C05.

In the #7107 System Expansion Unit, it can be supported in E08 from the base controller, and in either E03 from the #2809 controller in E07 or in E05 from an IPCS.

#9738 is the base LAN option on the Model 170.

If #2838/#9738 100/10 Mbps Ethernet is selected to be run on a #2857 IPCS, then one #0222 (100/10 Mbps Ethernet on IPCS) is required for each #2838/#9738 ordered.

Model 170	Maximum Number of #2838/#9738
#2838/#9738	3

PCI 16/4 Mbps Token-Ring IOA #2724/#9724

This feature provides a single attachment to either 16 Mbps or a 4 Mbps Token-Ring. The feature consists of an IOA card, internal code which supplies IEEE 802.5 Media Access Control (MAC), and IEEE 802.2 Logical Link Control (LCC) functions. The IOA is capable of operating in half or full duplex mode.

The #2724 comes with an 8ft/2.44m Token-Ring cable, or a separately purchased twisted-pair cable to the RJ45 connection on the IOA may be attached. It occupies one PCI card slot.

#9724 is the base LAN option on the Model 170.

If #2724/#9724 16/4 Mbps Token-Ring LAN IOA is installed on a #2857 IPCS, then one #0220 (Token-Ring on IPCS) is required for each #2724/#9724 ordered.

AS/400e server Model 170

PCI Ethernet IOA #2723/#9723

Provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC) plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode. It takes one PCI card slot. It has an RJ45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ45 twisted-pair cable must be ordered separately.

#9723 is the base LAN option on the Model 170.

If #2723/#9723 Ethernet IOA is selected to be run on a #2857 IPCS, then one #0221 (Ethernet on IPCS) is required for each #2723/#9723 ordered.

PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Unshielded Twisted Pair (UTP) cabling. The #2811 is typically used where 25 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot and can be installed in the system unit only if there is no #2857 IPCS present, or in slots E08 or E03 (#2809 is a prerequisite for this slot) in the #7101 System Expansion Unit for a maximum of three.

PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using coaxial cabling and the T3/DS3 interface. The #2812 is typically used where 45 Mbps speeds are required over distances of less than 1,000 meters. It requires one high-speed PCI card slot and can be installed in the system unit only if there is no #2857 IPCS present there, or in slots E08 or E03 (#2809 is a prerequisite for this slot) in the #7101 System Expansion Unit for a maximum of three.

AS/400e server Model 170

PCI 155 Mbps Unshielded Twisted Pair OC3 ATM #2815

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. The #2815 is typically used where 155 Mbps speeds are required over distances of less than 100 metres. It uses one high-speed slot but cannot be placed in the system unit. It attaches in slot E08 and slot E03 (where #2809 is a prerequisite) giving a maximum of two.

PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. This interface is intended for connection to both local area switches and direct connection to service provider equipment. #2816 is typically used where 155 Mbps speeds are required over distances of less than 2 Km. It uses one high-speed slot but cannot be placed in the system unit. It attaches in slot E08 and E03 (where #2809 is a prerequisite) of the system expansion unit, giving a maximum of two.

PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. #2818 is typically used where 155 Mbps speeds are required over distances from 16 to 40 Km. It uses one high-speed slot but cannot be placed in the system unit. In the System Expansion Unit, it can attach in slots E08 and E03 (where #2809 is a prerequisite), giving a maximum of two.

AS/400e server Model 170

PCI 34 Mbps Coaxial E3 ATM IOA #2819

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using coaxial cabling and the E3 interface. #2819 is typically used where 34 Mbps speeds are required over distances of less than 1,000 meters. It requires one high-speed card slot and can be installed in the system unit only if there is no #2857 IPCS present there, or in the System Expansion Unit in slots E08 and E03 (where #2809 is a prerequisite) giving a maximum of three.

PCI Integrated PC Server #2857

The Integrated PC Server (IPCS) contains an Intel 200 MHz Pentium Pro Processor, four main storage slots, and two LAN IOA slots. The adapter requires two reserved PCI card positions, one for the processor card and the second for the bridge card in order to interface the processor card to the AS/400. A maximum of two IPCS are supported, one in the Base System Unit and one in the #7101 System Expansion Unit.

The IPCS provides high-performance LAN serving to LAN-attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Microsoft Windows NT server are supported on the IPCS.

The IPCS comes with no base main memory and supports up to four of the following features:

- #2861 32M Memory for Integrated PC Server
- #2862 128M Memory for Integrated PC Server

Each LAN slot can contain either a Token-Ring or an Ethernet IOA from the list below:

- #2723/#9723 PCI Ethernet IOA
- #2724/#9724 PCI 16/4 Mbps Token Ring IOA
- #2838/#9738 PCI 100/10 Mbps Ethernet IOA

There can only be one #2838/#9738 on each #2857 IPCS. An external cable is included to enable connectivity to IPCS hardware

AS/400e server Model 170

(keyboard, mouse), which also allows for optional use of parallel and serial ports. If running Microsoft Windows NT on the IPCS, these additional features should be ordered.

#0325 IPCS Extension Cable for Windows NT (required)

#1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries)

A display must be connected to the IPCS to support NT

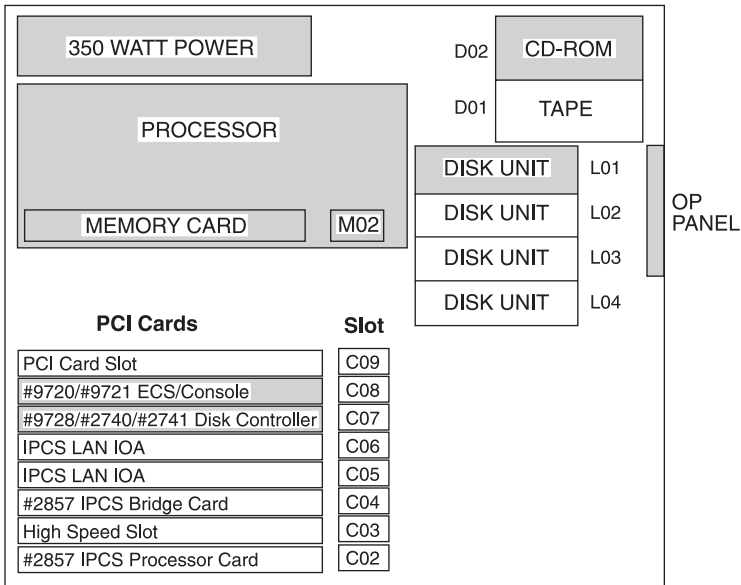
For keyboard/mouse and display support in countries outside the USA, the internet at:

<http://www.as400.ibm.com> should be consulted.

AS/400e server Model 170

Power and Packaging for the 9406 Model 170

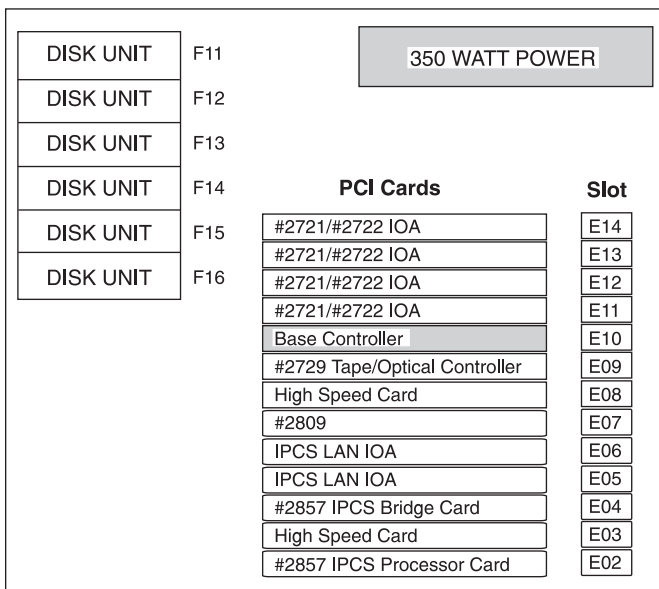
The following schematic diagram shows the system layout for the 9406 Model 170:



 = ARE PART OF BASE CONFIGURATION

AS/400e server Model 170

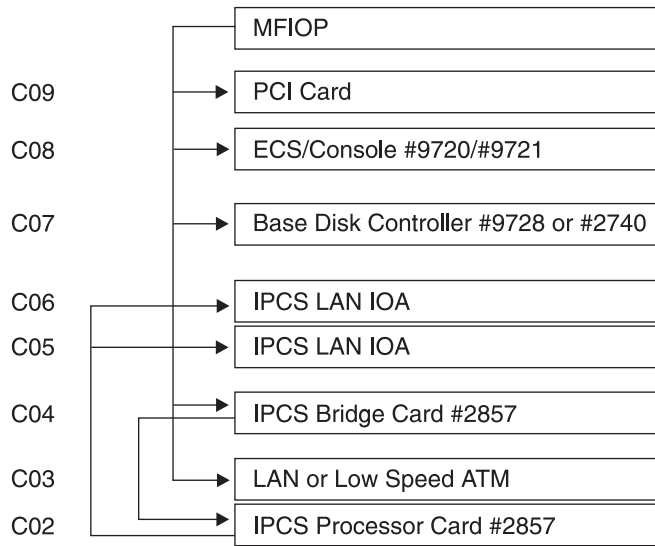
9406 Model 170 #7101 System Expansion Unit



 = ARE PART OF BASE CONFIGURATION

Base System Unit

The base system unit supports 4 disk units, one tape unit, and one CD-ROM. The base system unit includes a PCI controller (MFIOP) and further slots as illustrated below.



Slots C02/C04 are reserved for the #2857 IPCS. The LAN IOAs for the IPCS must be placed in C05 or C06. If there is no #2857 IPCS, then slot C03 can be used for any LAN or low-speed ATM. If there is a #2857 IPCS, then slot C03 must be empty.

Internal Expansion Features

System Expansion Unit #7101

For diagram, see page 83. This feature allows the addition of PCI cards and disk units. It includes one base controller card in slot E10. It supports six disks with concurrent maintenance. The disk controller for these six disk units resides in the system unit. However, concurrent maintenance is only supported when RAID-5 or mirroring disk protection is enabled. If the disk controller is operating the disk as #2740 or #2741 unprotected, there is no concurrent maintenance. Support is also provided for nine PCI adapter cards and three high-speed cards driven by two PCI controllers and one Integrated PC Server. In particular, it supports the #2729 Magnetic Media controller for external tape and optical drive support and the high-speed (155 Mbps) ATM cards #2815, #2816, and #2818 which require the #7101 System Expansion Unit as a prerequisite.

AS/400e server Model 170

Continuously Powered Main-Store (CPM)

The Model 170 utilizes the Continuously Power Main-Store (CPM) feature to be used in conjunction with specific UPSs. The UPS protects the AS/400e from spikes, power surges and burnouts. Power outages of up to 15 minutes are supported by the battery backup. After this time, if the power has not been restored to the AS/400e, the data currently in memory in the AS/400 is put into sleep mode. CPM sleep mode maintains memory data for up to 48 hours or until power has been restored. When power is restored, CPM allows the Model 170 to go into an orderly shutdown so an IPL can be completed in the shortest time possible after a long power outage.

Both CPM/UPS models include an extra tray for batteries to extend run time. AS/400 CPM/UPS offers user-replaceable and hot-swappable battery trays which allow the batteries to be easily replaced at any time, even during a blackout. The models are:

Model	Battery Trays	Additional Battery Tray	Voltage/Frequency	VA	Watts
9910-080	1	1	100-240V 50-60Hz	800	800
9910-140	2	1	100-240V 50-60Hz	*	1000-1400

* The watts and volt amperes (VA) are different depending on the voltage for the Model 140.

100V 1,000 watts 1,000 VA
120-127V 1,200 watts 1,200 VA
200-240V 1,400 watts 1,400 VA

AS/400e server Model 170

Internal Disk Units for 9406 Model 170

A base disk unit of 4.19G is standard on all Model 170s and is feature as #9707. This base disk can be changed to an 8.58G (#8813) or 17.54G (#8824) disk unit if required. There is a maximum of ten disk units supported on the Model 170. There is no support for external disk on the Model 170 nor can previous models of internal disk be migrated to the Model 170. Concurrent maintenance of the disks is supported with the #2740 or #2741 disk controller and only with RAID-5 or mirroring disk protection enabled). For any two disks to mirror each other, they must be the same size. To implement a RAID array, all disks in an array (minimum of four) must be the same capacity.

Feature	Size	Maximum
#6807	4.19G	9
#6813	8.58G	9
#6824	17.54G	9
#8813	8.58G	1
#8824	17.54G	1
#9707	4.19G	1

The base disk controller to support these disks is the #9728 Base PCI disk controller. It provides Ultra SCSI attachment for up to four disks, the internal CD-ROM drive, and one internal tape. It does not support RAID-5 or concurrent addition or maintenance of disks. It has a reserved slot (C07) supported from the MFIOP.

If specified, or if RAID-5 is chosen or if more than four disks are required, then the #9728 will be replaced with the #2740 PCI RAID Disk Unit controller. For more details on the #2740 or #2741 controller, see page 370 in Magnetic Media Controllers section. The #2740 or #2741 also supports a CD-ROM drive and one internal tape unit. If integrated hardware disk compression is required, the #2741 may be substituted for the #2740.

AS/400e server Model 170

Internal Tape, CD-ROM, and Diskette Units for Model 170

The following internal tape units are supported in the Model 170 system unit:

Feature	Size	One/Two Byte	SCSI Type
#6381	2.5G ¼"	1	Fast
#6382	4.0G ¼"	1	Fast
#6385	13G ¼"	2	Fast

Tape unit migrations from previous model AS/400s are not supported. Internal tapes cannot be installed in the #7101 System Expansion Unit.

Tape compaction can double device capabilities. However, the compaction used on the #6381 2.5G tape and #6382 4.0G tape is a special compaction which is not compatible with the compaction on #6385 13G tape.

Concurrent maintenance of tape and CD-ROM is not supported. The following are the current internal tapes and CD-ROM drives that are supported:

Base CD-ROM Drive

There is a base CD-ROM drive shipped with all Model 170s. It has no feature code associated with it. All code for the Model 170 ships on CD-ROM media. The base CD-ROM drive can be used for alternate IPL but not as a save/restore device for the system.

AS/400e server Model 170

2.5G Quarter-Inch Cartridge (QIC) #6381

This tape is mounted in the system unit and is controlled by the #9728 Base PCI Disk Unit Controller or the #2740 or #2741 PCI RAID-5 Disk Unit Controller. However, the standard quarter-inch cartridge for the Model 170 is the #6382 and so the #6381 is only orderable to be installed in the field and should only be ordered when compatibility with System/36 tape is required.

With special compaction using LZ1 (Lempel Ziv 1), the tape unit supports up to 50GB. However, this compaction is not compatible with the compaction used by the 13GB QIC #6385. It may be used for save/restore, alternate IPL, program distribution, migration, and QIC tape exchange.

It has an effective data rate of 300K per second when operating in the QIC-2G or QIC-1000 format, 200K per second when operating in the QIC-525 format, and 120K per second when operating in the QIC-120 format. For details of compatibility with other QIC media types and drives, see table on page 442.

4G Quarter-Inch Cartridge (QIC) #6382

This tape is mounted in the system unit and is the default internal tape drive in the configurator. It is controlled by the #9728 Base PCI Disk Unit Controller or the #2740 or #2741 PCI RAID-5 Disk Unit Controller. It is not compatible with System/36 tape units. Its compaction is not compatible with compaction on the 13GB #6385 QIC tape. It can be used for save/restore, alternate IPL, program distribution, migration, and QIC tape exchange.

It has an effective data rate of 380K per second or 760K per second with data compaction.

The #6382 supports data compaction using LZ1 (Lempel Ziv 1) when tapes are initialized using the appropriate format. This compaction is not compatible with that used on the #6385 13G QIC. The IBM QIC-4GB-DC tape media supported by the 4GB ¼" Cartridge Tape Unit is not supported in any other QIC drive. For details of

AS/400e server Model 170

compatibility with other QIC media types and drives, see table on page 442.

13G Quarter-Inch Cartridge (QIC) #6385

This optional tape is mounted in the system unit. It uses the QIC-5010 format. When using tape format QIC-5010, maximum native capacity is 13G and with compaction 26G. When using tape format MLR1 (PTFs may be required), maximum native capacity is 16G and with compaction 32G. The effective data rate is 1.5M per second native and 3M per second with compaction. Tape tensioning control improvements in the tape unit eliminate the need for an autoretension pass during the data cartridge load sequence. This is a major time saving as the autoretension pass on earlier QIC tape units could take up to five minutes. The #6385 Tape Unit retensions the data cartridge only when a loss of tension is detected. For typical operating conditions, this should be very infrequent. It may be used for save/restore, alternate IPL, program distribution, migration, and QIC cartridge tape exchange.

The tape unit is controlled by the #9728 Base PCI Disk Unit Controller or #2740 or #2741 PCI RAID-5 Disk Unit Controller. Note that the compaction used on this tape drive is not compatible with those used on the #6381 2.5G and #6382 4G QIC tape units.

For details of compatibility with other QIC media types and drives, see table on page 442.

AS/400e server Model 170

Table 1. QIC Internal Tape Drive Read/Write Compatibility

Format	Capacity	Media	#6380	#6381 #6481	#6382 #6482	#6385 #6485
MLR1	(16GB)	MLR1-16GB	--	--	--	R/W(1)
QIC5010	(13GB)	DC5010	--	--	--	R/W(1)
QIC4DC(2)	(8GB)	SLR5-4GB	--	--	R/W	--
QIC4GB	(4GB)	SLR5-4GB	--	--	R/W	--
QIC4DC(2)	(5GB)	DC9250	--	R/W	R/W	--
QIC2GB	(2.5GB)	DC9250	R/W	R/W	R/W	R/W
QIC1000	(1.2GB)	DC9120	R/W	R/W	R/W	R/W
QIC525	(525MB)	DC6525	R/W	R/W	R/W	R/W
QIC525	(320MB)	DC6320	R/W	R/W	R/W	R/W
QIC120	(120MB)	DC6150	R/W	R/W	R/W	R/W
QIC24	(60MB)	DC6150	R	R	--	--

Note 1: 13GB/16GB/25GB cartridges have auto-retension (retention done as required).

Note 2: QIC2DC and QIC4DC formats are compression formats. Cartridge capacity is data dependent (capacities shown are typical).

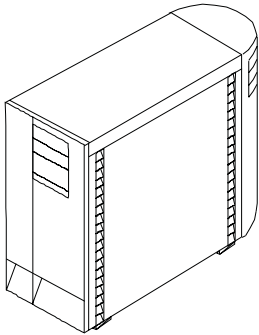
Note 3: QIC24 format is written by S/36.

Diskette Drive Support

There is no diskette support on the 9406 Model 170.

AS/400e server Model 170

AS/400e systems Models 600, 620



9406 Model 600 System Unit

The 9406 Model 600 System Unit has a base configuration of:

Model 600 Processor (one must be specified):

- #2129 22.7 CPW Processor with 64M memory
- #2134 32.5 CPW Processor with 64M memory
- #2135 45.4 CPW Processor with 64M memory
- #2136 73.1 CPW Processor with 128M memory

Multi-function I/O Processor (MFIOP)

One 4.19G Disk Unit

Four additional internal disk slots

One CD-ROM unit

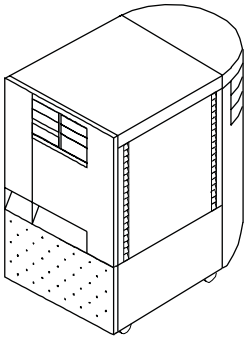
Console attachment (one must be specified)

- #9720 (Twinax/WAN) for Twinax console and ECS
- #9721 (WAN) for Operations Console or Client Access Console and ECS

Eight additional PCI card slots

No Battery Backup. Optional Uninterruptible Power Supply (UPS).

9406 Models 600, 620



9406 Model 620 System Unit

The 9406 Model 620 System Unit has a base configuration of:

Model 620 Processor (one must be specified):

- #2175 50.0 CPW Processor with 64M memory
- #2179 85.6 CPW Processor with 256M memory
- #2180 113.8 CPW Processor with 256M memory
- #2181 210.0 CPW Processor with 256M memory
- #2182 464.3 CPW 2-Way Processor with 256M memory

Multi-function I/O Processor (MFIOP)

One 4.19G Disk Unit

Base System Unit Expansion

Nine additional internal disk slots

One CD-ROM unit

Console attachment (one must be specified)

- #9720 (Twinax/WAN) for Twinax console and ECS
- #9721 (WAN) for Operations Console or Client Access
Console and ECS

Eight additional PCI card slots in system unit

Fourteen additional PCI card slots or six SPD card slots in the
System Unit Expansion

Internal Battery Backup

Card Technology

The AS/400 Model 600 and 620 support a different card technology than has previously been available to the AS/400. Peripheral Component Interconnect (known as PCI) is an industry-standard format that allows the AS/400e series to choose from a wide range of devices to be integrated into the system. Only PCI cards may be installed in the Model 600. The Model 620 has the ability to use both PCI cards and cards known as SPD cards. SPD cards are cards that use the same technology as that implemented on the previous AS/400 ranges. They are known as SPD because they were designed to be fitted on a bus designed by the System Products Division (SPD) of IBM.

Most functions supported with SPD cards are supported in the PCI format. However, the following functions are not supported with PCI cards and are therefore not supported at all on the Model 600, and only with SPD cards on the Model 620:

- Cryptographic Processors
- Fax Adapter
- ASCII Adapter
- ISDN Adapter

PCI adapters also do not support X.21 switched WAN dial up or Shorthold Mode WAN.

The fundamental bus architecture of the AS/400 remains unchanged with the move to PCI adapters. The AS/400 IOP architecture continues to offload the main processor, isolate the host from adapter and network errors, and to manage, configure, and service the adapters. This architecture continues to offer advantages over other system structures.

9406 Models 600, 620

The introduction of PCI cards has also allowed the implementation of Customer Installable Features (CIF). CIF is utilized on the Model 600 for orders of certain additional features, such as disk features, PCI I/O cards, and external cables. Orders for these items alone will have Feature #0002 added to the order to indicate they are to be installed by the customer. Orders for model upgrades, memory, and tape will still be installed by the IBM Customer Engineer (CE). On orders that contain a mix of CE install and CIF features, if the customer chooses, the CE will install all features. IBM installation of orders containing all CIF features will be available through normal chargeable service contracts.

9406 Models 600, 620

Main Storage for 9406 Models 600, 620

Model 600 Main Storage

The 9406 Model 600 ships with 64M of base main storage with five additional slots available for cards of either 32M or 64M up to a maximum of 384M, with the exception of the #2136 processor. The #2136 processor has six additional slots for main storage. This is due to the requirement that memory must be installed in pairs on this processor. Therefore, the additional memory options for the #2136 are either 64M (2x32M cards) or 128M (2x64M cards) up to a maximum of 512M. The configurator seeks to minimize the number of cards.

IBM may offer feature exchanges on a M-for-M basis to reach a precise memory requirement. There are no feature codes to specify base main storage.

The following lists the main storage options for the Model 600:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2129/#2134/#2135 (64-384)	64M	#3182 32M #3110 64M
#2136 (128-512)	128M	#3182 32M #3110 64M

9406 Models 600, 620

Model 620 Main Storage

The 9406 Model 620 ships with 256M of base main storage with the exception of the #2175 Processor. The #2175 Processor ships with 64M of base main storage. There are 14 slots available for additional cards of 32M or 128M which must always be added in pairs. Consequently, the minimum increase of main storage is 64M. There are no feature codes to specify the base memory.

The configurator seeks to minimize the cards used. IBM may offer feature exchanges on a M-for-M basis to reach a precise memory requirement.

For Processor #2182, a Main Storage Expansion (#2830) is available which provides a further 16 sockets for memory cards.

The following lists the main storage options for the Model 620:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2175 (64-1856)	64M	#3001 32M #3002 128M
#2179/#2180/#2181 (256-2048)	256M	#3001 32M #3002 128M
#2182 (256-4096)	256M	#3001 32M #3002 128M

Workstation Controllers for Models 600 and 620

The 9406 Model 600 supports only 5250-type workstations (excluding LAN attachments). The Model 620 supports both 5250-type and ASCII workstations. See the Summary Tables on page 35 to page 58 for maximums.

When ordered, the Multifunction I/O Processor, when ordered, has a choice of features that determine whether a 5250-type device (#9720) or a PC (#9721) is to be used as a console. If #9721 is selected, then choose one of the following cables:

#0367 Operations Console Cable (requires V4R3)

To enable use of the Remote Control Panel function with Operations Console, order feature #0381 (Remote Control Panel Cable).

#0362 Client Access Console Cable

The Models 600 and 620 do not support system console specify codes.

The following additional workstation controllers can be attached to the Model 600 and 620. The SPD features apply to the Model 620 only.

#9720 Base PCI WAN/Twinaxial IOA

#2722 PCI Twinaxial Workstation IOA

#6141 SPD ASCII Workstation Controller

#6142 SPD ASCII 12-Port Attachment

#6180 SPD Twinaxial Workstation IOA

Base PCI WAN/Twinaxial IOA #9720

This combined twinax/communication adapter supports 28 twinax addresses. It ships with a cable and a 4-port expansion box, with each port supporting seven attached devices. It also supports a single communications line. See Communications on page 106.

9406 Models 600, 620

PCI Twinaxial Workstation IOA #2722

This twinaxial workstation IOA provides support for up to 40 5250-type displays or printers. A cable with an 8-port expansion box comes with the adapter. Each port supports seven attached devices which allows a total of 56 attached devices, of which only 40 can be active.

SPD ASCII Workstation Controller #6141

The #6141 ASCII Workstation Controller is a 6-port workstation controller and workstation adapter with a 10 foot attachment cable. It provides support to attach up to six ASCII displays and printers. One SPD card slot is required to support the #6141. It is only available on the Model 620.

SPD ASCII 12-Port Attachment #6142

#6142 provides an additional 12 ports to the six provided by #6141. It provides support to attach up to 18 ASCII displays and printers. One #6142 can attach per #6141. It is only available on the Model 620.

SPD Twinaxial Workstation IOA #6180

The #6180 Twinaxial Workstation IOA provides support for up to 40 5250-type displays or printers. A cable with an 8-port expansion box comes with the adapter. Each port supports seven attached devices which allows a total of 56 attached devices, of which only 40 can be active. The #6180 feature requires a #2629 LAN/WAN/Workstation SPD IOP (see MFIOP) as a prerequisite. It is only available on the Model 620.

The following features are supported on the Model 620 as migration features only:

- #6050 Twinaxial Workstation Controller
- #6140 Twinaxial Workstation Controller

Multi-Function I/O Processor (MFIOP) on Models 600 and 620

A base MFIOP comes standard on all 9406 Model 600 and 620 systems. Certain other IOP cards support several functions, so the term MFIOP is not just limited to the base MFIOP when it was first introduced.

PCI Base Multi-Function IOP (MFIOP)

The base MFIOP provides support for four PCI card slots, one of which is the high-speed PCI card slot used for the disk controller. It also drives one Integrated PC Server. The slots in the MFIOP are of different speeds and consequently support different features.

High-speed slot (C11)	PCI Disk Unit Controller (#2726, #2740, or #2741) or Base PCI Disk Unit Controller (#9728)
Low-speed slot (C09)	PCI WAN/Twinaxial IOA (#9720) or PCI Two-Line WAN IOA (#9721)
Low-speed slots (C08 and C10)	PCI Two-Line WAN IOA (#2721) PCI Twinax Workstation IOA (#2722) PCI 10 Mbps Ethernet IOA (#2723) PCI 16/4 Mbps Token-Ring IOA (#2724)
Integrated PC Server slots (C06 and C07)	PCI Integrated PC Server (#2851 or #2854)

The MFIOP does not support two LAN adapters in slots C08 and C10. There is a further restriction that when a PCI Integrated PC Server (#2851 or #2854) is installed in C06/C07, Twinax IOA #2722 is not allowed in Slot C08 and LAN cards are not allowed in Slots C08 or C10.

9406 Models 600, 620

SPD LAN/WAN/Workstation IOP #2629

This is an SPD adapter that is only available on the Model 620. It uses one SPD slot. It supports up to three of the following IOAs:

- #2699 Two-Line WAN IOA
- #6149 16/4 Mbps Token-Ring IOA
- #6180 Twinaxial Workstation IOA
- #6181 Ethernet/IEEE 802.3 IOA

One #2629 supports any combination of adapters with the following restriction:

There is a maximum of two LAN IOAs

Up to seven #2629s can be placed into each 1063 Mbps System Unit Expansion Tower #5072. #2629 is not allowed in Slot 14 of #5072 tower. No restrictions apply when using #2629 with a #5073.

PCI LAN/WAN/Workstation IOP #2809

This IOP can be used for attaching LAN, WAN, and Workstation IOAs to the system. The #2809 supports different combinations of cards, depending upon which of the one System Unit position (Model 600 or 620), and which of the three #9364 System Unit Expansion positions (Model 620 only) the IOP is installed in:

System Unit Slot C03

Models 600 and 620. The #2809 supports PCI features installed in System Unit positions C01, C02, C04, and C05. In high-speed Slot C01 it supports the PCI 100/10M Ethernet IOA (#2838) or one of the PCI ATM IOAs (#281n). In the C02 high-speed Slot it supports the PCI Magnetic Media Controller (#2729) and in Slots C04 and C05 supports any one or two of the following:

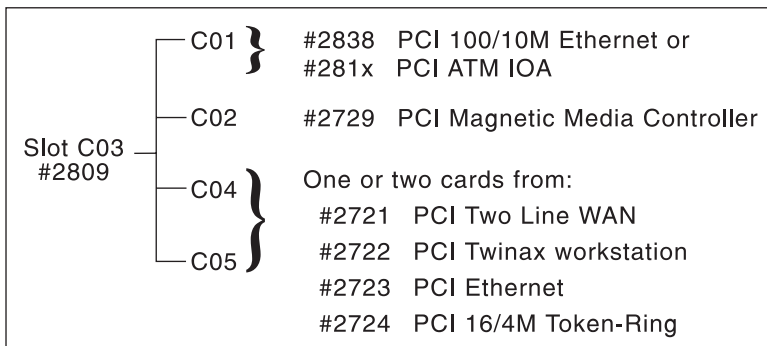
- #2721 PCI Two-Line WAN IOA
- #2722 PCI Twinaxial Workstation IOA
- #2723 PCI Ethernet IOA
- #2724 PCI 16/4M Token-Ring IOA

However, if the 100/10M Ethernet card is installed on this #2809, then the only allowable feature in positions C04 and C05 is

9406 Models 600, 620

Feature #2721. Also, if the #2851 or #2854 PCI Integrated PC Server is installed in Slots C06 and C07, then it is the IPCS that controls C04 and C05 and they are not available to the #2809.

This is subject to the restrictions mentioned, as is illustrated by:



System Unit Expansion (SUE) position E15 on Model 620

A base PCI LAN/WAN/Workstation IOP comes standard with the PCI Integrated Expansion Unit #9329 and is located in slot E15. There is no feature required to identify this card. It provides support for three PCI card slots, one high-speed PCI card slot (which is reserved solely for the SUE disk controller) and one Integrated PC Server.

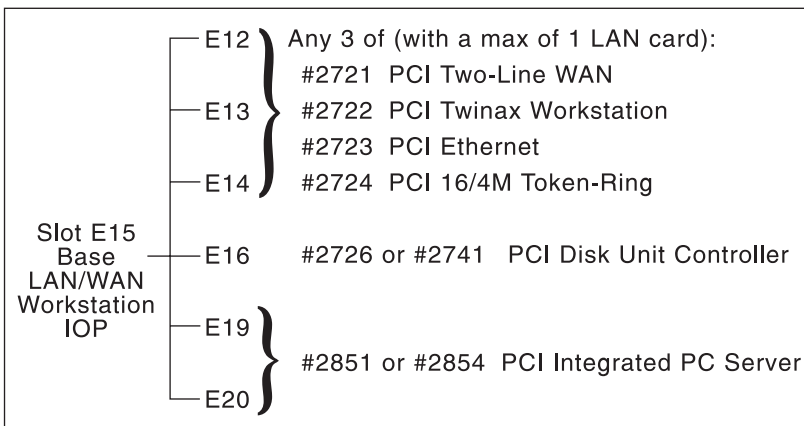
In the high-speed Slot E16, it supports only the #2726 or #2741 PCI Disk Unit Controller. In Slots E12, E13, and E14 it supports any three of the following (with a maximum of one LAN card):

- #2721 PCI Two-Line WAN IOA
- #2722 PCI Twinaxial Workstation IOA
- #2723 PCI Ethernet IOA
- #2724 PCI 16/4M Token-Ring IOA

When a #2851 or #2854 PCI Integrated PC Server is installed in SUE Slots E19/E20, no LAN IOAs are allowed in Slots E12, E13, and E14.

9406 Models 600, 620

Subject to the restrictions mentioned above, this is illustrated by:



System Unit Expansion (SUE) Slot E05 or E10 on Model 620

The #2809 provides support for three PCI card slots and one high-speed PCI card slot.

In the high-speed card slot (E06 or E11), it supports either a #2838 PCI 100/10M Ethernet IOA, a #281x PCI ATM IOA, or a #2729 PCI Magnetic Media Controller.

In the PCI card slots (E02, E03, E04 or E07, E08, E09), three of the following are supported

- #2721 PCI Two-Line WAN IOA
- #2722 PCI Twinaxial Workstation IOA
- #2723 PCI Ethernet IOA
- #2724 PCI 16/4M Token-Ring IOA

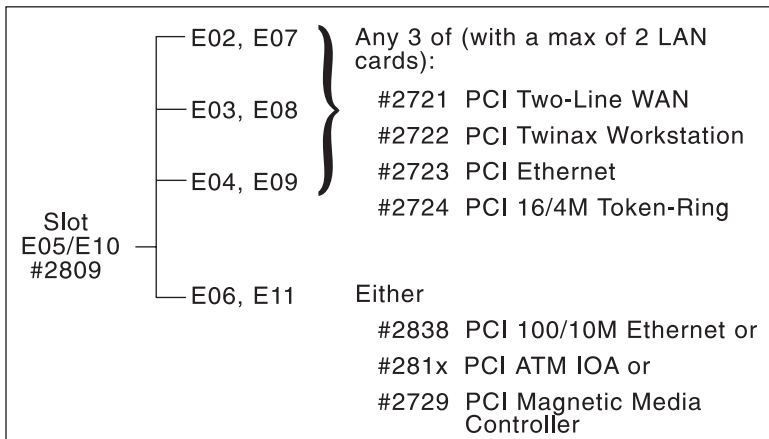
(only two may be LAN cards):

However, if #2838 PCI 100/10M Ethernet IOA is installed, then the first slot (E02, E07) becomes unavailable. Only the #2721 PCI Two-Line WAN IOA is allowed in the remaining slots.

If the #2729 PCI Magnetic Media Controller is installed in E06/E11, then only one LAN card is allowed, and not in positions E02/E07.

9406 Models 600, 620

This is subject to the restrictions mentioned above, as illustrated by:



The #2809 requires one PCI card position. There is a maximum of one in the base system unit and two in the #9329 PCI Integrated Expansion Unit, plus the Base LAN/WAN/Workstation IOP included as standard with #9329.

There may be performance implications in intermixing other communication features on a #2809 when a #2838 PCI 100/10M Ethernet is installed, and therefore this should be avoided.

The numbers of PCI cards used in the system is dependent on the numbers of controllers. Care must be taken in the selection of the controllers. Configuration rules should always be followed.

9406 Models 600, 620

Communications for 9406 Models 600 and 620

Model	Total Communications Lines
600	8*
620	95*†

Notes:

* This total does not include ECS or PC Console.

† An ISDN Adapter (#2605) is counted as two lines.

The following controller and adapters support communications on the Model 600 and 620. (The SPD features apply to the Model 620 only).

#2699	SPD Two-Line WAN IOA
#2721	PCI Two-Line WAN IOA
#9720	PCI Base WAN/Twinaxial IOA
#9721	PCI Base Two-Line WAN IOA
#2623	SPD Six-Line Communications Controller
#2620	SPD Cryptographic Processor
#2628	SPD Cryptographic Processor-Commercial
#2664	SPD Integrated Fax Adapter

SPD Two-Line WAN IOA #2699

The #2699 supports up to two multiple protocol communications ports where one or two (in any combination) of the following cable features are attached:

Cable Length	Attachment			
	EIA232 V.24	EIA449/ V.36	V.35	X.21
20ft/6m	#0330	#0335	#0338	#0341
50ft/15m	#0331	#0336	#0339	#0342
80ft/24m	N/A	N/A	#0340	N/A
150ft/45m	N/A	#0337	N/A	N/A

9406 Models 600, 620

#2629 LAN/WAN/Workstation IOP is a prerequisite for this feature. The #2699 takes up one of the three slots on the #2699. It is only available on the Model 620.

PCI Two-Line WAN IOA #2721

Attaches using a #2809 or base MFIOP. It supports up to two multiple protocol communication ports when one or two of the following cables are attached:

Cable Length	Attachment			
	EIA232 V.24	V.35	EIA449/ V.36	X.21
20ft/6m	#0348	#0353	#0356	#0359
50ft/15m	#0349	#0354	N/A	#0360
80ft/24m	#0365	#0355	N/A	N/A
150ft/45m	N/A	N/A	#0358	N/A

Base PCI WAN/Twinaxial IOA #9720

The #9720 feature is on the base MFIOP (mutually exclusive with #9721). It is included to support ECS on the communication adapter. One of the following cables must be selected:

- #0348 V.24/EIA232 20ft/6m PCI Cable
- #0349 V.24/EIA232 50ft/15m PCI Cable
- #0365 V.24/EIA232 80ft/24m PCI Cable

This adapter also supports twinax workstations. See the description under Workstation Controllers.

9406 Models 600, 620

Base PCI Two-Line WAN IOA #9721

This feature is on the base MFIOP (mutually exclusive with #9720). It supports ECS and a PC Console on its two communication ports. One of the following cables must be selected:

- #0348 V.24/EIA232 20ft/6m PCI Cable
- #0349 V.24/EIA232 50ft/15m PCI Cable
- #0365 V.24/EIA232 80ft/24m PCI Cable

One of the following console cables must also be selected:

- #0367 Operations Console PC Cable (requires V4R3)

To enable use of the Remote Control Panel function with Operations Console, order feature #0381 (Remote Control Panel Cable).

- #0362 Client Access Console Cable

Communication Restrictions

If using any of the following communications functions, restrictions may apply. In particular, this applies when using PCI Two-Line WAN IOA #2721, SPD Two Line WAN IOA #2699, or the IPX protocol (used over LAN adapters, ATM adapters, or over frame relay).

Frame relay protocol

IPX protocol

X.25 with more than 16 virtual circuits per line

SDLC protocol if used to connect to more than 64 remote sites

Communications line speeds greater than 64 Kbps for the synchronous PPP, X.25, SDLC, or frame relay protocols (Bisync is always limited to a maximum of 64 Kbps)

Non-async communications line speeds greater than 64 Kbps and up to 640 Kbps for X.25

Additional information is available in the file called AS4CNFG PACKAGE on Marketing Tools. This is a comprehensive document with details on communications restrictions which apply in a number of different circumstances. This document should be consulted for

9406 Models 600, 620

full details on what these restrictions are. Customers should be able to obtain this document from their local IBM sales office.

Six-Line Communications Controller #2623

The Six-Line Communications Controller (SLCC) is a SPD card that attaches to the Model 620. It provides attachment for a wide range of AS/400 communications adapters. While the #2623 continues to support all past functions, it is only orderable on the Model 620 where there is a requirement for the #2605 ISDN adapter. Two #2605s can fit onto a #2623. For full description of #2623 please refer to page 146

Other Communications Adapters Available

The following optional communications adapters can be added to the Model 620:

ISDN Adapter #2605

Requires one ISDN dedicated #2623. For full description see page 147.

Cryptographic Processor #2620

Requires one SPD slot. For full description see page 150.

Cryptographic Processor–Commercial #2628

Requires one SPD slot. For full description see page 151.

Integrated Fax Adapter #2664

Requires one SPD slot. For full description see page 151.

The following are only supported in the Model 620 as migration features:

- #2666 High-Speed Communications Adapter
- #26xx Adapters attached to #2623 Six-Line Communications Controller

9406 Models 600, 620

Local Area Networks and Asynchronous Transfer Mode for 9406 Models 600, 620

The following adapters and controllers support LAN and ATM attachment on the 9406 Model 600 and 620. (The SPD features are for the Model 620 only).

- #2723 PCI Ethernet IOA
- #2724 PCI 16/4 Mbps Token-Ring IOA
- #2811 PCI 25 Mbps UTP ATM IOA
- #2812 PCI 45 Mbps Coax T3/DS3 ATM IOA
- #2815 PCI 155 Mbps UTP OC3 ATM IOA
- #2816 PCI 155 Mbps MMF ATM IOA
- #2818 PCI 155 Mbps SMF OC3 ATM IOA
- #2819 PCI 34 Mbps Coax E3 ATM IOA
- #2838 PCI 100/10 Mbps Ethernet IOA
- #2851 PCI Integrated PC Server
- #2854 PCI Integrated PC Server
- #6149 PCI 16/4 Mbps Token-Ring IOA
- #6181 PCI Ethernet IOA
- #6616 SPD Integrated PC Server
- #6617 SPD Integrated PC Server

The ATM adapters are not available in all countries and are also subject to country homologation requirements which may also limit availability.

The following tables identify the maximum number of LAN and ATM ports allowed.

Model	System Maximum of LAN and ATM Ports
600	3
620	16

9406 Models 600, 620

	Maximum Number of ATM IOAs	
	Model 600	Model 620
#281x ATM IOA on #2810 (SPD)	0	16
#281x ATM IOA on #2809 (PCI)	1	3

PCI Ethernet IOA #2723

The #2723 provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC) plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode. It takes one PCI card slot. It has an RJ45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ45 twisted-pair cable must be ordered separately.

#2723 can also be driven by the #2851 or #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

PCI 16/4 Mbps Token-Ring IOA #2724

This feature provides a single attachment to either a 16 Mbps or a 4 Mbps Token-Ring. The feature consists of an IOA card, internal code which supplies IEEE 802.5 Media Access Control (MAC), and IEEE 802.2 Logical Link Control (LCC) functions. The IOA is capable of operating in half or full duplex mode.

The #2724 comes with an 8ft/2.44m Token-Ring cable, or a separately purchased twisted-pair cable to the RJ45 connection on the IOA may be attached. It occupies one PCI card slot.

#2724 can also be driven by the #2851 or #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

9406 Models 600, 620

PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Unshielded Twisted Pair (UTP) cabling. #2811 is typically used where 25 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2811 can also be used on the Model 620 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using coaxial cabling and the T3/DS3 interface. #2812 is typically used where 45 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2812 can also be used on the Model 620 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA #2815

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. It is intended for connection to both local area switches and to service provider equipment. #2815 is typically used where 155 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2815 can also be used on the Model 620 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. It is intended for connection to both local area switches and for direct connection to service provider equipment. #2816 is typically used where 155 Mbps speeds are required over

9406 Models 600, 620

distances of less than 2 kilometers. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2816 can also be used on the Model 620 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. #2818 is typically used where 155 Mbps speeds are required over distances from 16 to 40 kilometers. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2818 can also be used on the Model 620 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 34 Mbps Coaxial E3 ATM IOA #2819

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Coaxial cabling and the E3 interface. #2819 is typically used where 34 Mbps speeds are required over distances of less than 1000 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2819 can also be used on the Model 620 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 100/10 Mbps Ethernet IOA #2838

The 100 Base-X Ethernet PCI adapter feature allows the AS/400 to attach to standardized 100 Mbps high-speed Ethernet LANs and also allows attachment to existing 10 Mbps Ethernet LANs. The adapter comes with an RJ45 connector for attachment to UTP-5 media. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP, #2809, is a prerequisite. #2838 can also be used on the Model 620 systems when attached to a #2810 SPD LAN/WAN IOP (see page 153).

9406 Models 600, 620

	Maximum Number of #2838	
	Model 600	Model 620
#2838 on #2810 (SPD)	0	16
#2838 on #2809 (PCI)	1	3

#2838 can also be driven by the #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

PCI Integrated PC Server #2851

The Integrated PC Server (IPCS) contains an Intel 166 MHz Pentium processor, four main storage slots, and two LAN IOA slots. The IPCS provides high performance serving to LAN attached PCs. OS/2 Warp Server for AS/400, Novell NetWare, Lotus Domino, Flowmark, and Firewall for AS/400 are supported on the Integrated PC Server. This adapter requires two (reserved) PCI card positions. One is for the processor card, and one for a bridge card which acts as the interface to the system. The PCI IPCS comes with 32M of memory and supports up to three of the following additional memory features giving a maximum of 128M of main storage:

#2860 - 16M Memory for Integrated PC Server

#2861 - 32M Memory for Integrated PC Server

One or two of the following LAN IOA features must be in the Integrated PC Server:

#2723 - PCI Ethernet IOA

#2724 - PCI 16/4 Mbps Token-Ring IOA

Reserved slot positions exist in the Model 600/620 System Units and in the #9329 PCI Integrated Expansion Unit on the Model 620 for the #2851 Integrated PC Server.

9406 Models 600, 620

PCI Integrated PC Server #2854

The Integrated PC Server (IPCS) contains an Intel 200 MHz Pentium Pro processor, four main storage slots, and two LAN IOA slots. The IPCS provides high performance serving to LAN attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Microsoft Windows NT Server are supported on the Integrated PC Server. This adapter requires two (reserved) PCI card positions. One is for the processor card, and one for a bridge card which acts as the interface to the system. The IPCS also comes with a special cable which translates the connector on the back of the bridge card to industry standard keyboard, mouse, serial, and parallel connectors. Between one and four of the following memory features must be installed in the Integrated PC Server allowing between 32M and 512M of main storage:

- #2861 - 32M Memory for Integrated PC Server
- #2862 - 128M Memory for Integrated PC Server

One or two of the following LAN IOA features must be installed in the Integrated PC Server:

- #2723 - PCI Ethernet IOA
- #2724 - PCI 16/4 Mbps Token-Ring IOA
- #2838 - PCI 100/10 Mbps Ethernet IOA

Only one of the LAN IOAs can be a #2838 100/10 Mbps Ethernet IOA. If #2838 is run on the #2854 Integrated PC Server, then #0222 100/10 Mbps Ethernet on IPCS is required.

If Windows NT is running on the #2854 Integrated PC Server, then the following are also available for attachment to the IPCS:

- #0325 IPCS Extension Cable for Windows NT (required)
 - #1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries)
- A display must be connected to the IPCS to support NT

For keyboard/mouse and display support in countries outside the USA, the Internet at <http://www.as400.ibm.com> should be consulted.

9406 Models 600, 620

Reserved slot positions exist in the Model 600/620 System Units and in the #9329 PCI Integrated Expansion Unit on the Model 620 for the #2854 Integrated PC Server.

SPD LAN Features for Attachment to the Model 620

LAN/WAN IOP #2810

This IOP is used in SPD cages for attaching the #2838 PCI 100/10 Mbps Ethernet IOA or one of the #281x PCI ATM IOAs. It is a high workload IOP and has configuration limitations.

16/4 Mbps Token-Ring IOA #6149

Uses the #2629 LAN/WAN/Workstation IOP (the #2629 requires one SPD slot) or the #6616 IPCS (which requires two adjacent SPD slots). For full description see page 155.

Ethernet/IEEE 802.3 IOA #6181

Uses the #2629 LAN/WAN/Workstation IOP (one #2629 requires one SPD slot) or the #6616 IPCS (which requires two adjacent SPD slots). For full description see page 155.

Integrated PC Server #6616

Requires two contiguous SPD slots. For full description see page 156.

Integrated PC Server #6617

Requires three contiguous SPD slots. For full description see page 156.

The following are also supported on the Model 620 but only for migration:

- #2617 Ethernet Adapter/HP
- #2618 Fiber Distributed Data Interface Adapter
- #2619 Token-Ring Adapter/HP
- #2626 Token-Ring Adapter/A
- #2665 SDDI Adapter

9406 Models 600, 620

#2668 Wireless LAN Adapter

#6516/7/8/9 Integrated PC Server (formerly known as FSIOP)

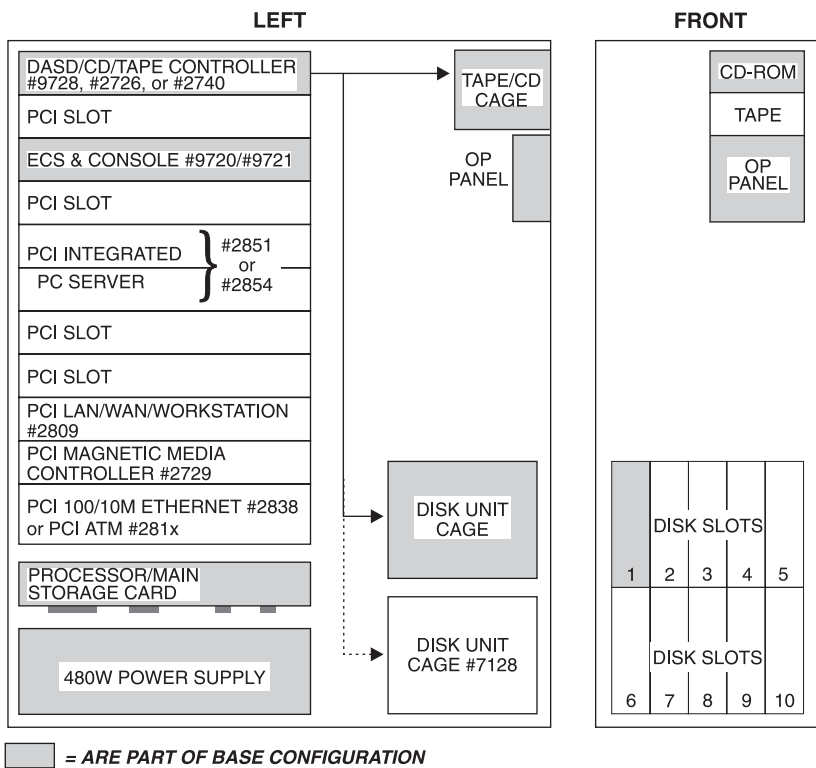
#6526/7/8/9 Integrated PC Server (formerly known as FSIOP)

9406 Models 600, 620

Power and Packaging for the 9406 Models 600, 620

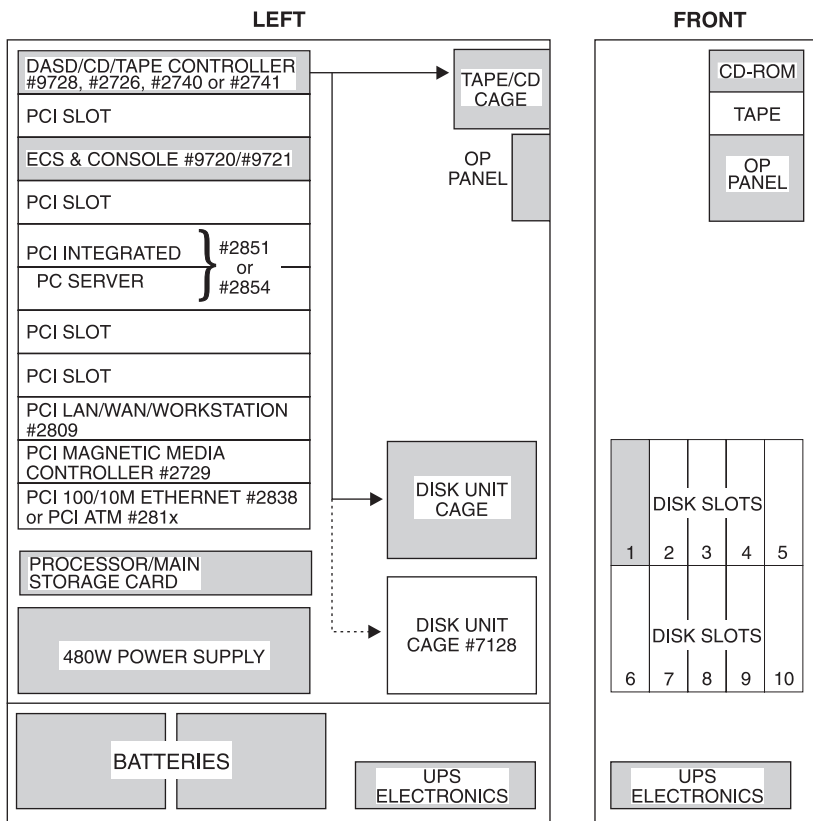
9406 Model 600 System Unit

The following schematic diagram shows the system layout for the 9406 Model 600:



9406 Models 600, 620

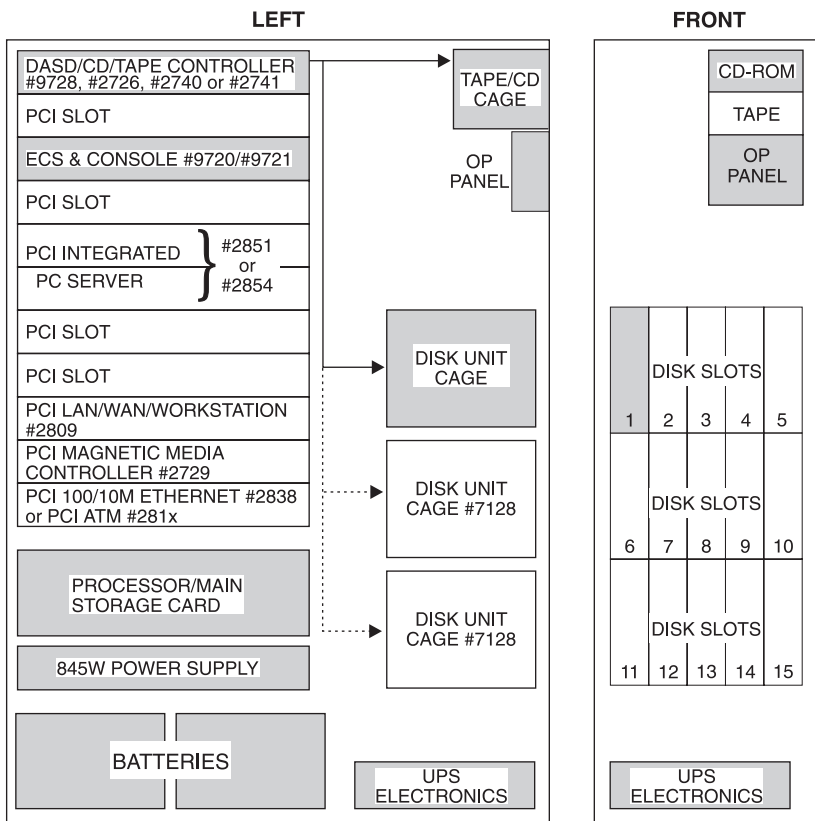
9406 Model 620 System Unit #2175, #2179, #2180



= ARE PART OF BASE CONFIGURATION

9406 Models 600, 620

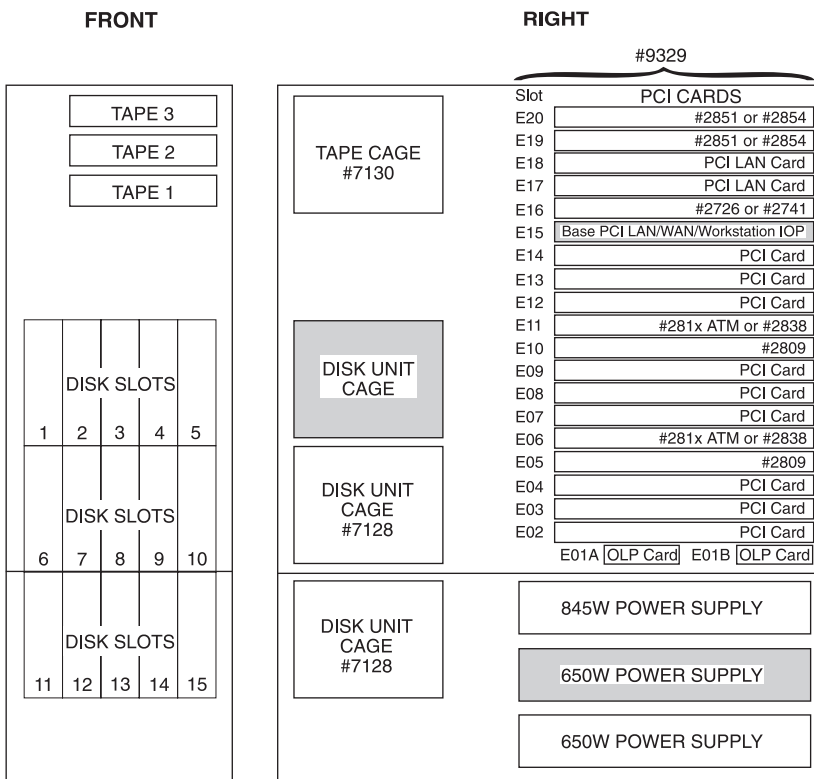
9406 Model 620 System Unit #2181, #2182



 = ARE PART OF BASE CONFIGURATION

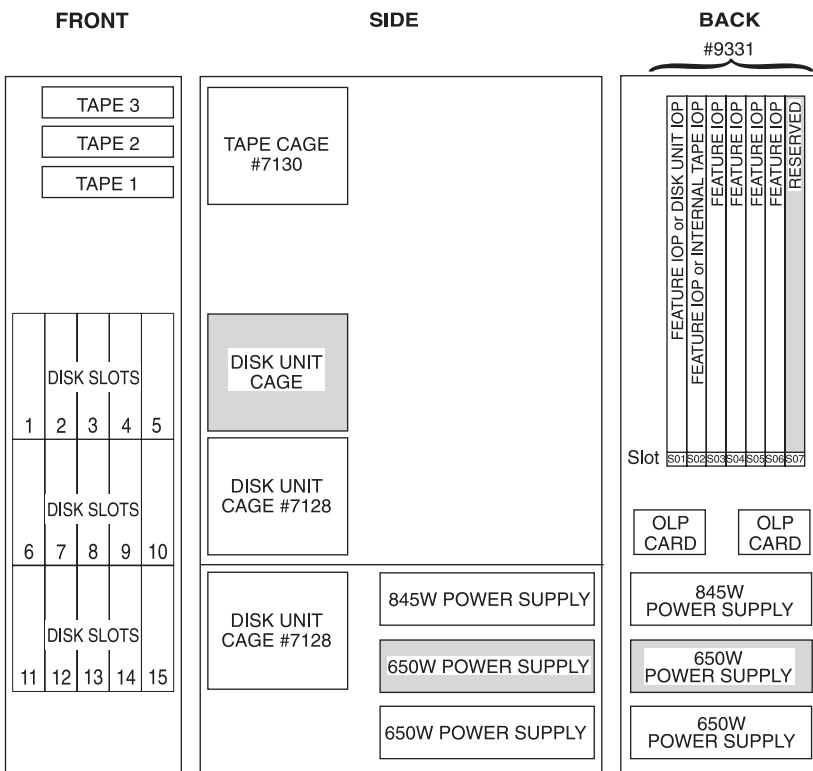
9406 Models 600, 620

PCI Expansion Unit #9364 Layout with #9329



9406 Models 600, 620

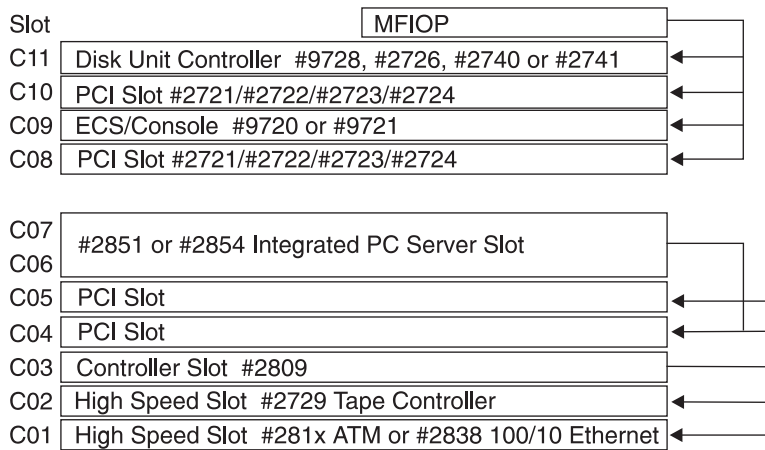
SPD Expansion Unit #9364 Layout with #9331



9406 Models 600, 620

Base System Unit

The base system supports five disk units, one tape unit, and one CD-ROM. It supports concurrent maintenance of the disk units. The base system unit includes a PCI controller (MFIOP) and further slots as illustrated below. Card slots C04 and C05 have special characteristics and are capable of being controlled from two slots. If an Integrated PC Server is in Slots C06 and C07, then it will drive C04 and C05. If, however, there is no IPCS in its reserved position, the controller in Slot C03 drives C04 and C05.



Refer to page 101 for rules governing the placement of cards in PCI Slots C08 and C10.

Internal Expansion Features

System Unit Expansion (SUE) #9364

For diagrams, see page 121 and page 122. This feature includes a standard DASD cage supporting up to five disks; and allows the addition of either an SPD or PCI Card Expansion Unit (#9329 or #9331 respectively); a #7130 Expansion Unit Tape/Cage to support up to three additional tape units; and up to two #7128 DASD Expansion Units to support up to a total of 15 disk units. It comes as

9406 Models 600, 620

standard with a Model 620 and must be ordered with either the PCI card unit (#9329) or the SPD card unit (#9331).

DASD Expansion Unit #7128

This feature allows the addition of five disk units to either the System Unit or the #9364 System Unit Expansion. It supports concurrent maintenance of these disks. Disks supported by the #7128 are described on page 128.

Maximum	Processor/Feature
1	Model 600 #2129, #2134, #2135, #2136,
1	Model 620 #2175, #2179, #2180
2	Model 620 #2181, #2182
2	#9364 System Unit Expansion

Expansion Unit Tape/Cage #7130

This feature allows the addition of three internal tape units to the #9364. A tape controller is required to support these tape devices.

New Tape Feature	Migrated Tape Feature	Media	PCI Controller	SPD Controller
--	#1349	1.2G ¼"	#2726 #9728 #2740 #2741	#6513
--	#1350	2.5G ¼"		
#6485	#1355	13G ¼"		
#6490	#1360	7G 8mm		
#6481	--	2.5G ¼"		
#6482	--	4G ¼"		

Only 2-byte tape devices (the #6485 ¼" cartridge) are supported in the third position.

9406 Models 600, 620

PCI Integrated Expansion Unit #9329

This feature allows the addition of up to 14 PCI adapter cards (using 11 PCI card slots and three high-speed PCI card slots) driven by three PCI controllers and one Integrated PC Server (IPCS). It also includes two Optical Link Processor card slots to support up to four external towers. A Base PCI LAN/WAN/Workstation IOP controller is included in Slot E15 with the #9329. This is the same as #2809 but no feature is required as it is standard on all #9329 PCI Integrated Expansion Units. The positioning of certain cards in particular slots can restrict further card placement (see details on #2809 PCI LAN/WAN/Twinaxial IOP on page 102). For a diagram of the layout of #9329 see page 121.

Expansion Unit for SPD Cards #9331

This feature allows the addition of up to six SPD cards and up to two Optical Link Processor cards (to support up to four external towers). An SPD controller card drives these cards and is included with the #9331. For a diagram of the layout of #9331 see page 122.

9406 Models 600, 620

External Towers

The following Expansion Towers and Units can attach to the #9329 or #9331.

Feature	Description	Prerequisites
#5043	Primary rack converted to secondary	--
#5044	System Unit Expansion Rack (migrated)	Optical Link Processor (OLP) Card #2686
#5052	Storage Expansion Unit	#5143 and #5072 or #5082 and one of #6502, #6512, #6530, #6532
#5058	Storage Expansion Unit	#5073 or #5083 and one of #6502, #6512, #6530, #6532, #6533
#5072	1063M System Unit Expansion Tower	One port on OLP card #2688 in System Unit Expansion #9364
#5073	1063M System Unit Expansion Tower	One port on OLP card #2688 in System Unit Expansion #9364
#5082	1063M Storage Expansion Tower	One of #6502, #6512, #6530, #6532, #6533 and One port on OLP card #2688 in System Unit Expansion #9364
#5083	1063M Storage Expansion Tower	See #5082

Full details on these is be found on pages 161 to 165, and 312 to 315.

9406 Models 600, 620

Expansion Tower I/O Features

Optical Link Processor (266 Mps) #2686

Used for attaching #5044. One #2686 is required per #5044. It requires an Optical Link Processor position in the #9329 or #9331.

Optical Link Processor (1063 Mps) #2688

Used for attaching #5072, #5082, #5073, and #5083 Expansion Towers. One can attach two towers. It requires an Optical Link Processor position on the #9329 or #9331.

Internal Disk Units for 9406 Models 600, 620

A base disk unit of 4.19G is standard on all new Models 600 and 620, and on upgrades from IMPI Models. This feature shows as #9707. This can be changed to an 8.58G file (#8813) or a 17.54G file (#8824) if required on new systems.

Disks of 17.54G, 8.58G, 4.19G, 1.96G, and 1.03G can be migrated from older AS/400 models. Support is not available for 320M, 400M, 640M, 800M, and 988Mb disks. Disks being converted from an earlier generation AS/400 may need a conversion kit.

All 600 and 620 Models support concurrent maintenance of internal disk features when the disks are part of a raid array or mirroring.

On the Model 620, integrated hardware disk compression is enabled using the #2741 and #6533 Disk Unit Controllers. All disk units, except 17.54GB (#1334, #6714, #6824, #8824), may be compressed. IBM intends to provide disk compression for 17.54G disk units in a future release of OS/400. A discussion of integrated hardware disk compression can be found on page 442.

9406 Models 600, 620

The disk support is summarized below:

Storage Expansion Units/Towers Internal Disk Support

Internal Disks		Storage Expansion Units and Towers					Mirror (4)	RAID (5)	
Feature	Description	Sys-tem Unit	#9364	#5052	#5058	#5082			#5083
#1312	1-Byte 1.03G Disk Unit Kit	X	X					5	B
#1313	1-Byte 1.96G Disk Unit Kit	X	X					4	A
#1322	2-Byte 1.03G Disk Unit Kit	X	X					5	B
#1323	2-Byte 1.96G Disk Unit Kit	X	X					4	A
#1325	2-Byte 1.03G Disk Unit Kit	X	X					5	B
#1326	2-Byte 1.96G Disk Unit Kit	X	X					4	A
#1327	2-Byte 4.19G Disk Unit Kit	X	X					6	C
#1333	2-Byte 8.53G Disk Unit Kit	X	X					7	D
#1334	2-Byte 17.54G Disk Unit Kit	X	X					8	E
#1336	2-Byte 1.96G Disk Unit Kit	X	X					4	A
#1337	2-Byte 4.19G Disk Unit Kit	X	X					6	C
#1602	Single Disk Unit Kit (1.03G)			X(1)	X(1)			5	B
#1603	Single Disk Unit Kit (1.96G)			X(1)	X(1)			4	A
#6605	1.03G Disk Unit/A			X	X	X	X	5	B
#6606	1.96G Disk Unit/A			X	X	X	X	4	A
#6607	4.19G Disk Unit/A			X	X	X	X	6	C
#6650	Additional Disk Unit (1.96G)			X	X	X	X	4	A
#6652	Additional Disk Unit (1.03G)			X	X	X	X	5	B
#6713	8.58G Disk Unit			N(3)	N(2)	N(3)	N(2)	7	D
#6714	17.54G Disk Unit			N(3)	N(2)	N(3)	N(2)	8	E
#6806	1.96G Disk Unit	N	N					4	A
#6807	4.19G Disk Unit	N	N					6	C
#6813	8.58G Disk Unit	N	N					7	D
#6824	17.54G Disk Unit	N	N					8	E
#6906	1.96G Disk Unit			N(3)	N(2)	N(3)	N(2)	4	A
#6907	4.19G Disk Unit			N(3)	N(2)	N(3)	N(2)	6	C
#8813	Opt Base 8.58G Disk Unit	N	N					7	D
#8824	Opt Base 17.54G Disk Unit	N	N					8	E
#9707	Base 4.19G Disk Unit	N	N					6	C

Notes:

- (1) Single-byte disks cannot be placed into Slots K8 through K16.
 - (2) For best performance, use with an Ultra-SCSI disk unit controller (#6532 or #6533).
 - (3) Not Ultra-SCSI when attached to this storage expansion unit.
 - (4) Like numbered disks can mirror each other.
 - (5) Like lettered disks can be part of the same RAID array.
- N Available as new disk.

Disk Feature Conversion/Kits for Upgrades

The base system unit of the Models 600 and 620 supports up to five disk units. Disk Unit Cage #7128 can be added and supports an additional five disk units. One #7128 can be added to the Model 600 and 620 with Processor #2175, #2179, or #2180. Two #7128s can be added to the Model 620 with Processor #2181 or #2182. On the Model 620, the Expansion Unit #9364 has space for five disk units and it can add up to two #7128 Disk Unit Cages.

If there are more than five disks located in the System Unit, or if disks are located in the Expansion Unit #9364 with the #9329 Expansion Unit for PCI Cards option, then in either case PCI Raid Disk Unit Controller #2726, #2740, or #2741 is required to support these disks. A maximum of one #2726, #2740, or #2741 is supported in the System Unit and it replaces Base PCI Disk Unit Controller #9728 which only supports a maximum of five disk units and does not support RAID. #2741 is not supported on the Model 600. A maximum of one #2726, #2740, or #2741 is supported in the #9364. For more details on #2726, #2740, or #2741 see page 368.

If there are disks located in #9364 with #9331 Expansion Unit for SPD Cards, then one #6532 or #6533 RAID Disk Unit Controller is required to support these disks. For more details on #6532 or #6533 see page 362.

Further internal disks can be located in Storage Expansion Tower #5083 or Storage Expansion Unit #5058. For more information on these see page 165.

The #2726, #2740, or #2741; and #6532 or #6533 support RAID-5 for disks located in the System Unit or System Unit Expansion. For details on RAID-5 see page 170.

9406 Models 600, 620

Internal Tape, CD-ROM, and Diskette Units for Models 600, 620

The following internal tape units are supported in the Model 600 and 620 System Unit and #9364 System Unit Expansion:

Feature	Size	One/Two Byte	SCSI Type	Migrated/ New
#1349	1.2G ¼"	1	Fast	Migrated
#1350	2.5G ¼"	1	Fast	Migrated
#1355	13G ¼"	2	Fast	Migrated
#1360	7G 8mm	1	Fast	Migrated
#6481	2.5G ¼"	1	Fast	New
#6482	4G ¼"	1	Fast	New
#6485	13G ¼"	2	Fast	New

The following internal tape units are supported in the #5072 and #5073 System Expansion Towers attached to the Model 620 only.

Feature	Size	One/Two Byte	SCSI Type	Migrated/ New
#1379	1.2G ¼"	1	Fast	Migrated
#1380	2.5G ¼"	1	Fast	Migrated
#6380	2.5G ¼"	1	Fast	New
#6381	2.5G ¼"	1	Fast	New
#6382	4G ¼"	1	Fast	New
#6385	13G ¼"	2	Fast	New

The 9406 Model 600 and 620 System Unit can accommodate one internal tape unit and the base CD-ROM drive. The 9406 Model 620 #9364 System Unit Expansion can accommodate up to three internal tape units. The #9728 Base PCI Disk Unit Controller or #2726, #2740, or #2741 PCI RAID Disk Unit Controller supports the CD-ROM drive and the first tape unit. For the Model 620, tape units situated in the #9364 System Unit Expansion requires a tape

9406 Models 600, 620

controller. For #9364 with #9329 PCI Integrated Expansion this is the #2726 or #2741 PCI RAID Disk Controller. For the #9364 with #9331 Expansion Unit for SPD cards this is the #6513 Internal Tape Controller.

On the Model 620 the System Unit Expansion Tower (#5073) can accommodate up to four internal tape units. They are supported by either a Storage Device Controller (#2624) which supports a maximum of three internal tape units or by an Internal Tape Device Controller (#6513) which supports a maximum of four internal tape units. #6513 is the default.

Concurrent maintenance of tape and CD-ROM is supported in the 620 System Unit, #9364 System Expansion Unit, and Expansion Towers. It is not supported on the Model 600.

The following are the current internal tapes and CD-ROM drives that are supported. The other tapes shown in the table above are supported for migration when upgrading to the 9406 Model 600 or 620.

Base CD-ROM Drive

Code for AS/400e series models is distributed on CD-ROM media. The CD-ROM drive is standard with 9406 Models 600 and 620. It is therefore not identified with a separate feature. It can be used for alternate IPL but not as a save/restore device for the system.

9406 Models 600, 620

2.5G ¼ " Cartridge Tape Unit #6381/#6481

See page 173 for full description.

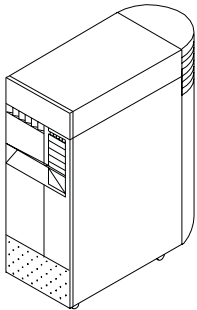
4G ¼ " Cartridge Tape Unit #6382/#6482

See page 174 for full description.

13G ¼ " Cartridge Tape Unit #6385/#6485

See page 174 for full description.

AS/400e systems Models 640, 650



9406 Model 640 System Unit

The 9406 Model 640 System Unit has a base configuration of:

Model 640 Processor (one must be specified):

- #2237 319.0 CPW 1-Way Processor with 512M memory
- #2238 583.3 CPW 2-Way Processor with 512M memory
- #2239 998.6 CPW 4-Way Processor with 512M memory

Ten additional main storage slots

One 4.19G Disk Unit

Eleven additional internal disk slots

One CD-ROM unit

One base communications adapter for Electronic Customer Support. (A separate chargeable communications cable for ECS must also be ordered.)

Three feature card slots

Workstation controller

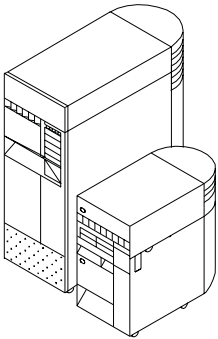
Multi-Function I/O Processor (MFIOP) which supports:

- 20 integrated disk units with RAID support
- One integrated tape unit
- One integrated CD-ROM unit
- Three I/O adapters

Battery backup

Bus adapter

9406 Models 640, 650



9406 Model 650 System Unit

The 9406 Model 650 System Unit has a base configuration of:

Model 650 Processor (one must be specified):

- #2240 1794.0 CPW 8-Way Processor with 1024M memory
- #2243 2340.0 CPW 12-Way Processor with 1024M memory
- #2188 3660 CPW 8-Way Processor with 1024MB memory
- #2189 4550 CPW 12-Way Processor with 1024MB memory

16 additional main storage slots

One 4.19G Disk Unit

Three additional internal disk slots

One CD-ROM unit

One base communications adapter for Electronic Customer Support. (A separate chargeable communications cable for ECS must also be ordered.)

Three feature card slots

Workstation controller

9406 Models 640, 650

Multi-Function I/O Processor (MFIOP) which supports:

- 20 integrated disk units with RAID support
- One integrated tape unit
- One integrated CD-ROM unit
- Three I/O adapters

Battery backup

Bus adapter

Card Technology

With the August 1997 announcement of the AS/400e series, an industry standard card technology known as Peripheral Component Interconnect (PCI) was introduced for the first time in the AS/400 range outside the AS/400 Model 150. The 9406 Models 640 and 650, however, do not support this PCI technology. They continue to support the System Product Division (SPD) technology cards that have been used in the AS/400 for a number of years. Throughout the rest of this chapter therefore, there is little reference to PCI or SPD as all I/O processor cards used in the Models 640 and 650 are SPD. Some of these support PCI technology cards as I/O Adapter cards. For example, the Integrated PC Server #6617 supports the #2723, #2724, or #2838 PCI LAN IOAs. However, in all cases on these models, the base card that plugs into the bus is SPD technology.

9406 Models 640, 650

Main Storage for 9406 Models 640, 650

Model 640 Main Storage

The 9406 Model 640 has two base and ten additional memory slots. Main storage cards require one slot each. Base and additional memory cards must be added in pairs of equal capacity.

The following lists the main storage for the Model 640:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2237/#2238/#2239 (512 - 16384)	#9179 Base 256M #8180 Optional Base 512M #8192 Optional Base 1024M #8193 Optional Base 2048M	#3189 128M #3179 256M #3180 512M #3192 1024M #3193 2048M

Model 650 Main Storage

The 9406 Model 650 has four base and sixteen additional memory slots. Main storage cards require one slot each. Base and additional memory cards must be added in units of fours with equal capacity.

The following lists the main storage options for the Model 650:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2240/#2243 (1024-32768) #2188/#2189 (1024-40960)	#9179 Base 256M #8180 Optional Base 512M #8192 Optional Base 1024M #8193 Optional Base 2048M	#3189 128M #3179 256M #3180 512M #3192 1024M #3193 2048M

16 Mb technology memory cards that were available with Version 4 Release 1 on these models were #9190 Base 256M (replaced by #9179 for Version 4 Release 2 and later); #8191 Optional Base 512M (replaced by #8180); #3190 256M (replaced by #3179); and #3191 512M (replaced by #3180).

9406 Models 640, 650

Memory cards of equal capacity but with different feature numbers cannot be mixed in a pair or groups of four on the Model 640 and 650. For example, #3179 and #3190 cannot be combined in a pair or group of four.

Continuously Powered Main Storage (CPM)

Models 640 and 650 include an internal battery backup capable of maintaining the CPM on 16GB of main storage for at least 24 hours. #5150 Battery Back-up (External) is required when the main storage size exceeds 16GB on the Model 650. #5150 can also be purchased to increase the CPM time over that of the internal battery backup (to at least 48 hours).

Multi-Function I/O Processor #9754 for 9406 Models 640, 650

A #9754 Multi-Function I/O Processor (MFIO) comes standard on all 9406 Models 640 and 650. The MFIO can control 20 disk units, one tape unit, and one CD-ROM unit. It also has three IOA slots for controlling LANs, twinaxial workstations, and communications controllers. It occupies two consecutive I/O slots.

The MFIO contains an Ultra SCSI Controller with a 4M cache that provides RAID-5 protection for up to 20 disks. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of four arrays are allowed on the MFIO with a maximum of ten drives allowed per array. Parity information can be spread across four or eight drives.

The #9754 MFIO is disk compression enabled beginning with Version 4 Release 3. Version 4 Release 2 and Release 3, it replaces for new machines and upgrade orders the #9751 MFIO that was previously available on these models but which does not support compression. With Version 4 Release 3, disk compression is available for all AS/400 internal disk units except the 17.54GB capacity drives. The #9751 and #9754 are functionally equivalent apart from the compression capability. Thus, all references to #9754 on the following pages also cover the #9751 in terms of device support.

On the Model 640, the MFIO supports disks 1 through 12 without prerequisites. For disks 13 through 20, the #5055 Storage Expansion Unit is required.

On the Model 650, the MFIO supports disks 1 through 4 without prerequisites. For disks 5 through 20, the #5057 Storage Expansion Unit is required.

The three IOA slots in the MFIO support the following adapters:

IOA slot A is reserved for attaching:

- One Communications IOA #2699 or
- One LAN IOA #6149 or #6181

9406 Models 640, 650

IOA slot B is reserved for attaching the Base Multi-Protocol Communications Adapter #9699, with ECS line

IOA slot C is reserved for attaching:

- One Communications IOA #2699 or
- One Twinaxial IOA #6180 or #9280

For more information on these IOAs, see the Communications section on page 146, the Local Area Networks section on page 152, or the Workstation Controllers section on page 142.

LAN/WAN/Workstation IOP #2629

The LAN/WAN/Workstation IOP supports up to three of the following IOAs:

- #2699 Two-Line WAN IOA
- #6149 16/4 Mbps Token-Ring IOA
- #6180 Twinaxial Workstation IOA
- #6181 Ethernet/IEEE 802.3 IOA
- #9280 Base Twinaxial Workstation IOA

One #2629 supports any combination of the IOAs listed above with the exception that all three IOAs cannot be LAN IOAs (#6149 or #6181).

One feature I/O card slot is required to support #2629. No more than seven #2629s can be placed in a #5072 System Unit Expansion Tower, nor is #2629 allowed in slot 14 of a #5072.

For more information on these IOAs, see the Communications section on page 146, the Local Area Networks section on page 152, or the Workstation Controllers section on page 142.

9406 Models 640, 650

Workstation Controllers for 9406 Models 640, 650

The 9406 Models 640 and 650 support 5250-type twinaxial and ASCII workstations. Both models support a maximum of 175 workstation controllers in total.

When placing an initial system order, a system console **must** be specified. One workstation controller/adaptor is required to drive the system console. One of the following specify codes must be specified to identify which type of controller is supporting the system console. These specify codes do not mean that the relevant system console device is included with the order. The system console still needs to be separately ordered.

#5540 System Console attached to Twinaxial Workstation Controller/Adapter

Specifies that the Twinaxial Workstation System Console attaches to a #6180 or #9280 Twinaxial Workstation IOA.

#5543 Client Access/400 Console

Specifies a PC System Console Feature. #0344 Cable for Attaching Client Access Console (6m) must also be ordered. This attaches to port 2 of the #9699 Base Multi-Protocol Communications Adapter. (For further information on #9699, see page 149.)

Mutually exclusive with #0328.

#5544 System Console on Operations Console

Specifies that a PC running Operations Console will be used as the system console. This feature also provides the capability to use the Remote Control Panel function within Operations Console. Appropriate cables (listed below) must be ordered for Operations Console.

- #0328 Operations Console Cable--required. Attaches to Port 2 of the #9699 Base Multiprotocol Communications Adapter. (For further information on #9699, see page 149.) Mutually exclusive with #0344.
- #0380 Remote Control Panel Cable--optional. If used, it attaches directly to the control panel of the system.

9406 Models 640, 650

The following additional workstation controllers can be attached to the Model 640 and 650:

- #6141/#9141 ASCII Workstation Controller
- #6142 ASCII 12-Port Attachment
- #6180/#9280 Twinaxial Workstation IOA

9406 Models 640, 650

ASCII Workstation Controller #6141/#9141

The ASCII Workstation Controller, #6141/#9141, is a 6-port workstation controller and workstation adapter with a 10 foot attachment cable for attaching up to 6 ASCII displays and printers. #9141 is specified on new orders as the base Workstation Controller. One I/O feature card slot is required to support #6141/#9141.

ASCII 12-Port Attachment #6142

#6142 provides an additional 12 ports to the 6 provided by #6141 to allow attachment of up to 18 ASCII displays and printers in total. One #6142 may attach per #6141/#9141.

Twinaxial Workstation IOA #6180/#9280

#6180/#9280 is an 8-port twinaxial workstation with a 20 foot attachment cable for attaching up to 40 5250-type displays and printers. One #6180 or #9280 is allowed in slot C of the MFIOA unless the system console is ASCII. All other twinaxial workstation IOAs must be placed into a #2629 LAN/WAN/Workstation IOP. #9280 is specified on a new order when a twinaxial workstation is required and an ASCII workstation controller is not specified. One IOA slot is required to support #6180/#9280.

The following features are only supported on the Model 640 and 650 as migration features:

- #6050/#9050 Twinaxial Workstation Controller
- #6140/#9140 Twinaxial Workstation Controller

9406 Models 640, 650

The following shows the feature requirements at the initial order stage.

Workstations Required		System Console Specify	Minimum Shipped Feature Codes			Other Feature Codes Based on Workstations Required
Twin-axial	A S C I I		MF IOP	No Charge WSC	Re-quired WSC	
Yes	No	5540	9751/ 9754	9280		6180
Yes	Yes	5540	9751/ 9754	9141	6180	6141, 6180
No	No	5543	9751/ 9754	(1)		
Yes or No	Yes	5543	9751/ 9754	9141	(1)	6141, 6180
Yes	No	5543	9751/ 9754	9280	(1)	6180
No	No	5544	9751/ 9754	(3)		
Yes or No	Yes	5544	9751/ 9754	9141	(3)	6141, 6180
Yes	No	5544	9751/ 9754	9280	(3)	6180

Notes:

- (1) When Client Access Console is selected, #0344 cable for Attaching Client Access Console (6m) must also be ordered.
- (2) #6180 is not supported on the #9751/#9754 MFIOP.
- (3) When Operations Console is selected, #0328 Operations Console Cable (6m) must also be ordered.

9406 Models 640, 650

Communications for 9406 Models 640, 650

Model	Total Communications Lines
640	200*
650	300*

Notes:

* An ISDN adapter (#2605) is counted as two lines.

The following controllers and adapters support communications on the Model 640 and 650:

- #2623 Six-Line Communications Controller
- #2620 Cryptographic Processor
- #2628 Cryptographic Processor–Commercial
- #2664 Integrated FAX Adapter
- #2699 Two-Line WAN IOA

Six-Line Communications Controller #2623

The Six-Line Communications Controller provides the basic control and common circuits for up to six communications lines. The following communication adapters attach to the #2623:

#2605	ISDN Basic Rate Interface Adapter
#2609	Two-Line EIA232/V.24 Adapter
#2610	Two-Line X.21 Adapter
#2612	One-Line EIA232/V.24 Adapter
#2613	One-Line V.35 Adapter
#2614	One-Line X.21 Adapter

One #2623 supports one of the following combinations of adapters:

- Two ISDN adapters
- Up to three EIA232/V.24, X.21, and V.35 adapters in any combination

9406 Models 640, 650

One I/O feature card slot is required to support #2623. All AS/400 D, E, and F Model Six-Line Communications Controller adapters are also supported—these are #2654, #2655, #2656, #2657, #2658, #2659, #6153, and #6173. On new orders, #2623 is included only if ISDN adapter #2605 is required. Otherwise, #2629 LAN/WAN/Workstation IOP with #2699 WAN IOA is ordered. However, the following adapters are still supported on the #2623.

Communications Adapters Attaching to #2623

(a) ISDN Basic Rate Interface Adapter #2605

#2605 consists of an adapter and one 50' cable used to attach one communications line to an ISDN network. The ISDN Basic Rate Interface supported by #2605 contains two 64,000 bps 'B' channels and one 16,000 bps 'D' channel. The ISDN Data Link Control (IDLC) protocol is supported. This adapter does not attach to a #2623 that also has EIA232/V.24, X.21, or V.35 adapters attached.

(b) Two-Line EIA232/V.24 Adapter #2609

#2609 consists of an adapter used to attach two communications lines using ASYNC, BSC, SDLC, or X.25 protocols. Line speeds up to 19,200 bps are supported. Two of the following cable types must also be specified:

- #9023 EIA232/V.24 enhanced cable (20' /6m)
- #9835 EIA232/V.24 enhanced cable (50' /15m)
- #9022 EIA232/V.24 cable (20' /6m)
- #9836 EIA232/V.24 cable (50' /15m)

#9023 and #9835 are **not** recommended for use with modem equipment that has a "signal quality detect" feature.

9406 Models 640, 650

(c) Two-Line X.21 Adapter #2610

#2610 consists of an adapter used to attach two communications lines to an X.21 or X.25 network. Line speeds up to 64,000 bps are supported using SDLC and X.25 protocols, and the X.21 Short Hold Mode Function. Two of the following cables must also be specified:

#9021 X.21 cable (20' /6m)

#9839 X.21 cable (50' /15m)

(d) One-Line EIA232/V.24 Adapter #2612

#2612 is a one-line equivalent of the #2609 above. Only **one** cable must be specified.

(e) One-Line V.35 Adapter #2613

#2613 consists of an adapter used to support one V.35 communications line. One of the following cables must also be specified:

#9020 For V.35 cable (20' /6m)

#9838 For V.35 cable (50' /15m)

Using appropriate T1/E1/J1 Data Communication Equipment (DCE) for high bandwidth applications the #2623 supports attachment of up to three SDLC lines using the V.35 One-Line adapter #2613 in the following combinations:

One line at up to 640 Kbps (one #2623 and one #2613)

Two lines each at up to 512 Kbps (one #2623 and two #2613)

Three lines each at up to 384 Kbps (one #2623 and three #2613)

9406 Models 640, 650

(f) One-Line X.21 Adapter #2614

#2614 is a one-line equivalent of the #2610 above. Only **one** cable must be specified.

There are configuration restrictions that can apply to combinations of protocols, controllers, capacity, and performance dependant on individual customer environments.

Two-Line WAN IOA #2699/#9699

The Two-Line WAN IOA supports up to two multiple protocol communications ports when one or two (in any combination) of the following cable features are attached:

Cable Length	Attachment			
	EIA232 V.24	EIA449/ V.36	V.35	X.21
20ft/6m	#0330	#0335	#0338	#0341
50ft/15m	#0331	#0336	#0339	#0342
80ft/24m	N/A	N/A	#0340	N/A
150ft/45m	N/A	#0337	N/A	N/A

#0328 20ft/6m Operations Console Cable is also supported but on #9699 only. Version 4 Release 3 required. If #0328 is selected, then #0380 Remote Control Panel Cable can also be installed.

#0344 20ft/6m Client Access Console Cable is also supported but on #9699 only.

The #2699 Two-Line WAN IOA requires an unused slot on a #2629 LAN/WAN/Workstation IOP (see page 141 for more information) or a #9751/#9754 MFIOP (see page 139 for more information) as a prerequisite. #9699 is the Base Multi-Protocol Communications Adapter and occupies Slot B of the #9751/#9754 MFIOP. On the #9699, at least one of the cables ordered must be #0329, #0330, or #0331 to support Electronic Customer Support (ECS).

9406 Models 640, 650

Communications Restrictions

If using any of the following communications functions, restrictions may apply. In particular, this applies when using SPD Two Line WAN IOA #2699, or the IPX protocol. (IPX is used over LAN adapters, ATM, or over frame relay).

- Frame relay protocol

- IPX protocol

- X.25 with more than 16 virtual circuits per line

- SDLC protocol if used to connect to more than 64 remote sites

- Communications line speeds greater than 64 Kbps for the synchronous PPP, X.25, SDLC, or frame relay protocols (Bisync is always limited to a maximum of 64 Kbps)

- Non-async communications line speeds greater than 64 Kbps and up to 640 Kbps for X.25

Additional information is available in the file called AS4CNFG PACKAGE on Marketing Tools. This is a comprehensive document with details on communications restrictions which apply in a number of different circumstances. This document should be consulted for full details on what these restrictions are. Customers should be able to obtain this document from their local IBM sales office.

Cryptographic Processor #2620

The Cryptographic Processor #2620 performs cryptographic functions based on a hardware implementation of the ANSI Data Encryption Standard (DES), and the Rivest, Shamir, and Adleman (RSA) Public Key Algorithm. Functions provided include encryption and decryption of data, authentication and verification of messages and data, creation and management of financial personal identification numbers (PINs) and management of cryptographic keys. Distribution of #2620 is restricted for security reasons by U.S. Government export regulations when shipped to countries outside the USA or Canada.

One I/O feature card slot is required to support this adapter.

9406 Models 640, 650

Cryptographic Processor-Commercial #2628

This feature provides the same functions as #2620 with the exception of DES (Data Encryption Standard) based data scrambling. Instead, #2628 uses the Commercial Data Masking Facility (CDMF) for data scrambling. #2628 is useful for providing assurance of data authentication and integrity. It is not subject to the export regulations of #2620.

One I/O feature card slot is required to support this adapter.

Integrated Fax Adapter #2664

This feature provides the AS/400 with two ports capable of transmission and receipt of facsimile data to or from a Group 3 capable fax machine, another AS/400 with an Integrated Fax Adapter, or PCs with appropriately programmed fax adapters. #2664 consists of a card, a wrap cable (one per machine), two country-unique attachment couplers, telephone cables and Licensed Internal Code.

#2664 can simultaneously support two send and two receive or one send and one receive operation. Any output that can be printed on an AS/400 Intelligent Printer Datastream (IPDS) printer can be faxed using the #2664.

#2664 supports facsimile protocols defined in CCITT Blue Book Volume VII, Facsimile VII.3 Recommendations T.4 and T.30. This adapter requires one I/O feature card slot and the Facsimile Support/400 licensed program.

The following is also only supported on the Model 640 and 650 as a migration feature:

#2666 High-Speed Communications Adapter

9406 Models 640, 650

Local Area Networks and Asynchronous Transfer Mode for 9406 Models 640, 650

The following adapters and controllers support LAN and ATM attachment on the 9406 Model 640 and 650:

- #2723 Ethernet/IEEE 802.3 IOA
- #2724 16/4 Mbps Token Ring IOA
- #2811 25 Mbps UTP ATM IOA
- #2812 45 Mbps Coax T3/DS3 ATM IOA
- #2815 155 Mbps UTP OC3 ATM IOA
- #2816 155 Mbps MMF ATM IOA
- #2818 155 Mbps SMF OC3 ATM IOA
- #2819 34 Mbps Coax E3 ATM IOA
- #2838 100/10 Mbps Ethernet IOA
- #6149 16/4 Mbps Token Ring IOA
- #6181 Ethernet/IEEE 802.3 IOA
- #6616 Integrated PC Server
- #6617 Integrated PC Server

The ATM adapters listed above are not available in all countries and are also subject to country homologation requirements which may also limit availability.

The maximum number of LAN and ATM features supported are as follows:

	Model	
	640	650
LAN or ATM Ports	32	72
Integrated PC Servers	16	16

PCI Ethernet IOA #2723

Provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC) plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of

9406 Models 640, 650

operating in half or full duplex mode. It has an RJ45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ45 twisted-pair cable must be ordered separately.

#2723 provides one LAN attachment for #6617 Integrated PC Server. #6617 is a prerequisite for #2723 and it uses one LAN IOA slot in the #6617.

PCI 16/4 Mbps Token-Ring IOA #2724

This feature provides a single attachment to either 16 Mbps or a 4 Mbps Token-Ring. The feature consists of an IOA card, internal code which supplies IEEE 802.5 Media Access Control (MAC), and IEEE 802.2 Logical Link Control (LCC) functions. The IOA is capable of operating in half or full duplex mode.

The #2724 comes with an 8ft/2.44m Token-Ring cable, or a separately purchased twisted-pair cable to the RJ45 connection on the IOA may be attached.

#2724 provides one LAN attachment for #6617 Integrated PC Server. #6617 is a prerequisite for #2724 and it uses one LAN IOA slot in the #6617.

LAN/WAN IOP #2810

This feature provides the hardware base for one PCI ATM IOA #2811/#2812/#2815/#2816/#2818/#2819 or the PCI 100/10 Mbps Ethernet IOA #2838. It is a prerequisite for these features and takes up one I/O feature card slot.

PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Unshielded Twisted Pair (UTP) cabling. #2811 is typically used where 25 Mbps speeds are required over distances of less than 100 meters. #2810 LAN/WAN IOP is a prerequisite for #2811.

9406 Models 640, 650

PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using coaxial cabling and the T3/DS3 interface. #2812 is typically used where 45 Mbps speeds are required over distances of less than 100 meters. #2810 LAN/WAN IOP is a prerequisite for #2812.

PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA #2815

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. It is intended for connection to both local area switches and to service provider equipment. #2815 is typically used where 155 Mbps speeds are required over distances of less than 100 meters. #2810 LAN/WAN IOP is a prerequisite for #2815.

PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. It is intended for connection to both local area switches and for direct connection to service provider equipment. #2816 is typically used where 155 Mbps speeds are required over distances of less than 2 kilometers. #2810 LAN/WAN IOP is a prerequisite for #2816.

PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. #2818 is typically used where 155 Mbps speeds are required over distances from 16 to 40 kilometers. #2810 LAN/WAN IOP is a prerequisite for #2818.

PCI 34 Mbps Coaxial E3 ATM IOA #2819

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Coaxial cabling and the E3 interface. #2819 is typically used where 34 Mbps speeds are required over distances of less than 1000 meters. #2810 LAN/WAN IOP is a prerequisite for #2819.

PCI 100/10 Mbps Ethernet IOA #2838

This feature allows the AS/400 to attach to a standardized 100 Mbps high-speed Ethernet LAN and also allow attachment to existing 10 Mbps Ethernet LANs. The adapter comes with an RJ45 connector for attachment to UTP-5 media. #2810 LAN/WAN IOP or #6617 Integrated PC Server is a prerequisite for #2838.

16/4 Mbps Token-Ring IOA #6149

This feature provides a single attachment to either a 16 Mbps or a 4 Mbps IBM Token-Ring Network. The feature consists of an adapter card, internal code which supplies IEEE 802.5 Media Access Control (MAC) and IEEE 802.2 Logical Link Control (LLC) functions, and an 8 ft/2.44m Token-Ring cable. The 16/4 Mbps Token-Ring IOA is capable of operating in half or full duplex mode.

LAN/WAN/Workstation IOP #2629, Integrated PC Server #6616, or MFIOIP #9751/#9754 is a prerequisite for #6149. It uses no I/O card slots and one IOA slot.

Ethernet/IEEE 802.3 IOA #6181

This feature provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. The feature consists of an adapter card and internal code which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC) plus IEEE 802.2 Logical Link Control (LLC) functions.

This IOA has an RJ45 connector and a 15 pin D-shell connector for attachment of customer supplied cabling. An AUI Ethernet cable or RJ45 twisted pair cable must be ordered separately. The

9406 Models 640, 650

Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode at a speed of 10 Mbps.

LAN/WAN/Workstation IOP #2629, Integrated PC Server #6616, or MFIOP #9751/#9754 is a prerequisite for #6181. It uses no I/O card slots and one IOA slot.

Integrated PC Server #6616

The Integrated PC Server allows the AS/400 to provide high performance serving to LAN attached PCs. OS/2 Warp Server for AS/400, Novell NetWare, Lotus Domino, Firewall for AS/400, and Flowmark are supported on the Integrated PC Server. The #6616 contains an Intel 166MHz Pentium Processor, two main storage slots, and two LAN IOA slots. One or two of the following memory features must be installed in the Integrated PC Server allowing between 32M and 256M of main storage:

- #2861 32M Memory for Integrated PC Server
- #2862 128M Memory for Integrated PC Server

One or two of the following LAN IOA features must be installed in the Integrated PC Server:

- #6149 16/4 Mbps Token-Ring IOA
- #6181 Ethernet/IEEE 802.3 IOA

#6616 occupies two consecutive I/O card slots.

Integrated PC Server #6617

The Integrated PC Server allows the AS/400 to provide high performance serving to LAN-attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Microsoft Windows NT Server are supported on the Integrated PC Server. The #6617 contains an Intel 200 MHz Pentium Pro Processor, four main storage slots, and three LAN IOA slots. Between one and four of the following memory features must be installed on the Integrated PC Server allowing between 32M and 512M of main storage:

9406 Models 640, 650

- #2861 32M Memory for Integrated PC Server
- #2862 128M Memory for Integrated PC Server

Between one and three of the following LAN IOA features must be installed in the Integrated PC Server:

- #2723 PCI Ethernet IOA
- #2724 PCI 16/4 Mbps Token Ring IOA
- #2838 PCI 100/10 Mbps Ethernet IOA

#2838 can occupy a maximum of two of the three LAN IOA slots.

For each #2838 run on the #6617 Integrated PC Server, #0222 100/10 Mbps Ethernet on IPCS is required. The third LAN adapter and a second #2838 are only supported if running Windows NT on the IPCS.

If Windows NT is running on the #6617 Integrated PC Server, then the following are also available for attachment to the IPCS:

- #0325 IPCS Extension Cable for Windows NT (required)
 - #1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries)
- A display must be attached to the IPCS to support Windows NT

For keyboard/mouse and display support, the Internet at **<http://www.as400.ibm.com>** should be consulted. #6617 occupies three I/O consecutive card slots.

9406 Models 640, 650

The following are supported on the Model 640 and 650 as migration features:

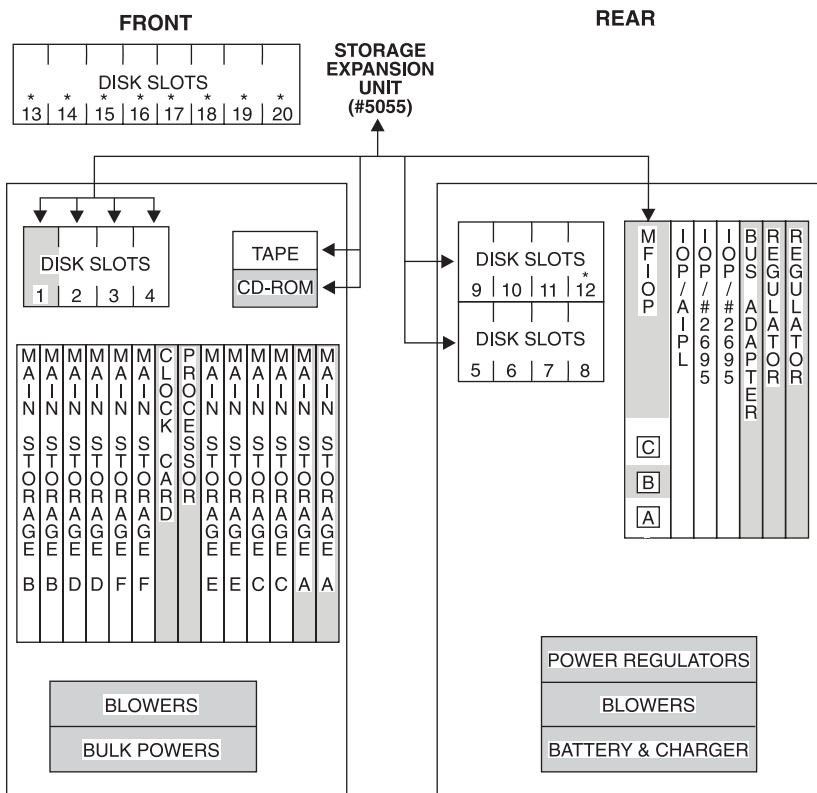
- #2617 Ethernet Adapter/HP
- #2618 Fiber Distributed Data Interface Adapter
- #2619 16/4 Mbps Token-Ring Adapter/HP
- #2626 16/4 Mbps Token-Ring Adapter/A
- #2665 SDDI Adapter
- #2668 Wireless LAN Adapter
- #6516/7/8/9 One-Port Integrated PC Server (formerly FSIOP)
- #6526/7/8/9 Two-Port Integrated PC Server (formerly FSIOP)
- #6520 Upgrade One-Port (#6516/7/8/9) Integrated PC Server to Two-Port
- #6509 Additional 16M Integrated PC Server (#65xx) Memory

9406 Models 640, 650

Power and Packaging for 9406 Models 640, 650

9406 Model 640 System Unit

The following schematic diagram shows the system layout for the 9406 Model 640.

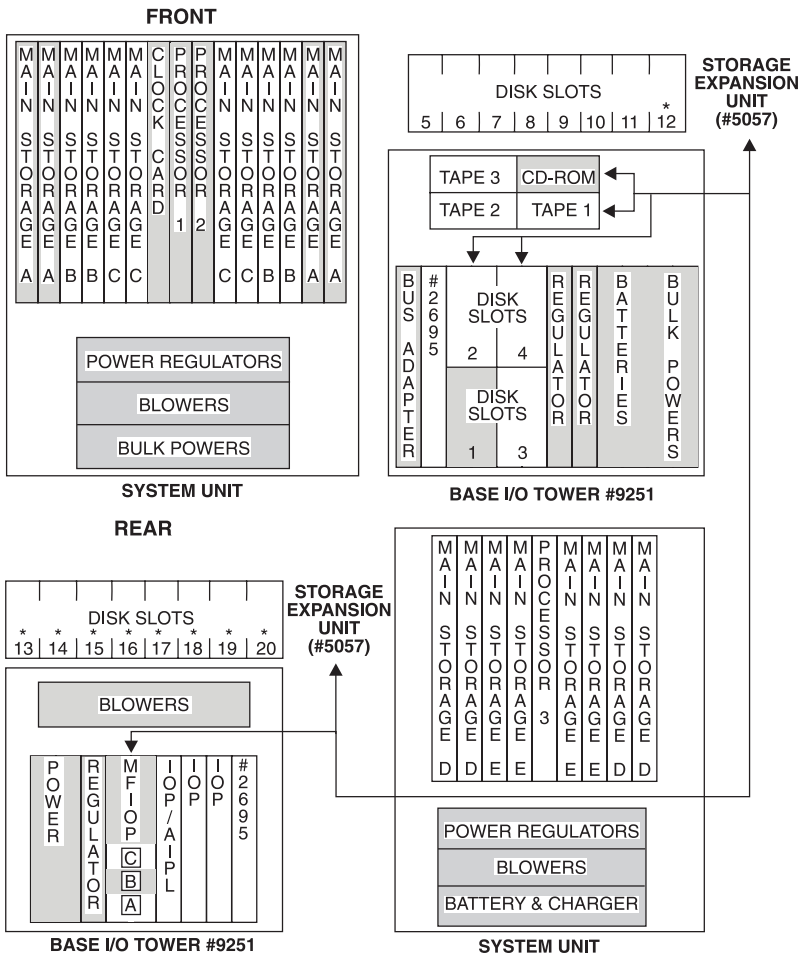


9406 Model 640 System Unit with Storage Expansion Unit #5055

9406 Models 640, 650

9406 Model 650 System Unit

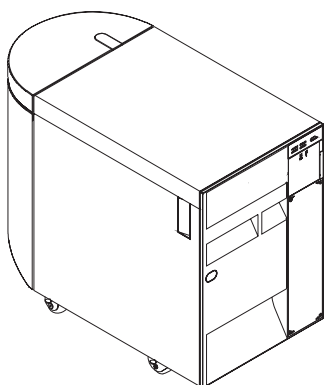
The following schematic diagram shows the system layout for the 9406 Model 650.



9406 Model 650 System Unit with Storage Expansion Unit #5057

9406 Models 640, 650

9406 System Unit Expansion Tower #5073



9406 Model 640 and 650 System Unit Expansion Tower (#5073)

The System Unit Expansion Tower, #5073, is a 13 card slot expansion unit available for 9406 Models 640 and 650. It provides an additional bus to the system and includes a 1063 Mbps optical bus card and optical cable for attachment.

The System Unit Expansion tower (#5073) can support up to four additional internal tape units which require a Storage Device Controller, #2624, or Internal Tape Device Controller, #6513, as a prerequisite. The tower also includes one battery backup unit, one 400 watt base power supply, and two 500 watt additional power supplies for higher availability. A Storage Expansion Unit, #5058, is supported on the system unit expansion tower and is attached on top of the tower providing space for up to 16 additional feature disk units. #5058 contains a battery backup unit and can support the new Ultra SCSI disk units (#6906, #6907, #6713, and #6714).

In order to attach the system unit expansion towers, an Optical Bus Adapter card is required in the System Unit. This card is specified as #2695. The Optical Bus Adapter card allows for the addition of up to six optical buses. A maximum of two #2695s are supported on 9406 Models 640 and 650. 9406 Models 640 and 650 System Units include a base Optical Bus Adapter. This also allows for the addition of six optical buses. For the maximum number of buses supported

9406 Models 640, 650

on a system, please refer to the Summary Tables on page 35 to page 58.

The Optical Bus Adapter (#2695) requires a daughter card to attach the optical buses. This daughter card is known as the Optical Link Processor #2688. #2688 specifies a 1063 Mbps Optical Link which supports the attachment of up to two System Unit Expansion Towers, #5073, or two Storage Expansion Towers, #5083. One #5073 and one #5083 can be attached to the same #2688. A maximum of three Optical Link Processors (#2688) are supported on an Optical Bus Adapter (#2695).

The 266 Mbps Optical Link Processor (#2686), which is also a daughter card of the Optical Bus Adapter (#2695), supports the System Unit Expansion Rack, #5044, which is a feature conversion of the 9309 System Unit Expansion Rack (#5040 or #5042). Only one #5044 is supported per #2686 and no other expansion towers can be attached to the same 266 Mbps Optical Link Processor.

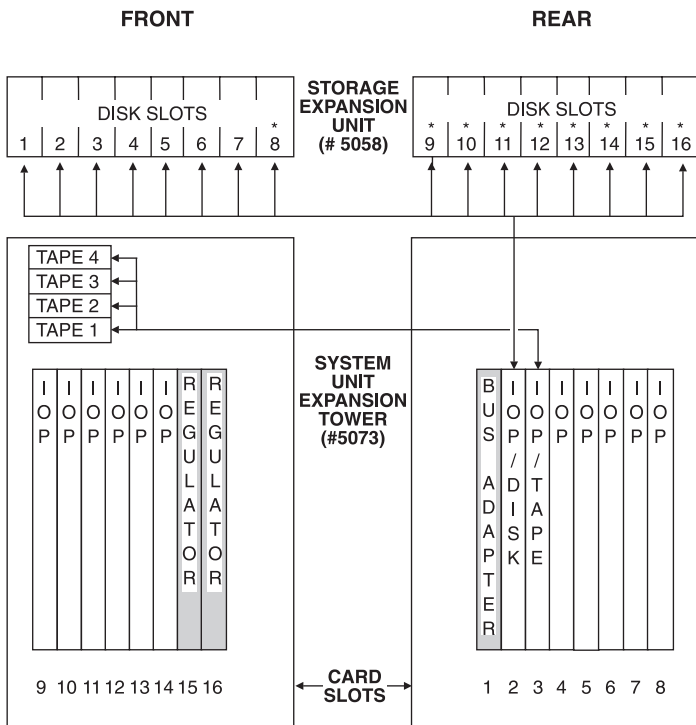
The System Unit Expansion Tower, #5072, which attaches to the 9406 Model 530 is supported on the Model 9406 Models 640 and 650 for migration only. New orders include the #5073 System Unit Expansion Tower and not the #5072.

Specify code #0086 can be used to indicate to the configurators that a #5073 is being dedicated for the attachment of a 3590 Magnetic Tape Subsystem in order to achieve maximum performance. Only the IOP used to connect the 3590 is placed in the #5073.

Feature #5602 may be used to indicate to the configurators that a #5073 is being used as an opticonnect hub. This allows only features related to opticonnect to be placed in the #5073.

The following schematic diagram shows the #5073 with a Storage Expansion Unit, #5058, attached.

9406 Models 640, 650



■ = ARE PART OF BASE CONFIGURATION

* = ONE-BYTE DISK UNITS CANNOT BE INSTALLED IN DISK SLOT 8 THROUGH 16

System Unit Expansion Tower, #5073 and Storage Expansion Unit, #5058

- Slot 1** is occupied by the fiber-optic bus adapter card.
- Slot 2** can be occupied by a feature I/O card or by the disk unit controller card if #5058 attached.
- Slot 3** can be occupied by a feature I/O card or by the internal tape Storage Device Controller (#2624 or #6513) to support the internal tapes in the #5073. #2624 supports up to three tape units. #6513 supports up to four tape units in the #5073.
- Slots 4 to 14** are for feature I/O cards.
- Slots 15 & 16** are occupied by power regulator cards.

9406 Models 640, 650

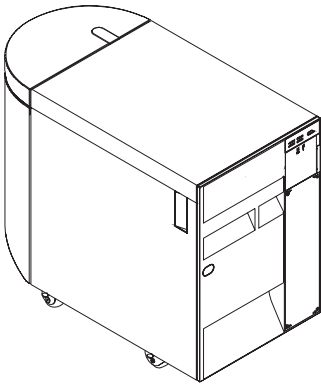
The four internal tape units in the #5073 can be a ¼" cartridge tape unit, or an 8mm cartridge tape unit.

The Storage Expansion Unit, #5058, can be mounted on the System Unit Expansion Tower (#5073) and provides space for up to 16 additional disk units. The disk units installed in the #5058 are supported by a disk unit controller (#6502, #6512, #6530, #6532, or #6533).

The Storage Expansion Unit (#5058) supports the concurrent maintenance of all internal disk units in RAID-5 protection or mirrored environment.

9406 Models 640, 650

9406 Storage Expansion Tower #5083



9406 Model 640 and 650 Storage Expansion Tower (#5083)

The Storage Expansion Tower, #5083, is available on 9406 Models 640 and 650 for adding up to 16 2-byte SCSI disk units. It provides an additional bus to the system and includes a 1063 Mbps optical bus card and optical cable for attachment.

The Storage Expansion Tower includes two IOP feature slots available for disk unit controller, #6532 or #6533. Disk unit controllers #6502, #6512, and #6530 are also supported if upgrading. One of these is to support the 16 disk units in the tower and the other is to support disk units in a Storage Expansion Unit, #5058. The #5058 can be attached to the Storage Expansion Tower to provide a total of up to 32 disk units.

The storage expansion tower includes one battery backup, one 400 watt base power supply, two 500 volt power supplies, and a regulator. The #5058 Storage Expansion Unit contains a battery backup unit.

A Storage Expansion Tower, #5083, should be specified as an alternative to the System Unit Expansion Tower, #5073, when adding disk units and no additional IOP feature cards are required.

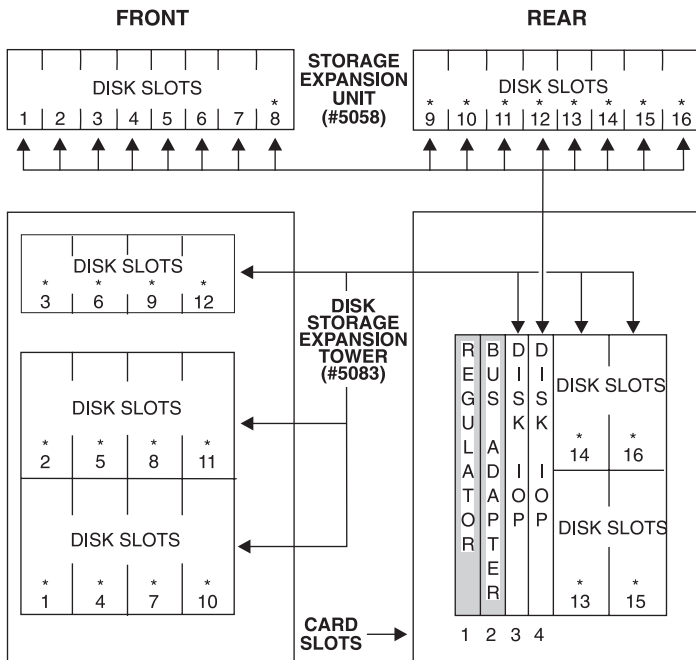
#5083 Storage Expansion Tower and #5058 Storage Expansion Unit can support the new Ultra SCSI disk units (#6906, #6907, #6713, and #6714).

9406 Models 640, 650

Refer to the section on the Optical Bus Adapter, #2695 on page 162 for details on the attachment requirements of the #5083.

The Storage Expansion Tower, #5082, which attaches to the 9406 Model 530 is supported on the Model 9406 Models 640 and 650 for migration only. New orders are for the #5083 Storage Expansion Tower and not the #5082.

The following schematic diagram shows a #5083. Storage Expansion Tower with a Storage Expansion Unit, #5058, attached.



■ = ARE PART OF BASE CONFIGURATION
 * = ONE-BYTE DISK UNITS CANNOT BE INSTALLED IN DISK SLOT 8 THROUGH 16 OF #5058 OR SLOT 1 THROUGH 16 OF #5083

9406 Storage Expansion Tower, #5083, and Storage Expansion Unit, #5058

9406 Models 640, 650

The slots in the Storage Expansion Tower are occupied as follows:

- Slot 1** is occupied by a power regulator.
- Slot 2** is occupied by the Fiber-optic Bus Adapter card.
- Slot 3** is for the disk unit controller (#6502, #6512, #6530, #6532, or #6533) for disk units installed in the #5083.
- Slot 4** is for the disk unit controller (#6502, #6512, #6530, #6532, or #6533) for disk units installed in the #5058.

The Storage Expansion Unit, #5058, can be mounted on the Storage Expansion Tower and provides space for up to 16 additional disk units. The disk units installed in the #5058 are supported by a disk unit controller (#6502, #6512, #6530, #6532, or #6533).

The Storage Expansion Tower and Storage Expansion Unit support concurrent maintenance of all internal disk units in RAID-5 protection or mirrored environment.

9406 Models 640, 650

Internal Disk Units for 9406 Models 640, 650

The following disk units are supported on the 9406 Model 640 and 650 System Units and Storage Expansion Units:

Feature	Size	One/Two Byte	SCSI Type	Migrated/New	Compression
#1602	1.03G	1	Fast	Migrated	Yes
#1603	1.96G	1	Fast	Migrated	Yes
#6605	1.03G	2	Fast	New	Yes
#6606/ #9606	1.96G	2	Fast	New	Yes
#6607/ #7607	4.19G	2	Fast	New	Yes
#6650	1.96G	2	Fast	New	Yes
#6652	1.03G	2	Fast	New	Yes
#6713/ #7713/ #8713	8.58G	2	Ultra	New	Yes
#6714/ #8714	17.54G	2	Ultra	New	SOD
#6906	1.96G	2	Ultra	New	Yes
#6907/ #9907	4.19G	2	Ultra	New	Yes
Compression requires Operating System/400 Version 4 Release 3. Compression is not support in the System Auxiliary Storage Pool. A discussion of compression may be found on page 442. IBM intends to provide compression on 17.54G Disk Units in a future release of OS/400.					

The base System Unit of the 9406 Model 640 supports up to 12 disk units. With the addition of the Storage Expansion Unit, #5055, a further eight disks may be added, making a total of 20. All 20 disks are supported by the MFIOP #9751/#9754.

The base System Unit of the 9406 Model 650 supports up to four disk units. With the addition of the Storage Expansion Unit, #5057, an additional 16 disks may be added, making a total of 20. All 20 disks are supported by the MFIOP #9751/#9754.

9406 Models 640, 650

Further internal disks can be installed in:

Storage Expansion Unit, #5058. This mounts on top of the #5073 or #5083 Expansion Tower. It provides space for up to 16 additional disk units.

Storage Expansion Tower, #5083. This provides space for up to 16 additional 2-byte disk units and should be used when additional disk capacity is required and no additional feature IOP cards are required. For further information, see page 165.

The #5052 and #5082 Storage Expansion Unit and Tower, and #5072 System Expansion Tower can be migrated to the 9406 Model 640 and 650 when upgrading to them. On new orders, the #5058, #5073, and #5083 is ordered.

A base disk unit of 4.19G (#9907) is standard on new 9406 Model 640 and 650. An optional 8.58G (#8713) or 17.54G (#8714) disk may be ordered in place of the standard disk unit. Upgrades from IMPI models of AS/400 (Fnn or 3nn Models) to Model 640 or 650 also includes as standard a 4.19G disk unit.

For the migrated disk units that are supported on upgrades using #1602 and #1603 migration kits, see page 294.

For best performance, the new Ultra SCSI disk units should be installed either attached to the MFIO (#9751 or #9754) or in the Ultra SCSI Tower and Storage Expansion Units (#5083 and #5058) with the Ultra SCSI RAID Disk Unit Controller—4M Cache (RAID/Mirrored/Unprotected), #6532 or #6533.

The internal disk units in the Storage Expansion Unit (#5058) and the Storage Expansion Tower (#5083) are supported by one of the following Disk Unit controllers:

- #6533 Ultra SCSI Disk Unit Controller—4M Cache (RAID/Mirrored/Unprotected)
- #6532 Ultra SCSI Disk Unit Controller—4M Cache (RAID/Mirrored/Unprotected)
- #6530 Disk Unit Controller—No Cache (Mirrored/Unprotected)

9406 Models 640, 650

#6502 High Performance Controller–2M Cache
(RAID/Mirrored/Unprotected)

#6512 High Performance Controller–4M Cache
(RAID/Mirrored/Unprotected)

The #6502, #6512, and #6530 can be migrated to the 9406 Model 640 or 650 when upgrading.

For more information on these controllers see page 361, page 358, and page 357.

RAID-5 for 9406 Models 640 and 650

The 9406 Models 640 and 650 support RAID-5 protection for all 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G (1-byte or 2-byte) disk units if they are controlled by the #9751 or #9754 MFIOP, or #6533, #6532, #6512, or #6502 disk unit controller.

A minimum of four disk units of the same capacity are required for a valid RAID-5 configuration. A maximum of two RAID-5 arrays are allowed per #6512, or #6502. A maximum of four RAID-5 arrays are allowed per #9751/#9754 or #6532/#6533, with a maximum of 10 disk units per array. Parity information can be spread across four or eight of the disk units in an array and is automatically maintained as part of the RAID-5 protection feature.

Having parity spread across eight disk units gives better performance in the event of a disk unit failure as the data required to dynamically rebuild the data on the failed disk is being accessed from an eighth of the disk units as opposed to a quarter.

If one disk unit fails it cannot be used to read or write data. The disk unit controller then reads the parity and data from the same data areas as the other disk units to dynamically rebuild the original data from the failed disk unit to satisfy ongoing read requests. When data needs to be written, the controller generates the parity information for the failed disk unit as if it were still operating. As far as the AS/400 is concerned, the disk units continues to respond to I/O even though a single disk unit has failed.

9406 Models 640, 650

If RAID-5 protection is not required then the Disk Unit Controller #6530 can be specified to support the disk units in base or mirrored mode.

Internal disk units of different technology (that is, different feature numbers), but of the same capacity can be either mirrored or RAID-5 protected.

The 9406 Models 640 and 650 support concurrent maintenance of all internal disk units in either RAID-5 protection or mirrored mode. External disk units can also be attached using external disk unit controllers.

For the maximum internal and external disk capacity and number of disk unit controllers, please refer to the Summary Tables on page 35 to page 58.

9406 Models 640, 650

Internal Tape, CD-ROM, and Diskette Units for 9406 Models 640, 650

The following internal tape units are supported on the 9406 Model 640 and 650 System Units and Storage Expansion Units:

Feature	Size	One/Two Byte	SCSI Type	Migrated/New
#1379	1.2G ¼"	1	Fast	Migrated
#1380	2.5G ¼"	1	Fast	Migrated
#6368	1.2G ¼"	1	Fast	New
#6369	2.5G ¼"	1	Fast	New
#6380	2.5G ¼"	1	Fast	New
#6381	2.5G ¼"	1	Fast	New
#6382	4G ¼"	1	Fast	New
#6385	13G ¼"	2	Fast	New

The 9406 Model 640 System Unit can accommodate one internal tape unit and the base CD-ROM drive. The 9406 Model 650 System Unit can accommodate up to three internal tape units and the base CD-ROM drive. The CD-ROM drive and first tape are supported by the MFIOP #9751/#9754. A Storage Device Controller (#2624 or #6513) is required to support the second and third additional tapes in the Model 650 System Unit.

The System Unit Expansion Tower (#5073) can accommodate up to four internal tape units. They are supported by a Storage Device Controller (#2624) which supports a maximum of three internal tape units or by an Internal Tape Device Controller (#6513) which supports a maximum of four internal tape units. #6513 is the default on initial orders.

The following are the current internal tapes and CD-ROM drives that are supported. The other tapes shown in the table above are supported for migration when upgrading to the 9406 Model 640 or 650. #6368 and #6369 require a Removable Media Cluster Box, #5032 (located within a 9309 Rack) to support them.

9406 Models 640, 650

Base CD-ROM Drive

PowerPC AS/400 Advanced Series Models code is distributed on CD-ROM media. The CD-ROM drive is standard on 9406 Models 640 and 650. It is therefore not identified with a separate feature. It can be used for alternate IPL but not as a save/restore device for the system.

2.5G ¼" Cartridge Tape Unit #6381/#6481

The 2.5G ¼" Cartridge Tape Unit is an optional high function, streaming tape drive. It has an effective data rate of 300K per second when operating in the QIC-2G or QIC-1000 format; 200K per second when operating in the QIC-525 format and 120K per second when operating in the QIC-120 format.

#6381/#6481 supports compaction using LZ1 (Lempel Ziv 1) when tapes are initialized using QIC2DC format.

It may be used for save/restore, alternate IPL, program distribution, migration and for ¼" cartridge tape interchange.

The #6381 2.5G Cartridge Tape Unit requires the Internal Tape Device Controller #6513 or MFIOF #9751/#9754 as a prerequisite. For a full description of #6513, see page 359. The #6513 occupies one I/O feature card slot.

The #6381/#6481 is supported by #2726, #2740, #2741, #6513, #9728, #9751, #9754 depending on the AS/400 model and physical placement of the drive. See Magnetic Media Controller section for more information.

#6381 is supported in the System Unit of the Model 640, 650, S30, S40 and SB1, and in the #5073 System Unit Expansion Tower.

#6481 is supported in the System Unit of the Model 600, 620, S10 and S20, and the #9364 System Unit Expansion.

For details of compatibility with other QIC media types and drives, see table on page Table 2 on page 175

9406 Models 640, 650

4G ¼" Cartridge Tape Unit #6382/#6482

The 4G ¼" Cartridge Tape Unit is an optional high-function, streaming tape drive. It has an effective data rate of 380K per second or 760K per second with data compaction.

#6382/#6482 supports data compression using LZ1 (Lempel Ziv 1) when tapes are initialized using the appropriate format. It can be used for save/restore, alternate IPL, program distribution, migration and ¼" cartridge tape interchange.

The #6382/#6482 is supported by #2726, #2740, #2741, #6513, #9728, #9751, #9754 depending on the AS/400 model and physical placement of the drive. See Magnetic Media Controller section for more information.

#6382 is supported in the System Unit of the Model 640, 650, S30, S40 and SB1, and in the #5073 System Unit Expansion Tower.

#6482 is supported in the System Unit of the Model 600, 620, S10 and S20, and the #9364 System Unit Expansion.

For details of compatibility with other QIC ¼" media types and drives, see table on page 175.

13G ¼" Cartridge Tape Unit #6385/#6485

The 13G ¼" Cartridge Tape Unit is an optional tape for the 9406. Maximum native capacity is 16G uncompressed and average compressed capacity is 32G. The #6385 supports data compression using LZ1 (Lempel Ziv 1). The effective data rate is 1.5M per second native and 3M per second with compaction. Tape tensioning control improvements in the tape unit eliminate the need for an auto-retension pass during the data cartridge/load sequence. During cartridge load an auto-retension is required to maintain correct auto-retension, during cartridge load, is required to maintain correct tape tension in earlier ¼" cartridge tape units and can take up to five minutes. The #6385/#6485 Tape Unit retensions the data cartridge only when a loss of tension is detected. For typical operating conditions this is very infrequent. The 13G Cartridge Tape Unit can

9406 Models 640, 650

be used for save/restore, alternate IPL, program distribution, migration and ¼" cartridge tape interchange.

The #6385/#6485 is supported by #2726, #2740, #2741, #6513, #9728, #9751, #9754 depending on the AS/400 model and physical placement of the drive. See Magnetic Media Controller section for more information.

#6385 is supported in the System Unit of the Model 640, 650, S30, S40 and SB1, and in the #5073 System Unit Expansion Tower.

#6485 is supported in the System Unit of the Model 600, 620, S10 and S20, and the #9364 System Unit Expansion.

For details of compatibility with other QIC media types and drives, see table on page 175.

<i>Table 2. QIC Internal Tape Drive Read/Write Compatibility:</i>						
Format	Capacity	Media	#6380	#6381 #6481	#6382 #6482	#6385 #6485
MLR1	(16G)	MLR1-16GB	--	--	--	R/W(1)
R/W(1)						
QIC5010	(13G)	DC5010	--	--	-	R/W(1)
QIC4DC(2)	(8G)	SLR5-4GB	--	--	R/W	--
QIC4GB	(4G)	SLR5-4GB	--	--	R/W	--
QIC2DC(2)	(5G)	DC9250	--	R/W	R/W	--
QIC2GB	(2.5G)	DC9250	R/W	R/W	R/W	R/W
QIC1000	(1.2G)	DC9120	R/W	R/W	R/W	R/W
QIC525	(525M)	DC6525	R/W	R/W	R/W	R/W
QIC525	(320M)	DC6320	R/W	R/W	R/W	--
QIC120	(120M)	DC6150	R/W	R/W	R/W	R/W
QIC24(3)	(60M)	DC6150	R	R	--	--
Note 1:	13G/16G cartridges have auto-retension (retention done as required).					
Note 2:	QIC2DC and QIC4DC formats are compression formats. Cartridge capacity is data dependent (capacities shown are typical).					
Note 3:	QIC24 format is written by S/36.					

9406 Models 640, 650

AS/400e servers

For customers in a Client/Server environment with a strong requirement for outstanding data serving performance, there are six models of AS/400 that are optimized to be powerful servers. They are the 9401 Model 150, and the 9406 Models 170, S10, S20, S30, and S40. The Sxx models can only be upgraded to or from AS/400 Advanced Server Models. They cannot be upgraded to or from AS/400 Advanced System Models. There are no upgrades offered to or from the Models 150 and 170.

The Client/Server environment has different workload and performance characteristics from the traditional, host-based application environment. These AS/400 server models have special hardware performance and growth characteristics to meet these demands. Performance improvements are achieved in database, print- and file-serving capabilities. In addition, applications that are CPU-intensive (such as compilers, statistical analyses and queries) will execute at much higher speeds. Applications utilizing the following functions will benefit from the AS/400 Server Models' performance improvements:

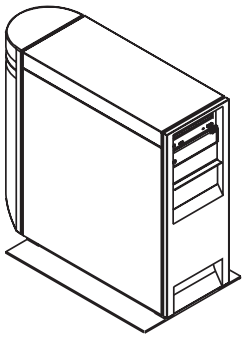
- LAN protocols (Token-Ring, Ethernet)
- SQL (ODBC)
- DDM
- APPC
- Shared Folders
- TCP/IP

The number of terminals supported by the AS/400e server models is strictly limited as these models are not designed for interactive processing. In particular, a maximum of seven twinax and six ASCII devices is supported. This limit is increased with Version 4 Release 2 and Version 4 Release 3 to a maximum of 28 devices. This limit applies to the number of active non-programmable terminals. The exception to this is the custom e-server processors on the Model S20, S30, and also the Model 170. For more details on these, see Custom e-server section on page 272. For more details as to what devices are included in this limit, see the table on page 244.

AS/400e servers

AS/400e server Model 150

AS/400e server Model 150



9401 Model 150 System Unit

The 9401 Model 150 System Unit is offered in four packages at OS/400 Version 4 Release 3. The four packages are summarized as follows:

Package Name	Entry Twinax	Growth Twinax	Entry Server	Growth Server
Package Feature	#0391	#0392	#0393	#0394
Relative System Performance (CPW)	13.8/20.2	20.2/20.2	13.8/20.2	20.2/20.2
Constrained	13.8/27.0	20.6/35.0	13.8/27.0	20.6/35.0
Unconstrained				
Main Storage (M) (min/max)	64-192	128-192	64-192	128-192
DASD (G) (min/max)	4.19-29.9	4.19-29.9	4.19-29.9	4.19-29.9
LAN IOAs	0-2	0-2	1-2	1-2
Communications line	1-5	1-5	1-5	1-5
Twinaxial Workstation Controller	1	1	0-1	0-1
Twinaxial Workstations	1-7	1-28	0-7	0-28

In addition, for those customers who require OS/400 Version 4 Release 2 equivalent, #029x packages remain available.

Notes:

CPW is the Commercial Processing Workload that is used to measure the performance of all AS/400 processors since the V4R1 timeframe. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system

AS/400e server Model 150

model, other factors, and the application being run determines what performance is achievable. For more details, refer to the section entitled *Commercial Processing Workload* on page 12.

The constrained figures are for the 9401 Model 150 with its maximum configuration. The unconstrained figures show what the performance would be if the processor was not limited by the maximum main storage and DASD of the Model 150. In each case, the first figure is for interactive workload, the second is for Client Server.

Six lines on the server packages but one is reserved for Operations Console.

All of the 9401 Model 150 packages include:

- Three main storage slots.
- One 4.19G Disk Unit.
- Three additional internal disk slots.
- One 4.0G ¼" Cartridge Tape Unit.
- Integrated CD-ROM unit.
- One communication line for Electronic Customer Support.
- Five feature card slots. Two of these slots are reserved for an Integrated PC Server. Three are driven by the MFIOP.
- Multi-Function I/O Processor (MFIOP).
- No battery backup. Optional Uninterruptible Power Supply.

In addition the packages also include the following:

- Entry Twinax Package (#0391)
 - 13.8/20.2 CPW Constrained, 13.8/27.0 CPW Unconstrained Processor
 - 64M of main storage, leaving two free main storage slots
 - Twinaxial adapter, cable, and two-port adapter supporting up to seven workstations
- Growth Twinax Package (#0392)
 - 20.2/20.2 CPW Constrained, 20.6/35.0 CPW Unconstrained Processor
 - 128M of main storage, leaving one free main storage slot
 - Twinaxial adapter, cable, and four-port adapter supporting up to 28 workstations
- Entry Server Package (#0393)

AS/400e server Model 150

- 13.8/20.2 CPW Constrained, 13.8/27.0 Unconstrained Processor
- 64M of main storage, leaving two free main storage slots
- An Ethernet or a Token-Ring LAN IOA
- Multi-Protocol Communications Adapter
- Operations Console Cable (20 ft/6m)

Growth Server Package (#0394)

- 20.2/20.2 CPW Constrained, 20.6/35.0 Unconstrained Processor
- 128M of main storage, leaving one free main storage slot
- A 64M Integrated PC Server
- An Ethernet or a Token-Ring or a 100/10 Mbps Ethernet LAN IOA for the Integrated PC Server
- Multi-Protocol Communications Adapter
- Operations Console cable (20 ft/6m)

The Entry Package (#0391 and #0393) can be upgraded by ordering #0295 Performance Enhancement. This provides the more powerful processor as well as supplying a 4-port twinax expansion allowing an increase in the number of twinaxial workstations supported to 28.

Main Storage for 9401 Model 150

The Model 150 has a total of three memory slots. On the entry packages (#0391 and #0393) the first slot is occupied with 64M; there are two spare slots. On the growth packages (#0392 and #0394) the first two slots are occupied with a total of 128M and there is one spare slot. All memory cards on the Model 150 plug into sockets on the CPU board.

The following lists the main storage options for the Model 150:

Package (min M/max M)	Main Storage Supported	
	Base	Feature
#0391/#0393 (64 - 192)	64M	#3182 32M
#0392/#0394 (128 - 192)	128M	#3110 64M

Workstation Controllers for 9401 Model 150

Workstation/Communications Adapter #2720

This adapter attaches to the Multi-Function I/O Processor (MFIOP). It supports a maximum of seven twinaxial workstations on the Entry Packages (#0391 and #0393) or 28 workstations on the growth packages (#0392 and #0394). If #0295 Performance Enhancement is ordered on the entry packages, the maximum number of twinaxial workstations increases to 28. The #2720 comes with a 2-port twinaxial attachment cable. This can be increased by ordering the optional 4-port Twinax Expansion #0399 allowing up to 28 devices to attach. #2720 also provides a single communications line (see the Communications section on the next page). The appropriate communications cable must be ordered for this. The #2720 ships a standard with no feature required on the Twinaxial Packages (#0391 and #0392). It is available as an additional feature on the Server Packages (#0393 and #0394).

Refer to page 244 for details on what is counted towards the maximum of 7 or 28 workstations on the 9401 Model 150.

Multi-Function I/O Processor

The Multi-Function I/O Processor (MFIOP) is standard on all 9401 Model 150 packages. It supports the following features:

- Base Workstation/Communications Adapter (standard on Twinaxial Packages #0391 and #0392)
- Base Multi-Protocol/Communications Adapter (standard on Server Packages #0393 and #0394)
- #2720 Workstation/Communications Adapter
- #2721 Multi-Protocol/Communications Adapter
- #2723/#9723 Ethernet/IEEE 802.3 Adapter
- #2724/#9724 16/4 Mbps Token-Ring Adapter

In addition to one base adapter, the MFIOP supports a maximum of two additional adapters.

AS/400e server Model 150

One #2720 Workstation/Communications Adapter can be installed with the Server Packages (#0393 and #0394).

Up to two #2721 Multi-Protocol Communications Adapters can be installed with any of the packages.

One LAN Adapter (#2723, #9723, #2724, or #9724) can be installed on the MFIOP with any of the packages except Growth Server (#0394). However, if an Integrated PC Server #2852 is installed, then no LAN adapters are supported on the MFIOP.

#9723 or #9724 is the standard LAN adapter that attaches to the Integrated PC Server in the Growth Server Package (#0394) or to the MFIOP in the Entry Server Package (#0393). On the #0394 Growth Server Package, the one additional optional LAN adapter that can be attached to the Integrated PC Server is #9738 100/10 Mbps Ethernet Adapter. The #9738 is also available if #2852 Integrated PC Server is ordered on the #0393 Entry Server Package.

The MFIOP supports a total of three adapters—one base plus two additional adapters.

Communications for 9401 Model 150

All 9401 Model 150 packages support a maximum of five communications lines. The Server Packages (#0393 and #0394) have a sixth line that is reserved for the Operations Console.

Workstation/Communications Adapter #2720

This adapter attaches to the MFIOP. It provides twinaxial workstation support as well as a single communications line. The #2720 ships as base with no feature showing on Twinaxial Packages (#0391 and #0392). It can be ordered as a feature on Server Packages (#0393 and #0394). For communications one of the following cables must be ordered:

- #0348 V.24/EIA 232 20ft (6m) PCI Cable
- #0353 V.35 20ft (6m) PCI Cable
- #0356 V.36/EIA 449 20ft (6m) PCI Cable

AS/400e server Model 150

#0359 V.21 20ft (6m) PCI Cable

Multi-Protocol Communications Adapter #2721

This adapter attaches to the MFIOP. It provides two communications lines. The #2721 ships as base with no feature showing on Server Packages (#0393 and #0394). Additional #2721s can be ordered on all packages up to the maximum of three (including the Base Multi-Protocol Communications Adapter). One or two cables must be ordered—see #2720 above for the cables that are supported. On Twinaxial Packages (#0391 and #0392) one of the following cables is also offered:

#0362 Client Access Console 20ft (6m) PCI Cable

#0367 Operations Console 20ft (6m) PCI Cable

Operations Console Cable ships as base with no feature showing on the Server Packages (#0393 and #0394). If Operations Console Cable is installed, then #0381 Remote Control Panel Cable can also be ordered.

Local Area Networks for 9401 Model 150

All 9401 Model 150 packages support a maximum of two LAN adapters.

Ethernet/IEEE 802.3 Adapter #2723/#9723

This adapter supports attachment to an Ethernet Network. AUI and RJ45 wrap connectors are included with this feature. However, an Ethernet Cable (3m AUI) or RJ45 Cable must be separately ordered. #2723 attaches to the MFIOP or #2852 Integrated PC Server. #9723 is the base Ethernet Adapter that attaches to the MFIOP on the Entry Server Package (#0393) or the Integrated PC Server on the Growth Server Package (#0394).

AS/400e server Model 150

16/4 Mbps Token-Ring Adapter #2724/#9724

This adapter supports attachment to a Token-Ring Network. A 2.4m Token-Ring cable is included as well as an AUI and RJ45 wrap connector. If RJ45 cabling is required, this must be separately ordered. #2724 attaches to the MFIOF or #2852 Integrated PC Server. #9724 is the base Token-Ring Adapter that attaches to the MFIOF on the Entry Server Package (#0393) or the Integrated PC Server on the Growth Server Package (#0394).

100/10 Mbps Ethernet Adapter #2838/#9738

This feature supports attachment to a standardized 100 Mbps high-speed Ethernet LAN and also supports attachment to existing 10 Mbps Ethernet LANs. The adapter comes with an RJ45 connector for attachment to UTP-5 media. #9738 is the base 100/10 Mbps Ethernet Adapter that attaches to the Integrated PC Server (#2852) on the Entry Server Package (#0393) or the base Integrated PC Server (no feature), on the Growth Server Package (#0394).

Integrated PC Server #2852

This adapter provides a 200 MHz Intel** Pentium** Processor giving high performance serving to LAN attached PCs. It occupies two dedicated Integrated PC Server card slots in the system unit. The Integrated PC Server comes with two times 32M of memory giving a base 64M. This can be increased by ordering up to two additional memory features:

- #2861 32M Integrated PC Server Memory
- #2862 128M Integrated PC Server Memory

The two base 32M memory can be removed and replaced by #2862 128M Integrated PC Server Memory. The maximum memory supported is therefore 512M.

In addition one or two LAN Adapters must be ordered to be installed on the Integrated PC Server:

- #2723/#9723 Ethernet/IEEE 802.3 Adapter
- #2724/#9724 16/4 Mbps Token-Ring Adapter

AS/400e server Model 150

#2838/#9738 100/10 Mbps Ethernet Adapter

Only one of the LAN adapters can be #2838 or #9738 100/10 Mbps Ethernet IOA.

The Integrated PC Server ships as base with no feature showing on the Growth Server Package (#0394). In this case, #9723, #9724, or #9738 will be ordered as the base LAN Adapter. #2852 can be ordered as the Integrated PC Server on the remaining three packages (#0391, #0392, and #0393). On package #0393; #9723, #9724, or #9738 can be ordered as the base LAN adapter on the Integrated PC Server #2852.

If Windows NT server will be run on the Integrated PC Server #2852, then the following are also available for attachment to the IPCS:

#0325 IPCS Extension Cable for Windows NT (required)

#1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries)

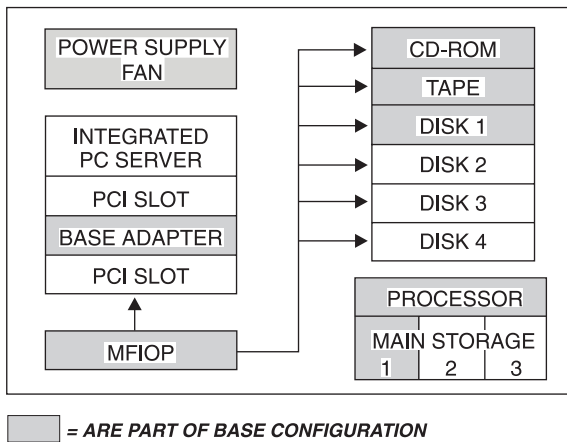
A display must be attached to the IPCS to support NT

For keyboard/mouse and display support in countries outside the USA, the Internet at <http://www.as400.ibm.com> should be consulted.

The #2850 Integrated PC Server with 133 MHz Intel Pentium Processor and a maximum of 128M memory is also available on the 9401 Model 150. However, the #2852 Integrated PC Server can run Windows NT Server whereas the #2850 Integrated PC Server cannot. A maximum of one Integrated PC Server can be installed on any 9401 Model 150 package. If one is installed, then no LAN adapter can be installed on the MFIOP.

Power and Packaging for 9401 Model 150

The following schematic diagram shows the layout of the Model 150:



9401 Model 150 System Unit

The 9401 Model 150 System Unit contains the processor, the MFIOP, CD-ROM drive, ¼" cartridge tape unit, one 4.19G Disk, base workstation/communications adapter or multi-protocol communications adapter, memory, power supply, and fan. An additional three disks, two PCI adapters, and Integrated PC Server can also be installed in the base system unit.

Internal Disk Units for 9401 Model 150

All 9401 Model 150 packages ship with one 4.19G base Disk Unit as standard with no feature required. Up to three of the following disk units can be added.

#6607 4.19G Disk Unit

#6713 8.54G Disk Unit

This gives a maximum of 29.9G of disk storage spread over four disks.

Internal Tape, CD-ROM, and Diskette Units for 9401 Model 150

A 4.0G ¼" cartridge tape unit ships as standard with no feature required on all 9401 Model 150 #039x packages. This tape unit supports compaction, increasing the total tape capacity to 8.0G per cartridge. It may be used for save/restore, alternate IPL, program distribution, migration, and for ¼" cartridge tape interchange. For details of compatibility with other ¼" media types see the table in Model 640, 650 section at the end.

Older 9401 Model 150 packages (the #018x and #019x packages that preceded the #029x and #039x packages) can order #6382 4.0G ¼" Cartridge Tape Unit as a replacement for the 2.5G ¼" Cartridge Tape Unit that shipped as standard on those packages.

2.5G ¼" Cartridge Tape Unit #6381

This tape unit can be ordered to replace the 4.0G ¼" Cartridge Tape Unit that ships as standard with all 9401 Model 150 #039x packages. This tape supports the QIC-24 format used in the System/36 ¼-inch Tape Units.

A CD-ROM drive ships as standard with no feature required on all 9401 Model 150 packages. System software is distributed on CD-ROM media for the Model 150. The CD-ROM drive can be used for alternate IPL but not as a save/restore device for the system.

Diskette Tape Unit

There is no diskette drive supported on the 9401 Model 150.

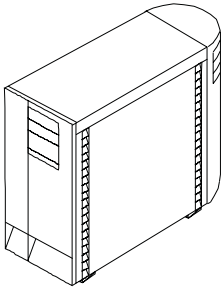
AS/400e server Model 150

9401 Model 150 Software

The following software is available under IBM International Program License Agreement terms for the 9401 Model 150:	Product Identifier	AS/400 Equivalent License
Advanced Entry Model 150 BasePak	5649-EP4	N/A
PSF/400 21-45 Printer Support	5649-SB6	5769-SS1 ftr
PSF/400 46+ IPM Printer Support	5649-SB7	5769-SS1 ftr
NetWare Enhanced Integration	5649-SC4	5769-SS1 ftr
Cryptographic Access Provider 40-bit@	5649-AC1	5769-AC1
Cryptographic Access Provider 56-bit@	5649-AC2	5769-AC2
Cryptographic Access Provider 128-bit@	5649-AC3	5769-AC3
Advanced Function Print Utility for AS/400	5649-AF2	5769-AF1
Advanced DBCS Printer Support	5649-AP2	5769-AP1
Integrated Language Environment COBOL for AS/400	5649-CB2	5769-CB1
Point-of-Sale Communications Utility for AS/400	5649-CF2	5769-CF1
Application Development ToolSet Client Server (ADTS)	5649-CL4	5769-CL3
CODE/400 for OS/2		
VRPG for OS/2		
CODE for Windows		
VRPG for Windows		
Integrated Language Environment C for AS/400	5649-CX4	5769-CX2
Language Dictionaries for AS/400	5649-DCT	5716-DCT
Firewall for AS/400	5649-FW3	5769-FW1
Internet Connection Secure Server for AS/400†	5649-NC4	5769-NC1
Internet Connection Secure Server for OS/400	5649-NCF	5769-NCE
Secondary Languages for 5649 Licensed Programs	5649-NL4	N/A
Application Program Driver for AS/400	5649-PD3	5769-PD1
Performance Tools for AS/400	5649-PT2	5769-PT1
Application Development ToolSet for AS/400	5649-PW2	5769-PW1
Application Dictionary Services for OS/400	5649-PWC	5769-PW1 ftr
Application Development Manager for OS/400	5649-PWD	5769-PW1 ftr
OnDemand for AS/400	5649-RD3	5769-RD1
Integrated Language Environment RPG for AS/400	5649-RG2	5769-RG1
Wireless Connection for AS/400	5649-TBX	5798-TBW
OfficeVision for AS/400	5649-WP3	5769-WP1
AS/400 Client Access Family	5649-XY1	5769-XY1
OS/2 Warp Server for AS/400	5649-XZ1	5769-XZ1
IBM Network Station Manager for AS/400	5648-C05	5648-C05
Navio NC Navigator for IBM Network Station (40 bit encryption)	5648-B10	5648-B10
Navio NC Navigator for IBM Network Station (128 bit encryption)†	5648-C20	5648-C20
IBM AFP FONT Collection for IBM Operating Systems	5648-113	5648-113
<p>Note:</p> <p>@ 5649-AC1 is available in EMEA only. 5649-AC2 is available in EMEA, AP and LA only. 5649-AC3 is available in the USA and Canada only.</p> <p>† These products are available in U.S.A. and Canada only.</p> <p>5649-EP4 BasePack Version 4 Release 3 is provided preloaded on 9401 Model 150 only. It includes OS/400, Client Access Family for Windows, Query, SQL Development Kit, Facsimile Support, Performance Manager, and a selection of OS/400 features including (PSF Fax Support, PSF 1-20 ipm Printer Support, CPA Toolkit, Integration Services for IPCS, Integration for Novell NetWare, TCP/IP Connectivity Utilities, LDAP Support for Lotus Domino, support for Java application development, enablement for AS/400 integration for Windows NT server, AS/400 Toolbox for JAVA, IBM HTTP Server for AS/400). No separate product identifiers are required for these products.</p> <p>Advanced Function Printing DBCS fonts are preloaded onto all DBCS systems.</p>		

AS/400e server Model 150

AS/400e servers Models S10, S20



9406 Model S10 System Unit

The 9406 Model S10 System Unit has a base configuration of:

Model S10 Processor (one must be specified):

- #2118 45.4 CPW Processor with 64M memory
- #2119 73.1 CPW Processor with 128M memory

Performance figures shown are for client/server workload only.
#2118 has an interactive performance rating of 16.2 CPW; #2119 has an interactive performance rating of 24.4 CPW.

Multi-function I/O Processor (MFIOP)

One 4.19G Disk Unit

Four additional internal disk slots

LAN adapter

One CD-ROM unit

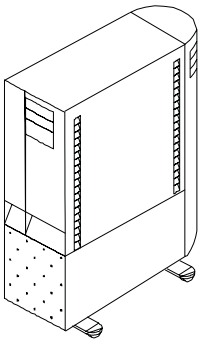
Console attachment (one must be specified)

- #9720 (Twinax/WAN) for Twinax console and ECS
- #9721 (WAN) for Operations Console or Client Access Console and ECS

Eight additional PCI card slots

No battery backup. Optional Uninterruptible Power Supply (UPS).

9406 Models S10, S20



9406 Model S20 System Unit

The 9406 Model S20 System Unit has a base configuration of:

Model S20 Processor (one must be specified):

- #2161 113.8 CPW Processor with 256M memory
- #2163 210.0 CPW Processor with 256M memory
- #2165 464.3 CPW 2-Way Processor with 256M memory
- #2166 759.0 CPW 4-Way Processor with 256M memory

Performance figures shown are for client/server workload only. The four processors have respective interactive performance rating of 31.0, 35.8, 49.7, and 56.9 CPW.

Multi-function I/O Processor (MFIOP)

One 4.19G Disk Unit

Four additional internal disk slots

LAN adapter

One CD-ROM unit

Console attachment (one must be specified)

- #9720 (Twinax/WAN) for Twinax console and ECS
- #9721 (WAN) for Operations Console or Client Access Console and ECS

Eight additional PCI card slots

Internal battery backup

Card Technology

The AS/400 Models S10 and S20 support a different card technology than has previously been available to the AS/400. Peripheral Component Interconnect (PCI) is an industry-standard format that will allow the AS/400e series to choose from a wide range of devices to be integrated into the system. Only PCI cards may be installed in the Model S10. The Model S20 has the ability to use both PCI cards and cards known as SPD cards. These are cards that use the same technology as that implemented on the previous AS/400 ranges, known as SPD because they were designed to be fitted on a bus designed by the System Products Division (SPD) of IBM.

Most functions supported with SPD cards are supported in the PCI format. However, the following functions are not supported with PCI cards and are therefore not supported at all on the Model S10, and only with SPD cards on the Model S20:

- Cryptographic processors
- Fax adapter
- ASCII adapter
- ISDN adapter

PCI adapters also do not support X.21 switched WAN dial-up or shorthold mode WAN.

The fundamental bus architecture of the AS/400 remains unchanged with this move to PCI adapters. The AS/400 IOP architecture continues to offload the main processor, isolate the host from adapter and network errors, and to manage, configure, and service the adapters. This architecture continues to offer advantages over other system structures.

PCI cards also allows the implementation of Customer Installable Features (CIF). For a long time, certain products have been designated Customer Setup (CSU). CIF is introduced on the Model S10 for orders of certain additional features. These additional features are disk features, PCI I/O cards, and external cables. Orders that are for these items alone will have feature #0002 added to the order to indicate that they are to be installed by the customer. Orders for model upgrades, memory, and tape will still be installed

9406 Models S10, S20

by the IBM Customer Engineer (CE). On orders that contain a mix of CE install and CIF features, if the customer chooses the CE will install all features. IBM installation of orders containing all CIF features will be available using normal chargeable service contracts.

9406 Models S10, S20

Main Storage for 9406 Models S10, S20

Model S10 Main Storage

The 9406 Model S10 #2118 ships with 64M of base main storage with five additional slots available for cards of either 32M or 64M up to a maximum of 384M. On the #2119 processor memory must be installed in pairs. There are six additional slots for main storage. The additional memory options for the #2119 are either 64M (2x32M cards) or 128M (2x64M cards) up to a maximum of 512M.

The configurator will seek to minimize the number of cards used. In addition, IBM may offer feature exchanges on a M-for-M basis to reach a precise memory requirement. There are no feature codes to specify base main storage.

The following lists the main storage for the Model S10.

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2118 (64-384)	64M	#3182 32M #3110 64M
#2119 (128-512)	128M	#3182 32M #3110 64M

9406 Models S10, S20

Model S20 Main Storage

The 9406 Model S20 ships with 256M of base main storage. There are 14 slots available for additional cards of 32M or 128M which must always be added in pairs. Consequently, the minimum increase of main storage is 64M.

There are no feature codes to specify the base memory. The configurator seeks to minimize the cards used. IBM may offer feature exchanges on a M-for-M basis to reach a precise memory requirement.

For Processor #2165 and #2166, a Main Storage Expansion (#2830) is available which provides a further 16 sockets for memory cards.

The following lists the main storage for the Model S20:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2161/#2163 (256-2048)	256M	#3001 32M #3002 128M
#2165/#2166 (256-4096)	256M	#3001 32M #3002 128M

Workstation Controllers for Models S10 and S20

The 9406 Model S10 supports only 5250-type workstations (excluding LAN attachments) while the Model S20 supports both 5250-type and ASCII workstations. See the Summary Tables on page 35 to page 58 for maximums.

The Multifunction I/O Processor, when ordered, has a choice of features that determine whether a 5250-type device (#9720) or a PC (#9721) will be used as a console. If #9721 is selected, then choose one of the following cables:

#0367 Operations Console Cable (requires Version 4 Release 3 and is the default). To enable use of the Remote Control Panel function with Operations Console, order feature #0381 (Remote Control Panel Cable)

#0362 Client Access Console Cable

The Models S10 and S20 do not support system console specify codes.

Refer to page 243 for details on counts towards the maximum of 28 workstations supported on the Model S10 and S20 with Version 4 Release 2. This is an increase from the seven workstations that were supported on the Model S10 and S20 with OS/400 Version 4 Release 1.

The following workstation controllers can be attached to the Model S10 and S20 (SPD are S20 only):

#9720 Base PCI WAN/Twinaxial IOA
#2720 PCI WAN/Twinaxial IOA
#6141 SPD ASCII Workstation Controller
#6142 SPD ASCII 12-Port Attachment

9406 Models S10, S20

Base PCI WAN/Twinaxial IOA #9720

This combined twinax/communication adapter supports 28 twinax devices. It ships with a cable and a 4-port expansion box, with each port supporting seven attached devices. It also supports a single communications line. If #9720 is installed, then #2720 PCI WAN/Twinaxial IOA cannot also be installed on the same system. See Communications on page 205.

PCI WAN/Twinaxial IOA #2720

The #2720 Twinaxial IOA supports up to 28 twinax devices. A cable with a 4-port expansion box comes with the adapter. Each port supports seven attached devices allowing for the 28 attached devices. This adapter also provides a single communication line. If #2720 is installed, then #9720 WAN/Twinaxial IOA cannot be installed on the same system. See Communications on page 205.

SPD ASCII Workstation Controller #6141

The ASCII Workstation Controller, #6141 is a 6-port workstation controller and workstation adapter with a 10 foot attachment cable for attaching up to six ASCII displays and printers. One SPD card slot is required to support #6141 and it is only available on the Model S20.

SPD ASCII 12-Port Attachment #6142

#6142 provides an additional 12 ports to the six provided by #6141 to allow attachment of up to 18 ASCII displays and printers in total. One #6142 may attach per #6141. It is only available on the Model S20.

9406 Models S10, S20

SPD Twinaxial Workstation IOA #6180

The #6180 Twinaxial Workstation IOA provides support for 40 5250-type displays or printers, but is limited to a maximum of 28 displays. A cable with an 8-Port expansion box comes with the adapter. Each port supports seven attached devices subject to the total maximum of 28. This feature requires a #2629 LAN/WAN/Workstation SPD IOP (see MF IOP) as a prerequisite and it is only available on the Model S20.

The following feature is only supported on the Model S20 as a migration feature:

#6050 SPD Twinaxial Workstation Controller

Multi-Function I/O Processor (MFIOP) on Models S10 and S20

A base MFIOP comes standard on all 9406 Model S10 and S20 systems. Certain other IOP cards support several functions, so the term MFIOP is not just limited to the base MFIOP.

PCI Base Multi-Function IOP (MFIOP)

The base MFIOP provides support for four PCI card slots, one of which is the high-speed PCI card slot used for the disk controller. It also drives one Integrated PC Server. The slots in the MFIOP are of different speeds and consequently support different features.

High-speed slot (C11)	PCI Disk Unit Controller (#2726, #2740, or #2741) or Base PCI Disk Unit Controller (#9728)
Low-speed slot (C09)	PCI WAN/Twinaxial IOA (#9720) or PCI Two-Line WAN IOA (#9721)
Low-speed slots (C08 and C10)	PCI WAN/Twinaxial IOA (#2720) PCI Two-Line WAN IOA (#2721) PCI 10 Mbps Ethernet IOA (#2723/#9723) PCI 16/4 Mbps Token-Ring IOA (#2724/#9724)
Integrated PC Server slots (C06 and C07)	PCI Integrated PC Server (#2851 or #2854)

The MFIOP will not support two LAN adapters in slots C08 and C10. There is a further restriction that when a PCI Integrated PC Server (#2851 or #2854) is installed in C06/C07, WAN/Twinax IOA #2720 is not allowed in Slot C08 and LAN cards are not allowed in Slots C08 or C10.

9406 Models S10, S20

SPD LAN/WAN/Workstation IOP #2629

This is an SPD adapter that is only available on the S20. It uses one SPD slot and will support up to three of the following IOAs.

- #2699 Two-Line WAN IOA
- #6149 16/4 Mbps Token-Ring IOA
- #6180 Twinaxial Workstation IOA
- #6181 Ethernet/IEEE 802.3 IOA

One #2629 will support any combination of adapters with the following restriction:

There is a maximum of two LAN IOAs

Up to seven #2629 may be placed into each 1063 Mbps System Unit Expansion Tower #5072. #2629 is not allowed in Slot 14 of tower #5072. No restrictions apply when using #2629 with #5073.

PCI LAN/WAN/Workstation IOP #2809

This IOP can be used for attaching LAN, WAN, and workstation IOAs to the system. The #2809 can support different combinations of cards, depending upon which of the one system unit position (Model S10 or S20); and which of the three #5064 System Unit Expansion positions (Model S20 only) the IOP is installed in:

System Slot C03

Models S10 and S20. The #2809 supports PCI features installed in system unit positions C01, C02, C04, and C05. In high-speed slot C01, it supports the PCI 100/10M Ethernet IOA (#2838 or #9738) or one of the PCI ATM IOAs (#281x). In the high-speed Slot C02, it supports the PCI Magnetic Media Controller (#2729) and in slots C04 and C05 supports any one or two of the following:

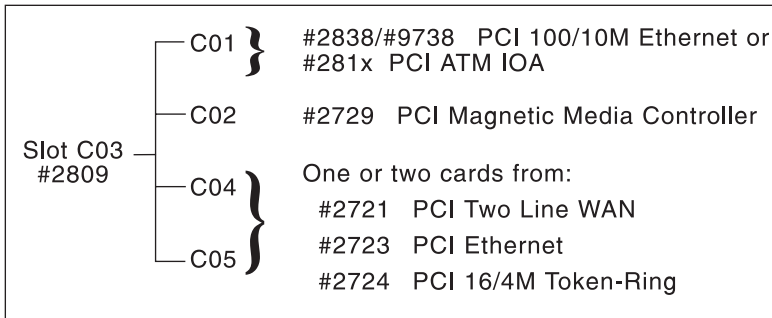
- #2721 PCI Two-Line WAN IOA
- #2723 PCI Ethernet IOA
- #2724 PCI 16/4M Token-Ring IOA

However, if the 100/10M Ethernet card is installed on this #2809, then the only allowable feature in positions C04 and C05 is

9406 Models S10, S20

feature #2721. Also, if the #2851 or #2854 PCI Integrated PC Server is installed in Slots C06 and C07, then it is the IPCS that controls C04 and C05. They are not available to the #2809.

Subject to the restrictions mentioned, this is illustrated by:



System Unit Expansion (SUE) position E15 on Model S20

A base PCI LAN/WAN/Workstation IOP comes as standard with the PCI Integrated Expansion Unit #9329 and is located in Slot E15. There is no feature required to identify this card. It provides support for three PCI card slots, one high-speed PCI card slot (which is reserved solely for the SUE disk controller) and also drives one Integrated PC Server.

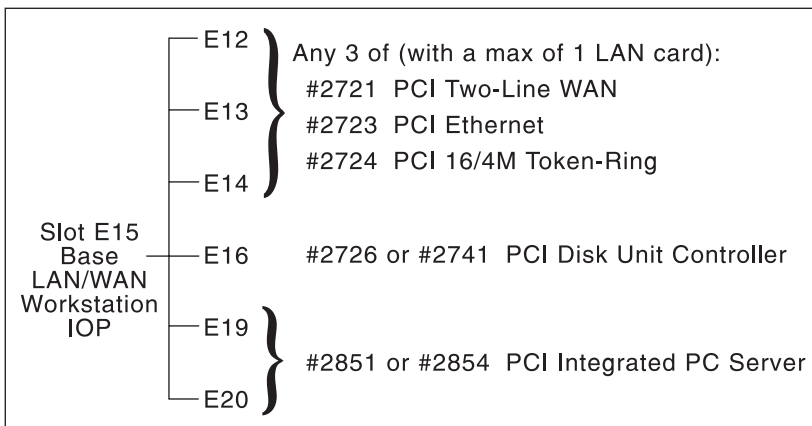
In the high-speed Slot E16, it will only support #2726 or #2741 PCI Disk Unit Controller. In Slots E12, E13, and E14 it will support any three of the following--with a maximum of one LAN card:

- #2721 PCI Two-Line WAN IOA
- #2723 PCI Ethernet IOA
- #2724 PCI 16/4M Token-Ring IOA

When a #2851 or #2854 PCI Integrated PC Server is installed in SUE Slots E19/E20, then no LAN IOAs are allowed in Slots E12, E13, and E14.

9406 Models S10, S20

Subject to the restrictions mentioned above, this is illustrated by:



System Unit Expansion (SUE) Slot E05 or E10 on Model S20

The #2809 provides support for three PCI card slots and one high-speed PCI card slot.

In the high-speed card slot (E06 or E11), it supports either a #2838 PCI 100/10M Ethernet IOA, a #281x PCI ATM IOA or a #2729 PCI Magnetic Media Controller only.

In the PCI card slots (E02, E03, E04 or E07, E08, E09), three of the following are supported, only two may be LAN cards:

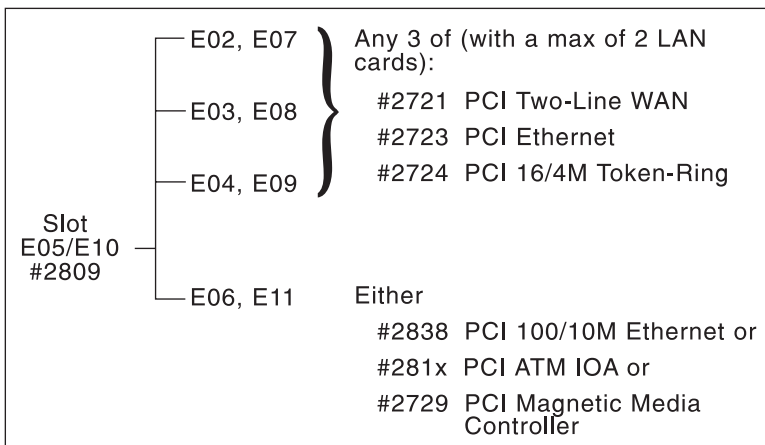
- #2721 PCI Two-Line WAN IOA
- #2723 PCI Ethernet IOA
- #2724 PCI 16/4M Token-Ring IOA

However, if #2838 PCI 100/10M Ethernet IOA is installed, then the first slot (E02, E07) becomes unavailable and only the #2721 PCI Two-Line WAN IOA is allowed in the remaining slots.

If the #2729 PCI Magnetic Media Controller is installed in E06/E11, then only one LAN card is allowed, however not in positions E02/E07.

9406 Models S10, S20

Subject to the restrictions mentioned above, this is illustrated by:



The #2809 requires one PCI card position. There is a maximum of one in the base system unit and two in the #9329 PCI Integrated Expansion Unit, plus the Base LAN/WAN/Workstation IOP included as standard with #9329.

There may be performance implications in intermixing other communication features on a #2809 when a #2838 PCI 100/10M Ethernet is installed. Therefore this should be avoided.

The numbers of PCI cards used in the system is dependent on the numbers of controllers. Care must be taken in the selection of the controllers and the configuration rules should always be followed.

9406 Models S10, S20

Communications for 9406 Models S10 and S20

Model	Total Communications Lines
S10	9*
S20	96†

Notes:

* Maximum on S10 is 10 if there is a PC Console

† An ISDN adapter (#2605) is counted as two lines

The following controller and adapters support communications on the Model S10 and S20 (SPD are S20 only).

#2699	SPD Two-Line WAN IOA
#2720	PCI WAN/Twinaxial IOA
#2721	PCI Two-Line WAN IOA
#9720	PCI Base WAN/Twinaxial IOA
#9721	PCI Base Two-Line WAN IOA
#2623	SPD Six-Line Communications Controller
#2620	SPD Cryptographic Processor
#2628	SPD Cryptographic Processor-Commercial
#2664	SPD Integrated Fax Adapter

SPD Two-Line WAN IOA #2699

The #2699 supports up to two multiple protocol communications ports where one or two (in any combination) of the following cable features are attached:

Cable Length	Attachment			
	EIA232 V.24	EIA449/ V.36	V.35	X.21
20ft/6m	#0330	#0335	#0338	#0341
50ft/15m	#0331	#0336	#0339	#0342
80ft/24m	N/A	N/A	#0340	N/A
150ft/45m	N/A	#0337	N/A	N/A

9406 Models S10, S20

#2629 LAN/WAN/Workstation IOP is a prerequisite for this feature and the #2699 takes up one of the three slots on the #2699. It is only available on the Model S20.

PCI WAN/Twinaxial IOA #2720

This combined twinax/communication adapter (mutually exclusive with #9720) will support one multiple protocol communications port based on which one of the following cables is attached:

Cable Length	Attachment			
	EIA232 V.24	V.35	EIA449/ V.36	X.21
20ft/6m	#0348	#0353	#0356	#0359
50ft/15m	#0349	#0354	N/A	#0360
80ft/24m	#0365	#0355	N/A	N/A
150ft/45m	N/A	N/A	#0358	N/A

PCI Two-Line WAN IOA #2721

Attaches using a #2809 or base MFIOP and will support up to two multiple protocol communication ports when one or two of the following cables are attached:

Cable Length	Attachment			
	EIA232 V.24	V.35	EIA449/ V.36	X.21
20ft/6m	#0348	#0353	#0356	#0359
50ft/15m	#0349	#0354	N/A	#0360
80ft/24m	#0365	#0355	N/A	N/A
150ft/45m	N/A	N/A	#0358	N/A

9406 Models S10, S20

Base PCI WAN/Twinaxial IOA #9720

Feature on base MFIOP (mutually exclusive with #2720 and #9721) and is included to support ECS on the communication adapter. One of the following cables must be selected:

- #0348 V.24/EIA232 20ft/6m PCI Cable
- #0349 V.24/EIA232 50ft/15m PCI Cable
- #0365 V.24/EIA232 80ft/24m PCI Cable

This adapter also supports twinax workstations. See the description under Workstation Controllers.

Base PCI Two-Line WAN IOA #9721

Feature on base MFIOP (mutually exclusive with #9720) which supports ECS and Client Access Console on its two communication ports. One of the following cables must be selected:

- #0348 V.24/EIA232 20ft/6m PCI Cable
- #0349 V.24/EIA232 50ft/15m PCI Cable
- #0365 V.24/EIA232 80ft/24m PCI Cable

One of the following console cables must also be selected:

- #0367 Operations Console Cable (requires Version 4 Release 3 and is the default)

To enable use of the Remote Control Panel function with Operations Console, order feature #0381 (Remote Control Panel Cable).

- #0362 Client Access Console Cable

Communication Restrictions

If using any of the following communications functions, restrictions may apply. In particular, this applies when using PCI Two-Line WAN IOA #2721, SPD Two Line WAN IOA #2699, or the IPX protocol. (IPX is used over LAN adapters, ATM, or over frame relay).

Frame relay protocol

IPX protocol

9406 Models S10, S20

X.25 with more than 16 virtual circuits per line

SDLC Protocol if used to connect to more than 64 remote sites

Communications line speeds greater than 64 Kbps for the synchronous PPP, X.25, SDLC, or frame relay protocols (Bisync is always limited to a maximum of 64 Kbps)

Non-async communications line speeds greater than 64 Kbps and up to 640 Kbps for X.25

Additional information is available in the file called AS4CNFG PACKAGE on Marketing Tools. This is a comprehensive document with details on communications restrictions which apply in a number of different circumstances. This document should be consulted for full details on what these restrictions are. Customers should be able to obtain this document from their local IBM sales office.

Six-Line Communications Controller #2623

The Six-Line Communications Controller (SLCC) is a SPD card that attaches to the Model S20. It provides attachment for a wide range of AS/400 communications adapters. While the #2623 will continue to support all past functions, it is only orderable on the Model S20 where there is a requirement for the #2605 ISDN adapter. Two #2605s can fit onto a #2623. For full description of #2623 please refer to page 146.

9406 Models S10, S20

Other Communications Adapters Available

The following optional communications adapters can be added to the Model S20:

ISDN Adapter #2605

Requires one ISDN dedicated #2623. For full description see page 147.

Cryptographic Processor #2620

Requires one SPD slot. For full description see page 150.

Cryptographic Processor–Commercial #2628

Requires one SPD slot. For full description see page 151.

Integrated Fax Adapter #2664

Requires one SPD slot. For full description see page 151.

The following are only supported in the Model S20 as migration features:

- #2666 High-Speed Communications Adapter
- #26xx Adapters attached to #2623 Six-Line Communications Controller

9406 Models S10, S20

Local Area Networks and Asynchronous Transfer Mode for 9406 Models S10, S20

The 9406 Model S10 and S20 base system includes one of the following base LAN adapters at no charge:

- #9723 PCI Ethernet IOA
- #9724 PCI 16/4 Mbps Token-Ring IOA
- #9738 PCI 100/10 Mbps Ethernet IOA

Other adapters and controllers supporting LAN and ATM attachment on the 9406 Model S10 and S20 (SPD are S20 only):

- #2723 PCI Ethernet IOA
- #2724 PCI 16/4 Mbps Token-Ring IOA
- #2811 PCI 25 Mbps UTP ATM IOA
- #2812 PCI 45 Mbps Coax T3/DS3 ATM IOA
- #2815 PCI 155 Mbps UTP OC3 ATM IOA
- #2816 PCI 155 Mbps MMF ATM IOA
- #2818 PCI 155 Mbps SMF OC3 ATM IOA
- #2819 PCI 34 Mbps Coax E3 ATM IOA
- #2838 PCI 100/10 Mbps Ethernet IOA
- #2851 PCI Integrated PC Server
- #2854 PCI Integrated PC Server
- #6149 PCI 16/4 Mbps Token-Ring IOA
- #6181 PCI Ethernet IOA
- #6616 SPD Integrated PC Server
- #6617 SPD Integrated PC Server

The ATM adapters announced in February 1998 are not available in all countries and are also subject to country homologation requirements which may also limit availability.

The following table identifies the maximum number of LAN and ATM ports allowed.

Model	System Maximum of LAN and ATM Ports
S10	3
S20	16

9406 Models S10, S20

	Maximum Number of ATM IOAs	
	Model S10	Model S20
#281x ATM IOA on #2810 (SPD)	0	16
#281x ATM IOA on #2809 (PCI)	1	3

PCI Ethernet IOA #2723/#9723

Provides a single attachment to one Carrier Sense Multiple Access/Collision Detect Local Area Network. It consists of an adapter card and internal code which supplies Ethernet Version 2 and IEEE 802.3 Media Access Control (MAC) plus 802.2 Logical Link Control (LLC) functions. The Ethernet/IEEE 802.3 IOA is capable of operating in half or full duplex mode. It takes one PCI card slot. It has a RJ45 connector and a 15-pin D-shell connector for attachment of customer-supplied cabling. A vendor AUI Ethernet cable or RJ45 twisted-pair cable must be ordered separately.

#2723/#9723 can also be driven by the #2851 or #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

#9723 is the base LAN option on the Model S10 or S20.

PCI 16/4 Mbps Token-Ring IOA #2724/#9724

This feature provides a single attachment to either 16 Mbps or a 4 Mbps Token-Ring. The feature consists of an IOA card, internal code which supplies IEEE 802.5 Media Access Control (MAC), and IEEE 802.2 Logical Link Control (LCC) functions. The IOA is capable of operating in half or full duplex mode.

The #2724 comes with an 8ft/2.44m Token-Ring cable, or a separately purchased twisted-pair cable to the RJ45 connection on the IOA may be attached. It occupies one PCI card slot.

#2724/#9724 can also be driven by the #2851 or #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

9406 Models S10, S20

#9724 is the base LAN option on the Model S10 and S20.

PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Unshielded Twisted Pair (UTP) cabling. #2811 will typically be used where 25 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2811 can also be used on the Model S20 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using coaxial cabling and the T3/DS3 interface. #2812 will typically be used where 45 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2812 can also be used on the Model S20 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA #2815

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Unshielded Twisted Pair (UTP-5) interface. It is intended for connection to both local area switches and to service provider equipment. #2815 will typically be used where 155 Mbps speeds are required over distances of less than 100 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2815 can also be used on the Model S20 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Multi-Mode Fiber (MMF) 62.5 micron interface. It is intended for connection to both local area switches and for direct connection to service provider equipment. #2816 will typically be used where 155 Mbps speeds are required over distances of less than 2 kilometers. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2816 can also be used on the Model S20 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using the Single-Mode Fiber (SMF) 9 micron interface. This interface is intended primarily for direct connection to service provider equipment but can be used for local area switches. #2818 will typically be used where 155 Mbps speeds are required over distances from 16 to 40 kilometers. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2818 can also be used on the Model S20 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

PCI 34 Mbps Coaxial E3 ATM IOA #2819

This feature allows the AS/400 to be attached to an Asynchronous Transfer Mode (ATM) network using Coaxial cabling and the E3 interface. #2819 will typically be used where 34 Mbps speeds are required over distances of less than 1000 meters. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP #2809 is a prerequisite. #2819 can also be used on the Model S20 when attached to a #2810 SPD LAN/WAN IOP (see page 153).

9406 Models S10, S20

PCI 100/10 Mbps Ethernet IOA #2838/#9738

The 100 Base-X Ethernet PCI adapter feature will allow the AS/400 to attach to standardized 100 Mbps high-speed Ethernet LANs and will also allow attachment to existing 10 Mbps Ethernet LANs. The adapter comes with an RJ45 connector for attachment to UTP-5 media. It requires one high-speed PCI card slot. The PCI LAN/WAN/Workstation IOP, #2809, is a prerequisite. #2838/#9738 can also be used on the Model S20 systems when attached to a #2810 SPD LAN/WAN IOP (see page 153).

#9738 is the base LAN option on the Model S10 and S20.

	Maximum Number of #2838/#9738	
	Model S10	Model S20
#2838 on #2810 (SPD)	0	16
#2838 on #2809 (PCI)	1	3
#9738 on #2809/#2810	1	1

#2838/#9738 can also be driven by the #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

PCI Integrated PC Server #2851

The Integrated PC Server (IPCS) contains an Intel 166 MHz Pentium processor, four main storage slots, and two LAN IOA slots. The IPCS provides high performance serving to LAN attached PCs. OS/2 Warp Server for AS/400, Novell NetWare, Lotus Domino, Flowmark, and Firewall for AS/400 are supported on the Integrated PC Server. This adapter requires two (reserved) PCI card positions. One is for the processor card, and one for a bridge card which acts as the interface to the system. The PCI IPCS comes with 32M of memory and supports up to three of the following additional memory features giving a maximum of 128M of main storage:

- #2860 - 16M Memory for Integrated PC Server
- #2861 - 32M Memory for Integrated PC Server

9406 Models S10, S20

One or two of the following LAN IOA features must be in the Integrated PC Server:

- #2723 - PCI Ethernet IOA
- #2724 - PCI 16/4 Mbps Token-Ring IOA

Reserved slot positions exist in the Model S10/S20 System Units and in the #9329 PCI Integrated Expansion Unit on the Model S20 for the #2851 Integrated PC Server. #2724 can also be driven by the #2854 PCI Integrated PC Server or #6617 SPD Integrated PC Server. See the descriptions of these features for more details.

PCI Integrated PC Server #2854

The Integrated PC Server (IPCS) contains an Intel 200 MHz Pentium Pro processor, four main storage slots, and two LAN IOA slots. The IPCS provides high performance serving to LAN attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Microsoft Windows NT Server are supported on the Integrated PC Server. This adapter requires two (reserved) PCI card positions. One is for the processor card, and one for a bridge card which acts as the interface to the system. The IPCS also comes with a special cable which translates the connector on the back of the bridge card to industry standard keyboard, mouse, serial, and parallel connectors. Between one and four of the following memory features must be installed in the Integrated PC Server allowing between 32M and 512M of main storage:

- #2861 - 32M Memory for Integrated PC Server
- #2862 - 128M Memory for Integrated PC Server

One or two of the following LAN IOA features must be installed in the Integrated PC Server:

- #2723/#9723 - PCI Ethernet IOA
- #2724/#9724 - PCI 16/4 Mbps Token-Ring IOA
- #2838/#9738 - PCI 100/10 Mbps Ethernet IOA

#9723, #9724, or #9738 specify the base LAN on the 9406 Model S10 and S20.

9406 Models S10, S20

Only one of the LAN IOAs can be a #2838/#9738 100/10 Mbps Ethernet IOA. If #2838/#9738 is run on the #2854 Integrated PC Server, then #0222 100/10 Mbps Ethernet on IPCS is required.

If Windows NT is running on the #2854 Integrated PC Server, then the following are also available for attachment to the IPCS:

- #0325 IPCS Extension Cable for Windows NT (required)
- #1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries)
- A display must be connected to the IPCS to support Windows NT

For keyboard/mouse and display support in countries outside the USA, the Internet at <http://www.as400.ibm.com> should be consulted.

Reserved slot positions exist in the Model S10/S20 System Units and in the #9329 PCI Integrated Expansion Unit on the Model S20 for the #2854 Integrated PC Server.

SPD LAN Features for Attachment to the Model S20

LAN/WAN IOP #2810

This IOP is used in SPD cages for attaching the #2838/#9738 PCI 100/10 Mbps Ethernet IOA or one of the #281x PCI ATM IOAs. It is a high workload IOP and has configuration limitations.

16/4 Mbps Token-Ring IOA #6149

Uses the #2629 LAN/WAN/Workstation IOP (the #2629 requires one SPD slot) or the #6616 IPCS (which requires two adjacent SPD slots). For full description see page 155.

Ethernet/IEEE 802.3 IOA #6181

Uses the #2629 LAN/WAN/Workstation IOP (one #2629 requires one SPD slot) or the #6616 IPCS (which requires two adjacent SPD slots). For full description see page 155.

9406 Models S10, S20

Integrated PC Server #6616

Requires two contiguous SPD slots. For full description see page 156.

Integrated PC Server #6617

Requires three contiguous SPD slots. For full description see page 156.

The following are also supported on the Model S20 but only for migration:

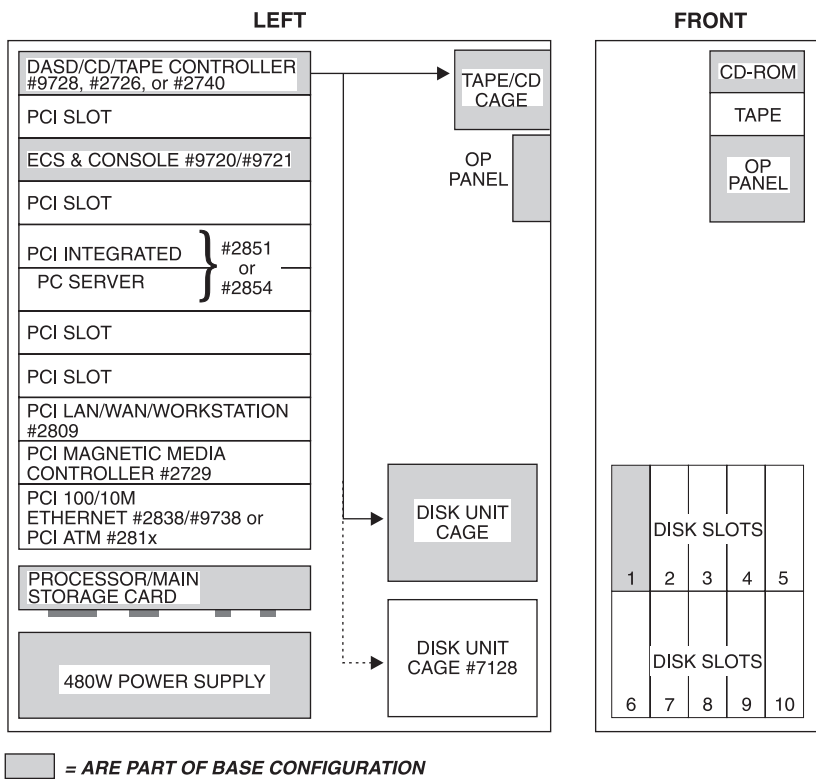
- #2617 Ethernet Adapter/HP
- #2618 FDDI Adapter
- #2619 Token-Ring Adapter/HP
- #2626 Token-Ring Adapter/A
- #2665 SDDI Adapter
- #2668 Wireless LAN Adapter
- #6516/7/8/9 Integrated PC Server (formerly FSIOP)
- #6526/7/8/9 Integrated PC Server (formerly FSIOP)
- #6520 Upgrade One-Port (#6516/7/8/9) Integrated PC Server to Two-Port
- #6509 Additional 16M Integrated PC Server (#65xx) Memory

9406 Models S10, S20

Power and Packaging for the 9406 Models S10, S20

9406 Model S10 System Unit

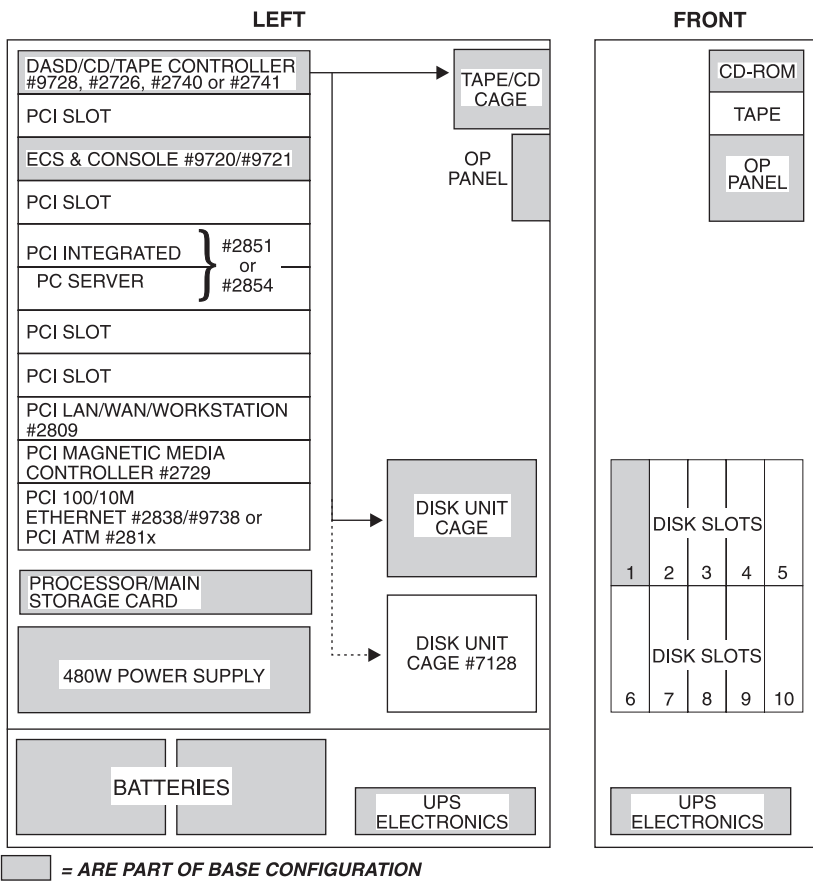
The following schematic diagram shows the system layout for the 9406 Model S10:



Note: Base PCI LAN card can be placed in a number of slots.

9406 Models S10, S20

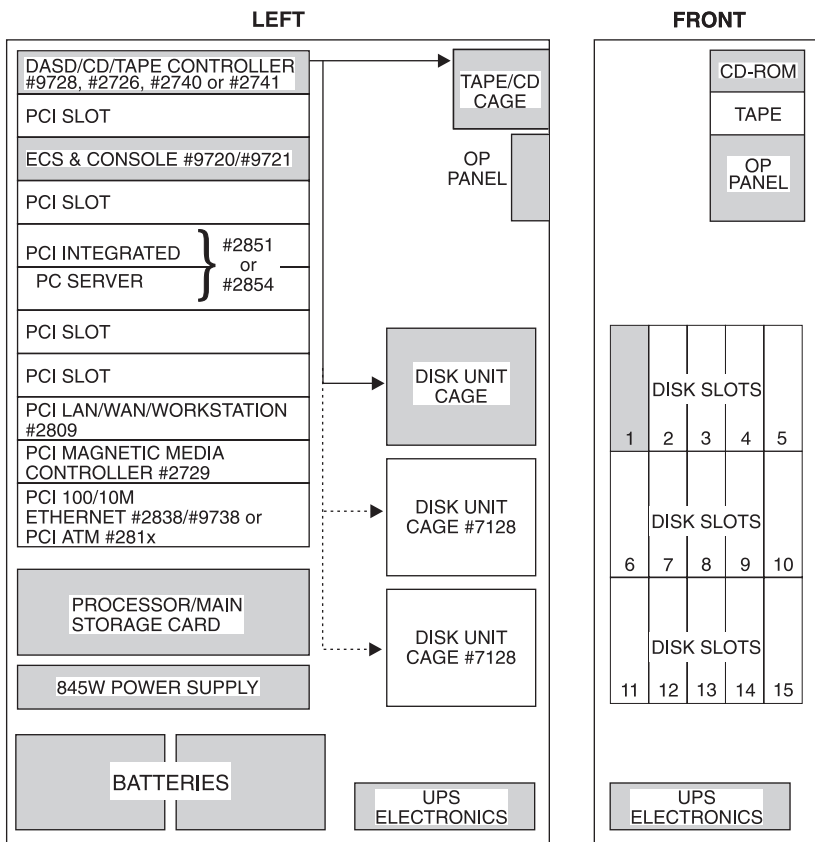
9406 Model S20 System Unit #2161



Note: Base PCI LAN card can be placed in a variety of slots.

9406 Models S10, S20

9406 Model S20 System Unit #2163, #2165, #2166

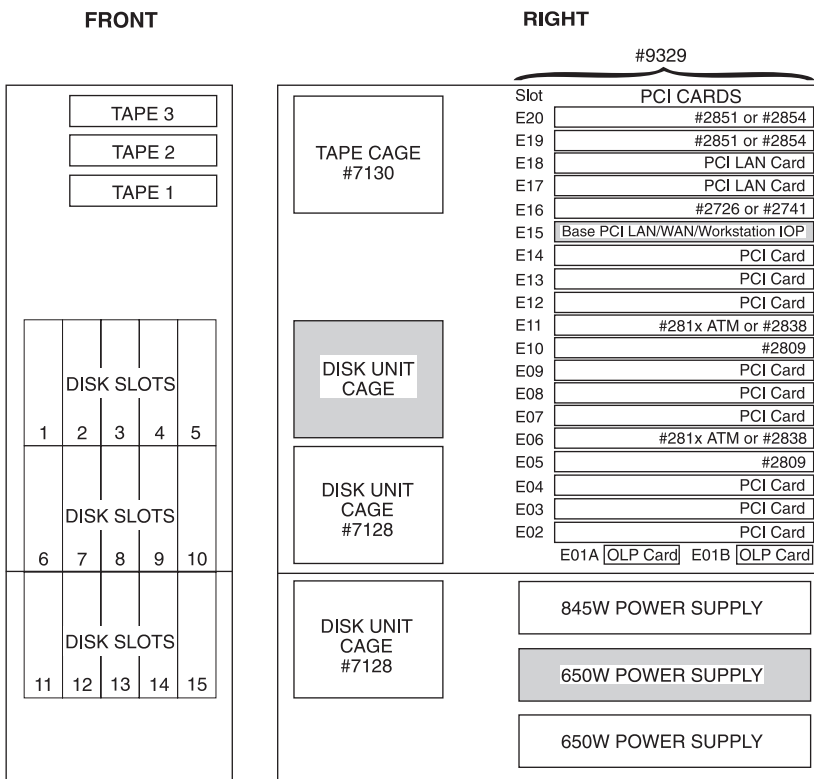


 = ARE PART OF BASE CONFIGURATION

Note: Base PCI LAN card can be placed in a number of slots.

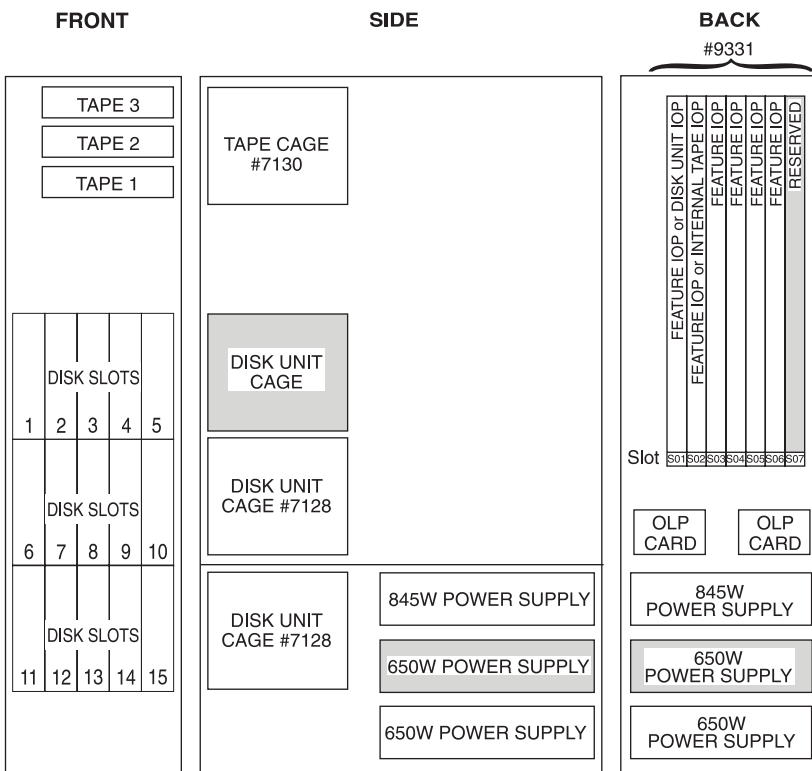
9406 Models S10, S20

PCI Expansion Unit #5064 Layout with #9329



9406 Models S10, S20

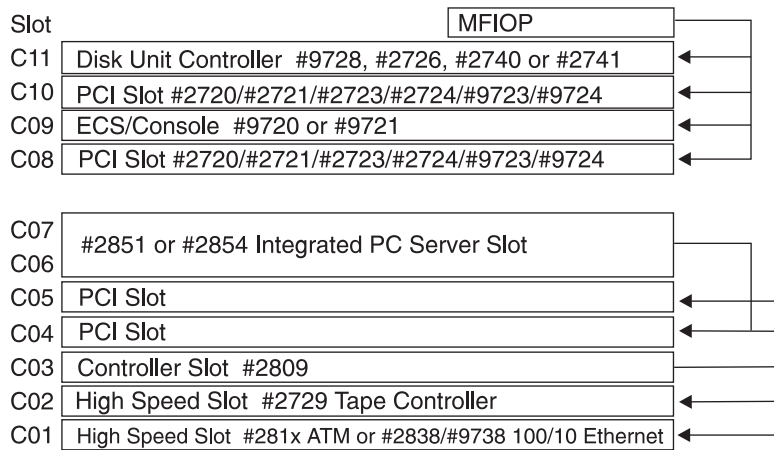
SPD Expansion Unit #5064 Layout with #9331



9406 Models S10, S20

Base System Unit

The base system supports five disk units, one tape unit, and one CD-ROM. It supports concurrent maintenance of the disk units. The base system unit includes a PCI controller (MFIOP) and further slots as illustrated below. Card slots C04 and C05 have special characteristics and are capable of being controlled from two slots. If an Integrated PC Server is in slots C06 and C07, then this will drive C04 and C05. If, however, there is no IPCS in its reserved position, then the controller in slot C03 drives C04 and C05.



Please refer to page 200 for rules governing the placing of cards in the PCI slots C08 and C10.

Internal Expansion Features

System Unit Expansion (SUE) #5064

For diagrams, see page 221 and page 222. This feature includes a standard DASD cage supporting up to five disks; and allows the addition of either an SPD or PCI Card Expansion Unit (#9329 or #9331 respectively); a #7130 Expansion Unit Tape/Cage to support up to three additional tape units; and up to two #7128 DASD Expansion Units to support up to a total of 15 disk units. It is an

9406 Models S10, S20

optional feature on the Model S20 and must be ordered with either the PCI card unit (#9329) or the SPD card unit (#9331).

DASD Expansion Unit #7128

This feature allows the addition of five disk units to either the System Unit or the #5064 System Unit Expansion. It supports concurrent maintenance of these disks. Disks supported by the #7128 are described on page 228.

Maximum	Processor/Feature
1	Model S10 #2118, #2119
1	Model S20 #2161
2	Model S20 #2163, #2165, #2166
2	#5064 System Unit Expansion

Expansion Unit Tape/Cage #7130

This feature allows the addition of three internal tape units to the #5064. A tape controller is required to support these tape devices.

New Tape Feature	Migrated Tape Feature	Media	PCI Controller	SPD Controller
--	#1349	1.2G ¼"	#2726 #9728 #2740 #2741	#6513
--	#1350	2.5G ¼"		
#6485	#1355	13G ¼"		
--	#1360	7G 8mm		
#6481	--	2.5G ¼"		
#6482	--	4G ¼"		

Only 2-byte tape devices (the #6485 ¼" cartridge) are supported in the third position.

9406 Models S10, S20

PCI Integrated Expansion Unit #9329

This feature allows the addition of up to 14 PCI adapter cards (in 11 PCI card slots and three high-speed PCI card slots) driven by three PCI controllers and one Integrated PC Server (IPCS). It also includes two Optical Link Processor card slots to support up to four external towers. A base PCI LAN/WAN/workstation IOP controller is included in slot E15 with the #9329. This is the same as #2809 but no feature is required as it is standard on all #9329 PCI Integrated Expansion Units. The positioning of certain cards in particular slots can restrict further card placement (see details on #2809 PCI LAN/WAN/Twinaxial IOP on page 201). For a diagram of the layout of #9329 see page 221.

Expansion Unit for SPD Cards #9331

This feature allows the addition of up to six SPD cards and up to two Optical Link Processor cards (to support up to four external towers). An SPD controller card drives these cards and is included with the #9331. For a diagram of the layout of #9331 see page 222.

9406 Models S10, S20

External Towers

The following Expansion Towers and Units can attach to the #9329 or #9331.

Feature	Description	Prerequisites
#5052	Storage Expansion Unit	#5143 and #5072 or #5082 and one of #6502, #6512, #6530, #6532
#5058	Storage Expansion Unit	#5073 or #5083 and one of #6502, #6512, #6530, #6532, #6533
#5072	1063M System Unit Expansion Tower	One port on OLP card #2688 in System Unit Expansion #5064
#5073	1063M System Unit Expansion Tower	One port on OLP card #2688 in System Unit Expansion #5064
#5082	1063M Storage Expansion Tower	One of #6502, #6512, #6530, #6532, #6533 and One port on OLP card #2688 in System Unit Expansion #5064
#5083	1063M Storage Expansion Tower	See #5082

Full details on these will be found on pages 161 to 165.

Expansion Tower I/O Features

Optical Link Processor (1063 Mps) #2688

Used for attaching #5072, #5082, #5073, and #5083 Expansion Towers. One can attach two towers. It requires an Optical Link Processor position on the #9329 or #9331.

Internal Disk Units for 9406 Models S10, S20

A base disk unit of 4.19G is standard on all new Models S10 and S20, and on upgrades from IMPI Models. This feature shows as #9707. This can be changed to an 8.58G file (#8813) or a 17.54G file (#8824) if required on new systems.

9406 Models S10, S20

Disks of 17.54G, 8.58G, 4.19G, 1.96G, and 1.03G can be migrated from older AS/400 models. Support is not available for 320M, 400M, 640M, 800M, and 988Mb disks. Disks being converted from earlier generation AS/400 may need a conversion kit.

All S10 and S20 models support concurrent maintenance of internal disks when the disks are mirrored or part of a RAID-5 array. On the S20 integrated hardware disk compression is enabled using the #2741 and #6533 disk unit controllers. Disk compression is not supported for the 17.54G disk units (#1334, #6714, #6824, and #8824). IBM intends to provide compression for 17.54G disk units in a future release of OS/400. A discussion of integrated hardware disk compression can be found on page 442.

9406 Models S10, S20

The disk support is summarized below:

Storage Expansion Units/Towers Internal Disk Support

Internal Disks		Storage Expansion Units and Towers					Mirror (4)	RAID (5)	
Feature	Description	Sys-tem Unit	#5064	#5052	#5058	#5082			#5083
#1312	1-Byte 1.03G Disk Unit Kit	X	X					5	B
#1313	1-Byte 1.96G Disk Unit Kit	X	X					4	A
#1322	2-Byte 1.03G Disk Unit Kit	X	X					5	B
#1323	2-Byte 1.96G Disk Unit Kit	X	X					4	A
#1325	2-Byte 1.03G Disk Unit Kit	X	X					5	B
#1326	2-Byte 1.96G Disk Unit Kit	X	X					4	A
#1327	2-Byte 4.19G Disk Unit Kit	X	X					6	C
#1333	2-Byte 8.53G Disk Unit Kit	X	X					7	D
#1334	2-Byte 17.54G Disk Unit Kit	X	X					8	E
#1336	2-Byte 1.96G Disk Unit Kit	X	X					4	A
#1337	2-Byte 4.19G Disk Unit Kit	X	X					6	C
#1602	Single Disk Unit Kit (1.03G)			X(1)	X(1)			5	B
#1603	Single Disk Unit Kit (1.96G)			X(1)	X(1)			4	A
#6605	1.03G Disk Unit/A			X	X	X	X	5	B
#6606	1.96G Disk Unit/A			X	X	X	X	4	A
#6607	4.19G Disk Unit/A			X	X	X	X	6	C
#6650	Additional Disk Unit (1.96G)			X	X	X	X	4	A
#6652	Additional Disk Unit (1.03G)			X	X	X	X	5	B
#6713	8.58G Disk Unit			N(3)	N(2)	N(3)	N(2)	7	D
#6714	17.54G Disk Unit			N(3)	N(2)	N(3)	N(2)	8	E
#6806	1.96G Disk Unit	N	N					4	A
#6807	4.19G Disk Unit	N	N					6	C
#6813	8.58G Disk Unit	N	N					7	D
#6824	17.54G Disk Unit	N	N					8	E
#6906	1.96G Disk Unit			N(3)	N(2)	N(3)	N(2)	4	A
#6907	4.19G Disk Unit			N(3)	N(2)	N(3)	N(2)	6	C
#8813	Opt Base 8.58G Disk Unit	N	N					7	D
#8824	Opt Base 17.54G Disk Unit	N	N					8	E
#9707	Base 4.19G Disk Unit	N	N					6	C

Notes:

- (1) Single-byte disks cannot be placed into Slots K8 through K16.
 - (2) For best performance, use with an Ultra-SCSI disk unit controller (#6532 or #6533).
 - (3) No Ultra-SCSI when attached to this storage expansion unit.
 - (4) Like numbered disks can mirror each other.
 - (5) Like lettered disks can be part of the same RAID array.
- N Available as new disk.

Disk Feature Conversion/Kits for Upgrades

The base System Unit of the Model S10 and S20 supports up to five disk units. Disk Unit Cage #7128 can be added and supports an additional five disk units. One #7128 can be added to the Model S10 and S20 with Processor #2161. Two #7128s can be added to the Model S20 with Processor #2163, #2165, or #2166. On the Model S20, the Expansion Unit #5064 has space for five disk units. It can add up to two #7128 Disk Unit Cages.

If there are more than five disks located in the System Unit, or if disks are located in the Expansion Unit #5064 with the #9329 Expansion Unit for PCI Cards option. In either case, PCI Raid Disk Unit Controller #2726, #2740 or #2741 will be required to support these disks. A maximum of one #2726, #2740 or #2741 is supported in the System Unit. It will replace Base PCI Disk Unit Controller #9728 which only supports a maximum of only five disk units and does not support RAID. #2741 is not supported on the Model S10. A maximum of one #2726 or #2741 is supported in the #5064. For more details on #2726, #2740 or #2741 see page 368.

If there are disks located in #5064 with #9331 Expansion Unit for SPD Cards, then one #6532 or #6533 RAID Disk Unit Controller will be required to support these disks. For more details on #6532 or #6533 see page 362.

Further internal disks may be located in Storage Expansion Tower #5083 or Storage Expansion Unit #5058. For more information on these see page 165.

The #2726, #2740 or #2741; and #6532 or #6533 support RAID-5 for disks located in the System Unit or System Unit Expansion. For details on RAID-5 see page 170.

9406 Models S10, S20

Internal Tape, CD-ROM, and Diskette Units for Models S10, S20

The following internal tape units are supported in the Model S10 and S20 System Unit and #5064 System Unit Expansion:

Feature	Size	One/Two Byte	SCSI Type	Migrated/New
#1349	1.2G ¼"	1	Fast	Migrated
#1350	2.5G ¼"	1	Fast	Migrated
#1355	13G ¼"	2	Fast	Migrated
#1360	7G 8mm	1	Fast	Migrated
#6481	2.5G ¼"	1	Fast	New
#6482	4G ¼"	1	Fast	New
#6485	13G ¼"	2	Fast	New

The following internal tape units are supported in the #5072 and #5073 System Expansion Towers attached to the Model S20 only:

Feature	Size	One/Two Byte	SCSI Type	Migrated/New
#1379	1.2G ¼"	1	Fast	Migrated
#1380	2.5G ¼"	1	Fast	Migrated
#6380	2.5G ¼"	1	Fast	New
#6381	2.5G ¼"	1	Fast	New
#6382	4G ¼"	1	Fast	New
#6385	13G ¼"	2	Fast	New

The 9406 Model S10 and S20 System Unit can accommodate one internal tape unit and the base CD-ROM drive. The 9406 Model S20 #5064 System Unit Expansion can accommodate up to three internal tape units. The #9728 Base PCI Disk Unit Controller or #2726, #2740, or #2741 PCI RAID Disk Unit Controller supports the CD-ROM drive and the first tape unit. For the Model S20, tape units situated in the #5064 System Unit Expansion will require a tape

9406 Models S10, S20

controller. For #5064 with #9329 PCI Integrated Expansion this will be the #2726 or #2741 PCI RAID Disk Controller. For the #5064 with #9331 Expansion Unit for SPD cards this is the #6513 Internal Tape Controller.

On the Model S20 the System Unit Expansion Tower (#5073) can accommodate up to four internal tape units. They are supported by a Storage Device Controller (#2624) which supports a maximum of three internal tape units or by an Internal Tape Device Controller (#6513) which supports a maximum of four internal tape units. #6513 will be the default on new orders.

Concurrent maintenance of tape and CD-ROM is supported in the S20 System Unit, #5064 System Expansion Unit, and expansion towers. It is not supported on the Model S10.

The following are the current internal tapes and CD-ROM drives that are supported. The other tapes shown in the table above are supported for migration when upgrading to the 9406 Model S10 or S20.

Base CD-ROM Drive

Code for AS/400e series Models will be distributed on CD-ROM media. The CD-ROM drive is standard with 9406 Models S10 and S20. It is therefore not identified with a separate feature. It can be used for alternate IPL but not as a save/restore device for the system.

2.5G ¼" Cartridge Tape Unit #6381/#6481

See page 173 for full description.

4G ¼" Cartridge Tape Unit #6382/#6482

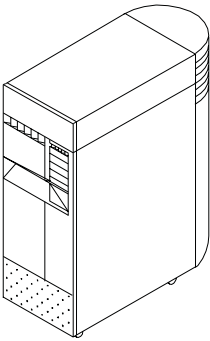
See page 174 for full description.

13G ¼" Cartridge Tape Unit #6385/#6485

See page 174 for full description.

9406 Models S10, S20

AS/400e servers Models S30, S40



9406 Model S30 System Unit

The 9406 Model S30 System Unit has a base configuration of:

Model S30 Processor (one must be specified):

- #2257 319.0 CPW 1-Way Processor with 512M memory
- #2258 583.3 CPW 2-Way Processor with 512M memory
- #2259 998.6 CPW 4-Way Processor with 512M memory
- #2260 1794.0 CPW 8-Way Processor with 1024M memory

Performance figures shown are for client/server workload only. #2257 has an interactive performance rating of 51.5 CPW; the other 3 processors have an interactive performance rating of 64.0 CPW.

Ten additional main storage slots on all processors except #2260 which has eight additional main storage slots

One 4.19G Disk Unit

Eleven additional internal disk slots

LAN adapter

One CD-ROM unit

One base communications adapter for Electronic Customer Support. A separate chargeable communications cable for ECS must also be ordered.

9406 Models S30, S40

Three feature card slots. Up to three may be used for base LAN.

Workstation controller

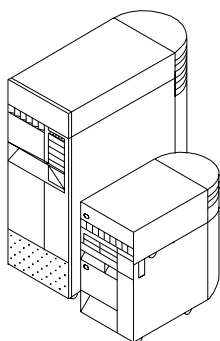
Multi-Function I/O Processor (MFIOP) which supports:

- 20 Integrated disk units with RAID support
- One integrated tape unit
- One integrated CD-ROM unit
- Three I/O adapters

Battery backup

Bus adapter

9406 Models S30, S40



9406 Model S40 System Unit

The 9406 Model S40 System Unit has a base configuration of:

Model S40 Processor:

- #2207 3660 CPW 8-Way Processor with 1024MB memory
- #2208 4550 CPW 12-way Processor with 1024MB memory
- #2256 1794.0 CPW 8-Way Processor with 1024M memory
- #2261 2340.0 CPW 12-Way Processor with 1024M memory

Performance figures shown are for client/server workload only. #2207 and #2208 have an interactive performance rating of 120 CPW. #2256 and #2261 have an Interactive Performance Rating of 64.0 CPW.

16 additional main storage slots

One 4.19G Disk Unit

Three additional internal disk slots

LAN adapter

One CD-ROM unit

One base communications adapter for Electronic Customer Support. A separate chargeable communications cable for ECS must also be ordered.

Three feature card slots. Up to three may be used for base LAN.

9406 Models S30, S40

Workstation controller

Multi-Function I/O Processor (MFIO) which supports:

- 20 integrated disk units with RAID support
- One integrated tape unit
- One integrated CD-ROM unit
- Three I/O adapters

Battery backup

Bus adapter

Card Technology

With the August 1997 announcement of the AS/400e series, an industry standard card technology known as Peripheral Component Interconnect (PCI) was introduced for the first time in the AS/400 range outside the AS/400 Model 150. The 9406 Models S30 and S40, however, do not support this PCI technology. They continue to support the System Product Division (SPD) technology cards that have been used in the AS/400 for a number of years. Throughout the rest of this chapter therefore, there is little reference to PCI or SPD as all I/O processor cards used in the Models S30 and S40 are SPD. Some of these support PCI technology cards as I/O adapter. For example, the Integrated PC Server #6617 supports the #2723, #2724, or #2838 PCI LAN. However, in all cases on these models, the base card that plugs into the bus is SPD technology.

9406 Models S30, S40

Main Storage for 9406 Models S30 and S40

Model S30 Main Storage

The 9406 Model S30 with Processors #2257, #2258, and #2259 has two base and ten additional memory slots. Main storage cards require one slot each. Base and additional memory cards must be added in pairs of equal capacity.

The 9406 Model S30 with Processor #2260 has four base and eight additional memory slots. Base and additional memory cards must be added in multiples of four of equal capacity.

The following lists the Main Storage for the Model S30:

Processor Options (min M/max M)	Main Storage Supported	
	Base	Feature
#2257/#2258/#2259 (512 - 16384)	#9179 Base 256M	#3189 128M
	#8180 Optional Base 512M	#3179 256M
	#8192 Optional Base 1024M	#3180 512M
#2260 (1024-24576)	#8193 Optional Base 2048M	#3192 1024M
		#3193 2048M

9406 Models S30, S40

Model S40 Main Storage

The 9406 Model S40 has four base and sixteen additional memory slots. Main storage cards require one slot each. Base and additional memory cards must be added in multiples of four and of equal capacity.

The following lists the Main storage for the Model S40:

Processor Option (min M/max M)	Main Storage Supported	
	Base	Feature
#2256/#2261 (1024-32768)	#9179 Base 256M #8180 Optional Base 512M	#3189 128M #3179 256M
#2207/#2208 (1024-40960)	#8192 Optional Base 1024M #8193 Optional Base 2048M	#3180 512M #3192 1024M #3193 2048M

16 Mb technology cards available with OS/400 Version 4 Release 1 on these models are #9190 Base 256M (replaced by #9179 for Version 4 Release 2); #8191 Optional Base 512M (replaced by #8180); #3190 256M (replaced by #3179); and #3191 512M (replaced by #3180).

Memory cards of equal capacity but with different feature numbers cannot be mixed in a pair or four on the Model S30 and S40. For example, #3179 and #3190 cannot be combined in a pair or four.

Continuously Powered Main Storage (CPM)

Models S30 and S40 include an internal battery backup capable of maintaining the Continuously Powered Main Storage (CPM) on 16GB of main storage for at least 24 hours. #5150 Battery Back-up (External) is required when the main storage size exceeds 16GB on the Model S40. #5150 can also be purchased to increase the CPM time over that of the internal battery backup (to at least 48 hours).

Multi-Function I/O Processor #9754 for 9406 Models S30, S40

A #9754 Multi-Function I/O Processor (MFIO) is standard on all 9406 Models S30 and S40. The MFIO can control 20 disk units, one tape unit, and one CD-ROM unit. It also has three IOA slots for controlling LANs, twinaxial workstations, and communications controllers. It occupies two consecutive I/O slots.

The MFIO contains an Ultra SCSI controller with a 4M cache that provides RAID-5 protection for up to 20 disks. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of four arrays are allowed on the MFIO with a maximum of ten drives allowed per array. Parity information can be spread across four or eight drives.

With OS/400 Version 4 Release 2 or later it replaces for new machines and upgrades the #9751 MFIO that was previously available on these models but which does not support compression. With OS/400 Version 4 Release 3, disk compression is available for all AS/400 internal disk units except the 17.54GB capacity drives. The #9751 and #9754 are functionally equivalent apart from the compression capability. Thus all references to #9754 on the following pages also cover the #9751 in terms of device support.

On the Model S30, the MFIO supports disks 1 through 12 without prerequisites. For disks 13 through 20, the #5055 Storage Expansion Unit is required.

On the Model S40, the MFIO supports disks 1 through 4 without prerequisites. For disks 5 through 20, the #5057 Storage Expansion Unit is required.

The three IOA slots in the MFIO support the following adapters:

IOA slot A is reserved for attaching:

- One Communications IOA #2699 or
- One LAN IOA #6149, #6181, #9249, or #9381

IOA slot B is reserved for attaching the Base Multi-Protocol Communications Adapter #9699, with ECS line

9406 Models S30, S40

IOA slot C is reserved for attaching:

- One Communications IOA #2699 or
- One Twinaxial IOA #6180 or #9280

For more information on these IOAs, see the Communications section on page 247, the Local Area Networks section on 250, or the Workstation Controllers section on page 243.

LAN/WAN/Workstation IOP #2629

The LAN/WAN/Workstation IOP supports up to three of the following IOAs:

- #2699 Two-Line WAN IOA
- #6149 16/4 Mbps Token-Ring IOA
- #6180 Twinaxial Workstation IOA
- #6181 Ethernet/IEEE 802.3 IOA
- #9249 Base 16/4 Mbps Token-Ring IOA
- #9280 Base Twinaxial Workstation IOA
- #9381 Base Ethernet/IEEE 802.3 IOA

One #2629 will support any combination of the IOAs listed above with the exception that all three IOAs cannot be LAN IOAs (#6149, #6181, #9249, or #9381).

One feature I/O card slot is required to support #2629. No more than seven #2629s can be placed in a #5072 System Unit Expansion Tower, nor is #2629 allowed in slot 14 of a #5072.

For more information on these IOAs, see the Communications section on page 247, the Local Area Networks section on 250, or the Workstation Controllers section on page 243.

9406 Models S30, S40

Workstation Controllers for 9406 Models S30, S40

The 9406 Models S30 and S40 will support 5250-type twinaxial and ASCII workstations. Both models support a maximum of three workstation controllers in total.

When placing an initial system order, a system console **must** be specified. One workstation controller/adaptor is required to drive this system console. One of the following specify codes must be specified to identify which type of controller is supporting the system console. These specify codes do not mean that the relevant system console device is included with the order. The system console still needs to be separately ordered.

#5540 System Console attached to Twinaxial Workstation Controller/Adapter

#5543 Client Access/400 Console

#5544 System Console on Operations Console

For a full description of the above features, see page 142.

The following table shows the maximum number of workstation controllers and devices supported on 9406 Models S30 and S40:

	Model S30, S40
Controllers Min/Max	1-3
Twinax Controllers	1
Devices	28
ASCII Controllers	2
Devices	28

With OS/400 Version 4 Release 2, the number of workstation devices supported on the 9406 Models S30 and S40 increased from the seven supported with OS/400 Version 4 Release 1, to 28.

The following table indicates which attachment is counted as part of the 28 active device limitation. This limitation applies to the AS/400e

9406 Models S30, S40

servers—S10, S20, S30, S40, and 9401 Model 150 (which has a maximum 7 or 28 twinax workstations supported).

This limitation does not apply to the Model S20, S30 and S40 custom e-servers. See page 272 for more information.

Counted	Description
Yes	Local display sessions
Yes	Remote display sessions
Yes	Sessions over 5x94 Controllers (including PCs emulating 5250s)
Yes	Network Routing Facility (NRF) or SPLS displays
Yes	Distributed Host Command Facility (DHCF) displays
Yes	5250 emulation
Yes	Twinaxial shared session devices (separate display devices)
No	Client Access using 5x94 (Virtual displays)
No	Client Access (APPC devices and VRT displays)
No	Retail/Finance devices
No	SNA passthru
No	TDLC (5150 type device)
No	Port sharing (ASCII) (5150 type device)
No	TCP/IP (TELNET session) (virtual display)
No	APPC (LU 6.2) sessions (APPC or host devices)
No	Display Station Passthru/5250 Passthru/Workstation Function (virtual displays)
No	3270 Emulation over host CDs (Host devices)
No	Apple** devices attached to a LocalTalk Workstation Controller
No	Wireless devices attached to a Wireless LAN Adapter
No	Twinaxial printers

The following additional workstation controllers can be attached to the Model S30 and S40:

- #6141/#9141 ASCII Workstation Controller
- #6142 ASCII 12-Port Attachment
- #6180/#9280 Twinaxial Workstation IOA

ASCII Workstation Controller #6141/#9141

For a full description of #6141/#9141, see page 144.

9406 Models S30, S40

ASCII 12-Port Attachment #6142

For a full description of #6142, see page 144.

Twinaxial Workstation IOA #6180/#9280

For a full description of #6180/#9280, see page 144.

The following feature is only supported on the Model S30 and S40 as a migration feature:

#6050/#9050 Twinaxial Workstation Controller

The following shows the feature requirements for the initial order.

Workstations Required		System Console Specify	Minimum Shipped Feature Codes			Other Feature Codes Based on Workstations Required
Twin-axial	A S C I I		MF IOP	No Charge WSC	Re-quired WSC	
Yes	No	5540	9751/9754	9280		6180
Yes	Yes	5540	9751/9754	9141	6180	6141, 6180
No	No	5543	9751/9754	(1)		
Yes or No	Yes	5543	9751/9754	9141	(1)	6141, 6180
Yes	No	5543	9751/9754	9280	(1)	6180
No	No	5544	9751/9754			
Yes or No	Yes	5544	9751/9754	9141	(3)	6141, 6180
Yes	No	5544	9751/9754	9280	(3)	6180

Notes:

- (1) When Client Access Console is selected, #0344 cable for Attaching Client Access Console (6m) must also be ordered.
- (2) #6180 is not supported on the #9751/#9754 MFIOP.

9406 Models S30, S40

- (3) When Operations Console is selected, #0328 cable for Operations Console (6m) must also be ordered.

9406 Models S30, S40

Communications for 9406 Models S30, S40

Model	Total Communications Lines
S30	200*
S40	300*

Notes:

* An ISDN adapter (#2605) is counted as two lines.

The following controllers and adapters support communications on the Model S30 and S40:

- #2623 Six-Line Communications Controller
- #2620 Cryptographic Processor
- #2628 Cryptographic Processor–Commercial
- #2664 Integrated FAX Adapter
- #2699 Two-Line WAN IOA

Six-Line Communications Controller #2623

The #2623 Six-Line Communications Controller provides the basic control and common circuits for up to six communications lines. The following communication adapters attach to the #2623:

#2605	ISDN Basic Rate Interface Adapter
#2609	Two-Line EIA232/V.24 Adapter
#2610	Two-Line X.21 Adapter
#2612	One-Line EIA232/V.24 Adapter
#2613	One-Line V.35 Adapter
#2614	One-Line X.21 Adapter

For a full description of #2623 and the above adapters, see page 146.

9406 Models S30, S40

Two-Line WAN IOA #2699/#9699

The #2699/9699 Two-Line WAN IOA supports up to two multiple protocol communications ports where one or two (in any combination) of the following cable features are attached:

Cable Length	Attachment			
	EIA232 V.24	EIA449/ V.36	V.35	X.21
20ft/6m	#0330	#0335	#0338	#0341
50ft/15m	#0331	#0336	#0339	#0342
80ft/24m	N/A	N/A	#0340	N/A
150ft/45m	N/A	#0337	N/A	N/A

#0344 20ft/6m Communications Console Cable is also supported but on #9699 only.

The #2699 Two-Line WAN IOA requires an unused slot on a #2629 LAN/WAN/Workstation IOP (see page 141 for more information) or a #9751/#9754 MFIOP (see page 139 for more information) as a prerequisite. #9699 is the Base Multi-Protocol Communications Adapter and occupies Slot B of the #9751/#9754 MFIOP. On the #9699, at least one of the cables ordered must be #0329, #0330, or #0331 to support Electronic Customer Support (ECS).

For a full description of #2699/#9699, see page 149.

9406 Models S30, S40

Communications Restrictions

If using any of the following communications functions, restrictions may apply. In particular, this applies when using SPD Two Line WAN IOA #2699, or the IPX protocol. (IPX is used over LAN adapters, ATM, or over frame relay).

- Frame relay protocol

- IPX protocol

- X.25 with more than 16 virtual circuits per line

- SDLC protocol if used to connect to more than 64 remote sites

- Communications line speeds greater than 64 Kbps for the synchronous PPP, X.25, SDLC, or frame relay protocols (Bisync is always limited to a maximum of 64 Kbps)

- Non-async communications line speeds greater than 64 Kbps and up to 640 Kbps for X.25

Additional information is available in the file called AS4CNFG PACKAGE on Marketing Tools. This is a comprehensive document with details on communications restrictions which apply in a number of different circumstances. This document should be consulted for full details on what these restrictions are. Customers should be able to obtain this document from their local IBM sales office.

Cryptographic Processor #2620

For a full description of #2620, see page 150.

Cryptographic Processor-Commercial #2628

For a full description of #2628, see page 151.

Integrated Fax Adapter #2664

For a full description of #2664, see page 151.

The following is also only supported on the Model S30 and S40 as a migration feature:

- #2666 High-Speed Communications Adapter

9406 Models S30, S40

Local Area Networks and Asynchronous Transfer Mode for 9406 Models S30, S40

The 9406 Model S30 and S40 base system includes one of the following base LAN adapters at no charge:

- #9249 16/4 Mbps Token-Ring IOA
- #9381 Ethernet/IEEE 802.3 IOA
- #9723 Ethernet/IEEE 802.3 IOA
- #9724 16/4 Mbps Token-Ring IOA
- #9738 100/10 Mbps Ethernet IOA

Other adapters and controllers supporting LAN and ATM attachment on the Model S30 and S40 are:

- #2723 Ethernet/IEEE 802.3 IOA
- #2724 16/4 Mbps Token-Ring IOA
- #2811 25 Mbps UTP ATM IOA
- #2812 45 Mbps Coax T3/DS3 ATM IOA
- #2815 155 Mbps UTP OC3 ATM IOA
- #2816 155 Mbps MMF ATM IOA
- #2818 155 Mbps SMF OC3 ATM IOA
- #2819 34 Mbps Coax E3 ATM IOA
- #2838 100/10 Mbps Ethernet IOA
- #6149 16/4 Mbps Token-Ring IOA
- #6181 Ethernet/IEEE 802.3 IOA
- #6616 Integrated PC Server
- #6617 Integrated PC Server

The ATM adapters are not available in all countries and are also subject to country homologation requirements which may limit availability.

9406 Models S30, S40

The maximum number of LAN and ATM features supported are as follows:

	Model	
	S30	S40
LAN or ATM Ports	32	72
Integrated PC Servers	16	16
Base LAN	1	1

Ethernet/IEEE 802.3 IOA #2723/#9723

For a full description of #2723, see page 152.

Specify #9723 if Ethernet/IEEE 802.3 IOA is required as Model S30 and S40 base LAN. Integrated PC Server #6617 is a prerequisite for #2723/#9723.

16/4 Mbps Token-Ring IOA #2724/#9724

For a full description of #2724, see page 153.

Specify #9724 if 16/4 Mbps Token-Ring IOA is required as Model S30 or S40 base LAN. Integrated PC Server #6617 is a prerequisite for #2724/#9724.

LAN/WAN IOP #2810

For a full description of #2810, see page 153.

PCI 25 Mbps Unshielded Twisted Pair ATM IOA #2811

For a full description of #2811, see page 153. #2810 LAN/WAN IOP is a prerequisite for #2811.

PCI 45 Mbps Coaxial T3/DS3 ATM IOA #2812

For a full description of #2812, see page 154. #2810 LAN/WAN IOP is a prerequisite for #2812.

9406 Models S30, S40

PCI 155 Mbps Unshielded Twisted Pair OC3 ATM IOA #2815

For a full description of #2815, see page 154. #2810 LAN/WAN IOP is a prerequisite for #2815.

PCI 155 Mbps Multi-Mode Fiber ATM IOA #2816

For a full description of #2816, see page 154. #2810 LAN/WAN IOP is a prerequisite for #2816.

PCI 155 Mbps Single-Mode Fiber OC3 ATM IOA #2818

For a full description of #2818, see page 154. #2810 LAN/WAN IOP is a prerequisite for #2818.

PCI 34 Mbps Coaxial E3 ATM IOA #2819

For a full description of #2819, see page 155. #2810 LAN/WAN IOP is a prerequisite for #2819.

PCI 100/10 Mbps Ethernet IOA #2838/#9738

For a full description of #2838, see page 155.

Specify #9738 if a 100/10 Mbps Ethernet IOA is required as Model S30 and S40 base LAN. #2810 LAN/WAN IOP or #6617 Integrated PC Server is a prerequisite for #2838/#9738.

16/4 Mbps Token-Ring IOA #6149/#9249

For a full description of #6149, see page 155.

Specify #9249 if 16/4 Mbps Token-Ring IOA is required as Model S30 and S40 base LAN. LAN/WAN/Workstation IOP #2629, Integrated PC Server #6616, or MFIOP #9751/#9754 is a prerequisite for #6149/#9249.

9406 Models S30, S40

Ethernet/IEEE 802.3 IOA #6181/#9381

For a full description of #6181, see page 155.

Specify #9381 if Ethernet/IEEE 802.3 IOA is required as Model S30 and S40 base LAN. LAN/WAN/Workstation IOP #2629, Integrated PC Server #6616, or MFIOF #9751/#9754 is a prerequisite for #6181/#9381.

Integrated PC Server #6616

The Integrated PC Server allows the AS/400 to provide high performance serving to LAN attached PCs. #6616 contains an Intel 166 MHz Pentium Processor. This IPCS does not support Windows NT Server.

One or two of the following memory features must be installed in the Integrated PC Server:

- #2861 32M Memory for Integrated PC Server
- #2862 128M Memory for Integrated PC Server

One or two of the following LAN IOA features must be installed in the Integrated PC Server:

- #6149/#9249 16/4 Mbps Token-Ring IOA
- #6181/#9381 Ethernet/IEEE 802.3 IOA

#9249 or #9381 specify the base LAN on the 9406 Model S30 and S40.

For a full description of #6616, see page 156.

Integrated PC Server #6617

The Integrated PC Server allows the AS/400 to provide high performance serving to LAN-attached PCs. OS/2 Warp Server for AS/400, Novell IntraNetWare, Lotus Domino, Flowmark, Firewall for AS/400, and Microsoft Windows NT Server are supported on the Integrated PC Server. The #6617 contains an Intel 200 MHz Pentium Pro Processor, four main storage slots, and three LAN IOA

9406 Models S30, S40

slots. Between one and four of the following memory features must be installed on the Integrated PC Server allowing between 32M and 512M of main storage:

- #2861 32M Memory for Integrated PC Server
- #2862 128M Memory for Integrated PC Server

Between one and three of the following LAN IOA features must be installed in the Integrated PC Server:

- #2723/#9723 PCI Ethernet IOA
- #2724/#9724 PCI 16/4 Mbps Token Ring IOA
- #2838/#9738 PCI 100/10 Mbps Ethernet IOA

#9723, #9724, or #9738 specify the base LAN on the 9406 Model S30 and S40.

#2838/#9738 can occupy a maximum of two of the three LAN IOA slots. For each #2838/#9738 run on the #6617 Integrated PC Server, #0222 100/10 Mbps Ethernet on IPCS is required. The third LAN adapter and second #2838/#9738 are only supported if running Windows NT on the IPCS.

If Windows NT is running on the #6617 Integrated PC Server, then the following are also available for attachment to the IPCS:

- #0325 IPCS Extension Cable for Windows NT (required)
 - #1700 IPCS Keyboard/Mouse for Windows NT (default in certain countries)
- A display must be attached to the IPCS to support Windows NT

For keyboard/mouse and display support in countries outside the USA, the Internet at <http://www.as400.ibm.com> should be consulted. #6617 occupies three consecutive I/O card slots.

The following are supported on the Model S30 and S40 as migration features:

- #2617 Ethernet Adapter/HP
- #2618 Fibre Distributed Data Interface Adapter
- #2619 16/4 Mbps Token-Ring Adapter/HP
- #2626 16/4 Mbps Token-Ring Adapter/A

9406 Models S30, S40

#2665 SDDI Adapter

#2668 Wireless LAN Adapter

#6516/7/8/9 One-Port Integrated PC Server (formerly FSIOP)

#6526/7/8/9 Two-Port Integrated PC Server (formerly FSIOP)

#6520 Upgrade One-Port (#6516/7/8/9) Integrated PC Server to Two-Port

#6509 Additional 16M Integrated PC Server (#65xx) Memory

#8665 Base SDDI Adapter

#8716/7/8/9 Base One-Port Integrated PC Server (formerly FSIOP)

#8726/7/8/9 Base Two-Port Integrated PC Server (formerly FSIOP)

#9617 Base Ethernet Adapter/HP

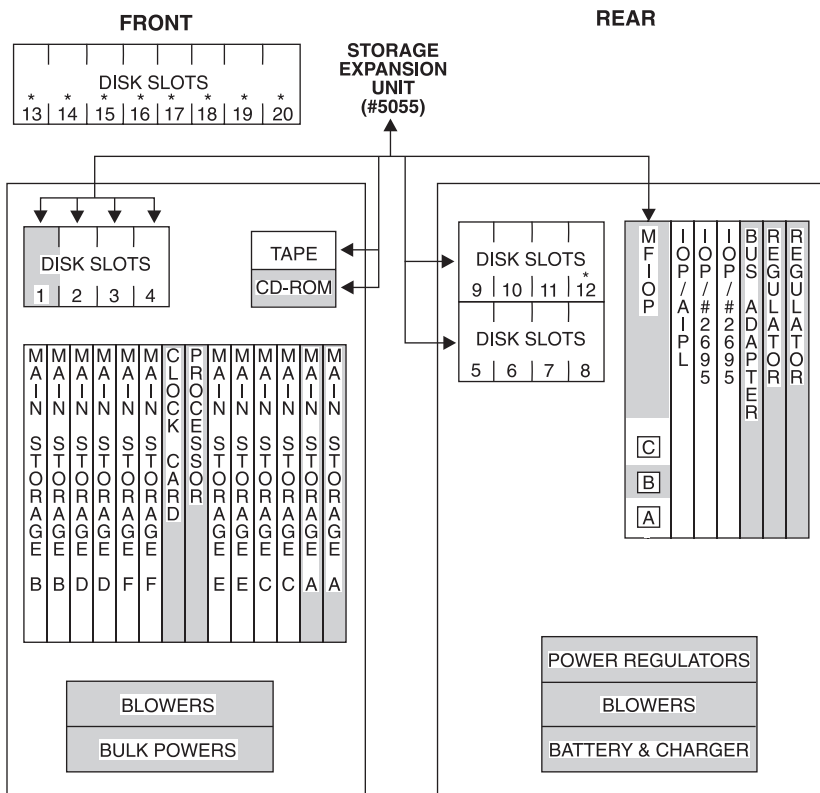
#9619 Base 16/4 Mbps Token-Ring Adapter/HP

9406 Models S30, S40

Power and Packaging for 9406 Models S30, S40

9406 Model S30 System Unit #2257, #2258, #2259

The following schematic diagram shows the system layout for the 9406 Model S30 with Processors #2257, #2258, or #2259.



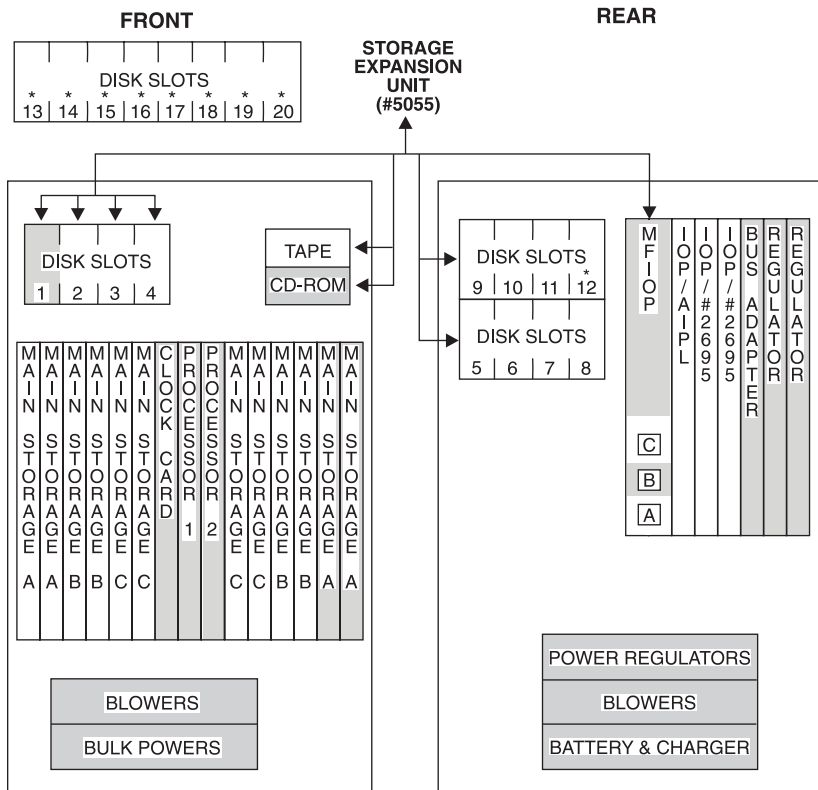
■ = ARE PART OF BASE CONFIGURATION
 * = ONE-BYTE DISK UNITS CANNOT BE INSTALLED IN DISK SLOT 12 THROUGH 20

9406 Model S30 #2257, #2258, or #2259 System Unit with Storage Expansion Unit #5055

9406 Models S30, S40

9406 Model S30 System Unit #2260

The following schematic diagram shows the system layout for the 9406 Model S30 with Processor #2260.



[Shaded Box] = ARE PART OF BASE CONFIGURATION

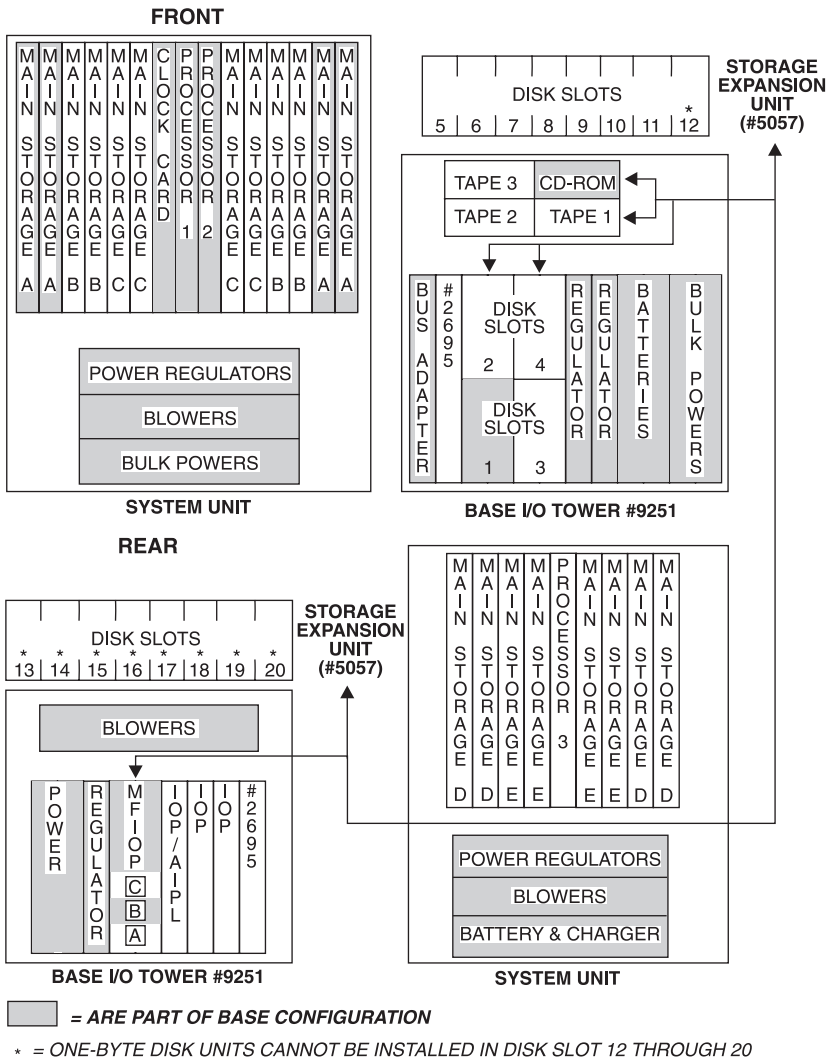
* = ONE-BYTE DISK UNITS CANNOT BE INSTALLED IN DISK SLOT 12 THROUGH 20

9406 Model S30 #2260 System Unit with Storage Expansion Unit #5055

9406 Models S30, S40

9406 Model S40 System Unit

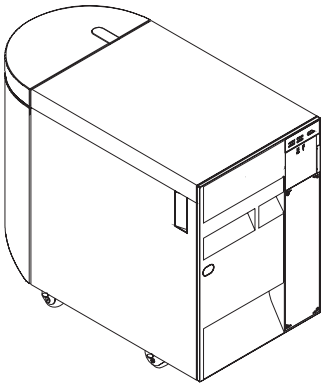
The following schematic diagram shows the system layout for the 9406 Model S40.



9406 Model S40 System Unit with Storage Expansion Unit #5057

9406 Models S30, S40

9406 System Unit Expansion Tower #5073



9406 Model S30 and S40 System Unit Expansion Tower (#5073)

The System Unit Expansion Tower, #5073, is a 13 card slot expansion unit available for 9406 Models S30 and S40. It provides an additional bus to the system and includes a 1063 Mbps optical bus card and optical cable for attachment.

The System Unit Expansion tower (#5073) can support up to four additional internal tape units which require a Storage Device Controller, #2624, or Internal Tape Device Controller, #6513, as a prerequisite. The tower also includes one battery backup unit, one 400 watt base power supply, and two 500 watt additional power supplies for higher availability. A Storage Expansion Unit, #5058, is supported on the system unit expansion tower and is attached on top of the tower providing space for up to 16 additional feature disk units. #5058 contains a battery backup unit and can support the Ultra SCSI disk units (#6906, #6907, #6713, and #6714).

In order to attach system unit expansion towers, an optical bus adapter card is required in the system unit. This card is specified as #2695. The optical bus adapter card allows for the addition of up to six optical buses. A maximum of two #2695s are supported on 9406 Models S30 and S40. 9406 Models S30 and S40 System Units include a base optical bus adapter. This also allows for the addition of six optical buses. For the maximum number of buses supported

9406 Models S30, S40

on a system, please refer to the Summary Tables on page 35 to page 58.

The Optical Bus Adapter (#2695) requires a daughter card to attach optical buses. This daughter card is known as the Optical Link Processor #2688. #2688 specifies a 1063 Mbps Optical Link which supports the attachment of up to two System Unit Expansion Towers, #5073, or two Storage Expansion Towers, #5083. One #5073 and one #5083 may be attached to the same #2688. A maximum of three Optical Link Processors (#2688) are supported on an Optical Bus Adapter (#2695).

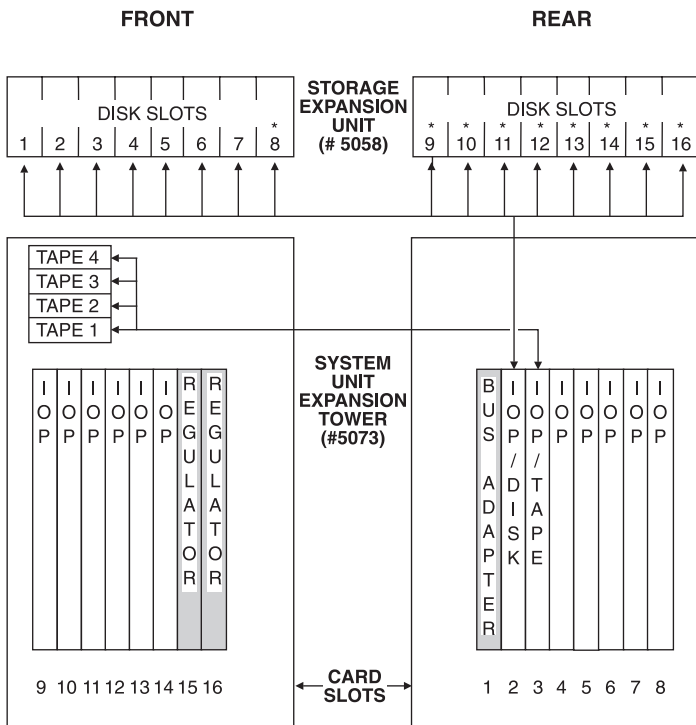
Specify code #0086 may be used to indicate to the configurators that a #5073 is being dedicated to attach a 3590 Magnetic Tape Subsystem in order to achieve maximum performance. Only the IOP used to connect the 3590 will be placed in the #5073.

Feature #5602 may be used to indicate to the configurators that a #5073 is being used as an opticonnect hub. This will allow only features related to opticonnect to be placed in the #5073.

The System Unit Expansion Tower, #5072, which attaches to the 9406 Model 53S is supported on the Model 9406 Models S30 and S40 for migration only. New orders will be for the #5073 System Unit Expansion Tower and not the #5072.

The following schematic diagram shows the #5073 with a Storage Expansion Unit, #5058, attached.

9406 Models S30, S40



■ = ARE PART OF BASE CONFIGURATION

* = ONE-BYTE DISK UNITS CANNOT BE INSTALLED IN DISK SLOT 8 THROUGH 16

System Unit Expansion Tower, #5073 and Storage Expansion Unit, #5058

- Slot 1** is occupied by the fiber-optic bus adapter card.
- Slot 2** can be occupied by a feature I/O card or by the disk unit controller card if #5058 attached.
- Slot 3** can be occupied by a feature I/O card or by the internal tape Storage Device Controller (#2624 or #6513) to support the internal tapes in the #5073. #2624 supports up to three tape units. #6513 supports up to four tape units in the #5073.
- Slots 4 to 14** are for feature I/O cards.
- Slots 15 & 16** are occupied by power regulator cards.

9406 Models S30, S40

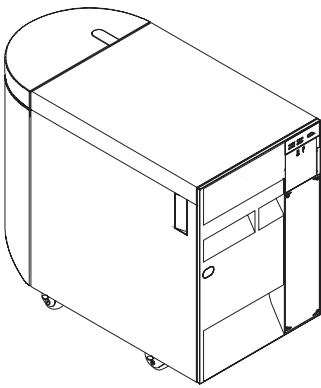
The four internal tape units in the #5073 can be a ¼" Cartridge tape unit, or an 8mm cartridge tape unit.

The Storage Expansion Unit, #5058, can be mounted on the System Unit Expansion Tower (#5073) and provides space for up to 16 additional disk units. The disk units installed in the #5058 are supported by a disk unit controller (#6502, #6512, #6530, #6532, or #6533).

The Storage Expansion Unit (#5058) supports the concurrent maintenance of all internal disk units in RAID-5 protection or mirrored environment.

9406 Models S30, S40

9406 Storage Expansion Tower #5083



9406 Model S30 and S40 Storage Expansion Tower (#5083)

The Storage Expansion Tower, #5083, is available on 9406 Models S30 and S40 for adding up to 16 2-byte SCSI disk units. It provides an additional bus to the system and includes a 1063 Mbps optical bus card and optical cable for attachment.

The Storage Expansion Tower includes two IOP feature slots available for disk unit controller, #6532 or #6533. Disk unit controllers #6502, #6512, and #6530 are also supported if upgrading. One of these is to support the 16 disk units in the tower. The other is to support disk units in a Storage Expansion Unit, #5058. The #5058 can be attached to the storage expansion tower to provide a total of up to 32 disk units.

The storage expansion tower includes one battery backup, one 400 watt base power supply, two 500 volt power supplies, and a regulator. The #5058 Storage Expansion Unit contains a battery backup unit.

A Storage Expansion Tower, #5083, should be specified as an alternative to the System Unit Expansion Tower, #5073, when adding disk units and no additional IOP feature cards are required.

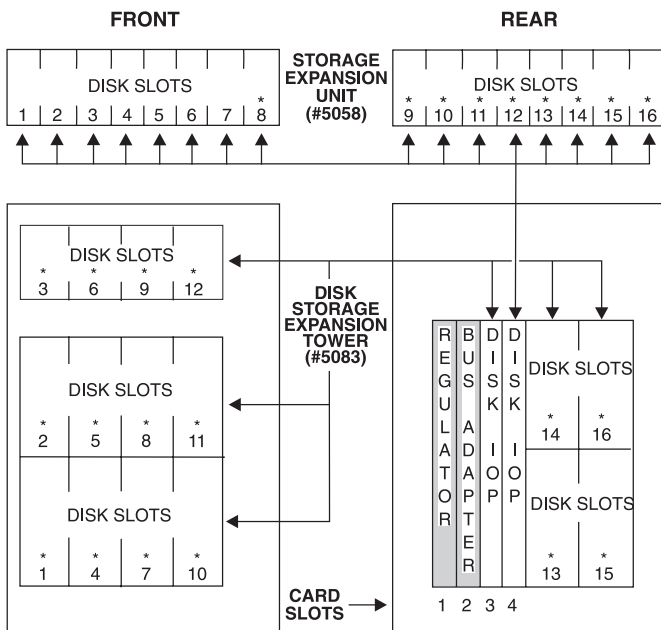
9406 Models S30, S40

#5083 Storage Expansion Tower and #5058 Storage Expansion Unit can support the new Ultra SCSI disk units (#6906, #6907, #6713, and #6714).

Refer to the section on the Optical Bus Adapter, #2695 on page 260 for details on the attachment requirements of the #5083.

The Storage Expansion Tower, #5082, which attaches to the 9406 Model 53S is supported on the Model 9406 Models S30 and S40 for migration only. New orders will be for the #5083 Storage Expansion Tower and not the #5082.

The following schematic diagram shows a storage expansion tower with a Storage Expansion Unit, #5058, attached.



■ = ARE PART OF BASE CONFIGURATION

* = ONE-BYTE DISK UNITS CANNOT BE INSTALLED IN DISK SLOT 8 THROUGH 16 OF #5058 OR SLOT 1 THROUGH 16 OF #5083

9406 Storage Expansion Tower, #5083, and Storage Expansion Unit, #5058

9406 Models S30, S40

The slots in the storage expansion tower are occupied as follows:

- Slot 1** is occupied by a power regulator.
- Slot 2** is occupied by the fiber-optic bus adapter card.
- Slot 3** is for the disk unit controller (#6502, #6512, #6530, #6532, or #6533) for disk units installed in the #5083.
- Slot 4** is for the disk unit controller (#6502, #6512, #6530, #6532, or #6533) for disk units installed in the #5058.

The Storage Expansion Unit, #5058, can be mounted on the Storage Expansion Tower and provides space for up to 16 additional disk units. The disk units installed in the #5058 are supported by a disk unit controller (#6502, #6512, #6530, #6532, or #6533).

The storage expansion tower and storage expansion unit supports concurrent maintenance of all internal disk units in RAID-5 protection or mirrored environment.

9406 Models S30, S40

Internal Disk Units for 9406 Models S30, S40

The following disk units are supported on the 9406 Model S30 and S40 System Units and Storage Expansion Units:

Feature	Size	One/Two Byte	SCSI Type	Migrated/New	Compression
#1602	1.03G	1	Fast	Migrated	Yes
#1603	1.96G	1	Fast	Migrated	Yes
#6605	1.03G	2	Fast	New	Yes
#6606/ #9606	1.96G	2	Fast	New	Yes
#6607/ #7607	4.19G	2	Fast	New	Yes
#6650	1.96G	2	Fast	New	Yes
#6652	1.03G	2	Fast	New	Yes
#6713/ #7713/ #8713	8.58G	2	Ultra	New	Yes
#6714/ #8714	17.54G	2	Ultra	New	SOD
#6906	1.96G	2	Ultra	New	Yes
#6907/ #9907	4.19G	2	Ultra	New	Yes
<p>Compression requires Operating System/400 Version 4 Release 3. Compression is not support in the System Auxiliary Storage Pool. A full discussion of compression may be found on page 442.</p> <p>IBM intends to provide compression on 17.54GB Disk Units in a future release of OS/400.</p>					

The base system unit of the 9406 Model S30 supports up to 12 disk units. With the addition of the Storage Expansion Unit, #5055, an additional eight disks may be added, making a total of 20. All 20 disks are supported by the MFIOP #9751/#9754.

The base System Unit of the 9406 Model S40 supports up to four disk units. With the addition of the Storage Expansion Unit, #5057, an additional 16 disks may be added, making a total of 20. All 20 disks are supported by the MFIOP #9751/#9754.

9406 Models S30, S40

Further internal disks can be installed in:

Storage Expansion Unit, #5058. This mounts on top of the #5073 or #5083 Expansion Tower. It provides space for up to 16 additional disk units.

Storage Expansion Tower, #5083. This provides space for up to 16 additional 2-byte disk units and should be used when additional disk capacity is required and no additional feature IOP cards are required. For further information, see page 263.

The #5052 and #5082 Storage Expansion Unit and Tower, and #5072 System Expansion Tower can be migrated to the 9406 Model S30 and S40 when upgrading to them. On new orders, the #5058, #5073, and #5083 will be ordered.

A base disk unit of 4.19G (#9907) is standard on new 9406 Model S30 and S40. An optional 8.58G (#8713) or 17.54G (#8714) disk may be ordered in place of the standard disk unit.

For the migrated disk units that are supported on upgrades using #1602 and #1603 migration kits, see page 294.

For best performance, the new Ultra SCSI disk units should be installed either attached to the MFIOP (#9751 or #9754) or in the Ultra SCSI Tower and Storage Expansion Units (#5083 and #5058) with the Ultra SCSI RAID Disk Unit Controller–4M Cache (RAID/Mirrored/Unprotected), #6532 or #6533.

The internal disk units in the Storage Expansion Unit (#5058) and the Storage Expansion Tower (#5083) are supported by one of the following Disk Unit controllers:

- #6533 Ultra SCSI Disk Unit Controller–4M Cache (RAID/Mirrored/Unprotected)
- #6532 Ultra SCSI Disk Unit Controller–4M Cache (RAID/Mirrored/Unprotected)
- #6530 Disk Unit Controller–No Cache (Mirrored/Unprotected)
- #6502 High Performance Controller–2M Cache (RAID/Mirrored/Unprotected)

9406 Models S30, S40

#6512 High Performance Controller–4M Cache
(RAID/Mirrored/Unprotected)

The #6502, #6512, and #6530 can be migrated to the 9406 Model S30 or S40 when upgrading.

For more information on these controllers see page 361, page 358, and page 357.

RAID-5 for 9406 Models S30 and S40

The 9406 Models S30 and S40 support RAID-5 protection for all 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G (1-byte or 2-byte) disk units if they are controlled by the #9751 or #9754 MFIO, or #6533, #6532, #6512, or #6502 Disk Unit Controller.

A minimum of four disk units of the same capacity are required for a valid RAID-5 configuration. A maximum of two RAID-5 arrays are allowed per #6512, or #6502. A maximum of four RAID-5 arrays are allowed per #9751/#9754 or #6532/#6533, with a maximum of 10 disk units per array. Parity information can be spread across four or eight of the disk units in an array and is automatically maintained as part of the RAID-5 protection feature.

Having parity spread across eight disk units gives better performance in the event of a disk unit failure as the data required to dynamically rebuild the data on the failed disk is being accessed from an eighth of the disk units as opposed to a quarter.

If one disk unit fails it cannot be used to read or write data. The disk unit controller then reads the parity and data from the same data areas as the other disk units and dynamically rebuilds the original data from the failed disk unit to satisfy ongoing read requests. When data needs to be written, the controller will generate the parity information for the failed disk unit as if it were still operating. As far as the AS/400 is concerned, the disk units will continue to respond to I/O even though a single disk unit has failed.

If RAID-5 protection is not required then the Disk Unit Controller #6530 can be specified to support the disk units in base or mirrored mode.

9406 Models S30, S40

Internal disk units of different technology (that is, different feature numbers), but of the same capacity can be either mirrored or RAID-5 protected.

The 9406 Models S30 and S40 support concurrent maintenance of all internal disk units in either RAID-5 protection or mirrored mode. External disk units may also be attached using external disk unit controllers.

For the maximum internal and external disk capacity and number of disk unit controllers, refer to the Summary Tables on page 35 to page 58.

9406 Models S30, S40

Internal Tape, CD-ROM, and Diskette Units for 9406 Models S30, S40

The following internal tape units are supported on the 9406 Model S30 and S40 System Units and storage expansion units:

Feature	Size	One/Two Byte	SCSI Type	Migrated/New
#1379	1.2G ¼"	1	Fast	Migrated
#1380	2.5G ¼"	1	Fast	Migrated
#6380	2.5G ¼"	1	Fast	New
#6381	2.5G ¼"	1	Fast	New
#6382	4G ¼"	1	Fast	New
#6385	13G ¼"	2	Fast	New

The 9406 Model S30 System Unit can accommodate one internal tape unit and the base CD-ROM drive. The 9406 Model S40 System Unit can accommodate up to three internal tape units and the base CD-ROM drive. The CD-ROM drive and first tape are supported by the MFIOP #9751/#9754. A Storage Device Controller (#2624 or #6513) is required to support the second and third additional tapes in the Model S40 System Unit.

The System Unit Expansion Tower (#5073) can accommodate up to four internal tape units. They are supported by a Storage Device Controller (#2624) which supports a maximum of three internal tape units or by an Internal Tape Device Controller (#6513) which supports a maximum of four internal tape units. #6513 will be the default on new orders.

The following are the current internal tapes and CD-ROM drives that are supported. The other tapes shown in the table above are supported for migration when upgrading to the 9406 Model S30 or S40.

9406 Models S30, S40

Base CD-ROM Drive

Code for PowerPC AS/400 Advanced Series Models will be distributed on CD-ROM media. The CD-ROM drive is standard on 9406 Models S30 and S40. It is therefore not identified with a separate feature. It can be used for alternate IPL but not as a save/restore device for the system.

2.5G ¼" Cartridge Tape Unit #6381

For a full description of #6381 see page 173.

4G ¼" Cartridge Tape Unit #6382

For a full description of #6382 see page 174.

13G ¼" Cartridge Tape Unit #6385

For a full description of #6385 see page 174.

Several ¼" cartridge tape units from other AS/400 models can be migrated to attach to the 9406 Models S30 and S40. See page 298 for further information.

AS/400e custom e-servers

9406 Model S20, S30, S40 Custom Mixed-Mode e-Servers

The Custom Mixed-Mode e-Server processor features offer higher levels of interactive performance compared with standard processor features that are otherwise available on server models. This increased interactive performance is appropriate when the nature of the application requires both interactive as well as client/server performance on the system.

Since these processors support a mixed mode environment--both interactive and client/server--they support a greater number of twinaxial and ASCII workstations than the standard server models. For details see the Summary Table section starting on page 33.

The Custom Mixed-Mode e-Server processor features can be ordered only as components of an overall packaged solution. Vendor software purchased from ISV channels is either preloaded or the license validated prior to shipment. A list of software vendors participating at time of publication are: SAP, .J.D. Edwards, SSA, Infinium, JBA, Intentia, IBS, MAPICS, and BAAN. IBM intends to expand this program to other top Independent Software Vendors based on their commitment to a business case to expand the opportunity for both AS/400 and the ISV applications. Since this list is under constant review, on-line systems should be reviewed for the latest information. Further information is also available at <http://www.softmall.ibm.com/as400/isvsol>.

The following 9406 Model S20 Custom Mixed-Mode e-Server processors are offered:

- #2170 464.3 CPW Client/Server, 49.7 CPW
Interactive 2-Way Processor with 256M memory
- #2177 759.0 CPW Client/Server, 110.7 CPW
Interactive 4-Way Processor with 256M memory
- #2178 759.0 CPW Client/Server, 221.4 CPW
Interactive 4-Way Processor with 256M memory

AS/400e custom e-servers

The following 9406 Model S30 Custom Mixed-Mode e-Server processors are offered:

- #2320 998.6 CPW Client/Server, 215.1 CPW
Interactive 4-Way Processor with 512M memory
- #2321 1794.0 CPW Client/Server, 386.4 CPW
Interactive 8-Way Processor with 1024M memory
- #2322 1794.0 CPW Client/Server, 579.6 CPW
Interactive 8-Way Processor with 1024M memory

The following 9406 Model S40 Custom Mixed-Mode e-Server processors are offered:

- #2340 3660.0 CPW Client/Server, 1050.0 CPW
Interactive 8-Way Processor with 1024M memory
- #2341 4550.0 CPW Client/Server, 2050.0 CPW
Interactive 12-Way Processor with 1024M memory

A prerequisite for ordering any of the Custom Mixed-Mode e-Server processors is a valid ISV preload or validation feature. The ISV software will, therefore, have to be licensed in order to be able to order one of these customer e-server processors.

There are no upgrades offered to the custom e-server processors. They can be ordered only as new systems. However, upgrades from one custom e-server Processor to another (for example S20 #2177 to #2178) are available. For more details, see the Model Conversion section.

All aspects of the 9406 Model S20, S30 and S40 Custom Mixed-Mode e-Server processor configuration apart from twinaxial and ASCII workstation support are the same as those for the S20, S30 and S40 with the standard processors. Thus, configuration of communications, local area networks and Asynchronous Transfer Mode, power and packaging, internal disk and tape units is the same as it is for the Model S20, S30 and S40 with the standard processors.

An exception is that because there are no upgrades available to the Custom Mixed-Mode e-Server processors, there are many features

AS/400e custom e-servers

that are supported for migration on the standard processors, which are therefore not supported at all on these Custom Mixed-Mode e-Server processors. See page 191 for full details on the configuration of the Model S20 and page 233 for full details on the configuration of the Model S30. See page 233 for full details on the configuration of the Model S40.

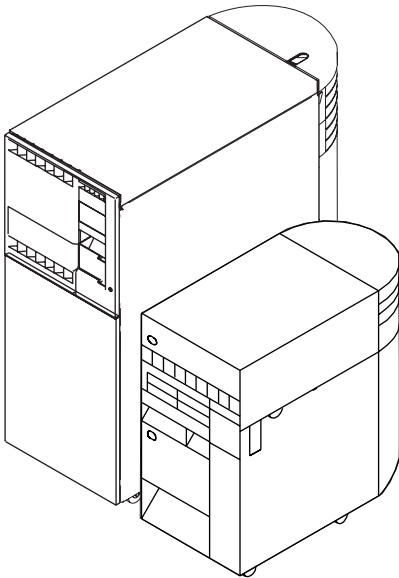
Custom Mixed-Mode e-Servers are not available in all countries.

AS/400e custom e-servers

AS/400e 9406 Model SB1 custom e-server

The AS/400e Custom Mixed-Mode e-Server Model SB1 performs dedicated compute-intensive processing for customers selecting ISV software targeted at a multitier environment. The Model SB1 provides considerable processing power, along with a fixed amount of main storage, and fixed amounts of disk storage to satisfy the ISV application requirements.

The 9406 Model SB1 can be ordered only as a component of an overall packaged solution. Vendor software purchased from ISV channels is preloaded (with license validation being performed) to complete the package prior to shipment. Currently, the only software vendors participating in this offering is SAP AG and BAAN.



9406 Model SB1 System Unit

The 9406 Model SB1 has a base configuration of:

Model SB1 Processor (one must be specified):

AS/400e custom e-servers

- #2310 125,888 normalized FI Dialog Steps per hour at 65% CPU utilization 8-Way Processor with 4096M memory*
- #2311 185,533 normalized FI Dialog Steps per hour at 65% CPU utilization 12-Way Processor with 4096M memory*
- #2312 8-Way Processor with 8192M memory. Normalized F1 Dialog steps were not available at time of print.
- #2313 12-Way Processor with 8192M memory. Normalized F1 Dialog steps were not available at time of print.

* FI Dialog Steps per hour may not be realized in all environments.

Up-to-date information concerning the performance of the various SB1 processors can be found at:

<http://www.softmall.ibm.com/as400/isvso/>

Four 4.19G Disk Units

LAN adapter

One CD-ROM unit

One base communications adapter for Electronic Customer Support. A separate chargeable communications cable for ECS must also be ordered.

Three feature card slots

Workstation controller

Multifunction I/O Processor (MFIO) which supports:

- Four integrated disk units
- One integrated tape unit
- One integrated CD-ROM unit
- Three I/O adapters

Battery backup

Bus adapter

A prerequisite for ordering the 9406 Model SB1 is ordering a preload or validation of ISV software. This software will, therefore, have to be licensed in order to be able to order this model.

AS/400e custom e-servers

There are no upgrades to the 9406 Model SB1. It can be ordered only as a new system. However, the SB1 processors can be upgraded within the SB1 range.

The 9406 Model SB1 physically resembles the 9406 Model S40. However, since upgrades to the SB1 are not supported, there are many features that are supported for migration on the S40 which are, therefore, not supported at all on the SB1. For detailed description of features, refer to the 9406 Model S30, S40 section starting on page 233. For an overall picture of the Model SB1, see the Summaries section starting on page 33.

The Model SB1 has some specific configuration limitations:

There is a limit of two IOP features in the system unit. One of these could be an Integrated PC Server which occupies two adjacent card slots in the case of #6616 or three adjacent card slots in the case of #6617.

There is a limit of four internal disks on the Model SB1. It comes with four 4.19G disks (#9907) as standard. These can optionally be changed to four 8.58G disks (#8713) at the time of initial order. They can also subsequently be replaced by four 8.58G disks by ordering feature #6713. The 8.58G disks can be ordered if they will be mirrored or placed into a RAID-5 array.

The Model SB1 comes with four 1024M main storage cards as standard on the #2310 and #2311 processors and eight 1024M main storage cards as standard on the #2312 and #2313 processors. No additional feature memory can be ordered.

The Model SB1 supports a maximum of two System Expansion Towers (#5073) and no Storage Expansion Units or Towers (#5057, #5058, or #5083).

The Model SB1 supports a maximum of three workstation controllers (two at OS/400 Version 4 Release 1), 16 communication lines, two fax adapters, and five LAN ports.

AS/400e custom e-servers

For more details of the capacities of the 9406 Model SB1, refer to the Summary Tables at the front of this book. For details on the adapters, refer to the 9406 Model S30, S40 chapter.

The 9406 Model SB1 is not available in all countries.

Conversion to AS/400e series 6xx and Sxx Models

Customers with Fxx, 200, 236, 300, 310, 320, 400, 436, 500, 510, and 530 Model AS/400s can upgrade to the AS/400e system Models 600, 620, 640, and 650. Customers with 40S, 50S, and 53S Model AS/400s can upgrade to the AS/400e server Models S10, S20, S30, and S40. If upgrading from the Fxx, 2xx, and 3xx Models, this move entails a move from AS/400 48-bit IMPI to 64-bit RISC PowerPC processors. IBM has announced that upgrades from Fxx, 200, and 3xx Models to 6xx Models will be withdrawn from marketing on March 31, 1999.

B, C, D, and E models cannot be upgraded to the 6xx Models.

When upgrading to AS/400 Advanced Series PowerPC technology 6xx and Sxx Models from IMPI systems, the following considerations should be kept in mind:

OS/400 Version 4 is required to support the 6xx and Sxx Models.

Advanced planning of the upgrade will be required. Consult the *AS/400 Road Map for Changing to PowerPC Technology (Version 4)*, SA41-5150. Those considering the upgrade should order the Licensed Program 5798-TBU. This will ship the Roadmap as well as the PTFs for the Upgrade Assistant, thus ensuring that the customer has what is needed to begin planning the upgrade.

Main storage cards and I/O adapters that are installed on the current machine may not be supported on the 6xx and Sxx models. In particular, the current SPD adapters are not supported at all on the Model 600 and S10 and are only supported on the 620 and S20 as long as they have a #9331 Expansion Unit for SPD cards or a #507x Expansion Tower attached.

On all models except the 600 Processors #2129, #2134, #2135, and S10 Processor #2118, Base main storage and Feature main storage must both be installed either in pairs or fours of equal

Model Conversion

capacity. Because of this some memory options are not available, so customers should plan ahead carefully when deciding what main storage features to order on these models.

Internal disk and tape units will normally require a conversion kit to be fitted inside the new System and Expansion Units.

The following I/O devices that are supported on the 5xx Models are not supported on the 6xx or Sxx Models:

- 9336 DASD
- 320M, 400M, and 988M internal disks
- 525M ¼" and 840M Mini-QIC cartridge tapes

Increased main storage and DASD are required on PowerPC-based models compared with IMPI models of AS/400. For further information, see the *Road Map (SA41-5150)* and also use the Upgrade Assistant which can be used as a tool to help plan and order the upgrade.

For details on items such as size, weight, power consumption, and cables for the 6xx and Sxx Models, refer to the *Physical Planning Reference (Version 4), SA41-5109*.

Application software must be in observable format or have either source code available or a PowerPC version available to move from IMPI to PowerPC models.

Upgrades from IMPI models will include a 4.19G disk. No additional disks will be shipped with the upgrades unless specifically ordered.

All PowerPC models include a CD-ROM drive. OS/400 Version 4 software will be shipped only on CD-ROM.

Model Conversion

Table 3. Supported Upgrade Paths

To From	V2R3	V3R05	V3R1	V3R2	V3R6	V3R7	V4R1	V4R2	V4R3
V2R3		X	X	X	X			e-Jump*	e-Jump*
V3R05			X	X	X	X			e-Jump*
V3R1				X	X	X	X		e-Jump*
V3R2						X	X	X	X
V3R6						X	X		
V3R7							X	X	X
V4R1								X	X
V4R2									X

Note: * e-Jump supports direct upgrades to the latest RISC software releases without the need to perform an intermediate software upgrade step.

CFAS400 or the PCAS400 Portable Configurator must be used to configure all upgrades to AS/400e series.

The following upgrade options are available when upgrading to the PowerPC-based RISC models 6xx and Sxx from IMPI models:

Replacing the Release (#0200): This no-charge specify code denotes the upgrade will be done via the Replacing the Release method. This upgrade method may be used for upgrading systems running the OS/400 IMPI version/releases as defined in the Supported Upgrade Paths table above. The Replacing the Release method is based on user objects remaining on the DASD units throughout the upgrade process. All supported DASD units are retained in the upgrade to Version 4. Prior to upgrading the hardware, the Disk Preparation Utility must be run to prepare the DASD units on the prior release system for the new 4KB page size. All necessary object conversions are done by the system as part of the upgrade. This is the preferred approach for larger systems when all DASD units will be moved to the Version 4 system. Replacing the Release reduces potential problems caused by save/restore and tape handling. It is the method most commonly used by AS/400 customers. IBM AS/400 Transition Services for PowerPC Technology are available for a charge. With #0200 the serial number of the system remains unchanged.

Model Conversion

Unload/Reload (#0201): This no-charge specify code denotes the upgrade will be done via the Unload/Reload upgrade method. This method consists of unloading user applications and data to tape, upgrading the hardware, installing OS/400 Version 4, and reloading the user applications and data. This approach is attractive for smaller systems, and reduces upgrade time compared to Replacing the Release. It may also be an effective method for upgrading common programs and files on multiple systems. IBM AS/400 Transition Services for PowerPC Technology are available for a charge. With #0201 the serial number of the system remains unchanged unless it is ordered with #0203 Side-by-Side Install.

Staged Upgrade Offering (#0202): This priced option provides an upgrade alternative that allows a customer to use the upgrade hardware for a limited period of time to translate and validate user applications prior to the actual upgrade. This option is available using either #0200 (Replacing the Release) or #0201 (Unload/Reload) methods. This priced offering requires careful advance planning. *AS/400 Roadmap for Changing to PowerPC Technology (SA41-5150)* describes this offering in detail. IBM AS/400 Transition Services for PowerPC Technology are available for a charge.

Note: The following hardware is delivered with this option:

- Power/Frame/Covers/Power Cord
- Processor Card
- Base Memory
- Feature Memory
- Base DASD
- New Feature DASD

The customer can order optional features for inclusion in this hardware package. This package does not include a workstation controller, a tape adapter (or internal tape drive), or a communications adapter to allow transferring of data and programs. The customer will need to supply these for the duration of the transition. These can be "borrowed from the current system," if possible. With #0202 the serial number of the system remains unchanged.

Model Conversion

Side-by-Side Install (#0203): This no-charge specify code is used to alert IBM service representatives of the intention to install a NEW system concurrently with an existing system, and over time, move applications to the new system. This method may be used when adding a system to an existing complex or network, or when a replaced system is being moved to another location. *AS/400 Roadmap for Changing to PowerPC Technology (SA41-5150)* describes this option in detail. IBM services are also available for a charge. If an upgrade is ordered with #0203, then this is effectively a new system and it will have a new serial number.

Staged Side-by-Side Upgrade (#0204): This no-charge specify code denotes that the Staged Side-by-Side Upgrade method will be used. Feature #0202 (Staged Upgrade Offering) is a prerequisite that provides a base functional PowerPC-based system that will be used to translate and validate user applications prior to the actual upgrade. #0204 assumes that the customer will be purchasing enough disk storage (and other features as necessary) to completely duplicate the disk storage of their IMPI machine. #0204 also indicates that the upgrade will be performed using a method similar to the Side-by-Side Install method (#0203) which is described in *AS/400 Roadmap for Changing to PowerPC Technology (SA41-5150)*. This offering requires careful advanced planning. IBM services are also available for a charge. With #0204 the serial number of the system remains unchanged.

If an upgrade is ordered using the above features #0200 or #0201 without #0203, then the system keeps the same serial number. If #0202 or #0204 is also included in the order, then again this is an upgrade and the serial number of the system will remain unchanged. However, if #0203 is ordered, then a new system is being ordered and it will have a new serial number.

Model Conversion

PowerPC to PowerPC Upgrades

This applies to upgrades from 4xx and 5xx Models to the 6xx and Sxx Models.

With these upgrades a new System Unit is shipped with the upgrade, which includes a new CD-ROM drive. The following considerations should be kept in mind:

No new DASD is shipped with the upgrade.

Sufficient workstation controllers must be added to the target system to ensure sufficient twinax addresses. When upgrading to the Model 600 and 620, systems with base 14 or 28 workstation support can be satisfied with a #9720 base.

Systems with a base 40 workstation support will need a #2722 feature workstation controller in addition to the base #9720 on a Model 600 or 620.

For systems without Expansion Towers, all internal disk units are to be moved to the System Unit and #5064/#9364 System Unit Expansion using the appropriate kits when upgrading to a Model 600, 620, S10, or S20.

Details on this upgrade path are found in the *System Upgrade Road Map (RISC to RISC)*, (SA41-5155).

Model Conversion

The following tables show with an "X" what upgrades are available to AS/400 6xx and Sxx Models from AS/400 IMPI and PowerPC based RISC Systems and from Advanced 36 Systems.

The only upgrades to the Model 6xx and Sxx Processors not shown in these charts are on the 9406 Model SB1. On this model, upgrades are available through the range of 4 processors offered.

From 9402/9404/9406		To 9402/9404/9406e system								
Model		600	600	600	600	620	620	620	620	620
	Pro-processor	#2129	#2134	#2135	#2136	#2175	#2179	#2180	#2181	#2182
	RSP CPW (2)	22.7	32.5	45.4	73.1	50.0	85.6	113.8	210.0	464.3
F02	5.5	X	X	X						
F04	7.3	X	X	X	X					
F06	9.6	X	X	X	X					
F10	9.6	X	X	X	X	X	X			
F20	11.6	X	X	X	X	X	X	X		
F25	13.7	X	X	X	X	X	X	X		
F35	13.7	X	X	X	X	X	X	X		
F45	17.1		X	X	X	X	X	X		
F50	27.8					X	X	X	X	
F60	40.0						X	X	X	X
F70	57.0							X	X	X
F80	97.1								X	X
F90	127.7								X	X
F95 (1)	148.8									
F97 (1)	177.4									

Notes:

- (1) There are no upgrades from these models to the Model 600 or 620.
- (2) See page 293 for RSP CPW details.
- (3) Upgrades from Fxx Models to 6xx Models will be withdrawn from marketing on March 31, 1999.

Model Conversion

From 9402/9404/9406		To 9402/9404/9406e system								
Model		600	600	600	600	620	620	620	620	620
	Pro-cessor	#2129	#2134	#2135	#2136	#2175	#2179	#2180	#2181	#2182
	RSP CPW (2)	22.7	32.5	45.4	73.1	50.0	85.6	113.8	210.0	464.3
236/#2100	--			X	X	X	X	X		
436/#2102	16.3			X	X	X	X	X		
436/#2104	20.6			X	X	X	X	X	X	
436/#2106	27.4							X	X	
200/#2030	7.3	X	X	X	X	X	X			
200/#2031	11.6	X	X	X	X	X	X	X		
200/#2032	16.8		X	X	X	X	X	X		
300/#2040	11.6	X	X	X	X	X	X	X		
300/#2041	16.8		X	X	X	X	X	X		
300/#2042	21.1		X	X	X	X	X	X	X	
310/#2043	33.8						X	X	X	X
310/#2044	56.5							X	X	X
320/#2050	67.5							X	X	X
320/#2051	120.3								X	X
320/#2052 (1)	177.4									

- (1) There are no upgrades from these models to the Model 600 or 620.
- (2) See page 293 for RSP CPW details.
- (3) Upgrades from 200 and 3xx Models to 6xx Models will be withdrawn from marketing on March 31, 1999.

Model Conversion

From 9402/9404/9406		To 9402/9404/9406e system								
Model		600	600	600	600	620	620	620	620	620
	Processor	#2129	#2134	#2135	#2136	#2175	#2179	#2180	#2181	#2182
	RSP CPW (3)	22.7	32.5	45.4	73.1	50.0	85.6	113.8	210.0	464.3
400/#2130 (2)	13.8	X	X	X	X	X	X	X		
400/#2131 (2)	20.6		X	X	X	X	X	X	X	
400/#2132 (2)	27.0			X	X	X	X	X	X	
400/#2133 (2)	33.3				X		X	X	X	
500/#2140	21.4					X	X	X	X	
500/#2141	30.7					X	X	X	X	X
500/#2142	43.9						X	X	X	X
510/#2143	77.7							X	X	X
510/#2144	104.2								X	X
530/#2150 (1)	131.1									
530/#2151 (1)	162.7									
530/#2152 (1)	278.8									
530/#2153 (1)	459.3									
530/#2162 (1)	509.9									
600/#2129	22.7		X	X	X	X	X	X	X	
600/#2134	32.5			X	X	X	X	X	X	
600/#2135	45.4				X		X	X	X	X
600/#2136	73.1							X	X	X
620/#2175	50.0						X	X	X	X
620/#2179	85.6							X	X	X
620/#2180	113.8								X	X
620/#2181	210.0									X

Notes:

- (1) There are no upgrades from these models to Model 600 or 620.
- (2) The 400 includes packaged Models 40E, 40G, 40L, 41E, 41G, 41L, 42E, 42G, and 42L with these processors.
- (3) See page 293 for RSP CPW details.

Model Conversion

From 9402/9404/9406		To 9402/9404/9406e system				
Model		640	640	640	650	650
	Processor	#2237	#2238	#2239	#2240	#2243
	RSP CPW (2)	319.0	583.3	998.6	1794.0	2340.0
F35 (1)	13.7					
F45 (1)	17.1					
F50 (1)	27.8					
F60	40.0	X				
F70	57.0	X	X			
F80	97.1	X	X			
F90	127.7	X	X	X		
F95	148.8	X	X	X		
F97	177.4	X	X	X	X	

Notes:

- (1) There are no upgrades from these models to the Model 640 or 650.
- (2) See page 293 for RSP CPW details.
- (3) Upgrades from Fxx Models to 6xx Models will be withdrawn from marketing on March 31, 1999.

Model Conversion

From 9402/9404/9406		To 9402/9404/9406e system						
Model		640	640	640	650	650	650	650
	Pro-processor	#2237	#2238	#2239	#2240	#2243	#2188	#2189
	RSP CPW (2)	319.0	583.3	998.6	1794.0	2340.0	3660.0	4550.0
300/#2040 (1)	11.6							
300/#2041 (1)	16.8							
300/#2042 (1)	21.1							
310/#2043	33.8	X						
310/#2044	56.5	X	X					
320/#2050	67.5	X	X					
320/#2051	120.3	X	X	X				
320/#2052	177.4	X	X	X	X			
500/#2140 (1)	21.4							
500/#2141	30.7	X						
500/#2142	43.9	X	X					
510/#2143	77.7	X	X	X				
510/#2144	104.2	X	X	X				
530/#2150	131.1	X	X	X	X			
530/#2151	162.7	X	X	X	X			
530/#2152	278.8		X	X	X	X	X	
530/#2153	459.3			X	X	X	X	X
530/#2162	509.9			X	X	X	X	X
620/#2175	50.0	X						
620/#2179	85.6	X	X					
620/#2180	113.8	X	X	X				
620/#2181	210.0	X	X	X	X			
620/#2182	464.3			X	X	X	X	X
640/#2237	319.0		X	X	X	X	X	
640/#2238	583.3			X	X	X	X	X
640/#2239	998.6				X	X	X	X
650/#2240	1794.0					X	X	X
650/#2243	2340.0						X	X
650/#2188	3660.0							X

Notes:

- (1) There are no upgrades from these models to Model 640 or 650.
- (2) See page 293 for RSP CPW details.
- (3) Upgrades from 3xx Models to 6xx Models will be withdrawn from marketing on March 31, 1999.

Model Conversion

From 9406e server		To 9406e server								
Model		170	170	170	170	170	170	170	170	170
	Processor	#2160	#2164	#2176	#2183	#2290	#2291	#2292	#2385	#2386
	CPW (1)	114	210	319	319	73	115	220	460	460
170/#2159	73	X	X	X	X				X	X
170/#2160	114		X	X	X				X	X
170/#2164	210			X	X				X	X
170/#2176	319				X				X	X
170/#2183	319									X
170/#2290	73						X	X	X	X
170/#2291	115							X	X	X
170/#2292	220								X	X
170/#2385	460									X

Notes:

- (1) The CPW figures are for Client/Server unconstrained environment. See page 293 for CPW details.
- (2) Model 170 CPW number are for processor (unconstrained) performance.

Model Conversion

From 9402/9404/9406		To 9402/9404/9406e server					
Model		S10	S10	S20	S20	S20	S20
	Processor	#2218	#2219	#2161	#2163	#2165	#2166
	RSP CPW (2)	45.4	73.1	113.8	210.0	464.3	759.0
40S/#2109 (1)	27.0	X	X	X	X		
40S/#2110 (1)	33.3		X	X	X		
40S/#2111 (1)	59.8			X	X	X	
40S/#2112 (1)	87.3				X	X	X
50S/#2120	77.7				X	X	X
50S/#2121	104.2				X	X	X
50S/#2122	130.7				X	X	X
S10/#2118	45.4		X	X	X	X	
S10/#2119	73.1			X	X	X	X
S20/#2161	113.8				X	X	X
S20/#2163	210.0					X	X
S20/#2165	464.3						X

Notes:

- (1) The 40S includes packaged Models 4SS, 4SE, 4SG, 4SL, 4TG, 4HS, 4HE, 4HG, and 4HL with these processors.
- (2) The CPW figures are for Client/Server environment. See page 293 for RSP CPW details.

Model Conversion

From 9402/9404/9406		To 9402/9404/9406e server							
Model		S30	S30	S30	S30	S40	S40	S40	S40
	Pro-cessor	#2257	#2258	#2259	#2260	#2256	#2261	#2207	#2208
	RSP CPW (1)	319.0	583.3	998.6	1794.0	1794.0	2340.0	3660.0	4550.0
50S/#2120	77.7	X	X						
50S/#2121	104.2	X	X	X					
50S/#2122	130.7	X	X	X					
53S/#2154	162.7	X	X	X	X	X			
53S/#2155	278.8		X	X	X	X	X		
53S/#2156	459.3			X	X	X	X	X	X
53S/#2157	509.9			X	X	X	X	X	X
S20/#2161	113.8	X	X	X					
S20/#2163	210.0	X	X	X					
S20/#2165	464.3			X	X	X	X	X	X
S20/#2166	759.0				X	X	X	X	X
S30/#2257	319.0		X	X	X	X	X	X	
S30/#2258	583.3			X	X	X	X	X	X
S30/#2259	998.6				X	X	X	X	X
S30/#2260	1794.0						X	X	X
S40/#2256	1794.0						X	X	X
S40/#2261	2340.0							X	X
S40/#2207	3660.0								X

Notes:

- (1) The CPW figures are for Client/Server environment.
- (2) See page 293 for RSP CPW details.

Model Conversion

From 9406e custom mixed-mode server		To 9406e custom mixed-mode server							
Model		S20	S20	S20	S30	S30	S30	S40	S40
	Processor	#2170	#2177	#2178	#2320	#2321	#2322	#2340	#2341
	CPW (1)	464.3/ 49.7	759.0/ 110.7	759.0/ 221.4	998.6/ 215.1	1794.0/ 386.4	1794.0/ 579.6	3660.0/ 1050.0	4550.0/ 2050.0
S20/#2170	464.3/ 49.7		X	X	X	X			
S20/#2177	759.0/ 110.7			X	X	X	X	X	X
S20/#2178	759.0/ 221.4					X	X	X	X
S30/#2320	998.6/ 215.1					X	X	X	X
S30/#2321	1794.0/ 386.4						X	X	X
S30/#2322	1794.0/ 579.6							X	X
S40/#2340	3660.0/ 1050.0								X

Notes:

- (1) The first CPW figure given is for Client/Server environment, the second is for Interactive.

The Relative System Performance Commercial Processing Workload (RSP CPW) is described on page 12. The figures quoted are as follows:

Models 170, 600, 620, 640, 650, S10, S20, S30, and S40:
Version 4 Release 3

Models 400, 500, 510, 530, 40S, 50S, 53S, 436: Version 3
Release 7

Models 200, 300, 310, 320, 20S, 30S, 236, and Fxx: Version 3
Release 1

Migrated Disk Units

Migrated Disk Units for AS/400e series 6xx and Sxx Models

When upgrading to an AS/400 6xx or Sxx Model from previous models, internal Disk Units must be adapted for use in the new packaging. This is achieved by means of conversion kits which are parts that allow the old disk units to be fitted in the new cages.

Each migrated disk unit conversion feature occupies one Disk Unit slot in the appropriate unit. Dual disk units will need two conversion features.

The following table shows which Disk Units can be converted for attachment in the new 6xx and Sxx models and the migration kit that is required to achieve this. Older disks are not supported (320M, 400M, 640M dual disks, 800M dual disks, 988M, 1976M dual disks) in the 6xx and Sxx Models.

Detail on any restrictions where the Migration Kits might be placed in the AS/400 are detailed with the Model details on page 127 (600, 620), page 168 (640, 650), page 226 (S10, S20), and page 266 (S30, S40).

Migrated Disk Units

Existing Disk Feature	Description	Size G	Migration Kit	Qty Req'd	Models Valid
1203	Single Disk Unit	1.03	1312	1	A
1204	Single Disk Unit	1.96	1313	1	A
1205	Two-Byte Disk Unit	1.03	1325	1	A
1206	Two-Byte Disk Unit	1.96	1326	1	A
1207	Two-Byte Disk Unit	4.19	1327	1	A
1211	Two-Byte Disk Unit	1.03	1322	1	A
1212	Two-Byte Disk Unit	1.96	1323	1	A
1213	Two-Byte Disk Unit	1.03	1322	1	A
1214	Optional Two-Byte Base Disk	1.96	1323	1	A
1312	Disk Unit Kit 1-Byte	1.96	1603	1	B
1313	Disk Unit Kit 1-Byte	1.03	1602	1	B
1602	Single Disk Conversion Kit	1.03	1312	1	A,E
1603	Single Disk Conversion Kit	1.96	1313	1	A,E
2802	Internal Disk Unit	1.03	1602	2	B
2802	Internal Disk Unit	1.03	1312	2	A
4205	Two-Byte Disk Unit	1.03	1325	1	A
4206	Two-Byte Disk Unit	1.96	1326	1	A
4207	Two-Byte Disk Unit	4.19	1327	1	A
4211	Two-Byte Disk Unit	1.03	1322	1	A
4212	Two-Byte Disk Unit	1.96	1323	1	A
4605	Two-Byte Disk Unit	1.03	1325	1	A,F
4606	Two-Byte Disk Unit	1.96	1326	1	A,F
4607	Two-Byte Disk Unit	4.19	1327	1	A,F
4650	Two-Byte Disk Unit	1.96	1323	1	A,F
4652	Two-Byte Disk Unit	1.03	1322	1	A,F
6601	Single Disk Unit	1.03	1312	1	A
6602	Single Disk Unit	1.03	1602	1	B
6602	Single Disk Unit	1.03	1312	1	A
6603	Single Disk Unit	1.96	1603	1	B
6603	Single Disk Unit	1.96	1313	1	A
6605	Two-Byte Disk Unit	1.03	1325	1	A,E
6606	Two-Byte Disk Unit	1.96	1326	1	A,E
6607	Two-Byte Disk Unit	4.19	1337	1	A,D
6607	Two-Byte Disk Unit	4.19	1327	1	A,C,E
6612	Dual Disk Unit	1.03	1602	2	B
6612	Dual Disk Unit	1.03	1312	2	A
6613	Dual Disk Unit	3.93	1603	2	B
6613	Dual Disk Unit	3.93	1313	2	A
6650	Two-Byte Disk Unit	1.96	1323	1	A,E
6652	Two-Byte Disk Unit	1.03	1322	1	A,E
6701	Single Disk Unit	1.03	1312	1	A
6713	Ultra SCSI Disk Unit	8.58	1333	1	A,E
6714	Ultra SCSI Disk Unit	17.54	1334	2	A,E
6802	Base Disk Replace	1.03	1602	1	B
6802	Base Disk Replace	1.03	1312	1	A

Migrated Disk Units

Existing Disk Feature	Description	Size G	Migration Kit	Qty Req'd	Models Valid
6812	Base Dual Disk Replace	1.03	1602	2	B
6812	Base Dual Disk Replace	1.03	1312	2	A
6906	Ultra SCSI Disk Unit	1.96	1336	1	A,E
6907	Ultra SCSI Disk Unit	4.19	1337	1	A,E
7607	Optional Base Two-Byte Disk Unit	4.19	1337	1	A,D
7607	Optional Base Two-Byte Disk Unit	4.19	1327	1	A,C
7613	Base DASD Replace	1.96	1603	2	B
7613	Base DASD Replace	1.96	1313	2	A
7713	Optional Base Ultra SCSI Disk	8.58	1333	1	A
8606	Optional Base Two-Byte Disk Unit	1.96	1326	1	A
8607	Optional Base Two-Byte Disk Unit	4.19	1327	1	A
8612	Base Dual Disk Unit	1.03	1602	2	B
8612	Base Dual Disk Unit	1.03	1312	2	A
8613	Base Dual Disk Unit	1.96	1603	2	B
8613	Base Dual Disk Unit	1.96	1313	2	A
8650	Optional Base Two-Byte Disk Unit	1.96	1323	1	A
8706	Optional Base Two-Byte Disk Unit	1.96	1326	1	A
8707	Optional Base Two-Byte Disk Unit	4.19	1327	1	A
8713	Optional Base Ultra SCSI Unit	8.58	1333	1	A
9601	Standard Disk Unit	1.03	1312	1	A
9602	Standard Disk Unit	1.03	1602	1	B
9602	Standard Disk Unit	1.03	1312	1	A
9605	Base Two-Byte Disk Unit	1.03	1325	1	A
9606	Base Two-Byte Disk Unit	1.96	1326	1	A
9652	Base Two-Byte Disk Unit	1.03	1322	1	A
9705	Base Two-Byte Disk Unit	1.03	1325	1	A
9802	Standard Internal Disk Unit	1.03	1602	2	B
9802	Standard Internal Disk Unit	1.03	1312	2	A

Notes:

A = 600, 620, S10, S20 Models

B = 640, 650, S30, S40 Models

C = If upgrading from 3xx and 5xx Models

D = If upgrading from 2xx and 4xx Models

Migrated Disk Units

E = Kit only required if disk is placed in System Unit or System Unit Expansion #9364/#5064. It is not required if positioned in an Expansion or Storage Tower.

F = No kit required if being placed in an Expansion or Storage Tower and a record-purposes-only conversion is done.

Migrated Tape Units

Migrated Tape Units for AS/400e series 6xx and Sxx Models

When upgrading to an AS/400 6xx or Sxx model from previous models, the internal ¼-inch Cartridge or 8mm Cartridge Tape Units must be adapted by means of a conversion kit to be fitted into the System Unit or #5064/#9364 System Unit Expansion. The kit contains parts to allow the tape to be fitted into the cage.

Each migrated tape unit conversion feature occupies one tape slot in the System Unit or Expansion Tower. The older 120M and 525M QICs do not migrate.

The following tables show the conversion kit feature number that must be ordered to achieve this migration. It is possible to migrate some QICs without the migration kit if they are to be placed in an Expansion Tower (see the final column in the first table).

Migrated Tape Units

Migrating Internal Tapes to 600, 620, S10, S20 Models

Existing Tape Feature	Format and Capacity	Migration Feature for System Unit & #9364/#5064 (2)	Supported Without Conversion in #5072/3 Expansion Tower
1251	1.2G QIC	1349	
1252	2.5G QIC	1350	
1260	2.5G QIC	1350	
1261	7G 8mm	1360	
1379	1.2G QIC	1349	Yes
1380	2.5G QIC	1350	Yes
5348	1.2G QIC	1349	
5349	2.5G QIC	1350	
6344	2.5G QIC	1350	
6348	1.2G QIC	1349	
6349	2.5G QIC	1350	
6368	1.2G QIC	1349	Yes (1)
6369	2.5G QIC	1350	Yes (1)
6380	2.5G QIC	1350	Yes
6385	13G QIC	1355	Yes
6390	7G 8mm	1360	Yes
7343	1.2G QIC	1349	
7344	2.5G QIC	1350	
7348	1.2G QIC	1349	
7349	2.5G QIC	1350	
8343	1.2G QIC	1349	
8344	2.5G QIC	1350	
8348	1.2G QIC	1349	
8349	2.5G QIC	1350	
9343	1.2G QIC	1349	
9348	1.2G QIC	1349	

Notes:

- (1) These do not need a kit only when installed in #5032 Removable Media Device Cluster Box which requires a 9309 rack.
- (2) The same migration kit feature will contain different parts when ordered for a 600/S10 as when ordered for a 620/S20 due to the concurrent maintenance ability of the 620/S20.

Migrated Tape Units

Migrating Internal Tapes to 640, 650, S30, S40 Models

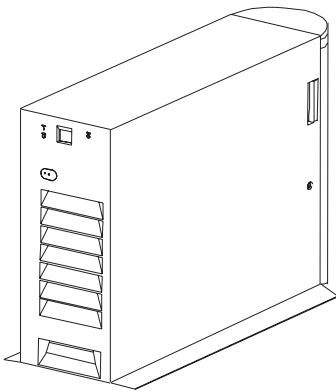
Existing Tape Feature	Format and Capacity	Migration Kit Required
1349	1.2G QIC	1379
1350	2.5G QIC	1380
5348	1.2G QIC	1379
5349	2.5G QIC	1380
6348	1.2G QIC	1379
6349	2.5G QIC	1380
6368	1.2G QIC	1379 (1)
6369	2.5G QIC	1380 (1)
7348	1.2G QIC	1379
7349	2.5G QIC	1380
8348	1.2G QIC	1379
8349	2.5G QIC	1380
9348	1.2G QIC	1379

Notes:

- (1) These do not need a kit only when installed in #5032 Removable Media Device Cluster Box which requires a 9309 rack.

9337 Disk Array Subsystem Models

IBM 9337 Disk Array Subsystem Models



9337 Standalone Model 545, 585, or 595

Note: All Models of the 9337 are being withdrawn from marketing effective September 30, 1998. For more information, see Announcement Letter dated July 14, 1998.

All AS/400 Advanced Series Models come with a base disk unit and have the ability to add additional embedded disk units. 9406 Models 620, 640, 650, S20, S30, and S40 can also attach external disks. The IBM 9337 Disk Array Subsystem is an external disk subsystem.

The six models of the 9337 Disk Array Subsystem Family (Models 540, 545, 580, 585, 590, and 595) offer performance improvements over previous 9337 models. Features of these models include:

A controller with:

- 4M non-volatile write cache
- 8M data store
- Faster internal microprocessor
- Faster SCSI interface chips
- Performance optimized microcode

Four base disk drives with the ability to add an additional four disk drives to the drawer

9337 Disk Array Subsystem Models

The ability to attach to supported open systems such as the AS/400, RS/6000, HP**, SUN, and NCR "Hot Spare" availability feature

The 9337 Models 540 and 545 come with four base 1.96G disk drives. Up to four additional 1.96G disk drives can be added per drawer. These additional 1.96G disk drives are specified by feature code #1249.

The 9337 Models 580 and 585 come with four base 4.19G disk drives. Up to four additional 4.19G disk drives can be added per drawer. These additional 4.19G disk drives are specified by feature code #1289.

The 9337 Models 590 and 595 come with four base 8.58G disk drives. Up to four additional 8.58G disk drives can be added per drawer. These additional 8.58G disk drives are specified by feature code #1290.

The 9337 Models 540, 580, and 590 are rack-mountable drawers supported in the AS/400 9309 rack enclosures. Up to six 9337 models are supported in a single rack. The 9337 Models 545, 585, and 595 are standalone desk-side models, which are available with either black or white covers by specifying feature code #2405 for black or feature code #2415 for white covers.

The 9337 Models 540, 545, 580, 585, 590, and 595 have a 4M high-performance controller that includes a 4M non-volatile write cache and a redundant write cache which is removable. In the event of a 9337 controller failure, no data is lost as all the data is duplicated in the removable write cache. This removable cache includes batteries that protect the data once it is removed from the controller. The write cache can then be replaced into a new controller. The data is then automatically downloaded to the disk drives.

The controller supports the 9337 in either "Base" or RAID-5 ("High Availability") mode which is selected from the control panel on the front of the 9337 drawer.

9337 Disk Array Subsystem Models

All the 9337 models have multiple power supplies which are active. Should one power supply fail, the remaining power supplies increase their output to compensate for the loss, thus allowing the 9337 subsystem to continue operations. The failed power supply can be concurrently replaced, that is, while the 9337 is active.

This concurrent maintenance support also applies to the disk drives when the 9337 is in RAID-5 mode.

The 9337 Models 540, 545, 580, 585, 590, and 595 can be supported within the same Auxiliary Storage Pool (ASP) when in either RAID-5 or mirrored mode.

A Direct Access Storage Device Controller, feature code #6501, is required to attach the 9337 Models 540, 545, 580, 585, 590, and 595 to the AS/400. Up to two 9337 drawers can be attached to each #6501. These 9337 models are only supported on AS/400 9406 Models D, E, or F or 9406 Advanced System Models 300, 310, 320, 500, 510, or 530 with Version 3 of OS/400 or AS/400e series Models 620, 640, 650, S20, S30, and S40 with Version 4 of OS/400. For the maximum number of disk controllers or disk capacity supported on an AS/400 9406 model see the Summary Tables on pages 35 through 56.

Previous models of the 9337 cannot be upgraded to these standalone 9337 Models 540, 545, 580, 585, 590, and 595. However, these 9337 models may be converted to attach to other open systems by specifying feature code #5001. Once converted, the 9337 model takes on the same attributes as the IBM 7137 Disk Array Subsystem which shares the same technology.

9337 Disk Array Subsystem Models

The following table summarizes the entire 9337 Disk Array Subsystem Family:

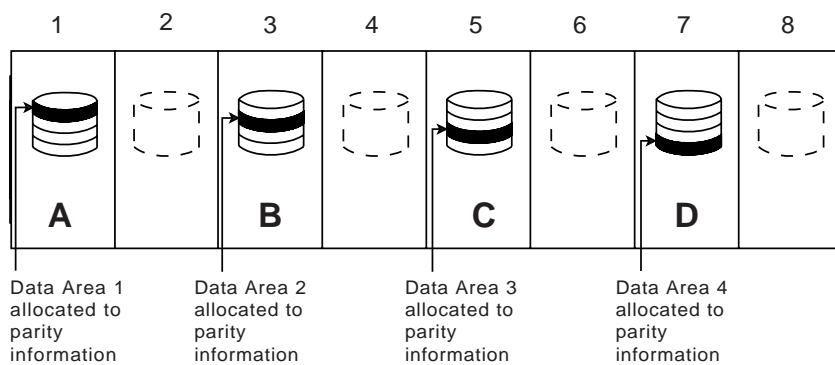
Type-Model	High Availability (HA)*	MB per Disk	No. of Disks Min/Max	Additional Disk Feature	Max Capacity (G)		9406 Models	Upgrade from
					Base Mode	HA Mode		
9337-010	N	542	2/7	#1206	3.79	--	B,D,E,F,	none
110	Y	542	4/7	#1206	--	3.25	300,310,320	010
020	N	970	2/7	#1212	6.79	--	500,510,530	none
120	Y	970	4/7	#1212	--	5.82	620,640,650	020
040	N	1967	4/7	#1220	13.76	--	S20,S30,S40	none
140	Y	1967	4/7	#1220	--	11.80		040
9337-015	N	542	2/7	#1207	3.79	--	B,D,E,F,	none
115	Y	542	4/7	#1207	--	3.25	300,310,320	015
025	N	970	2/7	#1213	6.79	--	500,510,530	none
125	Y	970	4/7	#1213	--	5.82	620,640,650	025
9337-210	S	542	2/8	#1206	4.33	3.79	D,E,F,	010,110
220	S	970	2/8	#1212	7.76	6.79	300,310,320, 500,510,530 620,640,650 S20,S30,S40	020,120
9337-215	S	542	2/8	#1207	4.33	3.79	D,E,F,	015,115
225	S	970	2/8	#1213	7.76	6.79	300,310,320, 500,510,530 620,640,650	025,125
240	S	1967	4/8	#1220	15.73	13.76	S20,S30,S40	040,140
9337-420	S	970	4/8	#1228	7.76	6.79	D,E,F,	210,215, 220,225,
440	S	1967	4/8	#1248	15.73	13.76	300,310,320, 500,510,530 620,640,650	240: #1400 controller upgrade
480	S	4194	4/8	#1288	33.55	29.35	S20,S30,S40	
9337-540	S	1967	4/8	#1249	15.73	13.76	D,E,F,	No upgrades supported.
545	S	1967	4/8	#1249	15.73	13.76	300,310,320, 500,510,530	
580	S	4194	4/8	#1289	33.55	29.35	620,640,650	
585	S	4194	4/8	#1289	33.55	29.35	S20,S30,S40	
590	S	8589	4/8	#1290	68.71	60.12		
595	S	8589	4/8	#1290	68.71	60.12		

* N=No Y=Yes S=Switchable

9337 Disk Array Subsystem Models

RAID-5 and the 9337 Disk Array Subsystem

The 9337 Models 540, 545, 580, 585, 590, and 595 incorporate an AS/400 optimized version of RAID-5 (Redundant Array of Independent Disks). The following schematic can be used to describe how RAID-5 is implemented in the 9337 models:



The schematic shows the eight slots available in a 9337 for disk drives. The base four disk drives are allocated to slots 1, 3, 5, and 7 and are either 1.96G, 4.19G, or 8.58G disk drives.

One quarter of each of these four disk drives is allocated to parity information that is automatically maintained as part of the RAID-5 based protection feature. Thus, the available capacity on each of these base disk drives is either 1.48G, 3.14G, or 6.44G. Additional disk drives can be added to the remaining slots. Their full capacity is available for data. All disk drives in a 9337 model must be of the same capacity.

If the four base disk drives, A, B, C, and D are each imagined to be divided into four data areas (see schematic), then Data Area 1 on disk A will contain parity information for Data Area 1 on all the other disk drives installed in the 9337. Similarly, Data Area 2 on disk B holds the parity information for Data Area 2 on all the other disk drives, and so on.

If a disk drive fails in the 9337, it cannot be used to read or write data. A message is sent indicating the status of the storage unit to

9337 Disk Array Subsystem Models

the AS/400. Meanwhile, the controller in the 9337 subsystem will read the parity and data in the same data areas on the other disks and dynamically rebuild the original data from the failed disk drive. This will satisfy any ongoing read requests. When data needs to be written, the 9337 controller generates the parity information for the failed disk drive as if it were still operating. As far as the AS/400 is concerned, the 9337 model in RAID-5 mode will continue to respond to I/O even though a single disk drive has failed.

The performance of the 9337 subsystem is degraded after the failure of a single disk. The failed disk drive can be replaced while the 9337 is still in use. This is known as concurrent maintenance. The content of the replacement disk drive will then be concurrently rebuilt from the parity data areas of the other disk drives. Failure of two disk drives within a 9337 in RAID-5 mode would cause the 9337 subsystem to cease operations.

The controller in the 9337 subsystem includes a 4M non-volatile write cache which provides fast and protected write operations. It also has a faster internal microprocessor and data paths to reduce internal processing time which overcomes the performance hit inherent with the RAID-5 write process. The controller also supports the 9337 subsystem in "Base" mode if RAID-5 ("High-Availability") mode is not required. If feature code #0044 is specified on the initial order, the 9337 model is shipped in RAID-5 mode. Once installed on the AS/400, the 9337 can be changed at any time to the required "Base" or "High-Availability" mode.

This 4M high performance controller, which is standard on the later models of the 9337 including the 420, 440, 480, 540, 545, 580, 585, 590, and 595, is available as an upgrade to earlier models (9337 Models 210, 215, 220, 225, and 240) by specifying feature code #1400. This controller also provides the optional Dynamic RAID Spare Function ("hot spare").

9337 Disk Array Subsystem Models

Dynamic RAID Spare Function

The Dynamic RAID Spare Function, otherwise known as a "hot spare," allows one of the disk drives to be assigned as a spare in the 9337 subsystem when in RAID-5 mode.

The hot spare drive is installed in slot 8 of the 9337 and is not addressable by the AS/400, thus reducing the maximum number of addressable disk drives in the 9337 from eight to seven.

In the event of a disk drive failure, the 9337 automatically and immediately begins restoring the failed disk drive data to the hot spare, again by using the parity data areas from the other disk drives.

Since the data restore process can begin before the failed disk drive is physically replaced, it reduces the time that the 9337 is in the "exposed" mode to the restore time of the hot spare. The "exposed" mode is when there is the potential of another disk drive failing in the same 9337 which would cause the 9337 to cease operation. The replaced drive then becomes the new hot spare.

This Dynamic RAID Spare Function is also available on 9337 210, 215, 220, 225, or 240 models that do not have the 4M controller as an RPQ (843795).

2105 Versatile Storage Server

The IBM 2105 Versatile Storage Server is designed to provide a flexible approach to storage centralization in support of server consolidation. By using the IBM 7133 Serial Disk Subsystem as its storage building block, Versatile Storage Server provides investment protection. With the Versatile Storage Server, disk storage can be consolidated into a single powerful system that offers many levels of advanced function. Examples include remote web-based management, true data sharing for like servers, and dynamic capacity allocation.

IBM Versatile Storage Server delivers centralized management of stored data. IBM Versatile Storage Server provides centralized management and sharing of disk storage for a variety of UNIX, Windows NT, and AS/400 servers. As requirements change, you can assign unallocated storage capacity dynamically to any of your attached servers without disruption.

Centralized management is simplified by using the IBM StorWatch . Versatile Storage Specialist (part of StorWatch) is a web-enabled, integrated storage management tool. Versatile Storage Specialist enables local or remote storage administrators to monitor and manage the Versatile Storage Server using a Java-compliant Internet browser, enabling growing volumes of data to be managed more cost effectively than ever before.

Based on the IBM Seascap storage enterprise architecture, Versatile Storage Server combines technology building blocks, including powerful storage servers, rich software function, high-performance adapters, and serial disk technology. Seascap solutions take advantage of technological advancements in various components without making entire systems obsolete, which protects existing storage investments. Versatile Storage Server is designed to grow with you, so you can add capacity as you need it--terabytes of usable storage. Mixed capacity hard disk drives are supported concurrently and Versatile Storage Server is designed to allow additional capacities and new generation serial disks to be easily incorporated.

9337 Disk Array Subsystem Models

Data center operations are enhanced by the many advanced features designed to protect data and deliver high availability, even in the event of a failure. Dual active processing clusters with automatic fail-over, hot spares, hot swappable disk drives, and redundant power and cooling deliver high availability. Data protection and integrity are provided by a high-performance RAID5 implementation that includes mirrored, nonvolatile fast-write cache. The IBM Versatile Storage Server provides further protection by verifying data accuracy at every operational step, even down to the disk level--an important safeguard for environments like e-business.

The Versatile Storage Server supports 7133 Models 010 and 020 Serial Disk Subsystem containing 4.5G and 9.1G Disk Drives. When attached to the AS/400, disk units must be grouped by four like units or eight like units. These groups of drives will then emulate 9337 Model 580 for the 4.5G (4.1G usable) disk units or 9337 Model 590 for the 9.1G (8.5G usable) disk units.

The Versatile Storage Server is attached to the AS/400 using the #6501 Tape/Disk Device Controller. Due to the capabilities of the #6501, when the Versatile Storage Server is attached to the AS/400, the maximum capacity is 536.3G when using the 4.5G Disk Units and 1099.5G when using the 9.1G Disk Units.

More information about the Versatile Storage Server and 7133 Serial Storage Subsystem can be found on the Storage Systems Division home page on the web at: <http://www.storage.ibm.com/>

Disk Storage Specifications Comparison Charts

IBM Disk Storage Specifications Comparison Charts

The following tables show the specifications of both the earlier and current IBM disk technologies that are supported on the AS/400. The tables cover both the IBM *external* disk subsystems, and the Advanced Series *imbedded* disks.

External Disk Subsystems

Disk Type	Disk Diameter (inches)	Capacity (M)	Avg. Seek Time (ms) (See note 1)	Avg. Latency (ms) (See note 2)	RPM	Data-Rate (Burst) (M/sec)	Areal Density (M/inch)	Read Ahead Cache (K)
9332 Model 200/400/600	8	200/400/600	19.5	9.6	3120	4.0	35.3	Nil
9335 Model B01	14	855	18.0	8.3	3600	4.0	25.9	Nil
9336 Model 010/020 Model 025	5.25 3.5	471/857 857	11.2 8.8	6.0 5.56	4996 5400	5.7 10.0	50.9 354	128 512
9337 Model 010/110/210 Model 020/120/220 Model 015/115/215 Model 025/125/225 Model 040/140/240 Model 420 Model 440/540/545 Model 480/580/585 Model 590/595	3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5	542 970 542 970 1967 970 1967 4194 8589	7.6 9.8 6.7 8.9 9.5 7.8 7.8 8.3 8.3	6.95 6.95 5.56 5.56 5.56 4.17 4.17 4.17 4.17	4317 4317 5400 5400 5400 7200 7200 7200 7200	5.0 5.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0	131.8 131.8 354 354 263 562 532 829 829	256 256 512 512 512 512 512 512 512
2105 (7133) 4.5G Disk 9.1G Disk	3.5 3.5	536.32G 1099.52G	8.0 8.0	4.17 4.17	7200 7200	12.58 15.4	829 829	1024 1024

Disk Storage Specifications Comparison Charts

Advanced Series Imbedded Disks

Disk Type	Disk Diameter (inches)	Capacity (M)	Avg. Seek Time (ms) (See Note 1)	Avg. Latency (ms) (See Note 2)	RPM	Data-Rate (Burst) (M/sec)	Areal Density (M/inch)	Read Ahead Cache (K)
#6652	3.5	1031	8.9	5.56	5400	20	354	512
#6650	3.5	1967	9.5	5.56	5400	20	354	512
#6605	3.5	1031	7.8	4.17	7200	20	562	512
#6606/#6806/#6906*	3.5	1967	7.8	4.17	7200	20	532	512
#6607/#6807/#6907*	3.5	4194	8.3	4.17	7200	20	829	512
#6713*/#6813*	3.5	8589	8.3	4.17	7200	20	829	1024
#6714*/#6824*	3.5	17548	8.5	4.17	7200	18	1253	1024

* Ultra SCSI disks, when located in 6xx or Sxx System Units or Ultra SCSI Expansion Units or Towers (#5058, #5081, #5083, #5064, or #9364) attached to Ultra SCSI Disk Unit Controllers (#6532, #6533, #2726, #2740, or #2741) will have a SCSI Bus Speed of 40 Mbps.

Note 1. Average Seek Time is the time taken for the actuator (disk arm) to move over 1/3 of the available tracks, in other words, the time taken to reach the data tracks. Measured in milliseconds.

Note 2. Latency is the time taken for the file on a track to be reached. Measured in milliseconds.

9309 Rack Enclosures

IBM 9309 Rack Enclosures

AS/400 Advanced Series 9406 Models support the 9309 Rack Enclosures. External I/O devices such as DASD, magnetic tapes, and diskette units would be accommodated in these 1.6M racks.

The 9309 Rack enclosures provide operator control panels, acoustic noise reduction, power control to all units within the rack (under the control of the System Unit), and power control to the next rack. All additional racks attached to the System Unit are termed "Secondary" racks.

The following 9309 Rack and System Unit Rack Enclosures are supported:

- 9309 #9171 General Purpose I/O Rack with SPCN
- 9309 #9141 General Purpose Expansion Rack without SPCN
- 9406 #5040 Bus Extension Unit Rack (9406-3X0 models only)
- 9406 #5042 System Unit Expansion Rack (9406-3X0 models only)
- 9406 #5043 Primary to Secondary Rack (ie, 9406 D, E, or F System Unit Rack conversion to a #9171 type rack)
- 9406 #5044 System Unit Expansion Rack (9406-5X0, 620, 640, and 650 models only)

The 9309 #9141 must be connected to either a 9309 #9171 rack, a 9406 #5044 rack, or a 9406 #5043 rack for power control. However, if the 9309 #9141 rack is only going to support tape or diskette devices, then it may attach directly to the 9406 System Unit using a wrap-around connector (part number 93X0167) and an EPO jumper (part number 6462413). Rack power control in this case is then performed manually.

The table below shows which racks can upgrade when upgrading to a 9406 Advanced Series or AS/400e Series Model.

9309 Rack Enclosures

9309/9406 Rack	Description	Upgrade to
#9177	9332 Disk Unit Rack w/SPCN	#9171
#9128	9335 Disk Unit Rack	#9141
#9129	I/O Expansion Rack	#9141
#9130	I/O Card Unit Rack	#9141
#9277	9335 Disk Unit Rack	#9141
#5040*	9406 Extension Unit	#5043/#5044
#5042*	9406 System Unit Expansion	#5044
System Unit Rack	9406 System Unit Rack	#5043 (#9171 type rack)

*9406 #5040 and #5042 are supported on 9406-3XX Models. When upgrading to 9406-5X0, 620, 640, and 650 Models, they are converted to a #5044 System Unit Expansion Rack.

Bus Extension Unit (#5040)

The Bus Extension Unit provides 11 additional I/O card slots to an existing I/O bus. It can attach to an existing I/O bus on 9406 Models 300 (with #5142), 310, and 320. It also supports external DASD, tape, and diskette devices.

If upgrading to a 9406 Model 500, 510, 530, 620, 640, or 650, the #5040 is converted to a #5044. It requires an Optical Bus Adapter Card (#2673, #2674, #2695, or a spare slot on the Base Optical Bus Adapter) and an Optical Link Processor Card (#2686) for attachment.

System Unit Expansion Rack (#5042 and #5044)

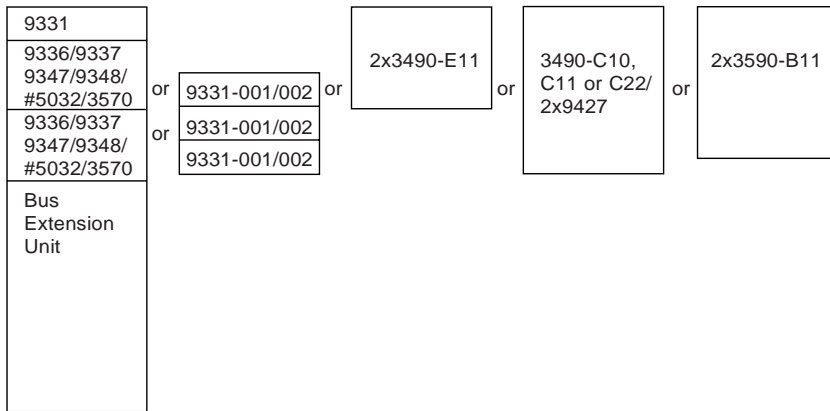
The System Unit Expansion Rack is a 12-card slot expansion rack which can also support external DASD, tape and diskette devices. This feature provides two additional I/O buses with six I/O card slots per bus. #5042 attaches to the 9406 Model 310 and 320 using a 5042 fiber optic attachment cable.

If upgrading to a 9406 Model 500, 510, 530, 620, 640, or 650, the #5042 is converted to a #5044. It requires an Optical Bus Adapter Card (#2673, #2674, #2695, or a spare slot on the Base Optical Bus Adapter) and an Optical Link Processor Card (#2686) for attachment.

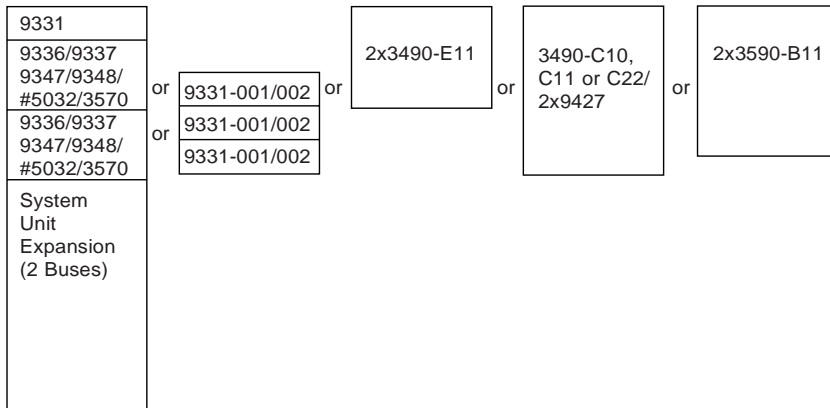
9309 Rack Enclosures

The following schematic diagrams illustrate the rack configurations, detailing where devices will be installed.

Bus Extension (#5040)

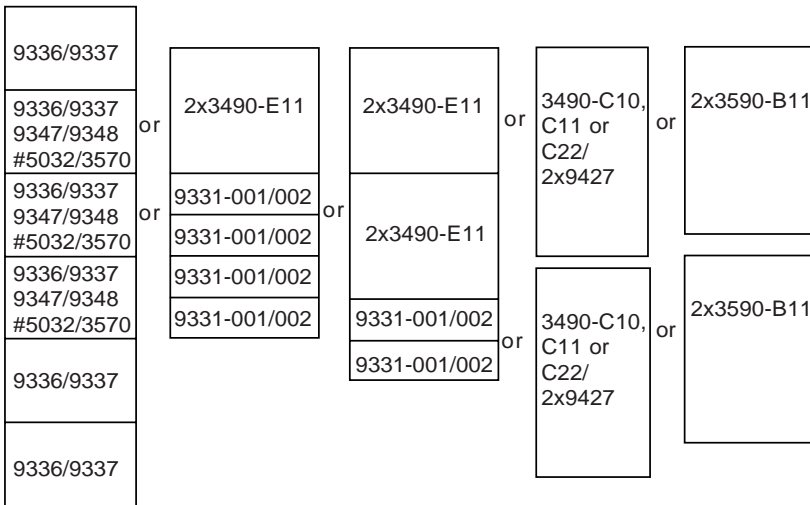


System Unit Expansion Rack (#5042 or #5044)



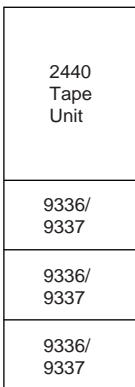
9309 Rack Enclosures

General Purpose I/O Rack (#9171, #9141, or #5043)



#5032 is not supported in a #9141 rack.

2440 Rack



A 2440 rack supports the 2440 Tape Subsystem and can accommodate up to 3 DASD units (#3907 for 9336s or #3908 for 9337s). If external DASD is installed in the 2440, then a wrap-around connector (part number 93X0167) and an EPO jumper (part number 6462413) are required if attaching it directly to a 9406 Advanced Series System Unit.

Removable Storage Media Devices

Removable Storage Media Devices

IBM 7208 External 8mm Tape Drive Model 342

The 7208 Model 342 is a standalone SCSI 8mm streaming tape drive with a capacity of 20G per cartridge.

The 7208 Model 342 supports the 170 meter advanced metal-evaporated (AME) data cartridge and attaches to the AS/400 in the following ways:

- #6534 AS/400 Magnetic Media Controller
- #2729 PCI Magnetic Media Controller

The #6534 will give attachment to 9406 Models 640, 650, 620 (with #9331 SPD card cage in #9364 System Unit Expansion), S20 (with #9331 SPD card cage in #5064 System Unit Expansion), S30, S40, SB1, 500, 510, 530, 50S, 53S, and 9402 Models 400, 40S, and 436 (with OS/400).

The #2729 card gives attachment to Models 600, S10, 170, 620, and S20.

The 7208 Model 342 requires OS/400 Version 4 Release 1 or later and can be used for save/restore or archiving.

The Model 342 can provide media capacity of up to 40G data storage per cartridge using the Improved Data Recording Capability (IDRC) algorithm for compression. It has a sustained data rate of 3.0M per second (6.0M per second with 2:1 compression), giving four times the capacity and six times the data rate of the 7208 Model 012.

It has the ability to read (but not write) earlier 7.0G, 5.0G, and 2.3G 8mm metal particle tape formats.

A cable must be specified with any order to attach the tape drive to its controller card. Options are #9245 (4.5m/15 ft), #9212 (12m/39 ft), and #9218 (18m/59 ft). A media feature must also be ordered, either #9019 consisting of one 8mm AME cartridge, one

Removable Storage Media Devices

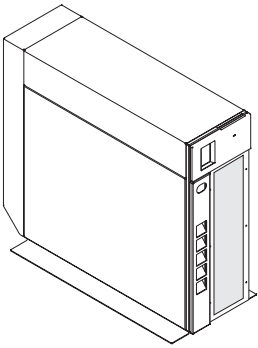
cleaning cartridge, and one test cartridge for the 7208 Model 342, or #7019 which includes an additional four 8mm AME cartridges over the #9019 package.

Additional cartridges (#2019) and cleaning cartridges (#2016) can be ordered by MES.

The 7208 Model 342 is only available in black.

Removable Storage Media Devices

IBM 9427 8mm Tape Cartridge Library Models 210 and 211



The 9427 8mm Tape Library is available in two models. The Model 210 is a standalone unit and the Model 211 is a rack mounted unit. These tape libraries provide tape storage of up to 280G capacity on 8mm tape cartridges. Two Model 211s can be placed in a rack side-by-side.

The 9427 is available as a single 7G drive (#0701) or as a dual 7G drive (#0702) unit. The dual drive feature is field installable. The 9427 can hold up to 20 8mm cartridges. It has two bonus slots that could contain a cleaning cartridge and a drive diagnostic cartridge, a test tape or an additional data cartridge.

The 9427 offers three modes of operation: manual, sequential, and random. Manual mode allows the user to control the 9427 with the operator panel. Sequential mode handles the tapes in sequence, beginning with tape 1. Random mode allows complete library functions controlled by the host AS/400.

Each 9427 8mm Tape Library comes with documentation, a power cord, one SCSI system-to-device cable, two removable ten-cartridge magazines, two keys, two 8mm cartridges, one cleaning cartridge and one test tape. The 9427 is available with either black (#9100) or white (#9200) exterior covers and must be specified at the time of order.

Removable Storage Media Devices

The 8mm cartridges are handled in removable ten-cartridge magazines. Each library has a standard bar code reader used to inventory the library contents, and a front panel display that is used for status and error codes. Keys located next to the display are used for selecting operating options. The 9427 also has a see-through front door so that the robotics, drives and cartridge tapes can be seen while in operation. The door is lockable using a physical lock and key and also using a software controlled lock for maximum security.

Tape cartridge capacity is 7G, and the sustained data transfer rate is 500K/sec per drive. Using Improved Data Recording Capability (IDRC), the effective compressed tape cartridge capacity is up to 14G, and the effective data transfer rate is up to 1M/sec.

The 9427 can be used for save/restore, alternate IPL (except Models 9401, D04, D06, D10 and D20), program distribution, migration, data interchange, automatic migration of data between disk and tape, and mass storage for data archive.

The 9427-210/211 8mm Tape Cartridge library can read/write to the following formats: FMT7G, FMT5G, and FMT2G.

The 9427 has optional features. The Direct Attach Feature (#2008) configures the 9427 so that drive 1 (#0701) attaches to port 1 of the #2621 and drive 2 (#0702) attaches to port 2 of the #2621. This allows two independent data streams to run concurrently from the AS/400 to the 9427. A second system-to-device cable must be ordered.

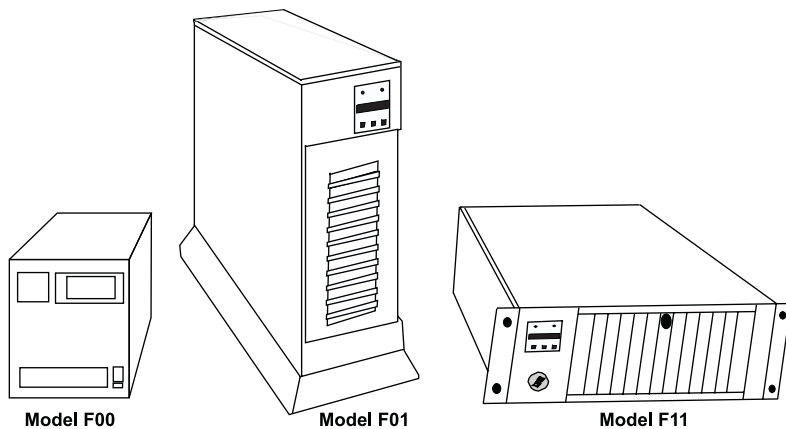
The 9427 also supports dual host attachment. Only one drive and a set of 10 cartridge slots can be addressed by each AS/400.

Removable Storage Media Devices

The 9427 attaches to the AS/400 using the Removable Media Drive attachment #2621. For best performance, only one 9427 may be attached per #2621. The 9427 also attaches to the Magnetic Media Controller #6534. #6534 and #2621 are supported on the 9406 Models 640, 650, S30, S40 and SB1; and the 620 and S20 with SPD card slots. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots use the PCI Magnetic Media Controller #2729. It is supported on all D, E, F and AS/400 Advanced Series models of the AS/400 except Models 9401, D02 and E02. OS/400 Version 3 Release 1 or later is required. *Backup Recovery and Media Services/400 for OS/400* (5769-BR1, 5763-BR1, or 5716-BR1) is recommended to support automation in tape handling, media management, and automatic migration of data between tape and disk based on user defined policies. For those developing unique library applications, OS/400 provides a library command interface.

Removable Storage Media Devices

IBM 3490E Magnetic Tape Subsystem Enhanced Capability Models F00, F01, F11 & Library Model F1A



The IBM 3490E Magnetic Tape Subsystem Enhanced Capability Models F00, F01, and F11 are reduced size single-drive tabletop, desk-side or rack-mounted versions of the 3490E family of tape drives and are compatible with 3490 E01, E11, C10, C11, and C22 Models. They can be used as the alternate IPL device.

The Model F00 is the tabletop version, the Model F01 is a desk-side version. The Model F11 is a rack-mountable version. Each uses ½" tape cartridges as the storage media. The F1A is the model used in the 3494 Tape Library.

The F01 and F11 models include a ten-cartridge Cartridge Stack Loader. All three models offer a 16-bit fast-and-wide SCSI-Differential Interface; a 3490E tape transport, and an integrated control unit. All 3490E Fnn's have sustained data transfer rate of up to 3M/sec. With Improved Data Recording Capability (IDRC) enabled, sustained data transfer rates of up to 6.8M/sec can be achieved. The actual throughput is a function of many factors and can vary. With the ten-cartridge Cartridge Stack Loader, the F01 and F11 models provide an automated, unattended backup capacity of up to 24G compressed. The standard capacity is up to 8G. Maximum capacity is provided by the 3490Es Improved Data

Removable Storage Media Devices

Recording Capability (IDRC), which is standard on Models F00, F01, F11, and F1A.

Models F00, F01, and F11 are intended for AS/400 Systems where limited time for system backup or large amounts of data require high performance tape. The standard cartridge stack loaders on the Models F01 and F11 automatically load and unload cartridges as they are filled, improving efficiency by reducing the need for operator handling.

The 3490E Models F00, F01, and F11 can be used to create tapes for archive files; for backup and restore in the event of system or disk storage problems; for off-site data storage for disaster recovery; and for data interchange with other systems. In addition to reading and writing 36-track tape, Models F00, F01, and F11 can also read the older 18-track ½" cartridge tape. There is write support for the 18-track cartridge tape at OS/400 Version 4 Release 2 or later when the 3490 is configured in F-mode, which also allows random mode to be selected for the ACL and the USEOPTBLK performance parameter.

The 3490E Models F00, F01, and F11 attach to all models of AS/400 Advanced Series and to traditional 9404/6 Models D, E, or F. They attach using the Tape Device Controller #6501 which can support up to two 3490E Models F00, F01, and F11. These 3490E Models cannot be shared between AS/400 Systems, and must be located within 25 meters (82 feet) of the #6501 I/O card. The 3490E Models F00, F01, and F11 are also supported by the newer Magnetic Media Controller #6534. One 3490E is supported per #6534. #6534 and #6501 are supported on the 9406 Models 640, 650, S30, S40, and SB1; and 620 and S20 with SPD card slots. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots use the PCI Magnetic Media Controller #2729.

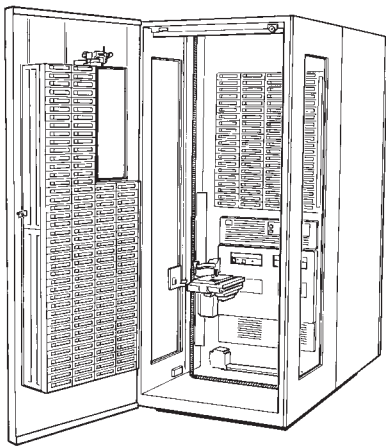
The 3490 F1A is the tape component of the 3494 library. It can be installed in any new 3494-L10 or any new or existing 3494-D10. The 3490 F1A can be upgraded to or from the 3490 F11. The Model F1A cannot be intermixed with a Model CxA within a 3494. There is no 18-track write support or USEOPTBLK support on the Model F1A. Attachment to the AS/400 is as for the other 3490E F

Removable Storage Media Devices

models (#6501, #6534, #2729). For further details, see the 3494 on the next page.

Removable Storage Media Devices

IBM 3494 Tape Library Dataserver Model



The 3494 Tape Library Dataserver is a stand-alone automated tape storage subsystem for ½" cartridges available for attachment to the AS/400. It provides an automated tape solution for automating tape operations such as save/restore, migration of data between disk and tape, and other mass-data applications.

It is comprised of a base unit called the Library Control Unit which is available in two models. The Model L10 has space for a 3490-C1A, 3490-C2A drive, or a 3490 F1A. The Model L12 has space for two 3590-B1A drives. Both models contain the accessor (robotic arm that accesses the tape cartridges), the Library Manager and storage cells for the ½" tape cartridges. The storage cell capacity is 240 cartridges. If the Convenience I/O Station, #5210, (which allows the operator to add or remove up to 10 cartridges without interrupting normal operations) is installed, the storage cell capacity is reduced to 210 cartridges. If the 30-cartridge Convenience I/O Station, #5230, is installed, the storage cell capacity is reduced to 160 cartridges. Currently installed 3490-C10, C11, and C22 Tape Subsystems can be field upgraded to a 3490-C1A or C2A. The 3490 F11 can be field upgraded to 3490 F1A. 3590 Model B11 may also be field upgraded to a Model B1A for attachment in the 3494 Tape Library.

Removable Storage Media Devices

The storage capacity and the number of tape drives can be increased on the 3494 Tape Library by adding either drive units or storage units. There are two drive unit models available. The 3494 Model D10 Drive Unit provides space for either a 3490-C1A, 3490-C2A, or a 3490 F1A Drive Unit and space for up to 300 ½" cartridges. The 3494 Model D12 Drive Unit provides space for up to six 3590-B1A drives and 250 ½" cartridges. If no tape drives are installed in the D10 or D12, they can hold up to 400 ½" cartridges. The Model D10 or D12 Drive Units can attach to either a Model L10 or L12 Library Control Unit. There is only one storage unit model, the 3494 Model S10, which can contain up to 400 ½" cartridges. The 3494 Model S10 has no support for tape drives.

Previously available storage units and drive units were denoted by feature number (#5400 and #5300 respectively). These are now denoted by model types 3494-S10 and D10. The #5300 Drive Unit can be field upgraded to a 3494-D12 that can support 3590-B1A tape drives by specifying #5302. Both #5400 and #5300 units are supported on the 3494-L10 and L12 Library Control Units.

Additional frames can be attached to the 3494 Model L10 or L12 in any combination of drive units and storage units, as long as the maximum of seven additional frames is not exceeded. This would provide storage capacity for up to 3,040 ½" cartridges (7.3T if 3490E cartridges or 91.2T with 3590-B1A cartridges), and support for up to sixteen 3490-CxA tape drives or up to sixteen 3590-B1A tape drives. Both 3490 and 3590 tape drives can be used in the same 3494 Tape Library Dataserver.

The 3494 Tape Library Dataserver Models L10 and L12 attach to the AS/400 using an RS 232 Host Attachment (#5211 for 50 feet attachment or #5213 for 400 feet attachment) or using a LAN attachment (#5219 for Token Ring or #5220 for Ethernet). Each AS/400 attached to a 3494 Tape Library Dataserver must have an RS232 Host Attachment specified to obtain the licensed code for the Media Library Device Driver (MLDD). The 3494 Tape Library Dataserver can also attach to the IBM RISC System/6000, the IBM ES/9000, POWERparallel SP2, and Sun** processors.

Removable Storage Media Devices

An Expansion Attachment Card (#5229) is required to support the fifth to eighth RS232 connections and/or the fifth to eighth tape control unit. The number of tape control units that can be attached to the 3494 Model L10 or L12 has been doubled to support up to 16 tape control units.

To expand the number of tape control units that can be attached to the Library Manager, the Tape Control Unit Expansion feature, #5228, should be specified. One feature will convert four RS232 host processor connections into four tape control unit connections in either the Library Manager or the Expansion Attachment Card (#5229). When combined with other interface features (see table below), up to 16 tape control units can be connected to the Library Manager. If all RS232 host processor connections are converted to tape control unit connections, a LAN adapter card will be required to provide the host processor connection as shown below:

No. of #5228 Features	Available RS232 Ports (for direct host attach)	Available Tape Control Unit Connections	Additional Features Required
0	4	4	None
0	8	8	#5229
1	0	8	#5219 or #5220
1	4	12	#5229
2	0	16	#5229 AND #5219 or #5220

This allows up to 32 systems to attach to the 3494 using the 3590 High Performance tape drives. A Remote Console Feature (#5226) is required when attaching the 3494 using a LAN which provides the capability of controlling and monitoring the status of up to eight 3494 Tape Library Dataservers from a remote location. The console can be password protected.

Removable Storage Media Devices

The Tape Subsystems installed in either the Library Control Units (3494 Models L10 and L12) or in the Drive Units (3494 Models D10 and D12) are attached to the AS/400 using the Magnetic Tape Subsystem Attachment Controller, #2644, if they are a 3490 Model C1A or C2A attaching using a channel adapter. If however, they are attaching using the SCSI adapter (#5040), then they are attached to the AS/400 using the Magnetic Media Subsystems Controller, #6501. The 3590 Model B1A also attaches to the AS/400 using this #6501. These attachment controllers allow the data transmission and tape commands to pass to the tape subsystems. The newer Magnetic Media Controller, #6534, also supports attachment of the 3494 Tape Library Dataserver. #6534 and #2644 are supported on the 9406 Models 640, 650, S30, S40, and SB1; and the 620 and S20 with SPD card slots. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots will use the PCI Magnetic Media Controller #2729.

The 3494 Tape Library Dataserver utilizes the *Media Library Device Driver* and *Backup Recovery and Media Services for AS/400*. The *Media Library Device Driver* (MLDD) is shipped with the 3494. It provides interfaces to the 3494 for configuration, control and service. It handles 3494 errors, providing error recovery and problem isolation. It maintains the inventory of cartridges in the library. It also schedules cleaning of drive units using a cleaning cartridge in the library. Users could write their own media management package using this software and OS/400 APIs. MLDD is only required for IMPI models of AS/400. For PowerPC-based models it is not required.

The *Backup Recovery and Media Services for AS/400* program (5769-BR1 or 5716-BR1) product supports the 3494. It provides a common directory for multiple AS/400 systems. It also provides the management for archive, backup and recovery facilities, based on customer policies, scheduled unattended system backup capability, and archival facilities to control the movement of seldom-used data from disk to tape.

The cartridges on the 3494 must have human- and machine-readable external labels. These are read by the accessor which travels on a linear rail (extended when additional units are

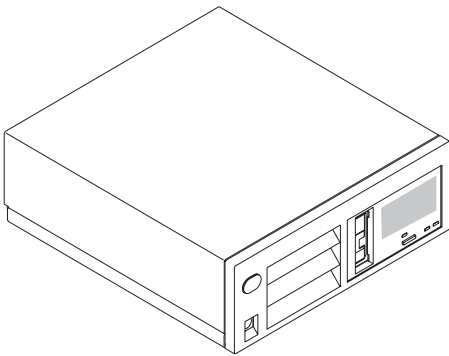
Removable Storage Media Devices

added). The accessor uses a barcode reader. Its movement is horizontal, vertical and 180° pivot.

Other optional features of the 3494 Tape Library Dataserver include a second Library Manager Disk Drive (#5214) which allows mirroring of the Library Manager (which is effectively a PC) database. It also provides the capability to recover the Library Manager database in the event of a failure on the primary disk drive. The Dual Gripper option (#5215) provides the accessor with a second tape cartridge gripper for better performance in the Library.

Removable Storage Media Devices

IBM Magstar MP 3570 Tape Cassette Subsystem, Cxx Models



The 3570 Tape Subsystem is based on the same technology as the IBM 3590 High Performance Tape Subsystem. It functionally expands the capability of tape to perform both write and read-intensive operations. It provides a faster data access than other tape technologies with a drive time to read/write data of eight seconds from cassette insertion. The 3570 also incorporates a high speed search function.

The 3570 utilizes a unique, robust, heavy usage tape cassette that is approximately half the size of the IBM 3490/3590 cartridge tapes. The tape drive reads and writes data in a 128-track format, reading and writing four tracks at a time. Data is written using an interleaved serpentine longitudinal recording format starting at the center of the tape (mid-tape load point) and continuing to near the end of the tape. The head is indexed to the next set of four tracks and data is written back to the mid-tape load point. This process is continued in the other direction until the tape is full.

The tape cassette capacity is 5G uncompressed and up to 15G per cassette with LZ1 data compaction. The drive data transfer rate is 7MB/sec (uncompressed) or 2.2M/sec (uncompressed) with up to 15MB/sec (compressed) using C-format cartridges. For B-format cartridges, the figures are 3.5MB/sec and 10.5MB/sec. The drive burst data rate is 20MB/sec. Automatic caching of data enables

Removable Storage Media Devices

balancing system read/write performance. Note that the actual throughput achieved is a function of many factors and can vary.

This tape cassette provides fast access to data by having two tape spools with the load point being at the middle of the tape. It is made from advanced metal particle media with servo tracks to ensure high data integrity. The tape never leaves the cassette, and maintains a self-enclosed tape path. This unique path eliminates tape thread time and ensures higher reliability.

The 3570 has a combination of read/write technology. Data write is provided by an exclusive thin-film write module and data read is provided by the IBM Magneto-Resistive (MR) head technology based on the IBM 3590. In addition, the 4-track 3570 head provides data redundancy and servo tracking support.

The 3570-Cxx is available in five models:

Model	Description	No. of Drives	Cassette Slots
C00	Table-Top Unit	1	1
C01	Standalone Library	1	20
C02	Standalone Library	2	20
C11	Rack-Mounted Library	1	20
C12	Rack-Mounted Library	2	20

The library models offer both a random mode or sequential data access mode. They support two 10-cassette magazines providing from 150G (uncompressed) to 300G (compressed) of data on 20 cassettes.

The integrated control unit contains the electronics and microcode for reading and writing data. The control unit functions include management of the data buffer, error recovery procedures, and the control of all the tape drive operations.

The library models use a cassette loading and transport mechanism to automatically transport the tape cassettes to and from the cassette magazines and the tape drive. A LCD operator panel provides the primary method of displaying information and allows selection of

Removable Storage Media Devices

various menu options. These models also have a security key lock which physically locks the cassettes in the library for additional security.

The 3570 Multipurpose Tape Subsystem attaches to all AS/400 Models D, E, F, and Advanced Series (except the D02, E02, F02, and the 9401) using feature #6501. Each #6501 can support up to two 3570 models and requires an AS/400 interposer, feature #2895 for each SCSI cable. The #6534 also supports the 3570. Each #6534 supports one 3570. #6534 and #6501 are supported on the 9406 Models 640, 650, S30, and S40; and the 620 and S20 with SPD card slots. #6534 is also supported on the 9406 Model SB1. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots will use the PCI Magnetic Media Controller #2729. The 3570 rack-mounted Models C11 and C12 require an AS/400 9309 Rack Enclosure. Multiple systems may be attached to the 3570 and the 3570 Cx2 Models may be varied online to two systems at a time, with each drive allocated to one system.

OS/400 Version 3 Release 1 upwards is required to support the 3570. OS/400 also provides support for the library models in random mode. The IBM EDMSuite OnDemand for AS/400 formerly known as Report/Data Archive and Retrieval System (R/DARS), is an application that stores and retrieves data on disk, optical, or tape media also supports the 3570 providing record level access to data.

The 3570 is supported as an alternate IPL device but AS/400 IMPI models require RPQ 843945. This RPQ is required because IBM software, PTFs, and MULIC/FULIC tapes are not distributed on 3570 media. A second tape drive, in addition to the 3570, must be specified as a valid alternate IPL device. The RPQ will ship IBM service instructions for attaching the 3570 as an alternate IPL device, and a license to make a copy of the MULIC/FULIC tape on 3570 tape media.

The 3570 brings a new dimension of functionality to tape storage because of its revolutionary data recall performance allowing new applications to be enabled in addition to traditional tape applications. This includes applications where:

Removable Storage Media Devices

Fast access to data is required such as storage management, network serving, mixed digital libraries, and image processing. High I/O intensive operations with multi-user access is required. Automated backup and restore or automated archive storage and retrieval are required.

In addition, the IBM 3570 offers connectivity other systems through the support of storage management offerings such as the IBM ADSTAR Distributed Storage Manager (ADSM), IBM Backup Recovery and Media Services (BRMS), and third-party products.

Removable Storage Media Devices

IBM Magstar 3570 MP Tape Cassette Subsystem, Bxx Models

The 3570-Bxx model is the first generation of 3570. The 3570-Bxx provides fast access with a drive time to read/write data of eight seconds. The 3570-Bxx also includes a high-speed search function. The 3570-Bxx can only read/write B-format cartridges. The later Cxx models can read/write both B-format and C-format cartridges.

The drive data transfer rate is 2.2M/sec (uncompressed) with up to 14M/sec compacted burst data transfer rate. The actual throughput achieved is a function of many factors and can vary. The tape capacity is 5G uncompressed and up to 15G per cassette with LZ1 data compaction.

The 3570-Bxx is available in five models:

Model	Description	Number of Drives	Cassette Slots
B00	Table-Top Unit	1	1
B01	Standalone Library	1	20
B02	Standalone Library	2	20
B11	Rack-Mounted Library	1	20
B12	Rack-Mounted Library	2	20

The 3570-Bxx models attach to all AS/400 D, E, F, and Advanced Series (except D02, E02, F02, and the 9401) using #6501. Each #6501 can support up to two 3570 models and requires an AS/400 interposer (feature #2985) for each SCSI cable. The #6534 also supports the 3570. Each #6534 will support one 3570. #6534 and #6501 are supported on AS/400 Models 640, 650, S30, and S40; and the 620 and S20 with SPD card slots. AS/400 Models 170, 600, S10, 620, S20 use the PCI Magnetic Media Controller #2729. The rack models (B11 and B12) require a 9309 rack enclosure. Multiple systems can be attached to the 3570 and the 3570-Bx2 models may be varied online to two systems at a time, with each drive allocated to one system.

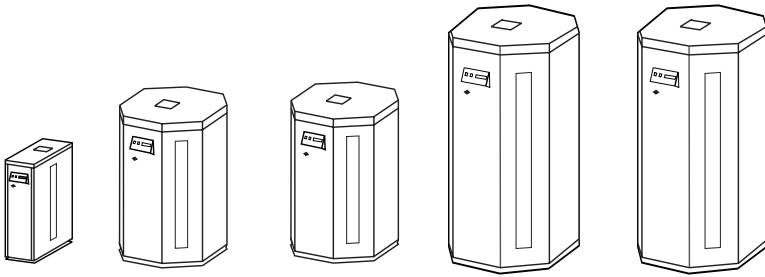
Removable Storage Media Devices

OS/400 Version 3 Release 1 upwards is required to support the 3570.

For further information on IPL support and 3570 technology, refer to the *IBM Magstar MP 3570 Tape Cassette Subsystem, Cxx Models* section.

Removable Storage Media Devices

Magstar MP (Multipurpose) 3575 Tape Library Dataserver



Highlights

- Offers five models for the SCSI systems environment

- Includes Magstar MP tape drives that provide fast data access for current and emerging applications such as save/restore, network storage management, data warehousing, and digital libraries

- Increases the amount of data that can be accessed with near-online performance for up to 4.8T of storage capacity (with 3:1 compression)

- Delivers an aggregate sustained data rate of 50 to 300 G/hour with maximum compression on Model C tape drives

- Provides rich multihost attachment for library sharing: up to six AS/400 hosts or any three heterogeneous hosts

- Supports industry-leading storage management offerings to provide enterprise-wide backup/restore and archive/retrieval

Overview

The IBM Magstar MP 3575 Tape Library Dataserver is a family of automated tape storage solutions designed for the growing unattended storage requirements of today's midrange systems and network servers. These compact, integrated tape storage libraries expand the capability of tape processing by optimizing both read- and write-intensive operations. A dual-gripper picker can provide fast

Removable Storage Media Devices

cartridge exchange times between the library slots and the Magstar MP tape drives in the library. The Magstar MP 3575 tape library attaches to AS/400, RS/6000, HP, Windows NT, Sun, and other SCSI-attached open systems in a single or multihost configurations. The patented new multipath architecture enables multiple homogeneous or heterogeneous hosts to share library resources. You can configure up to three user-defined logical libraries to optimize host library sharing.

Unattended Tape Operations and Higher Storage Capacity

There are five models of the Magstar MP 3575 tape library, ranging in size from 30G to 4.8T of compressed online storage capacity and from one to six tape drives. This spectrum of choices provides the high granularity required for a wide range of enterprise solutions. In addition, two of the models are expandable. With these capacities, the Magstar MP 3575 tape library can provide unattended tape handling for tape save/restore and can evolve into an advanced storage management solution to enable a more efficient and cost-effective combined use of disk and tape. Applications that previously required disk or optical technology can now benefit from the high capacities and fast data access characteristics of the Magstar MP 3575 tape library. These applications include:

- Automated save/restore
- Automated migrate/recall
- Backup/archive
- Large sequential files
- Records management
- Multimedia applications

Industry-leading software solutions for Magstar MP 3575 Tape Libraries are available from IBM, IBM Business Partners, and third-party solution providers. This broad range of applications enables you to select the solution that best meets your storage needs. Data-intensive applications used for heavy tape processing, backup/restore, and archive/retrieval can especially benefit from the high performance of the Magstar MP 3575 tape libraries.

Removable Storage Media Devices

Exceptional Performance

Magstar MP technology is an industry leader in retrieval performance. Average cartridge move times in the Magstar MP 3575 tape library are less than 4.0 seconds, which complements the fast load/search time of the Magstar MP drive. Sustained data rates of 7 M/sec (native) and 15 M/sec (maximum compression) per Model C tape drive make the Magstar MP 3575 tape library ideal for time-sensitive applications that require fast access to data, highly I/O-intensive operations by multiple users, and traditional save/restore operations. In addition, a barcode reader enables rapid inventory management by optically scanning the barcodes on the cartridges.

Outstanding Data Integrity

Based on popular and proven Magstar MP technology, the Magstar MP 3575 tape library brings a new level of reliability and data integrity to the midrange environment and is specifically designed for:

- Repeated tape load/unloads
- Higher tape drive duty cycles
- Increased overall mechanical reliability
- Increased overall media reliability

The Magstar MP 3575 tape library uses Magstar MP Fast Access Linear Tape Cartridges, which are designed to provide several enhancements over previous tape technologies. The cartridges are specially designed for repeated handling and use in automated libraries. The tape media is contained in a self-enclosed tape path within a rugged cartridge case, remaining protected at all times from outside environmental factors. The media itself is an advanced metal particle tape developed for high durability and capacity.

Software Considerations

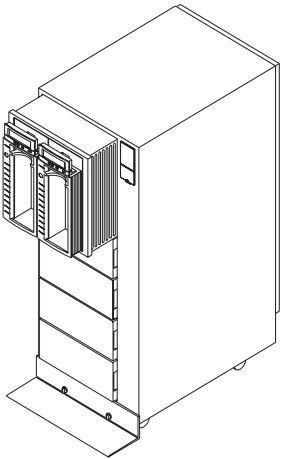
Device drivers are available from IBM for AIX, HP-UX, NT, and Sun. Supported software for the Magstar MP 3575 tape library includes IBM's ADSTAR Distributed Storage Manager (ADSM), BRMS/400,

Removable Storage Media Devices

and NetTAPE, as well as products from Cheyenne, Legato, Spectra Logic, SCH Technologies, and Veritas.

Removable Storage Media Devices

IBM 3590 High Performance Tape Subsystem Models B1A and B11



The 3590 High Performance Tape Subsystem Model B11 is a rack-mountable unit using high performance $\frac{1}{2}$ " tape cartridges as the storage media. The above schematic shows two 3590 Model B11s side by side in a 9309 rack. These cartridges utilize new metal particle media, providing a capacity of up to 10G. With the enhanced LZ1 compaction technique of the 3590, this capacity can be increased up to 30G per cartridge. The tape cartridges used by the 3590 are the same physical size as those used in the 3480 and 3490E but cannot be interchanged between the tape subsystems. Only the high performance $\frac{1}{2}$ " tape cartridges are supported in the 3590.

The 3590 incorporates an advanced longitudinal recording technique that makes 8 passes along the tape media. It writes 16 data tracks at a time to the end of the tape and then switches to the next 16 different interleaved tracks and writes back to the beginning of the tape cartridge. The heads then move down to the next set of tracks and repeat the process. This gives a total of 128 data tracks.

For greater reliability and data integrity, the 3590 has improved Error Correction Code (ECC) combined with servo tracks on each tape cartridge. A portion of each tape cartridge is reserved for error

Removable Storage Media Devices

history which is updated after each use to aid early identification of potential media problems.

The 3590 Model B11 provides one tape drive and includes an integrated control unit with 2 ports that support a 16-bit fast and wide SCSI-2 interface. This provides the attachment to the AS/400 using the Tape Device Controller, #6501, and has an instantaneous data transfer rate of 9M/sec. Performance is further enhanced by a 4M buffer. The actual throughput achieved is a function of many components and can vary. The Magnetic Media Controller, #6534, also supports the 3590 Model B11. #6534 and #6501 are supported on the 9406 Models 640, 650, S30, and S40; and the 620 and S20 with SPD card slots. #6534 is also supported on the 9406 Model SB1. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots will use the PCI Magnetic Media Controller #2729.

The dual port on the control unit provides support for a second AS/400 to share the 3590 Model B11. A maximum of two 3590s may be attached per #6501. No other devices can be attached to the #6501 if a 3590 is attached. The maximum distance between the AS/400 and the 3590 is 25 meters (82 feet). An interposer is required (#9410) to connect the 3590 SCSI cable to the #6501. The #6534 and #2729 Magnetic Media Controller can support a maximum of one 3590 Model B11.

The 3590 Model B11 also includes the Advanced Cartridge Function (ACF) which has the same operational function of an Automatic Cartridge Loader (ACL) but also allows random access of cartridge tapes. The ACF supports the 10-cartridge magazine that has 10 slots for the high-performance ½" cartridge tapes and a spare slot for a cleaning cartridge. Each 3590 Model B11 is shipped with the ACF, a high performance cartridge tape, a cleaning tape and a 10-cartridge magazine. Additional 3590 cartridge magazines can be ordered using RPQ 8B3184.

The 3590 Model B11 is supported on all AS/400 D, E, F and AS/400 Advanced Series models except for 9401, D02, E02 and F02. For PowerPC based models, the 3590 is supported as an alternate IPL device. For AS/400 IMPI models, the 3590 requires OS/400 Version 3 Release 1 or Version 3 Release 2. It is only supported as an

Removable Storage Media Devices

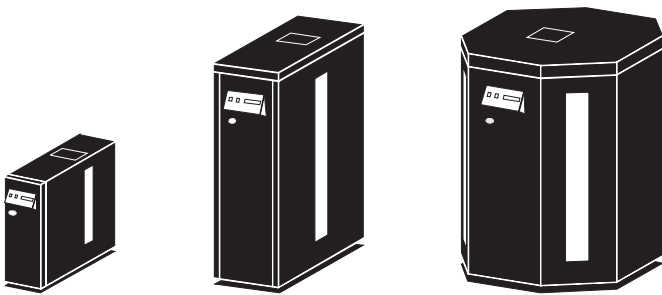
alternate IPL device on IMPI models with RPQ 843945, but is not supported for alternate IPL on 9404 Models D10 and D20.

This RPQ is required because IBM software, PTFs, and MULIC/FULIC tapes will not be distributed on 3590 media. A second tape drive, in addition to the 3590, must be specified as a valid alternate IPL device. The RPQ will ship IBM service instructions for attaching the 3590 as an alternate IPL device, and a license to make a copy of the MULIC/FULIC tape on 3590 tape media.

The 3590 is also supported in the 3494 Tape Library Dataserver as the Model B1A, and the 3590 Model B11 can be field upgraded to a Model B1A.

Removable Storage Media Devices

IBM 3995 Optical Library C-Models



3995 Optical Library Models C40, C42, and C46

Effective December 1, 1998, IBM is withdrawing selected features, MES and RPQs from IBM 3995 Optical Library Dataserver Models. For full details see announcement letter dated September 1, 1998. Included in this withdrawal is the 2.6G Extended Multifunction Optical drive which will be replaced by the 5.2G Extended Multifunction Optical drive. The documentation below only refers to the new drives.

During the period September 1, 1998 to December 1, 1998, customers can choose to receive the 5.2G Optical drive. Beginning December 1, 1998, all libraries will be equipped with 5.2G Optical drives.

The IBM 3995 Optical Library C-Models feature high capacity 5.2G or Extended Multifunction optical drives, known as 8X technology. It is eight times the capacity of the first generation optical technology. The drives use industry standard 5.25-inch optical cartridges, supporting the following optical technologies:

- Magneto-Optical (MO) rewritable which allows data on the cartridge

- Permanent Write-Once-Read-Many (WORM) which provides a permanent and unalterable copy of the data by physically ablating (burning) holes into the recording layer

Removable Storage Media Devices

Continuous Composite Worm (CCW) which provides an unalterable copy of data through a software implementation of WORM, using rewritable media

Rewritable, permanent (ablative) WORM and CCW optical cartridges can be mixed within the same library.

The 5.2G (8X) optical drives in the C models can read and write to 5.2G (8X) and 2.6G (4X) optical cartridges and read only 1.3G (2X) and 650M (1X) optical cartridges. The 2.6G (4X) optical drives in the C models can read and write to 2.6G (4X) and 1.3G (2X) optical cartridges and read only 650M (1X) optical cartridges.

Each library has an autochanger which is used to move the optical cartridges between the optical drives, the cartridge storage cells, and the entry/exit slot located on the top of the libraries. Certain models feature a dual-gripper cartridge picker on this autochanger for improved performance. All models have a viewing window through which the autochanger can be seen.

The following table summarizes the 3995 C-Models supported on the AS/400:

3995 Model	Capacity		Number of Drives	Attachment	Number of Autochanger Grippers
	G	Disks			
C40	104	20	1-2	Direct	1
C42	270	52	2	Direct	2
C44	540	104	2-4	Direct	2
C46	811	156	4-6	Direct	2
C48	1341	258	4-6	Direct	2
C20	104	20	1-2	LAN	1
C22	270	52	2	LAN	2
C24	540	104	2-4	LAN	2
C26	811	156	4-6	LAN	2
C28	1341	258	4-6	LAN	2

Only two model upgrades are supported. These are for the 3995 Model C24 to Model C26 and for Model C44 to Model C46.

Removable Storage Media Devices

The AS/400 direct attach 3995 C-Models (C40, C42, C44, C46, and C48) can attach using the Removal Media Attachment feature #2621 or using the #6534 Magnetic Media Controller (V4R2 required). They are supported on 9406 Models 640, 650, S30, S40, and SB1; and the 620 and S20 with SPD card slots. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots will use the PCI Magnetic Media Controller #2729 (OS/400 Version 4 Release 2 or later only).

The following OS/400 software is required to support 3995-Cxx:

- OS/400 Version 4 Release 2
- OS/400 Version 4 Release 1
- OS/400 Version 3 Release 7
- OS/400 Version 3 Release 6 with Group PTF SF 99087
- OS/400 Version 3 Release 2 with 5755-AS3 #1979 and PRPQ 5799-XBW #3520

Models C46 and C48 with six drives installed require:

- OS/400 Version 4 Release 2 or later and #2729 or #6534 AS/400 attachment

8X support on direct attach 3995 require:

- OS/400 Version 4 Release 3
- OS/400 Version 4 Release 2 and PTFs
- OS/400 Version 3 Release 2 with PRPQ 5799-XBW #3520 and PTFS

Note: Media must be formatted as WORM in LAN-attached libraries to be used in AS/400 direct-attached 3995 libraries.

The AS/400 integrated file system provides a UNIX**-type access to optical files through commands and APIs. It also provides workstation-to-AS/400 and AS/400-to-AS/400 access to optical byte stream files.

The LAN attach 3995 C-Models (C20, C22, C24, C26, and C28) require either an IBM Token-Ring LAN or an Ethernet LAN conforming to IEEE 802-3 protocol. Ethernet is available with an Ethernet 10/100 Mbps adapter. The LAN models include a desktop controller that provides command processing, autochanger control,

Removable Storage Media Devices

and optical drive controls for the library. An operator keyboard, display, and mouse are also included.

The IBM High Performance Optical File System (HPOFS) is also included in the controller which provides additional data protection in the event of power interruptions.

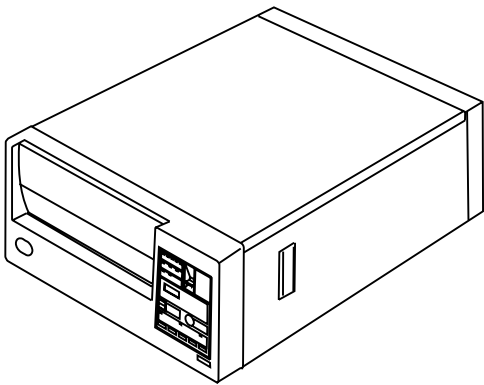
The IBM 5.2G Optical Disk Cartridges can be ordered in packs of 10 or 52 as a feature of the 3995 cartridge are available in rewritable, worm, and CCW technology. See announcement letter dated September 1, 1998 for details.

With the support of save and restore to optical storage in OS/400 Version 3 Release 7 and Version 4, the 3995 models can be used to archive and restore libraries and objects. Applications can also be used to archive and retrieve records and objects to optical storage by using many applications, including the IBM OnDemand for AS/400 (5769-RD1). This was the Report/Data Archive and Retrieval System for AS/400 (R/DARS) Licensed Program at earlier releases. Refer to page "IBM EDMSuite OnDemand for AS/400 Version 4 Release 3, 5769-RD1" on page 531 for further information.

The maximum number of LAN attach 3995 Optical Libraries supported on a single LAN is 24 and the maximum number of AS/400 direct attach 3995 Optical Libraries supported on an AS/400 system is dependent upon the AS/400 model. Refer to the AS/400 Model Summary Tables for these numbers.

Removable Storage Media Devices

IBM 9348 Magnetic Tape Unit



The 9348 Magnetic Tape Unit is a ½-inch reel-to-reel intermediate performance streaming tape drive that reads or writes data at 6250 bpi (bits per inch) or 1600 bpi. The 9348 has a tape speed of 125 inches per second. This allows a nominal data rate of 781K/sec at 6250 bpi or 200K/sec at 1600 bpi. A 1M buffer is utilized to optimize drive performance and mask tape repositioning actions. The 9348 can be used for program distribution, alternate IPL, save/restore, and data interchange with other ½-inch reel-to-reel tape systems.

The 9348 Model 001 is a rack-mounted version and the 9348 Model 002 is a table-top version, available with either white or black covers. The Model 001 can be converted to the Model 002. Both models attach to the AS/400 using the Removable Media Device Attachment feature, #2621. The hardware data compression function of the #2621 can further increase (by up to two times) the amount of data stored on the tape for save/restore. The 9348 can also be attached to the newer Magnetic Media Controller #6534. #6534 and #2621 are supported on the 9406 Models 640, 650, S30, S40, and SB1; and the 620 and S20 with SPD card slots. The Models 170, 600, and S10; and 620 and S20 with only PCI card slots will use the PCI Magnetic Media Controller #2729.

Removable Storage Media Devices

Magnetic Media Controllers

Magnetic Media Controllers

Removable Media Devices

The following table compares tape subsystems that can attach to the AS/400. It indicates whether the attachment IOP supports Hardware Data Compression (HDC) and whether the tape subsystem controller supports a compaction algorithm, either IDRC (Improved Data Recording Capability) or LZ1 (Lempel Ziv 1). These algorithms enable more data to be written to tape up to the maximum shown.

Magnetic Media Controllers

Tape Subsystem	IOP	OS/400 Version (min)	H D C	I D R C	L Z 1	Max. Capacity (compressed)	Data Transfer Rate (uncompressed)
¼" Cartridge Tape							
QIC-Mini	MFIO P	3.1	X			1.6G	300K/Sec
120M	MFIO P	1.1	X			200M	90K/Sec
525M	MFIO P/#2624	1.3	X			1G	200K/Sec
1.2G	MFIO P/#2624/#6513/	2.2	X			2G	300K/Sec
* 2.5G	#2726/#2740/#2741/#9728	3.0.5	X		X	4.5G	300K/Sec
	MFIO P/#2624/#6513						
* 4G	MFIO P/#6513/#2726/	4.1			X	8G	800K/Sec
	#2740/#2741/#9728						
* 13G	#2726/#2740/#2741/#9728	3.7			X	26G	1.5M/Sec
	MFIO P/#6513						
½" Reel							
2440	#2621	1.1	X			200M	918K/Sec
3422	#2644	1.1	X			200M	780K/Sec
3430	#2644	1.1	X			200M	312K/Sec
9347	#6112	1.1	X			100M	160K/Sec
* 9348	#2621/#6534/#2729	1.2	X			200M	781K/Sec
8mm Cartridge							
7208-002	#2621	2.2	X	X		5G	245K/Sec
7208-012	#2621/#6534/#2729	2.2	X	X		10G	500K/Sec
7208-222	#2621/#6534/#2729	3.1	X	X		14G	500K/Sec
7208-232	#2621/#6534/#2729	2.2	X	X		20G	500K/Sec
7208-234	#2621/#6534/#2729	2.2	X	X		28G	500K/Sec
* 7208-342	#6534/#2729	4.1		X		40G	3M/Sec
#6390/#1261	MFIO P/#2624/#6513	3.0.5	X	X		14G	500K/Sec
#6490	#2726/#2740/#2741/	4.1		X		14G	500K/Sec
	#9728/#6513						
½" Cartridge							
3490-D31	#2644	1.3	X	X		3.6G	3M/Sec
3490-D32	#2644	1.3	X	X		7.2G	3M/Sec
3490E-D41	#2644	2.1	X	X		14.4G	3M/Sec
3490E-D42	#2644	2.1	X	X		28.8G	3M/Sec
* 3490E-C10	#2644	2.1.1	X	X		2.4G	3M/Sec
* 3490E-C11	#6534/#6501/#2644/#2729	2.1.1	X	X		14.4G	3M/Sec
* 3490E-C22	#6534/#6501/#2644/#2729	2.1.1	X	X		28.8G	3M/Sec
3490E-E01/E11	#6501/#6534/#2729	2.3		X		16.8G	3M/Sec
* 3490E-F00	#6501/#6534/#2729	3.1		X		2.4G	3M/Sec
* 3490E-F01/F11	#6501/#6534/#2729	3.1		X		24G	3M/Sec
* 3590-B11	#6501/#6534/#2729	3.1			X	300G	9M/Sec
8mm Cassette							
* 3570-B00/C00	#6501/#6534/#2729	3.1			X	15G	2.2M/Sec
Libraries							
* 9427	#2621/#6534/#2729	3.1	X	X		280G	500K/Sec
* 3494-CxA	#2644/#6534/#2729	2.3	X	X		7.2T	3M/Sec
-B1A							
* 3570-Bxx/Cxx	#6501/#6534/#2729	3.1			X	91.2T	9M/Sec
* 3575	#6501/#6534/#2729	3.1			X	300G	2.2M/Sec

* Tape Models available. The others have been withdrawn from Marketing.

AS/400 has common magnetic media controllers for disk, tape units, optical libraries and diskettes. The following table indicates what can

Magnetic Media Controllers

be attached to each model. The following pages describe these controllers in more depth.

Magnetic Media Controllers

Common Magnetic Media Controllers

Feature/Function	9406 170	9406 600	9406 620 (1)	9406 640 650	9406 S10	9406 S20 (1)	9406 S30 S40	9406 SB1
#2621 Removable Media Device Attachment SPD			X	X		X	X	X
#2624 Storage Device Cntrlr SPD (2)			X	X		X	X	X
#2644 34XX Magnetic Tape Attachment SPD			X	X			X	X
#6501 Tape/Disk Device Cntrlr SPD			X	X		X	X	
#6502 High Performance Cntrlr (2M Cache) SPD			X	X		X	X	
#6512 High Performance Cntrlr (4M Cache) SPD			X	X		X	X	X
#6513 Internal Tape Device Cntrlr SPD			X	X		X	X	
#6530 Disk Unit Cntrlr (No Cache) SPD			X	X		X	X	
#6532 RAID Disk Unit Cntrlr Ultra (4M Cache) SPD			X	X		X	X	
#6533 RAID Disk Unit Cntrlr Ultra (4M Cache) Compression SPD			X	X		X	X	X
#6534 Magnetic Media Cntrlr Ultra SPD			X	X		X	X	X
#9751 Base MFIO with RAID Ultra (4M Cache) SPD				X			X	X
#9754 Base MFIO with RAID Ultra (4M Cache) Compression SPD				X			X	X
#2726 RAID Disk Unit Cntrlr Ultra (4M Cache) PCI		X	X		X	X		
#2729 Magnetic Media Cntrlr Ultra PCI	X	X	X		X	X		
#2740 RAID Disk Unit Cntrlr Ultra (4M Cache) PCI	X	X	X		X	X		
#2741 RAID Disk Unit Cntrlr Ultra (4M Cache) Compression PCI	X		X			X		
#9728 Base Disk Unit Cntrlr Ultra PCI	X	X	X		X	X		
#6146 (on #2624) 9331-01X Diskette Controller SPD		X	X		X	X	X	

Notes on Table

- (1) Model 620 and S20 can only support SPD cards when the Expansion Unit for SPD cards #9331 is installed in the System Unit Expansion #5064/#9364 or if a System Unit Expansion Tower #5072/#5073 is attached.
- (2) #2624 can support internal tape and diskette devices only.
- (3) #6112 can support 9347 001 ½" Reel Tape and 9331 00n Diskette Units only.

None of the above magnetic media controllers are supported on the 9401 Models.

Magnetic Media Controllers

SPD IOP workload and bus data traffic may need to be considered for Tape, DASD, and LAN subsystems.

If you are placing any of the following IOPs in combination on the same SPD bus, follow the rules provided in the table:

Limits to Combinations of High Workload IOPs (SPD Type)		
Subsystem	High Workload IOP	Bus Capability
DASD	#6112, #6500	Nonstreaming
Tape	#2621, #2624, #2644, #6112	Nonstreaming
DASD	#6501, #6530, #6502, #6512, #6532, #6533	Streaming
Tape	#6501, #6513, #6534	Streaming
Tape IOP with 3590 Tape	#6502, #6534	Streaming
Tape	#2621	Nonstreaming
LAN	#2810	Streaming
Limitations on Combinations: Maximum of five high workload IOPs per bus Maximum of three nonstreaming high workload IOPs per bus In #5044 System Unit Expansion Rack, no DASD controllers allowed on same bus with a 3590 tape controller		
Note: These guidelines are for all system buses and include the first system bus. Exceeding these guidelines will cause performance degradation.		

Magnetic Media Controllers

Removable Media Device Attachment SPD #2621

The Removable Media Device Attachment, #2621, provides for the attachment of one or two of the following devices, in any combination:

- 2440-A12 ½" Reel Tape Unit
- 9348-001 ½" Reel Tape Unit - Rack Mount
- 9348-002 ½" Reel Tape Unit - Table Top
- 7208-002 2.3G 8mm Cartridge Tape Unit
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 5.0G 8mm Cartridge Tape Unit (Single Drive)

#2621 provides a hardware data compress-decompress function for these devices. Hardware Data Compression (HDC) can increase the effective media capacity by up to two times. It requires one I/O card slot.

#2621 also provides attachment to one of the following devices:

- 3995 Optical Library (direct attach models)
- 7208-234 Dual 7.0G 8mm Cartridge Tape Unit
- 7208-232 5.0G 8mm Cartridge Tape Unit (Dual Drive)
- 9427 8mm Tape Library
- #5032 Removable Media Cluster Box

When #2621 is used to attach a 3995 Optical Library DataServer, a Dual Drive 7208-232 or 7208-234 8mm Cartridge Tape Unit, a 9427 8mm Tape Library, or #5032 Removable Media Cluster Box must be dedicated to it.

#2621 is not supported on the 9406 Model 170, 600 and S10 nor on the Model 620 and S20 with no SPD card slots.

For tape devices that are supported by the Magnetic Media Controller #6534 this Ultra SCSI device should be selected in place of #2621. For more information on #6534 see page 364.

Magnetic Media Controllers

Storage Device Controller SPD #2624

The Storage Device Controller, #2624, supports the ¼" cartridge and 8mm cartridge internal tape devices. The #2624 also supports external diskette devices 9331-011, 9331-012, or #6135.

As a feature on the 9406 Model 650, S40, and SB1 the #2624 can control up to two internal tape devices installed in the system unit and one external diskette unit. For 9406 Models 170, 600, 620, 640, S10, S20, and S30, the MFIOP or base PCI Disk Unit Controller supports the base CD-ROM and one internal tape in the system unit.

As a feature on a System Unit Expansion Tower (#5072, #5073, or #5044), the #2624 can support up to three internal tape devices and one external diskette unit.

The internal tapes that are supported by the #2624 are:

- 1.2G ¼" Cartridge Kit #1379
- 2.5G ¼" Cartridge Kit #1380
- 2.5G ¼" Cartridge #6380
- 7G 8mm Cartridge #6390

#2624 does not support the 2.5G QIC internal tape unit #6381; the 4G QIC internal tape unit #6382; 13G QIC internal tape unit #6385; 25G QIC internal tape unit #6386; or the #6481, #6482, #6485, #6486, or #6490 internal tape units located in the Model 600, 620, S10, or S20 System Unit or System Unit Expansion #5064/#9364.

#2624 provides a hardware data compress-decompress function for the internal tapes. Hardware Data Compression (HDC) can increase the effective media capacity by up to two times. #2624 requires one I/O card slot.

#2624 is not supported on the 9406 Model 170, 600, and S10; and the Model 620 and S20 with no SPD card slots. Unless the customer requires a #2624 in order to support a diskette drive, the Internal Tape Device Controller #6513 should be selected in place of #2624. For more information on #6513 see page 359.

Magnetic Media Controllers

34XX Magnetic Tape Subsystem Attachment SPD #2644

#2644 provides a S/370 Channel Interface for attachment of the following devices:

- 3422-A01/B01 ½" Reel to Reel Tape Subsystem
- 3430-A01/B01 ½" Reel to Reel Tape Subsystem
- 3480-A11/B11 ½" Cartridge Tape Subsystem
- 3480-A22/B22 ½" Cartridge Tape Subsystem
- 3490-A01/A02/B02/B04 ½" Cartridge Tape Subsystem
- 3490-D31/D32 ½" Cartridge Tape Subsystem
- 3490E-A10/A20/B20/B40 ½" Cartridge Tape Subsystem
- 3490E-D41/D42 ½" Cartridge Tape Subsystem
- 3490E-C10/C11/C22 ½" Cartridge Tape Subsystem
- 3490E-C1A/C2A ½" Cartridge Tape Subsystem
- 3494-L10 ½" Cartridge Tape Library Control Unit Frame (one 3490E C1A/C2A without #5040)
- 3494-D10 ½" Cartridge Tape Library Device Frame (one 3490E C1A/C2A without #5040)

#2644 requires one I/O card slot. A Serpentine Cable (#9980) is required for attaching all #2644 supported devices except the 3490E-CXX. The 3490E-CXX is attached using #9980 when "External Cables" are ordered on the 3490E-CXX. When "Internal Cables" are ordered on the 3490E-CXX the #9980 is not required.

#2644 can attach to all models of AS/400 Advanced Series and AS/400e series except 9401. It supports Hardware Data Compression (HDC) which can increase the effective media capacity by up to two times.

However, #2644 is not supported on the 9406 Model 170, 600, and S10; and the Model 620 and S20 with no SPD card slots.

Magnetic Media Controllers

Tape/Disk Device Controller SPD #6501

The Tape/Disk Device Controller, #6501, provides a SCSI interface with a two-byte wide data path and an instantaneous data rate of 20 M/sec.

On AS/400 Advanced Series and AS/400e series 9402 and 9406 models and traditional AS/400 9404/6 Models D, E, or F, the #6501 provides attachment for the following tape devices:

- 3490E-C11/C22/C1A/C2A ½" Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½" Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½" Cartridge Tape Subsystem
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½" Cartridge Tape Subsystem
- 3590-B11/B1A ½" Cartridge Tape Subsystem
- 3494-L10 ½" Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½" Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
- 3494-D10 ½" Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½" Cartridge Tape Library Device Frame (one to six 3590-B1A)

#6501 requires one I/O card slot and can support up to two tape units per one controller. #6501 does not support Hardware Data Compression (HDC). Tape subsystems attached to the #6501 support a compaction algorithm using their own controller.

In addition, on 9406 Advanced Series and e-series models and traditional AS/400 Models D, E, or F, #6501 is used to attach the 9337 Models 210, 215, 220, 225, 240, 420, 440, 480, 540, 545, 580, 585, 590 and 595 and the 2105 Model B09 and 100 Versatile Storage Server

One #6501 will drive two 9337s or 2105s. The maximum number of #6501s that can be attached to support the 9337s or 2105s varies by model. One I/O card slot is required and must be accommodated in

Magnetic Media Controllers

the 9406 System Unit, or System Unit Expansion (#5072, #5073, or #5044).

#6501 cannot support a tape unit and a 9337 or 2105 on the same controller.

The #6501 is not supported on the 9406 Models 170, 600, S10, and SB1; and 620 and S20 with no SPD card slots. The #6501 is supported on the 9406 Models 620, 650, S30, and S40; and 620 and S20 with SPD card slots. However on new orders, for tape attachment, the newer #6534 Magnetic Media Controller should be ordered in its place.

High Performance Controller (2M Cache) SPD #6502/#6522

#6502 is a SCSI controller and provides unprotected, mirroring and RAID-5 protection of internal disk units not supported by the MFIOP. #6502 also has a 2M write cache for better performance and improved device utilization.

In the 9402 Advanced Series Models 2xx and 4xx, #6522 provides attachment capabilities for up to 8 two-byte SCSI disk units installed in the Integrated Expansion Unit (#7117). It requires one I/O card slot in the #7117. Only one #6522 is supported on 9402 models.

In the 9406 Advanced Series and AS/400e series models, #6502 provides attachment capabilities for up to 8 disk units in the Storage Expansion Unit (#5051 or #9051), and up to 16 disk units in the Storage Expansion Unit (#5052 or #8052), or Storage Expansion Tower (#5061, #5082, or #5083). These can be either one-byte or two-byte SCSI disk units. It requires one I/O card slot in the System Unit, System Unit Expansion Tower, or the Storage Expansion Towers.

On the 9406 Model 620 and S20 with System Unit Expansion (#9364/#5064), with Expansion Unit for SPD Cards #9331, the #6502 can support up to 15 disk units located in the System Unit Expansion.

Magnetic Media Controllers

One #6502 supports a maximum of two RAID-5 DASD arrays with a maximum of ten drives per array. All drives in an array must be of the same capacity and parity can be spread across four or eight drives. Drives not supported in a RAID-5 array can also be attached to the same #6502 in either a mirrored or unprotected environment.

Only the 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G disk units are supported under RAID-5 with #6502.

The #6502 is not supported on the 9406 Models 170, 600, S10, and SB1; and 620 and S20 with no SPD card slots. The #6502 is supported on the 9406 Models 640, 650, S30 and S40; and 620 and S20 with SPD card slots. However on new orders the newer #6532 or #6533 should be ordered in its place.

The #6522 High Performance Controller which was available on 9402 Models 2xx and 4xx is functionally equivalent to #6502 and will be converted to #6502 if upgrading to the Models 620, 640, 650, S20, S30, or S40.

High Performance Controller (4M Cache) SPD #6512

The #6512 disk controller provides unprotected, mirroring, or RAID-5 protection for internal disk units and includes a 4M write cache for better performance and improved device utilization.

It is supported on 9406 Models 3xx and 5xx. #6512 controls disk units installed in the Storage Expansion Units (#5051, #5052, #8052, and #9051) and the Storage Expansion Towers (#5061, #5082, and #5083).

On the 9406 Model 620 and S20 with System Unit Expansion (#9364/#5064), with Expansion Unit for SPD Cards #9331, the #6512 can support up to 15 disk units located in the System Unit Expansion.

The #6512 supports a maximum of 16 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. Disk units not supported in a RAID-5

Magnetic Media Controllers

array can also be attached to the same #6512 in either unprotected or a mirrored environment.

Only the 1.03G, 1.96G, 4.19G, 8.58G, and 17.54G disk units are supported under RAID-5 with #6512. #6512 occupies one I/O card slot position.

The #6512 is not supported on the 9406 Models 600, S10, and SB1; and 620 and S20 with no SPD card slots. The #6512 is supported on the 9406 Models 640, 650, S30 and S40; and 620 and S20 with SPD card slots. However on new orders the newer #6532 or #6533 should be ordered in its place.

Internal Tape Device Controller SPD #6513

This feature provides a two-byte wide SCSI interface for attachment of one or two internal tape drives in the 9406 Model 650, S40, and SB1 System Unit and up to four internal tape drives in the System Unit Expansion Towers (#5072 and #5073).

It is only supported in PowerPC based models of AS/400 and requires OS/400 Version 3 Release 7 or Version 4.

The supported internal tape drives include:

- 1.2G ¼" Cartridge Tape Unit Kit, #1349
- 2.5G ¼" Cartridge Tape Unit Kit, #1350
- 13G ¼" Cartridge Tape Unit Kit, #1355
- 7G 8mm Cartridge Tape Unit Kit, #1360
- 1.2G ¼" Cartridge Tape Unit Kit, #1379
- 2.5G ¼" Cartridge Tape Unit Kit, #1380
- 2.5G ¼" Cartridge Tape Unit, #6380
- 2.5G ¼" Cartridge Tape Unit, #6381
- 4G ¼" Cartridge Tape Unit, #6382
- 13G ¼" Cartridge Tape Unit, #6385
- 7G 8mm Cartridge Tape Unit, #6390
- 2.5G ¼" Cartridge Tape Unit, #6481
- 4G ¼" Cartridge Tape Unit, #6482
- 13G ¼" Cartridge Tape Unit, #6485
- 7G 8mm Cartridge Tape Unit, #6490

Magnetic Media Controllers

#6513 occupies one I/O card slot position.

#6513 is not supported on the 9406 Models 170, 600, and S10; and 620 and S20 with no SPD card slots. The #6513 is supported on the 9406 Models 640, 650, S30, S40, and SB1; and 620 and S20 with SPD card slots.

Magnetic Media Controllers

Disk Unit Controller (No Cache) SPD #6530/#6523

This is a SCSI controller and provides mirrored and unprotected support for additional internal disk units not supported by the MFIOP.

In the 9402 Advanced Series Models 2xx and 4xx, #6523 provides attachment capabilities for up to 8 two-byte SCSI disk units installed in the Integrated Expansion Unit (#7117). It requires one I/O card slot in the #7117. It cannot be installed with the Disk Unit Controller for RAID (#6522). Only one #6523 is supported on 9402 models.

On the 9406 Advanced Series Models 3xx and 5xx, #6530 provides attachment capabilities for up to 8 disk units in the Storage Expansion Unit (#5051 or #9051), and up to 16 disk units in the Storage Expansion Unit (#5052 or #8052) or the Storage Expansion Towers (#5061, #5080, and #5082). These can be either one-byte or two-byte SCSI disk units. It requires one I/O card slot in the system unit, system unit expansion tower, or the storage expansion towers.

On the 9406 Model 620 and S20 with System Unit Expansion (#9364/#5064), with Expansion Unit for SPD Cards #9331, the #6530 can support up to 15 disk units located in the System Unit Expansion.

The #6523 Disk Unit Controller which was available on 9402 Models 2xx and 4xx is functionally equivalent to #6530 and will be converted to #6530 if upgrading to the Models 620, 640, 650, S20, S30, or S40.

The #6530 is not supported on the 9406 Models 170, 600, S10, and SB1; and 620 and S20 with no SPD card slots. The #6530 is supported on the 9406 Models 640, 650, S30 and S40; and 620 and S20 with SPD card slots. However on new orders the newer #6532 or #6533 should be ordered in its place.

Magnetic Media Controllers

RAID Disk Unit Controller (4M Cache) Ultra SCSI SPD #6532

The #6532 disk controller provides unprotected, mirroring or RAID-5 protection for internal disk units. It includes a 4M write cache for better performance and improved device utilization.

#6532 will control Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the Storage Expansion Unit #5058 and Storage Expansion Tower #5083. The new Ultra SCSI disks will give best performance when attached to a #6532 in these Ultra SCSI Expansion Units or Towers. These Ultra SCSI disks are 17.54G Disk Unit #6714, 8.58G Disk Unit #6713, 4.19G Disk Unit #6907 and 1.96G Disk Unit #6906.

The #6532 will also control internal disks that are not Ultra SCSI in Storage Expansion Units #5052 and Storage Expansion Tower #5082 that are also not Ultra SCSI. However, in that case the disks will not perform at Ultra SCSI speeds.

#6532 also supports disks installed in the Storage Expansion Units #5051, #5052, #8052 and #9051 and in the Storage Expansion Towers #5080 and #5082. None of these are Ultra SCSI Units and Towers and they therefore do not give full Ultra SCSI performance. These #50xx Storage Expansion Units and Towers are supported on the 5xx Models. #5052 and #5082 are also supported for migration to the Models 620, 640, 650, S20, S30, and S40. For the 5xx models, the Storage Expansion Unit #5058 and Storage Expansion Towers #5081 and #5083 which are both Ultra SCSI are offered which provides full Ultra SCSI performance when the disks are attached to a #6532. #5081 is supported on the Models 500, 510, and 50S. #5083 is supported on the Models 530 and 53S. One #5058 is supported per #5081 or #5083.

On the 9406 Model 620 and S20 with System Unit Expansion (#9364/#5064), with Expansion Unit for SPD Cards #9331, the #6532 supports up to 15 disk units located in the system unit expansion.

The #6532 controller supports a maximum of 16 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per

Magnetic Media Controllers

RAID-5 array are supported. Parity information can be spread across four or eight disks units. A maximum of four RAID-5 arrays are supported on one #6532. Disk units not supported in a RAID-5 array can also be attached to the same #6532 in either unprotected or a mirrored environment.

The #6532 requires OS/400 Version 4. #6532 is supported on PowerPC based models including 9406 Models 500, 510, 530, 50S, 53S, 640, 650, S30 and S40; and 620 and S20 with SPD card slots. It is not supported on Models 170, 600, S10 and SB1; and 620 and S20 with no SPD card slots.

#6532 offers improved performance over #6502, #6512, and #6530 and therefore effectively replaces them. #6532 occupies one I/O card slot. #6532 does not offer support for compression. The #6533 RAID Disk Unit Controller, which supports compression effectively, supercedes #6532 when systems are ordered with Version 4 Release 2 or later although Version 4 Release 3 is required for compression.

RAID Disk Unit Controller (4M Cache) Ultra SCSI Compression SPD #6533

The #6533 disk controller is functionally equivalent to the #6532. For a full description see the #6532 section above.

The #6533 offers an enhancement over the #6532 in that it supports data compression when used with OS/400 Version 4 Release 3 onward. The 17.54GB drives (#6714, #6824, #8714, and #8824) do not currently support data compression. IBM intends to offer a future release of OS/400 which will support data compression for the 17.54GB drives when attached to a suitable controller.

The #6533 requires OS/400 Version 4 Release 2 or later For all new orders with that release or later, #6533 will be ordered in place of the #6532.

Magnetic Media Controllers

Magnetic Media Controller Ultra SCSI SPD #6534

The Magnetic Media Controller Ultra SCSI, #6534, provides for attachment of one of the following devices:

- 3490E-C11/C22/C1A/C2A ½" Cartridge Tape Subsystem with #5040
- 3490E-E01/E11 ½" Cartridge Tape Subsystem
- 3490E-F00/F01/F11/F1A ½" Cartridge Tape Subsystem
- 3494-L10 ½" Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-L12 ½" Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
- 3494-D10 ½" Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
- 3494-D12 ½" Cartridge Tape Library Device Frame (one to six 3590-B1A)
- 3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
- 3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem
- 3575-L06/L12/L18/L24/L32 ½" Cartridge Tape Subsystem
- 3590-B11/B1A ½" Cartridge Tape Subsystem
- 3995-C40/C42/C44/C46/C48 Optical Library Dataserver
- 7208-012 5.0G 8mm Cartridge Tape Unit
- 7208-222 7.0G 8mm Cartridge Tape Unit
- 7208-232 Dual 5.0G 8mm Cartridge Tape Unit
- 7208-234 Dual 7.0G 8mm Cartridge Tape Unit
- 7208-342 20.0G 8 mm Cartridge Tape Unit
- 9348-001 ½" Reel Tape Unit–Rack Mount
- 9348-002 ½" Reel Tape Unit–Table Top
- 9427-21x 8mm Tape Library

#6534 is an Ultra SCSI controller. It provides a hardware data compress-decompress function for these devices. Hardware Data Compression (HDC) can increase the effective media capacity by up to two times.

#6534 occupies one I/O card slot. It requires Version 4 Release 1 or later of OS/400 and is supported on all PowerPC based models including 9402 Models 400 and 40S and 9406 Models 500, 510, 530, 50S, 53S, 640, 650, S30, S40 and SB1; and 620 and S20 with SPD

Magnetic Media Controllers

card slots. It is not supported on Models 170, 600, and S10; and 620 and S20 with no SPD card slots.

#6534 offers improved performance over #2621 and #6501 for external tape attachment and therefore effectively replaces them. However there are some devices such as Removable Media Cluster Box #5032; 1/2" Reel Tape Unit 2440-A12; and 2.3G 8mm Cartridge Tape Unit 7208-002; that are not supported by the #6534. For these devices #2621 is still required.

Version 4 Release 2 or later is required for #6534 to support 3995 Optical Library Dataserver.

Magnetic Media Controllers

MFIOP with RAID Ultra SCSI #9751

The #9751 MFIOP with RAID is an Ultra SCSI controller that provides unprotected, mirroring or RAID-5 protection for internal disk units. It includes a 4M write cache for better performance and improved device utilization. The #9751 also controls the internal CD-ROM drive, one internal tape unit and contains three IOA slots for communications, LAN, and twinaxial I/O adapters.

#9751 will control Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the system unit and the Storage Expansion Unit #5055 (Model 640 or S30) or #5057 (Model 650 or S40). The Ultra SCSI disks gives the best performance when attached to the #9751. These Ultra SCSI disks are 17.54G Disk Unit #6714, 8.58G Disk Unit #6713, 4.19G Disk Unit #6907, 1.96G Disk Unit #6906, and their base disk equivalents.

The #9751 will also control disks that are not Ultra SCSI but in that case the disks will not perform at Ultra SCSI speeds.

The MFIOP with RAID #9751 supports a maximum of 20 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. A maximum of four RAID-5 arrays are supported on one #9751. Disk units not supported in a RAID-5 array can also be attached to the #9751 in either an unprotected or a mirrored environment.

#9751 requires OS/400 Version 4 Release 1 or later. It occupies two card slots. It is standard on 9406 Models 640, 650, S30, S40 and SB1. It is not available on any other model of AS/400. #9751 does not offer support for compression and the #9754 MFIOP with RAID, which supports compression effectively, supercedes #9751 when systems are ordered with OS/400 Version 4 Release 2 or later. Version 4 Release 3 will be required to support compression.

Magnetic Media Controllers

MFIOP With RAID Ultra SCSI Compression #9754

The #9754 MFIOP is functionally equivalent to the #9751. See above for a full description of the #9751.

The #9754 offers an enhancement over the #9751 in that it supports data compression when combined with OS/400 Version 4 Release 3. The 17.54GB drives (#6714 and #8714) do not currently support data compression. IBM intends to offer a future release of OS/400 which will support data compression for the 17.54GB drives when attached to a suitable controller. The #9754 requires Version 4 Release 2 of OS/400. For all new orders with that release or later, #9754 will be ordered in place of the #9751.

Magnetic Media Controllers

PCI RAID Disk Unit Controller Ultra SCSI #2726

The #2726 PCI RAID Disk Unit Controller provides unprotected, mirroring or RAID-5 protection for internal disk units. It includes a 4M write cache for better performance and improved device utilization. #2726 also supports one CD-ROM drive and one internal tape unit when placed in the system unit. When placed in the System Unit Expansion #5064/#9364 the #2726 can support up to three internal tape units.

#2726 will control Ultra, Fast Wide and Fast Narrow SCSI disk units located in the System Unit and the System Unit Expansion #5064/#9364 with Expansion Unit for PCI cards #9329. The Ultra SCSI disks provide the best performance when attached to the #2726. These Ultra SCSI disks are 17.54G Disk Unit #6824, 8.58G Disk Unit #6813, 4.19G Disk Unit #6807, 1.96G Disk Unit #6806, and their base disk equivalents and the #1334 (17.54G), #1333 (8.58G), #1337 (4.19G) and #1336 (1.96G) Disk Unit Migration Kits. These are all supported in the System Unit and System Unit Expansion #5064/#9364. The #2726 also controls migrated disks that are not Ultra SCSI. In that case the disks do not perform at Ultra SCSI speeds.

The PCI RAID Disk Unit Controller #2726 supports a maximum of 15 one or two-byte disk units. A minimum of four disk units of equal capacity are required to implement RAID-5 protection. A maximum of 10 disk units per RAID-5 array are supported. Parity information can be spread across four or eight disk units. A maximum of three RAID-5 arrays are supported on one #2726. Disk units not supported in a RAID-5 array can be attached to the #2726 in either unprotected or a mirrored environment.

Concurrent maintenance of disks attached to the #2726 is only supported if the disks are part of a RAID array.

The supported internal tape drives include:

- 1.2G ¼" Cartridge Tape Unit Kit, #1349
- 2.5G ¼" Cartridge Tape Unit Kit, #1350
- 13G ¼" Cartridge Tape Unit Kit, #1355
- 7G 8mm Cartridge Tape Unit Kit, #1360

Magnetic Media Controllers

2.5G ¼" Cartridge Tape Unit, #6481
4G ¼" Cartridge Tape Unit, #6482
13G ¼" Cartridge Tape Unit, #6485
25G ¼" Cartridge Tape Unit, #6486
7G 8mm Cartridge Tape Unit, #6490

#2726 requires OS/400 Version 4 Release 1 or later. It occupies one High Speed PCI card slot. It is supported on the 9406 Model 600, 620, S10, and S20 only. A maximum of one #2726, #2740, #2741, or #9728 can be installed in the system unit and one #2726 or #2741 in the System Unit Expansion #5064/#9364 with Expansion Unit for PCI cards #9329. If RAID is to be implemented or more than five disk units are required in the system unit, then #2726 should be ordered in place of #9728 Base PCI Disk Unit Controller.

#2726 does not offer support for compression. The #2741 PCI Raid Disk Unit Controller which supports compression when used with Version 4 Release 3 and it effectively, supercedes #2726 when systems are ordered with Version 4 Release 2 or later. If only a maximum of 10 disks are required and there is no requirement for compression, then #2740 can be ordered as an alternative to #2741.

PCI Magnetic Media Controller Ultra SCSI #2729

The PCI Magnetic Media Controller Ultra SCSI, #2729, provides for attachment of one of the following devices:

3490E-C11/C22/C1A/C2A ½" Cartridge Tape Subsystem with #5040
3490E-E01/E11 ½" Cartridge Tape Subsystem
3490E-F00/F01/F11/F1A ½" Cartridge Tape Subsystem
3494-L10 ½" Cartridge Tape Library Control Unit Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
3494-L12 ½" Cartridge Tape Library Control Unit Frame (one or two 3590-B1A)
3494-D10 ½" Cartridge Tape Library Device Frame (one 3490E-C1A/C2A with #5040 or one or two 3490E-F1A)
3494-D12 ½" Cartridge Tape Library Device Frame (one to six 3590-B1A)
3570-B00/B01/B02/B11/B12/B1A Cassette Tape Subsystem
3570-C00/C01/C02/C11/C12/C1A Cassette Tape Subsystem

Magnetic Media Controllers

3575-L06/L12/L18/L24/L32 ½" Cartridge Tape Subsystem
3590-B11/B1A ½" Cartridge Tape Subsystem
3995-C40/C42/C44/C46/C48 Optical Library Dataserver
7208-012 5.0G 8mm Cartridge Tape Unit
7208-222 7.0G 8mm Cartridge Tape Unit
7208-232 Dual 5.0G 8mm Cartridge Tape Unit
7208-234 Dual 7.0G 8mm Cartridge Tape Unit
7208-342 20.0G 8mm Cartridge Tape Unit
9348-001 ½" Reel Tape Unit–Rack Mount
9348-002 ½" Reel Tape Unit–Table Top
9427-21x 8mm Tape Library

#2729 is an Ultra SCSI controller. It provides a hardware data compress-decompress function for these devices. Hardware Data Compression (HDC) can increase the effective media capacity by up to two times.

#2729 occupies one High-Speed PCI card slot. It requires OS/400 Version 4 Release 1 or later. It is supported on the 9406 Models 170, 600, 620, S10, and S20 only. A maximum of one #2729 can be installed in the system unit and two #2729s in the System Unit Expansion #5064/#9364 with Expansion Unit for PCI cards #9329.

#2809 PCI LAN/WAN/Workstation IOP is a prerequisite for the #2729.

OS/400 Version 4 Release 2 or later is required for #2729 to support the 3995 Optical Library Dataserver.

PCI RAID Disk Unit Controller #2740

The #2740 is functionally equivalent to the #2726 PCI RAID Disk Unit Controller. However, the #2740 can only be located in the System Unit. It cannot be located in the System Unit Expansion #5064/#9364. #2740 is supported on the 9406 Models 170, 600, 620, S10, and S20 only. #2740 supports a maximum of 10 one- or two-byte disk units. A maximum of two RAID-5 arrays are supported on one #2740. A maximum of one #2740, #2726, #2741, or #9728 can be installed in the system unit. #2740 does not offer support for compression. However, if only a maximum of 10 disks are to be

Magnetic Media Controllers

required and there is no requirement for compression, then #2740 should be ordered.

Concurrent maintenance of disks attached to the #2740 is only supported if the disks are part of a RAID array.

Otherwise, the #2740 offers the same support as the #2726. Refer to page 368 for more information. The #2740 requires OS/400 Version 4 Release 2 or later.

PCI RAID Disk Unit Controller Compression #2741

The #2741 is functionally equivalent to the #2726 PCI RAID Disk Unit Controller. See page 368 for a full description of #2726. The #2741 offers an enhancement over the #2726 in that it supports data compression when used with OS/400 Version 4 Release 3. The 17.54GB drives (#6824 and #8824) do not currently support data compression. IBM intends to offer a future release of OS/400 which will support data compression for the 17.54GB drives when attached to a suitable controller. The #2741 requires Version 4 Release 2 or later of OS/400. For all new orders with that release or later, #2741 will be ordered in place of the #2726.

Concurrent maintenance of disks attached to the #2741 is only supported if the disks are part of a RAID array.

#2741 is supported on the 9406 Model 170, 620 and S20 only. A maximum of one #2741, #2726, #2740, or #9728 can be installed in the system unit and one #2741 or #2726 in the System Unit Expansion #5064/#9364 with Expansion Unit for PCI cards #9329. If only a maximum of 10 disks will be required and there is no requirement for compression, then #2740 can be ordered instead of #2741.

Magnetic Media Controllers

Base PCI Disk Unit Controller Ultra SCSI #9728

The #9728 Base PCI Disk Unit Controller is the base controller for the system unit. It is an Ultra SCSI controller which provides mirroring or unprotected support for up to five disks located in the system unit. The #9728 does not include any write cache and it does not support RAID. As well as five disks, it also supports the internal CD-ROM drive and one internal tape unit.

#9728 will control Ultra, Fast Wide, and Fast Narrow SCSI disk units located in the system unit. The Ultra SCSI disks provide the best performance when attached to the #9728. These Ultra SCSI disks are 17.54G Disk Unit #6824, 8.58G Disk Unit #6813, 4.19G Disk Unit #6807, 1.96G Disk Unit #6806, and their base disk equivalents and the #1334 (17.54G), #1333 (8.58G), #1337 (4.19G) and #1336 (1.96G) Disk Unit Migration Kits. The #9728 also controls migrated disks that are not Ultra SCSI. In that case the disks do not perform at Ultra SCSI speeds.

The Base PCI Disk Unit Controller supports a maximum of five one or two-byte disk units. It requires OS/400 Version 4 Release 1 or later occupies one High Speed PCI card slot. It is supported on the 9406 Models 170, 600, 620, S10 and S20 only. A maximum of one #2726, #2740, #2741, or #9728 can be installed in the system unit. If RAID is to be implemented or more than five disk units are required in the System Unit then #2726, #2740, or #2741 PCI RAID Disk Unit Controller should be ordered in place of #9728.

#9728 does not offer support for compression. If compression will be required, then #2741 should be ordered in its place. #2741 is only supported on the Models 170, 620 and S20.

The following are also supported on the 6xx and Sxx models as migration features:

#6112 Magnetic Storage Device Controller SPD

- Supported on Model 620 with SPD card slots, 640 and 650
- Supports 9331 Diskette Unit Models 001 and 002 and 9347 Tape Unit

#6500 Direct Access Storage Device Controller SPD

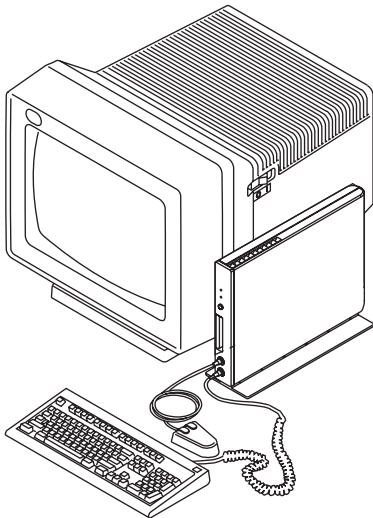
Magnetic Media Controllers

- Supported on Model 620 and S20 with SPD card slots, 640, 650, S30, and S40
- Supports 9337 Disk Array Subsystem Models 0xx and 1xx

Magnetic Media Controllers

Peripherals

IBM Network Station



The IBM Network Station is a compact desktop network computer that offers low-cost network computing by taking advantage of leading-edge application technologies like corporate intranets, the Internet and Java while benefiting from the simplicity and cost effectiveness of non-programmable terminals.

The small logic unit (1.8 lbs/0.8 Kg) is supplied with base memory (expandable to 64Mb), 1Mb of video memory (expandable to 2Mb), mouse, standard 102-character PC keyboard, power unit and cable, and monitor support for VGA/SVGA monitors (which are orderable separately).

IBM Network Stations are best suited for situations where users need multi-system sign-ons, where green-screen applications still exist but there is a requirement for intranet capability, for back office clerical applications, for areas using secure data which is best held centrally on a server rather than on individual PCs, and in situations where

Displays

green screens and old PCs are being replaced where terminal emulation is the prime use.

IBM Network Stations comply with the U.S. EPA "Energy Star" program for energy efficient office technology.

The cabling requirements are dependent on the model, Token-Ring, Ethernet, or Twinax. For Token-Ring, a Telephone Twisted Pair (TTP) cable with an RJ45 8-position connector is required. The cable type is generally describe as STP, UTP, or TTP RJ45 Category 3 (4Mb) or Category 4 (16Mb) depending on the ring speed.

For Ethernet, a TTP cable with an RJ45 8-position connector is required, being an industry standard 10baseT cable. The cable type is generally described as Unshielded Twisted Pair (UTP) Category 3.

For Twinax, the system unit is shipped with a five-foot cable which provides a mini D-shell connector and a standard terminated "T" twinax connector for connection to the AS/400. Twinax models can co-exist on the same controller with traditional 5250 devices. Support is not provided by 5x94 (remote workstation controllers). OS/400 Version 4 Release 2 or later is required as is Network Station Manager R3.0 (5648-C05).

All models of the IBM Network Station use an operating system program kernel which is downloaded from the AS/400 over a TCP/IP LAN. The kernel and other Network Station programs are loaded using the IBM Network Station manager residing on the AS/400. The Network Station operates without disk storage as when powered on it performs initial diagnostics and then contacts the AS/400 requesting the Network Station Manager to download the kernel. The OS/400 software requirement is Version 3 Release 2 or Version 3 Release 7 or higher with the appropriate IBM Network Station Manager software (see page 487). This provides simultaneous window access to AS/400, RS/6000, and S/390 applications, as well as Windows applications (using third-party multiuser Windows NT software) from a PC server. It also encompasses multiple server access with browser access to applications and services from the Internet, Intranet, and Extranets.

Displays

Series	Machine Type	Model	Connection	Base Memory	Processor (PowerPC)
100	8361	100	Ethernet	8	33 MHz
100	8361	200	Token-Ring	8	33 MHz
300	8361	110	Ethernet	16	66 MHz
300	8361	210	Token-Ring	16	66 MHz
300	8361	341	Twinax	16	66 MHz
1000	8362	A22	Token-Ring	32	200 MHz
1000	8362	A23	Token-Ring	64	200 MHz
1000	8362	A52	Ethernet	32	200 MHz
1000	8362	A53	Ethernet	64	200 MHz

The Series 100 models are particularly designed to access multiple servers supporting 3270 and 5250 applications, work with applications on AIX and UNIX using X-Windows server support, and to run Windows applications using multiuser implementations of Windows NT.

The more powerful Series 300 models also run simple Java applets and applications. However, to run all Java applets and applications directly on the network station, the Series 1000 provides the power required.

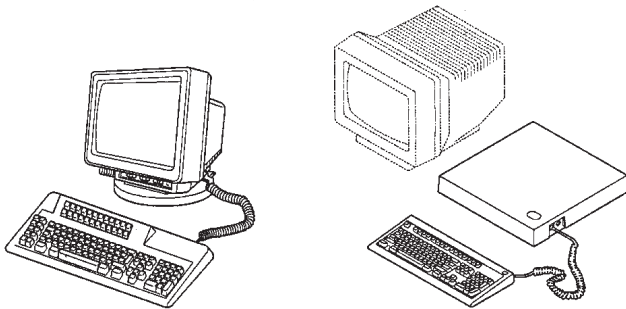
The Series 1000 are also designed to use eSuite, a comprehensive set of tools and applications written in Java, with a desktop environment called eSuite WorkPlace and a set of web development tools called eSuite DevPack.

eSuite WorkPlace provides a comprehensive set of applets, including calendar, mail, address book, word processor spreadsheet, and presentation graphics. Further information on eSuite can be found at the web site: <http://www.esuite.lotus.com>

Further information on network stations is to be found at the web site: <http://www.ibm.com/nc>

Displays

IBM InfoWindow II Displays



The InfoWindow II 3486, 3487, 3488 and 3489 provide a GUI-like (Graphical User Interface) capability. They also incorporate a variable split screen, calculator, an expansion cartridge to enable future IBM product enhancements or unique customer requirements to be added to the display, and both a mouse port and printer port as standard.

The InfoWindow IIs have screen front characteristics which meet the VDT section of the ISO Standard 9241 Part 3. They also meet the Swedish requirement of MPR-2 for low emissions, and the US EPA "Energy Star" Program for energy efficient office technology.

The 3486 and 3487 are integrated in design with a 122-key or enhanced keyboard, a Lift/Tilt/Swivel stand and a monitor, with a choice of Green, Amber-Gold or color screens. They support up to two host display sessions, operator selectable horizontal or vertical split screen, and additional support for additional printers.

The 3488 and 3489 are modular in design with a 122-key or enhanced keyboard and Modular Logic Unit which supports attachment of most IBM monitors. They support up to four host display sessions, have a 6,000 keystroke Record/Play/Pause facility, a 262,000 color palette, extended foreground and background colors and support a lightpen.

The G54 and G74 color monitor models limit emissions below MPR-II guidelines and are capable of ENERGY STAR and NUTEK power

Displays

management via DPMS; monitor Plug and Play via DDC; and ISO 9241-3 image quality.

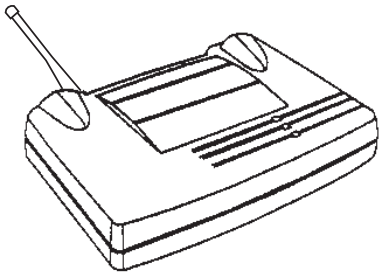
The 3489 supports the Image/Fax-View and print facility and one PC/TV attachment, which allows end users to control audio and motion video using cable, antenna or external video source in a sizeable pop-up window. The 348n Displays connect to the AS/400 using twinaxial attachment.

For more information see *IBM InfoWindow II 3486/3487/3488/3489 Display Guide*, G326-0265.

The InfoWindow II 3153 is a family of Displays that have ASCII attachment to the AS/400 and also to the RS/6000, a PC or the ES/9000 using a 3174 controller. The 3153 emulates a variety of the most widely used ASCII displays. It has two RS232 ports and a parallel printer port. There are different models of the 3153 offering green, amber or white monitors. The 3153 meets recognized international standards and guidelines on ergonomics, emissions, safety and power consumption.

Peripherals

IBM 2480 AS/400 Wireless Access Point



An Access Point is a small device that connects to a wireless LAN network and extends the area it covers. Each access point creates a cell of wireless LAN coverage. Networks are designed to create overlapping cells to ensure consistent coverage of the area desired. Transparent movement from cell to cell within a network can be achieved while maintaining continuous interaction with the AS/400. The range of each cell depends on the environment it is used in. Most office environments allow 100 to 300 feet coverage in all directions.

Five models of the AS/400 Wireless Access Point are supported.

2480 Model RS0: Acts as a bridge from an RS-485 network to a wireless LAN. The access point attaches to the AS/400 through a RS-485 twisted pair wired backbone connected to an AS/400 Wireless LAN Adapter or through the Radio Frequency (RF) link created by the AS/400 Wireless LAN Adapter. The twisted pair wiring can extend up to 5000 feet with a data rate of 230Kbps. The raw bit rate between RF connected access points is 2Mbps. The 2480-RS0 is supported on all AS/400 systems that support an AS/400 Wireless LAN Adapter (#2668).

Peripherals

2480 Model E00: Acts as a bridge from an Ethernet 10Base5 or 10BaseT wired LAN creating an AS/400 Wireless LAN network. They can be attached either using the cable connected to an AS/400 Ethernet adapter or through the RF link created by the AS/400 Wireless LAN Adapter. Multiple units can be used to create a multi-cell network.

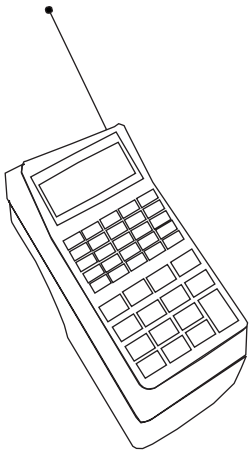
2480 Model EB0: This Ethernet Bridge Access Point allows two or more Ethernet LANs to be connected together without wires. This access point provides wireless data communications between two hard wired Ethernet LANs or between a hardwired Ethernet LAN and a wireless LAN network. The Model EB0 can be used in any combination with the Model E00 Access point.

2480 Model TR0: This Token-Ring Access Point acts as a bridge from a Token-Ring LAN to allow wireless devices to attach to the Token-Ring. The wireless connection can be up to 400m outdoors or 300m indoors. The first access point attaches using Token-Ring cabling and additional access points are added either directly or using wireless.

2480 Model TB0: This Token-Ring LAN Bridge Access Point allows two or more Token-Ring LAN segments to be bridged without wires. When LAN segments are connected this way, workstations on any segment can communicate with each other as though they were on the same LAN. A minimum of two are required to create a bridge network.

Peripherals

IBM 248X Portable Transaction Computers for AS/400 Wireless Networks



These AS/400 Portable Transaction Computers (PTC) use an advanced technology, spread spectrum direct sequence radio operating in the 2.4 to 2.4835 GHz band. Spread spectrum provides excellent resistance to interferences from other radio frequency sources.

The PTCs are preconfigured with 5250 emulation software and have battery packs and trickle chargers. There are several models:

2482-PTC: Battery powered and hand held, it appears to the AS/400 as a 5250-type terminal. Data can be entered into an AS/400 application through the PTC 2482, with an optional bar code laser scanner, LED pencil wand, or through the PTC keypad. Currently available as Model S20.

2483 Integrated Laser PTC: Three models contain an integrated bar code laser scanner. Data entry can also be done using the PTC keyboard. The three models of the 2483 are based on the range of the bar code scanner. The Model 5S0 (standard range), Model 5L0 (long range), and Model 5X0 (extended range).

Peripherals

2484 Industrial PTC: Is battery or AC powered designed for harsh environments. This features a NEMA-style waterproof case with a heavy-duty industrial bracket for mounting. Data can be entered using an optional bar code scanner or through the PTC keypad. The two models are for vehicles with different batteries--the Model 520 for vehicles with 12 VDC batteries, the 540 for use on vehicles with 24-72 VDC.

2486 PTC: Two models offer a smaller, lighter unit with superior tolerance to temperature and environmental extremes. There are dual CPUs for optimum performance: A V20H/80C88 microprocessor running at 10 MHz for terminal processing and a Z182 microprocessor dedicated exclusively to RF communications. It also features a 256K operating system flash EPROM and a 256K application flash EPROM. Standard RAM is 1M. The two models are both standard range scanners but offer different keyboards--The Model 5S0 has a 5250 keyboard, the DS0 has a D05 keyboard.

For PTCs 2483 Model 5S0 and 2484 540, there is an alternative to the standard TXP 5250 emulation shipped with these products. The TN5250 emulation package is shipped as a feature (#0910) on the PTC and provides native TCP/IP connectivity between the PTC and an AS/400 host on Ethernet or Token-Ring LAN. TN5250 provides full 5250 emulation for Telnet sessions with the AS/400 applications. It is plant install only for order at time of initial purchase.

A web home page provides more information at:

<http://www.networking.ibm.com/wireless>

Peripherals

IBM 5308 ASCII to 5250 Connection

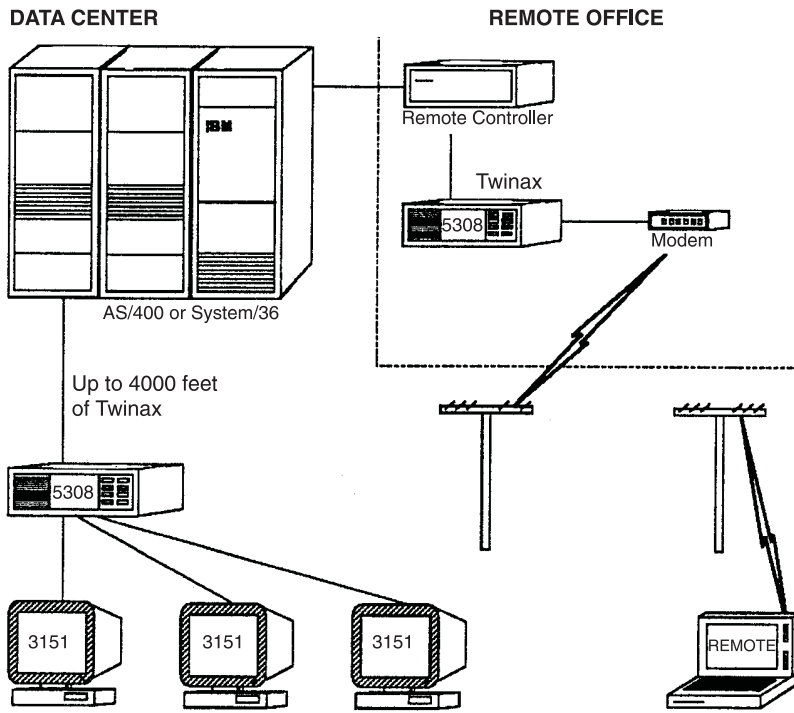
The IBM 5308 ASCII to 5250 Connection is the link between low-cost ASCII displays and the IBM AS/400 or 5394 or 5494 remote controllers. It attaches using the twinax workstation controller port. Each ASCII display can use up to four simultaneous sessions.

There are three models of 5308:

- 5308 002 Two-Port ASCII to 5250 Connection
- 5308 0M2 Two-Port ASCII to 5250 Connection with Modem
- 5308 007 Seven-Port ASCII to 5250 Connection

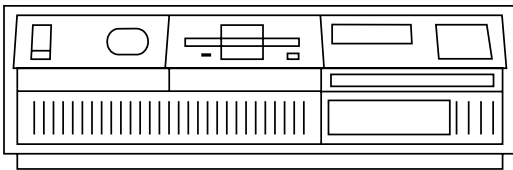
IBM 5308 requires at least one ASCII device such as a supported ASCII display, a PC emulating a supported ASCII display or a PC running the PC Terminal Program provided with the 5308 ASCII to 5250 Connection.

Peripherals



Peripherals

IBM 5494-EXT Remote Control Unit



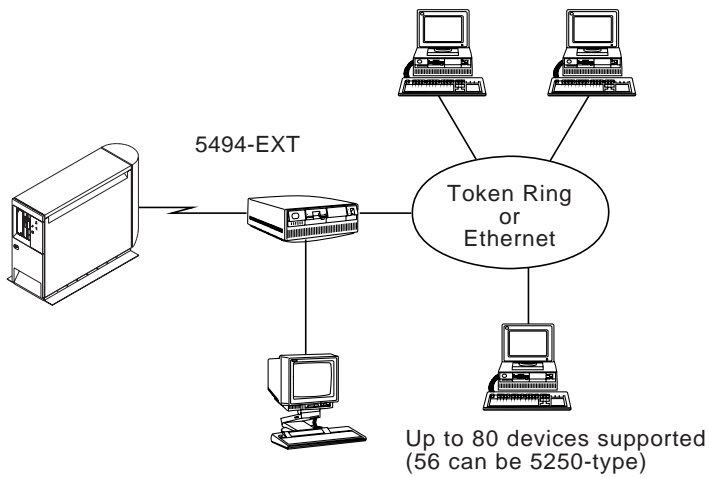
The 5494-EXT is a Remote Control Unit that allows control of workstations in both local and remote environments from the AS/400 host system. The Model EXT consolidates the functionality of both 5494-001 and 5494-002 Remote Control Units into a single model with features. An operator panel with 21 key pads, 1x16 character LCD, and 4 LEDs is provided in the 5494 Remote Control Unit. This allows access to controller and system information and is used for problem determination and isolation.

The 5494-EXT base model supports up to 28 5250-type devices. This can be doubled to allow a maximum of 56 by adding the Twinaxial Expansion Kit (#1200). The EXT can be further enhanced by adding the Token-Ring Adapter (#1100) or Ethernet Adapter (#1500). With one of these adapters installed, the EXT can support up to 80 devices, of which a maximum of 28 (56 if #1200 is installed) can be 5250-type.

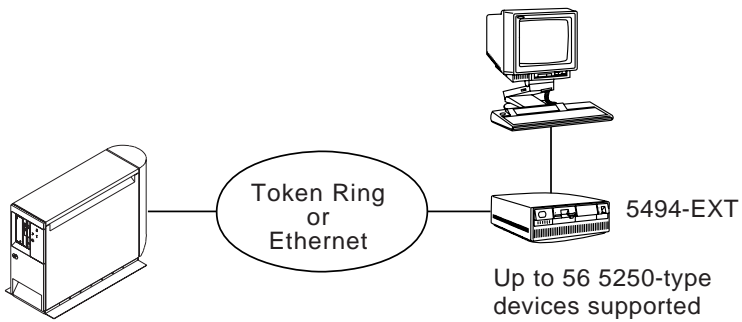
Peripherals

The 5494-EXT can be connected to AS/400 using the following methods:

(a) Remote Token-Ring or Ethernet Gateway

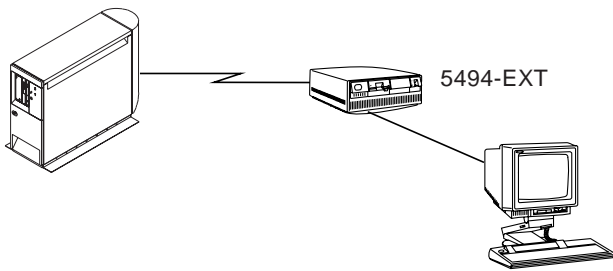


(b) Directly attached to AS/400 using Token-Ring or Ethernet



Peripherals

(c) No Token-Ring or Ethernet



Up to 56 5250-type devices

The 5494 can support several different interfaces such as EIA 232D, CCITT V.24/V.28/V.35, and CCITT X.21, depending upon the type of communication cable used. Speeds of up to 128 Kbps, when attached to a CCITT X.21 or V.35 interface, and up to 19.2 Kbps, when attached to an EIA 232D or CCITT V.24/V.28, can be achieved.

The 5494 Utility Program incorporates a remote access function enabling a user to access a 5494 from a Programmable Workstation not directly attached to the 5494.

Existing 5494 Models 001 and 002 can be converted to an EXT simply by upgrading to the 5494 Release 3.0, 3.1, or 3.2 Microcode.

5494 Release 3.2 Microcode supports the following enhancements:

Universally Administered LAN address—for both Token-Ring and Ethernet allows the use of the adapter's universally administered address rather than entering a LAN address during configuration.

Time/Date Synchronization—5494 error messages can be sent to the AS/400 to correctly synchronize the time and date.

Load Configuration from Diskette—allowing loadable configurations to be stored on a system diskette for quicker activation of a backup host link.

V-DOS Support—allowing the 5494 utility program to be run under V-DOS, the latest DOS used in Japan and other Far Eastern countries.

Peripherals

LAN Printer Support—3130 and 3935 Token Ring attached printers are now supported by the 5494.

OS/400 Version 3 Release 1 and Version 3 Release 6 Local Controller Function—maintaining functional consistency for local and attached devices.

Other Support:

The 5494 has been successfully tested in an ISDN environment, using terminal adapters to connect to the ISDN network.

The 5494 has been successfully tested in a Wireless LAN environment, using IBM Wireless equipment to provide this support.

The 5494 can be managed by the Nways Campus Manager LAN for AIX Version 2.0.

An additional capability of the 5494 is that the Frame Relay—Token-Ring Bridge feature (#1150) supports source route bridging of Token-Ring traffic across the Frame Relay connection to a bridge partner (which must support RFC 1490, Frame Relay Bridging). Example Bridge Partners include an AS/400, a 6611 Network Processor, a 2210 Nways Multiprotocol Router, and a PC running RouteXpander/2. This feature allows non-SNA traffic on Token-Ring LANs to access the rest of the communication network through the 5494.

Peripherals

IBM 6299 Midrange Hub

This product is not available in all countries.

The IBM 6299 Midrange Hub Family is a complete line of networking hubs for connecting 5250-type devices, including PCs with 5250 emulation adapters, twinax-attached printers, and InfoWindow displays to the AS/400 using Unshielded Twisted Pair (UTP) wiring. The 6299 also has a unique Host Port Multiplexer feature that connects the host to remote sites using a single UTP, twinax, or fiber optic cable.

The 6299 converts AS/400 cabling topology from daisy-chain to star topology. Once the initial cabling is installed, any future device movement, addition and deletion of UTP attached devices is easier than with twinax attached devices.

The 6299 Hub family consists of five models:

Model	Description
6299-100	Single-Slot Chassis (1 available module slot)
6299-200	Dual-Slot Chassis (2 available module slots)
6299-900	Nine-Slot Rack (9 available module slots)
6299-8DB	UTP Distribution Block (RJ11/RJ45 connections)
6299-8TC	8-Port Twinax Multiplexer

The three modules supported on the Models 100, 200, and 900 are:

Device Communication Module: This has one UTP host port and seven UTP device ports. It increase the reliability of the network by providing a cleaner signal and less noise.

Peripherals

Host Port Multiplexor Module: This allows up to eight host ports from a single workstation controller to be combined into a single UTP, twinax, or duplex fiber optic cable link. Up to 50 devices are supported over a single multiplexor cable. A pair of Host Port Multiplexors work together so one side connects directly to the AS/400 as twinax controller and the second Host Port Multiplexor replicates the AS/400 output to a remote floor on site up to a maximum distance of 6600 feet. This is available on the Models 100, 200, and 900 or as an integrated 8-Port Twinax Multiplexor Unit (the Model 8TC).

Midrange UTP Distribution Block Module: This converts up to eight host ports on a single DB25 cable to eight separate UTP host ports. This can be supported on the Models 200 and 900 or ordered in its own chassis as Model 8DB.

The 6299 attaches to an AS/400 either directly or using a workstation controller.

Peripherals

IBM 7299 Express Hub for AS/400

The IBM 7299 Express Hub for AS/400 is a star hub that allows connection of 5250-type devices to AS/400s using low-cost Category 5 or FTP cabling.

This enables devices to take advantage of the cost savings of twisted-pair cabling over twinax, as well as the ability to use it for voice and other data connections.

All 7299 models connect one or two twinaxial workstation controller ports to seven or fourteen 5250-type devices. Each device is connected directly to the hub using star topology and a patch panel, removing the need for daisy chaining twinaxial devices.

The 7299 supports all models of AS/400, AS/400 Advanced 36, IBM 5394 and 5494 Remote Controllers.

The 7299 Express Hub family consists of four models, each with an option (must be specified) for unshielded RJ-45 or unshielded RJ-11 connector types (except the Model 2FX which is shielded RJ-45 only).

Model	Host Ports	Device Support	Diagnostic LEDs	Active/Passive
7299-1PA	1	7	No	Passive
7299-2PA	2	14	No	Passive
7299-2EX	2	14	Yes	Active
7299-2FX	2	14	Yes	Active

The 2EX and 2FX models have improved receiver circuitry with advanced filtering and noise suppression for reliability and performance. They also provide two host and fourteen device LEDs to aid in analyzing connection problems.

The 7299 supports the 5250 Express Data Stream providing speed improvements of up to four times. There are PTFs for Version 3 Release 7 (or higher). The 5250 Express Data Stream also requires an IBM 5250 Express ISA, PCI, or PC adapter card in a supported PC.

Peripherals

IBM 5250 Express Network Kit

Using the V4R2 enhancement of TCP/IP over twinax cabling, it is possible to have non-LAN PCs access the worldwide web, share printers and files, and use workgroup applications like Lotus Notes using Express 5250 Adapters.

It is intended for customers with PCs attached to twinax workstation controllers, sites with large investments in twinax cabling, or twinax to NTP hubs, or sites with nonprogrammable workstations intending to migrate to PCs. One of the benefits of running TCP/IP over twinax is that it supports cable distances of up to 5,000 feet of twinax without any kind of repeater, or 4,200 feet using one active 7299 Express Hub. This is longer than many LAN types that require additional hubs to attain this distance.

The prerequisites to running TCP/IP over twinax are any model of AS/400 running OS/400 Version 4 Release 2 or later, all 5250 Express ISA, PCI, or PC adapter cards, or certain specific Enhanced 5250 Display Station Adapters (Part Numbers 92G5364 or 884H0240) and a PC with a card slot running Microsoft Windows 95 (with the latest updates) or Windows NT Version 4.0 or later.

The adapters can be attached to the AS/400 using twinax, Unshielded Twisted Pair (UTP), Foiled Twisted Pair (FTP), or the IBM Cabling System (ICS). The twinax workstation controllers on the AS/400 that support TCP/IP are the #2720, #2722, #6180, and #9280. There are two 5250 TCP/IP transport drivers (which allows TCP/IP to use twinax cabling) now included with the 5250 Express Adapters, one for Microsoft Windows 95 and one for Windows NT. The Transport Drivers are also available to download from the worldwide web at:

<http://www.networking.ibm.com/525/525home.html>

Peripherals

The 5250 Express Network Kit includes everything needed to enable TCP/IP applications for five PCs:

- Five 5250 Express ISA adapters with the 5250 TCP/IP Transport Drivers
- Five DB15 to UTP RJ45 Baluns
- One Twinax-to-UTP Baluns
- One 7299 Express 400 Model 2EX

Six 10-foot UTP patch cables are included with the kit. Additional UTP cables may be required depending on the size of the customer site.

The 7299 2EX has the following distance limitations:

- Legacy 1 Mbp/s transmission speed (where nonprogrammable workstations are included on a port) host to 7299 is 610m (2,000 feet), while 7299 to device is 671m (2,200 feet).

Peripherals

IBM 7852 Model 400 Modem

The 7852 Model 400 is an externally attached data/fax modem capable of full duplex transmission speeds of up to 33.6 Kbps. It operates in either synchronous or asynchronous mode and supports electronic mode switching using V.25bis AT commands.

Connections can be made on Public Switched Telephone Networks (PSTNs) and/or point-to-point 2-wire leased telephone type circuits. Other features include enhanced V.34 standards, call back security, remote configuration, and automatic rate negotiation between modems. The modem is factory set for AS/400 Electronic Customer Support communications, with custom application settings available through the use of dip switches.

ITU V.42 error correction and V.42bis data compression provide 100% error-free data transmission. It offers interactive automatic dialing, as well as command mode option configuration. You can store up to 10 command line/telephone numbers of up to 60 characters each in the non-volatile memory. The modem pulse or tone dials and recognizes dial tones and busy signals for reliable call-progress detection. The modem can detect AT&T** calling card tones. It is FCC-Registered for connection to telephone networks without any Data Access Arrangements (DAAs).

It offers Callback Security to protect networks from unauthorized use, and to help manage phone line costs. By using the modem's phone number and password directory, a host site can, upon receipt of a call, callback to a remote site at a predetermined number.

Remote configuration provides support for users at remote sites, saving the time and trouble of site visits and preventing misinterpretation of configuration instructions.

The 7852-400 includes dial back-up with automatic lease line restoral, adaptive protocol enhancing used in typical UNIX batch file transfers and support for the AS/400 and System 3X environment.

Peripherals

The 7852-400 meets the ITU V.17 standard for sending and receiving faxes. When linked to a compatible fax machine or modem, it can transmit faxes at 14.4K bps. It also meets ITU Group 3 Designation for 9.6K bps and Group 2 for 4.8K bps. It is downward compatible with modems to speeds as low as 300 bps, making it compatible with virtually any fax machine in the world.

Support for this modem varies depending upon homologation and other country-specific telecommunications regulations. For further information, contact your local IBM representative.

Laser Printers

IBM InfoPrint and Network Printer Families

IBM InfoPrint and IBM Network Printers are a family of monochrome and color laser printers designed for AS/400 and network printing environments. These printers include the Network 12, Network 17, InfoPrint 20, and InfoPrint 32 advanced network printers. As a group, they provide 600 dots-per-inch (dpi) quality, multiple concurrent connections, support for multiple print datastreams (IPDS, Postscript, PCL), and a wide range of paper handling options.

Machine Type	Description	Print Speed (maximum)	Maximum Monthly Usage (pages)
4312	Network Printer 12	12 ppm	35,000
4317	Network Printer 17	17 ppm	65,000
4320	InfoPrint 20	20 ppm	75,000
4332	InfoPrint 32	32 ppm	150,000

Key features shared by these IBM InfoPrint and Network Printers:

Connections to three systems, with automatic switching and automatic print datastream sensing, enables maximum productivity by handling AS/400, network, and client print applications concurrently.

AS/400 and LAN connectivity, including Token-Ring, Ethernet, twinax, and parallel.

- Integrated LAN attachment eliminates need for separate LAN attachment box.

Complete IPDS printer featuring:

- True IPDS controller (in contrast to an IPDS protocol convertor) for system-managed printing with page-level error recovery
- Edge-to-edge printing
- Full range of AFP fonts--AS/400-resident and printer-resident, raster and outline formats

IPDS connection over TCP/IP provides same level of application and print management support as twinax-connected AS/400 printers.

Laser Printers

Crisp, high-quality 600-dpi output using TruRes image enhancement technology.

TonerMiser technology that can reduce toner use by 50% and save supply costs.

Laser Printers

IBM Network Printer 12

Entry monochrome network printer

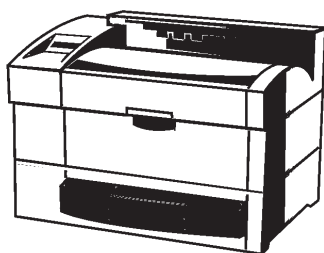
Duplex standard

IBM Network Printer 17

Maximum input capacity of 1,350 sheets with up to five addressable input sources, low-cost duplex option, and additional 500-sheet output tray with job offset for true network paper handling.

Optional 10-bin secure mailbox feature

IBM InfoPrint 20 Printer



New member of InfoPrint AS/400 printers scalable to over 1,000 pages per minute. InfoPrint 20 provides true Adobe Postscript 3 and PCL 5e print datastreams standard. Additional features not common in printers in its class include:

- 11" by 17" ledger/A3 paper size

- 13" by 20" support for full-bleed printing on 11" by 17" forms

- Duplex with offset stacker

- 3,150-sheet total input capacity with optional 2,000-sheet input drawer

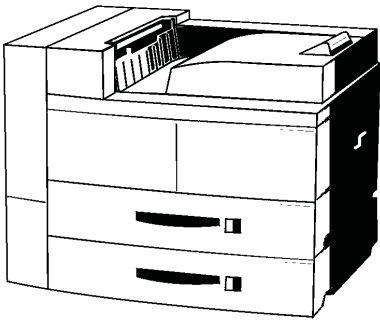
- Output enhancement to 1200 dpi (dots per inch) resolution

Laser Printers

One-year, on-site warranty with world-class IBM service

Laser Printers

IBM InfoPrint 32 Printer



High-speed, large volume, network printing solution for mission critical applications where document delivery, control, and printing management are essential. Newest member of the IBM InfoPrint family of AS/400 printers, the InfoPrint 32 delivers printing speeds up to 32 pages per minute with monthly volumes up to 150,000 impressions. Output is printed at 600 by 600 dpi with edge smoothing, plus a high quality image mode that approaches 1200 dpi.

Additional specifications include:

- True Adobe Postscript Level 3 and PCL 5e datastream support are standard, and AFP/IPDS and SCS datastream support are available.

- Duplex (two-sided) printing is standard.

- Optional large input feeder that increases total input capacity to 3,550 sheets from 6 input sources.

- Optional 100 envelope feeder.

- Optional high-capacity finisher that provides 2,000-sheet stacking to three bins, and program control for job offset jogging and stapling functions.

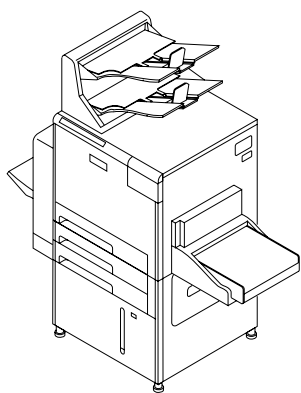
Laser Printers

Prints on multiple paper sizes, including 11" by 17" or A3 for large format documents.

One year, on-site warranty with world-class IBM service.

Laser Printers

IBM 3130 Advanced Function Printer



The 3130 Advanced Function Printer is a floor standing, network page printer designed to be shared by multiple users connected to AS/400 and LANs. The 3130 will print up to 30 impressions per minute, with both simplex and duplex models. Flexible paper-handling options, support of most physical connections, simultaneous connection and switching across up to three systems, and automatic handling of most popular print data streams (IPDS, PCL, Postscript) make the 3130 a superior departmental printer.

Key features include:

- Monthly duty cycle of 200,000 pages.

- Driven by IBM's Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents, automatic datastream switching, and comprehensive connectivity.

- High-performance AFP printer supporting the full range of electronic printing capabilities (bar code, electronic forms, image, graphics, and variable fonts)

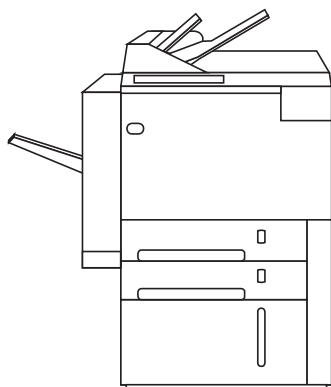
- Supports seven different paper sizes (up to 11" by 17") from up to four input trays (3,000 sheet capacity) to up to three output stackers (2,500 sheet capacity)

Laser Printers

IPDS integration with AS/400 delivers "industrial strength" print management with full page-level error recovery over both direct (Twinax) and LAN (SNA, TCP/IP) connections.

Laser Printers

IBM InfoPrint 60 Advanced Function Printer and 3160 Advanced Function Printer



The InfoPrint 60 Advanced Function Printer and 3160 Advanced Function Printer provides duplex production printing at up to 60 impressions per minute. The InfoPrint 60 (3160 Model 2) provides 600 dots-per-inch (dpi) resolution. The 3160 provides 240 dots-per-inch (dpi) resolution. These printers are designed for high-speed printing in host, host distributed, and LAN printing environments. AS/400 attachment is supported via SNA or TCP/IP Token-Ring or Ethernet.

Key features include:

- Monthly duty cycle of 750,000 pages.

- Driven by IBM's Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents and comprehensive connectivity.

- Paper handling capabilities include up to 5,000 pages from four input bins, up to 3,500 pages in output stackers

- Optional high-capacity finisher provides for finishing operations such as stapling, insertion, and z-fold, all under AS/400 program control

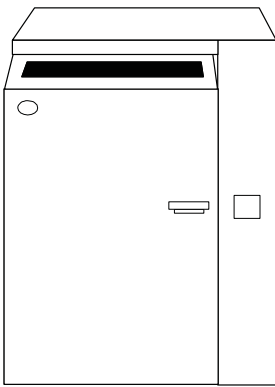
- Paper sizes include letter, legal, ledger, A3, A4, B4, and B5 (up to 11" by 17")

Laser Printers

IPDS integration with AS/400 delivers "industrial strength" print management with full page-level error recovery over SNA and TCP/IP connections.

Laser Printers

IBM InfoPrint 62 Continuous Forms Printer



The IBM InfoPrint 62 is a high-performance production printer with the versatility to print special forms and labels. It offers high-volume, cost-effective, continuous-forms printing while providing exceptional reliability and excellent print quality on a wide range of media types, sizes, and weights. Driven by IBM's Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents, complete AFP/IPDS function, and comprehensive connectivity. Attachment to AS/400 via Token-Ring or Ethernet.

Features include:

- Speeds up to 62 ppm

- Designed for both general purpose and special forms printing

- Full-function AFP printer handles complex AFP applications with electronic forms, image, fonts, bar code, graphics, and multi-up printing

- Straight paper path and unique flash fusing technology for printing on wide variety of paper types and sizes, including difficult to print forms

- Unique cutting design eliminates paper waste

Laser Printers

IBM InfoPrint 3000 Advanced Function Printing System

High-speed, high-resolution, continuous-form production printing system designed and integrated for high-volume AS/400 printing. The IBM InfoPrint 3000 Advanced Function Printing System is an intermediate production printing family that fits between the AS/400 midrange printers (InfoPrint 60 and InfoPrint 62) and the AS/400 high-end production printing systems (InfoPrint 4000). The IBM InfoPrint 3000 printers deliver print speeds from 112 to 344 impressions per minute with the capability to do 2-up printing (8.5 by 11 inch pages) utilizing new 17-inch print head technology. Monthly print volumes can go up to 4.4 million impressions.

This new printing system not only prints at high speed, but also prints at high quality. Print fidelity is at 480 dots per inch (dpi) or 600 dpi, and the print resolution is switchable. Existing AS/400 applications developed at 240 dpi or 300 dpi are automatically enhanced to either 480 dpi or 600 dpi.

The IBM InfoPrint 3000 is directly attached to the AS/400 (via EtherNet or Token Ring) and is fully supported by Print Services Facility/400, the full-function print management subsystem of OS/400. Full application enablement includes AS/400 printer file function, DDS, AFP Utilities, Advanced Print Utility (APU), Page Printer Formatting Aid (PPFA/400), AFP Toolbox, and many other IBM and third party document composition products.

With high-volume applications such as reports, statements, documents, and direct mail, continuous-forms printing ensures high reliability as well as the attachment of a wide variety of pre and post processing devices (paper roll input, cutters, inserters, etc) that ensure a smooth end-to-end process, an intelligent process that starts with blank paper and can end up a complete package ready for mailing.

Additional features include:

- Simplex and duplex configurations. Duplex configurations (two InfoPrint 3000 printers in tandem) can also be run in dual simplex mode when required.

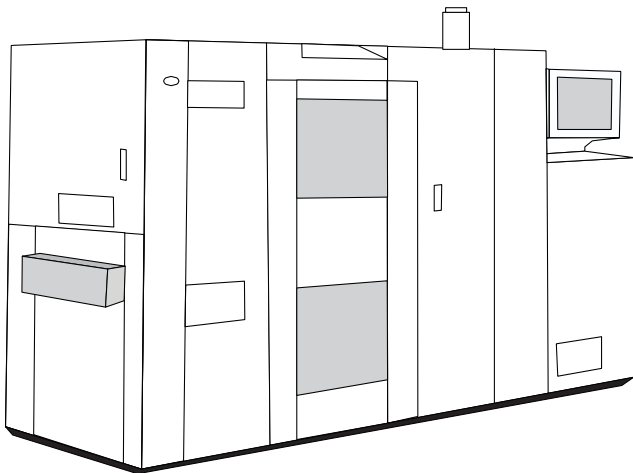
Laser Printers

RISC-based Advanced Function Controller provides comprehensive print and document functionality as well as high performance for even the most complex jobs

Smallest footprint (up to 25% smaller) in its class

Laser Printers

IBM InfoPrint 4000 Advanced Function Printing Systems



The InfoPrint 4000 is the follow-on family to the 3900 for high-speed, continuous-form production printing. Speeds range up to 1002 impressions (8.5" by 11") per minute. Models include simplex, wide, and duplex with resolutions of 240, 480, and 600 dots per inch (dpi).

InfoPrint architecture provides higher resolutions and support for Postscript data streams in order to meet far more wide-ranging organizational document requirements, including replacement of applications that traditionally went to offset printing.

AS/400 attachment via Token-Ring or Ethernet.

Key features include:

- Maximum usage of up to 17.4 million impressions per month.

- Driven by IBM's Advanced Function Common Control Unit (AFCCU), which provides high-speed processing of complex documents, full IPDS function, and comprehensive connectivity.

- Wide models provide 17" wide platen for 2-up printing of 8.5" X 11" output

Laser Printers

Designed for production print environments with appropriate intelligent preprocessing (ie, roll paper input) and postprocessing (ie, cutters, collators) equipment.

Optional pinless drive replaces traditional tractor-fed paper.

Optional InfoPrint Hi-lite Color post processor enables variable data in color, up to three colors per page.

IBM InfoPrint 4005 Hi-Lite Color Printer

IBM InfoPrint 4000 Hi-Lite Color Printing System

High-speed, high-quality color post-processor to complement IBM 3900 and IBM InfoPrint 4000 production printing systems. Highlight variable or constant information, up to three colors anywhere on the page at speeds from 150 to 480 impressions per minute. Integrated print management with Print Services Facility/400 (PSF/400) and direct color support with DDS and other AS/400 document application enablers (see printing software).

IBM InfoPrint 4005 Hi-Lite Color Printer

The IBM Info-Print Hi-Lite Color Printer is an accent color printer that can print color at production speeds. It provides the ability to add color to documents produced by InfoPrint 4000 and IBM 3900 printers. The IBM InfoPrint Hi-Lite Color installs downstream from an IBM Wide or Wide Duplex 240 dpi printer. It supports the paper length, width, and most weight specifications of the production printer model. The printing speed and capacity is equal to the host printer.

The IBM InfoPrint Hi-Lite Color Printer communicates with the IBM host printer using IBM's exclusive Advanced Function Post-Processing Interface. This ensures accurate color printing in the precise location specified. In addition, the Advanced Function Presentation (AFP) software, together with the lead printer's Advanced Function Common Control Unit (AFCCU), enables rapid error recovery and ensures data integrity through the entire printing process.

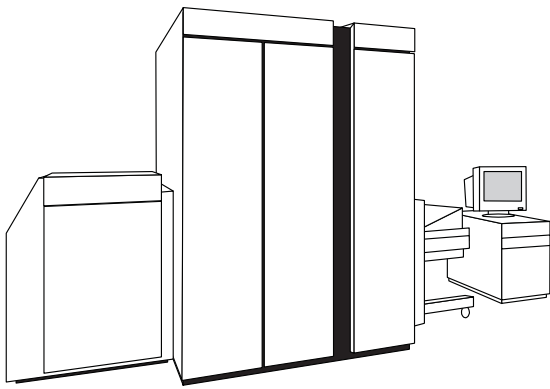
The model available is HC1.

Specifications include:

- Both fixed and variable data can be printed in color; up to three highlight colors per page
- Speeds up to 480 2-up impressions per minute
- Application selection of color with printer file DDS, Advanced Print Utility, AS/400 page and form definitions, AFP Toolbox, and third-party products

Laser/Electrophotographic Process Printers

IBM InfoColor 70 Full-Color Digital Printer



The IBM 3170 Full-Color Digital Printer is a 70 impressions-per minute, high-quality color printer that provides an on-demand alternative to offset printing. It is designed for any organization that prints color brochures, personalized mailings, documentation, reports, directories, books, and newsletters now as an efficient way to print short runs and customize the text, images, and customer data on each document. Designed as a standalone printing system which would accept Variable data from the AS/400 to customize each document.

Highlights of the IBM 3170 Full-Color Digital Printer:

- Monthly duty cycle of 700,000 impressions

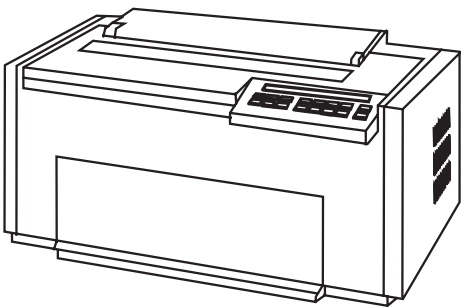
- 600 dpi, with variable gray levels per dot, per color Color sensing technology ensures color match prior to production runs

- PowerPC-based controller ensures print quality, ease of operations, and performance

- True Adobe** Postscript Level 2

Impact Printers

IBM 4230 Impact Matrix Printer



The 4230 range of printers provides heavy-duty, impact matrix printing. The six models of 4230, the 101, 111, 1S2, 102, 4S3 and 4I3 can all be twinaxially attached to an AS/400 using the twinax workstation controller. The Model 4S3 and 4I3 also offer serial and parallel attach.

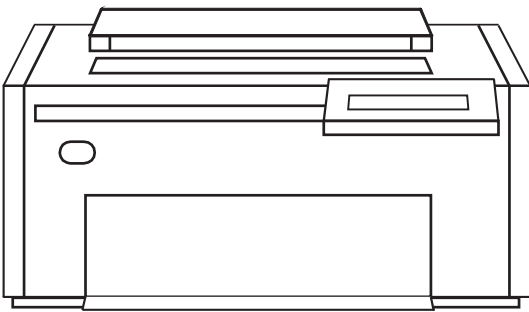
All 4230s have an LCD display providing prompts and menu selections in a choice of eight languages. They also have forms handling modules for continuous forms and document insertion. One of these forms modules is supplied with the initial order, as selected by the customer. The others are available as options.

Models 101 and 1S2 have 32K memory as standard and support the IBM 4214 data stream SCS (SNA Character String). Models 111 and 102 have 128K memory as standard and support the IBM Intelligent Printer Data Stream (IPDS). Memory on the 111 and 102 can be increased to 512K as an option. Models 4S3 and 4I3 have 128K memory as standard. Model 4S3 supports the SCS data stream while Model 4I3 supports IPDS. The following table shows each model's print speeds.

Model	Mode			
	Fast Draft	DP	DP Text	NLQ
101, 111	375 cps	300 cps	150 cps	75 cps
1S2, 102	480 cps	400 cps	200 cps	100 cps
4S3, 4I3	600 cps	400 cps	200 cps	100 cps

Impact Printers

IBM 4232 Impact Dot Matrix Printer



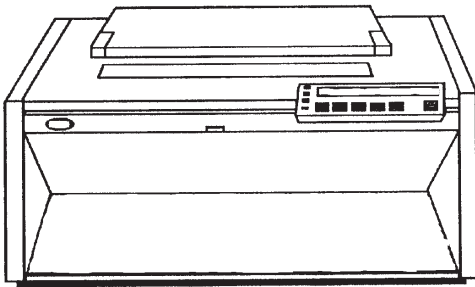
The 4232 is a heavy-duty, unattended impact dot matrix printer, capable of printing 600 characters per second (cps). It is designed for workstation printing or shared printer applications using an ASCII datastream.

The 4232 Model 302 can be used for printing data processing, office and business documents as well as for bar code labels and multi-part forms.

The 4232 has an LCD display providing prompts and menu selections in a choice of eight languages. It also has forms handling modules for continuous forms and document insertion.

Impact Printers

IBM 4247 MultiForm Matrix Printer



The 4247 range of printers are desktop model impact printers. They are capable of printing up to 700 characters per second (cps) in its fastest DP (data processing) mode. They include two continuous paper paths and a standard manual cut sheet input.

The 4727 can be used as a directly attached workstation printer, as a system printer, remote or distributed, or for departmental printing. Supported applications include word-processing and spreadsheets, business graphics such as pie charts, bar code printing, line drawing from CAD/CAM applications, and special forms for checks, labels, and mailers.

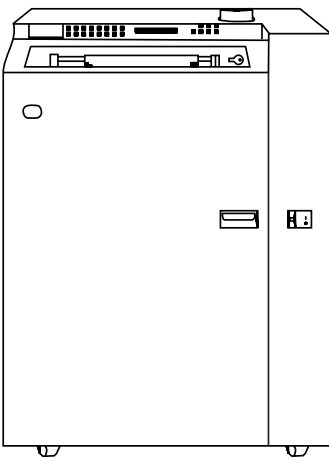
The 4247 models have a duty cycle of up to 20 million characters-per-month and print qualities include DP, DP Text, and NLQ (Near Letter Quality).

Attachment to AS/400 can be Twinax, Serial/Parallel, Ethernet, and Token-Ring. Coax and attachment to LAN using ASCII interface are also available.

IPDS support for the full range of electronic printing capabilities (bar code, electronic forms, image, graphics, and variable fonts), as well as full printing error recovery

Impact Printers

IBM 6262 Impact Line Printer

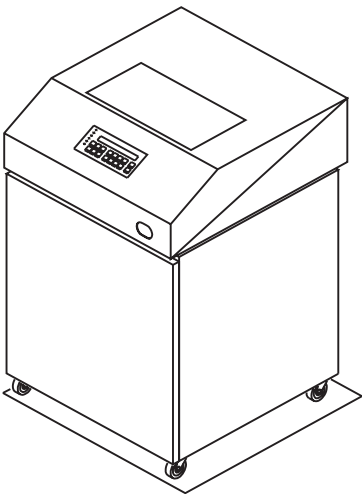


The 6262 Impact Line Printer uses character print band technology to produce high print quality at 2200 lpm. It has a 48 character set print band.

The 6262 Model T22 attaches locally to the AS/400 using the twinax workstation controller or, remotely using the 5394 or 5494 Remote Control Units. The 6262 Model A22 attaches using the PC Parallel or Serial (RS232) printer interfaces and emulates the IBM 4202 Printer for traditional line mode printing of simple text and numbers.

Impact Printers

IBM 6400 Line Matrix Printer



The 6400 family of line matrix printers are higher function replacements for the 6408 and 6412 printers. These printers provide heavy-duty, continuous-form impact line printing, as well as all-points-addressable or graphics function (IPDS, Code V, IGP).

There are five models:

6400 Model 5 and 5P The Model 5 is a cabinet unit. The Model 5P is a pedestal unit.

6400 Model 9 and 9P The Model 9 is a cabinet unit. The Model 9P is a pedestal unit.

6400 Model 14

Direct attachment to AS/400 via Twinax or serial/parallel. ASCII LAN attachment via the Network Print Server (NPS) feature. IPDS LAN attachment via the 7913 LAN attachment.

Standard data stream support for IBM Proprinter* III XL, Epson** FX 1050, Printronix** P-series, Printronix P-series XQ Variant, and Printronix Serial Matrix emulations.

Impact Printers

Optional feature for Intelligent Printer Data Stream (IPDS) support enables fully graphical applications with electronic forms, bar codes, graphics, scalable fonts, and optical character recognition. Optional features also available for Code V and IGP emulations.

Impact Printers

Operating System/400, 5769-SS1

The AS/400 operating system, OS/400, is conceived as a *single entity*. What this means is that facilities such as relational database, communications and networking capabilities, online help, and much more, are fully integrated into the operating system and the machine. The user can communicate with all components of OS/400 using a single command language, the Control Language, CL.

OS/400 provides the tools to handle two different computing environments. AS/400 continues to provide integrated function based on the commercial computing environment. To this has been added the AS/400 client/server dimension, combining the open environment with the system's price/performance and integration of system solutions for a complete product package.

The industry is moving rapidly towards a network-centric world made up of global networks. Version 4 Release 1 of the AS/400 software contained many significant enhancements to the AS/400 capability in this area. Version 4 Release 2 and Release 3 extensively build on that to make the AS/400 system a key player in this vital area. These enhancements to the AS/400 capability as a Network-centric system are described in this section and the next one which contains descriptions of Licensed Programs.

For the AS/400e series, which includes Models 170, 600, 620, 640, 650, S10, S20, S30, S40, and SB1, with Version 4 the system price includes OS/400 at no additional charge and OS/400 user charges have been eliminated.

Version 4 Release 2 is a prerequisite for the new Model 170 of the AS/400 family announced in February 1998. Version 4 Release 2 and Release 3 of OS/400 also run on all previously announced AS/400 models with PowerPC processors. These are the 9401 Model 150; the 9402 Models 400, 40S, 436 and packages based on the 400 and 40S; and the 9406 Models 500, 510, 530, 50S, 53S, 600, 620, 640, 650, S10, S20, S30, S40, and SB1. Version 4 of OS/400 does not run on earlier models of AS/400 based on IMPI processors. These include the Bxx, Cxx, Dxx, Exx, Fxx, 100, 135, 140, 2xx, and 3xx Models.

OS/400

OS/400 Version 4 Release 2 and higher is delivered only on CD-ROM for speed of loading and risk reduction for media errors. Softcopy manuals are also delivered by this method.

OS/400 Version 4 Change of Terms and Conditions

Beginning with Version 4 Release 1, OS/400 is included in the AS/400 Model 170, 6xx, and Sxx systems price. OS/400 Version 4 remains with the designated serial number machine on which it is initially installed. OS/400 Version 4 is licensed to operate on only that serial number machine and may not be moved from one machine to another except in an emergency backup situation. In the event that the designated machine is transferred, OS/400 must transfer with it. You must notify the other party of the program's terms. IBM licenses the other party when that party accepts the program's license terms by initial use of the program. Your license is then terminated.

To operate on the designated serial number machine, OS/400 Version 4 requires a unique OS/400 license authorization code supplied by IBM. The OS/400 License Authorization Code is preloaded by IBM on new AS/400 system purchases. In the case of a hardware upgrade to a Version 4 system or a software-only upgrade to OS/400 Version 4, the OS/400 License Authorization Code provided by IBM must be entered at the time of installation. OS/400 Version 4 will operate for 70 days without the License Authorization Code. During those 70 days, the system will generate daily warning messages requesting that the customer obtain an OS/400 License Authorization Code from IBM. After 70 days, users will not be permitted to sign on to the system. A valid OS/400 License Authorization Code is required to reset the 70 day period. For software-only OS/400 Version 4 orders, the OS/400 License Authorization Code will need to be ordered from IBM. Contact your IBM representative or IBM Business Partner for ordering information.

These terms apply only to OS/400 Version 4.

Software Subscription

With the announcement of Software Subscription the way in which customers pay for upgrading to new versions or releases of AS/400 software has changed. Customers must take out Software Subscription when they move to Version 4 in order to upgrade to new versions or releases. Software Subscription is available at a monthly charge (billed quarterly) or as a prepayment option for between 1 and 5 years. The price of Software Subscription is the same no matter what system software has been licensed to that machine. Most AS/400 stacked software is covered by Software Subscription. Customers who do not take out Software Subscription when they install Version 4 must either relicense the software or pay the Currency Access Fee of Software Subscription in order to join if they wish to upgrade to a new version or release. During the introduction of Software Subscription certain transition provisions apply. For further information on Software Subscription contact your IBM Sales Representative or refer to the appropriate announcement letter. You can also refer to <http://iws.as400.ibm.com/sftsol/subscription.htm> for more information on Software Subscription and to <http://iws.as400.ibm.com/sftsol/subscription2.htm> for a list of the programs covered by Software Subscription.

OS/400

What's New in Version 4 Release 2

Version 4 Release 2 sees the implementation of the product previews made with the V4R1 announcement. The following enhancements have been announced.

Support for Lotus Domino for AS/400

The Lotus Domino for AS/400 program is the Domino 4.6 release, providing the AS/400 with a full-function Domino server. The Domino software provides the Notes client and Notes applications with direct access to the DB2/400 program database, can co-exist with an Integrated PC Server (IPCS) running Domino, supports two-way directory synchronization, and co-exists with other AS/400 mail services while utilizing the high availability and reliability of the AS/400 system.

Direct access to the DB2/400 program database is provided without the need for ODBC drivers. However, Notes clients are provided with direct access to DB2/400 programs using an inherent ODBC driver. The Notes C and C++ interfaces are provided enabling AS/400 versions of standalone applications, server add-ins, database hook drivers, extension manager hook libraries, and two external database drivers. A database driver to access DB2/400 data is shipped with the Domino server; and with the proper authorization, Notes clients are able to import the data directly into Notes documents.

There is two-way, real-time directory synchronization between the AS/400 System Distribution Directory and the Domino Names and Address book. This enables changes to user information in either location to be automatically reflected in the other.

Lotus' Simple Mail Transport Protocol Mail Transport Agent (SMTP MTA) runs on the AS/400 and is integrated into the AnyMail framework enabling the Domino for AS/400 program to interact with other mail systems including the OfficeVision/400 program.

The scalability of the Domino for AS/400 program leads to the opportunity to consolidate Notes/Domino servers onto an AS/400, for as well as the scalability within the AS/400 server, the AS/400 also supports multiple instances with partition server

OS/400

support for Domino Advanced Services allowing 16 partition servers. These partition servers allow multiple instances of the Domino server to be running on a single system, enabling workloads to be split up for various applications.

Domino for AS/400 is packaged, priced, and supported by Lotus and purchased through an authorized Lotus reseller. IBM intends to support future releases of Lotus Domino on the AS/400 platform but the availability of these will be controlled by Lotus and may not match new release schedules for OS/400.

OfficeVision users considering migration should consider Licensed Program 5639-B80, OfficeVision/400 to Lotus Notes Migration Tool.

Further information on Lotus Domino on the AS/400 may be found at:

<http://www.as400.ibm.com/notes>

Support for NotesPump (Domino.Connect)

An optional Lotus product enabled for the AS/400 which allows data transfer automation between data sources including Notes, DB2, Oracle, Sybase, and many 32-bit ODBC-compliant databases. It can be used for a variety of data transfer requests including replication and propagation between a DB2 system and a NotesPump target (using the DataPropagator program activity).

It is currently available on numerous platforms at Release 2.5, and the NotesPump for AS/400 program includes all applicable functions supported in the current NotesPump 2.5 release.

The transfer activities can be scheduled, event-driven or executed ad hoc, and are administered from the NotesPump Administration Notes database. An additional activity provided by the NotesPump for AS/400 program allows synchronization of data security mapping between DB2/400 and Notes databases.

Customized data transfer requests can be written using the NotesPump program extensions to LotusScript and the new NotesPump C APIs. Data source views and fields can be selected using the NotesPump Administrator database. Web clients can be enabled to submit the NotesPump program activities from any browser.

OS/400

Further information can be found at:

<http://www.edge.lotus.com>

Java Support

Now integrated under the AS/400 Machine Interface is a Java-compatible Java Virtual Machine (JVM). This positioning optimizes Java software performance on the AS/400. Java includes three primary functions and capabilities:

1. An object-oriented programming language (developed by Sun Microsystems).
2. A run-time environment for Java Virtual Machine that can be integrated into operating systems (such as OS/400) or into web browsers (such as Netscape Navigator or Microsoft Internet Explorer).
3. A standard set of class libraries that support network communications, controlling multimedia data, creating GUIs, and accessing data in stream files and relational databases.

Java provides an object-oriented programming environment that is dramatically simpler than C++. The AS/400 implementation also provides greater scalability when compared to other platforms due to synergy with the AS/400's object-based architecture.

Java programs are compiled into platform-independent object code interpreted by the run-time support of the JVM on each platform. Also incorporated in the OS/400 implementation is a Static Compilation option, which compiles Java into AS/400-dependent object code for improved performance.

AS/400 Developer Kit for Java

A no-cost tool designed to enable Java applets to easily access AS/400 data. It contains a collection of development tools, help files, and documentation for Java programmers. It is compliant with Sun's Java 1.1 specification and will be updated as Sun Microsystems releases new Java technologies and updates.

It currently supports:

- Java programming language and compiler
- Java interpreter and virtual machine

OS/400

- Java run-time (class files and packages)
- Java Developer Kit commands and utilities
- AS/400 system CL commands for creating and managing Java programs
- Java debugging facility

AS/400 Integration with Windows NT

Provides enablement for Microsoft Windows NT Server Version 4.0 to be installed on the Integrated PC Server for file, print, personal productivity, and other applications.

The main advantages of this are flexibility for AS/400 applications and NT services in a combination server, improved hardware control and availability with reduced maintenance costs, and simplified user administration and server options.

The customer must purchase a copy of Windows NT Server 4.0 from a Microsoft reseller. A Pentium Pro Integrated PC Server with 64 Mb of memory is required to install Windows NT, and a PC screen, keyboard, and mouse are attached to the IPCS to provide a console for the Windows NT server.

The AS/400 operator can start and stop the Windows NT server, manage NT disk resources from AS/400 disk, and manage server operations such as hardware error messages from NT server which are sent to the AS/400 message queue. In addition to disk resources being shared, the AS/400 CD-ROM drive and tape drives can be allocated to Windows NT for installing applications or backup. There is also simple user administration for user profiles and password updates between the two systems. Additionally, there is an internal TCP/IP link within the AS/400 between OS/400 and the Windows NT server providing a reliable and secure connection for applications, and database integration utilities protecting the application from LAN hub failures.

Network Computing

The network computing facilities have been extended in V4R2 with advances in areas of internal security and application enabling. Using the Lotus Domino for the AS/400 program, web-enabled applications can now be built that interface with DB2/400 programs via a web site or HTML forms. Security is

OS/400

built into the Domino software including client authentication and data encryption.

Java also extends the Network Computing (NC) capabilities as it is the preferred language for NC and can be used for standalone applications or client-server applications running over the Internet. Remote Method Invocation (RMI) is built into the AS/400 Java software and can be used to communicate with the AS/400 Toolbox for Java program running on any platform.

The AS/400 Toolbox for Java provides access to the numerous services available on the AS/400. With this program, only the client part of a client server application need be written, and since it is written in Java, it will run on virtually any platform.

The AS/400 suite of built-in TCP/IP servers and services is extended with function to assist Internet and Intranet users. See the section below for these functions.

TCP/IP Enhancements

- New features include Point-to-Point Protocol (PPP). This is an open protocol for WAN TCP/IP connectivity that supports dial and leased lines (with ISDN support). It has a full range of synchronous and asynchronous protocols that supports a broad range of WAN connectivity options from low-speed dial-ups to high-speed T1 and E1 lines. It is the defacto standard for connecting to the Internet through an Internet Service Provider (ISP), is more robust in a dial-up environment than SLIP (serial line internet protocol), and is well placed to extend an intranet across multiple locations.
- Routing Internet Protocol 2 (RIP2) program has been added which adds routing security features.
- OS/400 now includes the TCP/IP standard-name server, Domain Name Service (DNS). This new capability, together with PPP and RIP2, allows multiple AS/400s to be networked together over LANs and WANs without requiring other systems for routing or name services. TCP/IP is simpler to configure and administer by the addition of new GUIs with the AS/400 Operations Navigator, as well as a central administration service based on Dynamic Host Configuration Protocol (DHCP).

OS/400

- TCP/IP connectivity options have been extended to include ATM and Twinax. TCP/IP Twinax connectivity to workstations will include Network Stations as well as PCs. There are improvements (up to 20%) in TCP/IP communications performance, and high-throughput environments will benefit from a load-balancing capability for outbound IP traffic to be balanced across multiple physical connections.
- TCP/IP now has multicost support enabled. Applications written using this support will make more efficient use of the network. Additionally, there is now Socks client program support. This allows for example, FTP or Telnet clients to communicate with server programs running outside the Firewall for AS/400 program and to safely transmit data packets; and by using the Firewall, the internal network is protected from data packets coming in from an unsecured network.

DRDA Run Support of TCP/IP

Allows systems using Distributed Relational Database Architecture (DRDA) in the Remote Unit of Work (RUW or DRDA1) mode of TCP/IP to use applications using SQL to transparently access data on any remote databases supporting DRDA and vice versa.

Passing Descriptors on AS/400

OS/400 now supports the passing of file socket descriptors from one thread to another without requiring knowledge of the specific thread that is to receive the file using standard APIs of `sendmsg ()` and `recvmsg ()`. This allows the easy porting of UNIX-based socket applications to the AS/400.

OS/400

Webserver Enhancements

The Internet Connection Server (renamed in OS400 Version 4 Release 3 to IBM HTTP Server for AS/400) program has been enhanced for application enablement. The Common Gateway Interface (CGI) gives a framework to allow the server to interface with external programs. This has been enhanced by removing stream limitations between the web server and a CGI program, making the job of writing and porting CGI applications much easier. CGI applications now have the ability to use AS/400 activation groups to provide performance improvements to the AS/400 web server solution.

Availability Improvements

- Continued improvements in IPL recovery, shutdown processing, and communications error recovery, particularly in directory recovery, work control block, and main storedump copy.
- Improved save commands for generic library names and omit options making it easier to use multiple tape drives to reduce save time.
- Multiple concurrent restore operations with two or more tape units to restore objects to a single library or to restore DLOs into a single ASP.
- Remote Journaling. New support for remote journal receivers allows database changes to be sent immediately to another system for high-availability applications. This can offload CPU consumption from the source machine to achieve more throughput on that system. It can also reduce time and effort required to reconcile source and target databases following a system failure. If a high-availability software solution is being used from other vendors, customers should contact them for more information, as Remote Journaling may benefit those customers using hot-backup, data replication, and high-availability applications.

Database

- Call Level Interface (CLI) support enhanced with additional functions to increase portability of applications that use ODBC to run on the AS/400.

OS/400

- SQL procedures now supported with the addition of ANSI- and ISO-defined SQL procedures, thus making it easier to convert procedures written in other proprietary procedure languages.
- Competitive SQL functions. Key functions for data warehousing that comply with ANSI and ISO standards to enhance portability and increase the AS/400 functionality including the CASE, CAST, and POSITION expressions, together with a new query optimizer for improved query performance.

Others

AS/400 kernel threads model introduced, which is used by the Domino for AS/400 program. Threads save time by avoiding extra job initiations and using less system resources, so allowing the program to scale to thousands of mail users on the larger AS/400s. It is also used in the Java environment to reduce the complexity and overhead of programming.

Corequisite PTF tracking. Additional corequisite tracking to order corequisite PTFs when a PTF is ordered.

AS/400 Operations Navigator extended to cover and simplify TCP/IP configuration (including DHCP and DNS) and administering Domino for AS/400 and NetServer software. It can also launch a web browser interface to configure the Internet Connection Server, Firewall, and Network Station Manager programs.

Support for Windows Network Neighborhood (AS/400 NetServer). This supports PCs running Windows 95, Windows NT, and Windows for Workgroups to seamlessly access data and printers managed by the AS/400. It also can access OS/2 data, but not printers. TCP/IP is prerequisite for this, and it is administered via Operations Navigator.

This support does not require any extra software for the PC beyond the native file sharing protocol delivered with the Windows 95, Windows NT, Windows for Workgroups, or OS/2 software; and on the AS/400, only OS/400 is required.

This support may be an alternative to installing Client Access if clients only require simple file and print services. If Client

OS/400

Access is needed, then using this function it can be installed across the network from the AS/400 system. AS/400 NetServer and Client Access have separate identities so can coexist on the same AS/400 and workstation.

This support complies with the Common Internet File System (CIFS) standard currently proposed by Microsoft.

Asynchronous Transfer Mode (ATM) LAN Emulation (LANE). This enables current LAN applications to run over ATM networks without modification.

High-performance routing for customers who have medium-to-large SNA networks by better load balancing across underutilized links, dynamically adjusting to network congestion, and automatic reroutes around failures.

Enhancements in configuration and usability for Performance Management/400. See the web page at:

<http://www.as400.ibm.com/pm400>

Further date enhancements for Year 2000 support. ANZUSROBJ is now standard within the operating system; also date, time, and timestamp support in display files, printer files, and UIM panels. Additionally, 4-digit-year support is included in Date Description Specifications (DDS) via DATE and EDTCDE keywords.

National Language Support for Lao and Vietnamese increases support to 51 languages.

Global sign-on. A multiplatform product to launch and run many applications from a single user-id and password, now supports AS/400 as a target via PC 5250 Emulator Version 4.1. See the web page at:

<http://www.networking.ibm.com/sso/ssohome.html>

OS/400 conversion of Postscript Level 1 spool files (SBCS only) to AFP/PCL format. Especially important for network station users to enable them to print locally or remotely to PC printers as they produce postscript output.

What's new in Version 4 Release 3

Version 4 Release 3 improves Internet functions, database, Operations Navigator, ease of use and much more:

IBM HTTP Server for AS/400

IBM HTTP Server for AS/400 is the new name for the Internet server functions previously know as Internet Connection Server. Client support must be at HTTP1.1 or HTTP1.0 with 1.1 extensions.

Client Authentication supports SSL V3, including client and server authentication. You can associate client certificates with AS/400 user profiles or validation lists, allowing users seamless access to your Web server's resources without having to sign on.

Socks Support and SSL Tunnelling. If your environment has a Socks-based firewall for access to the Internet, you can use the IBM HTTP Server for AS/400 proxy server to access destinations outside the firewall. Client connections that use SSL are tunneled through the proxy server, eliminating the need to decrypt and encrypt the data at the proxy.

Expanded CGI Support includes Java, REXX, and C++. You can bypass the server on output using no-parsed header CGIS. You can also fully configure any codepage conversions the server performs on your Web application's input or output.

Websphere Application Server is a portable, Java servlet-based execution environment that transforms IBM HTTP Server for AS/400 into a Java Web application server. It includes full support for the latest session-tracking APIs, personalization support, and Java Server Pages (JSP).

Server API Support, a follow-on to ICAPI, enables users to write applications that extend or customize how the Web server handles client requests.

Automatic Browser Detection. Use this feature to provide different documents for different clients, allowing your Web site to seamlessly exploit the unique capabilities of whatever browser your customers are using.

OS/400

Digital ID authentication requires SSL client authentication for HTTP Server client certificates. This offers resource protection with:

- Valid client certificates
- Client certificates with certain distinguished names values
- Client certificates associated with AS/400 user profiles
- Client certificates associated with AS/400 validation lists

NetQuestion

NetQuestion is a powerful, full-text search engine that builds a global Internet or centralized intranet search service. It can handle the large amounts of information that are typically stored on Web sites. Documents to be indexed by NetQuestion need to be provided in either plain text or text with HTML markup. CGI scripts and HTML forms are provided for search and administration. Administration can also be done, using command line functions.

For all single-byte character languages NetQuestion features:

Boolean queries for phrase and proximity searches as well as for front-, middle-, and end-masking using wildcards

Precise term searches optimized for Web applications in both Internet and intranet environments

High speed for indexing and retrieval where one precise index is built

An optimized and reduced index to about 35% to 40% of the document size

Sophisticated lexical affinities-based ranking for free-text and hybrid queries

Advanced relevance ranking

Detection of misspellings in documents and expanding the search request accordingly

Operations Navigator

Ease-of-Use:

- AS/400 functions are reorganized on the AS/400 Operations Navigator window
- Drag and drop printer output to various printers and to the desktop
- Set your windows to refresh their content automatically
- Open separate windows to monitor specific items of interest
- Create desktop shortcuts to items within Operations Navigator
- Find text within Operations Navigator lists

Install. AS/400 Operations Navigator CD-ROM is shipped with OS/400 and allows you to install only those Operations Navigator functions you need.

Application Administration. Administrators can use this support to select the Operations Navigator functions available to specific users.

Management Central. Immediate and up-to-the-minute performance information about systems being managed. Administrators or operators with multiple systems and networks can easily gather, analyze, and react to this information. System groups let you control and monitor multiple AS/400 systems in your network from a central AS/400 server.

With real-time graphical performance monitoring you can:

- Monitor multiple systems or groups
- Establish thresholds for each monitor
- Automatically execute programs/actions on threshold events
- View threshold events

TCP/IP. Set up TCP/IP security to include:

- Network Address Translation (NAT)
- IP Packet filtering to accept or reject IP packets based on criteria

OS/400

Network File System (NFS). Manage an AS/400 NFS server and the exports and netgroups set up for that server.

NetServer. You can view:

- Server statistics with optional automatic refreshing
- Shared objects being used by a session
- Sessions using a shared object

Database.

- Update table contents
- Manage remote journals
- Manage aliases
- Copy and move tables between systems

DCE. Set up and manage AS/400 DCE services.

LDAP. Set up and manage an AS/400 Directory server and publish user information to an LDAP directory.

Security Wizard. Asks questions about your AS/400 system and then recommends how to configure base system security. You can apply some or all of the recommendations or save them. If you save them, the next time you run the wizard, you can apply the changes from the first screen. If you apply changes, the next time you start the wizard, a "reset changes" option appears on the first page to change the security configuration back to what it was before the changes were applied.

The security wizard also generates an administrator and a user report.

- The administrator report shows the recommended settings and how those settings affect the behavior of the system.
- The user report contains the information that users need to know about the system, including password composition rules and job timeout intervals.

AS/400 Messages. In addition to viewing AS/400 messages through Operations Navigator, you can now send messages.

Operations Console

The AS/400 supports integrated remote console and control panel capabilities to simplify remote systems management tasks. The remote console application is a full-function 5250 system console session. The remote control panel application complements the remote console and provides a graphical user interface that resembles its hardware counterpart. Both applications in general make it possible to perform the majority of system operations tasks, for example backup and recovery, with the AS/400 systems and the operations staff in physically separate locations.

The applications are included on the Operations Navigator CD-ROM shipped with OS/400 V4R3. They are installed and used from PCs using the Windows NT Workstation 4.0 (required for local console when remote PC access is desired) or Windows 9X operating systems. The operations console application requires the appropriate operations console cable, based on the AS/400 model on which it will be used. The remote control panel application requires a remote control panel cable, also based the AS/400 model.

AS/400 Toolbox for Java

Additional Access Classes. A series of low-level APIs for accessing AS/400 data and resources. The following are added:

- Access to AS/400 user spaces. The user space classes give Java programs access to AS/400 user space objects. The Java program can create, read from, write to, and delete AS/400 user spaces.
- Access to digital certificates stored on the AS/400. The digital certificate classes allow Java programs to manage digital certificates stored on the AS/400.
- Job listing capabilities. The job classes give Java programs the ability to list active jobs on the AS/400 and retrieve information about those jobs. The Java program can also list messages in the job log of a job.
- Access to AS/400 message queues. The message queue classes give Java programs access to AS/400 message queues, plus send a message to a message queue. The

OS/400

Java program can list, delete, and answer messages in a message queue.

- User listing capabilities. The user and group classes give Java programs the ability to list users on the AS/400 and retrieve information about those users.

Graphical Access Classes. The Toolbox provides a set of GUI classes.

These classes use the access classes to retrieve data, then present the data to the user. The classes use Java's Swing 1.0 (JFC 1.1) framework.

Graphical APIs are available to access various AS/400 resources, such as the Database, Integrated File System, Command Call and Data queues.

AS/400 data can be displayed in various pane formats.

AS/400 Developer Kit for Java

Support for JDK 1.1.6.

Performance improvements include improved transaction rates or lower CPU utilization on applications that use the database.

Windows NT IPCS Server Support

You can mirror the Windows NT event log to an AS/400 message queue or job log.

With the Windows NT Install command you can specify:

- Type of Windows NT event log entries you want to send to an AS/400 message queue
- Drive sizes for the Windows NT operating system
- Keyboard type at installation time

You can now submit Windows NT commands from the AS/400 console. An AS/400 administrator can submit Windows NT commands directly to the NT IPCS from the AS/400 with output returned to a job log, Integrated File System, or spool file. This saves the administrator from switching back and forth between the two systems.

OS/400

The Windows NT Integrated PC Server (NT IPCS) can use the AS/400 tape drive. Tape backup utilities written for Windows NT can now back up data to the AS/400 tape drive. Both Windows NT Backup and Seagate Backup Exec Version 6.11 have been tested.

Other backup utilities written for Windows NT are being tested. For the latest information on product testing, visit:

<http://www.as400.ibm.com/nt>

Changes to OS/400 for the Windows NT IPCS include:

The client storage space drive lettering matches the Windows NT drive numbering.

The AS/400 CD-ROM drive can be concurrently shared among multiple IPCSs and the AS/400. Multiple applications can access a CD.

e-Jump

e-Jump, in conjunction with the Enhanced Upgrade Assistant Tool, upgrades to OS/400 Version 4 Release 3 (V4R3) in one step.

If you are using OS/400 Version 3 Release 0 Mod 5 or Version 3 Release 1 (V3R0M05 or V3R1), upgrade to ensure that your software continues to work properly as the next century approaches. With e-Jump you cannot only become Year 2000 ready, you can also take advantage of the tremendous enhancements to the AS/400e series and its newest AS/400 operating system.

The following table explains upgrade paths provided by e-Jump:

Source Release	Target Releases			
	V3R7	V4R1	V4R2	V4R3
V2R3	No	No	Yes*	Yes*
V3R0.5	Yes	No	No	Yes*
V3R1	Yes	Yes	No	Yes*
V3R2	Yes	Yes	Yes	Yes

OS/400

*using e-Jump

Lightweight Directory Access Protocol (LDAP) on the AS/400

OS/400 provides an LDAP-accessible directory server and corresponding APIs that communicate with other LDAP directory servers. APIs are provided for both OS/400 and Windows applications written in Java, C, and C++. LDAP-enabled applications, such as Internet mail clients, can access, update, and manage the AS/400 directory.

You can develop OS/400 applications to use LDAP for managing distributed information across the Internet and intranets using LDAP directories for both IBM and non-IBM platforms. AS/400 user information, such as e-mail addresses, is accessible to mail clients and other LDAP applications.

Euro Currency

AS/400 support includes updates to input, display, print, and process the euro currency sign for both the host and PC client computing environments. This support includes, but is not limited to:

- Underlying operating system and LPP changes which are transparent to the user.

- The addition of euro country extended code pages (CECP's) and CCSID'S.

- The addition of euro keyboard types, including device configuration and device controller changes.

- The addition of euro font and glyph support.

Support for the euro currency sign is staged through the second half of 1998, with most function being available by year end 1998. Some function is in the base of V4R3, but Program Temporary Fixes (PTFs) are required for full euro support. Additionally, updates to external display, print, and client function may need to be obtained from external vendors. Euro support is provided on V3R2, V4R1,

OS/400

and V4R2 and will be available by December 31, 1998. The euro function for these releases is provided via PTFs.

For the latest available information and a roadmap to euro currency sign support on the AS/400, refer to the following website:

<http://www.as400.ibm.com/euro>

TCP/IP

Enhancements include additional network security, flexibility, and manageability. All of these features are configured with the Operations Navigator GUI.

Some of these technologies are also found in firewall products such as Firewall for AS/400. Although AS/400 by itself is not intended to be a firewall (the Firewall for AS/400 product requires a separate integrated PC Server card), the addition of these functions may eliminate the need for a separate firewall product in some instances.

TCP/IP Packet Security. Selectively limits or journals network access to applications and services with additional protection for AS/400 systems that:

- Run sensitive applications
- Act as Web servers

TCP/IP packet security also helps protect an entire subnetwork when the AS/400 acts as casual router.

TCP/IP Address Mapping and Hiding. When the TCP/IP addressing schemes of networks conflict, or you need to hide all or part of the network topology, network address translation (NAT) capabilities provide a solution. In addition, TCP/IP masquerading allows all the computers on one network to access servers on another network by sharing a single TCP/IP address. Masquerading is particularly useful when connecting to another network, such as the Internet, using a dial-up link.

TCP/IP Dial-on-Demand (DOD) Networking. Connections are made only when there is a need to communicate. Dial-on-Demand is supported on all switched network types and is particularly well-suited to ISDN with its fast call setup time. It

OS/400

is also valuable for burst and infrequent traffic patterns, especially if you have more remote locations than physical lines. With Dial-on-Demand, modem and telephone line resources are not committed until an application attempts to communicate with a remote site. Thus, a small number of physical resources can dynamically serve a large number of remote networks.

TCP/IP Integrated Load Balancing. Virtual IP Addressing (VIPA) creates a virtual TCP/IP address that is not associated with a physical network interface. This virtual address exists on the AS/400 system and can be reached from the network through all installed physical interfaces. VIPA can dramatically increase capacity for high-volume AS/400 e-business servers.

Availability Improvements - Concurrent Maintenance of Expansion Towers

V4R3 extends concurrent maintenance for I/O cards, power, and other components contained in expansion towers. You can power off an expansion tower and add, remove, replace, upgrade, move, or swap a card or other component without stopping or powering off your system. Applications that use hardware resources in that expansion tower may need to be stopped and restarted. When the expansion tower is powered back on, new or changed hardware resources are automatically recognized and associated with existing resource names, if appropriate, to preserve existing configuration information and to allow applications to immediately use these resources without having to IPL. Expansion tower concurrent maintenance uses Hardware Service Manager (HSM) functions under System Service Tools (SST) or Dedicated Service Tools (DST), or can use the control panel if HSM cannot be accessed. For more details, contact your service provider.

Integrated Hardware Disk Compression

OS/400 Version 4 Release 3 now supports data compression. Data is dynamically compressed/uncompressed by the DASD controller as data is written to and read from disk. Disk compression has no effect on the main CPU utilization since this function is performed by the DASD controller IOP (input/output processor).

OS/400

Support for Integrated Hardware Disk Compression is only provided by PCI DASD controller #2741 and SPD DASD controllers #6533 and #9754. The 17.54G drives are not supported. However, IBM intends to provide a future release of OS/400 which will support compression on 17.54G drives. Compression is limited to user ASPs.

The results of DASD compression can vary. The compression rates achieved and the impact on DASD performance is dependent on the data.

Database Enhancements

DB/2 FOR AS/400

IBM continues to enhance DB/2 for AS/400 with the addition of several functions that provide increased universal database (UDB) support.

Increased Parallel Support. Improved performance of Dynamic Bit Mapped Index support, Parallel Index Build and Parallel Data Load and Unload have been added to DB2 Symmetric Multiprocessing for AS/400. Two new commands, Copy From Import File (CPYFRMIMPF) and Copy To Import File (CPYTOIMPF), allow a user to import or export in parallel between DB2 for AS/400 and other databases. The data can be in fixed format or in delimited format.

SQL Update Statement Enhancement. A single SQL statement can now update columns of one table based on values from other tables.

SQL Call Level Interface (CLI) Server Mode: Users of the SQL CLI can write applications that do database serving for multiple users.

SQL Encoded Vector Indexes (EVI). A new type of index that can be created through SQL. EVIs cannot be used to order records, but in many cases, they can improve query performance. An EVI has several advantages over a traditional index with the same keys:

OS/400

- Precise statistics about the distribution of key values that are automatically maintained can be accessed much more quickly by the query optimizer than traditional indexes.
- The query optimizer can scan EVIs and dynamically build bit maps much more quickly than traditional indexes.
- EVIs can be built much faster and take significantly less storage than traditional indexes. Less storage means less main storage is necessary when the query is run.

SQL Alias Support. SQL has added alias support to allow an alternate name for a table or a view. You can also define an alias to reference a specific member of a table or view. Like tables and views, an alias can be created, dropped, and have a comment or label associated with it. An alias can reside in a different library from the referenced table or view. You can use an alias in place of a table or view in most SQL statements.

AS/400 NetServer

Improved performance over the original release. Users will see noticeable improvements when reading files from, and writing files to, AS/400 NetServer. No programming or configuration changes are necessary to take advantage of these performance improvements.

New administration options are available through the AS/400 NetServer APIs:

- Gathering server status
- Listing shared objects being used by a session
- Listing sessions used by a shared object

AS/400e Information Center

The AS/400e Information Center is your next generation for information retrieval. It offers a new path to AS/400 technical information using the power of browsers and new technology. The Information Center gives you fast, easy access to how-to information, example scenarios and program code, reference lookups, and background conceptual information. The Information Center is the starting point for all your technical information needs. You can

OS/400

access over 1,500 pages within the Information Center, as well as link to a wide variety of Internet sites with crucial technical content. You can also access the Information Center from the CD-ROM that arrives with your system software (CD-ROM order number: SK3T-2027).

For more information visit the Information Center home page at:

<http://publib.boulder.ibm.com/html/as400/infocenter.html>

The first release of the AS/400 Information Center includes a subset of the total AS/400 technical information set in these areas:

- Database
- Domino for AS/400 Server
- Firewall
- Internet
- Java
- Networking
- Programming
- System Administration and Maintenance
- TCP/IP
- Troubleshooting

PTHREAD (POSIX-Based) APIs

Pthread APIs allow IBM Business Partners or AS/400 application developers to take advantage of new system support for kernel threads. With APIs based on industry-standard POSIX APIs, the task of creating or porting applications becomes faster and more cost effective. Even more, the Pthread APIs significantly increase the ability to write large server or high performance parallel applications.

Creates threads to process smaller portions of application or server processing than traditional applications. Creating an AS/400 thread is faster than creating an AS/400 job. A thread is extremely lightweight in comparison to a job.

Separate threads in an application share all of the application data and job information. The sharing allows tightly integrated and parallel applications, such as Internet servers, to be written more naturally.

OS/400

Provides powerful mechanisms for communication, locking, serialization between and management of threads in an application. These capabilities further extend the ability of threads to coherently share application resources, and enhance the integrated nature of the application.

The Pthread application interfaces are based on open APIs described in the ANSI/IEEE Standard 1003.1 1996 Edition (also known as ISO/IEC 9945-1: 1996) and the Single UNIX Specification, Version 2, 1997 standards.

OS/400 is enhanced with Hierarchical Storage Management (HSM) APIs that are used by BRMS to provide HSM functions. These APIs can also be used to develop custom HSM applications. The APIs are documented in the AS/400 Hierarchical Storage Management manual, SC41-5153. Refer to the following URL for more information on BRMS HSM:

<http://www.as400.ibm.com/hsmcomp>

Internet PTFs

In V4R3 AS/400 customers will be able to download PTFs over the Internet. The client hardware needed is a PC with WIN95/NT, a TCP connection to the AS/400 over a LAN and access to the Internet. The various configurations and set up information will be documented at the web site:

<http://as400service.rochester.ibm.com>

Except for the medium of transport (internet), the functionality is the same as the ECS method of transport. The user selects the PTFs and options using a web browser and submits the order. At the referenced web site above, the user can also search on PTF cover letters and read them before the order is even placed. The same entitlement rules that apply on the ECS connection are enforced. In other words if a user can acquire PTFs electronically over the ECS, then they will be able to acquire PTFs over the Internet.

New Support for AFP Printers and Applications

Print Services Facility/400 and associated native OS/400 print support (printer file and DDS) are enhanced to take advantage of new printers, attachments, and application capabilities.

AFP Viewer, an integrated part of Client Access/400, includes the full functionality of the AFP Workbench product that was previously available as a priced upgrade to CA/400. With AFP Viewer, CA/400 users can view any document on their PC or in a CA/400 shared folder that is in AFP, ASCII, TIFF, PCX, DCX, or DIB data format.

The AFP presentation architecture includes structures for indexing fields in a print record or data set for navigation by an archival/retrieval program, or by a document viewing or browsing program such as the AFP Viewer in CA/400.

Most new IPDS printers, including the InfoPrint 20, InfoPrint 32, and InfoPrint 60, print at a resolution of 600 dpi. However, many applications use raster fonts in 240 dpi or 300 dpi resolutions. New multiple resolution font support takes advantage of the increased print quality of new printers without application or resource changes.

For applications that use AFP fonts downloaded to a printer that supports both raster and outline fonts, a performance enhancement can result in a reduction in CPU utilization of 50 to 70%.

The InfoPrint 60, a 60 impression-per-minute cutsheet printer with a resolution of 600 dpi for extremely high print quality, can now be attached to OS/400 using SNA Token Ring. Previous attachment support was for TCP/IP only.

PSF/400 and OS/400 Host Print Transform (HPT) now support the InfoPrint 20 and InfoPrint 32. Both printers support PCL printing. An IPDS printer feature is optional. Both printers print at a resolution of 600 dpi. They can be attached to AS/400 via either twinax or TCP/IP Ethernet or Token Ring.

New device support for continuous form printers, called cutsheet emulation, enables applications to migrate their output from cutsheet printers to a high-speed continuous form printer, and

OS/400

print two 8.5 by 11 inch pages side by side without application changes. The output from a 3900 or InfoPrint 4000, after the forms are sliced in two and interleaved by postprocessing, is identical to that from a cutsheet duplex printer.

Miscellaneous

The maximum number of active storage pools is increased from 16 to 64. This adds additional granularity for users who want to manage their system's memory.

OS/400 contains a new file system that connects the AS/400 to a Windows NT domain as a client. The new file system is QNTC.

Standard POSIX APIs provide access to the QNTC.

Industry standard protocols NetBIOS over TCP/IP are used as a transport mechanism.

Industry standard messaging protocols Common Internet File System (CIFS) also known as Server Message Block (SMB) are used.

By allowing access to data stored within a Windows NT domain, the AS/400 can become a mechanism for distribution of applications and data within the domain.

The file system can also be used by any AS/400 application that can use data as formatted on the Windows NT server, such as Java applications.

It allows access to data on both stand-alone Windows NT servers and the AS/400 Windows NT application processor.

Windows NT 4.0 and later are supported.

Note: The QNTC file system lets you share data with servers that can communicate using the Windows NT LM 0.12 dialect. The SMB server (AS/400 support for Windows Network Neighborhood) does not use the Windows NT LM 0.12 dialect. The QNTC file system can communicate with Windows NT servers. This includes stand-alone server and any NTAP servers running in the domain.

Operating System/400 Capabilities

OS/400 is designed to be comprehensive and scalable. Some of its features are described in this section. They help to make OS/400 the most complete operating system on the market today.

Ease of Installation and Use

New AS/400s can be delivered with OS/400 (and sometimes Business Partner software as well) fully installed. System-supplied menus are provided so that the system can be set up by someone unfamiliar with the control language. Fastpath commands exist for those who are familiar. Local devices can be automatically configured.

The online help text is context sensitive and can be browsed through an index search facility where the user requests help text in their own words. A Copy Screen Image function allows an image from a workstation to be displayed on another. This can be used when a departmental user requires support from a help desk or in conjunction with IBM's Electronic Customer Support. Other assist menus like the Operational Assistant help in day-to-day tasks and clean-ups.

Included with all AS/400s is a standard V.24 communications line (although a chargeable cable and modem are also required). This is intended for Electronic Customer Support to enable customers to sign on to remote systems for support (that is, from Business Partners or IBM). If a hardware or software problem arises, Program Temporary Fixes (PTFs) can be downloaded to the AS/400 to assist in problem determination and resolution. The line can also be used for Service Director, where the AS/400 will initiate a call to an IBM service center at a prearranged time for its error logs to be checked and to enable service actions to be taken, often before the customer is aware of the existence of a problem.

OS/400

Security

Within the AS/400 a level of security can be chosen to meet a customer's need. These range through:

- minimal security where no passwords are used and any user can perform any function.
- password security where passwords are used, but users can perform any function.
- resource security where passwords are required and object usage can be controlled and users can be restricted to specific functions.
- resource security and operating system integrity. Passwords are required and object usage can be controlled. Users can be restricted to specific functions, and use of unsupported interfaces is restricted.

A security journal is provided which logs all security violations. The highest level of security (Level 50) enables the AS/400 to operate at the C2 level of trust as defined by the U.S. government.

For departments where several members have the same duties or requirements, group profiles can be used. There are numerous system values that can be implemented controlling passwords and their expiry dates, and what is and not allowable for a password. Shipped with OS/400 is the publication "Tips and Tools for Securing Your AS/400" (SC41-5300) which provides report generation tools to assist administrators in assessing their implementation of security. Within communications, further security is possible by implementing LU6.2 Session Level Encryption (SLE) for AS/400 applications which use LU6.2 communications.

Connectivity

AS/400 offers a wide range of communication capabilities and functions that enable the AS/400 to communicate with most IBM and non-IBM systems.

The AS/400 supports the following protocols and networks:

- IDLC (ISDN Data Link Control)
- IBM Token-Ring Network (IEEE 802.5 and 802.2)

OS/400

- T1/E1/J1 and Fractional T1 Networks (high bandwidth)
- Asynchronous
- Binary Synchronous
- Synchronous Data Link Control (SDLC)
- X.25
- Ethernet Version 2 or IEEE 802.3
- FDDI LANs
- ATM LANs

OS/400 offers the following facilities:

- Alerts support to NetView, System/36, System/38, AS/400
- IBM Token-Ring Network Management Support
- Distributed Host Command Facility (DHCF)
- Link Problem Determination Aid (LPDA)
- Distributed System Node Executive (DSNX)

OS/400 has the following communication facilities:

- SAA Common Programming Interface for Communications (CPI-C)
- X.21 Short Hold Mode and Multiple Port Sharing
- SNA Distribution Services (SNADS)
- Network Configuration Menu
- Intersystems Communication Function (ICF)
- Object Distribution Facility (ODF)
- ICF Finance Communications
- Non-ICF Finance Communications
- ICF Retail Communications Support
- Binary Synchronous Communications Equivalence Link (BSCCL)
- Remote Workstation Support (RWS)
- Advanced Peer-to-Peer Networking (APPN)
- Advanced Program-to-Program Communication (APPC)
- Display Station Passthrough (DSPT)
- Distributed File Management
- SNA Upline Facility to S/370 IMS and CICS Hosts (SNUF)
- SNA Primary LU2 support
- Autocall and Smart Modem (V.25 bis) Support
- 3270 Device Emulation
- Network Routing Facility (NRF)
- ISDN Basic Rate Interface (BRI) Adapter

OS/400

- S/390 - Personal Computer File Transfer
- 3x74 Remote Attach
- 5x94 Remote Attach
- 5x94 SNA Support
- 4700/3694 Finance Support
- File Transfer Support (FTS)
- Interactive Terminal Facility (ITS)
- Distributed Relational Database Support (DRDS)
- SNA/Management Services Transport
- SNA Passthrough
- 3270 SNA API Support for IBM 3278 Models 3, 4, 5.
- Packet InterNet Groper (PING)
- Network Status (NETSTAT)
- AnyNet
- Simple Network Management Protocol (SNMP)

All these facilities are part of OS/400. Other communication facilities are available as licensed programs, such as Communications Utilities for AS/400 (see 5769-CM1 on page 494 of Licensed Program section), and Client Access Family for AS/400 (see 5769-XW1 and 5769-XY1 on page 502 of Licensed Program section).

TCP/IP Utilities has been included with OS/400, (though not part of OS/400) since Version 3.1. The TCP/IP communication protocol function, along with related administration and configurations, is packaged with OS/400. TCP/IP applications, such as TELNET, SMTP (Simple Mail Transfer Protocol), FTP (File Transfer Protocol), RIP (Routing Information Protocol), and LPR/LPD (remote print support) remain part of the TCP/IP Utilities along with the Pascal-based API. These TCP/IP Utilities are automatically shipped to all customers that order OS/400, although they are not a part of OS/400.

TCP/IP, as part of the OS/400, supports:

- PING (Packet Internet Groper)
- NETSTAT (Network Status)
- Sockets API
- SNMP (Simple Network Management Protocol)

OS/400

NETSTAT, the network status function on the AS/400 system provides information about the status of TCP/IP network interfaces, routes, and connections on a local AS/400 system.

Sockets API allows unrelated processes to exchange data locally and over networks. Both connection-oriented and connectionless communication are provided for TCP/IP.

SNMP is the protocol for systems management used in TCP/IP networks. Simple Network Management Protocol is the industry standard for managing networks in the worldwide TCP/IP Internet environment.

Elements provided with OS/400 include SNMP agent, SNMP framework, and TCP/IP protocol support. The TCP/IP communications protocol is enhanced with network management capabilities to support SNMP control.

The SNMP management function is split between two kinds of entities--the "manager" and the "agent." The SNMP agent function runs on the AS/400 system and allows it to be managed by network management stations that have implemented the SNMP manager function.

The SNMP framework provides the ability to write SNMP applications on the AS/400 system.

The APIs for SNMP managing applications have the ability to manipulate SNMP management data using SNMP agents either locally or remotely. By using Anynet/400 support, SNMP information can be retrieved from Anynet configured systems on SNA or TCP/IP networks, thus making it easier to discover and manage potential problems anywhere within the network. TCP/IP has been further enhanced at Version 4 Release 2 and Version 4 Release 3.

HTTP Server for AS/400

For AS/400, network computing is supported with HTTP Server for OS/400, formerly known as Internet Connection Server. An AS/400 can access a vast network of computers as if they were a single entity. Everyone and everything can access and distribute information, applications, and services provided by the network.

OS/400

HTTP Server for the AS/400 system provides:

- WebConnection support for OS/400, providing a common protocol for support of multiple vendor products on the World Wide Web (WWW):

- Digital ID authentication (certificate support). (Requires one of the Cryptographic products).
- Socks and SSL tunneling
- 5250/Hypertext Markup Language (HTML) Workstation Gateway (WSG).

Server automatically transforms current AS/400 5250 applications to HTML for display on web browsers.

- Logging of World Wide Web Server access for tracking activity, allowing AS/400 owners to get feedback on who is accessing their servers and what parts are being accessed.
- Automatic browser detection
- Support for the Secure Sockets Layer (SSL) is provided by one of the following cryptographic products:

5769-AC1* 40-bit for AS/400

5769-AC2* 56-bit for AS/400

5769-AC3**128-bit for AS/400

* Approved for export by U.S government

** Available in USA and Canada only

- TCP/IP Support
 - Point-to-Point Protocol (PPP) synchronous and asynchronous communication connections spanning low to high bandwidth connections to the World Wide Web and Internet.
 - Serial Line Internet Protocol (SLIP) asynchronous communication connections allows inexpensive, limited bandwidth access to the World Wide Web and Internet.
 - Anonymous FTP support provides access to a restricted area of data on the AS/400 system that the public can access without a password or user identification.

OS/400

- Direct database serving to web browsers which allows DB2 for OS/400 data to be queried and served (with graphics, if desired) to a web browser using HTTP Server for AS/400.

In addition, other products in the Network Computing area, such as Firewall for AS/400, provide important enhancements in this area. For more information see the Net.Commerce web site at:

<http://www.internet.ibm.com/commercepoint/net.commerce>

AS/400 Operations Navigator

Operations Navigator continues to be a strategic platform for providing a graphical interface to systems administration functions. Operations Navigator has been extensively enhanced with Version 4. This graphical front end to the AS/400 is provided by a Windows 95/98/NT client (Client Access is not required). It is designed to be highly integrated with Windows and allows users to perform AS/400 tasks and work with systems resources. Some of the facilities are discussed below:

- Managing Jobs—enables users to perform actions against or change the properties of jobs on AS/400 systems.
- Management central allows you to monitor up-to-the-minute performance information on the systems being managed. Administrators can easily gather, analyze, and react to this information. Real-time graphical performance monitoring allows you to monitor multiple systems, establish thresholds, and automatically execute programs/actions on threshold events.
- Messages—enables users to view and manipulate messages on AS/400 systems; properties of a message can be displayed and replied to.
- File System—enables users to work with file system properties, filtering, open AS/400 objects using PC programs.
- Printer Output—allows users to work with printer output that is waiting to be printed (for example, actions include open, hold, release, move, and delete). Users can also change the properties of the output (such as, the printer, number of copies, priority, and the form type).

OS/400

A subset of the Advanced Function Presentation Workbench product called the AFP Viewer is included with the printer output capability. The AFP Viewer provides powerful viewing capabilities. The viewer allows users to view the contents of AS/400 printer output from the Printer Output list.

- User and User Group Administration—user profiles can be created, changed, or deleted with the click of a mouse and easy-to-use dialog boxes. Users can be added to a group through drag-and-drop operations.
- A security wizard generates an administrator and user report. The administrator report shows recommended settings and how those settings affect the behavior of the system. The user report contains the information the users need to know about the system, such as password composition rules.
- Backup—users can schedule daily, weekly, and monthly backups of remote AS/400 systems and, through easy-to-use panels, select what should be backed up, when to schedule it, and where to save it.
- Database Administration—users can create and modify DB2/400 table definitions with the use of a Wizard. Administrators can easily set up ODBC configurations for other PCs in the network, create and change database object definitions, control access to database objects, back up database objects, organize file data to enhance performance, copy object definitions and data, and display data in tables and views.
- Resource Security and Security Policy—enables resource information such as user's authority, public authority, owner, primary group, authorization list, default public authority for newly created objects (libraries only), sensitivity level (QDLS objects only), and security policy information to be changed easily.
- Hardware and Software Inventory—can also now be displayed through a Windows, shell-based user interface.

Programming interfaces (such as, OLE OCXs) are also provided so application programmers can quickly and easily use these

OS/400

functions when developing their own applications for AS/400 PC servers.

Graphical Access for AS/400 transforms "green screen" interfaces for programs such as OS/400, OfficeVision/400, AFP Utilities, Query/400, and many more, to an easy-to-use, point-and-click graphical interface. Graphical Access can also be used as the 5250 emulation program for running other AS/400 applications as well.

Ability to use AS/400 printers as network printers or to use the AS/400 integrated file system for network drives is also tightly integrated into the client.

Direct TCP/IP communications connectivity is also provided with this client software.

A comprehensive online user's manual is integrated into the Windows 9x and NT desktop to make it easy to learn and understand the functions available when connecting to AS/400 systems.

Some functions shipped with AS/400 Client Access for Windows 95/NT cannot be used when connecting to AS/400 systems unless you have also acquired the AS/400 Client Access Family for Windows license for those systems. Lotus cc: Mail and the following functions require an AS/400 Client Access Family for Windows license to use:

- PC5250 display and print emulation
- SNA/APPC network support using NetSoft router
- TCP/IP network support using AnyNet
- Data Transfer

Support for the Year 2000

OS/400 Version 3 Release 7 and later handle dates and date fields for the Year 2000 and beyond. The Year 2000 problem exists because the practice of using only two digits in system and application programs yields incorrect results on arithmetic operations, comparisons, or the sorting of date fields for years outside the range 1900 to 1999. With the Year 2000 enablers, OS/400 is an operationally safe environment for further application enablement. The enablers also facilitate the making of existing customers

OS/400

programs Year 2000 safe. For further information on this topic, visit the web site:

<http://www.software.ibm.com/year2000/>

Further information can also be found in the following redbooks:

SG24-2156-00 AS/400 Applications: IBM Year 2000 Tools, Tips, and Techniques

SG24-4790-00 AS/400 Applications: Moving to the 21st Century

SG24-4829-00 AS/400 Year 2000 Enablement and Services Considerations

See the following web site for more details on redbooks:

<http://www.redbooks.ibm.com>

System Management Facilities

System Managed Access Path Protection (SMAPP)

SMAPP supports and automates the process of selecting which access paths should be protected. The system uses the EDTRCYAP value to estimate the amount of journaling to do. The shorter the time in this value, the more journaling takes place, thus impeding system performance, but it leads to shorter IPLs. The longer the value, the longer IPLs are, but the cost to runtime CPU and DASD utilization taken by journaling is less.

Expert Cache

Expert Cache provides a disk cache tuner option which allows the AS/400 to take advantage of available main storage capacity. It dynamically responds to system jobs to cache pages of data in main storage so reducing time to processor and disk I/O.

System Availability

Various functions are available to help maintain the availability of an AS/400. These include:

- All AS/400s support an optional Uninterruptable Power Supply (UPS) to maintain power to the AS/400 during a site power loss.

OS/400

- Disk mirroring for the entire system or one individual auxiliary storage pool. If the entire system is mirrored, then double the disk capacity is needed. Additional disk controllers and placement of these controllers on separate buses can give even higher protection.
- Journaling provides the capability to record all changes to records in a file as they occur. These journaled changes are applied to the file if the system is lost. This can be extended to cover access paths as well to provide faster recovery of access paths in the event of an abnormal system termination from Version 4 Release 2 and later with the implementation of remote journals.
- Commitment Control ensures that if a transaction requires multiple database changes, all of them (or none of them) are made.
- Auxiliary Storage Pools (ASPs) are individual disks reserved for particular objects (like individual libraries) which can be used to isolate those objects to assist in their recovery.
- Save While Active function allows customers to continue to use applications while they are backed up, thus reducing the time they are unavailable and lessening the time to save.
- RAID-5 disk protection can be implemented with the use of a disk controller and at least four disks to make up an array. Refer to the sections on RAID-5 for information on how this is implemented.

Application Development

AS/400 Control Language

The control language provides a consistent single interface to all system functions. Most commands can be executed both interactively and in a compiled CL program. CL programs provide a high degree of function in that they allow the use of variables, error handling, and access to the database.

Runtime support is provided for languages such as ILE RPG/400, ILE COBOL/400, ILE C for OS/400, AS/400 PL/1, AS/400 Pascal, and AS/400 Basic.

OS/400

Procedures Language 400/REXX is implemented within OS/400. REXX is designed to facilitate the writing of clear, structured, interpreted procedures.

Database Support

The integrated database, DB2 for OS/400, provides stability and compatibility of previous releases of the AS/400 database with the standards-based technology required for a heterogeneous computing environment. DB2 for OS/400 provides compliance in the area of standards compliance coupled with advanced function, distributed capabilities, and performance. DB2 for OS/400 provides support for:

- Structured Query Language (SQL) standards conformance. Supplies the industry standard database access language conforming to the IBM SQL Version 1, ANSI X3.135.1992, ISO 9075-1992, and FIPS 127-2 standards. Support is provided for embedded static, dynamic, and extended dynamic SQL, together with IBM's Distributed Relational Database Architecture (DRDA), Microsoft's Open Database Connection (ODBC), and Apple's Data Access Language (DAL).

- Declarative referential integrity preventing conflicting data from being entered in the database.

- Stored procedures allowing the distribution of application workloads between a client and an application server.

- Triggers which cause automatic program execution before and/or after database modifications.

- Two-phase commit transaction management to allow access to multiple heterogeneous databases simultaneously.

- Data replication automatically in distributed DB2 family environment.

- System-wide database catalog allowing applications to query information concerning all objects on a system using a single system catalog.

- Multiple-level concurrency control providing read stability, cursor stability, uncommitted read, and no commit isolation levels.

OS/400

National Language Support to store data in a preferred language, character set (single and double byte), and a sort sequence.

Security up to Level 50 (Level 50 provides C2 level of trust as defined by the U.S. Government publication DOD 5200.28-STD, *Department of Defense Trusted Computer System Evaluation Criteria*.)

Application Development facilities are provided in the optional DB2 Query Manager and SQL Development Kit for AS/400 (5769-ST1) and the Application Developer's Toolset (5769-PW1) in Licensed Programs section. See pages 485 and 556 for details.

Multiple Operating Environments

In addition to the creation of native AS/400 applications, OS/400 allows the execution of applications or programs migrated from the System/36 and System/38 with few or no modifications required, or applications with a mixture of native and System/36 or System/38 function. This means that applications can be migrated into completely native AS/400 applications at a pace that suits the customer. See System/36 Migration Aid (5727-MG1) on page 543 and System/38 Migration Aid (5714-MG1) on page 540 of the Licensed Programs section.

Additionally on all PowerPC-based models of the AS/400, it is possible to run System/36 Operation System SSP Release 7.5 under OS/400, allowing System/36 applications to run unchanged on an AS/400.

OS/400

Support for Central Site Maintenance

OS/400 provides many capabilities to assist in the maintenance of a network of AS/400 systems from one central site. These include:

- Most application objects can be saved on a system and restored to another AS/400 system at the prior release level. (Typically the support is from the current release to two release levels back.)
- Screen copy image allows the image on one screen to be sent through a network of AS/400s to another screen.
- Programs developed under CSP/AD (Cross System Product/Application Development) on an IBM S/390 can be run under CSP/AE (CSP/Application Execution) on an AS/400.
- Operations management functions can be performed using remote commands and display station passthrough (within OS/400) for AS/400 controlled networks and Host Command Facility (on S/370) to Distributed Host Command Facility (on AS/400 within OS/400) on S/370-controlled networks.

Nonchargeable Features of OS/400

Windows 95/NT Client and Operations Navigator (#2601)

OS/400 has been expanded to include the client software needed to connect Windows 95 and 98 and Windows NT workstations to an AS/400 system. The AS/400 Client Access for Windows 95/NT Client is shipped with all orders for OS/400. This, however, does not ship the AS/400 code, and therefore gives limited function. For full function, an AS/400 Client Access License needs to be purchased. This means that a PC with just the client loaded can use ODBC to access data transparently on the AS/400.

Other application enablers are provided to simplify development of AS/400 Client/Server applications like Data Queues, Distributed Program Call, and Submit Remote Command as well as OLE automation objects and custom controls for the Client Access APIs. The Windows 95/NT Client also includes the graphical interface of AS/400 Operations Navigator that gives end users and administrators a simple way to work with AS/400 resources by integrating the AS/400 environment with the Windows 95/NT client.

AS/400 Integration with Windows NT Server (Version 4.0) (#2692)

AS/400 Integration with Windows NT Server enables Microsoft Windows NT Server Version 4.0 to be installed on the AS/400 Integrated PC Server (IPCS). In a single combination server, customers can run their mission critical business applications on the AS/400, while also running Windows NT Server for file, print, personal productivity and other applications.

Some advantages of running Windows NT Server on the AS/400 IPCS are:

1. Flexibility for AS/400 applications and NT services in a combination server
2. Improved hardware control and availability with reduced maintenance costs
3. Simplified user administration and server operations

OS/400

An AS/400 Integrated PC Server with a Pentium Pro processor and a minimum of 64 MB of memory is required to install Windows NT Server. A PC screen, keyboard and mouse must be attached to the AS/400 IPCS to provide a console for the Windows NT Server.

The AS/400 operator can start and stop the Windows NT Server, improving server management in remote branch office and dealership installations. The AS/400 operator can also manage NT disk resources, allocating disk space from the AS/400's disk pool. The AS/400 operator can also better manage server operations since hardware error messages from the Windows NT Server are sent to the AS/400 message queue. Maintenance costs are reduced compared to a PC-based server, since Integrated PC Server maintenance charges are included in the AS/400 system maintenance offering.

AS/400 Integration with Windows NT Server allows customers to share hardware resources between the AS/400 and Windows NT Server. The AS/400 CD-ROM drive and tape drives can be allocated to Windows NT for installing an application or for data backup.

AS/400 Integration with Windows NT Server provides simplified user administration of a combined network environment. Network operators can create both AS/400 and NT user profiles in a single step; users can change their password on the AS/400 and have it automatically updated on the Windows NT Server.

AS/400 Integration with Windows NT Server provides an internal connection between the AS/400 and Windows NT Server. This internal TCP/IP link provides a reliable and secure connection for applications and database integration utilities between the two systems, protecting the application from local area network hub failures.

Windows NT Server (Version 4.0) is packaged, priced and supported by Microsoft and must be purchased through a Microsoft dealer.

Integrated Services for the FSIOP (#2644)

The File Server I/O Processor (FSIOP) is the name for some of the older models of what has now become the Integrated PC Server (IPCS). It provides LAN enablement of the LAN cards as well as an OS/2 WARP base for the Notes Release 4 when running on a FSIOP/IPCS. It is not required for LAN Server/WARP Server for AS/400. After installation it should be possible to vary on an IPCS so that it can be used as a LAN adapter to run APPC, TCP/IP, or IPX protocols. To obtain the full function of the IPCS as a file server or groupware application server, the appropriate server or groupware application must be installed.

Common Programming API (CPA) Toolkit (#2690)

This provides AS/400 C application developers the ability to build applications using additional system interfaces and C runtime functions compatible with OS/2, DOS, NT, POSIX, XPG, and UNIX. It was further enhanced to support additional Spec 1170 APIs to reduce the cost of porting applications and improve AS/400 architecture for client server applications.

IBM SystemView Base for AS/400 (#2195)

Part of the SystemView series for integrated products on multiple platforms, OS/400, AIX, MVS, and OS/2. An OS/2-based graphical interface provides access to system management function using the SystemView launch window. From this launch window, system management tasks provided by OS/400 can easily be accessed together with SystemView applications. Other PC applications can be added to the SystemView launch window to create a single interface.

Over 150 tasks can be selected from the launch window and other AS/400 CL commands, menus, and CL command scripts also added. Specific tasks provided include management of 5250 emulation sessions, single sign-on support (when a user is authorized by SystemView Base of OS/400 and OS/400 security), and support for a roving use so that wherever the enrolled SystemView user signs on, they have the same capabilities and interface characteristics.

OS/400

Integration for Lotus Notes (#2656)

Required for using Lotus Notes from an IPCS, this provides the following functions:

Installation support of the Lotus Notes Release 4 OS/2 server from a LAN-attached PC to a dedicated Integrated PC Server environment.

Administrative capability to manage the Notes server on the Integrated PC Server by executing Notes server commands from an OS/400 command line.

Shadowing of the AS/400 System Distribution Directory (SDD) entries to the Notes Name and Address Book residing on the Integrated PC Server provides enhanced user-profile management.

Remote PC dial-in access to Notes applications through supported AS/400 communications adapters and connection with an Integrated PC Server-based Notes server. This is provided with TCP/IP SLIP and appropriate communications hardware support installed. Using AS/400 remote PC capabilities replaces the need to have dedicated communication ports on the Integrated PC Server for Notes' users, thereby consolidating remote and mobile configurations on the AS/400.

Lotus Domino (Notes Server) 4.5 and Lotus Notes 4.1 are supported on the Integrated PC Server.

Statement of Direction: Customers running OS/2 Warp Server for AS/400 and Novell 4.11 on the AS/400 IPCS will be supported with their current capabilities until 31st January 2001; however these products will not be functionally enhanced. It is also recommended that customers with Domino on the OS/2 based AS/400 IPCS plan to migrate to the Domino for AS/400 product, which provides enhanced scalability, reliability and integration. V4R3 is the last release of OS/400 which will support Lotus Domino running on the OS/2 based AS/400 IPCS. Future releases of OS/400 will not be capable of running Lotus Domino on the OS/2 based AS/400 IPCS.

Chargeable Features of OS/400

IBM Print Services Facility for AS/400 (PSF/400) (#2691)

Print Services Facility for AS/400 (PSF/400), a feature of OS/400, provides support for high-function AFP (Advanced Function Presentation) electronic printing and IPDS (Intelligent Printer Data Stream) print management. With AFP, application output can be transformed into fully graphical documents utilizing electronic forms, image, graphics, bar coding, lines, boxes, and text in a wide variety of fonts--electronic documents that are more effective and enable the reengineering of business processes. Documents can be produced using a variety of enabling tools, including printer file keywords (ie, front and back overlays, N-Up, duplex). DDS output keywords, page and form definitions, the applications within AFP PrintSuite (ie, Advanced Print Utility, AFP Toolbox), and a variety of third party products. Output created by network clients, as well as Postscript and image files, can also be handled by PSF/400 and sent to IPDS printers.

PSF/400 is the OS/400 subsystem driving the interactive management of IPDS printers. IPDS is a bi-directional print architecture that ensures that the printing process can be managed every step of the way. When an AS/400 writer is started to an IPDS printer, PSF/400 provides the following services:

- Establish communication and query printer capabilities and status

- Manage overlay, image, and font resources required in the printer

- Transform the AS/400 spooled file (from AFP, IPDS, or SCS) into a printer-specific IPDS data stream.

- Manage the print process, including handling error conditions and managing error recovery down to the page level

The net effect of this level of print management is to ensure each page of each spooled file is printed completely and accurately. PSF/400 enables all parameters of the printer file and all DDS print keywords (subject to printer limitations).

OS/400

IPDS printing takes on added significance across the network. TCP/IP print support is much more limited than traditional AS/400 print management. SNDNETSPLF (LPR in TCP/IP terminology) simply sends a spooled file with limited instructions and no feedback as to whether it was received and printed correctly. Applying IPDS to a TCP/IP network restores the same level of print support (as described above) as twinax-connected printers. This includes sending standard SCS spooled files across the network.

Enhancements to PSF/400 for Version 4 Release 3 include:

- Enhanced Postscript transform to IPDS

- New DDS option to automatically scale and rotate images (AS/400 page segments) during printing

- New DDS option to index document data for archival functions as pages are created

- Cut sheet emulation enables multiple-up, duplex jobs to print in the desired order on continuous forms printer

- Resolution independence automatically resized 240 and 300 dpi applications to higher resolution printers

- Applications using DDS for basic page formatting can now use AFP page definitions for advanced document formatting

- Enhancements to font performance

- Support for euro currency symbol

- AFP Workbench for Client Access/400 (formerly an optional feature) is now standard with Client Access/400

DB2 Multisystem for AS/400 (#2699)

Allows multiple AS/400 systems to be connected to allow the processing power and storage capacity of all the systems to be used. From a database perspective, these interconnected AS/400 systems will appear as a single large system. It is intended for use when AS/400s are being used for large data warehouse installations.

DB2 Symmetric Multiprocessing for AS/400 (#2698)

This enables a single database operation to run on multiple processors at the same time. Typically, this would be used for queries run through Query, DB2 Query Manager, or a PC-based query or reporting writing tool. Both SQL and native database interfaces are supported. The SMP function takes advantage of the N-way processor capability of the AS/400 which supports up to 12 N-way processors on the high-end models. The query will see performance improvements by being run in parallel across these multiple processors.

Media and Storage Extensions (#2619)

A prerequisite feature for using the Backup Recovery and Media Services/400 (BRMS/400) (5769-BR1). It is also required for developing Hierarchical Storage Management (HSM) applications. APIs are provided for managing tape usage and managing recall of data from off-line media to DASD.

For software developers who want to customize their own storage management applications, Media and Storage Extensions provides an API that enables application monitoring and control of media usage, including volumes to be selected and volume expiration dates. The API also enables fast search for IBM 3480, 3490, 3490E, and 3575 tape drives.

An API is also provided to handle the interruption that occurs when an application tries to open a database file that has been migrated to off-line media. The API enables on-demand recall of a database file from off-line media to DASD and resumption of the application without requiring changes to the application.

Enhanced NetWare Integration (#2646)

OS/400 Enhanced Integration for Novell NetWare provides NetWare client and integration services for AS/400 users, operators and applications. This is achieved using a Network Loadable Module (NLM) that runs on either NetWare 3.12 or 4.1x servers. It supports the NetWare servers whether or not there is an IPCS installed on the system. A license is required for each NetWare server. IPX support

OS/400

in OS/400 is used to connect the AS/400 using a LAN adapter or a communications adapter using X.25 or frame relay services.

It provides user profile and password integration from the AS/400 to NetWare. The user or group profiles can be propagated to multiple NetWare Directory Services (NDS) trees and/or NetWare 3.12 servers, so when AS/400 users change their passwords, the change is propagated to NetWare. Other facilities include AS/400 to NetWare printing support so that AS/400 users output is sent from the AS/400 output queue to a printer queue managed by the NetWare server. OS/400 host print transform services are used to translate the output to print on common PC printers.

Integrated File System support is provided allowing AS/400 users and applications to access files and directories in multiple NDS trees or NetWare 3.12 servers throughout the network. Therefore, a Client Access user can access files on a NetWare server throughout the AS/400 network. Full integration with NetWare security ensures that each AS/400 user of these services is fully authenticated in NetWare Directory Services or the NetWare 3.12 binders.

There is also a set of server configuration and management tasks operated from AS/400 interfaces. Although this is not intended to be full management and operations of a NetWare server, AS/400 operators can manage user connections and disk resources. Facilities are provided for creating, extending, and mounting/dismounting volumes on NetWare servers.

OptiConnect for AS/400 (#2642)

Provides high-speed transparent access to data through fiber optic bus connections and performance enhancements to AS/400 Distributed Data Management (DDM). This allows customers who are reaching capacity limits of a large AS/400 to offload database application CPU cycles to other AS/400s within a local environment. DB2 Multisystem for AS/400 environments can be connected on a shared bus with OptiConnect for AS/400 to increase the efficiency of parallel database operations. Two-phase commitment control allowing distributing units of work is supported on OptiConnect for AS/400 networks. Because OptiConnect for AS/400 operates only among systems sharing the same bus (connected with fiber optic

OS/400

cables), it can achieve transport efficiencies not possible with more general purpose wide-area communication protocols.

OS/400

Programs Within OS/400

The following programs are all part of OS/400 and all ship within OS/400. They do not need to be ordered separately. However, they all appear within the AS/400 Software Resources and Licensed Program menus as separate products.

- 5763-JC1 Java Toolbox for AS/400 (#2585)
- 5769-JV1 IBM VisualAge for Java (#2586)
- 5769-PM1 Performance Management/400 (#2556)
- 5769-SA3 Integration for Novell NetWare (#2645)
- 5769-TC1 IBM TCP/IP Connectivity Utility (#2529)

The feature quoted is the code that must appear on the 5755-AS5 software programs shipment order for these programs to be shipped.

AS/400 Toolbox for Java

The AS/400 Toolbox for Java is a set of Java classes delivered as a Java package. The classes can be used by Java applets and applications to easily access AS/400 data and resources and require no additional support over the inherent OS/400 support of Java Virtual Machine and the AS/400 Developer Kit for Java.

The Toolbox for Java provides support for similar functions to that provided by Client Access APIs. It uses the OS/400 host servers (part of OS/400) to access the AS/400 data and resources. Each of these servers run in a separate job on the AS/400, communicating with a Java client program using architected data streams on a socket connection. The socket interfaces are hidden from the Java programmer by the Toolbox classes. Java Beans are provided for most public interfaces. They provide access to these AS/400 resources:

- Database using JDBC driver

- Database using Record-Level file access using the interface of the classes

- Integrated File System

OS/400

Programs--Any AS/400 program can be called, parameters passed to the AS/400 program, and data returned to the Java program

Commands--Any AS/400 batch command that is not interactive can be run

Data Queues--Access to both keyed and sequential data queues

Print--Using the print classes lists of spool files, output queues printers, and other print resources can be retrieved

Additional classes provide the infrastructure needed to manage sign-on information, create and maintain sockets connections to the AS/400 services and send and receive data. Data description classes for numeric and character data are provided to allow the Java program to describe the record format of a buffer of data with an object.

IBM VisualAge for Java

Enterprise Toolkit for AS/400 (ET/400)

IBM VisualAge for Java is a powerful, rapid application development tool for building Java-compatible applications, applets, and JavaBean components supporting IBM's Visual Construction from parts. Delta changes are compiled incrementally and automatically using VisualAge for Java.

VisualAge for Java comes in two packages: the Professional Edition and the Enterprise Edition. ET/400 is part of the Enterprise edition 2.0 release of VisualAge for Java only. ET/400, formerly known as AS/400 feature in Version 1.0.1 of Visual, is now enhanced and fully integrated into the IBM VisualAge for Java Version 2.0.

In addition to the advanced Integrated Development Environment (IDE) of VisualAge for Java, ET/400 makes the job of developing Java client and server programs targeting AS/400 much easier.

Create Java graphical user interface (GUI) for existing 5250 displays.

Take your existing Data Description Specifications (DDS) display files of your current RPG or COBOL program and convert them to Java AWT files using the "Convert Display File" SmartGuide feature in OS/400.

Call your AS/400 program in Java programs.

With the "Create AS/400 Program Call" SmartGuide, the code is generated for you. Data conversion between AS/400 and the Java data type is also handled for you.

Deploy your Java program to AS/400.

After developing Java code using VisualAge for Java, you can export the files to AS/400 Integrated File System and compile them for better performance. This can be done using the "Export Java Files" and "Compile AS/400 Java Class" SmartGuides.

You can then use the graphical debugger available in Code/400.

OS/400

IBM AS/400 Toolbox for Java classes available inside VisualAge for Java IDE.

All of the IBM AS/400 Toolbox for Java classes are loaded into the VisualAge for Java IDE at install time. You can therefore use them inside the workbench, as well as in the Visual Composition Editor, without downloading. The Toolbox for Java is a set of Java programs that enables the Internet programming model. These can be used to access AS/400 resources.

Version 2.0 Enhancements

In version 2.0 of VisualAge for Java, all the AS/400 SmartGuides are fully integrated with the IDE. SmartGuides are launched from within IDE and generated classes are placed automatically inside the repository. New functions for version 2.0 include:

- JDK 1. 1.6 and JFC support
- Team capability
- Data Access Beans
- High performance compiler for Java

Integration for Novell NetWare

This feature provides support to run Novell NetWare 4.10 on the Integrated PC Server (IPCS). It does not include the NetWare server software or license which must still be purchased from a NetWare distributor.

The support allows the ability to install Novell NetWare on the IPCS. It also allows AS/400 disk to be used for NetWare file serving and enables the file, print, and application serving functions of Novell NetWare.

Statement of Direction: Customers running OS/2 Warp Server for AS/400 and Novell 4. 1 1 on the AS/400 IPCS will be supported with their current capabilities until 31st January 2001; however these products will not be functionally enhanced. It is also recommended for customers using Domino on the OS/2 based AS/400 IPCS to migrate to the Domino for AS/400 product, which provides enhanced scalability, reliability and integration. V4R3 is the last release of

OS/400

OS/400 which supports Lotus Domino running on the OS/2 based AS/400 IPCS. Future releases of OS/400 will not be capable of running Lotus Domino on the OS/2 based AS/400 IPCS.

Performance Management/400

Performance Management/400 (PM/400) is shipped with OS/400. At the first IPL the customer is asked if they want PM/400 activated.

The activation causes summary performance data to be collected that is transmitted using the ECS line to an IBM service center. The customer then receives easily understood capacity and performance reports and graphs to assist in running their AS/400 and to plan for future growth.

PM/400 is intended for long-term systems management planning with regard to CPU utilization, memory utilization, DASD utilization, and individual disk arm utilizations, which can enable a consistent level of service.

For further information, visit the web site at:

<http://www.as400.ibm.com/pm400>

IBM TCP/IP Connectivity Utilities for AS/400

TCP/IP is fundamental to the new network computing paradigm. Much of the new AS/400 e-business infrastructure runs exclusively on TCP/IP including Lotus Domino, Java, Web serving and IBM Network Stations. AS/400 has excellent TCP/IP support built into its operating system. Recent AS/400 TCP/IP enhancements make AS/400 an even more powerful e-business server. TCP/IP has become an extremely popular protocol and can now be regarded as the de facto standard for computer networking.

AS/400 ships with a complete and robust suite of TCP/IP protocols, servers and services. TCP/IP is an internationally standardized protocol. TCP/IP and its constituent protocols are standardized by the Internet Architecture Board. The standards specifications are provided in documents called RFCs (Request for Comments). There are hundreds of RFCs available today. The AS/400 conforms to the appropriate RFCs.

TCP/IP Connectivity Utilities for AS/400 is shipped with each OS/400 licence from Version 3 Release 1 and is non-chargeable. It is installed as 5769-TC1. TCP/IP Connectivity Utilities has a rich suite of servers and services including:

- GUI configuration support
- File Transfer Protocol (FTP) client and server
- Simple Mail Transfer Protocol (SMTP)
- Post Office Protocol (POP) Version 3 server
- Internet Connection Server (HTTP)
- Internet Connection Secure Server (ICCS)
- Web-based Administration server
- Network File System (NFS) client and server
- Domain Name System (DNS) server
- Dynamic Host Configuration Protocol (DHCP) server
- IP Printing to HP-compatible network printers
- Line Printer Requester (LPR) and Line Printer Daemon (LPD)
- 5250/HTML Work station Gateway (WSG) server
- TELNET client and server
- Remote EXECution (REXEC) client and server
- Remote IPL support

OS/400

BOOT-P Server
TFTP Server

The AS/400 supports a wide range of physical interfaces including:

- IBM Token-Ring LAN
- Ethernet LAN
- Ethernet 100Mb LAN
- Frame relay
- Wireless (LAN)
- X.25 (PVC and SVC)
- X.25 over ISDN
- Integrated PC Server LAN
- Asynchronous support
- Synchronous support
- ATM (LAN emulation)
- Twinax

The base protocols are implemented within OS/400 and OS/400 microcode for excellent performance, security and stability. The base protocols include:

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)
- Internet Protocol (IP)
- Internet Control Message Protocol (ICMP)
- Address Resolution Protocol (ARP)

Software Packages

AS/400 Software Packages

The following software packages are available for the AS/400 with Version 4 Release 3. The table shows the contents of these packages. Software configuration must be done for these packages using the IBM Software Configurator to ensure that the correct feature numbers and number of users are added to the software stack.

ValuPak for OS/400	Client Access Family for Windows (5769-XW1) DB2 Query Manager and SQL Development Kit (5769-ST1) Query (5769-QU1) PSF 1-19 IPM (Feature of OS/400) Performance Tools (5769-PT1) Manager Feature	5769-VP1
GrowthPak for OS/400	Client Access Family for Windows (5769-XW1) DB2 Query Manager and SQL Development Kit (5769-ST1) Query (5769-QU1) OfficeVision (5769-WP1)* Dictionaries (5716-DCT) Performance Tools (5769-PT1) Manager Feature	5769-GP1
ValuPak for AS/400 for Print	AFP Utilities (5769-AF1) AFP Font Collection (5648-113) AFP PrintSuite (5798-AF3) Advanced Print Utility and Page Printer Formatting Aid	5769-PPK
Application Development Toolset Plus	Application Development ToolSet (5769-PW1) Application Dictionary Services/400 Application Development Manager/400 Application Development ToolSet Client Server (5769-CL3)	5769-PWK
AS/400 Operations Productivity Pak	Job Scheduler (5769-JS1) Backup Recovery and Media Services (5769-BR1) ADSTAR Distributed Storage Manager (5769-SV3)	5769-OPK

*Not included in DBCS version.

Software Packages

IBM Licensed Programs-Database Products

IBM Intelligent Miner for AS/400 Version 1, 5733-IM1

The Intelligent Miner is an integrated solution for larger scale, sophisticated analysis of data. It allows data analysts to harvest valuable information from databases and present it to business users for decision making.

The Intelligent Miner is applicable to a wide range of business problems such as:

- Performing database marketing
- Streamlining business and manufacturing processes
- Detecting potential cases of fraud

The Intelligent Miner is a suite of functions that support data mining operations and deploys a variety of techniques to:

- Create classifications and prediction models
- Discover associations and sequential patterns in large databases
- Automatically segment databases into groups of related records
- Find similar patterns of behavior within time sequences

Intelligent Miner for AS/400 provides functions to prepare the data for mining, and to present the discovered information using advanced graphical techniques.

The Intelligent Miner extends the analytical capabilities available to data analysts to data-driven discovery. This allows users to increasingly leverage the data warehouse and more quickly derive business value from that investment by more efficient analysis of substantial amounts of data and reduction of that data to consistently present the most promising business information to analysts.

Benefits are further increased by the use of data mining applications. Using business-relevant terminology and processes, data mining applications can invoke the Intelligent Miner functions using a published API and present actionable information to the business analyst.

IBM Cryptographic Support for AS/400 Version 4 Release 2, 5769-CR1

The main purpose of Cryptographic Support for AS/400 is to provide a means to protect information that is moved outside the perimeter of the protection already provided by the IBM AS/400 system and your physical security measures. Additionally, Cryptographic Support for AS/400 can be used to add a level of protection to sensitive data stored within your AS/400 system's protected environment.

The encryption/decryption function is performed in accordance with the ANSI Data Encryption Algorithm/Data Encryption Standard (ANSI X3.92). The application-level cryptographic functions include:

- Data Encryption/Decryption
- Message Authentication Code Generation and Verification
- Key Management
- Personal Identification Number Management.

Cryptographic Support for AS/400 can be used to protect information travelling across a communication line, or stored in a file on tape, diskette, or other recorded media. It also provides enhanced protection for data in the AS/400 database.

A main focus for Cryptographic Support for AS/400 is communications security within a financial environment. To accomplish this Cryptographic Support for AS/400 is compatible with the 4700 Finance Communications Subsystem. The Cryptographic Support for AS/400 licensed program includes the Data Encryption Algorithm microcode for the AS/400 system.

IBM System/38 Utilities for AS/400 Version 4 Release 2, 5769-DB1

The System/38 Utilities is used for running applications written using System/38 Data File Utility or System/38 Query that have been migrated from the System/38. The alternative is to rewrite all these existing System/38 applications. The Text Management/38 component of System/38 Utilities for AS/400 is for use by migrators

Licensed Programs-Database Products

whose word processing and data processing personnel use the Text Management/38 component of System/38 Personal Services.

IBM DataPropagator Relational 5.1 for AS/400 5769-DP2

The IBM DataPropagator Relational 5.1 for AS/400 automatically replicates data within and between DB2/400, DB2 MVS, DB2 Universal Database, DataJoiner, and Lotus Notes Pump making data available when and where it is needed. Immediate access to current and consistent data reduces the time necessary for analysis and decision making.

DataPropagator Relational 5.1 for AS/400 allows you to update replicated data, maintain historical change information, and control replication impact on system resources. Replication may involve transferring the entire contents of a user table (full refresh) or transferring only the changes that have occurred since the last replication (update).

Making copies of database data (snapshots) is a solution to the problem of remote data access and availability. Copied data requires varying levels of synchronization with production data depending on how the data will be used.

Replicating data may even be desirable within the same database. If excessive contention occurs for data access in the master database, replicating the data can off-load some of the burden from the master database.

Licensed Programs-Database Products

Replicating data allows users to get information without impacting their production applications and removes any dependency on the performance of remote data access and the availability of communication links.

DataPropagator Relational 5.1 for AS/400 highlights include:

- Automatic and on-demand database replication
- Full support for SQL (enabling summaries, derived data, and subsetting copies)
- Availability/recovery improvements
- Open architecture to enable new applications
- Subscription sets of related tables to support referential integrity requirements
- Easy-to-use Graphical User Interface (GUI) for defining operations using the Control Center integrated into DB2
- Universal Database on OS/2, Windows 95, or Windows NT

DataPropagator Relational 5.1 for AS/400 commands support AS/400 system definitions only and operate only on the local AS/400 on which they are run.

Enhancements for Version 4 Release 3

- Coexistence between Datapropagator Relational 5.1 and Version 1 is supported with commands executed by either version using a parameter
- Support for the system remote journal function has been added
- Support for alias names has been added

IBM Query for AS/400 Version 4 Release 3, 5769-QU1

Query for AS/400 is an interactive query definition, management, and execution facility allowing users to extract and analyze data from their databases. Queries can be created and modified using a variety of record selection criteria, without programming knowledge. Users can control the formatting of the extracted data for display upon a workstation or printer, or can save the data in a database file. This program also enables a variety of text-data merge functions in OfficeVision for AS/400.

Licensed Programs-Database Products

Query for AS/400 supports two expression operators in the Define Result Field function. These will contain selected similar function for character and graphic data as the SQL Development Kit.

IBM DB2 Query Manager and SQL Development Kit for AS/400 Version 4 Release 3, 5769-ST1

The DB2 Query Manager and SQL Development Kit for AS/400 provides an interactive query and report writing interface, as well as precompilers and tools to assist in writing Structured Query Language (SQL) application programs in high-level programming languages.

DB2 Query Manager and SQL Development Kit for AS/400 contain the following functions which assist in writing SQL queries and application programs for the DB2 for OS/400 database manager.

Query Manager

The Query Manager program is an interactive query and report generator which allows users to define and run queries accessing DB2 for OS/400 databases. Data edit and report format capabilities are also provided.

SQL Development Kit

The SQL Development Kit provides precompilers for processing embedded SQL statements in the C++, RPG, and COBOL programming languages. Support is provided for the following DB2 for OS/400 functions:

- IBM SQL Version 1, ANSI X3.135.1992, ISO 9075-1992, and FIPS 127-2 SQL conformance
- Embedded static, dynamic, and extended dynamic SQL
- Declarative referential integrity
- Stored procedures
- Triggers
- Two-phase commit transaction management
- Explain function
- Long names supported for SQL objects

Licensed Programs-Database Products

A significant advantage of the DB2 for OS/400 database manager and twin product are that DB2 for OS/400 SQL objects are compatible with OS/400 objects.

Interactive SQL

The Interactive SQL program allows users and programmers to enter SQL statements and queries interactively. Full syntax prompting is available to assist in defining SQL statements.

Version 4 Release 3

DB2 Query Manager and SQL Development Kit for AS/400 has added precompiler support for C++ so that application developers can write applications using C++ and embedded SQL. The size limit on SQL packages has been removed. The ability to update one table based on the values from another table has been added through the implementation of scalar subselect in the UPDATE statement. Multisystem subquery support has been added which allows subqueries to be performed over a distributed database. ALIAS support has been added which allows the user to specify an alternate name for a database file or member to be used through SQL.

IBM Licensed Programs–Networking Products

IBM Network Station Manager, Release 3, 5648-C05

Cross-platform network connectivity is supported using the IBM Network Station Browser and Java applets. Applets are similar to applications; they are small applications that load and execute quickly.

The configuration and administration of IBM Network Stations are web browser-based, so that a central site administrator can configure and manage all IBM Network Stations. A client data and program repository is maintained on the AS/400 system. The AS/400 file system supports all data management and storage through normal server mechanisms.

Printing support is controlled by the server. The user has a choice of printing on a printer directly attached to an IBM Network Station or on a system printer using supported AS/400 printer transforms. The IBM Network Station Manager uses the OS/400 Host Print Transform (HPT) to print to ASCII parallel-interface-attached printers connected to the IBM Network Station. There are over 100 printers that support the Host Print Transform that can be selected from the configuration option of the IBM Network Station.

The IBM Network Station operates without local disk storage. When powered on, IBM Network Station performs initial diagnostics and then contacts the server requesting the IBM Network Station Manager to download the IBM Network Station's program. After the server connection and successful entry of the user-ID and password, the predefined user preferences are returned to the IBM Network Station. Various software environments (3270 or 5250 terminal sessions, NC Navigator for Network Station browser, Java, and applets) are downloaded and initiated. User preferences are stored on the IBM Network Station server, providing the user with a personalized network computer on any IBM Network Station the user would select.

Licensed Programs-Networking Products

The IBM Network Station can also act as an X-Windows terminal, permitting AIX and other UNIX applications to display to the IBM Network Station. The IBM Network Station is X11 Release 4-compliant.

IBM Network Station Manager includes NC Navigator for IBM Network Station with 40-bit encryption. This fully compatible subset of the popular Netscape Navigator 3.0 browser is an upgrade of the existing Navio NC Navigator browsers currently available (5648-B08 or 5648-B10). It replaces those products in Release 3 of the IBM Network Station. The currently available Navio NC Navigator (5648-B08 or 5648-B10) product will not run on Release 3 of the Network Station.

Some of the key features of NC Navigator are:

- User interface compatible with Netscape Navigator 3.0

- Ability to display web pages that contain text, HTML, GIF images (including animated GIFS), and JPEG images in a manner compatible with Netscape Navigator 3.0

- JavaScript 1.1 (same as in Navigator 3.0)

- SSL 2 and SSL 3 encryption at 40-bit level (128-bit available in NC Navigator for Network Station, 5648-C20, for U.S. and Canada or for export), with server and client certificates

- Ability to execute Java applets using the Network Station's JVM

Network Station Manager Release 3 can be used on Network Stations that are connected to AS/400s running OS/400 Version 3 Release 7 or Version 4.

The IBM Network Station Manager allows the IBM Network Station to execute Windows applications on an Intel-based server, with third-party software such as WinCenter Pro for IBM Network Station, available from Network Computing Devices, Inc. The entire program runs on the Intel server, but the monitor, keyboard, and mouse functions are redirected across the network to an IBM Network Station. Users can access the whole suite of Windows personal productivity applications, and eliminate the demand for occasional users to install Windows-based clients at their desktop. Contact the

Licensed Programs-Networking Products

third-party software supplier with questions regarding Windows applications. It is not expected that a large number of concurrent users would be supported on an Intel server in this manner. Further information on the IBM Network Station can be found at the Internet URL:

<http://www.internet.ibm.com/networkstation/>

New in Network Station Manager Release 3

Network Station Manager group support

Java Just-In-Time (JIT) compiler (Series 1000 only)

Broadcast boot for AS/400

ICA Client protocol

VTxxx Telnet (English MRI only) emulation

Converged 3270/5250 emulators

Java Virtual Machine (JVM) 1. 1.4

Support for the twinax-enabled IBM Network Station Model 341

Remote AWT -- application runs on one host (server); GUI interface (display, mouse) runs on another host (Network Station)

Streaming LPR/LPD print support

Support for serial print and AS/400 Anyprint

Integration of the NC Navigator browser with 40-bit encryption

The JIT compiles an application's or applet's Java Bytecode as it is downloaded into an IBM Network Station Series 1000 to improve performance. Currently, the JIT supplied with the Network Station Manager 3.0 is most effective in improving compute-intensive and string manipulation operations. The amount of performance improvement varies based on these characteristics. Reference the Planning Information section for memory guidelines.

NPT Clients: The 3270 and 5250 client functions are enhanced and now have very similar user interfaces. For example, both 3270 and 5250 clients:

Licensed Programs-Networking Products

- Support keystroke record and playback, with automated sign-on assistance

- Offer full-screen coverage for all major CRT monitor modes

- Offer multisession capability with an option to disable creation of additional sessions using NSM

- Include customizable keypads

- Enable local screen copy that supports ASCII, PCL, and PostScript printer datastreams

Session screen sizes and locations can be specified using NSM to preserve them between uses. NLS of over 30 different locales includes host session window content and help text, menus, and buttons. Additional improvements to client functions include 3489 fax/image display and print and 3270 local server print.

In conjunction with Dynamic Host Configuration Protocol (DHCP), Release 3.0 enables systems administrators to distribute services required by the Network Station (R3.0) across the network. They can build on the strengths of the Network Station -- central administration, access to data from anywhere, and adapt to the scale and support needs of very large enterprise networks.

Administrators can balance loads and reduce congestion by using multiple servers. For example, downloading Network Station executables can be spread across more than one server, reducing the time needed to boot large numbers of Network Stations and maintaining central administration of the Network Stations from a single server.

The NC Navigator for Network Station browser also has the following enhancements in OS/400 V4R3:

- Mail client function enables a user to send and receive e-mail using a POP3 server

- News Reader function enables a user to read news items on an NNTP server

- Print to remote printers

- Execute Java applets that require authentication

Licensed Programs-Networking Products

Use of auto-proxy feature when JVM runs applets from the browser

Localized versions in French, German, Japanese, and other languages (in addition to English)

Ability to invoke the 3270 emulator and telnet applications from the browser

Navio NC Navigator for IBM Network Station (128-Bit), 5648-C20

NC Navigator for Network Station (128-Bit) can be used to replace the browser included with Network Station Manager (5648-C05) to support the stronger 128-bit encryption available in the United States and Canada. All other functions of the browser are identical to those provided with Network Station Manager. See Network Station Manager on page 487 for more information on supported functions.

Cryptographic Access Provider 40-bit for AS/400 Version 4 Release 3, 5769-AC1

Cryptographic Access Provider 56-bit for AS/400 Version 4 Release 3, 5769-AC2

Cryptographic Access Provider 128-bit for AS/400 Version 4 Release 3, 5769-AC3

The Cryptographic Access Provider products provide the support to secure e-business transactions by implementing the security needed to send proprietary or confidential information over the Internet and corporate intranets. They enable encryption in the AS/400 for use by other products such as HTTP Server for AS/400. One of these products must be installed on the AS/400 to enable the secure sockets layer (SSL) function of the HTTP Server for AS/400. SSL is used to enable sensitive online transactions to be performed by providing end-to-end security.

Licensed Programs-Networking Products

SSL is a security protocol that is widely used to enable secure communications between servers and clients on the World Wide Web. Data transferred between the server and client is encrypted to ensure the data remains private. In addition, the identity of the server is authenticated by the client, through the use of a certificate (or digital ID). Most popular Web browsers support SSL. This means that SSL-enabled Web browsers can establish a secure communications session with the AS/400, where the browser authenticates the identity of the AS/400 and the data transferred is encrypted.

Cryptographic Access Provider 128-Bit for AS/400, 5769-AC3, supports 128-bit data encryption capability and cannot be exported outside the USA and Canada. Cryptographic Access Provider 40-Bit for AS/400, 5769-AC 1, supports 40-bit data encryption and is not restricted to the USA and Canada only. Cryptographic Access Provider 56-Bit for AS/400, 5769-AC2, supports 56-bit data encryption and is also not restricted to the USA and Canada only.

When Firewall for AS/400 is used in conjunction with the HTTP Server for AS/400 and one of the Cryptographic Access Providers, AS/400 systems attached to the Internet can send and receive information from Internet users in a secure fashion. The firewall prohibits unwanted traffic from entering your secure network while the Cryptographic Access Provider encrypts data that is exchanged over the Internet.

IBM CallPath Server for AS/400 Version 2 Release 2, 5769-CP4

CallPath Server for AS/400 is the latest release of IBM's CallPath software for the AS/400, delivering advanced computer telephony features such as call routing, coordination of calls and date, and call center reporting. This new version of CallPath adds support for many new switches, support for OS/400 Version 4, Release 3, and support for a "one box" AS/400 solution using an AS/400 Integrated PC Server (IPCS).

The CallPath Server for AS/400 provides a software platform that enables AS/400 applications to link the data processing capabilities of AS/400 with the telephony processing capabilities of certain PBXs (Private Branch Exchange), CBXs (Computerized Branch Exchange), central office switches, and other specialized telecommunications equipment using the rich function and connectivity of CallPath Server 2.2.

CallPath Server for AS/400 consists of two major components:

The CallPath API which is installed on the AS/400

CallPath Server V2.2 which can be installed on:

- An AS/400 Integrated PC Server (IPCS) running Windows NT
- A network attached Personal Computer running OS/2 or Windows NT, or
- An RS/6000 running AIX

When running CallPath Server V2.2 on an AS/400 IPCS, the telephone switch must be connected using Ethernet.

The CallPath Server for AS/400 program is based on the IBM CallPath Services Architecture (CSA).

Some uses of CallPath for AS/400 are:

In many locations, the telephone number of the calling party is available. This can be used to retrieve customer details so that

Licensed Programs-Networking Products

those details are presented on the workstation display at the same time that the incoming call is answered.

AS/400 applications can direct the PBX and CBX to generate outbound calls, transfer calls, and establish conference calls. When, for example, a customer call is transferred within an establishment, both the telephone call itself, and its associated workstation display, can be transferred together.

As well as intelligent answering and intelligent dialling, CallPath/400 can collect call detail records (such as date, time, duration, etc) and use this information to produce reports on call activity.

Further details about CallPath are available on the Web at:

<http://www.networking.ibm.com/callpath>

IBM Point-of-Sale Communications Utility for AS/400 Version 4 Release 3, 5769-CF1

This provides the necessary connectivity to allow the AS/400 system to be used as an in-store processor (store-and-forward) or as a host system in the Retail Distribution and Supermarket industries. Its menus and display screens follow IBM's Systems Application Architecture guidelines.

AS/400 Point-of-Sale Utility provides the following three major subsystems:

- Advanced Data Communications for Stores (ADCS) Emulation
- Host Command Processor (HCP) Emulation
- Point-of-Sale Translation System.

IBM Communications Utilities for AS/400 Version 4 Release 3, 5769-CM1

The Communications Utilities for AS/400 comprises the MVS/VM bridge and Remote Job Entry (RJE) functions. These capabilities provide for interchange of mail and files and submitting or receiving jobs between connected systems.

Licensed Programs-Networking Products

The MVS/VM bridge provides support to allow the movement of mail and files to and from a System/370 host system (VM PROFS and RSCS) using the BSC protocol or SNA over SDLC lines, over an X.25 network, or over an IBM Token-Ring Network. The SDLC and X.25 lines may connect through an X.21 interface. This support also includes direct connection to VM/RSCS or MVS via JES2 or JES3. Other operating systems may be reached indirectly through the RSCS or JES network including DOS/VSE using VSE/POWER. Other AS/400 systems, System/36s, and System/38s that are connected to an AS/400 system MVS/VM bridge system using SNADS can also exchange mail and files with systems in the network.

An AS/400 with the MVS/VM bridge may act as a bridge between PROFS users and users of OfficeVision for AS/400, Personal Services/36, Personal Services/38, 5520, and DISOSS. Users may exchange Document Content Architecture (DCA) Final Form Text or DCA Revisable Form Text documents, notes and messages with PROFS users.

The MVS/VM bridge capability enables the AS/400 system to exchange with RSCS files, spooled output and messages generated by the Object Distribution Facility on the AS/400, the System/36, or the System/38. Other files, such as job streams, generated on an AS/400, a System/36, or a System/38 may be stored on the VM system and forwarded to the appropriate AS/400, System/36, or System/38 via the MVS/VM bridge.

The RJE portion of the Communications Utilities for AS/400 allows AS/400 to function as an RJE workstation for submission of jobs or receipt of output from a host IBM 308x, 3090, 937x, or 43xx using BSC and/or SNA over SDLC lines, over an X.25 network or over IBM Token-Ring Network. The SDLC and X.25 lines may connect through an X.21 interface. RJE support communications with host systems running MVS/SP JES2, MVS/SP JES3, VM RSCS Networking, and VSE/AF POWER.

IBM Distributed Computing Environment (DCE) Base Services for AS/400 Version 4 Release 3, 5769-DC1

Distributed Computing Environment (DCE) Base Services for OS/400 increases distributed computing in the open systems environment for the AS/400. It includes the basic DCE services:

- Remote Procedure Call
- Cell Directory Client function
- Security Client function
- Time Services

DCE is an integrated set of distributed computing technologies provided by the Open Software Foundation** (OSF**) Specification Version 1.2.2. The components of DCE form a layer that lies between the operating system and network and the distributed application. DCE enables application programmers to implement an open distributed computing environment, allowing for interoperability among distributed applications within a network of multivendor systems.

Support of these functions on the AS/400 system enables OS/400 to participate in a heterogeneous distributed environment by interoperating with other systems that also support the OSF/DCE standard. OSF/DCE has its origins in UNIX. It is enhanced by the DCE Base Services for OS/400 product to provide the familiar look and feel of the AS/400 with support for AS/400 messages, menus, prompts and help text. AS/400 customers can comfortably proceed along a familiar path that leads ultimately into the world of open systems.

IBM Distributed Computing Environment (DCE) DES Library Routine Version 4 Release 3, 5769-DC3

The DCE DES Library Routine provides data encryption support for the Distributed Computing Environment (DCE) Base Services on the AS/400. If secure communications are required when using DCE services on the AS/400, this product must be installed on the system.

IBM Firewall for AS/400 Version 4 Release 3, 5769-FW1

A firewall is a blockade between a secure, internal private network and another nonsecure network such as the Internet. A firewall has two jobs:

- It lets users in your own network use authorized resources that are located on the outside network.

- It keeps unauthorized users who are outside your network from using resources on your network.

Firewall for AS/400 enables an Integrated PC Server to function as a firewall. This application-proxy-based firewall, enables the web server and other functions on the main AS/400 processor to be used safely. Since the firewall runs on a separate processor, attacks against the firewall do not affect the AS/400's performance. As the firewall has separate storage, attackers cannot access AS/400 data. The OS/400 TCP/IP stack is completely independent of the TCP/IP stack on the Integrated PC Server.

Firewall for AS/400 helps you protect your network in the following ways:

- It allows authorized users to move through the firewall to the unsecured network while keeping unauthorized users from crossing the firewall into the secured network.

- It prevents the outside world from seeing the structure of your network.

- It allows mail to flow in and out of your secure network while hiding the network address.

- It allows the establishment of Virtual Private Networks (VPN) that allow encrypted data to flow between firewalls to safeguard data transported across the Internet.

The Internet Protocol (IP) packet filter provides the basic protection mechanism for the firewall. The packet filter is a set of rules that limits IP packet flow into or out of the secure network. You can filter on any of the following fields in the IP packet header:

Licensed Programs-Networking Products

- Server IP address and mask
- Destination IP address and mask
- TCP/UDP source port
- TCP/UDP destination port
- TCP/IP ack flag
- Secure or nonsecure port

There is a separate proxy server for each server application, such as Telnet, FTP, or HTTP server. The support is provided in the firewall with no software change required on the client. This is the older implementation for "hiding internal information."

SOCKS is implemented in the firewall but requires co-operative SOCKS software on the client--a "socksified client." The SOCKS Server provides common support for all server applications using it. This is the newer implementation for "hiding internal information" because it does not require the overhead used by a Proxy server, which should improve performance.

After installing a firewall to protect your secure network, you should isolate the Domain Name Services that are accessible inside the secure network so that your internal network structure is not visible from the outside.

The Mail Server works with the domain name server to relay mail between the internal or secure mail server and other mail servers on the Internet using SMTP, thus isolating the secure mail server so that your internal network is not visible from the outside.

When Firewall for AS/400 is used in conjunction with HTTP Server for AS/400 (formerly known as Internet Connection for AS/400) and one of the Cryptographic Access Providers Licensed Programs, AS/400 systems attached to the Internet can send and receive information from Internet users in a secure manner. The firewall prohibits unwanted traffic from entering your secure network while the Cryptographic Access Provider encrypts data that is exchanged on the Internet.

Several logging facilities are available with the Firewall. Also included is the capability to export the log files to database tables for analysis using SQL queries.

Licensed Programs-Networking Products

Enhancements in Version 4 Release 3

There have been several enhancements to the IBM Firewall for AS/400 in Version 4 Release 3. These include:

Network Address Translation

- Allows direct access from secure clients to the external network without proxies, while concealing internal network addresses
- Simplifies exposing secure hosts, protected by the firewall, to the Internet community without exposing internal network addresses

Virtual Private Network

- Enables establishment of encrypted connections between firewalls to safeguard data transported through the network

Log Management and Analysis

- Creates database tables from firewall log files, allowing SQL queries to tailor reports on usage, or identify potential attacks. Unneeded log files can also be deleted

For more information on the IBM Firewall for AS/400 you can access the Firewall home page at:

<http://www.as400.ibm.com/firewall>

IBM MQSeries for AS/400 Version 4 Release 2 Modification 1, 5769-MQ2

MQSeries products provide commercial messaging, allowing business applications to communicate by sending and receiving messages. MQSeries for AS/400 (MQS/400) provides similar function to MQSeries on OS/2 and UNIX platforms, including:

Ability for Lotus Notes users on several platforms to access transactions and data on the AS/400.

An increase in the data limits for queue capacity and the number of messages

Model queue object (template for a dynamic queue)

Licensed Programs-Networking Products

- Improved instrumentation to monitor the operation of queue managers
- Users' message data handling with mixed national languages
- Client support for distributed applications

In addition, MQSeries client support enables distributed applications to participate in commercial messaging in cross-platform and multiprotocol environments.

MQS/400 implements an enhanced level of Message Queue Interface (MQI), a component of the Networking Blueprint. MQI is documented in the "Messaging and Queuing Technical Reference" (SC33-0850). Messaging and queuing insulates the application from many of the complexities of the networking environment.

MQS/400 is a networked application support environment (middleware). Three communication programming interfaces designed for program-to-program communication, MQI, CPI-C, and RPC, and one mail messaging interface, X.400, are identified in the Networking Blueprint. MQS/400 provides the MQI and can interoperate with other queue messagers.

MQS/400 supports message exchange with other users of the MQSeries on over 20 IBM and non-IBM platforms, including MVS/ESA, VSE/ESA, Tandem NSK, IBM TPF 4.1, Pyramid DC/OSx, DYNIX/ptx, AS/400, SINIX, DEC OpenVMS VAX, DEC OpenVMS AXP, DEC UNIX, AIX, HP-UX, NCR (AT&T GIS), SunOS, Solaris, SCO OperServer UNIX, SCO UnixWare, Linux, HP MPE, and Windows NT.

More information on MQSeries is available via the Web at:

<http://www.software.ibm.com/ts/mqseries>

Enhancements with Version 4 Release 2

- Distribution lists to allow a single message to be put to multiple queues using a single MQPUT or MQPUT1 call. This simplifies application design and can improve performance

- Automatic creation of channel definitions for receiver and server-connection channels to save work for administrators

Licensed Programs-Networking Products

Static bindings for the ILE RPG programming language and support for Message Queuing Interface (MQI) applications written in C++ increase programmer choice

Message segmentation ordering and grouping to improve checking of transactional data and allow more applications to use MQSeries for AS/400, particularly for large transactions

Reference messages with chained exits to allow the transfer of large amounts of data (such as files) between nodes

Fast nonpersistent messages to let more programs make use of the MQI for data which needs simple, fast delivery

Channel heartbeats to provide faster response when the system is stopping or resetting

Enhancements with Version 4 Release 2 Modification 1

MQSeries is available in two ways:

- When ordered as 5769-MQ2, MQSeries ships stacked on the AS/400 installation CD-ROM
- A shrink-wrapped version of MQSeries for AS/400 is also available through the workstation marketing channel. The shrinkwrap package also includes a copy of Candle Command Center Admin Pac for MQSeries at no additional charge

Candle Command Center Admin Pac for MQSeries is a selection of Candle Corporation solutions for testing MQSeries applications, configuring MQSeries networks, and managing MQ-based computing enterprises. This Admin Pac is only available in the MQSeries shrinkwrapped package

A dead-letter-queue handler has been added to MQSeries

IBM AS/400 Client Access Family for Windows Version 4 Release 3, 5769-XW1

With OS/400 Version 4 the AS/400 is a powerful distributed server which includes capabilities such as high capacity storage, advanced database functionality, scalable and expandable hardware product line, high performance PC file serving using the Integrated PC Server, AS/400 Systems Management support, and a large application base with remote access using remote program call and remote command interfaces.

AS/400 Client Access builds upon these server capabilities, exploits the strengths of Windows operating systems, and transparently delivers the power of AS/400 to desktop users by providing two very powerful clients for accessing the AS/400:

- Client Access for Windows 95/NT
- Client Access for Windows 3.1 and Windows for Workgroups 3.11

AS/400 Client Access for Windows 95/NT

The 32-bit Windows 95/NT client is closely integrated with the Microsoft Windows 95 and 98 and Windows NT 4.0 operating systems.

The Windows 95/98/NT client merges the technologies of the Windows 95/98 and Windows NT operating systems with the AS/400 system to present a single, integrated view at the desktop. For example, AS/400 user profiles and Lotus Notes users can be managed simultaneously through the Windows 95/NT Explorer. A user profile can be copied from one AS/400 to another by dragging the user name from one AS/400 user list and dropping it onto another system.

Network drives to the AS/400 (previously called shared folders drives) are integrated into the Windows 95/98/NT Explorer. Network printers to the AS/400 (previously called virtual printers) are integrated into the Windows 95/NT Add Printer Wizard. Thus, AS/400 server resources are viewed and accessed as seamlessly as client resources.

Licensed Programs-Networking Products

The Windows 95/98/NT client further exploits the capabilities of Windows 95/98/NT by incorporating Windows 95/98/NT shell extensions and tool tips, integrating Windows 95/98/NT Network Neighborhood with AS/400, and providing ActiveX and OLE (Object Linking and Embedding) automation objects and custom controls for Client Access APIs. Client Access provides many other powerful enablers, such as Distributed Program Call, Data Queues, and Remote Command, that can be used for client/server application development.

The Windows 95/98/NT client features a user-friendly interface, easy navigation, helpful messages, and simple installation options. AS/400 tasks are easier to accomplish with the graphical interface of Operations Navigator. With its focus on end-user functions and streamlined administrative operations, usability enhancements include:

- The newest version of Operations Navigator extends the range of graphical OS/400 tasks to the network administrator. The functions available depend on the OS/400 version and release level.

- Operations Navigator allows you to launch the Network Station Manager and configure HTTP Server and Firewall.

- Simplified view of TCP/IP information such as sockets and started host servers is available through a properties panel in Operations Navigator.

- The servers required for TCP/IP, Client Access, and other OS/400 servers can be managed with the click of a mouse instead of a series of commands. Additionally, the IBM AS/400 Support for Windows Network Neighborhood is managed from Operations Navigator.

- Configuring OS/400 TCP/IP communications is simplified and extended to include point-to-point protocol (PPP).

- A quick view of AS/400 data provides a method of directly displaying AS/400 data without a data transfer step.

- Ultimedia Systems Facilities, which manages multimedia applications and objects, is available on the Windows 95/98/NT client.

Licensed Programs-Networking Products

A Welcome Wizard directs new users through a tutorial based on the Client Access Online User's Guide, program panels, and Web pages. A second path, for the experienced user, lists many of the new features added to the product.

An installation option for 16-bit APIs and ODBC extends Client Access application support when existing 16-bit programs are used.

When you create customized installation images, you can select specific components of Client Access such as PC5250, data transfer, or Operations Navigator, and copy them to diskette or a network drive. You can also maintain control of the installation by capturing keystrokes with a recordable response file, which can then be used with Silent Install function to minimize end users' involvement during installation.

Service pack updates have new flexibility for controlling distribution. The introduction of a service pack schedule panel lets you choose monthly, weekly, or other values for when Client Access programs are updated. Startup time is improved--a connection to check for updates is not required each time Windows is started.

Installation of Client Access can be done without any local media such as PC CD-ROMs using the AS/400 support for the Network Neighborhood (also referred to as NetServer). With a TCP/IP connection to OS/400 Version 4 Release 2 or later, Client Access can be installed directly from the AS/400.

You can access AS/400 data from a Windows 95NT workstation by viewing AS/400 data from the Integrated File System, analyzing data with PC applications through Open Database Connectivity (ODBC), or transferring data through the interactive and batch data transfer interfaces.

The 32-bit Windows 95/98/NT client's integration with other Windows 95/98/NT internetworking applications is significant. The Windows 95/98/NT client uses the native TCP/IP communications support that is part of the Microsoft Windows operating system. This means you can connect your PCs directly into TCP/IP networks to communicate with AS/400 systems and use all functions of Client Access including PC5250 printer emulation and device ID naming.

Licensed Programs-Networking Products

In the past, users who needed Internet or dial-in TCP/IP support had to use a LAN-attached router or gateway server to connect to an AS/400 system. OS/400 V4R2 and later supports both TCP/IP Serial Link Internet Protocol (SLIP) and point-to-point (PPP) in its communications. Windows 95/98/NT users can use these functions to connect over an asynchronous link using a simple modem pair over a telephone line and eliminate the need for costly routers and servers between the clients and the AS/400 system.

Understanding that customers have many client/server applications which have been written to the SNA/APPC protocol (such as EHNAPPC, CPI-C, WINAPPC) and they now wish to run those applications in a TCP/IP network, the Windows 95/NT client includes AnyNet (the advanced technology Multiprotocol Transparent Networking) to its communications layer.

Applications written to the Windows 16-bit APIs can also run on TCP/IP networks when using AnyNet (APPC or TCP/IP) support.

The Windows 95/NT client can run directly on networks that use IPX protocols. This capability is particularly useful for customers who have PC servers in their network that are using the IPX protocol. PC users can access both AS/400 and PC server resources using a common IPX protocol. This capability also reduces the need for gateway software such as NetWare for SAA and SNA Server. IPX protocol is available on OS/400 V3R7 and later. PC5250 printer emulation and applications written to SNA/APPC protocols (such as EHNAPPC and CPI-C) are not supported over IPX.

The NetSoft NS/Router is provided for SNA/APPC network connectivity. A Configuration Wizard provides seamless connectivity to AS/400 systems. NS/Router enables SNA/APPC communications using connectivities such as Token-Ring, Ethernet, asynchronous, SDLC, and twinax. Network interoperability also includes support for running the Windows 95/NT client over PC gateway products such as Novell NetWare for SAA Version 2.0 and Microsoft SNA Server Version 2.1 1. Support is also provided for the IBM 5394 and 5494 Remote Control Units. Additionally, the Windows 95/NT client can run over the NetSoft NS/Router 2.0 (32-bit) and the IBM Personal Communications AS/400 (32-bit) routers.

Licensed Programs-Networking Products

AS/400 Client Access includes Graphical Access for AS/400, which changes OS/400 from a green screen interface to a graphical, easy-to-use, point-and-click GUI. Graphical Access provides a graphical interface to OS/400 commands, menus, and displays. Users who are accustomed to the PC graphical environment can have a similar graphical interface to all their favorite OS/400 functions. Even command prompting is as simple as the click of a mouse button. Graphical Access includes additional adaptation to graphical operations with automatic scaling of fonts when the window size changes. You can customize colors on emulation screens to quickly identify input areas or important text fields.

The Windows 95/NT client includes Personal Communications AS/400 5250 emulation (PC5250). With pop-up keypads, copy, cut and copy link functions, 3-D hotspots and extensive macro capability, PC5250 provides a plethora of end-user productivity aids. PC5250 provides menu bar customization that is especially useful in installations where a standardized environment is required for each end user. Each session can be customized to either provide all selections to an end user or to provide only a small subset of options for end-user customization. An easy-to-use utility is provided with administration tools for customizing the menu bar. The PC Console function, which enables a PC running Client Access to act as the system console, is available for both Windows 95 and Windows NT desktops. The PC Console function is built directly into the PC5250 emulator so there is no need to order or install any additional software. PCs can use the asynchronous connection built into the PC to connect to AS/400 systems through the input/output adapter on the AS/400.

Client Access provides the Windows standard Microsoft Mail API (MAPI) to integrate OS/400 AnyMail/400 Mail Server frameworks into the Windows 95/98/NT environment. Examples of products that use MAPI are Lotus Mail 4.5 and Microsoft Exchange client. Lotus Mail 4.5 is shipped at no additional charge. It can be used with Microsoft Windows 95/98 and Windows NT 4.0 desktops. The AS/400 server is POP3 enabled so e-mail users can tap into the rich set of mail distribution services provided by the AS/400 system, such as native Internet e-mail connectivity and seamless interoperability with OfficeVision/400 with no gateways required. Combining Client

Licensed Programs-Networking Products

Access connectivity software and e-mail products with the AS/400 system yields a powerful mail solution for your business environment.

AS/400 Client Access Enhanced for Windows 3.1

Client Access Enhanced for Windows 3.1 addresses the continued requirement for a Windows 3.1 client within the AS/400 Client Access Family for Windows product. This client is designed for use on Windows 3.1 and Windows for Workgroups 3.11 desktops. The consistency in communications protocol, emulation features, national language support, and API support between this client and the Windows 95/NT client sets the standard for Windows and AS/400 connectivity.

The Enhanced Windows client is a true Windows 3.1 application and takes advantage of many Windows facilities including memory management. Since this Windows client runs entirely under control of Windows, it is easy to install, configure, and use for Windows 3.1 users. Communications installs from within Windows. Thus connecting to an AS/400 system is as easy as clicking a mouse versus having to exit to DOS to manage connectivity. The Enhanced Windows client is also well integrated with Windows utilities such as Program Manager, File Manager, Control Panel and Printer Manager, which allows access to any network resource without leaving the Windows environment. This Enhanced for Windows client has an updated look with 3-dimensional panels that reflect the Windows 3.1 graphical interface.

The Enhanced for Windows 3.1 client includes the following communications support:

- TCP/IP networks
- AnyNet over TCP/IP networks
- In SNA networks - APPC and CPI-C protocol interface
- Twinax

Within the same PC you can run concurrent communications protocols on the same adapter. This is particularly useful when running SNA and TCP/IP or AnyNet and TCP/IP.

Licensed Programs-Networking Products

Management and administration of the Enhanced for Windows 3.1 client includes a core set of installation, configuration and update functions.

The Enhanced for Windows client provides PC5250 as an emulator in addition to Graphical Access. Enhanced for Windows includes Version 4 of PC5250. Additional facilities provided with this version include all of the facilities of PC5250 available with the Windows 95/NT client and offers additional functions:

- Ease-of-use functions such as simplifying AS/400 sign-on with a single entry for the user ID and password

- Ability to select icons from the Toolbar to start Data Transfer function, which uploads and downloads data between PCs and the AS/400 database

- A three-dimensional view of display functions, such as hot spots and pop-up keypads

- A standard PC keyboard layout is shipped as the default. PC-labeled keys such as Enter, Print Screen, and Escape will execute the appropriate PC command.

- Print lines of 198 characters wide and a crisp, legible font

Graphical Access can also be used for 5250 emulation. It transforms OS/400 "green screens" and many other AS/400 Licensed Program Product screens, including OfficeVision/400, into a graphical, point-and-click interface. Users who are accustomed to the PC graphical environment can have a similar graphical interface to all their favorite OS/400 functions. Even command prompting is as simple as the click of a mouse button.

A PC Console feature allows a PC using Client Access/400 to use the AS/400 serial communications port and function as the system console.

Database Access is a graphical, point-and-click method of accessing AS/400 data. Interactively launched from an icon, Database Access uses SQL and the ODBC driver of Client Access. Data is transferred to a viewer; and with macros provided, the data can be directed to Lotus 1-2-3 or Microsoft Excel spreadsheets. Business users (not

Licensed Programs-Networking Products

programmers) can easily get DB2/400 data into their favorite Windows application (such as Microsoft Word, Microsoft Excel, or Lotus 1-2-3), where it can then be easily transformed into a report, a spreadsheet, or a dynamic 3-D chart. This visual graphical interface allows non-technical users to quickly and easily build and execute queries so they can analyze data in timely ways, yet the security and integrity of corporate information is maintained.

Data Transfer (previously known as File Transfer) is another graphical, point-and-click method of selecting data. Designed to both download AS/400 data to the PC and upload PC data to the AS/400, Data Transfer handles several popular PC data types including the latest Excel data format. Data Transfer can be selected from the PC5250 toolbar or from an icon in the Client Access program group. Batch transfers, including timed transfers, can direct the PC output to a printer, display, or file. Stored Client Access or PC Support transfer requests (those with a file extension of TTO, TFR, and RTO) are recognized and executed by Data Transfer.

Additional support for other standard data access methods are continued in this client, including an ODBC driver. An ODBC driver at Version 2 Level 2 provides transparent data access links to popular PC applications, such as, Lotus 1-2-3, Approach, or Microsoft Excel.

The Integrated File System extends this client's access to data significantly beyond Shared Folders. A single view of data stored in AS/400 files is provided by the Integrated File System. Folders/documents, and OS/2 and UNIX-compatible byte-stream files can be easily accessed using the Windows File Manager and Network Drive support.

The data accessed by the Enhanced for Windows 3.1 client uses OS/400's security to provide protection, management of files and databases, and backup/recovery facilities.

VirtualNetwork Print enables Windows users to direct PC-generated output to any AS/400-defined printer in the network.

Licensed Programs-Networking Products

The PC5250 printer emulation service can be used to direct AS/400-managed output to a PC printer connected on SNA/APPC networks or TCP/IP networks using AnyNet.

The rich suite of APIs continues to be the strength of Client Access. Application enablers such as ODBC, Data Queues, and Distributed Program Call can be used over direct TCP/IP and SNA/APPC networks. Other enablers that are written directly to SNA interfaces such as Optimized Remote SQL, CPI-C, and ENHAPPC will continue to function on an SNA/APPC network or through AnyNet for a TCP/IP environment. Multimedia capability with support for Ultimea System Facilities APIs and a graphical interface is provided. This API support enables PC applications to integrate multimedia capability (such as video, image, graphics) and others in an SNA environment.

A migration utility from the Client Access for Windows 3.1 or DOS Extended clients aids in migration to the Enhanced for Windows 3.1 client. The utility will aid in migrating IBM RUMBA/400 profile icons, workstation profiles (with WSF extensions), print profiles (with PRN extensions), and keyboard mappings (files with MAP extensions) to PC5250-recognized files. Additionally it will migrate information from CONFIG.PCS, NSD.INI, and PCS.INI files.

Note: Macros created in RUMBA/400 do not migrate from Client Access for Windows 3.1 or DOS Extended Clients.

All Windows Dynamic Link Library (DLL) APIs provided in PC Support/400 are supported so applications previously written to these APIs will run unchanged. A DOS Reflector function is provided so that users can continue to run any of the PC Support/400 or Client Access/400 DOS API applications using this native Windows client.

PC Tools for Client Access

AS1400 Client Access Programmer Toolkit for Windows 95/NT

A Toolkit ships with the Windows 95/NT client and provides the resources needed to develop effective applications quickly and correctly. The Toolkit provides tested sample programs that developers can modify quickly to meet end user needs. The sample

Licensed Programs-Networking Products

programs and supporting tools help eliminate errors and speed the learning process for application development. The Toolkit contains all the linkages needed for applications to obtain the correct interfaces to Client Access/400 programs. The development of these applications is enhanced with the use of sample programs. By using a common programming technique of copying a sample program as a model for the application program, the chance for programming errors can be reduced. With the use of sample programs, programmers can learn about the interfaces as they develop applications. The models supplied are complete and error free. Programmers select the interfaces needed for the design and copy them into the application.

Programming aids include an online API reference document for advanced application development. This reference document is very useful to application programmers as they become proficient in Client Access/400 application development. An index file guides the programmer to the particular topic of interest. It lists the contents and provides a short description of each item.

Easy access to the contents of the Toolkit is just a query away. User questions and answers are also included to provide the benefit of learning from others.

The Toolkit provides the concepts of NLS enabling developed for AS/400 Client Access, an industry leader in NLS. For worldwide applications, the NLS formats allow applications to be translated into key languages. NLS enabling lets the customer develop the application once. By simply translating the machine-readable instructions (MRI) and package it with the application code, a new product is made available in a worldwide market.

Licensed Programs-Networking Products

PC Tools Folder

Sample programs are provided for the Enhanced Windows 3.1 Client in the PC Tools Folder on the AS/400 system. This folder contains a wide range of utilities, sample programs (including examples of the Client Access APIs, as well as sample Graphical User Interface (GUI) applications). Tools in the PC Tools folder are provided to assist programmers, administrators, and end users.

Enhancements in Version 4 Release 3

Client Access for Windows 95/NT Client

The client for Windows 95/NT has been enhanced to support Windows 98. This client functions on all Windows 98, Windows 95, and Windows NT 4.0 workstation and server operating systems.

In the past the Windows 95/NT Client included a subset version of the 16-bit AFP Workbench product. If users desired the full-function version they had to acquire it. Now the 32-bit, full-function AFP Workbench is included at no additional charge. The Viewer can be used to display information stored in AS/400 spooled files (AFP or SCS). It can also be used to view image files such as those stored in GIF, TIFF, or JPEG formats.

New parameters are provided in the Device Settings panel to send output as text rather than graphics. This reduces the size of printed output files created with the AFP driver and thus will reduce the time required to send large documents across the network for printing.

Network print buffering has been enhanced to improve performance for applications that make small write requests to redirected PC printers. This change is not applicable to the Windows NT operating system.

The NS/Router has been enhanced to support the AutoSync I protocol, developed by Hayes Microcomputer Products, Inc., which enables PCs to dial an AS/400 communications controller through the use of an asynchronous modem that supports the AutoSync I protocol. This allows dial-up SNA connection without

Licensed Programs-Networking Products

the need for an ASCII workstation controller on the AS/400 or SDLC (multiprotocol adapter) on the PC.

The NS/Router has been enhanced to support multiple "dial from" locations when different parameters are required at each location, such as needing to dial '9' for an outside line or not. At connect time the user is prompted for which location to call.

The IBM 5250 Express twinax adapter cards and other selected IBM twinax adapter cards can be used to connect PCs to AS/400 systems using the TCP/IP protocol. A list of the non-Express cards that can function in this environment can be found in Information APAR II11022.

PC5250 has extended its native TCP/IP connectivity support of 5250 printer emulation, workstation device ID designation, and the ability to bypass the AS/400 sign-on screen for the following DBCS national language versions: Traditional Chinese, Simplified Chinese, and Korean.

Graphical Access provides native TCP/IP connectivity support to designate a specific 5250 workstation device ID for display sessions and the ability to bypass the AS/400 sign-on screen.

The AS/400 Connection has been enhanced with new error message, online help, return codes and changes to the Verify function to assist the user in determining what problem may exist when attempting to connect to an AS/400.

The Client Access Software Developers Toolkit, SDK for ActiveX and OLE DB, is included on the family CD-ROM with the Windows 95/NT client. The SDK enables programmers to easily build applications to access AS/400 resources using record level access, SQL, stored procedures, data queues, programs, and CL commands across TCP/IP and SNA/APPC connections to the AS/400. Client/server programs generated using the SDK can be run using the OLE DB for AS/400 provider (run-time driver) included with the Windows 95/NT client.

The Windows 95/NT client provides a Microsoft ODBC Driver Manager enabling applications written to either ODBC 2.0 or ODBC 3.0 to access AS/400 database information over any supported connection. This enables new applications to take advantage of new functions provided by the Microsoft ODBC 3.0

Licensed Programs-Networking Products

specification, yet allows current applications written to the Microsoft ODBC 2.0 specification to continue to execute.

The Windows 95/NT client now provides policy templates for use with the Microsoft System Policy Editor, an integral part of the Microsoft initiative for Zero Administration for Windows (ZAW). This system policy support enables an AS/400 administrator to pick and choose which Client Access functions are available to PC users. Additionally, the administrator can restrict the use of Operations Navigator, control the use of ODBC, and disable users from changing their passwords. These enhancements vastly improve an AS/400 administrator's ability to manage and control PC desktops.

Operations Navigator has many enhancements with OS/400 Version 4 Release 3. A discussion of these enhancements can be found on page 435

Operations Console is a follow-on function to PC Console, which is current enabled through 5250 emulation and connects directly to an AS/400 through a special cable. Operations Console connects to a AS/400 through TCP/IP and improves remote AS/400 system operations and service from a PC as it provides an AS/400 System Console session and a Graphical Control Panel application. All Control Panel functions are supported (except for those for onsite CE use such as power up/down and keylock position changing). This function can be installed when installing the Windows 95/NT client. Operations Console requires OS/400 Version 4 Release 3.

Client Access for Windows 3.1 and Windows for Workgroups 3.11

The following functions, previously available only for SNA/APPC and AnyNet connections, are now available when using a native TCP/IP connection:

Ability to define and run a PC5250 printer emulation session. This enables users to send AS/400 print files to PC printers. PC print files transformed to an AS/400 spool file can be redirected to a PC-attached printer. Use of standard Windows 95 NT print drivers or customization through the PC5250 print menu offers optimal printing flexibility.

Licensed Programs-Networking Products

Ability to designate a specific 5250 workstation device ID for display sessions

Ability to bypass the AS/400 sign-on screen

These capabilities are available with PTFs for PC5250. Refer to Information APAR II11226 for PTF numbers and availability.

IBM AS/400 Client Access Family Version 4 Release 3, 5769-XY1

The AS/400 Client Access Family provides the following clients:

- Client Access Optimized for OS/2 (including OS/2 Warp 4.0)
- Client Access for OS/2
- Client Access for Windows 3.1
- Client Access for DOS with Extended Memory
- Client Access for DOS

The Client Access Family provides SNA connectivity options including Token-Ring and Ethernet LAN, twinaxial, SDLC, X.25, and asynchronous support. TCP/IP network support is provided for the 16-bit Windows client and 32-bit OS/2 client through AnyNet, a protocol independent program that runs APPC over TCP/IP networks. Print and display emulation is provided with RUMBA/400, PC5250 and Workstation Function. Other end user functions are Virtual Network Print, Graphical File Transfer of data between PC and AS/400 database (including a graphical Database Query program) and other graphical interfaces that enhance the usability and productivity of AS/400 programs. APIs such as ODBC drivers, Data Queues, Remote Command and Remote SQL are included in this group of clients.

The Client Access Family provides a competitive suite of applications for the PC environments listed above. Function within this family has been stabilized. *This product will be withdrawn from marketing on February 25, 2000.*

IBM OS/2 Warp Server for AS/400 Version 4 Release 3, 5769-XZ1

In September 1998 it was announced that OS/2 Warp Server for AS/400 has been functionally stabilized and will be withdrawn from marketing on January 31, 2001.

OS/2 Warp Server for AS/400 provides replacement for the previous LAN Server/400 product for file serving and print serving, but it is not intended to be an application server.

LAN Server/400 Servers can migrate to OS/2 Warp Server with only a vary on command.

The Warp Server can provide up to a 300% save/restore performance increase over LAN Server/400, depending on the system environment. There is no keyboard, display, or mouse interface. OS/2 Warp Server for AS/400 runs on any Integrated PC Server that uses Pentium or 486** processors with at least 32M of memory on PowerPC-based models of AS/400.

OS/2 Warp Server includes support for Netbios over TCP/IP. Also added is print capability for LAN-attached printers. OS/2 Warp Server supports the same printers that OS/2 supports except the serial port on legacy Lexmark 4033 hardware.

IBM Wireless Connection for AS/400 Version 4 Release 3, 5798-TBW

IBM Wireless Connection for AS/400 connects AS/400 Wireless LAN barcode scanning devices to AS/400 through a wireless LAN network. This addresses application requirements such as wireless data collection and wireless barcode scanning. Wireless Connection for AS/400 eliminates the need for a separate controller for wireless barcode scanning applications. Functions provided include wireless network management, centralized configuration of radio frequency (RF) data collection devices and direct connection to Ethernet and Token-Ring LANs. IBM Wireless Connection for AS/400 supports the IBM 2480 family of wireless LAN products.

IBM Wireless Connection for AS/400 supports IBM 248x Portable Transaction Computers (PTCs) configured with 5250 emulation and communications technology. This enables the data transmitted by the PTCs to be routed using the Internet Protocol (IP).

Version 4 Release 2

Wireless Connection for AS/400 was enhanced in Version 4 Release 2. New functions include:

- Screen Reformat displays existing applications on the PTC screen.

- Keyboard Remap redefines the PTC keyboard. To enable screen reformatting and keyboard remapping, the system administrator must purchase a utility license from Telxon, Inc.

- You can change the PTC configuration without first ending Wireless Connection for AS/400.

- The system administrator can name PTC device sessions.

Licensed Programs-Networking Products

IBM Licensed Programs–Systems Management Products

IBM SystemView Base for OS/400

SystemView Base for OS/400 is a no-charge feature of OS/400. The program number is not orderable as a licensed program.

SystemView Base for OS/400 provides a single OS/2-based graphical interface, known as the SystemView Launch window, plus additional AS/400 systems management capabilities. The SystemView Launch window provides access to the systems management tasks supported by the various SystemView for OS/400 applications. Other PC applications can be added to the SystemView Launch window to integrate systems management tasks and create a single interface.

Over 150 tasks can be selected from the SystemView Launch window. Other AS/400 CL commands, menus, CL command scripts, and other IBM and non-IBM products can be added to provide a complete enterprise-wide systems management solution.

In addition, SystemView Base for OS/400 provides:

- Session management support which simplifies management of emulation sessions for operators

- Single sign-on support allowing users to enter sign-on information once where they have access to several AS/400 systems

- Support for roving users

The following SystemView for OS/400 applications can be invoked from the SystemView Launch window:

- Performance Tools for AS/400 (5769-PT1)

- Backup Recovery and Media Services (BRMS) for AS/400 (5769-BR1)

- SystemView System Manager for AS/400 (5769-SM1)

Licensed Programs-Systems Management Products

SystemView Managed System Services for AS/400 (5769-MG1)

ADSTAR Distributed Storage Manager for AS/400 (5769-SV3)

Job Scheduler for AS/400 (5769-JS1)

NetView FTP/400 (5798-TBG)

IBM Netfinity Server for AS/400 Version 4 Release 3, 5769-SVA

IBM Netfinity AS/400 Manager for OS/2 Version 4 Release 3, 5769-SVD

IBM Netfinity AS/400 Manager for Windows 95 Version 4 Release 3, 5769-SVE

Netfinity for AS/400 gives tools to move systems management tasks for PCs from end users to a more experienced and skilled system administrator. With these tools, PC clients in an enterprise client/server network can be better managed by enabling:

- Hardware and software inventory

- Remote control of PC clients

- Software distribution

Netfinity for AS/400, working with IBM Netfinity 5.0 and IBM Netfinity Services for AS/400 Version 5.0 (5697-B95), has two components:

- Netfinity Server for AS/400—the server component—installed on the AS/400, and the central site system—5769-SVA

- Netfinity for AS/400 Manager—the manager component—installed on a PC running OS/2 or Windows 95 connected to an AS/400 central server in its workgroup—5769-SVD or 5769-SVE

Hardware and Software Inventory—Netfinity Server for AS/400 contains an inventory server that collects hardware and software inventory information from its managed clients and stores it in the DB2/400 database on the AS/400. This information can be used to

Licensed Programs-Systems Management Products

perform management tasks such as software distribution, distributed monitoring, and remote control.

Remote Control of PC Clients—Remote workstation control allows the system administrator to perform systems management, administration, and application help desk assistance without leaving his or her desk. This allows potential problems to be identified and corrected before they impact the business.

Managing Software Distribution—Netfinity for AS/400 provides a graphical interface for:

- Defining custom reports for querying the hardware and software database

- Running custom reports and displaying the results

- Generating a node list based on results of the report for distributing software in an enterprise based on those results

ADSTAR Distributed Storage Manager for AS/400 Version 3 Release 1, 5769-SV3

ADSTAR Distributed Storage Manager (ADSM) for AS/400 Version 3 Release 1 is supported on OS/400 Version 4 Release 3.

ADSTAR Distributed Storage Manager (ADSM) for AS/400 is a member of the SystemView Family. It provides an enterprise-wide backup and archive facility for a wide variety of both LAN file-servers and individual workstations by allowing the AS/400 to act as the backup and recovery server. It provides operational flexibility by allowing users to define their backup/archive needs and provides productivity gains by automating the system operations. ADSM is designed to:

- Protect data stored on workstations and LAN file servers

- Reduce workstation and LAN administrator time

- Reduce the necessity for additional workstation storage devices

- Access data for local or remote OS/2 Version 2 applications

Licensed Programs-Systems Management Products

ADSTAR Distributed Storage Manager for AS/400 handles data backup and archiving for a wide array of workstations and file servers including clients from different vendors:

- Lotus Notes
- Apple Macintosh PowerPC
- Macintosh System 6.02 or System 7
- Hewlett Packard HP-UX for System 700 and System 800
- IBM AIX for RISC System/6000
- IBM or MS-DOS**
- IBM OS/2
- Microsoft Windows
- Windows NT
- Windows 95
- Novell NetWare
- Sun Microsystems SunOS, SPARC**/Solaris
- OpenEdition MVX
- Bull DPX/2
- Digital UNIX
- DEC** ULTRIX for DECstation
- SCO UNIX 386, Open Desktop

Administrator usability has been improved with an updated GUI for OS/2, AIX, HP-UX, and Sun Microsystem Sun OS or Solaris administrative clients and an automated scheduling capability for ADSM server and client commands.

ADSM allows workstation users to backup or archive files to an ADSM server, and also enables the implementation of disaster recovery solutions for LANs, workstation disks, and diskettes.

ADSM servers store data within system managed, administrator controlled ADSM storage hierarchies. Hierarchical Storage Management for the AIX client platform has been included as an optional feature that provides automated migrate and recall support for local file systems. The ADSM administrator can define backup schedules, levels of administration, and grouping of file servers or workstations with common requirements.

The ADSM server supports automated policies to store data on AS/400 system disk or directly to supported tape devices. Once

Licensed Programs-Systems Management Products

stored on the system disk, ADSM data can be automatically migrated to supported tape devices.

Stored ADSM data can be retrieved by the supported file servers or individual workstations when needed. Optical devices are not supported in this release.

The ADSM server supports many communication protocols, including TCP/IP and APPC (LU 6.2). The communications capability also supports the OS/400 Internetwork Packet Exchange (IPX) communications.

Enhancements in Version 3 Release 1

There are many enhancements in ADSM Version 3.1 to handle the explosive growth in the client/server distributed environment. Among those enhancements are:

Version 3.2 backs up data from any ADSM Version 2 client. In addition, ADSM Version 3.1 backup-archive clients are available for the following platforms:

- IBM AIX
- Apple Macintosh
- Data General LTNIX
- Digital UNIX
- Hewlett-Packard HP-UX
- NCR UNIX SVR4
- NEC EWS-UJN
- Novell NetWare
- IBM OS/2
- SCO
- Sequent PTX
- Siemens Nixdorf SINIX Reliant
- Silicon Graphics IRIX
- Sun Microsystems Solaris
- Windows 32-bit (Windows NT, Windows 95, and Windows 98)
- Windows 32-bit DEC Alpha

Licensed Programs-Systems Management Products

An AS/400 Application client for ADSM is available as part of Backup and Recovery Media Services (BRMS) for the AS/400. For more information, see page 525.

There are a several enhancements in ADSM Version 3.1 related to the control/management of ADSM clients. Some of those enhancements are:

- The ability to support centralized logging of operations information allows ADSM client and server events to be made available from a central point.
- Most client options can be stored at the server, providing additional administrator control for setting options to relieve clients of this operational requirement.
- An optional Server-to-Server Communication feature is available to support enterprises deploying multiple ADSM servers. This allows the movement of information between storage pools on multiple ADSM servers.
- An SQL and ODBC interface to the ADSM database and real-time ADSM server information is provided. This allows the user to build queries that satisfy their business requirements in a format to suit their specific needs.

ADSM Version 3.1 provides enhancements to provide substantially improved performance over prior versions of ADSM. Due to the increase in around-the-clock operations and the high growth of networked data, backup and restore throughput has become a vital concern. Some of the enhancements are:

- Larger buffers in and between selected clients and the server are implemented. ADSM groups multiple small files together as a single object on the server, reducing the number of data pointers and storage pool entries. This is transparent to the end user and does not prevent the retrieval of individual files.
- There is a new algorithm for the restore function which enhances the restoration of directory trees to consume less client resources.
- ADSM Version 3.1 provides new fault-tolerant features that allow intelligent resumption of interrupted file system restores.

Licensed Programs-Systems Management Products

ADSM Version 3.1 features a new interface that masks the complexity of the network environment and enables faster navigation and movement through the screens.

- An initial client GUI panel provides an easy, intuitive way of selecting the primary functions of ADSM
- The main backup, archive, restore, and retrieve panels are re-designed to allow more flexibility in making choices.
- Selection techniques allow an entire directory tree to be easily selected for ADSM operations
- Support for collapsible directory trees to eliminate excessive scrolling

A Disaster Recovery Manager function has been added to ADSM Version 3.1 to assist with the development and maintenance of a disaster recovery plan for an ADSM server. Some of the functions provided are:

- Automated creation of an auditable, up-to-date disaster recovery plan using information supplied in a recovery plan file
- Support is provided for off-site recovery media management to assist in the movement of storage pool volumes to and from an off-site storage location
- An inventory of machine information is maintained about the server and its associated clients
- Automatic generation of the commands required to perform server database recovery and primary storage pool recovery
- Query capabilities are provided to determine what client machines are lost and need to be recovered

IBM Backup Recovery and Media Services for AS/400 Version 4 Release 3, 5769-BR1

The IBM Backup Recovery and Media Services for AS/400 (BRMS/400) is a licensed program offering. A number of enhancements have been added including the automatic recall of archived database files from tape devices to Direct Access Storage

Licensed Programs-Systems Management Products

Devices (DASD) when required, and fast search on IBM 3480, 3490, 3490E, 3590, and 3570 tape drives.

BRMS/400 provides AS/400 with support for policy-oriented setup and execution of archive, backup, recovery and other removable-media-related operations. BRMS/400 uses a consistent set of intuitive concepts and operations. The user interface is menu-driven, with list-supported windows and cursor-sensitive help consistent with OS/400. BRMS/400 facilitates centralized management of media by maintaining a consistent view of removable media, its contents, location and availability across multiple AS/400 systems. Available tapes are eligible for use by any participating AS/400 providing a common scratch pool. When a tape is used, that usage is known by all participating AS/400s.

The *automatic database file recall (Dynamic Retrieval)* facility enables archived files to be restored automatically when they are opened by a program. This means that the user does not need to be concerned about the data being accessed whether it is on disk or tape. *Dynamic Retrieval* can be implemented without any changes to application code, which enables users to archive hierarchical storage management with ease of implementation. This function, combined with tape automation, provides for unattended operations and can help save DASD space.

The *fast search* facility for files on tape, improves the tape performance by positioning the tape to the start block rather than having to ship a file at a time.

The *archive, backup and recovery* facilities enable the customer to establish how these operations are to be performed. Media, whether used for backup or other operations, can be managed and tracked in various ways (by volume ID, type, content, location, container, quality, and so on).

Operation planning facilities assist the customer in anticipating resources (devices, media, operational steps, and so on). Operations are guided, making them less error-prone.

Policy support enables the customer to define a hierarchical system of defaults which makes setup fast, easy and consistent.

Licensed Programs-Systems Management Products

BRMS/400 provides interfaces that enable the customer to use it with other facilities that provide scheduling, distribution and verification services.

Backup Recovery and Media Services for AS/400 supports also backup, recovery and archive of Integrated File System (IFS) data. This allows users to specify directories on their PCs and other systems as well as on their AS/400. BRMS/400 can recover from media-related errors while using tape automation improving unattended operations. Hot site recovery allows the replication of media content information on one or more systems in a BRMS/400 shared inventory network enabling those systems to act as data recovery centers.

Enhancements for Version 4 Release 3

BRMS/400 has two major enhancements in Version 4 Release 3. They are:

Support is provided in BRMS/400 for Hierarchical Storage Management (HSM). HSM provides the ability to reduce storage costs by storing objects that are infrequently accessed on less costly storage media. Some of the functions provided by HSM are:

- Automatic, transparent management of data across a storage hierarchy consisting of high-performance disk, compressed disk, tape, and ADSM server storage based on user defined policies.
- Migration of user libraries, folders, and spooled files between ASPs
- Archival of database files, database file members, or documents
- Migration of stream files between various storage media
- Transparent access to migrated or archived data from applications
- Automatic movement of data based on system policies

Licensed Programs-Systems Management Products

- Support for tape automation and ADSM server storage to provide unattended operations

Support is provided in BRMS/400 for the AS/400 Application Client for ADSM. This allows BRMS to backup or archive low-volume AS/400 user data on any ADSM server, including another AS/400, RS/6000, S/390, or 3466 Network Storage Manager. BRMS can also be used on multiple AS/400 systems with shared inventory support which allows objects saved from one system onto ADSM server storage to be restored to another AS/400 system managed by the same ADSM server.

IBM Job Scheduler for AS/400 Version 4 Release 2, 5769-JS1

IBM Job Scheduler for AS/400, part of the IBM SystemView family of offerings, facilitates unattended operations, which can reduce cost of ownership and help improve efficiency and accuracy in managing batch applications. It provides a highly comprehensive, full-function job scheduler and report distribution system on the AS/400, enhanced with graphical user interface capabilities.

Leading-edge scheduling functions include:

- Automation
- Batch Job Stream Management
- Forward Planning and Production Forecasting
- Full Calendaring of Operations
- Dependency Scheduling

Overall this allows any batch-capable function to be scheduled on a single AS/400 or across a network, allowing complete user control of how, when, and where a job is submitted.

Licensed Programs-Systems Management Products

Version 4 Release 2

Job Scheduler is enhanced in Version 4 Release 2.

Dependency Scheduling. Allows jobs to be started based on a variety of criteria such as the completion of a dependant job.

Jobs can be copied to other AS/400 systems

A calendar can be used in conjunction with most schedule codes and date manipulation can be accomplished with the use of a formula

Sundry other enhancements give added flexibility in terms of job dependencies and report distribution

IBM SystemView Managed System Services for AS/400 Version 4 Release 2, 5769-MG1

The SystemView Managed System Services for AS/400 (MSS/400) licensed program is part of SystemView Operation Center/400, which includes SystemView System Manager for OS/400. MSS/400 enables an AS/400 to be managed from a central site running either:

S/390 NetView Distribution Manager for MVS (Release 5 or later) for MVS-based networks

SystemView System Manager for AS/400 (Version 3 Release 1 or later) for AS/400-based networks

The central site defines, schedules, and tracks software distribution (change management) requests sent to AS/400 with Managed System Services for AS/400 installed. These change management requests include sending receiving, and deleting AS/400 files, programs and other objects (libraries, save files, message files, documents, folders, PTFs, and so on).

AS/400 objects can be sent directly to or received from AS/400 libraries or through the local AS/400 distribution repository.

Running programs, installing products, applying PTFs and re-IPLing can be scheduled to run automatically under MSS/400 control.

Licensed Programs-Systems Management Products

MSS/400 forwards the results of all change requests to the central site for tracking.

The capability for the central site to define, schedule and run these change requests one time or repetitively significantly enhances unattended operation of remote AS/400s. While MSS/400, together with central site control and tracking, provides a significant set of automated operations, it does not provide real time monitoring and automated action for the entire AS/400 operating environment.

MSS/400 also supports unscheduled running of AS/400 commands issued by the central site, without having to first sign on to the AS/400 with MSS/400. Printed output from these commands can optionally be returned to the central site that issued the command.

Version 4 Release 2

Using OS/400 Version 4 Release 2 or later and system manager enhancements for automated tracking and management of corequisite PTFs within a product, Managed System Services reduces the risks and complexities of managing such relationships.

IBM Performance Tools for AS/400 Version 4 Release 2, 5769-PT1

Performance Tools for AS/400 is a program product that provides a set of reporting, analysis and modelling functions to assist an AS/400 administrator to manage the performance of the system. It provides printed and on-line reports. These can be in graphic or tabular form. A Performance Advisor function assists the user in analyzing system performance and provides recommendations. Performance Tools for AS/400, through its modelling facility, can be used to help predict probable system performance before changes are made.

Performance Tools for AS/400 makes use of an easy-to-use menu interface. From this menu interface, users can initiate requests for performance reports, and enter the results into a capacity planning session.

Licensed Programs-Systems Management Products

The Performance Advisor component of Performance Tools for AS/400, makes recommendations to improve system performance and can implement tuning recommendations, if specified by the user. The knowledge-based Advisor also provides detailed explanations of its analysis, of great benefit to novice and experienced users.

A capacity-planning product, the *BEST/1-400 Capacity Planner* written by BGS Systems, is integrated into Performance Tools for AS/400.

Performance Tools for AS/400 is divided into three elements: Enabler, Manager and Agent. The Enabler is the base code onto which you must add Manager **or** Agent. Adding Manager to the Enabler gives full Performance Tools functionality as described above. Adding Agent to the Enabler gives the equivalent of Performance Tools Subset functionality for those customers who do not require all the tools contained with Manager and Enabler. Key functions include Collect Performance Data, Delete/Copy/Convert Data, Display Performance Data, Work with Historical Data and the Performance Advisor are included in the Agent. Functions not contained are Select Status Type, Performance Reports, Capacity Planning, Programmer Performance Utilities, System Activity and Performance Graphics. Manager and Agent are mutually exclusive.

Performance Tools for AS/400 includes the Performance Explorer which is the primary detailed analysis tool for AS/400 based on PowerPC technology.

IBM EDMSuite OnDemand for AS/400 Version 4 Release 3, 5769-RD1

IBM EDMSuite OnDemand for AS/400 is renamed from Report/Data Archive and Retrieval System (R/DARS) for AS/400 (5733-218, 5763-RD1, 5716-RD1). The new name reflects its strong affinity within IBM's OnDemand family of Enterprise Archive Solutions, which offers archive solutions across several IBM hardware platforms. OnDemand for AS/400 offers several features to assist in information management. These features can be ordered separately.

Licensed Programs-Systems Management Products

Spool File Archive--provides rich capture and archive management functions for large volumes of spooled print data and retrieval capability on demand

Record Archive--allows existing applications to be enhanced to store and retrieve selected data records from optical storage for users who require occasional access to historical data

Object Archive--allows efficient storage of versions or "generations" of AS/400 objects on tape or optical storage

AnyStore--allows archive and retrieval of binary large objects (BLOBs) such as PC files and small scanned images. AnyStore requires that the spool file archive feature also be ordered

OnDemand features can be ordered separately with the exception of AnyStore, which requires the Spool File Archive feature:

Spool File Archive

Organizations can cost-effectively store large volumes of spooled print data from current applications on disk, optical, or tape storage media. Users can easily retrieve selected pages or documents on demand.

Powerful processing and management of spooled print data provides fast, automated capture, auto indexing, immediate compression, and unattended storage migration.

Users can retrieve individual segments such as invoices or statements within minutes after current applications generate reports

Multiple document types (including groups of related reports) and multiple data types (including AFPDS) can be processed and indexed automatically using pre-defined criteria

Compressing reports from 1/2 to 1/17th of the original size immediately increases effective magnetic storage space

Magnetic disk storage becomes affordable for extended high-access periods before compressed reports are automatically migrated to optical or tape. Migration to optical libraries takes less time using OnDemand compression and multiple report

Licensed Programs-Systems Management Products

management cycles that allow writing to multiple drives at the same time

OnDemand for AS/400 report definition is fast and easy with the Graphical Report Definition tool, included as part of Spool File Archive. The graphical report definition tool enables report administrators to easily define reports, using a visual mouse-driven point-and-click approach. Using the tool, AS/400 spooled files are selected directly from the workstation. Reports are then defined to OnDemand by highlighting the location of data such as key fields and report date. Other characteristics of the report are also defined using the tool, such as the report's printer file and collection name. The graphical report definition tool is an alternative to the 5250-based "Work with Report Definition" screens, which are available to administrators who do not have access to a programmable workstation. The graphical report definition tool reduces the time required to get reports into production for end-users and requires less time to learn report definition.

The graphical report definition tool runs on an OS/2 or Windows 95 workstation and requires Client Access.

Spool File Archive APIs are available to add advanced integration function to application programs. The APIs include:

- Retrieve a list of archived document segments that match specific search criteria
- Retrieve specific archived document segments from the document hit-list
- Retrieve a set of archived index records
- Retrieve a specific set of archived resources

Reports and documents can include electronic "sticky" notes with the document annotation feature of Spool File Archive. Annotations allow end-users to attach notes to individual archived documents or segments. Viewing of annotations can be limited to the user who created the note or made available to all OnDemand users. Annotations are stored separately from the archived document, maintaining the integrity of the original spooled file.

Licensed Programs-Systems Management Products

OnDemand provides support for the Integrated File System (IFS). Spool File Archive reports and Object Archive objects which have been archived to disk are stored using the Integrated File System. Use of Integrated File Systems can provide faster data retrieval times and provides an easier way to save OnDemand data while excluding other data stored in Integrated File Systems files or folders.

New security enhancements for OnDemand include tighter report data security, group profile for administration security, and document selection lists that shows only authorized reports.

Record Archive

Organizations can use IBM's 3995 optical libraries to cost-effectively store aged data records, such as historical sales or customer data. Users can continue to use existing applications, which are functionally rich and familiar, with the added capability of retrieving historical data from optical files and more current data from magnetic disk. Record Archive maximizes the savings using optical (instead of magnetic) media for long data retention periods and offers faster retrieval than tape archival. Although performance for optical retrieval is good, it should not be expected to be a replacement for quick retrieval from disk.

OnDemand Record Archive is designed to minimize the magnetic storage space required to keep track of these data records on optical.

For quicker access, only pointers to the data are stored on magnetic disk
Actual data is stored on optical

Using OnDemand Record Archive's Application Programming Interfaces (APIs), existing applications can be enhanced to store and retrieve records to and from optical files. Programmers can avoid dealing with the internal details of creating, reading, writing, and securing data on optical.

Licensed Programs-Systems Management Products

Object Archive

Organizations can compress and archive a variety of AS/400 objects such as program source files, database files, or entire application libraries on tape or optical media. A common use is to store monthly versions of purged detail records such as general ledger transactions. Later, an individual version (called a "generation") can easily be restored from optical or tape for research as needed.

Objects are compressed with more efficient disk space utilization than with standard OS/400 save commands

Multiple generations of archived objects, such as monthly or annual detail files, can be managed. Users simply specify which generation is to be retrieved and let OnDemand manage the multiple copies

AnyStore

AnyStore extends the archive and storage management capabilities of Spool File Archive to binary large objects (BLOBs). For example, PC files such as spreadsheets, technical images (MRIs or x-rays), and small scanned images (remittance slips, insurance cards) can be archived with AnyStore. AnyStore is a programmer's toolkit of APIs, which can be used to create an archive/retrieval application or to enhance an existing application with archive functions.

The application passes the index data and BLOB to OnDemand Spool File Archive to manage the data. OnDemand archives and manages the data regardless of content. Your application does the segmentation and extraction of indices. OnDemand provides storage, migration, and retrieval capabilities to and from disk, optical, or tape media.

Applications include adding AnyStore to an existing bank item scanning and OCR application to pass bank item indices and images to OnDemand Spool File Archive for management and subsequent retrieval. AnyStore requires the Spool File Archive feature of OnDemand for AS/400 as a prerequisite.

Licensed Programs-Systems Management Products

Enhancements in Version 4 Release 3

In OS/400 Version 4 Release 3, OnDemand includes a client for Windows 3.1, Windows 95, Windows NT, and OS/2 that delivers specialized functions for report and document retrieval.

Spool File Archive has also been enhanced to support AFP index fields which can be defined in Data Description Specifications (DDS).

IBM SystemView System Manager for AS/400 Version 4 Release 3, 5769-SM1

The SystemView System Manager for AS/400 (SM/400) licensed program is part of the integrated offering Operations Control Center/400, which includes MSS/400 (IBM SystemView Managed System Services for AS/400). SM/400 integrates with Simple Network Management Protocol (SNMP) management products, such as NetView for AIX. An SNMP manager can monitor for alerts, obtain system information, and execute remote commands if the AS/400 system is to be managed from an SNMP platform. The change management functions support the Integrated File System. SystemView System Manager for OS/400 provides central site control for:

Remote AS/400 problem management

This includes remote problems analysis, comparing to existing available PTFs, automatic distribution of selected PTFs, and a single connection to IBM electronic support for new problem reporting, to IBM or ISV for processing.

Central site packaging of Independent Software Vendor (ISV) applications for AS/400 Licensed Program management support

This enables ISV applications to receive the same system support as IBM licensed programs.

Central site distribution and change management support for remote AS/400 systems using MSS/400, remote RISC/6000 systems using NetView DM/6000, remote PS/2 systems using NetView DM/2 and remote Novell NetWare Servers using NVDM for NetWare.

Licensed Programs-Systems Management Products

SM/400 permits the central site AS/400 to define, schedule, and track software distribution (change management) requests sent to AS/400s with Managed System Services/400, NetView DM/2, or NetView DM/6000 installed or Novell NetWare. These change management requests include sending, receiving, and deleting files, programs, other AS/400 objects (libraries, save files, message files, documents, folders, PTFs), and non-AS/400 (OS/2 and RISC/6000) files, programs, software.

AS/400 objects can be sent directly to or received from AS/400 libraries or through the local AS/400 distribution repository. Non-AS/400 objects can be received into, stored, and distributed from the AS/400 distribution directory.

Running programs, installing software, applying PTFs and re-IPLing can be scheduled to run automatically on the remote system. The remote system running MSS/400, NetView DM/2, NetView DM/6000 or Novell NetWare forwards the results of all change requests to the central site SM/400 system for tracking.

The capability for the central site AS/400 to define, schedule, run these change requests one time or repetitively and track their status significantly enhances unattended operation of the remote systems supported by SM/400.

Sending of AS/400 commands to remote AS/400s using MSS/400 without signing on.

This support is intended for unplanned operations to be performed on one or more remote AS/400s, such as deleting a particular file or library that has been found to no longer be in use. The support is generally equivalent to the NetView Remote Operations Manager MVS support and works to either NetView Remote Operations Agent/400 or MSS/400.

SystemView System Manager for AS/400 includes a graphical interface for a network operator to graphically monitor and manage a network of systems. The change management functions provide support for the Integrated PC Server.

Licensed Programs-Systems Management Products

Enhancements in Version 4 Release 3

The central site system no longer has to have all software at a remote site installed in order to service the remote site. This allows savings on DASD and time at the central site.

IBM Licensed Programs–Application Development Products

IBM AS/400 BASIC

BASIC is not offered as a Licensed Program under OS/400 Version 4 Release 2 or later. Customers are encouraged to migrate to ILE languages to take advantage of their compile technology and enriched functions. There is no BASIC compiler available after OS/400 Version 4 Release 1. The only support for BASIC is run-time support under OS/400 for programs developed using the BASIC compiler on earlier releases of OS/400.

IBM AS/400 Pascal

Pascal is not offered as a Licensed Program under OS/400 Version 4 Release 2 or later. Customers are encouraged to migrate to ILE languages to take advantage of their compile technology and enriched functions. There is no Pascal compiler available after OS/400 Version 4 Release 1. The only support for Pascal is run-time support under OS/400 for programs developed using the Pascal compiler on earlier releases of OS/400.

IBM AS/400 PL/I

AS/400 PL/I is a general purpose programming language suited for use in commercial, scientific, and system programming application areas.

- Support of imbedded SQL statements

- Procedural-based language that supports floating point, pointers, bit and string manipulation, picture editing, and error trapping

- Interactive syntax checking

- Full-screen processing for formatting display screens

- Based on ANS X3.74-1981 PL/I General Purpose Subset Standard

Licensed Programs-Application Development Products

PL/I is not offered as a Licensed Program under OS/400 Version 4 Release 2 or later. Customers are encouraged to migrate to ILE Languages to take advantage of their compile technology and enriched functions. However as an interim, PRPQ P10131 is available which offers a PL/I compile for OS/400 Version 4 Release 3. There is also run-time support in OS/400 Version 4 Release 3 for PL/I programs.

System/38 Migration Aid, 5714-MG1

System/38 Migration Aid provides facilities and functions to select and migrate System/38 objects to AS/400. System/38 programs can be transported in object format and re-encapsulated automatically on AS/400.

For further details, see *Migration from System/38 Planning Guide*, GC21-9624.

IBM VisualAge C++ for AS/400 Version 3 Release 6, 5716-CX4; Version 3 Release 7, 5716-CX5

VisualAge C++ for AS/400 provides a comprehensive application development environment for one of the most commonly used object-oriented programming languages C++. It has VisualAge C++ for OS/2 (5716-CX4) or VisualAge C++ for Windows 95 and Windows NT (5716-CX5) as its workstation development front end to generate executable programs that can run on OS/2, Windows 95 or NT workstations and the AS/400. This provides a similar look and feel as VisualAge C++ and has the flexibility to select a runtime environment (OS/2, Windows 95, Windows NT, or AS/400), based on the requirements of the application.

Customers must purchase their own PC shrink-wrap product (VisualAge for C++ for Windows V3.5) as a prerequisite to 5716-CX5. This is because the majority of the workstation tools are packaged externally to the client components.

IBM VisualAge C++ offers an extensive set of integrated programming tools including:

Licensed Programs-Application Development Products

Visual Application Builder:

An object-oriented visual application development environment to rapidly prototype and build OS/2 Presentation Manager applications

Data Access Class Builder:

To quickly bring existing database data into the object world by visually mapping a DB2/2 table into class objects with a single click

VisualAge C++ Editor:

A highly customizable and extensible editor which as well as normal editor functions also provides language sensitive support for C++

IBM Open Class Library:

A comprehensive set of building blocks for OS/2, Windows, and AS/400 environment consisting of:

Standard Class Library: lets you manipulate complex numbers and also lets you easily write C++ input and output statements

Collection Class Library: a complete set of abstract data types such as trees, stacks, queues and link lists

User Interface Class Library: includes extensive Presentation Managers (PM) control support so you can easily build PM applications

Application Support Class Library: includes classes such as buffers and string classes for single-byte and multibyte character set objects, date and time classes, error classes to retrieve error information and text and trace class for module tracing

Access Class Library: provides access to OS/400 resources such as OS/400 database, data queues, user spaces, commands and programs commonly used to construct client/server applications for an AS/400 and a PC

Binary Coded Decimal Class Library: corresponds to the packed decimal type on the AS/400 and allows you to represent numerical quantities accurately

Browser:

Licensed Programs-Application Development Products

A new PM static analysis tool that lets you look at C++ source code in many different ways.

Highly Optimized C++ Compilers:

C/C++ OS/2 Compiler or C/C++ Windows Compiler: generates industry standard C and C++ code allowing applications the full potential of OS/2 and Windows.

C++ AS/400 Cooperative Compiler: takes C++ source code on OS/2, Windows 95 or NT and creates executable code that runs on the AS/400.

Performance Execution Trace Analyzer:

A unique analyzer enables you to time and tune your OS/2 and Windows applications, analyze program hangs and deadlocks, view multithread interactions and improve program code.

Debuggers:

Source-Level Debugger: helps you analyze your OS/2 and Windows C++ program by displaying the code using PM services.

AS/400 C++ Cooperative Debugger: looks, feels and functions like an OS/2 debugger, cooperative with the AS/400 host.

AS/400 ILE System Debugger: allows you to debug ILE applications from a nonprogrammable terminal.

Disconnected Mode:

Allows you to edit, compile and browse C++ code without being connected to an AS/400 - a fast way to get compile time bugs out of source.

Workframe:

Provides a fully configurable and open integration environment allowing you to mix and match your favorite tools with ones from VisualAge C++ to create a personal development environment.

All functions are available in DBCS environment.

Licensed Programs-Application Development Products

In addition to providing integrated tools, VisualAge C++ for AS/400 enables future growth, increases productivity and protects investment in data and software applications.

IBM VisualGen Host Services for OS/400 Version 3 Release 6, 5716-VG1

VisualGen is an OS/2 based application development solution. It is part of the AS/400 Client Series and provides the capability to define, test, and generate in the same development environment, graphical user interface (GUI) client applications, server applications and single-system applications.

The VisualGen 1.1 family of products provides execution support for OS/400 applications generated using VisualGen OS/400 Application Generator Version 1.1 with VisualGen Host Services for OS/400.

By providing single-system definition for these applications, there are significant productivity gains over other client/server development tools. Developers can define an application where the business logic is divided between client and server applications.

VisualGen allows faster development of application solutions allowing faster responses to changing business needs.

System/36 Migration Aid, 5727-MG1

System/36 Migration Aid provides the facilities on System/36 to analyze data, libraries, files and programs prior to saving them for migration to AS/400. Files and data providing system-related information, for example, security, configuration information, and document folders, may also be migrated.

Once saved using a choice of media, facilities are provided on AS/400 to load and reformat the data as required. These facilities are part of OS/400.

Licensed Programs-Application Development Products

The migration process is clearly defined by a menu-driven interface. For further details, see *Migration from System/36 Planning Guide*, GC21-9623.

IBM Integrated Language Environment COBOL for AS/400 Version 4 Release 2, 5769-CB1

ILE COBOL for AS/400 is a programming language that is used in the processing of business problems. COBOL can be used to manipulate DB2 for OS/400 database files in a relatively simple way. COBOL uses English-like syntax which assists the programmer in generating self-documenting, structured programming constructs.

Through ANSI-85 high level functions of ILE COBOL for AS/400, such as nested source programs, it is easier to port code to AS/400 from other platforms. Programmer productivity is increased with ILE COBOL for AS/400, through its extensive database and workstation support, static, interlanguage calls, interactive syntax checking, debug facilities, and a full complement of compile-time error diagnostics.

ILE COBOL for AS/400 consists of the following COBOL components:

- ILE COBOL for AS/400
- COBOL/400
- IBM System/36-Compatible COBOL
- IBM System/38-Compatible COBOL
- COBOL/400 Previous Release Compiler
- System/36-Compatible COBOL Previous Release Compiler

COBOL/400 provides American National Standards (ANS) COBOL X3.23-1985, Intermediate Level function. COBOL/400 also conforms to the 1986 FIPS COBOL Language Standard and the IBM C-S3-9025-02 standard.

COBOL/400 supports imbedded SQL statements and interactive communication facilities functions.

Interactive syntax checking; provided by the Source Entry Utility (SEU) component of the AS/400 Application Development Tools. Full-screen processing for formatting display screens.

Licensed Programs-Application Development Products

System/36 and System/38 COBOL source programs may be created on AS/400 using SEU. These can be compiled on the System/36 and on the System/38 to generate executable object code.

The AS/400 System/36-Compatible COBOL and AS/400 System/38-Compatible COBOL compiler options of the COBOL/400 accept and compile COBOL programs written in accordance with the ANS COBOL X3.23-1974 standard.

The following enhancements are included in ILE COBOL for AS/400:

Support for Double-Byte Character Set (DBCS)

ILE COBOL for AS/400 will allow you to define and work with a new double-byte character type (that is PIC G(nn)). It also allows you to work with DBCS literals. This DBCS support improves interlanguage communications in an ILE environment.

Licensed Programs-Application Development Products

Support for Four-Digit Years

The ACCEPT statement accepts a four-digit year dates in support of the Year 2000

Support for Floating Point Data

Users can use floating-point formats to represent numeric data in a COBOL program

Additional Compiler Support

Enables users to collect statistics to aid performance analysis on applications

Support of Library Qualified Calls

Allows a user to associate programs referenced in the COBOL program with a specific library

Version 4 Release 2

The following enhancements are available in ILE COBOL Version 4 Release 2:

User-defined data types

The TYPEDEF clause to enable users to define data types. These serve as templates of defined data description entries that can be applied to other data description entries using the TYPE clause

Date, time, and timestamp data type support

Class date-time data item classes including date, time, and timestamp categories. These are declared with a FORMAT clause of the Data Description Entry

Program Profiling support

The PRFDTA parameter on the CRTCBMOD and CRTBNDCBL commands and PROCESS statement, to allow a program to be profiled for optimization

Licensed Programs-Application Development Products

Null-values support

Null-values support to allow the manipulation of null values in database records

Locale support

Culturally specific locales can be defined in the SPECIAL-NAMES paragraph or a PICTURE entry. These allow locale-sensitive categories to be manipulated.

IBM Application Development ToolSet Client Server for AS/400 Version 4 Release 2, 5769-CL3

Application Development ToolSet Client Server (ADTS CS) helps facilitate application development for both host and client. ADTS CS consists of two components:

Cooperative Development Environment/400 (CODE/400) for Windows and OS/2

This set of tools provides edit, compile, and debug facilities for AS/400 applications. With CODE/400, you develop programs on your workstation and then compile and run them on the AS/400 system.

VisualAge for RPG for Windows and OS/2

This set of client/server tools brings new facilities to AS/400 application developers. It contains a powerful GUI builder with an integrated RPG development and execution environment. VisualAge for RPG provides a conversion function to assist developers in updating their existing applications by converting AS/400 user interface objects to a GUI. Resulting VisualAge for RPG programs run on Windows or OS/2 workstations. VisualAge for RPG feature also provides communication services to access the AS/400 database and other AS/400 programs.

Licensed Programs-Application Development Products

With ADTS CS you have a choice of operating systems:

OS/2
Windows 95 or Windows NT 4.0

When you order ADTS CS, you get both the OS/2 and Windows clients.

Version 4 Release 2

The following ADTS CS enhancements are available with Version 4 Release 2.

CODE/400

Edit/compile

- Improved edit and compile support for Java
- ILE C Reference help to the OS/400 Version 4 Release 2 release level
- EXTRAS macros included in the product base for easier access: RPGINC.LX, CBLINC.LX, CINC.LX, FIELDS.LX, and SEUPRINT.LX

CODE Project Organizer

- Java actions
- Column management in the File list to allow users to customize the columns in the File list to obtain a tailored presentation
- Import and export actions
- GUI actions for some AS/400 commands: CRTDUPOBJ, CRTLIB, ADDLIB, ADDPFM, CRTSRCPF, CPYSRCF, and CPYLIB

CODE Designer

CODE Designer replaces DSU, or the DDS Design Utility. The CODE Designer provides a WYSIWYG design tool for DDS screens and reports. It sports a completely reworked modern Windows interface.

Licensed Programs-Application Development Products

CoOperative Debugger

The CoOperative Debugger supports applications written in Java and AS/400 native threads. All the existing debug functions in the CoOperative Debugger apply to Java and native threads with the exception of Watch which is not available for Java.

Communication

Native TCP/IP is supported

VisualAge for RPG

Parts enhancements

- Subfile
- Canvas
- Multi-Line Entry
- Window
- Graph (new)
- Calendar (new)
- Component Reference
- Container
- Entry field
- Combination Box and List Box
- Image
- Component
- Push button
- Graphic Push button

GUI Designer

- Batch compile. A command, in conjunction with parameters, can be used to compile a sequence of projects without having to bring up the GUI Designer.
- TCP/IP support. TCP/IP is integrated into the communication layer. Users can choose either a SNA or TCP/IP connection for the project.
- Windows look and feel. All settings notebooks and information area conform to Windows standards. A resolution rectangle menu option can be selected to help the user to determine if the window is displayed correctly on certain resolutions.

Licensed Programs-Application Development Products

- Help can be created with the editor of choice. With this option, the user can build RTF help for the application.
- Plug-in support. With this support, users can create their own tools that can be 'plugged-in' to the GUI designer. This support also allows the user to create menu options for the GUI designer that invokes user-written routines, as well as allowing the user to interface with the LPEX editor.
- Auto save. This option allows the user to specify a time period after which their project is automatically saved.
- Recover projects after abnormal termination. When used in conjunction with the Auto save feature, allows the user to recover a project if the GUI designer ends abnormally.
- Cache directory can be specified in the build options. Users can specify a directory name for cached file descriptions to be stored.
- Merge projects. Users can merge parts and code from an existing project into the current project.
- Update field reference. This enhanced feature will check and update the reference field with the changed information during batch builds.
- Define page and user-defined parts. This option allows users to specify a page name for user-defined parts.
- Other enhancements include more dialog sizing capability, a local file code page build option and shared components for application packaging.
- In addition to the file view, the Project Organizer allows for quick browsing capability of the GUI components.

Compiler

- Variable length fields support
- Indicator data type support
- Extend range of CYY/MM/DD support
- Compile options in source support

Licensed Programs-Application Development Products

Runtime

- Fly over help, sometimes referred to as bubble help. Users can define fly over help for most parts.
- Help title can be specified.
- Performance enhancements
- Additional events and event attributes

IBM Integrated Language Environment C for AS/400 Version 4 Release 3, 5769-CX2

The IBM ILE C compiler is a full-function compiler for the AS/400 system, compliant with the American National Standards Institute (ANSI) programming Language C (ANSI/ISO 9899-1990).

IBM ILE C for AS/400 provides a high-performance, 100% ANSI-compliant compiler. IBM ILE C for AS/400 replaces SAA C/400, the System C/400 PRPQ and the APTA PRPQ. The primary benefits of using IBM ILE C for AS/400 are performance and easier code reuse. IBM ILE C for AS/400 simplifies and encourages programmers to migrate their C applications written on other platforms to the AS/400 system.

IBM ILE C for AS/400 and IBM VisualAge for C++ for AS/400 can bind components written in any ILE language into a single application. With its rich set of functions, IBM VisualAge for C++ for AS/400 and the IBM ILE C for AS/400 languages complement other languages, such as RPG/400 and COBOL/400, providing better support for string and bit manipulation, numerical computation, floating point data, dynamic memory allocation, and system programming functions.

Highlights of the existing product:

- Native thread enablement of ILE C run time (V4R2)
- More XPG4/ANSI functions for POSIX locale (V4R2)
- Argopt support in the ILE C/400 compiler is shipped as an optionally installable library.
- PRFDTA support on CRTCMOD/CRTBNDC commands (V4R2)
- ILE C runtime locale is enabled for the new system locale support

Licensed Programs-Application Development Products

- Supports single-byte, pure double-byte and mixed-byte character data
- New keyword on the CRTBNDC/CRTCMOD commands
- Stream I/O enablement on integrated file system
- TCP/IP Sockets
- Faster Exception Handling
- Function inlining
- Compile to previous release
- CICS* enablement
- Faster compile runtime
- Module replacement
- Mutex support
- 100% ANSI Compliant
- MAKE Utility
- Imbedded SQL support
- Packed Decimal data type
- MI (Machine Interface) access
- Excellent Documentation
- Source Level debugger
- ASCII data support
- Static binder
- National Language support
- Dynamic Screen Manager (DSM)
- DDS Support
- Extensive Example Library
- Sophisticated Optimizer
- AS/400 Pointer Support
- Migration support
- Source Code Checker
- Online Help (like Unix** LINT)

ILE C run-time functions are thread-safe in a multi-threaded environment. In addition, the run time provides full support for wide-character functions that are either sensitive or non-sensitive to POSIX locale. Combined with strong tradition of 100% ANSI compliance, customers with applications written in C on other platforms can easily migrate these applications to the AS/400 system.

Programmer Productivity

Licensed Programs-Application Development Products

The ILE C compiler provides a number of tools to make more efficient use of time and resources. The CHECKOUT compile option identifies possible programming errors that might otherwise be difficult to find at run time. The CVTCSRC tool assists in migrating EPM and System C/400 code to ILE C code. The tool scans the source and recommends changes. It is located in the example source files in the QCLE library. The ILE source Debugger provides interactive source level debugging. It provides capabilities such as viewing source programs, setting break-points by cursor position, stepping through source statements, and displaying or changing values of program variables.

IBM ILE C for AS/400 continues to support industry standards, such as ANSI, enabling applications written in ANSI C on other platforms to be easily ported to the AS/400.

Version 4 Release 3 Enhancements

New 64 bit, long long integer type. The long long type increases the range of integers so that larger numbers can be stored and processed in a C application.

Ability to compile C source from an integrated file system file. The new compile option (SRCSTMF), allows C code in an integrated file system source stream file to be compiled. This enhancement allows greater flexibility when porting C applications to the AS/400.

IBM CICS for AS/400 Version 4 Release 3, 5769-DFH

CICS for AS/400 supports CICS COBOL Command-Level or C applications on AS/400. It is based on a major subset of the CICS/ESA Application Programming Interface (API) and supports Minimal Function Basic Mapping Support (BMS).

The CICS platform is widely-used as a basis for implementing business solutions. CICS for AS/400 enables many of these existing applications to be made available on AS/400 without excessive costs of code conversion. AS/400 applications can co-exist with CICS applications.

Licensed Programs-Application Development Products

If a user wishes to write an application program using the CICS for AS/400 API, then ILE COBOL for AS/400 (see page 544) or ILE C for AS/400 (see page 551) is required. COBOL or C applications developed for CICS/DOS/VS, CICS/OS/VS, CICS/ESA, CICS/MVS, CICS/VM, CICS OS/2, and CICS/6000 are generally source-compatible with CICS for AS/400 if they use only the CICS command-level API. Application Support is available for both single byte and double byte character set based applications.

Basic Mapping Support (BMS) maps are also source-compatible, provided they use only CICS family base level BMS when ported to CICS for AS/400. The CICS macro-level API is not supported by CICS for AS/400.

CICS for AS/400 offers server support for direct communication with workstation based CICS clients over SNA APPC links, without the need for an intermediate CICS OS/2 server.

Improved data integrity is ensured with CICS for AS/400 exploiting the OS/400 two-phase commit capability. When a CICS for AS/400 application updates multiple systems it ensures successful updates of all files and backs out partial updates if the full transaction is not completed. CICS for AS/400 two-phase commit support provides a backward recovery facility.

The Inter-Systems Communications (ISC) facilities of CICS for AS/400 allows connectivity to other CICS platforms, giving access to both applications and data on those systems. CICS for AS/400 will support ISC functions on the following products:

- CICS for AS/400 (other AS/400s running CICS for AS/400)
- CICS/ESA V3R2 and V3R3
- CICS/MVS V2R1
- CICS/VSE V2R1
- CICS OS/2 V1R2 and V2R0
- CICS/6000 V1R1

CICS for AS/400 provides support for running CICS command level COBOL or C applications on OS/400. Its InterSystem Communications (ISC) capabilities allow OS/400 users to share data and applications with other CICS systems. Enhancements include a

Licensed Programs-Application Development Products

binary call interface from other languages and more simplified OS/400 based administration.

IBM Application Program Driver for AS/400 Version 4 Release 3, 5769-PD1

The Application Program Driver for AS/400 (APD/400) allows customers to standardize a number of functions which are nearly always present in every application, and to present a standardized interface to the user.

APD/400 includes the following:

- Menu driver—allows interactive creation and modification of menus

- Access control—access control functions (which can be granted and revoked interactively by the administrator) are available for menus, menu options

- Fastpath—supports fastpath jumps to other menus, programs or applications

- Conflict management—control of mutually exclusive programs (the choice of one menu option can disallow one or more other options)

- Save/restore—this allows the user to define save intervals, number of generations, restore sequences, backup volume IDs

- Batch scheduling function

All APD/400 administrative programs offer HELP text for screens and input fields.

Version 4 Release 3 Enhancements

A GUI makes the AS/400 easier to use, particularly those companies working in a graphical environment. Graphical Access from Client Access is required for this function.

- Point-Click
- Fast path commands

Licensed Programs-Application Development Products

- AS/400 connectivity
- Detailed help
- Consistent Gui to reduce learning curve

IBM Application Development ToolSet for AS/400 Version 4 Release 2, 5769-PW1

The IBM Application Development ToolSet for AS/400 (ADTS/400) consists of nine components and two features.

ADTS/400 also serves as the prerequisite licensed program for client/server application development tools. It contains the server access programs for the three client/server products: CODE for OS/400 VRPG Client, and ADTSCS for OS/400.

The AS/400 Application Development ToolSet (ADTS) provide an integrated set of application development tools usable by analysts, programmers, and support personnel in the design, development and maintenance of applications. ADTS takes advantage of the rich function in the IBM OS/400 and its relational database. It enhances productivity in the tasks performed to develop interactive, transaction batch, and client/server applications.

Version 4 Release 2

There is support for DECFMT allowing developers to take advantage of this new keyword.

The Application Development ToolSet contains the following five utilities:

ADT: Programming Development Manager (PDM)

The Programming Development Manager provides the focal point of this integrated application development environment by managing lists of items to be developed or maintained. By easily subsetting and selecting from lists the user can manipulate any number of objects. This enhances the productivity of analysts, programmers, and support personnel in managing programs, data and systems information, by focusing activities on a grouping of objects or items to

Licensed Programs-Application Development Products

be worked on. The other tools are fully integrated; the user always returns to the PDM list when use of a tool is complete. Also, by automatically invoking the appropriate command with correct parameters and syntax, keying and errors are reduced.

This integration is further enhanced by user-definable options to extend this environment with the user's own tools.

ADT: Source Entry Utility (SEU)

SEU is a full-screen editor providing syntax checking of compiler source statements. Commands have a strong affinity with those provided by the System/370 Program Development Facility (PDF) editor as well as the System/36 Development Support Utility (DSU) editor, and the System/38 SEU.

The following are key characteristics and functions:

Syntax checking of entered statements is effected through interfaces to language syntax checkers.

30 line commands are provided, for example: copy, delete, move, and insert.

SEU commands provide "fastpath" access to many functions.

Editor profiles are created for each user for storing of parameter values.

The editor is interactively accessed from Programming Development Manager lists.

Scan functions facilitate locating text within a member, for example: date, character string.

Predefined high-level language prompts and format lines are provided.

User-defined prompts to allow programmers to define their own language prompts for use while editing.

A split screen capability allows the browse/scan/copy of:

- Other source members
- Spooled compilation listings.

Licensed Programs-Application Development Products

System/36 and System/38 as well as AS/400 system source types are supported.

Enhancements to System/38 SEU are provided through the addition of System/36 DSU line commands plus other new line commands, the editor profiles and interface with PDM.

Version 4 Release 2

SEU supports user-defined line commands allowing users to tailor their development environment to their own needs.

ADT: Screen Design Aid (SDA)

SDA is used to interactively design, create and maintain customer application screens (displays and menus).

Changes to the attributes and colors of fields can be made and immediately displayed using the testing facility of SDA. This also provides a useful application prototyping capability to allow end users of the application to participate in the design phase.

SDA allows the programmer to:

- Define fields and constants for the screen format
- Select a database file and fields from that database file
- Add or remove attributes and colors to or from the fields and constants
- Change positions (move/copy/shift) of, or remove, a field
- Display or change work display field conditioning
- Display or change ruler where cursor is positioned

In addition to testing the display being worked on, a print facility is also provided to assist with the documentation of an application.

Screen Design Aid provides also support in the System/36 and System/38 Environments.

Licensed Programs-Application Development Products

Version 4 Release 2

SDA supports new DDS keywords, reducing the time needed by developers to take advantage of new features.

ADT: Report Layout Utility (RLU)

The Report Layout Utility (RLU) allows a programmer to define the layout of a printed report on the screen. RLU has a full-screen editing capability, and allows the programmer to review report prototypes easily. After the report image is final, the programmer would use RLU line commands and function keys to define record formats and fields.

Version 4 Release 2

RLU supports new DDS keywords, reducing the time needed by developers to take advantage of new features.

ADT: Data File Utility/Application Development (DFU/AD)

Data File Utility/Application Development can be used to define, create, and maintain database applications that are primarily oriented to data entry, inquiry, or file maintenance. It is also especially useful for the creating of test data for an application being developed.

DFU/AD can use any of three file definitions:

- RPG II File and Input specifications (F & I specs)
- Interactive Data Definition Utility (IDDU) definitions
- File definition stored with a database file

All AS/400 system file access methods are supported: sequential, indexed, and direct. Applications created take advantage of the Data File Utility/Application Execution (DFU/AE) support provided within the IBM OS/400 which allows validation of database fields and additional fields as well as scrolling forward and backward when browsing database records.

Two additional components in ADTS/400 are:

Licensed Programs-Application Development Products

File Compose and Merge Utility (FCMU)

A compare function that performs comparison on two or more source physical files and locates the differences. When synchronization of multiple versions of a source file is required, the merge function can take the output of the compare and integrate into the base file automatically. This can also be done through the interactive session of split screen merge facility similar to the browse/copy split screen in SEU.

Interactive Source Debugger (ISDB)

This helps in testing and debugging the programs. It is a tool that displays the source of the program while the program is under debug mode. Problems and program bugs can be easily identified by displaying variables and reviewing the source statements. Interactive Source Debugger speeds debugging and moves the applications into production faster.

The two features of ADTS/400 are:

Application Dictionary Services

The IBM Application Dictionary Services feature is a programmer development tool which assists in program development and maintenance. It is a dictionary on the AS/400, providing references and cross-references of data on the system. It can generate a complete inventory of all the software components on AS/400, regardless of programming language. This inventory is stored in the dictionary and can be kept up to date while an application is being modified.

Application Dictionary Services can also analyze impacts due to changes. It will provide lists of files and programs that will be affected by a potential change to a field. This reduces the time spent in identifying and understanding all the components of an application.

A synchronization capability, known as the Notify function, allows Application Dictionary Services to monitor for user domain object

Licensed Programs-Application Development Products

changes (create, delete, rename, etc.) to keep its dictionary and the system synchronized. This is based on a centralized system facility (the System Audit Journal) that can be set to record any operation on an object in the user's domain of the system.

Application Dictionary Services can be accessed from CODE/400.

Application Development Manager

The IBM Application Development Manager feature provides version control and software configuration management functions. It allows a group of application developers to create, manage, and organize multiple versions of their application. The application manager maintains the integrity of the application by not allowing one developer to overwrite another developer's source changes. Application Development Manager helps to automate the process of building, or compiling, source code. Application developers no longer have to analyze relationships between pieces of code: the build process does it for them. Application Development Manager provides developers with a mechanism for efficiently managing application objects throughout the life of an application.

Application Development Manager supports applications written in these programming languages: ILE C for AS/400, ILE COBOL for AS/400, ILE RPG for AS/400. It also supports CL, SQL and DDS (Data Description Specifications).

Application Development Manager contains security, auditability and administrative functions which facilitate the management of an application development environment:

- Application Development Manager security functions: limits access to appropriate users

- Audit trail: keeps dates and times of changes, and user IDs of person making changes

- Report facility: shows impact of the change to an application component

- Administrative functions: enrolling users to a project or application; defining projects and defining a project hierarchy.

Licensed Programs-Application Development Products

These Application Development Manager facilities help developers to work efficiently and effectively in a well-organized and controlled application development environment. ADM functions are available through CODE/400.

The Application Development Toolset for AS/400 has been enhanced with:

- Support for distribution of applications from a development machine to target production machines.

- Support on the large production system to copy the needed programs.

- A new value *DIRCHAIN on the BLDSCOPE parameter of the BLDPART command to allow building the parts which are directly dependent on the part being built.

- Provides templates of compile commands used by CODE/400 in the build option port.

- Provides a Self Study Guide for quick orientation of product concept and functions.

- ADM/400 is enhanced to allow for uses libraries outside ADM/400 environment to be supported.

- Support for VRPG and System/36 ports. Programmers can take advantage of the ADM/400 checkin-checkout mechanism to manage multiple versions of these applications.

- PDM support for ADM/400 distribution, VRPG and System/36 port types.

IBM Integrated Languages Environment RPG for AS/400 Version 4 Release 2, 5769-RG1

ILE RPG for AS/400 is designed for writing various types of application programs. This language is easy to learn, yet offers many advanced functions for experienced programmers.

ILE RPG for AS/400 delivers RPG IV the next evolution of IBM's programming language. The RPG IV compiler offers improved programmer productivity and application growth and quality. A number of functions have been incorporated in the RPG IV language definition which include:

New Definition capabilities

Licensed Programs-Application Development Products

The new definition specification in RPG IV consolidate and expand definition capabilities. Added functions include stand-alone fields and pointer-based structures.

Support for ten-character names

This greatly enhances the readability of RPG programs and reduces the requirement for renaming fields defined in DDS to RPG field names.

Expression support

New operation codes have been provided to support character, arithmetic, logical, and relational expressions. The user is not required to break up complex expressions into individual RPG statements.

Prefix option

For externally described files and data structures allows global prefixing of all fields in an externally described file or data structure.

Date and Time Data type support

RPG users now have the capability to deal directly with the DB2 for OS/400 date, time, and time stamp and perform arithmetic operations.

Pointer support

RPG users now have the capability to operate on pointer based structures, pass pointers to applications written in other programming languages, and call system functions requiring pointers.

NLS support

RPG has improved the portability of applications, across systems with different national language requirements, by allowing the user to specify numeric editing functions, date and time editing functions, and national language sort sequence tables to be retrieved from the job attributes at program runtime, or to be defined at program compile time.

Full Graphic Data type support

Licensed Programs-Application Development Products

RPG now supports the graphic (2-byte) data type. Character operations and string manipulations have been enhanced to recognize and handle graphic data according to its 2-byte character length.

Static call

Users can now develop their applications in smaller, better maintainable modules, and link them together as one program, without incurring the penalty of dynamic call overhead. This facility, together with the Integrated Language Environment provided by the system, also improves the user's ability to write mixed-language applications. The Integrated Language Environment programming languages will permit the binding of C, RPG, COBOL and CL into a single program regardless of the mix of source languages.

The ILE RPG/400 consists of the following RPG compilers:

- ILE RPG-IV
- RPG/400
- IBM System/36-Compatible RPG II
- IBM System/38-Compatible RPG III
- RPG/400 Previous Release Compiler
- System/36-Compatible RPG II Previous Release Compiler

The following enhancements are included in ILE RPG for AS/400:

Floating Point Data Type

This data type improves integration with OS/400 database and improves interlanguage communications in an ILE environment, specifically with C and C++ languages.

Signed and Unsigned Integer Data Type

These data types will improve interlanguage communication in an ILE environment, specifically with the C and C++ languages.

Support for Database Null Fields

This will provide the ability to test for and set database null fields.

Date Enhancement

Licensed Programs-Application Development Products

The Date data type supports the Century date format (*CYM) when using the MOVE, MOVEL and TEST operation codes.

Prefix Enhancement

The facility to globally rename externally described files and record formats supports a facility that allows a specified number of characters to be replaced.

Multiple Procedures Per Module

This enhancement enables programmers to use the following capabilities in preparation for support of object-oriented facilities within RPG IV.

- Interface prototyping
- A new free format CALL capability
- Function calls in expressions with Return Value support to C, C++ and RPG IV

Enhanced structured programming through RPG procedures. These will have the following characteristics:

- No RPG cycle
- Automatic storage
- Can be recursively called
- Local variables and structures
- Return value support through free form expressions on the RETURN (supporting the full range of RPG data types)
- Support for the parameters Passed by Value

Version 4 Release 2

RPG IV is enhanced in Version 4 Release 2. The major enhancements relate to indicators and the ability to specify compile options on the control specifications. These further improve the integration of RPG with OS/400 and ILE interlanguage communication. The enhancements include:

- Support for variable length fields
- Ability to use your own data structure for INDARA indicators
- Ability to use built-in functions instead of result indicators
- Compile options on the control specification

In addition there are the following new functions:

Licensed Programs-Application Development Products

- Support for import and export of mixed-case procedures and variables
- Ability to dynamically set the DEEDIT value
- Built-in functions %CHAR and %REPLACE have been added to make string manipulation easier
- New *CMDY, *CDMY, and *LONGJUL date data formats
- An extended range of century formats
- Ability to define indicator variables
- Ability to specify the current data structure as the name parameter for the OVERLAY keyword
- Support for application profiling
- Ability to handle packed-decimal data that is not valid when it is retrieved from files using FIXNBR(*INPUTPACKED)
- Ability to specify the BNDDIR command parameter on the CRTRPGMOD command

IBM SEARCH2000 for AS/400 Version 3, Release 1, 5697-C72

IBM SEARCH2000 for AS/400 Version 3 helps you evaluate the impact of date fields in database files. With IBM SEARCH2000 for AS/400 Version 3, you can identify the dates in your database files, the programs that use these dates and the formats of the dates.

IBM SEARCH2000 for AS/400 Version 3 offers two functions: A date finding tool and an object reference tool.

The DATE FINDING TOOL scans database files for fields that contain values consistent with common date formats.

The OBJECT REFERENCE TOOL uses the information gathered by the date finding tool. It identifies the programs that use the files containing the date fields. You can use the information collected to modify programs that are not Year 2000 ready. Data values can be alphanumeric, zoned, packed decimal, and date data types. IBM SEARCH2000 for AS/400 Version 3 supports the most common date formats.

The date finding tool works with externally described files and files with no external descriptions. The tool browses the actual data in

Licensed Programs-Application Development Products

the file to find candidate date fields. If an external field-level description exists, the tool matches the candidate date fields to the field names. For files with no external description, the candidate date fields are identified by their starting position and length in the record format.

Some of the date search criteria for IBM SEARCH2000 for AS/400 Version 3 are customizable by the user. IBM SEARCH2000 for AS/400 Version 3 provides reports on date fields by file and by programs that use the files containing date fields.

IBM BYPASS2000 for AS/400 Version 3, 5697-D11

IBM's BYPASS2000 for AS/400 is a tool to assist customers and IBM Business Partners in migrating AS/400 RPG and COBOL applications to properly handle the transition to the Year 2000. Unlike other Year 2000 tools, BYPASS2000 uses application-understanding technology to track the affected code, significantly reducing the amount of manual work required. By using the IBM BYPASS2000 for AS/400 tool, application developers and technical support staff can convert their AS/400 RPG and COBOL applications to properly handle four-digit years throughout their applications with a minimal amount of manual intervention.

IBM BYPASS2000 for AS/400 uses program-understanding technology to locate and change areas of an application that need to be changed to accommodate four-digit years. Once complete, the program source and data files can be recompiled and tested to ensure the application continues to execute as required.

Version 3 of BYPASS2000 for AS/400 supports AS/400 applications written in RPG, as well as related Command Language programs, and AS/400 database files. Version 3 also supports COBOL-based AS/400 applications and double-byte systems, and is available in several additional national languages.

IBM Net.Commerce for AS/400 Version 2, 5798-NC2

Net.Commerce is a merchant solution that provides a framework to conduct business on the Internet in a secure and scalable manner. It supports business-to-consumer and business-to-business environments.

An integrated solution includes a merchant server and components to customize the Net.Commerce site. Net.Commerce uses the relational database, DB2/400, the Internet Connection Secure Server, and Net.Data. Net.Data provides the access to DB2/400 relational data, so your electronic business solution can be built around the key data in your enterprise.

Net.Commerce provides a complete e-commerce solution from catalog and virtual storefront creation to payment processing. Whether businesses are creating a single store or a mall application, a fully integrated system such as Net.Commerce means that businesses can get up and running quickly.

Net.Commerce is a member of IBM's CommercePOINT offerings, a family of products designed to provide an extensive set of e-commerce solutions. IBM's CommercePOINT offerings embody the core processes of electronic business on a global scale. These offerings go well beyond handling sales transactions over the Internet to include all aspects of building strong customer relationships. CommercePOINT offerings include unique, leading-edge technologies that enable customers to differentiate their electronic sales channel and maintain a competitive edge.

Flexibility is provided by Net.Commerce so that the site look, feel, and flow can be customized to meet individual preferences. Unlike other merchant servers, users are not limited to a standardized storefront template. Businesses have flexibility in defining the flow of the buying experience, designing the storefront, and capturing shopper information.

A Template Designer is included in Net.Commerce to let you design your own Web pages. Its graphic look, drag and drop capabilities, and quick testing function help you create and test your pages. The

Licensed Programs-Application Development Products

design is laid out on a template, which can be reused, saving you time and work. You can create customized templates for different applications, such as one for regular-priced products, and another for products on sale. It can also be used to create a home page for a store or mall, prototype category pages, product pages, and unique pages for members of shopper groups.

API's are provided with Net.Commerce to customize functions related to shipping and handling costs, inventory check, and the calculation of taxes. An easy-to-use site administrator function assists in defining product categories, controlling authorization at both a mall and store level, opening stores, and viewing information about shoppers.

Net.Commerce is built to be scalable to meet the needs of the small to very large business. Merchants can take advantage of their existing operating environments and expand to larger systems as their e-commerce traffic grows. The database can be put on a separate machine, from the Net.Commerce server, providing additional performance as well as further protection when placed behind a firewall.

A multiple merchant server feature is available such that with one Net.Commerce package, separate Net.Commerce servers can be run on one AS/400, with each server servicing its own database and having a unique URL. This capability allows the user to develop several independent virtual storefronts on one machine. In addition, a mass data transfer facility has been provided that allows the merchant to load data, in bulk, into the Net.Commerce database helping reduce the setup time.

IBM KnowledgeTool Runtime for OS/400 Version 3 Release 6, 5798-TAT; and IBM KnowledgeTool Development Toolkit for OS/400 Version 3 Release 6, 5798-TAW

The two KnowledgeTool program products enable knowledge-based systems (KBS) to be developed and executed on AS/400. KnowledgeTool is comprised of two program products:

Licensed Programs-Application Development Products

KnowledgeTool Development Toolkit for OS/400 and KnowledgeTool Runtime for OS/400. Application development requires both program products to be installed; application execution requires installation of KnowledgeTool Runtime for OS/400 only.

The KnowledgeTool program products provide a rule-based language, a forward-chaining inference engine, a callable interface for conventional application programs, and an application debugging environment that can be used to develop and integrate knowledge-based technology into new or existing AS/400 applications. KnowledgeTool Development Toolkit for OS/400 supports a powerful and versatile rule-based language that enables users to encode declarative statements within the framework of a procedural language. The language combines the flexibility of rules, which specify a set of conditions to test, and actions to perform under the control of the inference engine, and the capabilities of a powerful procedural language. The source statements are a mixture of rule constructs and PL/1 statements. KnowledgeTool Development Toolkit for OS/400 charges program source statements into PL/1 source code, which is then combined into a regular AS/400 program object.

KnowledgeTool Runtime for OS/400 provides a forward-chaining inference process, a flexible conflict resolution strategy, a run-time debugging facility, and a flexible interface to and from conventional AS/400 application programs. KnowledgeTool Runtime for OS/400 executes the application under the control of various interactive commands. It optionally provides tracing and monitoring commands that both aid the developer and inform the user. KnowledgeTool Runtime for OS/400 provides a number of callable interfaces that can be used by any AS/400 application to integrate KBS into conventional applications.

IBM Licensed Programs-Office Products

IBM AFP Font Collection for IBM Operating Systems Version 1 Release 1, 5648-113

A comprehensive set of AFP fonts with over 1,000 fonts from the most popular type families—like Times New Roman, Helvetica**, and Courier—in a full range of sizes, resolutions (240, 300, and outlines), and languages (over 48).

An optional feature of AFP Font Collection, **International Fonts and Programs** provides a comprehensive set of double-byte fonts and font design programs, including:

- Outlines for Chinese, Japanese, and Korean DBCS fonts.
- Type Transformer to convert any Adobe Type 1 outline to an AFP font.
- Fontlab for creating your own font designs.
- Code page and coded font editor to set up your new fonts for use on the AS/400.

IBM ImagePlus (VI) VisuallInfo for AS/400 Version 4 Release 3, 5769-VI1

IBM ImagePlus VisuallInfo for AS/400 is a document imaging and work management system that can be implemented in a client/server or host implementation. It changes the way paper documents are processed.

A graphical user interface is provided so the client or the user can develop a customized document management solution that includes library and information processing capabilities. One can create image, workflow, and other applications to automate and gain control of the information the enterprise processes each day. VisuallInfo for AS/400 controls the capture, indexing, storage, and retrieval of documents as images. Initially, documents are stored on AS/400 DASD and can be migrated to an optical storage system. VisuallInfo for AS/400 also provides both production and ad-hoc work management functions. Processing documents as images helps you

Licensed Programs-Office Products

manage work more efficiently, reliably, and securely. It can also dramatically reduce the storage space required for paper documentation.

Workfolder Application Facility Version 4 Release 1 is the host feature of VisuallInfo for AS/400. Workfolder Application Facility offers two interfaces, either traditional AS/400 5250 emulation or application programming interfaces (APIs).

VisuallInfo for AS/400 can serve the needs of a small departmental organization or serve as an enterprise solution for a large corporation.

This document imaging and work management system saves you money in many ways. VisuallInfo stores large quantities of documents and makes them available throughout your organization in seconds, leading to a dramatic increase in productivity. Even in geographically dispersed enterprises, mission-critical information can be delivered to users when they need it, in the form they need. And multiple users can view the same documents simultaneously.

Functions include:

- Desktop integration with VisuallInfo for AS/400 through workstation-based APIs

- GUI

- Content class support that you can use to capture, store, and retrieve documents containing information other than MODCA, for example, work processing or spread sheets

- Integrated File System support

- Additional user exits such as work with file cabinet documents and review case documents

- Year 2000 enablement

For additional information on VisuallInfo visit the IBM Image web site:

<http://www.software.ibm.com/data/imageplus>

Licensed Programs-Office Products

Version 4 Release 3 Enhancements

The workflow enhancements include functions for building a work process and for routing documents and folders through a business automatically.

Imageplus VI for AS/400 provides flexibility for controlling access to index classes (types of documents), workbaskets and advanced workflow processes. By using access lists, the ImagePlus VI for AS/400 administrator can control by user or by group all levels of access to these resources.

The ImagePlus VI for AS/400 API set, initially implemented on Windows 95 and Windows NT is now available on OS/400. These APIs are supported from ILE C, ILE COBOL and ILE RPG.

ImagePlus VI for AS/400 continues to support all the capabilities of Workfolder Application Facility (WAF) version 4.1).

IBM Advanced Function Printing Utilities for AS/400 Version 4 Release 3, 5769-AF1

Advanced Function Printing (AFP) Utilities consists of three integrated utilities that support AFP print applications. Included are Overlay Utility for electronic forms, Resource Management Utility for managing document resources, and Print Format Utility, a "Query/AFP" tool that enables you to build advanced electronic output directly from AS/400 database files.

Overlay Utility enables design of AFP electronic forms through an AS/400 interface. The design interface includes all elements of typical electronic forms such as lines, boxes, text, images, graphics, and bar codes. Overlay Utility provides both an interactive, near-graphical design interface, and a command interface. Both AS/400-resident and printer-resident fonts are supported. Complete facilities are included to compile, print, and manage an organization's electronic forms.

Print Format Utility enables creation of special electronic printing applications interactively, directly from the AS/400 database. PFU is well suited for producing packing lists, shipping labels, or similar

Licensed Programs-Office Products

applications that require graphical output. Print Format Utility produces complex output that features overlays, image, and bar codes.

Resource Management Utility is a "workbench" for AFP resources, enabling you to create, print, copy, and maintain overlays and images.

Version 4 Release 2

AFP Utilities has been enhanced in Version 4 Release 2.

Viewing electronic forms while designing them eliminates the need to print to verify individual changes

The addition of a toolkit containing sample overlays, page layouts, and print formats allows easy development of report formats

Individually specifying all the features and capabilities of printers when designing an overlay or report format, helps to take advantage of new printer hardware without software fixes or upgrades

Selecting fonts that use outline font technology gives flexibility in designing documents with different font sizes and styles

Enhanced job submission options allow a wider selection of form and paper handling

The addition of parameters to generate the Royal Mail and Japan Postal barcodes allow businesses in the UK and Japan to save on postal rates by including automatic identification information in addresses

IBM Advanced Function Printing (AFP) PrintSuite for OS/400, 5798-AF2 (V3R2 Mod 1), 5798-AF3 (V3R7 Mod 1)

AFP PrintSuite for AS/400 is a new family of products to create electronic printing applications (output with enhanced application data, electronic forms, bar coding, image and graphics, etc). The AFP PrintSuite for AS/400 solutions--Advanced Print Utility, Page

Licensed Programs-Office Products

Printer Formatting Aid, AFP Toolbox, and SAP R/3 AFP Print are generally designed to enable AS/400 customers to transform application output without changes to the line-of-business application.

The AFP PrintSuite for OS/400 family of advanced printing solutions are separately orderable. The AS/400 customer (or developer) would select the product that met their requirements. New versions of all four AFP PrintSuite solutions were released March 1998 for V3R2, V3R7, and later OS/400 versions.

Advanced Print Utility (APU)

End users design how existing line output will be blended with new fonts, electronic forms, image, bar code; how each page and copy will look. When complete, the existing application is automatically monitored and transformed, using the APU design.

- End-user design of advanced electronic output

- Application-independent, no changes to application program

- Supports complex document requirements, such as multiple page formats and copies, each with customized layouts

- New APU production monitor provides capability to customize precisely how transformed application output is produced and distributed. User exists now enable changes to output. Full control is provided over where output pages, including different copies, are directed.

Pager Printer Formatting Aid (PPFA)

Compiler for page and form definitions, formatting objects for AS/400 printing applications. These definitions, a standard in electronic printing, separate the formatting of electronic documents from the application data. Once PPFA creates these formatting objects, they are referenced in the printer file. Unlike spool reformatting systems, page and form definitions are integrated within the AS/400 printer file. Once created and specified in the application printer file, the application printer file, the application is automatically transformed, producing new electronic output in one high-performance pass.

Licensed Programs-Office Products

Programmer approach to document design (there are also graphical Windows front-ends to PPFA available)

Application-independent, no changes to application program

With Version 4 Release 3, page and form definitions can be used in conjunction with DDS-defined output

Consistency with page and form definitions on other systems

AFP Toolbox for OS/400

A rich set of APIs that provide complete control over the Advanced Function APrinting (AFP) data stream. Designed for applications which require documents precisely tailored to each customer, dynamic integration of image, or similar function.

Developers tool for advanced printing requirements such as variable placed boxes, images, overlays, and formatted text in customized, complex documents

Invoked from C, COBOL, and RPG programs

Also available for MVS, OS/2, AIX, and Windows

SAP R/3 AFP Print

Provides enhanced application output and support of AFP/IPDS printing for SAP R/3 customers.

SAP output is transformed dynamically into AFP while adding document elements such as electronic forms, typographic fonts, and bar coding. This enhanced output can then be routed to system-managed IPDS printers.

IBM Advanced DBCS Printer Support for AS/400 Version 4 Release 3, 5769-AP1

The Advanced Printer Writer (APW) provides capabilities to print large characters, underlines, and grid lines on SCS DBCS printers. Symbols and special characters can also be printed.

Licensed Programs-Office Products

Advanced DBCS Printer Support for AS/400 contains a feature that has enhanced the Advanced Printer Writer (APW) to now support IPDS printers.

IBM Business Graphics Utility for AS/400 Version 4 Release 3, 5769-DS1

The Business Graphics Utility for AS/400 (BGU) licensed program provides very flexible and powerful business graphics function via a menu-driven interface. Users can create, modify, store, display, print, and plot business graphics using data from a keyboard or database file.

Extensive options provided by BGU offer users considerable flexibility in creating computer-generated charts. Font style, font size, font color, line styles, legend type, legend position, annotation, and grid line construction are but a few of the many options.

Exercise and tutorial materials have been supplied in the BGU User's Guide to provide the necessary familiarization.

IBM Advanced Function Printing Fonts for AS/400 Version 4 Release 3, 5769-FNT

The AS/400 AFP Fonts for AS/400 product provides font family support for advanced function printers attached to the AS/400. Each font family is available as a separate feature of the base license program.

IBM Advanced Function Printing DBCS Fonts for AS/400 Version 4 Release 3, 5769-FN1

This provides several SBCS and DBCS fonts that can be used with Advanced Function Printing (AFP).

Advanced Function Printing DBCS Fonts for AS/400 supports the latest national standard for Japanese and Korean languages. Other

Licensed Programs-Office Products

capabilities include various typeface and sizes for Japanese fonts and two additional SBCS fonts for Korean.

AFP DBCS Fonts for AS/400 also has six different sizes and styles of DBCS fonts including Round Gothic-style for Japanese fonts and eight different sizes and styles of SBCS fonts for Korean fonts.

IBM OfficeVision for AS/400 Version 4 Release 3, 5769-WP1

OfficeVision for AS/400 provides extensive office system functions for both nonprogrammable terminals and Personal Computers attached to AS/400 as part of AS/400 business communications support. These include electronic mail, document processing, calendar services, information storage and document retrieval. AS/400 Communications support allows users to participate in IBM office networks to exchange documents and notes. Customer business applications can be integrated with these office functions to provide a single “desktop” for the user.

These are the main features of OfficeVision for AS/400:

Installation flexibility

- Modular product
- Base is document library services
- Three optional installable features – calendar, electronic mail, and editor
- Direct access to other editors from OfficeVision for AS/400. It can process objects created by other applications such as editors and forms packages.

Easy-to-use operating characteristics:

- Simple point-and-click graphical user interface for PC users running OS/2, Windows 3.1, or Windows 95 clients
- Nine additional main menu options that allow more applications to be directly accessed from OfficeVision for OS/400

Licensed Programs-Office Products

- Menu-driven, prompted interface to all functions
- System-guided operation for the novice user
- Novice Mail mode giving a simplified way of dealing with mail
- Optional menu bypass and line commands in word processing for experienced users
- Documentation for beginners and experienced users
- Administration Assist for automatically enrolling users
- Novice Administrator mode for a quick and simple way to add and change users

OfficeVision for AS/400 has the "unopened mail" indicator which displays on the main menu when a user has opened their in-basket but has not handled all the new mail.

Full-function word processing

The word processing functions address the needs of users whether they require simple or advanced editing capabilities on AS/400. The editor is available to enrolled users on both nonprogrammable AS/400 displays and IBM Personal Computers.

Data from files and Queries can be included in documents, to automatically produce mass mailings, multiple copy documents with unique information in each copy or multiple line reports.

Graphics, images and PC files also can be embedded in documents.

Proofreading aids

Language dictionaries are provided in 23 languages including medical and legal. A document can be checked against up to 8 dictionaries in one pass, plus user-created and system supplemental dictionaries. These dictionaries are ordered via 5716-DCT and are optionally installable.

Language dictionaries offer:

- Spelling verification
- Spell aid and correction assistance
- Automatic hyphenation

Licensed Programs-Office Products

- Synonym aid (certain languages only)

Support for the Russian language is provided through the use of the enhanced IBM linguistics engine, which has been added to OS/400. As new dictionaries are released for the linguistics engine, OfficeVision for AS/400 will be able to utilize them with minimal impact.

Word Processing in the Client Access Family Environment

The Client Access Family licensed program provides enhanced word processing support through the Text Assist and Organizer functions. Documents can be prepared using the most appropriate editor. This can be the OfficeVision for AS/400 editor, DW4/DW5, or any non-IBM editor (PC-based).

Users can run multiple editor sessions concurrently.

Calendar Services

The calendar module allows users to easily manage their day-to-day activities. These activities can range from the simple daily reminder or to-do list to scheduling meetings for a large group across a network or starting a job on the system. Users can access other applications directly from the calendar using function codes, allowing the calendar to be used base or “desktop” for all applications.

The resource calendar option (available only for OfficeVision for AS/400) specifies whether a calendar is a resource or a user calendar. Overlapping meetings will not be allowed to be scheduled on a resource calendar. In addition, this option will prevent single or recurring meetings, events, or meeting entries from being added, changed, or copied to resource calendars when conflicts exist.

Also, when scheduling recurring meetings, notification of all scheduling conflicts will be displayed for all invitees and all dates. Again, this function is only available for OfficeVision for AS/400 and not for OfficeVision JustMail for OS/400.

Electronic mail

The OfficeVision for AS/400 electronic mail module provides the user with menu-driven access to mail handling functions. Mail functions allow the user to:

Licensed Programs-Office Products

- Work in “Novice” mode which provides base mail functions with simplified mail handling functions and pop-up help facilities. A function key allows users to switch to normal mail mode and more advanced functions.
- Send, receive, forward and reply to notes, messages and documents.
- Delegate mail to be opened by another user
- Interchange documents, PC files and notes between OfficeVision for AS/400 users and other OfficeVision environments. Notes and documents can also be exchanged through TCP/IP and X.400.

Mail handling functions provide the ability to send to and receive from users on their own AS/400 or other IBM and non-IBM systems in the network.

Administration

Support is provided for ongoing administration and maintenance of office objects. Administration assist provides a method of automatically enrolling office users when they first request office services. The novice administrator mode provides a subset of administrative functions to allow a quick and easy way to create and tailor user profiles.

Some administration functions are available only for the designated security officer and administrator, such as:

- Deleting and changing the owner on public nicknames and distribution lists.
- Enrolling office users.
- Creating and maintaining access codes for document library services distribution lists and system directory entries.
- Backup and securing office objects.

Access to office services

Application Programming Interfaces (APIs), specific to OfficeVision for AS/400, allow programmers to integrate office functions into applications and access office services on AS/400.

Examples are:

Licensed Programs-Office Products

- Document distribution services allow the user interface to:
 - Send, receive, cancel and query
- Distribution directory services allow the user interface to:
 - Manage and display the directory
 - Add, change and delete directory entries
 - Automatically propagate changes throughout an AS/400 network
 - Manage and display distribution lists
 - Retrieve, add, remove and change office enrollment.
- Document library services allows the user interface to:
 - File a document
 - Query document library
 - Retrieve a document
 - Replace a document
 - Delete a document
 - Change document library owner
 - Change document details
 - Retrieve DLO name
- Calendar services allow the user to:
 - Create and delete calendars
 - Change calendar authority
 - Query, add, remove and display calendar entries
 - Perform housekeeping on calendars

Version 4 Release 1

OfficeVision for OS/400 now has ad hoc Internet Addressing. This is an alternative mail addressing panel added to OfficeVision/400 into which an Internet address or a regular OV/400 address can be entered. The PostNet Bar Code support allows businesses to save money on postage by taking advantage of the Post Office discounts given when zip codes are printed in the PostNet Bar Code on mailing envelopes.

IBM OfficeVision JustMail for OS/400 Version 4 Release 3, 5798-TBT

JustMail for OS/400 is an entry level electronic mail system for AS/400 customers. JustMail for OS/400 allows you to create, address, and transmit electronic mail worldwide. It supports the wide variety of communication protocols available on the AS/400, allowing mail exchange between IBM and non-IBM systems, public networks, and PC LANs.

In addition to electronic mail, JustMail for OS/400 provides a set of office functions for nonprogrammable and programmable workstations, including note editing, and information filing and retrieval in document folders.

The IBM Current-OfficeVision for OS/400 Workgroup program can work with JustMail for OS/400 to provide a graphical user interface, travelling user support (download/upload of mail), and additional personal productivity functions, which includes a personal calendar, personal information management (PIM) support, and dynamic data exchange for integrating other Windows applications.

JustMail for OS/400 is a simplified subset of the OfficeVision for OS/400. JustMail for OS/400 and OfficeVision for AS/400 are mutually exclusive.

JustMail for OS/400 has the "unopened mail" indicator which displays on the main menu when a user has opened their in-basket but has not handled all the new mail. This replaces the "new mail" indicator that previously remained displayed in this instance.

Version 4 Release 1

OfficeVision JustMail for OS/400 now has ad hoc Internet Addressing. This is an alternative mail addressing panel into which an Internet address or a regular OV JustMail address can be entered.

IBM Facsimile Support for AS/400 Version 4 Release 3, 5798-TBY

Facsimile Support for AS/400 provides complete support for sending and receiving a FAX to or from an existing AS/400 Integrated Printer Data Stream (IPDS) print spool support, using industry-standard facsimile node service.

Facsimile Support for AS/400 utilizes either the AS/400 Integrated FAX Adapter or a dedicated PS/2 controller for the FAX telephone lines. Output capabilities include text, image, graphics and multiple fonts.

With Facsimile Support for AS/400, FAX support can be integrated into either existing or new applications. Potential outbound users of integrated FAX include order confirmation, purchase orders, and shipment notices.

Facsimile Support for AS/400 is integrated with the AnyMail/400 Mail Server Framework which is included with OS/400 allowing users of various electronic mail services to exchange mail from many sources including OfficeVision for AS/400 notes and documents and spooled files that can be sent using the Send Network Spooled File command. If you have more than one AS/400 in a network, electronic mail may be sent as a Fax. There is also now more flexibility for inbound Fax routing through Dual Tone Multi-Frequency (DTMF) codes. The DTMF capabilities of IBM's FaxConcentrator Adapter/A and some models of GammaLink** programmable fax boards are now supported.

Facsimile Support for AS/400 supports the IBM 7852-400 fax/data modem (see page 395 for more details). This uses the same application and user interfaces already provided by Facsimile Support for AS/400 for the Integrated Fax Adapter. Client Access for AS/400 supports faxing through the 7852-400 modem allowing PC users to fax directly from OS/2 and Windows 3.1 applications.

Licensed Programs-Office Products

Version 4 Release 2

Facsimile Support is enhanced in Version 4 Release 2.

Print-to-fax through Client Access AFP print driver is supported in Windows NT using Version 4 Release 2 Client Access Windows 95/NT Client. You can now browse the Facsimile Support/400 phonebook databases.

Inbound routing based on DTMF and DID codes sent by GAMMAFAX adapters is available in enhanced services.

Enhancements to Outbound AnyMail integration include integration with the AnyImage APIs to support level-one PostScript GIF, TIFF, and BMP mail attachments. Also, faxes are now sent using the sender userid fax profile, allowing customized cover pages, and all the status checking features of enhanced services.

Licensed Programs-Office Products

Client Series

AS/400 Client Series

The AS/400 Client Series Program identifies and tests a select set of premier products that exploit advanced AS/400 capabilities and utilize emerging technologies. Products are positioned within categories to aid differentiation in marketing situations. As the program is in transition, product details are not available hardcopy but can be viewed on the web site at:

<http://www.softmall.ibm.com/as400/cseries/>

AS/400 Softcopy Library

AS/400 Softcopy Library

Softcopy publications are shipped on machine-readable CD-ROM. For Version 4, a CD-ROM containing the softcopy books will be shipped automatically. Additional copies are available for a fee.

These softcopy manuals can be displayed, read, and searched using the Infoseeker program which is shipped with OS/400. The manuals can also be read with the Library Reader or the BookManager READ family of licensed programs. Note that the Library Readers are provided on the CD-ROM.

AS/400 publications can also be displayed and ordered from the AS/400 Online Library on the Internet. Portable Data Format (PDF) files are available for most Version 4 Release 3 publications also. For more information, see the following URL:

<http://as400bks.rochester.ibm.com>.

Application Development Program

The Application Development Program

Along with the languages and tools provided by IBM is an array of high level languages, CASE and object-oriented development tools offered by a variety of third party vendors. In September 1992, IBM launched the "IBM AS/400 Application Development Program" to facilitate the selection of these tools in the marketplace. Membership in this program entitles the third party vendor to attach the IBM trademark emblem to the particular development product. This signifies that the development product has been subjected to rigorous testing and evaluation by an independent third party. There are currently 13 vendors worldwide participating in the program. These are:

Focus/400 from Information Builders Inc--a popular, easy-to-learn 4GL to seamlessly integrate PC interface to the database capabilities of the AS/400 and AS/400 to mainframe database structures.

GeneXus from ARTech--a PC-based product using a knowledge-based application development approach to design and generate native AS/400 applications.

GUI/400 from Seagull Business Software--provides an add-on graphical user interface to existing AS/400 5250 user interface applications.

GUISys/400 from Client/Server Technology Inc--a knowledge-based system which based on an expert system "learns" the patterns of 5250 text display and how it is used to automatically transform the look of AS/400 code to a graphical user interface.

LANSA from Aspect Computing Pty Ltd--is a native AS/400 application generator using a 4GL to generate host-based code which can be extended to a Client/Server model.

NATURAL from Software AG--provides an integrating infrastructure to build portable scaleable applications which include the AS/400, providing the flexibility of nonprogrammable terminal, PC or Client/Server application execution and also supporting right-sizing to AS/400 from a variety of mainframe platforms.

Application Development Program

OBSYDIAN from SYNON Corp--provides an entry to a new method of building and distributing applications by generating C++ objects that support the reusable paradigm of object-oriented programming.

PROGRESS/400 from Progress Software Corp--is an integrated application development environment that enables users to rapidly prototype, build and deploy applications that are portable and interoperable across a wide range of environments.

Magic/400 from Magic Software--is a unique table-driven 4GL application development tool for mission-critical client/server and host systems. It provides unsurpassed productivity by integrating prototyping, development, modification, enhancement and maintenance in one tool reducing backlogs and freeing IS resources.

mrc Productivity Series from Michaels, Ross, and Cole--is a specifications-based 4GL/CASE application development/report writing tool designed and written exclusively for the AS/400. The mrc-Productivity Series combines menus and windows for an intuitive, user friendly interface allowing programmers and end-users to create reports, window applications, on-line inquiries, GDDM graphics, database extracts, and data entry applications.

PowerBuilder from PowerSoft--is a developer's tool for creation of client/server applications that communicate with a consistent graphical user interface (GUI). It creates desktop databases using object oriented techniques.

Seer HPS/400 from Seer--is a suite of software development tools that meet the challenges of developing, implementing, and managing mission-critical distributed applications across multi-platform environments.

VisualAge (C++ - Smalltalk) from IBM--is an integrated application development environment designed for mission-critical client/server applications through visual programming and construction from components. You simply select parts from the extensive library and make the appropriate connections on the screen.

VisualGen from IBM--is an OS/2-based 4GL application development solution for applications that run on a variety of

Application Development Program

workstation and host environments. It provides the capability to define, test, and generate GUI client, server, and single-system applications.

To find out more detail on any of the tools listed above, including how to contact the appropriate company, or for more information on Application Development on the AS/400, consult the *AS/400 Development Handbook*, G325-6249, or browse the Application Development web site at URL:

<http://www.softmall.ibm.com/as400/adp>

Rochester Redbooks

AS/400 Rochester Redbooks

AS/400 redbooks are the publications produced by the International Technical Support Organization (ITSO) in Rochester. They provide practical advice on how to implement and integrate AS/400 products. They are written by AS/400 professionals from around the world.

Where to get more information:

To find the latest information on IBM redbooks including ordering information, visit:

<http://www.redbooks.ibm.com>

To view Redbooks on the AS/400 Softcopy Library CD-ROM and the latest AS/400 related Redbooks not yet on the current CD-ROM see:

<http://as400bks.rochester.ibm.com>

To learn more about ITSO and how to become a part of our residency program, visit our internal web site at:

<http://w3.itso.ibm.com>

For telephone information call:

(800) IBM-4FAX (United States) or
(+1) (415) 855-4329 (Outside U.S.A.)

and ask for:

Index #4420 Redbooks for last 6 months

Index #4421 Abstract for new Redbooks

Index #4422 IBM Redbooks

Some of the latest AS/400 redbooks are:

IBM Network Station Printing Guide, SG24-5212

Magstar MP 3575: Implementation Guide, SG24-4983

IBM Magstar 3494 Tape Libraries: A Practical Guide, SG24-4632

Unleashing AS/400 Applications on the Internet, SG24-4935

A Fast Path to AS/400 Client/Server Using AS/400 OLE DB, SG24-5183

Developing Multi-Threaded Applications for OS/400, SG24-5181

Rochester Redbooks

AS/400 TCP/IP Autoconfiguration: DNS and DHCP Support,
SG24-5147

AS/400 Programming with VisualAge for RPG, SG24-2222

AS/400--Implementing Windows NT on the Integrated PC Server,
SG24-2164

AS/400 Internet Security: IBM Firewall for AS/400, SG24-2162

AS/400 Server Capacity Planning, SG24-2159

AS/400 Printing V, SG24-2160

*The System Administrator's Companion to AS/400 Availability
and Recovery,* SG24-2161

AS/400 Internet Connection Servers, SG24-2150

AS/400 Net.Commerce, SG24-2129

IBM Redbooks can be ordered individually or you can choose to set up a subscription to all AS/400 Redbooks in a general interest area (including future publications) by ordering the following numbers:

- SBOF-7271 - Commonly Used Redbooks
- SBOF-7272 - Office and Decision Support Redbooks
- SBOF-7273 - General Systems and Publications Redbooks
- SBOF-7274 - Client/Server Redbooks
- SBOF-7275 - System Management and Operations Redbooks
- SBOF-7276 - Communications and Networking Redbooks
- SBOF-7277 - Application and Development Tools Redbooks
- SBOF-7278 - Database and Files Redbooks
- SBOF-7279 - Application and System Support Redbooks
- SBOF-7280 - Planning, Installation, and Migration Redbooks

Note that some Redbooks are included in more than one of the above categories.

All users of ITSO Publications are encouraged to provide feedback to improve quality over time. A feedback form is in the back of any redbook. Questions and feedback to redbooks may also be sent to:

**REDBOOK at WTSCPOK,
REDBOOK@VNET.IBM.COM on the Internet**

Earlier AS/400 Models

Summary of All Earlier AS/400 Models

9401 Models P01, P02

9401 Model	P01	P02
Relative System Performance Metric (CPW value)	N/A	7.3
Relative System Performance Ratio (RAMP-C)	2.5	2.5
Main Storage (M)	8	8-16
Disk Storage (G) (maximum)	0.98	2.06
Max. no. workstations Twinax	3	7
Comm. lines (maximum)	1	1
LAN adapters (maximum)	0	0
Available card slots (for I/O adapters)	0	0
No. of System I/O buses	1	1
Version 3 Software Charge Group	P05	P05

Earlier AS/400 Models

9401 Model P03 and 10S

9401	9401 Model P03								
Package ID	Twin-ax T01	Twin-ax T02	Twin-ax T03	Twin-ax T11	Twin-ax T12	LAN L01	LAN L02	LAN L03	Server S01
Relative System Performance Metric (CPW)	7.3	9.6	16.8	9.6	7.3	7.3	9.6	16.8	5.5/ 17.1
Relative System Performance Rating (RAMP-C)	2.5	3.3	3.9	3.3	2.5	2.5	3.3	3.9	1.9/ 5.9
Main Storage (M)	8-24	8-40	8-56	8-40	8-24	8-24	8-40	8-56	8-56
Disk Storage (G) (Maximum)	2.99	3.93	3.93	2.99	3.93	2.99	3.93	3.93	3.93
Maximum Number Workstations									
Twinax	7	14	14	14	7	--	--	--	--
LAN Attached	--	--	--	--	--	16	16	16	16
Communication Lines (Maximum)	1	2	2	2	1	2	2	2	2
Version 3 Software Charge Group	P05	P05	P05	P05	P05	P05	P05	P05	P05

Earlier AS/400 Models

9402 Models C04, C06

9402 Model	C04	C06
Relative System Performance Metric (CPW value)	3.1	3.6
Relative System Performance Ratio (RAMP-C)	1.1	1.3
Main Storage (M)	8-12	8-16
Disk Storage (G) (maximum)	1.28	1.28
Max. no. workstations		
Twinax	14	54
ASCII	6	24
Comm. lines (maximum)	5	5
LAN adapters (maximum)	1	1
Available card slots (for I/O adapters)	3	3
No. of System I/O buses	1	1
Version 3 Software Charge Group	P10	P10

9402 Models D02, D04, D06

9402 Model	D02	D04	D06
Relative System Performance Metric (CPW value)	3.8	4.4	5.5
Relative System Performance Ratio (RAMP-C)	1.3	1.5	1.9
Main Storage (M)	8-16	8-16	8-20
Disk Storage (G) (maximum)	1.20	1.60	1.60
Max. no. workstations			
Twinax	14	28	54
ASCII	12	12	24
LocalTalk	31	31	31
Comm. lines (maximum)	3	8	8
LAN adapters (maximum)	1	1	1
Available card slots (for I/O adapters)	1	3	3
No. of System I/O buses	1	1	1
Version 3 Software Charge Group	P10	P10	P10

Earlier AS/400 Models

9402 Models E02, E04, E06

9402 Model	E02	E04	E06
Relative System Performance Metric (CPW value)	4.5	5.5	7.3
Relative System Performance Ratio (RAMP-C)	1.5	1.9	2.6
Main Storage (M)	8-24	8-24	8-40
Disk Storage (G) (maximum)	2.01	4.08	4.08
Max. no. workstations			
Twinax	14	42	68
ASCII	12	48	66
LocalTalk	31	31	62
Comm. lines (maximum)	3	8	14
LAN adapters (maximum)	1	1	2
Available card slots (for I/O adapters)	1	3	7
No. of System I/O buses	1	1	1-2
Version 3 Software Charge Group	P10	P10	P10

9402 Models F02, F04, F06

9402 Model	F02	F04	F06
Relative System Performance Metric (CPW value)	5.5	7.3	9.6
Relative System Performance Ratio (RAMP-C)	1.9	2.5	3.3
Main Storage (M)	8-24	8-24	8-40
Disk Storage (G) (maximum)	2.06	4.12	8.24
Max. no. workstations			
Twinax	28	68	108
ASCII	18	66	102
LocalTalk	31	62	93
Comm. lines (maximum)	8	8	14
LAN adapters (maximum)	1	1	2
Available card slots (for I/O adapters)	1	3	7
No. of System I/O buses	1	1	1-2
Version 3 Software Charge Group	P05	P10	P10

Earlier AS/400 Models

9402 Model 200

9402 Model 200 Processor	#2030	#2031	#2032
Relative System Performance Metric (CPW value)	7.3	11.6	16.8
Relative System Performance Ratio (RAMP-C)	2.5	4.0	6.2
Main Storage (M)	8-24	8-56	16-128
Disk Storage (G) (Maximum) V3R1 (Maximum) V3R2	23.6 50.3	23.6 50.3	23.6 50.3
Max. no. workstations Twinax ASCII LocalTalk	280 126 217	280 126 217	280 126 217
Comm. lines (maximum)	20	20	20
LAN adapters (maximum)	2	2	2
Available card slots (for I/O adapters)	6	6	6
No. of System I/O buses	1	1	1
Version 3 Software Charge Group	P05	P10	P10

9402 Model 236

9402 Model	236
Main Storage (M)	32-96
Disk Storage (G) (maximum)	4.12
Max. no. workstations Twinax	80
Comm. lines (maximum)	8
LAN adapters (maximum)	2
Available card slots (for I/O adapters)	6
No. of System I/O buses	1

Earlier AS/400 Models

9402 Model 400

9402 Model 400 Processor	#2130	#2131	#2132	#2133
Relative System Performance Metric (CPW) Version 3 Release 6	12.3	18.3	24.5	30.6
Relative System Performance Metric (CPW) Version 3 Release 7	13.8	20.6	27.0	33.3
Relative System Performance Metric (CPW) Version 4	13.8	20.6	27.0	35.0
Relative System Performance Rating (RAMP-C)	4.1	6.1	8.7	10.9
Main Storage (M)	32-160	32-224	32-224	32-224
Disk Storage (G) (Maximum) V3R6 (Maximum) V3R7 and later	23.6 50.3	23.6 50.3	23.6 50.3	23.6 50.3
Maximum Number Workstations				
Twinax	280	280	280	280
ASCII	126	126	126	126
Local Talk	217	217	217	217
Communication Lines (Maximum)	20	20	20	20
LAN Adapters (Maximum)	2	2	2	2
ATM Adapters (Maximum)	1	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6
Number of System I/O Buses	1	1	1	1
Version 3/4 Software Charge Group	P05	P10	P10	P10

Earlier AS/400 Models

9402 Model 436

9402 Model 436 Processor	SSP Only			SSP and OS/400		
	#2102	#2104	#2106	#2102	#2104	#2106
Relative System Performance Metric (CPW) Version 3 Release 6	N/A	N/A	N/A	14.4	18.3	24.5
Relative System Performance Metric (CPW) Version 3 Release 7 and Version 4	N/A	N/A	N/A	16.3	20.6	27.4
Relative System Performance Rating (RAMP-C)	1.0	1.3	2.4	4.8	6.1	8.7
Main Storage (M)	32-224	32-224	32-256	64-224	64-224	64-256
Disk Storage (G) (Maximum) Version 3 Release 6	4	4	4	23.6	23.6	23.6
(Maximum) Version 3 Release 7 and later	4	4	4	50.3	50.3	50.3
Maximum Number Workstations						
Twinax Devices	160	160	160	280	280	280
ASCII Devices	0	0	0	108	108	108
LocalTalk Devices	0	0	0	0	0	0
Communications Lines (Maximum)	8	8	8	20	20	20
LAN Adapters (Maximum)	2	2	2	2	2	2
ATM Adapters (Maximum)	0	0	0	1	1	1
Available Card Slots (For I/O Adapters)	6	6	6	6	6	6
Number of System I/O Buses	1	1	1	1	1	1
Version 3/4 Software Charge Group	N/A	N/A	N/A	P05	P10	P10

Earlier AS/400 Models

9404 Models B10, B20

9404 Model	B10	B20
Relative System Performance Metric (CPW value)	2.9	5.1
Relative System Performance Ratio (RAMP-C)	1.0	1.7
Main Storage (M)	4-16	4-28
Disk Storage (G) (maximum)	2.40	4.80
Max. no. workstations		
Twinax	40	80
ASCII	36	72
Comm. lines (maximum)	8	14
LAN adapters (maximum)	1	2
Available card slots (for I/O adapters)	4	9
No. of System I/O buses	1	1-2
Version 3 Software Charge Group	P10	P10

9404 Models C10, C20, C25

9404 Model	C10	C20	C25
Relative System Performance Metric (CPW value)	3.9	5.3	6.1
Relative System Performance Ratio (RAMP-C)	1.3	1.8	2.2
Main Storage (M)	8-20	8-32	8-40
Disk Storage (G) (maximum)	2.40	4.80	6.40
Max. no. workstations			
Twinax	40	80	80
ASCII	36	72	72
Comm. lines (maximum)	8	14	14
LAN adapters (maximum)	1	2	2
Available card slots (for I/O adapters)	4	9	9
No. of System I/O buses	1	1-2	1-2
Version 3 Software Charge Group	P10	P10	P10

Earlier AS/400 Models

9404 Models D10, D20, D25

9404 Model	D10	D20	D25
Relative System Performance Metric (CPW value)	5.3	6.8	9.7
Relative System Performance Ratio (RAMP-C)	1.9	2.4	3.4
Main Storage (M)	8-32	8-40	16-64
Disk Storage (G) (maximum)	9.50	9.50	15.80
Max. no. workstations			
Twinax	80	80	160
ASCII	72	72	108
LocalTalk	62	62	124
Comm. lines (maximum)	14	14	14
LAN adapters (maximum)	2	2	2
Available card slots (for I/O adapters)	9	9	9
No. of System I/O buses	1-2	1-2	1-2
Version 3 Software Charge Group	P10	P10	P10

9404 Models E10, E20, E25

9404 Model	E10	E20	E25
Relative System Performance Metric (CPW value)	7.6	9.7	11.8
Relative System Performance Ratio (RAMP-C)	2.6	3.5	4.2
Main Storage (M)	8-40	8-72	16-80
Disk Storage (G) (maximum)	19.67	19.67	19.67
Max. no. workstations			
Twinax	160	160	240
ASCII	162	162	162
LocalTalk	124	124	184
Comm. lines (maximum)	14	20	26
LAN adapters (maximum)	2	2	3
Available card slots (for I/O adapters)	9	9	9
No. of System I/O buses	1-2	1-2	1-2
Version 3 Software Charge Group	P10	P10	P20

Earlier AS/400 Models

9404 Models F10, F20, F25

9404 Model	F10	F20	F25
Relative System Performance Metric (CPW value)	9.6	11.6	13.7
Relative System Performance Ratio (RAMP-C)	3.4	4.2	4.8
Main Storage (M)	8-72	16-80	16-80
Disk Storage (G) (maximum)	20.62	20.62	20.62
Max. no. workstations			
Twinax	360	360	360
ASCII	162	162	162
LocalTalk	279	279	279
Comm. lines (maximum)	14	20	26
LAN adapters (maximum)	2	4	4
Available card slots (for I/O adapters)	9	9	9
No. of System I/O buses	1-2	1-2	1-2
Version 3 Software Charge Group	P10	P20	P20

Earlier AS/400 Models

9406 Models B30, B35, B40, B45, B50, B60, B70

9406 Model	B30	B35	B40	B45	B50	B60	B70
Relative System Performance Metric (CPW value)	3.8	4.6	5.2	6.5	9.3	15.1	20.0
Relative System Performance Ratio (RAMP-C)	1.4	1.6	2.0	2.3	3.2	5.2	7.0
Main Storage (M)	4-36	8-40	8-40	8-40	16-48	32-96	32-192
Disk Storage (G) (maximum)	13.7	13.7	13.7	13.7	27.4	54.8	54.8
Max. no. workstations							
Twinax	160	160	240	240	400	600	800
ASCII	72	72	108	108	180	270	360
Comm. lines (maximum)	16	16	32	32	32	32	48
LAN adapters (maximum)	4	4	4	4	4	4	4
Main Storage feature card slots	2	2	2	2	2	4	5
Available card slots (for I/O adapters)	5	5	5	5	10	13	13
Maximum System I/O card slots	14	14	24	24	39	71	71
No. of System I/O buses	1	1	1	1	2	3	3
Version 3 Software Charge Group	P10	P10	P10	P10	P10	P20	P20

Earlier AS/400 Models

9406 Models D35, D45, D50, D60, D70, D80

9406 Model	D35	D45	D50	D60	D70	D80
Relative System Performance Metric (CPW value)	7.4	10.8	13.3	23.9	32.3	56.6
Relative System Performance Ratio (RAMP-C)	2.6	3.7	4.8	8.3	11.2	19.8
N-way Multiprocessors	1	1	1	1	1	2
Main Storage (M)	8-72	16-80	32-128	64-192	64-256	64-384
External Disk Storage (G) (maximum)	63.0	63.0	94.3	141.7	141.7	251.8
Max. no. workstations						
Twinax	240	400	600	800	1200	2000
ASCII	108	180	270	360	540	900
LocalTalk	186	310	465	620	930	1550
Comm. lines (maximum)	17	33	33	33	49	64
LAN adapters (maximum)	4	4	4	4	4	4
Main Storage feature card slots	2	2	5	5	5	5
Available card slots (for I/O adapters)	55	55	84	140	140	196
No. of System I/O buses	2	2	3	3-5	3-5	3-7
Version 3 Software Charge Group	P10	P10	P20	P20	P30	P30

Earlier AS/400 Models

9406 Models E35, E45, E50, E60, E70, E80, E90, E95

9406 Model	E35	E45	E50	E60	E70	E80	E90	E95
Relative System Performance Metric (CPW value)	9.7	13.8	18.1	28.1	39.2	69.4	96.7	116.6
Relative System Performance Ratio (RAMP-C)	3.4	4.8	6.4	10.2	14.2	25.2	34.4	42.1
N-way Multiprocessors	1	1	1	1	1	2	3	4
Main Storage (M)	8-72	16-80	32-128	64-192	64-256	64-512	64-1024	64-1152
External Disk Storage (G) (maximum)	63.0	63.0	94.3	141.7	141.7	251.8	251.8	251.8
Max. no. workstations								
Twinax	360	480	720	1000	1400	2400	2400	2400
ASCII	162	216	324	450	630	1080	1080	1080
LocalTalk	279	372	558	775	1085	1860	1860	1860
Comm. lines (maximum)	20	33	33	33	49	64	64	64
LAN adapters (maximum)	4	4	4	4	4	6	6	6
Main Storage feature card slots	2	2	5	5	5	5	5	5
Available card slots (for I/O adapters)	55	55	84	140	140	196	196	196
No. of System I/O buses	2	2	3	3-5	3-5	3-7	3-7	3-7
Version 3 Software Charge Group	P10	P20	P20	P30	P30	P40	P40	P40

Earlier AS/400 Models

9406 Models F35, F45, F50, F60, F70, F80, F90, F95, F97

9406 Model	F35	F45	F50	F60	F70	F80	F90	F95	F97
Relative System Performance Metric (CPW value)	13.7	17.1	27.8	40.0	57.0	97.1	127.7	148.8	177.4
Relative System Performance Ratio (RAMP-C)	4.8	6.0	10.2	14.7	21.0	36.5	50.5	59.0	71.5
N-way Multi-processors	1	1	1	1	1	2	3	4	4
Main Storage (M)	16-80	16-80	64-192	128-384	128-512	128-768	128-1024	128-1280	128-1536
External Disk Storage (G) (maximum)	63.0	63.0	110.2	141.7	251.8	251.8	251.8	251.8	251.8
Max. no. workstations									
Twinax	480	720	1000	1400	2400	2400	2400	2400	4800
ASCII	216	324	450	630	1080	1080	1080	1080	2160
LocalTalk	372	558	775	1085	1860	1860	1860	1860	3720
Comm. lines (maximum)	20	33	33	33	64	64	64	64	96
LAN adapters (maximum)	4	4	4	4	6	6	6	6	8
Main Storage feature card slots	2	2	5	5	5	5	5	5	5
Available card slots (for I/O adapters)	55	55	140	140	195	195	195	195	195
No. of System I/O buses	2	2	3-5	3-5	3-7	3-7	3-7	3-7	3-7
Version 3 Software Charge Group	P20	P20	P30	P30	P30	P40	P40	P40	P40

Earlier AS/400 Models

9406 Models 300, 310, 320

9406 Models 300, 310, 320 Processor	300 #2040	300 #2041	300 #2042	310 #2043	310 #2044	320 #2050	320 #2051	320 #2052
Relative System Performance Metric (CPW value)	11.6	16.8	21.1	33.8	56.5	67.5	120.3	177.4
Relative System Performance Ratio (RAMP-C)	4.2	6.0	7.5	12.0	20.2	25.7	45.8	71.5
N-way Multiprocessors	1	1	1	1	2	1	2	4
Main Storage (M)	8-72	16-80	32-160	64-832	64-832	128-1536	128-1536	128-1536
Disk Storage (G) (maximum)	117.4	117.4	117.4	159.3	159.3	259.6	259.6	259.6
Max. no. workstations	1000	1000	1000	2400	2400	4800	4800	4800
Twinax	450	450	450	1080	1080	2160	2160	2160
ASCII	775	775	775	1860	1860	3720	3720	3720
LocalTalk								
Comm. lines (maximum)	33	33	33	64	64	96	96	96
LAN adapters (maximum)	4	4	4	8	8	8	8	8
Available card slots (for I/O adapters)	45	45	45	115	115	151	151	151
No. of System I/O buses	1-2	1-2	1-2	1-5	1-5	1-7	1-7	1-7
Version 3 Software Charge Group	P20	P20	P20	P30	P30	P40	P40	P40

Earlier AS/400 Models

9406 Models 500, 510, 530

9406 Models 500, 510, 530	500 #2140	500 #2141	500 #2142	510 #2143	510 #2144	530 #2150	530 #2151	530 #2152	530 #2153	530 #2162
Relative system Performance Metric (CPW) Version 3 Release 6	18.7	26.9	38.3	66.7	85.0	107.1	132.5	198.7	299.0	349.8
Relative System Performance Metric (CPW) Version 3 Release 7	21.4	30.7	43.9	77.7	104.2	131.1	162.7	278.8	459.3	509.9
Relative System Performance Metric (CPW) Version 4	21.4	30.7	43.9	81.6	111.5	148.0	188.2	319.0	598.0	650.0
Relative System Performance Ratio (RAMP-C)	6.4	9.3	12.6	21.6	28.5	37.4	48.9	74.0	119.2	†
N-Way Multi-processors	1	1	1	1	1	1	1	2	4	4
Main Storage (M)	64-768	64-768	64-1024	256-1024	256-1024	512-4096	512-4096	512-4096	512-4096	512-4096
Disk Storage (G) V3R6/V3R7 (Max) V4 (Max)	150.9 652.8	150.9 652.8	150.9 652.8	318.7 652.8	318.7 652.8	520.0 996.4	520.0 996.4	520.0 996.4	520.0 996.4	520.0 996.4
Max No. Workstations Twinax ASCII Local Talk	1400 630 1085	1400 630 1085	1400 630 1085	2400 1080 1860	2400 1080 1860	7000 3150 5425	7000 3150 5425	7000 3150 5425	7000 3150 5425	7000 3150 5425
Communication Lines (Maximum)	33	33	33	96	96	200	200	200	200	200
LAN Ports (Maximum)	16	16	16	16	16	32	32	32	32	32
ATM Ports (Maximum)	8	8	8	8	8	16	16	16	16	16
Available Card Slots (for I/O Adapters)	6-83	6-83	6-83	6-83	6-83	4-238	4-238	4-238	4-238	4-238
No. of System I/O Buses	1-7	1-7	1-7	1-7	1-7	1-19	1-19	1-19	1-19	1-19
Version 3/4 Software Charge Group	P20	P20	P20	P30	P30	P40	P40	P40	P40	P40

Earlier AS/400 Models

9402 Server Model 100 and 9404 Server Models 135 and 140

9402/4 Model	100	135	140
Relative System Performance Metric (CPW value) Interactive	5.5	9.6	11.6
Relative System Performance Metric (CPW value) Client/Server	17.1	32.3	65.6
Relative System Performance Ratio (RAMP-C) Interactive	1.9	3.3	4.0
Relative System Performance Ratio (RAMP-C) Client/Server	5.9	10.9	22.5
Main Storage (M)	16-56	32-384	64-512
Disk Storage (G) (maximum)	8.2	27.5	86.5
Max. no. workstations			
Twinax	7	7	7
ASCII	6	6	6
LocalTalk	31	62	62
Comm. lines (maximum)	8	14	20
LAN adapters (maximum)	2	4	6
Available card slots (for I/O adapters)	6	6	21
No. of System I/O buses	1-2	1-2	1-5
Version 3 Software Charge Group	P10	P20	P20

Earlier AS/400 Models

9402 Server Model 20S and 9406 Server Model 30S

9402/6 Model 20S, 30S Processor	20S #2010	30S #2411	30S #2412
Relative System Performance Metric (CPW value) Interactive	5.5	9.6	11.6
Relative System Performance Metric (CPW value) Client/Server	17.1	32.3	68.5
Relative System Performance Ratio (RAMP-C) Interactive	1.9	3.3	4.0
Relative System Performance Ratio (RAMP-C) Client/Server	5.9	10.9	23.5
N-way Multiprocessors	1	1	2
Main Storage (M)	16-128	32-384	64-832
Disk Storage (G) (Maximum) V3R1	23.6	86.5	86.5
(Maximum) V3R2	50.3	86.5	86.5
Max. no. workstations			
Twinax	7	7	7
ASCII	6	6	6
LocalTalk	31	62	62
Comm. lines (maximum)	20	33	33
LAN adapters (maximum)	2	8	8
Available card slots (for I/O adapters)	5	64	114
No. of System I/O buses	1	1-3	1-5
Version 3 Software Charge Group	P05	P10	P10

Earlier AS/400 Models

9402 Model 40S

9402 Model 40S Processor	#2109	#2110	#2111	#2112
Relative System Performance Metric (CPW) Version 3 Release 6				
Client/Server Environment	24.5	30.6	52.9	77.3
Interactive Environment	8.4	12.3	18.3	26.9
Relative System Performance Metric (CPW) Version 3 Release 7				
Client/Server Environment	27.0	33.3	59.8	87.3
Interactive Environment	9.4	13.8	20.6	30.7
Relative System Performance Metric (CPW) Version 4				
Client/Server Environment	27.0	35.0	63.0	91.0
Interactive Environment	9.4	14.5	21.6	32.2
Relative System Performance Rating (RAMP-C)				
Client/Server Environment	8.3	10.6	†	†
Interactive Environment	2.6	3.8		
Main Storage (M)	32-224	32-224	64-512	64-512
Disk Storage (G)				
(Maximum) V3R6	23.6	23.6	23.6	23.6
(Maximum) V3R7 and later	50.3	50.3	50.3	50.3
Maximum Number Workstations				
Twinax	7	7	7	7
ASCII	6	6	6	6
Local Talk	31	31	31	31
Communication Lines (Maximum)	20	20	20	20
LAN Adapters (Maximum)	2	2	2	2
ATM Adapters (Maximum)	1	1	1	1
Available Card Slots (for I/O Adapters)	5	5	5	5
Number of System I/O Buses	1	1	1	1
Version 3/4 Software Charge Group	P05	P05	P05	P10

Earlier AS/400 Models

9406 Models 50S and 53S

Processor Features	50S #2120	50S #2121	50S #2122	53S #2154	53S #2155	53S #2156	53S #2157
Relative System Performance Metric (CPW) Version 3 Release 6 Client/Server Environment	66.7	85.0	106.8	132.5	198.7	299.0	349.8
Interactive Environment	18.7	26.9	26.9	26.9	26.9	26.9	26.9
Relative System Performance Metric (CPW) Version 3 Release 7 Client/Server Environment	77.7	104.2	130.7	162.7	278.8	459.3	509.9
Interactive Environment	21.4	30.7	30.7	30.7	30.7	30.7	30.7
Relative System Performance Metric (CPW) Version 4 Client/Server Environment	81.6	111.5	138.0	188.2	319.0	598.0	650.0
Interactive Environment	22.5	32.8	32.8	32.8	32.8	32.8	32.8
Relative System Performance Rating (RAMP-C) Client/Server Environment	19.7	26.6	†	43.4	66.6	101.4	†
Interactive Environment	5.7	8.3		8.3	8.3	8.3	
Number of N-Way Multiprocessors	1	1	1	1	2	4	4
Main Storage (M)	64-1024	64-1024	64-1024	256-4096	256-4096	256-4096	512-4096
Disk Storage (G) V3R6/V3R7 (Max)	318.7	318.7	318.7	520.0	520.0	520.0	520.0
V4 (Max)	652.8	652.8	652.8	996.4	996.4	996.4	996.4
Communication Lines (Maximum)	96	96	96	200	200	200	200
LAN Ports (Maximum)	16	16	16	16	32	32	32
ATM Ports (Maximum)	8	8	8	16	16	16	16
Available Card Slots (for I/O Adapters)	5-82	5-82	5-82	4-237	4-237	4-237	4-237
Number of System I/O Buses	1-7	1-7	1-7	1-19	1-19	1-19	1-19
Version 3/4 Software Charge Group	P10	P10	P10	P20	P20	P20	P20

Earlier AS/400 Models

9406 Model 170

Processor Features	#2159	#2160	#2164	#2176	#2183
Relative System Performance Metric (CPW) Constrained	73.0	114.0	125.0	125.0	125.0
Client/Server Environment Interactive Environment	16.0	23.0	29.0	40.0	67.0
Unconstrained					
Client/Server Environment Interactive Environment	73.0	114.0	210.0	319.0	319.0
	16.0	23.0	29.00	40.0	67.0
Number of N-Way Multiprocessors	1	1	1	1	1
Main Storage (M)	64-832	64-832	256-1024	256-1024	256-1024
Disk Storage (G)					
V4R2 (Maximum)	85.8	85.8	85.8	85.8	85.8
V4R3 (Maximum)	175.4	175.4	175.4	175.4	175.4
Communication Lines (Maximum)	12	12	12	12	12
LAN Ports (Maximum)	6	6	6	6	6
ATM Ports (Maximum)	3	3	3	3	3
Available Card Slots (for I/O Adapters)	6-15	6-15	6-15	6-15	6-15
Number of System I/O Buses	1	1	1	1	1
Version 4 Software Charge Group	P05	P05	P10	P10	P20

Earlier AS/400 Models

9402 2XX Packages

Models 2FS, 2SS, 2SG	Twinax Server 2FS	LAN Server 2FS	Starter Server 2SS	Growth Server 2SG
Relative System Performance Metric (CPW)				
Client/Server Environment	17.1	17.1	17.1	17.1
Interactive Environment	5.5	5.5	5.5	5.5
Relative System Performance Rating (RAMP-C)				
Client/Server Environment	5.9	5.9	5.9	5.9
Interactive Environment	1.9	1.9	1.9	1.9
Main Storage (M)	16-128	16-128	16-128	32-128
Disk Storage (G) (Maximum)	7.86	7.86	7.86	7.86
Maximum Number Workstations				
Twinax	7	0	0	0
ASCII	0	0	0	0
Local Talk	0	0	0	0
Communication Lines (Maximum)	3	2	2	2
LAN Adapters (Maximum)	2	2	1	1
Available Card Slots (for I/O Adapters)	0	0	0	0
Number of System I/O Buses	1	1	1	1
Version 3 Software Charge Group	P05	P05	P05	P05
Software	OS/400 Query for AS/400 Client Access for AS/400 Novell NetWare Support LAN Server for AS/400 (Includes 10 LAN Requesters)		OS/400 Query for AS/400 Client Access for AS/400 DB2 for OS/400 Query Manager and SQL Novell NetWare Support ADSM for AS/400 (10 Clients With 25G Max) LAN Server for AS/400 (Includes One LAN Requester)	

Earlier AS/400 Models

9402 Model 400 Packages

Model 400 Package	Entry 40E	Entry 41E	Growth 40G	Growth 41G	Large 40L	Large 41L	Entry 42E	Growth 42G	Large 42L	
Relative System Performance Metric (CPW) Version 3 Release 6	12.3	18.3-30.6	12.3	18.3-30.6	12.3	18.3-30.6	12.3-30.6	12.3-30.6	12.3-30.6	
Relative System Performance Metric (CPW) Version 3 Release 7	13.8	20.6-33.3	13.8	20.6-33.3	13.8	20.6-33.3	13.8-33.3	13.8-33.3	13.8-33.3	
Relative System Performance Metric (CPW) Version 4	13.8	20.6-35.0	13.8	20.6-35.0	13.8	20.6-35.0	13.8-35.0	13.8-35.0	13.8-35.0	
Main Storage (M)	64-160	64-224	96-160	96-224	160	160-224	64-224	96-224	160-224	
Disk Storage (G) (Max) V3R6 (Max) V3R7 and later	23.6-50.3	23.6-50.3	23.6-50.3	23.6-50.3	23.6-50.3	23.6-50.3	23.6-50.3	23.6-50.3	23.6-50.3	
Maximum Number Workstations										
Twinax	280	280	280	280	280	280	280	280	280	
ASCII	108	108	108	108	90	90	108	108	90	
Local Talk	186	186	186	186	155	155	186	186	155	
Communication Lines (Maximum)	20	20	20	20	20	20	20	20	20	
LAN Adapters (Maximum)	2	2	2	2	2	2	2	2	2	
ATM Adapters (Maximum)	1	1	1	1	1	1	1	1	1	
Available Card Slots	6	6	6	6	6	6	6	6	6	
Number of System I/O Buses	1	1	1	1	1	1	1	1	1	
Version 3/4 Software Charge Group	P05	P10	P05	P10	P05	P10	Processor #2130 (P05) Processor #2131/#2132/ #2133 (P10)			
Software Included	OS/400 Client Access for AS/400 Query for AS/400 DB2 Query Manager and SQL Development Kit for AS/400						Hardware Only			

Earlier AS/400 Models

9402 Model 436 Packages

Model 436 Package	Entry #0114	Growth #0115	Large #0116
Relative System Performance Metric (CPW) Version 3 Release 6	14.4-24.5	14.4-24.5	14.4-24.5
Relative System Performance Metric (CPW) Version 3 Release 7 and Version 4	16.3-27.4	16.3-27.4	16.3-27.4
Relative System Performance Rating (RAMP-C) OS/400	4.8-8.7	4.8-8.7	4.8-8.7
Relative System Performance Rating (RAMP-C) SSP	1.0-2.4	1.0-2.4	1.0-2.4
Main Storage (M)	32-256	32-256	64-256
Disk Storage (G) (Maximum) Version 3 Release 6 (Maximum) Version 3 Release 7 and later	23.6 50.3	23.6 50.3	23.6 50.3
Maximum Number Workstations Twinax Devices ASCII Devices LocalTalk Devices	280 108 0	280 108 0	280 108 0
Communications Lines (Maximum)	20	20	20
LAN Adapters (Maximum)	2	2	2
ATM Adapters (Maximum)	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6
Number of System I/O Buses	1	1	1
Version 3/4 Software Charge Group	Processor #2102 (P05) Processor #2104/#2106 (P10)		

Earlier AS/400 Models

9402 Model 40S Packages

Model 40S Hardware/Software Packages	Small Server 4SS	Entry Server 4SE	Growth Server 4SG	Growth Server 4TG	Large Server 4SL	Large Server 4TL
Relative System Performance Metric (CPW) Version 3 Release 6 Client/Server Environment Interactive Environment	24.5-52.9 8.4-18.3	24.5-52.9 8.4-18.3	24.5-52.9 8.4-18.3	77.3 26.9	24.5-52.9 8.4-18.3	77.3 26.9
Relative System Performance Metric (CPW) Version 3 Release 7 Client/Server Environment Interactive Environment	27.0-59.8 9.4-20.6	27.0-59.8 9.4-20.6	27.0-59.8 9.4-20.6	87.3 30.7	27.0-59.8 9.4-20.6	87.3 30.7
Relative System Performance Metric (CPW) Version 4 Client/Server Environment Interactive Environment	27.0-63.0 9.4-21.6	27.0-63.0 9.4-21.6	27.0-63.0 9.4-21.6	91.0 32.2	27.0-63.0 9.4-21.6	91.0 32.2
Main Storage (M)	32-224/ 64-512	32-224/ 64-512	64-224/ 64-512	128-512	96-224/ 128-512	128-512
Disk Storage (G) (Maximum) V3R6 (Maximum) V3R7 and later	23.6 50.3	23.6 50.3	23.6 50.3	23.6 50.3	23.6 50.3	23.6 50.3
Maximum Number Workstations						
Twinax	7	7	7	7	7	7
ASCII	6	6	6	6	6	6
Local Talk	31	31	31	31	31	31
Communication Lines (Maximum)	20	20	20	20	20	20
LAN Adapters (Maximum)	2	2	2	2	2	2
ATM Adapters (Maximum)	1	1	1	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6	6	6
Number of System I/O Buses	1	1	1	1	1	1
Version 3/4 Software Charge Group	P05	P05	P05	P10	P05	P10
Software	OS/400 Client Access for AS/400 Query for AS/400 DB2 Query and SQL Development Kit for AS/400					

Earlier AS/400 Models

9402 Model 40S Packages

Model 40S Hardware Packages	Small Server 4HS	Entry Server 4HE	Growth Server 4HG	Large Server 4HL
Relative System Performance Metric (CPW) Version 3 Release 6 Client/Server Environment Interactive Environment	24.5-77.3 8.4-26.9	24.5-77.3 8.4-26.9	24.5-77.3 8.4-26.9	24.5-77.3 8.4-26.9
Relative System Performance Metric (CPW) Version 3 Release 7 Client/Server Environment Interactive Environment	27.0-87.3 9.4-30.7	27.0-87.3 9.4-30.7	27.0-87.3 9.4-30.7	27.0-87.3 9.4-30.7
Relative System Performance Metric (CPW) Version 4 Client/Server Environment Interactive Environment	27.0-91.0 9.4-32.2	27.0-91.0 9.4-32.2	27.0-91.0 9.4-32.2	27.0-91.0 9.4-32.2
Main Storage (M)	32-224/ 64-512	32-224/ 64-512	64-224/ 128-512	96-224/ 128-512
Disk Storage (G) (Maximum) V3R6 (Maximum) V3R7 and later	23.6 50.3	23.6 50.3	23.6 50.3	23.6 50.3
Maximum Number Workstations Twinax ASCII Local Talk	7 6 31	7 6 31	7 6 31	7 6 31
Communication Lines (Maximum)	20	20	20	20
LAN Adapters (Maximum)	2	2	2	2
ATM Adapters (Maximum)	1	1	1	1
Available Card Slots (for I/O Adapters)	6	6	6	6
Number of System I/O Buses	1	1	1	1
Version 3/4 Software Charge Group	Processor #2109/#2110/#2111 (P05) Processor #2112 (P10)			

Earlier AS/400 Models

CPW is the Commercial Processing Workload that is now being used to measure the performance of all AS/400 processors. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application being run determine what performance is achievable. For more details, please see the section entitled *Commercial Processing Workload* on page 12.

9404 Model B10 with 16M Main Storage and 945M of Disk assigned value 1.0. All data for 70% system utilization, and maximum configurations. IBM RAMP-C workload. Customer results may vary.

There are particular limitations within SSP that means that quoted minimums/maximums are often with OS/400 installed.

RSP CPW 5.5/17.1 refers to Interactive and Client/Server environments respectively on the 9401 Server 10S, and RSP RAMP-C of 1.9/5.9 also refers to these two environments in the same order.

Three LANs are allowed when running IBM Firewall for AS/400 (5769-FW1).

- † This processor was announced in September 1996 when IBM introduced CPW as the new method of measuring the performance of AS/400 processors. For this and future processor announcements, CPW figures only will be quoted.

Index

Special Characters

#0200	281	#2178	56
#0201	282	#2179	94
#0202	282	#2180	94
#0203	283	#2181	94
#0204	283	#2182	94
#0344	145	#2183	63
#0362	197	#2188	45
#0367 Operations Console PCI		#2189	45
Cable 20ft/6m	74	#2207	54, 55
#0381	197	#2208	54, 55
#0391	35, 179	#2237	133
#0392	35, 179	#2238	133
#0393	35, 179	#2239	133
#0394	35, 179	#2240	134
#1349	359, 369	#2243	134
#1350	359, 369	#2256	54, 55, 235
#1355	359, 369	#2257	233
#1360	359, 369	#2258	233
#1379	359	#2259	233
#1380	359	#2260	233
#2118	191	#2261	54, 55, 235
#2119	191	#2290	37
#2129	93	#2290 73/20 CPW Processor with	
#2134	93	64M memory	63
#2135	93	#2291	37
#2136	93	#2291 115/25 CPW Processor with	
#2159	63	64M memory	63
#2160	63	#2292	37
#2161	192	#2292 220/30 CPW Processor with	
#2163	192	256M memory	63
#2164	63	#2312	60
#2165	192	#2313	60
#2166	192	#2385	37
#2175	94	#2385 460/50 CPW Processor with	
#2176	63	256M memory	63
		#2386	37

#2386 460/70 CPW Processor with 256M memory 63	#2852 185
#2605 147	#2854 115, 215
#2609 147	#2857 80
#2610 148	#2860 114, 214
#2612 148	#2861 114, 115, 214, 215
#2613 148	#2862 115, 215
#2614 149	#3001 67, 98, 196
#2620 150	#3002 98, 196
#2621 353	#3110 97, 195
#2623 146	#3179 137, 238, 239
#2624 354	#3180 137, 238, 239
#2628 151	#3182 97, 195
#2629 102, 201	#3189 137, 238, 239
#2644 355	#3190 137, 239
#2664 151	#3191 137, 239
#2686 127	#3192 137, 238, 239
#2688 126, 226	#3193 137
#2695 161, 259	#3193 2048M 137
#2699 106, 149, 205, 248	#5032 172, 353
#2720 183, 198	#5040 313
#2721 73, 107, 184, 206	#5042 313
#2722 68, 100	#5043 313
#2723 78, 111, 152, 184, 211	#5044 313
#2724 77, 111, 153, 185, 211	#5052 126, 226
#2726 368	#5055 159, 257
#2729 369	#5057 160, 258
#2740 370	#5058 126, 169, 226, 267
#2741 371	#5064 223
#2809 70, 102, 201	#5072 126, 226
#2810 153	#5073 161, 259
#2811 78, 112, 153, 212	#5082 126, 226
#2812 78, 112, 154, 212	#5083 165, 263
#2815 79, 112, 154, 212	#5540 142
#2816 79, 112, 154, 213	#5543 142
#2818 79, 113, 154, 213	#5544 142
#2819 80, 113, 155, 213	#6050 100, 199
#2838 77, 113, 155, 214	#6112 349
#2850 186	#6140 100
#2851 114, 215	#6141 100, 144, 198
	#6142 100, 144, 198

#6149	155	#9280	144
#6180	100, 144, 199	#9329	121, 125, 221, 225
#6181	155	#9331	122, 125, 222, 225
#6381	89, 132, 173, 231	#9364	123
#6382	89, 132, 174, 231	#9699	149
#6385	90, 132, 174, 231	#9707	87, 127, 226
#6481	132, 231	#9720	68, 74, 107, 207
#6482	132, 174, 231	#9721	74, 108, 207
#6485	132, 231	#9723	78, 211
#6501	356	#9724	77, 211
#6502	357	#9728	372
#6512	358	#9738	77, 214, 252
#6513	360	#9751	366
#6522	357	#9754	367
#6523	361	#9835	147
#6530	361	#9836	147
#6532	362	#9838	148
#6533	363	#9839	148
#6534	364	¼" Cartridge	173, 231
#6605	128, 168, 228, 266, 311		
#6606	128, 168, 228, 266, 311		
#6607	128, 168, 228, 266, 311		
#6616	156		
#6617	156		
#6650	128, 168, 228, 266, 311		
#6652	128, 168, 228, 266, 311		
#6807	87		
#6813	87		
#7101	83, 85		
#7128	124, 224		
#7130	124, 224		
#8813	87		
#9020	148		
#9021	148		
#9022	147		
#9023	147		
#9141	144		
#9171	313		
#9179	137, 238, 239		
#9190	137, 238, 239		

Numerics

100/10 Mbps Ethernet 77, 113, 155, 214

13G ¼" Cartridge Tape Unit 132, 174, 231

155 Mbps Multi-Mode Fiber ATM IOA 79, 112, 154, 213

155 Mbps Single-Mode Fiber OC3 ATM IOA 79, 113, 154, 213

155 Mbps Unshielded Twisted Pair OC3 ATM IOA 79, 112, 154, 212

16/4 Mbps Token-Ring Network Adapter/HP 155

2.5G ¼" Cartridge Tape Unit 132, 173, 231

2440 353

2440 Rack 315

2480 380

248X 382

25 Mbps Unshielded Twisted Pair	5648-C05	487
ATM IOA 78, 112, 153, 212	5648-C20	491
3130 Advanced Function	5649-EP4	189
Printer 403	5697-C72	566
3153 379	5697-D11	567
3270 Device Emulation 451	5714-MG1	540
3270 SNA API Support 452	5716-CX4	540
34 Mbps Coaxial E3 ATM IOA 80,	5716-CX5	540
113, 155, 213	5716-DCT	579
3422 355	5716-SVA	520
3430 355	5716-VG1	543
3480 355	5727-MG1	543
3486 378	5733-IM1	481
3487 378	5769-AC1	491
3488 378	5769-AC2	491
3489 378	5769-AC3	491
3490 355	5769-AF1	573
3490E Magnetic Tape	5769-AP1	576
Subsystem 321	5769-BR1	525
3490E Models E01 and E11 322	5769-CB1	544
3494 Tape Library Dataserver 324	5769-CF1	494
34XX Magnetic Tape Subsystem	5769-CL3	547
Attachment 355	5769-CM1	494
3570 Tape Cassette	5769-CP4	493
Subsystem 329	5769-CR1	482
3575 Tape Library Dataserver 335	5769-CX2	551
3590 High Performance Tape	5769-DB1	482
Subsystem 339	5769-DC1	496
3995 Optical Library C-Models 342	5769-DC3	496
4230 Impact Matrix Printer 414	5769-DFH	553
4232 Impact Dot Matrix Printer 415	5769-DP2	483
4247 MultiForm Matrix Printer 416	5769-DS1	577
45 Mbps Coaxial T3/DS3 ATM	5769-FN1	577
IOA 78, 112, 154, 212	5769-FNT	577
4G ¼" Cartridge Tape Unit 132,	5769-FW1	497
174, 231	5769-JS1	528
5308 384	5769-MG1	529
5494-EXT Remote Control	5769-MQ2	499
Unit 386	5769-PD1	555
5648-113 571	5769-PT1	530

5769-PW1 556
 5769-QU1 484
 5769-RD1 531
 5769-RG1 562
 5769-SM1 536
 5769-SS1 421
 5769-ST1 485
 5769-SV3 521
 5769-SVD 520
 5769-SVE 520
 5769-VI1 571
 5769-WP1 578
 5769-XW1 502
 5769-XZ1 516
 5798-NC2 568
 5798-TAT 569
 5798-TAW 569
 5798-TBT 583
 5798-TBW 517
 5798-TBY 584
 6262 Impact Line Printer 417
 6299 Midrange Hub 390
 6400 Line Matrix Printer 418
 7208 External 8mm Tape Drive
 Model 242 316
 7299 Express Hub 392
 7852 Model 400 395
 8mm Cartridge Tape 316
 9309 Rack Enclosures 312
 9332 310
 9335 310
 9336 310
 9337 310
 9337 Disk Array Subsystem 301
 9348 Magnetic Tape Unit 346
 9401 Model 150 35, 179
 9406 Model 170 37, 63
 9406 Model 600 39, 93, 118
 9406 Model 620 41, 94, 119
 9406 Model 640 43, 133, 159

9406 Model 650 45, 134, 160
 9406 Model S10 47, 191, 218
 9406 Model S20 49, 192, 219
 9406 Model S20 custom
 e-server 56, 272
 9406 Model S30 52, 233, 256
 9406 Model S30 and S40 custom
 e-servers 58
 9406 Model S30 and SB1 custom
 e-servers 275
 9406 Model S40 54, 235, 258
 9406 Model SB1 Custom
 Mixed-Mode e-Servers 60
 9427 8mm Tape Cartridge Library
 Models 210 and 211 318

A

ADSM 521
 ADSTAR Distributed Storage
 Manager for AS/400 521
 ADTS/400 556
 ADTSCS/400 547
 Advanced Application
 Architecture 5
 Advanced DBCS Printer Support for
 AS/400 576
 Advanced Function Printing DBCS
 Fonts for AS/400 577
 Advanced Function Printing Fonts
 for AS/400 577
 Advanced Function Printing Utilities
 for AS/400 573
 Advanced Peer-to-Peer
 Networking 451
 Advanced Print Utility (APU) 575
 Advanced Program-to-Program
 Communication 451
 Advanced Technology 14
 AFP 447

AFP Font Collection for IBM
 Operating Systems 571
AFP Toolbox for OS/400 576
Alerts 451
APD/400 555
API 553, 581
Application Development
 Manager 561
Application Development
 Products 539
Application Development
 Program 589
Application Development ToolSet
 Client Server for AS/400 547
Application Development ToolSet for
 AS/400 556
Application Development Toolset
 Plus 479
Application Dictionary Services 560
Application Program Driver for
 AS/400 555
AS/400 Advanced Entry 33
AS/400 Operations Productivity
 Pak 479
AS/400e 9406 Model SB1 custom
 e-server 275
AS/400e custom e-servers 272
AS/400e series 33
AS/400e server Model 150 179
AS/400e servers 33, 177
AS/400e servers Models S10,
 S20 191
AS/400e servers Models S30,
 S40 233
AS/400e systems Model 170 63
AS/400e systems Models 600,
 620 93
AS/400e systems Models 640,
 650 133
ASCII 12-Port Attachment 100,
 144, 198

ASCII to 5250 Connection 384
ASCII Workstation Controller 100,
 144, 198
Asynchronous 451
ATM 76, 112, 153, 212, 451

B

Backup Recovery and Media
 Services for AS/400 525
Base CD-ROM Drive 131, 173,
 231, 271
Base PCI Two-Line WAN IOA 74,
 207
Base PCI WAN/Twinaxial IOA 68,
 74, 207
BASIC 539
battery backup 161, 165, 259, 263
BEST/1 13, 531
BGU 577
Binary Synchronous 451
BRMS/400 525
Bus Extension Unit 313
Business Graphics Utility for
 AS/400 577
Business Intelligence 27
BYPASS2000 for AS/400 567

C

C++ 540
calendar 580
CallPath Server for AS/400 493
Card Technology 65, 95, 136, 193,
 237
CCW 343
CD-ROM 88, 172, 271, 588
CICS for AS/400 553
CL 421
Client Access Family for
 Windows 502

Client Access/400 Console 142,
243
Client Series 587
CODE/400 561
Commercial Processing
Workload 12
Communications 73, 106, 146,
183, 247, 451
Communications Utilities for
AS/400 494
Concurrent Maintenance 442
Continuous Composite Worm 343
Continuously Powered Main
Storage 138
Continuously Powered Main Storage
(CPM) 239
Continuously Powered
Main-Store 86
Control Language 421
Conversion to AS/400e series 6xx
and Sxx 279
CPW 12
Cryptographic Processor 150
Cryptographic
Processor-Commercial 151
Cryptographic Support for
AS/400 482

D

DASD Expansion Unit 124, 224
Data File Utility/Application
Development 559
Database Products 481
Database Support 460
DataPropagator Relational 5.1 for
AS/400 483
DB2 for OS/400 485
DB2 Multisystem for AS/400 468
DB2 Query Manager and SQL
Development Kit for AS/400 485

DB2 Symmetric Multiprocessing for
AS/400 469
Developer Kit for Java 438
Disk Storage Specifications
Comparison Charts 310
Disk Unit Controller (No
Cache) 361
Disk Unit Controller Ultra SCSI 372
Disk Unit Controller-No Cache 169,
267
Display Station Passthrough 451
Distributed Computing Environment
(DCE) Base Services for
AS/400 496
Distributed Computing Environment
(DCE) DES Library Routine 496
Distributed File Management 451
Distributed Relational
Database 452
Distributed System Node
Executive 451
Domino for AS/400 23
DRDA 429
Dynamic RAID Spare Function 307

E

e-Jump 439
EDMSuite OnDemand for
AS/400 531
EIA232/V.24 147
EIA232/V.24 Adapter 148
Enterprise Toolkit for AS/400 474
Ethernet 78, 111, 152, 184, 211
Euro Currency 440
Expansion Unit for SPD Cards 125,
225
Expansion Unit Tape/Cage 124,
224
Express Hub for AS/400 392

F

Facsimile Support for AS/400 584
Fax Adapter 151
File Compose and Merge
Utility 560
Firewall for AS/400 497
Focus 589

G

General Purpose I/O Rack 315
GeneXus 589
GrowthPak for OS/400 479
GUI/400 589
GUISys/400 589

H

Hierarchy of Microprocessors 8
High Performance Controller (2M
Cache) 357
High Performance Controller (4M
Cache) 358
HTTP Server for AS/400 430, 433,
453, 491

I

IBM Advanced Function Printing
(AFP) PrintSuite for OS/400 574
IBM InfoPrint and Network Printer
Families 397
IDLC 450
IEEE 802.5 and 802.2 450
ILE C for AS/400 551
ILE COBOL for AS/400 544
ILE RPG for AS/400 562
ImagePlus VisualInfo for
AS/400 571
InfoColor 70 Full-Color Digital
Printer 413

InfoPrint 20 Printer 399
InfoPrint 3000 Advanced Function
Printing System 408
InfoPrint 32 Printer 401
InfoPrint 4000 Advanced Function
Printing Systems 410
InfoPrint 4000 Hi-Lite Color Printing
System 412
InfoPrint 4005 Hi-Lite Color
Printer 412
InfoPrint 60 Advanced Function
Printer 405
InfoPrint 62 Continuous Forms
Printer 407
Information Center 444
InfoWindow 378
Integrated Fax Adapter 151
Integrated File System (IFS) 527
Integrated Hardware Disk
Compression 442
Integrated PC Server 80, 156, 465,
466
Intelligent Miner for AS/400 481
Intelligent Printer Data Stream 414
Interactive Source Debugger 560
Internal Disk Units 87, 127, 168,
226, 266
Internal Tape 88, 130, 172, 230,
270
Internal Tape Device
Controller 359
IPCS 438
IPDS 577
ISDN 450
ISDN Basic Rate Interface
Adapter 147

J

Java 14, 375, 426, 437, 438, 472,
474, 487

Job Scheduler for AS/400 528
JustMail for OS/400 583

K

KnowledgeTool Development Toolkit
for OS/400 569
KnowledgeTool Runtime for
OS/400 569

L

LAN/WAN IOP 153
LAN/WAN/Workstation IOP 102,
141, 201, 242
LANSA 589
LDAP 440
Licensed Programs 481
Lightweight Directory Access
Protocol 440
Local Area Networks 76, 110, 152,
210, 250
Lotus Domino 22, 424
Lotus Notes 466

M

Magic 590
Magnetic Media Controller Ultra
SCSI 364, 369
Magnetic Media Controllers 348
Magneto-Optical to be erased and
the cartridge reused 342
Magstar MP (Multipurpose) 3575
Tape Library Dataserver 335
Main Storage 67, 97, 137, 181,
195, 238
Media and Storage Extensions 469
MFIOIP 69, 101, 139, 200, 240,
349, 366

Midrange Hub 390
Migrated Disk Units 294
Migrated Tape Units 298
Migration Kit 296
Model 150 179
Model 150 Software 189
Model 170 63
Model SB1 275
Models 600, 620 93
Models 640, 650 133
Models S10, S20 191
Models S30, S40 233
Modem 395
MQSeries for AS/400 499
mrc-Productivity Series 590
MSS/400 529
Multi-Function I/O Processor 69,
101, 139, 200, 240
Multi-Protocol Communications
Adapter 73, 107, 184, 206

N

NATURAL 589
Navio NC Navigator for IBM Network
Station 491
Net.Commerce for AS/400 568
Netfinity for AS/400 520
NetQuestion 434
NetServer 444
NetWare Integration 469
Network Printer 12 399
Network Printer 17 399
Network Routing Facility 451
Network Station 375, 487
Network Station Manager 487
Networking Products 487
Novell NetWare 475

O

Object Distribution Facility 451
OBSYDIAN 590
Office Products 571
OfficeVision for AS/400 484, 578
OfficeVision JustMail for
OS/400 583
OnDemand for AS/400 531
One-Line V.35 Adapter 148
One-Line X.21 Adapter 149
Operating System/400 421
Operations Console 437
Operations Navigator 435, 455,
463
Optical Bus Adapter 161, 259
Optical Link Processor 162, 260
OptiConnect 470
OS/2 522, 540, 542
OS/2 Warp Server for AS/400 516
OS/400 421

P

Pager Printer Formatting Aid
(PPFA) 575
Pascal 539
PCI 65, 95, 136, 193, 237
PCI 100/10 Mbps Ethernet IOA 77,
113, 155, 214
PCI Integrated Expansion Unit 125,
225
PCI LAN/WAN/Workstation IOP 70,
102, 201
PCI RAID Disk Unit Controller 368,
370
PCI WAN/Twinaxial IOA 183, 198
PDM 556
Performance Advisor 531
Performance Management/400 476

Performance Tools for AS/400 530
Peripheral Component
Interconnect 65, 95, 136, 193,
237
Permanent
Write-Once-Read-Many 342
PL/I 539
Point-of-Sale Communications Utility
for AS/400 494
Power and Packaging 82, 118,
159, 218, 256
power supply 161, 259
PowerBuilder 590
Print Services Facility/400 467
Product Previews 31
Programming Development
Manager 556
PROGRESS 590

Q

Query for AS/400 484

R

rack 312
RAID Disk Unit Controller (4M
Cache) 362
RAID Disk Unit Controller Ultra
SCSI 368
RAID-5 170, 268, 302, 305, 358,
359
RAMP-C 12
Redbooks 592
Removable Media Device
Attachment 353
Replacing the Release 281
Report Layout Utility 559
Retail Distribution 494
RLU 559

S

S10, S20 191
S20, S30 272
S30, S40 233
SAP R/3 AFP Print 576
SB1 275
Screen Design Aid 558
SDA 558
SEARCH2000 for AS/400 566
Security 450
Seer HPS 590
SEU 557
Side-by-Side Install 283
Single-Level Storage 9
Six-Line Communications
Controller 146
SM/400 536
SNA Passthrough 452
SNA/Management Services 452
SNMP 453
softcopy library 588
Software Subscription 423
Source Entry Utility 557
SPD 95
SPD ASCII 12-Port
Attachment 100, 198
SPD ASCII Workstation
Controller 100, 144, 198
SPD LAN/WAN/Workstation
IOP 102, 201
SPD Twinaxial Workstation
IOA 100, 144, 199
SPD Two-Line WAN IOA 106, 149,
205, 248
SQL 485
Staged Side-by-Side Upgrade 283
Staged Upgrade Offering 282
Storage Device Controller 354
Storage Expansion Tower 165,
263, 267

Storage Expansion Unit 169, 267
Summary of All Earlier AS/400
Models 594
Supermarket 494
SVA 520
Synchronous Data Link
Control 451
System Concepts 4
System Concepts and
Architecture 3
System Console Attached to ASCII
Workstation Controller 243
System Console Attached to
Twinaxial Workstation
Controller/Adapter 142, 243
System Unit Expansion 123, 223
System Unit Expansion Rack 162,
313
System Unit Expansion Tower 161,
259
System/36 Migration Aid 543
System/38 Migration Aid 540
System/38 Utilities 482
Systems Management
Products 519
SystemView Base 465
SystemView Base for OS/400 519
SystemView Managed System
Services for AS/400 529
SystemView System Manager for
AS/400 536

T

Tape Cartridge 318
Tape Cassette 329
Tape Subsystem 321
tape unit 172, 270
Tape Units 298
Tape/Disk Device Controller 356

TCP/IP 428, 441, 454, 477, 523, 581
Technology-Independent Machine Interface 5
Token-Ring 77, 111, 153, 185, 211
Token-Ring Gateway 387
Toolbox for Java 437, 472
Twinaxial 245
Twinaxial Expansion Kit 386
Twinaxial Workstation IOA 100, 144, 245
Two-Line EIA232/V.24 Adapter 147
Two-Line WAN IOA 73, 107, 149, 206, 248
Two-Line X.21 Adapter 148

U

UNIX 496
Unload/Reload 282

V

V.35 148
ValuPak for OS/400 479
Version 3 Release 6 588
Version 4 Release 1 421
VisualAge 590
VisualAge C++ for AS/400 540
VisualAge for Java 474
VisualGen 590
VisualGen Host Services for OS/400 543

W

Windows 522
Windows 95/NT Client 463
Windows NT 26, 427, 438, 463
Wireless Access Point 380

Wireless Connection for AS/400 517
Workstation Controller 197
Workstation Controllers 68, 99, 142, 182, 243
Workstation/Communications Adapter 182, 183
WORM 343

X

X.21 148
X.25 451
X.400 581

Y

Year 2000 457, 567