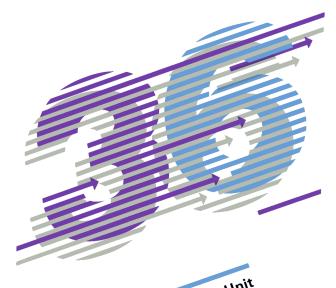# IBM

System/36
Facts Folder

5360 System Unit
5362 System Unit
5364 System Unit

IBM

System/36
Facts Folder

Preface

This facts folder describes the IBM System 36. Topics discussed include the IBM 5360, 5362 and 5364 System Units highlights, I/O devices, communications capabilities, the System Support Program (SSP), and application software.

This publication will be updated periodically to reflect changes; however, the authoritative sources of information for the associated components and for programming support are the System Library publications.

Consult your local IBM Marketing Representative for availability dates of the system hardware components and the various programming functions.

Contents

Introduction

IBM System/36 is an advanced, cross-industry data processing system especially designed to provide new and powerful functions for the growing interactive data processing, communication, office automation, and business graphics environments.

System/36 includes three fully compatible system units-the 5360, 5362, and System/36 PC (5364)—to match the needs of a wide spectrum of users.

IBM has provided a high degree of compatibility between System/36 and System/34 to allow the System/36 user to benefit from the many application packages developed for the System/34. This publication provides a brief description of the features and functions of this powerful system.

IBM System/36 highlights

System/36 is a multiprogramming, multitasking system which features a multiprocessor architecture in all system units and allows overlapped task execution in the 5360 and 5362.

The System/36 multiprocessor architecture takes advantage of the latest technologies. The processors use LSI (large scale integration) for the logic circuitry. Storage technology is MOSFET (metal oxide semiconductor field effect transistor).

System/36 has a HELP support that is available at all user levels. By simply pressing a HELP key, users have access to general or detailed information about menus, commands, and procedures as well as their own applications if the applications are programmed with HELP text.

Consequently, display operators need minimal education on the System/36 before using it.

All System/36 units are customer setup; that means they are manufactured and packaged to allow the user to install the System/36 without assistance from an IBM Customer Service Representative. This feature allows flexibility in moving and reinstalling the System/36.

System/36 offers a number of facilities to help improve end user productivity. At any System/36 display station, the user can access functions like text creation and processing, quality printing, processing, document maintenance and distribution to local users or remote users or to users of DISOSS networks, as well as creation and maintenance of mailing lists and telephone directories, and business graphics.

System/36 provides hardware and software for use in a distributed data processing environment supporting both office and departmental users.

Hardware general description

IBM 5360 System Unit

The 5360 System Unit includes:

- A control storage processor and a main storage processor unit with main storage sizes of:

— 128K bytes	— 512K bytes	— 1280K bytes
— 256K bytes	— 768K bytes	— 1536K bytes
— 384K bytes	— 1024K bytes	— 1792K bytes

- A diskette magazine drive or single diskette drive

- An integrated nonremovable disk storage in the following sizes:

— 30 Mb	— 400 Mb
— 60 Mb	— 600 Mb
— 200 Mb	— 800 Mb

- An integrated workstation processor for up to 36 local workstations

- Optional communications features (up to eight communication lines)

- A system control panel

- The I/O processor and adapters

5360 System Unit summary

Model	Main storage* (K bytes)	Diskette drive	Disk storage (Mb)
A11	128	Single	30
A21	128	Magazine	30
A12	128	Single	60
A22	128	Magazine	60
B13	256	Single	200
B23	256	Magazine	200
B14	256	Single	400
B24	256	Magazine	400
B15	256	Single	600
B25	256	Magazine	600
B16	256	Single	800
B26	256	Magazine	800

* Additional main storage (up to 256K on AXX models and up to 1792K on BXX models) is available as a feature.

All the model changes are field installable.

5360 attachable devices

- 3180 Model 2 Display Station
- 5292 Color Display Station Models 1 and 2
- 5291 Display Station Models 1 and 2
- 5251 Display Station Model 11
- 4214 Printer
- 5262 Line Printer
- 5224 and 5225 Matrix Printers
- 5219 high-quality Printer Models D01 and D02
- 5256 Matrix Printer
- 51 50/5160 XT/5170 AT/5155 Portable Personal Computer (with 5250 emulation)
- Selected PC Printers

The maximum number of the above workstations that can be locally attached is 36 (in any combination).

- One 3262 Line Printer Models B1, or C1
- Up to two 8809 Magnetic Tape Drives Models C01, C02
- One 1255 Magnetic Character Reader
- Up to eight communication lines

    The communication lines allow the 5360 System Unit to be connected to other IBM systems or devices (remote workstations or systems). The section entitled "5360 communication adapter and processor" lists the additional devices connectable to the 5360 System Unit.

5360 components

The 5360 System Unit features a multiprocessor central electronic complex that can include from three to seven processors, depending on the system configuration. There are two types of processors:

1. System management and user application processors
2. Input/output dedicated processors

The first type includes:

- The main storage processor
- The control storage processor

The second type includes:

- The workstation processor (always included)
- The file support processor
- The line printer processor
- The communications processor
- The 1255 Magnetic Character Reader processor

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The last four processors are present only when the corresponding peripherals are connected to the system.

The multiprocessor architecture of the 5360 System Unit central electronic complex allows the various processors to operate independently from each other because each processor has an independent storage that stores microprogram instructions and data to be interchanged with other units.

5360 main storage processor (MSP)

The purpose of this unit is to process user applications as well as system supervisor routines residing in main storage.

Error correcting code is maintained in main storage and automatically corrects any single-bit error and detects any two-bit error within two bytes.

5360 control storage processor (CSP)

The CSP processes the main storage processor calls (supervisor calls) and deals with storage management, resource management, task management, main storage contents management, input/output device support, interval timer support, scientific instruction set execution, diagnosis and error recovery. CSP storage is 64K and has direct access to main storage.

5360 channel

The channel provides the hardware interface between the control storage processor and the I/O processors. It has a 2-byte bidirectional bus with a transfer rate of up to 2.5 megabytes per second.

5360 workstation processor

The workstation processor provides for direct local attachment of the IBM 3180 Model 2, 5251, 5291 and 5292 Displays, and the IBM 5150/5160 XT/5170 AT/51 55 Portable Personal Computer (with 5250 emulation). The workstation processor also provides for attachment of the IBM 4214, 5262, 5256, 5224, 5225, and 5219 Printers to the 5360 System Unit.

- The basic attachment is standard on all models of the 5360 System Unit and supports a maximum of six workstation devices in any combination; with the Expansion Feature, the workstation processor will support a maximum of 36 devices.

5360 file support processor

This is an optional processor, installed when the tape drive is connected.

- It supports tape, disk, and diskette input/output devices, offloading the control storage processor.
- It is architecturally equivalent to the CSP and features 1 28K bytes of storage.
- When the file support processor is not installed, a buffered file adapter supports overlapped disk and diskette operations and is directly connected to the channel.

5360 line printer processor

The line printer processor features an 8K storage and is dedicated to the control of the connection between the 5360 System Unit and 3262 Printer. System/36 supports only one 3262 printer (Model B1 or C1).

5360 communication adapter and processor

Two mutually exclusive communication alternatives are available:

- Single line communication adapter (SLCA)
  - Has a line speed up to 9600 bps
  - Interfaces are: EIA-RS232, DDSA, X.21 non-switched, and 1200 bps integrated modem
- Eight line communication adapter (ELCA)*
  - Has a dedicated processor — able to handle up to eight lines
  - Has an aggregate line speed up to 170,000 bps, individual line speed up to 56,700 bps.
  - Allows auto-answer and manual answer
  - Only one line is utilized for X.25 or auto-answer
  - Allows local attachment to IBM 3705/3725 Communications Controller

    Communication adapters allow switched, nonswitched with Binary Synchronous Communication (BSC) or Synchronous Data Link Control (SDLC), and multipoint tributary operation with SDLC protocols. Host Data Link Control (HDLC) supports X.25 on the MLCA and ELCA.

    The System Support Program (SSP) provides necessary modules for the 5360 System Unit to communicate with:

    * Multiple Line Communication Adapter (MLCA) has been functionally replaced by ELCA on the 5360.

- 5251 Model 12 Remote Display Station and Controller
- 5294 Remote Control Unit
- Another System/36
- System/32, System/34 and System/38
- System/3
- Series/1
- Datamaster
- Systems 5110/5120
- System/370, 43XX, 303X, 308X hosts
- 5280 Distributed Data System
- 3741 Data Station
- IBM 51 50/5160 XT/5170 AT Personal Computer (when attached to 5251 Model 12 or to 5294 or using Enhanced 5250 Emulation Program)
- 5520 Administrative System
- 6580 Displaywriter
- 6670 Information Distributor
- 5230 Data Collection System
- 5260 Point of Sale Terminal
- 4700/3600 Financial System
- 3694 Document Processor

The type of software support for the connection of these devices ranges from the high-function ICF (Interactive Communications Feature) and DDM (Distributed Data Management) software to user-written routines (through RPG II telecommunications or Assembler routines). An overview of the System/36 software is contained in the section en-titled, "Communications support."

5360 disk storage devices

The 5360 System Unit can contain 30, 60, 200, 400, 600, or 800 Mb of disk storage. These capacities are achieved with one or more disk drives, each of which handles a 30 Mb or 200 Mb disk.

The characteristics of each drive are shown in the following table:

	30 Mb	200 Mb
Rotational speed (rpm)	3151	2964
Average rotational delay (ms)	9.52	10.1
Seek time (average) (ms)	35	25
Instantaneous data rate (Mb/sec)	1.25	1.50
Data storage capacity per drive (Mb)	30.845	200.202
Maximum number per system	2	4

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IBM 5362 System Unit

The 5362 System Unit includes:

- A control storage processor and a main storage processor unit with main storage sizes of:

  — 128K bytes   — 512K bytes
  — 256K bytes   — 768K bytes
  — 384K bytes   — 1024K bytes

- A single diskette drive

- An integrated nonremovable disk storage in the following sizes:

  — 30 Mb   — 90 Mb
  — 60 Mb   — 120 Mb

An integrated workstation processor for up to 22 local workstations

- An optional communications feature (up to four communication lines)

- A system control panel

5362 System Unit summary

Model	Main storage* (K bytes)	Disk storage (Mb)
A01	128	30
A02	128	60
A03	128	90
A04	128	120
*Additional main storage (up to 1024K) is available.		

The available model changes are: from A01 to A02, or to A03, or to A04; from A02 to A04; from A03 to A04.

All the available model changes are field installable.

5362 attachable devices

- 3180 Model 2 Display Station
- 5292 Color Display Station Models 1 and 2
- 5291 Display Station Models 1 and 2
- 5251 Display Station Model 11
- 4214 Printer
- 5262 Line Printer
- 5224 and 5225 Matrix Printers
- 5219 high-quality Printer Models D01 and D02
- 5256 Matrix Printer
- 5150/5160 XT/5170 AT Personal Computer (with 5250 emulation)
- Selected PC Printers

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The maximum number of the preceding workstations that can be locally attached is 22 (in any combination).

- Up to four communication lines allow the 5632 System Unit to be connected to other IBM systems or devices (remote workstations or systems). The section entitled "5362 communication adapter and processor" lists the additional devices connectable to the 5362 System Unit.

5362 components

The 5362 System Unit features a multiprocessor central electronic complex that can include many processors, depending on the system configuration.

These are two types of processors:

1. System management and user application processors.
2. Input/output dedicated processors

The first type includes

- The main storage processor
- The control storage processor

The second type includes:

- The workstation processor
- The communications processor

The multiprocessor architecture of the 5362 System Unit central electronic complex allows the various processors to operate independently from each other because each processor has an independent storage that stores microprogram instructions and data to be interchanged with other units.

5362 availability and flexibility

The 5362 System Unit includes a UPS (uninterruptable power supply) interface port to accommodate a customer-supplied cable or connector to the UPS battery low contacts.

The customer installs all the feature cards by plugging them in the 5362 board.

5362 main storage processor (MSP)

The purpose of this unit is to process user applications as well as system supervisor routines residing in main storage.

Error correcting code is maintained in main storage and automatically corrects any single-bit error and detects any two-bit error within two bytes.

5362 control storage processor (CSP)

The CSP processes the main storage processor calls (supervisor calls) and deals with storage manage-

ment, resource management, task management, main storage contents management, input/output device support, interval timer support, scientific instruction set execution, diagnosis and error recovery. CSP storage is 64K and has direct access to main storage.

5362 channel

The channel provides the hardware interface between the control storage processor and the I/O processors. It has a 2-byte bidirectional bus with a transfer rate of up to 2.5 megabytes per second.

5362 workstation processor

The workstation processor provides for direct local attachment of the IBM 3180 Model 2, 5251, 5291 and 5292 Displays, and the IBM 5150/5160 XT/5170 AT/5155 Portable Personal Computer (with 5250 emulation). The workstation processor also provides for attachment of the IBM 4214, 5262, 5256, 5224, 5225, and 5219 Printers to the 5362 System Unit.

- The basic attachment is standard on all models of the 5362 System Unit and supports a maximum of six workstation devices in any combination; with the Expansion Feature, the workstation processor will support a maximum of 22 devices.

5362 communication adapter and processor

Two mutually exclusive communication alternatives are available:

- Single line communication adapter (SLCA)
  - Has a line speed up to 9600 bps
  - Interfaces are: EIA-RS232, DDSA, and X.21 nonswitched
- Multiple line communication adapter (MLCA)
  - Has a dedicated processor — able to handle up to four lines — with the same architecture as the CSP
  - Has an aggregate transmission rate up to 115,200 bps
  - Allows the same interfaces as SLCA plus Autocall, V.35, X.25, and X.21 switched
  - Allows auto-answer and manual answer
  - Allows local attachment to IBM 3705/3725

Both adapters allow switched, nonswitched with Binary Synchronous Communication (BSC) or Synchronous Data Link Control (SDLC), and multipoint tributary operation with SDLC protocols. Host Data Link Control (HDLC) supports X.25 on the MLCA.

The System Support Program (SSP) provides the necessary modules for the 5362 System Unit to communicate with:

- 5251 Model 12 Remote Display Station and Controller
- 5294 Remote Control Unit
- Another System/36
- System/32, System/34 and System/38
- System/3
- Series/1
- Datamaster
- Systems 5110/5120
- System/370, 43XX, 303X, 308X hosts
- 5280 Distributed Data System
- 3741 Data Station
- IBM 5150/5160 XT/5170 AT Personal Computer (when attached to the 5251 Model 12 or 5294 or using Enhanced 5250 Emulation Program)
- 5520 Administrative System
- 6580 Displaywriter
- 6670 Information Distributor
- 5230 Data Collection System
- 5260 Point of Sale Terminal
- 4700/3600 Financial System
- 3694 Document Processor

The type of software support for the connection of these devices ranges from the high-function ICF (Interactive Communications Feature) and DDM (Distributed Data Management) software to user-written routines (through RPG II telecommunications or Assembler routines). An overview of the System/36 software is contained in the section entitled, "Communications support."

5362 disk storage devices

The 5362 System Unit can contain 30, 60, 90, or 120 Mb of disk storage. These capacities are achieved with one or two disk drives, each of which handles a 30 Mb or 60 Mb disk.

The characteristics of each drive are shown in the following table:

	30 Mb	60 Mb
Rotational speed (rpm)	3151	3151
Seek time (average) (ms)	38	38
Instantaneous data rate (Mb/sec)	1.25	1.25
Data storage capacity per drive (Mb)	30.847	61.694
Maximum number per system	1	2

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IBM System/36 PC (5364) System Unit

The 5364 System Unit requires:

• An IBM 5150 PC, 5160 PC XT, or 5170 PC AT as a system console

The 5364 System Unit includes:

• A control storage processor and a main storage processor unit with main storage sizes of:

  — 256K bytes   — 512K bytes

• A single 5¼" diskette drive

• An integrated nonremovable disk storage in the following sizes:

  — 40 Mb   — 80 Mb

• An integrated workstation processor for up to 4 local workstations including the system console

• An optional communications feature 5364 System Unit summary

Model	Main storage* (K bytes)	Disk storage (Mb)
001	256	40
002	256	80
* Additional main storage (up to 512K) is available.		

Additions to main storage or model changes from 001 to 002 are field installable.

5364 attachable devices

• Directly attached 5150 PC, 5160 PC XT, 5170 PC AT (minimum of one is required)

• Additional 51 50/5160 XT/5170 AT Personal Computer (with 5250 emulation)

• 3180 Model 2 Display Station

• 5292 Color Display Station Models 1 and 2

• 5291 Display Station Models 1 and 2

• 5251 Display Station Model 11

• 4214 Printer

• 5262 Line Printer

• 5224 and 5225 Matrix Printers

• 5219 high-quality printer Models D01 and D02

• 5256 Matrix Printer

• Selected PC Printers

The maximum number of the preceding workstations that can be locally attached is four. A 5150 PC, 5160 PC XT or 5170 PC AT is required as the system console.

- A communication line allows the 5364 System Unit to be connected to other IBM systems or devices (remote workstations or systems). The section entitled "Communication adapter and processor" lists the additional devices connectable to the 5364 System Unit.

5364 components

Processors: The 5364 has a multiple processor architecture. A control storage processor operates in parallel with the main storage processor and provides microcoded control function for the I/O processors and interfaces. Data is stored as EBCDIC characters. Each EBCDIC character is stored in an 8-bit byte. All main storage is parity checked.

Diskette Drive: Both models of the 5364 have a single 5¼" diskette drive. This drive can read and write only System/36 extended format 5¼" diskettes. The recording format on these diskettes precludes interchange with PC diskettes. The extended format diskette specifications for the 5¼" diskette are:

Bytes/sector	1,024
Sectors/track	8
Tracks/cylinder	2
Data bytes/diskette	1,212,416
Data transfer rate	62.5 Kb (.0625 Mb/sec)

Diskette data may be compressed as a means of improving the overall save or restore performance. Identical contiguous bytes within a file are compressed into a control/repetition byte with the character to be repeated.

Workstation Controller: All local workstation controller functions in the 5364 are provided by microcode in the control storage processor. The directly attached PC is attached to the 5364 by a cable (1.2 meter, 47 inch) shipped with the 5364 System Unit. A printer attached to the PC can be assigned as a local System/36 PC workstation and used as a System/36 PC printer. Additional local display and printer workstations connect to the 5364 System Unit via a single twinaxial cable connector or IBM cabling system. The maximum aggregate length of the twinaxial cable attached to the 5364 cable connector is 1525 meters (5000 feet).

Communications: A single communications line interface for either BSC or SDLC protocols can be supported on the 5364 through the directly attached PC. This hardware is a shared resource between the 5364 and the PC. The PC must have the appropriate prerequisites such as communications feature, cable and modem. System/36 communication functions and PC communication functions cannot occur simultaneously.

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If both BSC and SDLC cards are installed in the PC, only one of them can operate at a time. There is no overlap. The 5364 can switch between the cards without operator intervention, provided both cards have cables and modems attached.

The System Support Program (SSP) provides the necessary modules for the 5364 System Unit to communicate with:

- 5251 Model 12 Remote Display Station and Controller
- 5294 Remote Control Unit
- Another System/36
- System/32, System/34 and System/38
- System/3
- Series/1
- Datamaster
- Systems 5110/5120
- System/370, 43XX, 303X, 308X hosts
- 5280 Distributed Data System
- 3741 Data Station
- IBM 5150/5160 XT/5170 AT/5155 Portable Personal Computer (when attached to the 5251 Model 12 or 5294 or using Enhanced 5250 Emulation program)
- 5520 Administrative System
- Displaywriter
- 6670 Information Distributor
- 5230 Data Collection System
- 5260 Point of Sale Terminal
- 4700/3600 Financial System
- 3694 Document Processor

The type of software support for the connection of these devices ranges from the high-function ICF (Interactive Communications Feature) and DDM (Distributed Data Management) software to user-written routines (through RPG II Telecomunications or Assembler routines). An overview of the System/36 software is contained in the section entitled, "Communications support."

Disk Storage: The 5364 System Unit can contain one or two disk drives each with 40 Mb capacity. Disk storage is high speed, direct access media. Field upgrade with the second disk drive is designed for customer setup (CSU). Programs and data are stored on the disk for processing.

Data can be stored off-line for security or backup purposes by copying the data to diskettes. When

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data is being copied to/from the diskette drive, there will be some degradation in batch throughput and interactive response times. Operations on a disk are not overlapped with diskette. If a second disk drive is installed, disk operations on the two disk drives are not overlapped. The disk drive specifications are:

Bytes/sector	256
Bytes/cylinder	57,344
Cylinders/drive	731
Capacity/drive (bytes)	41,917,440
Access times (ms)	
Cylinder to cylinder	> 6
Average	> 40
Rotational speed (RPM)	3600
Instantaneous data rate (Mb/sec)	.625

Directly Attached PC

- Can be an IBM 5150 PC, 5160 PC XT, or 5170 PC AT

- Provides the following functions for 5364 System Unit:

  System control panel

  Work station capability

  Communications support (BSC or SDLC) for 5364 communications programs

  Default system console

  Given adequate main storage, the PC can:

- Use its own diskette or fixed disk for PC applications.

- Use the printer attached to the PC when it is not assigned to the 5364.

- Use PC Support/36 (5727-WS6). PC Support/36 runs in the 5364 and the PC. It provides the PC with virtual disk capability on the 5364 disk, allowing PC applications to use a System/36 printer, and provides for transfer of data between System/36 files on the 5364 and the PC.

Switching between the PC and System/36 sessions is accomplished through a "hot key" sequence. When the user has "hot keyed" to PC mode, the System/36 screens are not displayed. However, the System/36 applications, including communications and printing (even if the 5364 is printing on the PC printer) remain active and continue processing. When the user "hot keys" from PC mode to System/36 mode, the PC application is suspended. The PC application resumes when the user "hot keys" back into PC mode.

Input/output devices

A number of different terminals and the IBM Personal Computers can be attached to the System/36 via the local workstation controller, or remotely, through communication lines, allowing online applications such as:

- Data entry
- Inquiry and update
- Interactive applications
- Printing
- Business graphics
- Program development

Workstations (displays, printers and IBM Personal Computers) can be configured to match the particular requirements of a wide range of applications:

- Local workstations — up to 36 workstations can be attached locally to the 5360 System Unit, up to 22 workstations can be attached locally to a 5362 System Unit and a maximum of 4 workstations can be attached locally to a 5364 System Unit. Maximum distance for local workstation connection is 1525m (5000 ft) using twinax cable.

- Remote workstations — remote displays and printers can be connected via communication lines and depending on performance required a maximum of 64 units can be addressed. Eight control units (5251 Model 12 or 5294) can be attached to a communication line. Each control unit can attach eight workstations.

IBM 3180 Model 2 Display Station

- Small, ergonomic 15-inch display
- High definition characters (24 lines of 80 characters or 27 lines of 132 characters)
- Screen can be tilted, rotated, and height-adjusted
- Flicker- and glare-free, and smudge-resistant screen
- Single stroke command function and key operation for text support
- Expanded keyboard with adjustable low profile (122 keys)
- Separate message/error line
- Improved reliability, availability, and serviceability

- Plug-compatible with 5251 Model 11 and 5292 if attached locally to a System/36. Can be attached remotely only through the IBM 5294 Remote Control Unit

- Optional large screen format of 27 rows by 132 columns

IBM 5251 Display Station

5251 Model 11 attaches directly to the System/36 or to the 5251 Model 12 or the 5294 Remote Control Unit.

Both data entry and typewriter keyboard are supported.

The 5251 Model 12 Display Station provides control for communications with the System/36 via SNA/SDLC protocol. It also supports data entry, edit, display, and printing functions for attached workstations and printers. When using the cluster features available on the 5251 Model 12, up to eight workstations can be attached to each 5251 Model 12.

Highlights

- 24 lines, 80 characters each
- 96 character set:
    - 52 upper/lowercase alphabetic
    - 10 numeric
    - 34 special
- 15-inch screen

Display functions

- Normal/high intensity
- Blinking
- Underscore
- Column separator
- Reverse image
- Non-display fields

Major field editing functions

- Alphameric
- Alphabetic
- Signed numeric
- Right adjust
- Mandatory entry/fill
- Self-check modules 10 and 11
- Duplication enables

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IBM 5291 Display Station

The 5291 is a low-cost workstation with advanced ergonomic design.

Highlights

- Functionally similar to the 5251 Model 11 (does not accept the multinational character set)
- 24 lines, 80 characters each
- 83-key typewriter keyboard
- Ergonomic design
- 128 character set

IBM 5292 Color Display Station Model 1

The 5292 Model 1 is a color display station that is functionally similar to the IBM 5251 in the areas of operator interface, I/O facilities, and programming.

Highlights

- 35.5 cm (14 in.) CRT, three-color gun, high-resolution mask tube
- Seven different colors

  - Red
  - Green
  - White
  - Yellow
  - Blue
  - Pink
  - Turquoise

- Ergonomic design with tiltable keyboard and screen
- Two-color functioning

IBM 5292 Color Display Station Model 2

The IBM 5292 Model 2 is a model of the 5292 Color Display Station capable of producing business graphics. Flexibility in creating graphic images and "host offload" is achieved by the inclusion of an all-points-addressable (APA) display and a custom vector-to-raster conversion processor. Examples of graphic images that can be displayed include bar charts, pie charts, point plots, line graphs, and surface graphs.

Also included in the 5292 Model 2 Display Station are three output ports that allow the attachment of various types of equipment such as color printers and plotters. The 5292 Model 2 can be integrated into existing 5250 Display System networks. Business graphics programming support is available on System/36 via Business Graphics Utility (5799-BNW) on the 5360 and 5362.

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Highlights

- Produces graphics in up to eight colors
    - Black plus seven user-selected colors
    - User can select colors from a palette of 512 colors

- All-points-addressable (APA) processor is in the display
    - Host offload
    - Easy fill of complex shapes
    - Easy shield (or outline) creation
    - Flexible line styles
    - Double-width lines

- Three output ports provided:
    - IEEE 488
    - Parallel printer
    - Red, green, blue-like video

- The output ports allow direct attachment of:
    - IBM XY/749 Plotter
    - IBM 7371 Color Plotter
    - IBM 7372 Color Plotter
    - IBM 5182 Model 1 Personal Computer Color Printer
    - IBM 5152 Model 2 Personal Computer Printer
    - Other parallel printers
    - Electronic film cameras or monitors

- Operator controls:
    - Graphics on/off
    - Graphics erase
    - Graphics mode termination
    - Local hard copy

All functions of the 5292 Model 1 are maintained for alphameric applications. The display of colors for alphameric data is achieved through the use of existing attribute codes and can be used without program modification. Default color functions will replace the attributes associated with each field as the formats are displayed on the 5292. For example, the high-intensity attribute code will result in white color; the blink attribute code will result in red color, and so on.

The 5292 Model 2 Color Display Station can be added to existing System/36 configurations, it can also replace any System/36 display station, either local or remote.

Field conversion between 5292 Model 1 and 5292 Model 2 is not available. The 5292 Model 2 is a customer setup machine.

IBM graphic devices for System/36

The following devices for graphic applications are connected to System/36 system units through the IBM 5292 Color Display Station Model 2.

IBM XY/749 Digital Plotter

- Attaches to System/36 through the 5292 Model 2 Color Display
- Intelligent plotter with eight program-selectable pens
- Multicolor plots can be drawn without manually stopping plotter to change pens
- Flat-bed electrostatic plotting surface simplifies positioning and monitoring of full drawing
- Plots on paper, vellum, or projection transparencies
    - Standard 8½ x 11-inch format
    - Microprocessor control provides vector generation, circle (full, arc, and sector) and axis generation
- Supports various line textures: solid, dotted, dash, uneven dash, and dash-dot
- Bar graphs, pie charts, line charts, etc. are easily generated by the Business Graphics Utilities

IBM 7371 and 7372 Color Plotters

The IBM 7371 (2 pen) and 7372 (6 pen) are desktop, multicolor multimedia, high-resolution vector plotters that provide the capability to plot various size drawings on paper or transparency film with highly accurate registration and repeatability.

Highlights

- Up to A and A4 (IBM 7371) and A, A3, A4, B (IBM 7372) size drawings.

    The plot sizes are:

    A (8½ x 11 in.)
    B (11 x 17 in.)
    A4 (210 x 297 mm)
    A3 (297 x 420 mm)

- Three pen types
  - Fiber tip (paper)
  - Fiber tip (transparencies)
  - Liquid ink (highest quality final drawings)
- Automatic pen speed and force settings
- Automatic pen capping
- Two media types
  - Paper
  - Transparency film
- Superior line quality
- Highly accurate
- Simple and convenient pushbutton control

Printers

The IBM 5152 Model 2 Personal Computer Printer is a monochromatic printer that can be used to make screen copies in three shades of gray.

IBM 5182 Model 1 Personal Computer Color Printer can be used to make screen copies in up to eight colors.

- 200-cps dot-matrix printer
- High resolution (82.5 dots per inch)
- Three choices of four-band ribbons, one of which is eight color (yellow, magenta, cyan, black bands; mixable to produce to eight colors)

- Print modes:
  - Draft - 200 cps
  - APA graphics
- 16K byte RAM, 6K byte print buffer
- 13.5-inch print line
- Attaches to IBM Personal Computer and 5292 Model 2 Color Display parallel printer adapter

IBM Personal Computers

The IBM 51 50/5160 XT/5170 AT/51 55 Portable Personal Computer can emulate a 5251 Model 11 Display and, like the 5251, can be attached to a System/36 or to a 5251 Model 12 or 5294 Remote Control Unit. To operate in 5250 emulation, the Personal Computer requires the IBM Personal Com-

puter 5250 Emulation Program and the IBM Personal Computer Display Station Emulation Adapter or the IBM Enhanced Display Station Emulation Adapter and the IBM Enhanced 5250 Emulation Program for the IBM Personal Computer; with this enhanced adapter card and software, the PC can be attached to the System/36 with these additional capabilities: fixed disk concurrency, dual host sessions, printer (5256, 5219) emulation, keyboard customization, and external switch settings via program control. Also when the IBM PC Support/36 Licensed Program is installed on the System/36, the IBM PC user can:

- Transfer a System/36 file to the IBM Personal Computer
- Interactively create, save, and execute the file transfer definition
- Transfer a record or selected fields within a record
- Sort the output records into ascending/descending order
- Direct the records to the IBM Personal Computer display, printer, or diskette
- Write an IBM Personal Computer program that uses the Application Programmer Interface (API) to retrieve records from a System/36
- Use a System/36 printer as a Personal Computer printer
- Use System 36 disk storage as Personal Computer disk storage (virtual disk)
- Create up to eight (8) virtual disks of variable size (up to 32 MB each) per user program.
- Upload files to the System/36

PC Support/36 also runs with the Remote 5250 Emulation Program. The Remote 5250 Emulation Program for the IBM Personal Computer allows the PC to appear to the System/36 as a 5294 Remote Control Unit with an attached 5291 Display Station and either a 5256 Printer or a 5219 Printer. With this capability, the PC can communicate with a System/36 without requiring connection to a 5294. (The Text Entry Assist Feature of the 5294 is not supported; therefore, a DisplayWrite/36 and Personal Services/36 cannot be used on a Personal Computer using the Remote 5250 Emulation Program.)

IBM 5294 Remote Control Unit

The IBM 5294 Remote Control Unit is a remote workstation controller for System/36.

Highlights

- Can attach up to eight of the following workstations:
    - 3180 Model 2 Display Station
    - 5251 Model 11, 5291, or 5292 Display Stations
    - 4214, 5262, 5219 (Model D01, D02), 5224, 5225, or 5256 Printers
    - IBM 51 50/5160 XT/5170 AT/5155 Portable Personal Computer (with 5250 emulation)
- Operates as an SDLC or an X.25 (HDLC) unit
- Features high-speed communication capability (up to 56,000 bps via DDS (digital data service) and 48,000 bps via X.21 signal conversion)

IBM 4214 Printer

The IBM 4214 is a compact tabletop impact serial matrix printer with the ability to print both the DP Mode and in Near Letter Quality and also print special characters, logos, business graphics and oversize characters.

Highlights

- Attaches to the System/36 via Twinax cable or via the 5294 Remote Control Unit
- Print speeds:
    - 200 cps in DP Mode
    - 50 cps in Near Letter Quality
- Horizontal spacing:
    - DP Mode: 5, 10, 12, 15, 16.7 characters per inch
    - NL quality: 10, 12 characters per inch
    - Graphics: 10, 15 characters per inch
- Paper handling:
    - Variable width form tractor
    - Document on demand
    - Document insertion (semi-automatic single sheet or multipart forms feed)

IBM 5262 Line Printer

The IBM 5262 Printer is an expansion of the IBM 3262 family of freestanding high speed impact line printers using the etched steel print band technology. It emulates a 5256 printer but provides up to 650 lines per minute (LPM) rated speed with a 48 character set print band. The 5262 utilizes LSI circuitry to implement the twinaxial attachment to System/36 and to the 5294 Remote Control Unit.

Highlights

- 650 LPM print speed using a 48 character set print band
- Twinaxial interface attachment up to 5000 cable feet from the CPU
- Engraved print quality
- 132 print positions, 10 characters per inch, 6 or 8 lines per inch vertical spacing
- Fine horizontal and vertical vernier adjustment for forms alignment
- Forms skipping and spacing under application and operator control
- Skip speed up to 20 inches (508mm) per second
- Forms width up to 16 inches (406.4mm) wide
- Same selection of character sets as offered on the IBM 3262 Models B1 and C1
- A 288 character band image buffer is standard
- All standard character sets (print band images for character set changes) are loaded from 5262 internal storage, selected by the operator
- Customer print bands or character sets are available via RPQ
- Optional Optical Character Printing, OCR Feature
- Cable-thru and Audible alarm are standard
- Multiple 5262 printers can be attached within the limits of the system and available I/O ports
- Remote attachment via 5294 Remote Control Unit
- Utilizes existing 5256 software support to run as a 5256, but prints at line printer speed

IBM 5256 Printer

The 5256 is a tabletop bidirectional serial printer with a 256-byte buffer and full buffer-formatting capabilities. Print speeds are 40 cps (Model 1), 80 cps (Model 2), and 120 cps (Model 3).

- Attaches to the System/36 via the local workstation processor or the 5251 Model 12 or 5294
- Contains 132 print positions
- Includes an adjustable forms tractor

IBM 5224 Printer

The 5224 is a tabletop line printer that uses impact wire-matrix technology.

Highlights

- Horizontal character density of 10 or 15 characters per inch with a maximum of 132 or 198 characters per line
- Character density selectable under manual or program control
- 8x9 dot matrix
- Six or eight lines per inch vertical spacing with manual or program selection
- Accommodates paper width of 3 to 17.7 inches
- Under program control, prints any matrix position for graphics applications
- Interfaces with the System/36 or the 5251 Model 12 or 5294
- Maximum print rate at 10 cpi is 140 lpm (Model 1) and 240 lpm (Model 2)

IBM 5225 Printer

The 5225 is a family of standalone line printers that use impact wire-matrix technology to accommodate a wide variety of printing requirements.

Highlights

- Functional characteristics similar to 5224 printers
- Maximum print rate at 10 cpi is 280 lpm (Model 1), 400 lpm (Model 2), 490 lpm (Model 3), and 560 lpm (Model 4).

IBM 5219 Printer

The 5219 is a high-function, engraved-font, print wheel printer capable of word processing quality output.

Highlights

- Attaches to the System/36 via twinax cable like the other workstation printers or via the 5251 Model 12 or 5294
- Supports 10, 12 and 15 characters per inch (12 and 15 cpi with DisplayWrite/36.
- Supports 6 lines per inch with single-line spacing; and with DisplayWrite/36, double or triple line-spacing
- Accommodates paper widths, of 3.15 to 15.4 inches
- Utilizes single and continuous forms
- Incorporates the optional automatic sheet feed device
- Supports 2 trays for paper and 1 for envelopes
- Supports multiple character sets (operator is notified when printer element has to be changed)
- Prints at the following rates:
  — Model D01 - 40 cps
  — Model D02 - 60 cps

IBM 3262 Printer

One 3262 Printer can be directly attached to the 5360 System Unit as the system printer. It is a standalone line printer with an interchangeable print belt.

Highlights

- Speeds of up to 650 lines per minute (with 48-character set)
- A universal character set buffer of 288 positions allow graphic sets of up to 288 characters
- Additional and specialized print belts are available as optional accessories
- Horizontal spacing: 10 characters per inch; 132 print positions
- Vertical spacing: six or eight lines per inch under manual control
- Forms skipping and spacing under program control
- Form sets of up to six parts; quality should be tested for more than four parts

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- 188 multinational character set is available as a special feature
- Continuous metal print belt with 288 engraved characters
- Maximum distance for connection is 7.6m (25 ft.)
- Two models: B1 (non-customer setup) and C1 (customer setup)

IBM 8809 Tape Drive

The 5360 System Unit supports 8809 Magnetic Tape Drives for high-volume save/restore and data interchange. Two drives can be attached, one Model 1C as the first drive, and one Model 2C as the second drive.

Highlights

- Customer setup
- Three types of label tape format: IBM standard, nonstandard, unlabeled
- Recording format: 1600 bpi, 9 track, phase-encoded
- Speeds:
    — 12.5 ips in start/stop mode
    — 100 ips in streaming mode
- Data transfer rates:
    — 20K bytes per second (start/stop mode)
    — 160K bytes per second (streaming mode)
- Reel diameters supported:
    — 6.25 inches (300-600 ft.)
    — 7 inches (300-600 ft.)
    — 8.50 inches (1200 ft.)
- Also supported is a reel diameter of 10.5 inches (2400 ft.) with a capacity of up to 43 Mb.

1255 Magnetic Character Reader

The 5360 System Unit supports the 1255 Magnetic Character Reader, which is designed for banking and finance applications. It reads and sorts documents that are inscribed with magnetic ink (for example, checks, money orders, bank drafts, and deposit tickets).

The 1255:

- Reads and validates the inscribed magnetic ink characters (MICR E13B type font) under the control of programs running in the 5360 System Unit.

- Sorts documents under control of a 5360 program or in standalone mode.

The 1255 reads and/or sorts 6-inch documents at the following rates:

Model	Documents per minute
1	500 (into 6 stackers)
2	750 (into 6 stackers)
3	750 (into 12 stackers)

The characters, print quality, and codeline arrangement must meet the specifications recommended by the American Bankers Association Technical Committee on Check Handling.

The unit is designed for ease of operation and operator training. The operator panel, feed hopper, and stackers are in a compact area for operator convenience and minimum space requirements.

Software for the System/36 Family

IBM System/36 System Support Program (SSP)

The System/36 SSP provides control programming functions for the 5360, 5362 and 5364 System Units of the System/36; these functions support user application programs and IBM licensed programs providing ease-of-use and general system facilities.

The System/36 SSP is layered to enhance productivity for all of its users through availability of the HELP menus and text, and prompted procedures. The operation control language and the procedure control expressions allow the user to build procedures with full job stream control using decision logic.

Programming features

The user can access services at different levels through SSP:

- User application
- Utilities and languages
- Control language and control commands
- System Support Program procedures
- Service aids

A user can interact with the system at the first level or go through all the different access levels (operator, programmer, security administrator). The System/36 has devised a set of functions that present a coherent interface to the user that simplifies the approach to the system. These functions are referred to as System Guided Operation.

System Guided Operation

The functions implemented are:

Simplified configuration (at installation)

In most instances, the time required to configure a system after installation is not extensive and is accomplished by eliminating questions, increasing the number of defaults, simplifying menus and prompts, and using HELP screens.

Users are not required to answer many questions; they need only specify the hardware devices to be attached and the work areas; system file sizes are computed automatically.

Procedures are available to configure all hardware even if the system being used does not contain a specific hardware feature. This is particularly important in the distributed data processing (DDP) environment. A configuration definition does not require a dedicated system, and it can be created/modified on a remote workstation provided the operator has the proper security level. Again, this is important in a DDP environment.

Auto-configuration (in day-to-day environment)

Auto-configuration support is a feature of System/36. It locates newly attached (powered on) local displays and locally attached printers, and automatically adds them, with default values, to the system configuration. Consequently, the user does not have to edit a configuration member and then apply it to the system. When setting up a device for the first time, a unique address set need only be assigned to the device address switches.

HELP support

HELP support consists of a set of display screens to assist the user when performing a task on the system. The display screens:

1. Are easy to understand
2. Are self-guiding
3. Use nonprogrammer terminology
4. Categorize functions into logical groups

The HELP screens lead the user to the needed function or command. The user need not remember details associated with initiating a command or a procedure. HELP reduces operator confusion and eliminates concerns like:

- How the sign-on starts
- What information a function requires
- What are the valid response values

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- In what order are entries required
- What is the syntax of the command
- What procedures must be used for a certain task

By providing a user-friendly interactive interface to the system, the amount of education an operator needs to use the System/36 productively is minimal. Different modes of operation, differences in procedure commands, or system operator control commands are not apparent to the user. Users can bypass HELP by keying the desired command and all parameters directly onto a command display.

When the user presses the HELP key during sign-on, the system provides the user with the system HELP that contains additional instructions on how to operate the system. The user can execute any system procedure without knowing the name of the procedure. A hierarchy of menus guides the user through a question/selection choice of menu steps that lead to the function to be performed. Additional HELP text is also provided for system menus and prompts.

Users can define their own alternate beginning HELP menu. This provision enables experienced users to employ HELP at the most appropriate level for their requirements without involving the system operator.

The system keeps track of menus that an operator sees; the operator can back up to previously displayed menus by pressing a command key.

By employing the Screen Design Aid Utility, the programmer can define screen formats to be used as HELP text for a user menu. When the user presses the HELP key while viewing a user menu and has not keyed an option, the general menu HELP text for the entire menu is displayed (provided one has been defined). If the user keys a valid menu option and presses the HELP key the system displays the HELP text for the menu option that the operator entered. While viewing menu HELP text, the user can roll forward or backward through the HELP text displays for that menu, or return to the user menu that was previously displayed.

The programming effort required to provide such ease of use is minimal. The implementation of menu HELP for a user application requires no additional application code.

Application HELP is a support that gives the programmer an easy-to-implement tool by using the HELP key in any situation relating to user applications. By creating HELP text screen formats, the user can activate the HELP key for existing applications.

Control language

Control language is the primary interface to SSP and is made up of:

- Operation control language statements (OCL)
- Procedure control expressions (PCE)
- Control commands

OCL statements are the interface that enables the user to run jobs and programs; these statements allow the programmer to specify job control information. They are usually included in procedures (a procedure is a series of program-linked OCL statements). A procedure might contain a call to another procedures, creating a nested procedure. The PCE provides dynamic job control that allows decision logic (like conditional expressions) to be used in procedures substitution expressions and arithmetic functions.

The control commands are used to control the system and devices and can be entered from any keyboard or selected from menu options.

Job management

Job management facilities provide the framework through which the system controls performance. These facilities include system functions necessary to:

- Operate in a multiprogramming environment
- Manage main storage as a pool of separate and noncontiguous 2K-byte blocks
- Swap programs to and from disk according to their status (active or waiting) and their priority, and to overall system resource management
- Allocate programs in main storage in the 2K-byte blocks available on a best-fit basis to provide most efficient usage of main storage
- Run multiple jobs with a combined storage requirement in excess of the system main storage (overcommitment)
- Execute multiple requesting terminal (MRT) programs. One unique copy of an MRT program supports and allows service to multiple workstations which saves storage and swapping time.

End users can run:

- Interactive jobs
- Input job queue
- Print spool
- Evoked jobs (at specified times or intervals)

Data management performs input and output operations for the disk, printer, display station, and communications. When a user program requires input or generates output, data management interfaces between the user program and the appropriate hardware or interrupt handler to perform the desired operation(s).

Disk data management

System/36 disk data management is designed to perform the following functions:

- Support the access methods for sequential, direct, and indexed files
- Provide a new generalized access method (GAM) for both keyed and non-keyed processing
- Provide alternate access path support across all file types
- Support the access of files stored on another System/36 when Distributed Data Management is installed

Sharing of disk files is supported to allow two or more programs to access the same file. The SSP prevents records read for updating by one program from being updated by another program (until the first update is done). When required, the SSP can automatically extend the disk files if they were created as extendable.

The access method is the software support that determines the way the system processes the files. The user can select from the following:

- Consecutive access method
- Direct access method
- Sequential by key (indexed file only)
- Random by key

In addition, System/36 features the general access method which allows an indexed file to be accessed at any time:

- Sequentially
- Randomly
- By adding records

Alternate access paths support

System/36 disk data management supports access to files through alternate access paths. Several advantages occur for applications that require differ-

ent access paths into the same set of data records. For instance, the user can:

- Avoid duplication of the data in different files that have the required alternate access paths, thus saving disk space and programming effort while maintaining data integrity
- Limit the use of sorts for applications requiring alternate ordering of data
- Eliminate implementation of alternate access paths support at the application level

The System/36 alternate access paths support includes the following functions:

- File sharing of access paths and data
- Update/add/delete capabilities through either the physical file index or any of the alternate index files.
- Support of an option that allows records to have duplicate keys in the alternate index files
- Maintenance of the relationships between the alternate index files and the physical data file
- Dynamic update of all access paths for ADD, DELETE, and UPDATE
- User view of the file via an alternate index as if it were a complete physical file
- File name security on each access path
- Rebuilding an associate alternate index file whenever a physical file is rebuilt by the initial program load rebuild function

Sort function

The sort function is included in the basic System Support Program. It provides the following options:

- Record sort
- Tag sort
- Summary sort

Merge is also provided because, as a result of a comparison, selection or omission is allowed during sort operation.

Printer data management

Printer data management supports output to one or more printers from one user program. Printers

can be selected via OCL or by using the configured printer default. The differences between printers (direct attached printer and workstation printers) are transparent to user programs.

Workstation data management

Workstation data management supports input and output operations for the 3180 Model 2, 5251, 5291 and 5292 Display Stations, IBM 5150/5160 XT/5170 AT Personal Computer, and 4214, 5256, 5224, 5225, 5256, and 5219 Printers. Programs can specify that a display screen format stored in a library be retrieved, that program data be merged, and that the resulting display text and commands be sent to either a local or a remote display station. The difference between remote and local display stations is transparent to application programs.

Communications support

Communications support is implemented as features of the SSP. Therefore, the programmer need not learn any specialized languages to implement these communications applications. On-line problem determination aids are also available.

The communications data management provides:

* Communications support for a single line (BSC or SDLC with a speed of up to 9600 bps). The 5364 System unit utilizes a single line on the attached IBM Personal Computer.

* Communications support for multiple lines:
  — Up to four lines on the 5362, and up to eight lines (BSC, SDLC or HDLC) on the 5360.
  — An aggregate speed up to 170,000 bps on the 5360 System Unit and up to 115,200 bps on the 5362 System Unit. 5364 transmits at a rate of 9600 bps
  — Auto-call
  — X.21   } on 5360 and 5362
  — X.25

* BSC support (RPG II, Assembler) for batch file transfer

Multiple Session Remote Job Entry (MSRJE) feature provides a common user interface for the Remote Job Entry function with the following characteristics:

* Can support multiple lines concurrently (on 5360 and 5362)

* For BSC links:
  — A maximum of seven readers, seven writers, seven punches, and one console
  — Host compatibility with System/34 MRJE

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- For SNA links:
  — A maximum of 15 readers, 15 writers, 15 punches, and one console
  — Host compatibility with System/34 SRJE

- Support for full function SNA ACF/VTAM cross-domain network

- Support for the following host subsystems:
  — RSE, JES2, JES3, RSCS (BSC only), POWER/VSE (SNA only)

- Printing of forms control table and other utilities

The Interactive Communications Feature (SSP-ICF) is a set of subsystems matching the link and logical protocol of various host subsystems, terminals, and other systems. A common user interface is provided to isolate the user from the link and the protocols. The System/36 SSP-ICF provides support for:

- Intra-subsystem (program-to-program data interchange within a System/36)

- BSC subsystems
  — CCP (S/3 Model 15 CCP)
  — CICS (S/370 CICS/VS and CICS/DOS/VS)
  — IMS (S/370 IMS/VS IRSS)
  — BSCEL (S/3 batch, 3740 BSC and the office system BSC)

- SNA subsystems
  — SNUF (S/370 CICS-LU.0 and IMS/VS-LU.P)
  — Peer (S/34 and S/36 as LU6.0)
  — Finance (3600, 4700 and 3694 as LU.0)
  — Advanced Program-to-Program Communication (APPC) mapped conversion support of SNA LU6.2 to S/36, S/38, and S/370 CICS/VS

The 3270 Device Emulation feature is a utility program that supports BSC and SDLC 3270 line protocols. With this utility, System/36 appears to the host as a 3271 (BSC) or as a 3274 (SDLC). A local or remote 3180 Model 2, 5251, 5291 or 5292 Display Station, or 5150/5160 XT/5170 AT/5155 Portable Personal Computer with 5250 emulation appears as a 3277 Model 2, and any local printer (3262, 5219, 5224, 5225, 5256) appears as a 3288 Model 2 Printer. Up to 32 device addresses are supported under BSC, and up to 30 device addresses per line are supported under SDLC.

Communications and Systems Management Feature

The Communications and Systems Management Feature includes a Distributed Systems Node Executive (DSNX) function which is compatible with and a companion to Distributed Systems Executive

DSX (5668-986) Version 2 Release 2, or (5668-915) Version 3, Release 1 that is required on the host system (any System/370, 43xx-308x). System/36 DSNX supports the DSX command protocols for receiving and sending programs, screen formats, procedures, and data files, including sequential data sets originating on a DSX host. A System/36 procedure can be sent to a System/36, stored, executed, and the results reported back to the DSX host.

This feature also supports the sending of alerts to a central System/370 (43xx-308x) to be processed by Network Problem Determination Application (NPDA) and Network Communications Control Facility (NCCF).

Distributed Data Management (DDM) Feature

The Distributed Data Management Feature extends System/36 disk data management support to permit a System/36 application program to access files stored on another System/36. This facility makes it easier to distribute data processing among two or more systems.

Security

SSP security provisions allow users to control access to the system according to their needs. Options are provided for:

- Password security-requires the operator to enter a password before allowing access to the system

- File library and folder security — requires identification of each operator authorized to use a secured library or data file, and identification of the type of access allowed

- Menu security - allows automatic display of menus to specified operators at sign-on with an option to restrict access to only those functions described on the menu. Included in this support is the ability to assign a default user library from which the system can load programs and procedures.

System Measurement Facility (SMF)

The SMF of SSP gives the user access to detailed information about the system resources usage by application. This data allows the user to take action to improve system performance, schedule system operations, and plan future expansions.

Customer engineering (CE) service

The SSP support system maintenance concur-

rently with user programs. System/36 utility programs are available to:

- Retrieve and analyze disk errors detected during system usage
- Utilize the hardware at its maximum overlap capability
- Run specific tests and maintenance aids under SSP control

Using these utilities will often pinpoint the failing part of the system, thus reducing CE service time and, thereby, improving system availability.

Programmer services (languages and utilities)

System/36 provides many functions required for on-line program development from either local or remote workstations. The main feature for productivity improvement is the programmer interface which consists of simple, menu-guided operations that enable the user to perform programming and debugging activities at every display unit. Through one menu, the programmer can use:

- Language compilers
- Source Entry Utility (SEU)
- Screen Design Aid (SDA)
- Online programming Workstation Utility (WSU)
- Overlay Linkage Editor (OLE)
- Data File Utility (DFU)

The System/36 provides a procedure to chain, automatically, the Source Entry Utility to a language compiler and back, allowing the compiler output to diagnose the source file. With the Overlay Linkage Editor facility, the programmer can combine object modules, produced by RPG II, COBOL, FORTRAN, and Assembler, to create a load module that can be run. OLE is automatically controlled by the system or controlled independently by the user.

RPG II

RPG II is a high-level language that uses a fixed-format syntax. Programming is done with nine different preformatted specification forms. Many common program functions are built in and require a minimum of user code. The System/36 RPG II source code is compatible with System/34 RPG II.

System/36 RPG II has the following added functions:

Procedural file access

This file access method on the System/36 allows random access by key or sequential access using the SET LOWER LIMIT instruction; at the same time the file access method allows records to be added to the file within the same file definition. On the System/34, it is necessary to define two files: one for random access and record addition, and a second file definition for sequential programming, fewer lines of code and, consequently, smaller program size.

Exception output by group name

On the System/36, this operation code allows one or more output records to be grouped, and each group to be identified with a name. These names may then be used to differentiate which records, among several groups of records, are to be written with the EXCPT operation code.

Overlay Linkage Editor

The user can control the generation of the load modules on the System/36.

COBOL (ANS 74)

System/36 COBOL is a high-level programming language that is defined by an industry standard. It is intended primarily for commercial data processing applications. Its English-like syntax provides an effective method by which the user can write programs that are self-documenting.

The processing modules and the levels of the American National Standard X3.23-1974 COBOL supported by System/36 are:

2	NUC	1,2	
2	SEQ	1,2	
2	REL	1,2	
2	INX	0,2	Note 1
2	SRT	0,2	
0	RPW	0,1	
1	SEG	0,2	Note 2
2	LIB	0,2	
1	DEB	0,2	
1	IPC	0,2	
0	COM	0,2	Note 3

Note 1: Except ALTERNATE RECORD KEYS
Note 2: Except SEGMENT-LIMIT and independent segment last-used state
Note 3: Communications and workstations are handled through TRANSACTION I-0 (IBM extension)

The system-supported general access method of disk data management provides System/36 COBOL with complete dynamic access support. System/34 and System/36 COBOL languages are source compatible. Users can specify some compiler options like source listing (yes/no), debugging (yes/no), storage maps (yes/no), and so on, from a prompt screen instead of changing the source program to modify the options.

BASIC

BASIC is a high-level interactive programming language that is easy to learn, easy to use, and easy to remember. All System/36 file organization types and access methods, extensive editing and report formatting, and program interception of error return codes are supported. An extensive HELP facility provides information on language syntax and functions. Support for disk files alternate access paths is included.

System/36 BASIC is source compatible with System/34 BASIC and includes the following features:

Reduced system load

System/36 architecture, together with reentrant BASIC compiler modules, allows a single copy of the compiler to serve multiple BASIC users. As a result, the system runs faster for the single user and the load on the system is reduced for multiple users.

Cursor position

A new intrinsic function enables the cursor position for BASIC when a function key is used. Cursor-positioning information enhances the support of an improved application-user interface for user-written applications such as text processing.

FORTRAN IV (ANS 66)

The System/36 FORTRAN IV complies with the ANS 66 level; it is functionally equivalent and source compatible with System/34 FORTRAN IV. The new and improved System/36 functions are:

- Faster array I/O
- Concurrent execution of BASIC/FORTRAN
- User debug output to printer
- Improved execution of diagnostics

Assembler

System/36 Assembler takes advantage of the SSP improvements and increased ease of use.

Utilities Licensed Program

This program offering provides utilities to help programmers and operators:

- Create, delete, maintain and list data files
- Create and maintain source members and procedure members in libraries
- Create and maintain display screen formats and menus
- Generate skeleton RPG and WSU programs
- Code data entry and inquiry programs

The Utilities Licensed Program consists of the following utilities:

- Data File Utility
- Source Entry Utility
- Screen Design Aid
- Workstation Utility

The Sort Utility is provided with the SSP.

Data File Utility

DFU permits users to establish their own data entry applications, optimized for their individual use and tailored to their individual requirements. DFU supports the following functions:

- Data file creation
- Inquiry into existing data files
- List of the contents of the data file in reports with:
  - Record selection
  - Result field calculation
  - User information from a related master file

DFU can access files whose record lengths are up to 1024 bytes. Sequential files are supported for all the functions. A maximum of 200 screen formats and up to 60 fields per record are allowed.

Workstation Utility

The Workstation Utility of System/36 provides a powerful tool to generate programs for data entry, inquiry, and file maintenance. The editing, processing, and formatting capabilities of WSU are more complex than DFU. The generated programs can be used by multiple operators simultaneously.

The WSU programs can perform:

- Simple data entry

- Data entry with edit
- Data entry with update
- Inquiry
- Review and insertion of records into a transaction file
- RPG-compatible array support
- Maximum number of displays is 245
- Alternate access paths support

Source Entry Utility

The Source Entry Utility is, primarily, a means for the user to enter and maintain source statements for RPG, COBOL, BASIC, FORTRAN, Assembler, and procedure members, and it will also syntax check RPG and COBOL. All source statements carry a sequence number and the date of creation or the last modification. Some of the major functions of SEU are: Enter, Add, Change, Delete, Move, Copy, Include, Search, Auto-duplication, Shift, and Display.

- Display of the library name and the member name
- Subtype support
- Align statement on ENTER key

Screen Design Aid

The Screen Design Aid is an interactive utility used to design and maintain application display formats and HELP menus.

SDA provides the following facilities:

- Create, change, and delete display screen formats
- Create and change menus
- Create skeleton RPG II workstation programs
- Create skeleton WSU programs for inquiry, maintenance, or data entry
- Allows users to design and change display screen formats interactively

SDA on System/36 is easy to use and allows the programmer to:

- Proceed immediately to the SDA main option menu

- Select library, member, and submember names while in SDA, viewing a list of members in the library and/or submembers; the user profile maintains the pertinent "last used" selection.
- Move forward or backward in any definition process with the ability to change previously keyed data
- Select the end-of-function option pertinent to the work just completed
- Access the HELP text on any SDA menu, selection, definition, or end-of-function screen by pressing the HELP key
- Field color prompting and 132 position line for 3180, Model 2
- Supports up to 225 screen formats per format member
- Menus
  — Free-format menus have expanded edit areas for title, text area, line-21 prompts and 27 line support for the 3180.
  — HELP text definition support
  — S and D specifications source is generated and saved

Programmer and Operator Productivity Aid PRPQ

The System/36 Programmer and Operator Productivity Aid is an integrated set of four utilities (File, Diskette, Library, and Edit); it is designed for ease of installation and is intended for programmers/operators who have the responsibility for maintaining files/libraries and for assisting programmers in writing and maintaining applications (programs/procedures). Additionally, the Edit Utility supports a basic document entry with formatted printing facility.

Controlled access to files, libraries, and members within a library can be assisted by using the resource security functions provided on the System/36.

File, Library, and Diskette Utilities

These provide the facilities to display from the system disk or a diskette the names of all libraries, of all members within a library, the names within a file, and the data within a library member.

Up to 64 file names, library names, or library member names are shown at one time.

Test File Generation. The File Utility allows a user, via a prompted interface, to generate test data files. This facility provides support for file defini-

tion (sequential, direct, or indexed), field definition (character, zoned, packed, or binary), and field initialization (ascending, descending, random, constant, or keyed value). Optionally, RPG II or COBOL source specifications that define the file can be generated.

Command keys. These utilities support the use of the command keys for requesting additional information.

User modification. Support is provided for users to define their own operation codes and use of command keys to perform functions that are unique to their installation.

Edit Utility

The Edit Utility helps simplify the creation and changing of source or procedure members by:

- Maintaining a profile record for each user sign-on

- Prompting the user for job information

- Setting default initialization values for use during data entry and as replacement options at end of job

- Providing both single line and multiple line command for use in deleting, inserting, duplicating, and rearranging lines of data

- Providing a search facility for locating occurrences of a specified character string and, if desired, to change those occurrences to another character string

- Allowing statements from a member in the same or a different library to be copied into the member being edited

Office applications

System/36 office applications are intended primarily to provide an easy-to-use package to guide the user to each operation by illustrating a series of steps on the display station screen, to be an office or departmental system, supporting electronic document distribution, to include high function text editor and to provide queries in System/36 files. These applications are implemented through various IBM licensed offerings.

- Personal Services/36 Licensed Program

- DisplayWrite/36 Licensed Program

- DisplayWrite/36 Language Dictionaries Licensed Program

- Query/36 Licensed Program

The System/36 office applications are provided by the following IBM programs:

Personal Services/36 Licensed Program

The Personal Services/36 Licensed Program is a set of related office functions which provide: electronic document distribution, calendar and scheduling, directory services, user list maintenance functions, and local messages. These functions can be used by principals, secretaries, and other professionals to help improve their productivity. The IBM Office System Architectures— Document Interchange Architecture and SNA Distribution Services (SNADS)—are supported.

Highlights

- A part of the integrated System/36 office support, consisting of DisplayWrite/36, Personal Services/36, and Query/36.
- Local and remote document distribution via DIA and SNADS.
- Revisable arid final form document interchange using Document Content Architectures (RFTDCA and FFTDCA).
- Handling incoming mail.
- Checking outgoing mail.
- Calendar management.
- Maintaining name, address, telephone directory, and distribution lists.
- Group support to define subsets of the name, address, and phone directory.
- Sending messages to individual local users or groups of users
- Local and remote document distribution using Document Interchange Architecture (DIA); is via SNA Distribution Services (SNADS). Document distribution is supported between PS/36 and the following programs via (SNA LU6.2 protocols) with:
  — IBM Distributed Office Support System/370 (DISOSS/370) Version 3, Release 2 (Program Number 5665-290 for OS/VS2 (MVS) and Program Number 5666-270 for VSE).
  — Electronic Document Distribution (EDD) Licensed Program for the IBM 6580 Displaywriter System (Program Number 5608-SR8).

- 5520 Administrative Processing Program (Program 5611-SS2).

- Documents can be interchanged through DISOSS/370 with the following products: System/36 (PS/36), Displaywriter (EDD), Personal Computer (Personal Services/PC), 5520 (Administrative Processing Program), and 8100 (DOSF).

DisplayWrite/36 Licensed Program and DW/36 Language Dictionaries Licensed Program

The DisplayWrite/36 Licensed Program includes a high-function word processing program to run on the System/36. The full-screen text editor is designed with Displaywriter-like interface and function as its basis and provides basic text functions supporting the creation, revision, and printing of documents. In addition, DW/36 provides capabilities for data and text merge, processing large documents, automatic hyphenation, spelling verification, spelling correction assistance, synonyms, repetitive letters, label printing, and report writing. DW/36 supports document interchange in revisable format (RFTDCA) with other systems supporting this IBM office system architecture interchange format. Support is provided to facilitate the exchange of PC DisplayWrite 2, 3 documents and DW/36 documents between a virtual disk and a DW/36 folder. A utility is included with DW/36 to assist the user in converting documents created by the System/36 Text Management System to DW/36 formats.

The System/36 DW/36 Language Dictionaries Licensed Program makes available to the DW/36 user seven optional language dictionary diskettes to support spelling verification, hyphenation, spelling correction aid, and synonyms (U.S. English only).

Highlights

- A part of the integrated System/36 office support consisting of DisplayWrite/36, Personal Services/36, and Query/36.

- Operating characteristics:
  - Menu driven, prompted interface to all functions
  - Cursor-sensitive help available throughout all System/36 office support
  - Online user's guide
  - Getting Started Manual for first-time users
  - System-guided operation for the novice user with optional menu bypass and line commands for advanced users

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- Document processing options
- Basic editing capabilities
- Advanced editing capabilities
- Proofreading aids
- Extensive print support
- Flexible data text merge
- Security (optional)
- Recoverability

Query/36 Licensed Program

Query/36 Licensed Program provides functions which can be used by principals, secretaries, and other office workers to help improve their productivity. This program supplies easy to use information retrieval that can result in data being displayed, printed, or saved in a disk file using a variety of selection criteria.

Highlights

- A part of the integrated System/36 office support, consisting of DisplayWrite/36, Personal Services/36, and Query/36.
- Prompted interface for definitions
- Fast path for definitions
- Data entry: create, update, or delete data records in disk files
- Online information
- Output options to display, printer, or disk file
- Revise a query or pattern a query after an existing query
- Copy and delete a query
- Execute a previously defined query
- Result field defined by calculations performed with constants and existing fields
- Field selection and ordering
- Record selection by field content, constant value, result field, range of values, or list of values
- Ascending or descending sort on up to five fields
- Totals, averages, maximums, minimums, and counts of fields

The System/36 office applications are also provided by the following IBM programs:

- Text Management System Licensed Program

- Office Management System Licensed Program
- Retrieval/36 program offering
- Business Graphics Utilities PRPQ P84056 for 5360 and 5362
- Advanced Printer Function Licensed Program

Text Management System

This is a menu-driven application that gives the casual user the ability to create, maintain, store, and print documents.

The major functions included in the Text Management System enable the user to:

- Personalize user profiles
- Create/revise a document:
  — Copy the entire document under a new name
  — Enter text
  — Copy text within a document
  — Include text from a different document
  — Copy, move, and delete quantities of text
  — Insert characters, words, sentences, and/or paragraphs
  — Adjust paragraphs
  — Create auto-table of contents
- Select formatting options
  — Margin setting
  — Tab stops
  — Line alignment
  — Page/line numbers (optional)
  — Center text
  — Underscore lines of text
- Use proofreading aids:
  — Spellcheck
  — Spell aid
  — Synonyms

Office Management System (5727-OS1)

The System/36 Office Management System requires the Text Management System as a prerequisite. Its functions are to:

- Schedule appointments on calendars. Add, update, delete, copy, add notes to, and reschedule appointments
- View calendars by day or by week and print them for specified days or weeks
- Select access levels for each calendar
- File and find a document-this function uses the text processing package to support the document profile, correspondence filing, and multiple document libraries
- Distribute documents to local users

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- Check mail status
- Open incoming mail - the system allows the user to file, delete, view, or print a document and acts as an in-basket for documents
- Create/maintain directories and mailing lists used for name and address files and phone books
- Print labels

Retrieval/36

Retrieval/36 guides the user in creating customized reports through fully prompted display screens. Each screen that asks for specification information has associated! HELP text screens that explain what is needed. This facility minimizes the initial learning time and continued dependence on external reference manuals.

- Extensive HELP text and other operator assistance demonstrates the design emphasis on the non-DP trained user.
- Flexible information selection allows the user to choose the information to be included on the report.
- Reports may be viewed on the display station or printed.
- Summary or detail reports may be requested.
- User-defined calculations may be requested.
- Information selected may be sequenced (sorted).
- Numeric columns may have subtotals and totals.
- Once created, reports are stored and listed on a Report Menu to be rerun or changed by the user.
- Three levels of user-defined security restrict unauthorized access into sensitive information.
- Security can be tailored to allow employees access to certain types of information while prohibiting access into other areas.

Retrieval/36 also contains an interface to System/36 Business Graphics Utilities and can accumulate user-specified data formatted for graphics processing; the graphic interface allows access to Retrieval/36 functions such as sorting, record selection, and calculation.

Business Graphics Utilities

The graphics support utility allows the user to convert the data keyed-in or collected by programs into meaningful charts. The System/36 can gener-

ate various types of charts:

- Pie charts
- Bar graphs
- Line graphs
- Surface graphs

The display used is the IBM 5292 Model 2; the graph definition can also be done on the IBM 3180 Model 2, 5251/11, the 5291 and the 5292/1 Displays. Printouts can be directed to the 5224/5225 and 4214 Printers. In addition, the IBM XY/749, 7371 and 7372 color plotters can be attached to the 5292 Model 2 Display to plot results. The 5292 Model 2 also allows attachment of the 51 52 Model 2 Personal Computer Printer and the 5182 Model 1 Personal Computer Color Printer for screen copies. The user interface for accessing the System/36 business graphics support consists of a set of menues, HELP screens, and prompts.

Advanced Printer Function

Access to the Advanced Printer Function is through the office menu.

The functions provided are:

- Print a document using large characters
- Design logos, forms, and character sets
- Merge spooled data with a form
- Support multiple character sets
- Create UPC bar-codes
- Code 39 bar-codes

Migration Aids

The IBM System/34 to IBM System/36 Migration Aid is a set of System/34 and System/36 programs and procedures that assist the user in moving from a System/34 application to a System/36 application. Some characteristics of the Migration Aid are:

- Performs in a menu and prompt-driven manner
- Produces reports that identify source and OCL differences
- Generates OCL to move user library members
- Creates control files
- Maintains an audit trail of migration activities

Aids are also available for migrating from System/32, System/3, and the IBM 5110/5120 Computing System.

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Installation aids

System/36 is designed for ease of installation and can be moved without special tools. Some of the most widely used installation aids are discussed below.

Education. Classes are provided for System/36 users in a variety of formats. One format is the self-study course that can be taken in the customer's office or in the local IBM facility. Other formats include the instructor and classroom method and the computer-assisted training method.

Test allowance. A test allowance will be provided with each System/36 ordered to permit testing and entering data prior to the arrival of the on-order system. This testing can be conducted at most IBM Branch Offices or Customer Centers to enable the on-order system to become productive as soon as possible after it arrives.

Diskette Exchange Facility/36 (DEF/36) is designed to support diskette data interchange between 8" diskettes on the 5360 and 5362 and 5¼" diskettes for use on the 5364 system unit.

Site preparation. The 5360, 5362 and 5364 System Units are set up by the customer. A set of manuals is provided to aid in performing the setup tasks.

Conversion facilities. Most IBM Systems Centers and Branch Offices will have IBM equipment to assist those installations that already have data in a machine-processable format for converting to any model of the System/36. Preinstallation test time can be used for conversion purposes.

Application programs

System/36 is supported by application programs that are directly related to specific industries; IBM developed these programs after a comprehensive study of those industries.

Many applications packages are also available through Software and Services Organizations.

For detailed information about IBM application programs and other installation aids, contact your local IBM Marketing Representative.

Applications available from IBM include the following.

System/36 MAPICS II (Manufacturing Accounting And Production Information Control System) consists of 19 integrated applications designed to help

manage all aspects of the business; for the manufacturing industry.

The applications are:

- Accounts Payable
- Accounts Receivable
- General Ledger
- Inventory Management
- Order Entry and Invoicing
- Payroll
- Sales Analysis
- Product Data Management
- Material Requirements Planning
- Production Control and Costing
- Capacity Requirements Planning
- Data Collection System Support
- Financial Analysis
- Purchasing
- Forecasting
- Master Production Schedule Planning
- Inventory Management for Process
- Location/Lot Management
- Cross Application System Support

Highlights

- Total integrated solution
- Flexibility in installation (only the required application need be installed)
- Online system
- Documented applications
- Ease of installation (no need to program)

System/36 BRADS (Business Report/Application Development System) is an application generator to develop additional applications and extend existing applications, often without using programmer resource. In addition, System/36 BRADS also contains a spread sheet generator which provides the user with a powerful decision support tool.

System/36 Distribution Management Accounting System (DMAS) offers distribution industry customers one complete application set to help manage accounting, financial, inventory management and purchasing functions. Using System/36 DMAS, distributors can monitor important aspects of their operations, and draw upon timely, accurate data to

make critical business decisions. These program products also ease the migration path for current System/34 DMAS II, DFAS II, and INVEN/34 users to System/36.

The following 10 applications are included:

- Billing
- Accounts Receivable
- Inventory Management
- Inventory Control
- Sales Analysis
- Purchasing
- General Ledger
- Accounts Payable
- Payroll
- Cross-Application System Support

System/36 Business Management System (BMAS) provides fully integrated, full-function accounting programs applicable to a wide range of industry classifications. Written in enhanced System/36 BASIC, the Business Management Accounting System provides the ease-of-use characteristics required for the first-time computer user. The IBM System/36 Business Management Accounting System is identical in function to the System/34 Business Management Accounting System licensed programs.

The following applications are included:

- General Ledger
- Payroll
- Accounts Payable
- Inventory Accounting
- Accounts Receivable
- Billing

The IBM System/36 Construction Management and Accounting System (CMAS) and Cross Application System Support provide an integrated and comprehensive workstation-oriented accounting and financial control system for the small- to medium-size construction firm and related project-oriented business. The applications include:

- Job Costing
- General Ledger
- Accounts Payable
- Payroll and Labor Costing
- Revenue Accounting
- Cross Application Systems Support

Bibliography

For a complete list of System/36 publications, refer to System/36 Guide to Publications, GC21-9015 or to *Pocket Guide for Ordering System/36 Publications*, SX 21-9490.

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