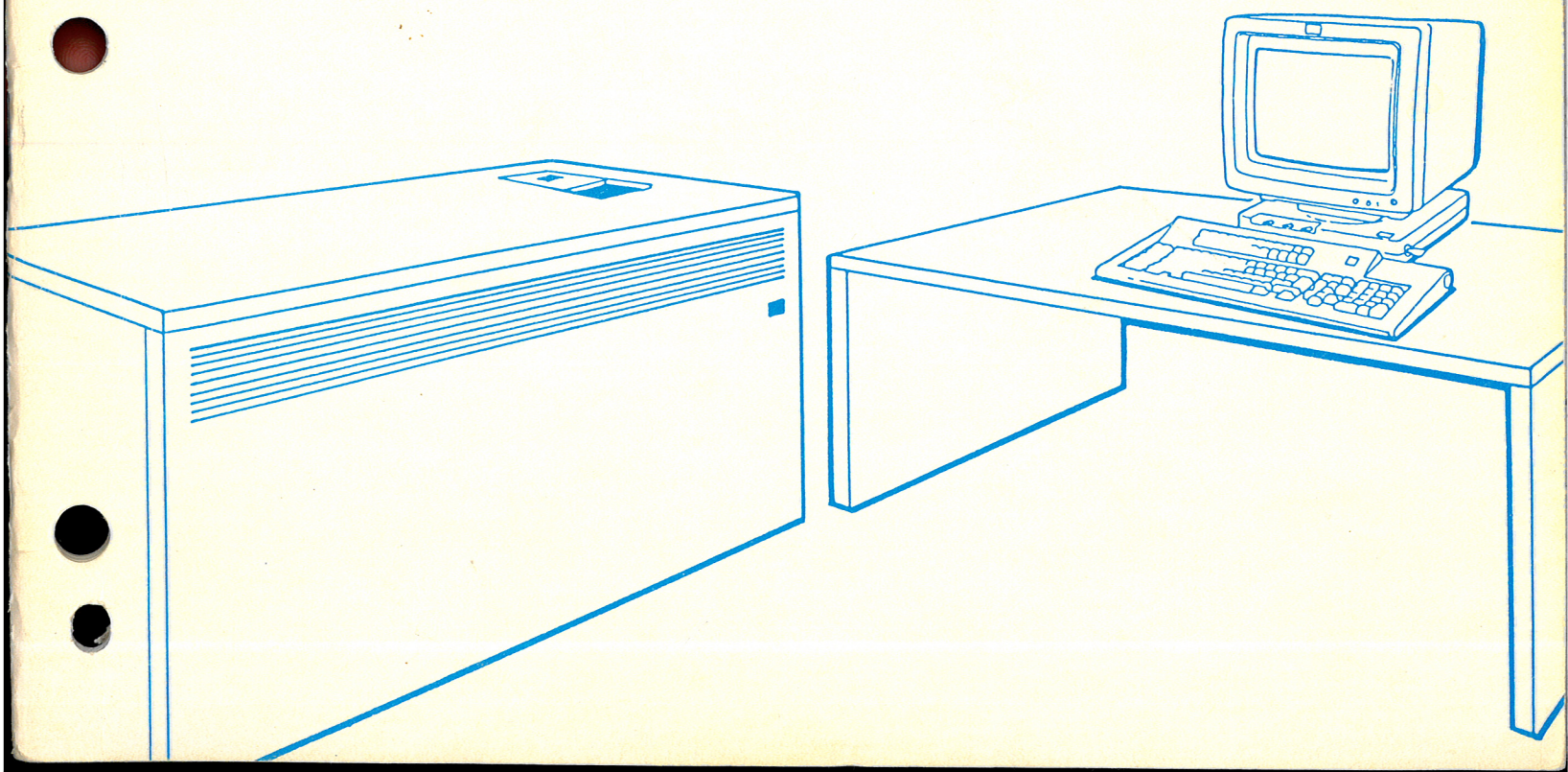
IBM

4361

IBM 4361 Processor Summary



IBM

IBM 4361 Processor Summary

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First Edition (September 1984)

By this manual, information on the IBM 4361 Model Groups 4 and 5, formerly contained in the *IBM 4321, 4331, 4341, 4361 Processors Summary*, Form GA33-1523-5, is separated. Also, information on Model Group 3 of the 4361 Processors is added.

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Preface

This publication gives a general understanding of the IBM 4361 Processors. We assume you have the basic knowledge of data processing systems provided by *Introduction to IBM Processing Systems*, GC20-1684. This publication is divided into three chapters:

- Chapter 1 introduces the 4361 Processors and their most important functions and features.
- Chapter 2 describes the Processor Model Groups, the differences between them, and the functions and features available for them.
- Chapter 3 presents the configurator for the most commonly used local Input/Output (I/O) devices.

Attachable I/O devices are described in *IBM Input/Output Device Summary*, GA32-0039. More detailed information on 4300 Processors is given in the *IBM 4300 Processors Principles of Operation for ECPS:VSE Mode*, GA22-7070.

For information related to the System/370 mode of operation selectable on 4361 Processors, see *IBM System/370 Principles of Operation*, GA22-7000.

For further reading, the following publication is recommended:
IBM 4361 Processor Functional Characteristics, GA33-1566.

For abbreviations and a glossary of terms, refer to the *IBM Data Processing Glossary*, GC20-1699.

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Introduction

The IBM 4361 Processors are powerful and versatile computers employing integrated circuitry and advanced processor design. They are general-purpose units designed for tasks in such varied fields as commerce, engineering and science, data acquisition, and data communications. Each model consists of a single processing unit with arithmetic, logic, control functions, and integrated input/output adapters. Several specialized processors for control and checking purposes are also part of the 4361 Processors.

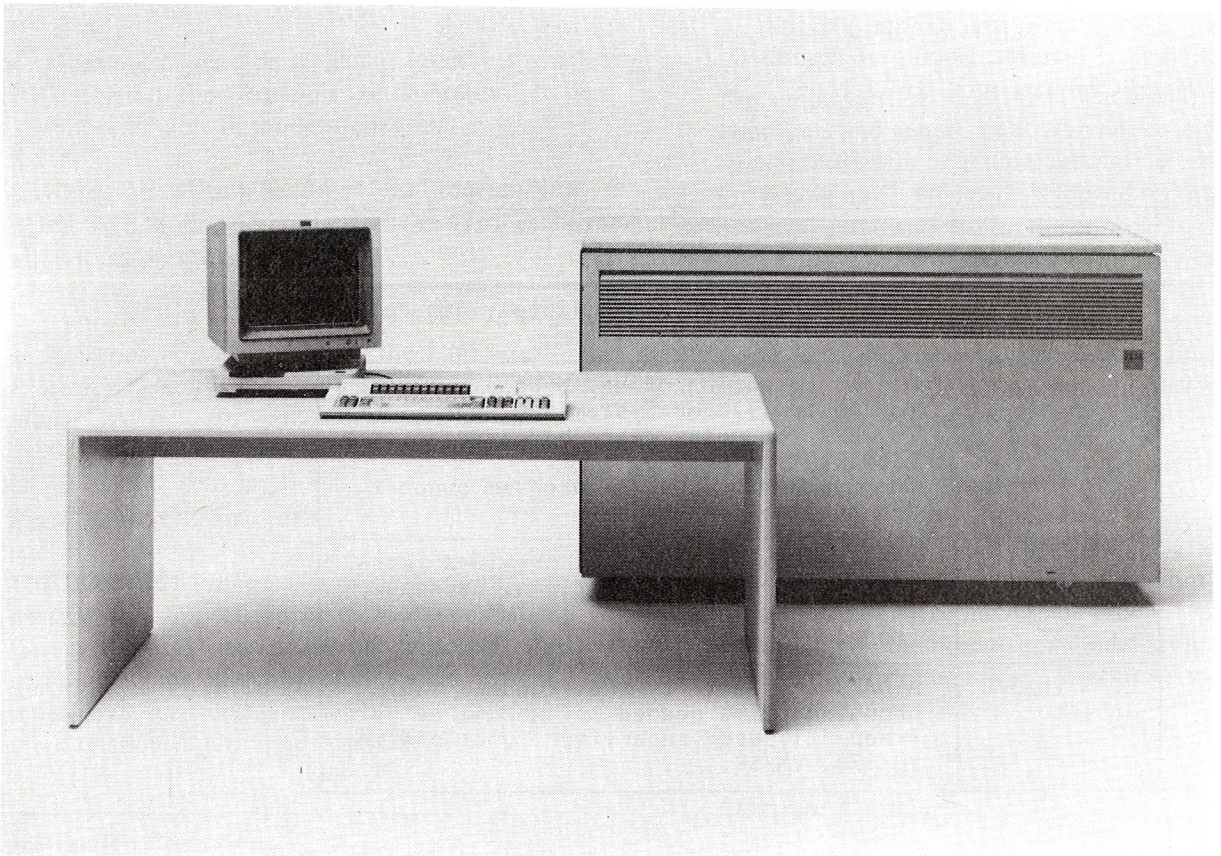

Figure 1. IBM 4361 Processor with Operator Console.

Modes of Operation

The two modes of operation available are ECPS:VSE (Extended Control Program Support: Virtual Storage Extended) or System/370 mode. The mode is selected at initial program load time. For System/370 mode, assist options are available.

The following table shows the characteristics of the two operation modes.

To ease migration to the 4361 by using earlier releases of the operating systems, setting of 4331 mode is possible at initial program load time. When 4331 mode is set, the 4361 behaves like a 4331 Model Group 2 processor, and therefore, the user cannot take full advantage of all 4361 features. Details are described in *IBM Functional Characteristics*, GA33-1566.

Mode of Operation	Option	Description
ECPS:VSE	—	Operates with an appropriately generated VSE or SSX/VSE System.
System/370	—	Allows operation of any program written for System/370 or System/360 that follows the rules described under 'Compatibility' on page 3. Two options of control program support are available:
	ECPS:MVS Assist	A hardware facility that provides fourteen privileged instructions, necessary to allow support by MVS system products (Model Group 5 only).
	ECPS:VM/370 Assist	A hardware facility that reduces the processor time needed to execute certain frequently used supervisor functions in VM/370, VM/SP.

Compatibility

Any programs written for System/370 or /360 will operate on the 4361 Processors in System/370 mode, provided that it does not depend on functions that differ between System /360 and System /370 and it

- is not time-dependent,
- does not depend on system facilities (storage size, I/O equipment, optional features, operation codes, etc.) being present when the facilities are not included in the configuration,
- does not depend on features or facilities (interruptions, operation codes, etc.) being absent when the facilities are included in the 4300 Processor, and
- does not depend on results or functions which are defined in the "Principles of Operation" to be unpredictable or model-dependent.

Any program written for any 4300 Processor in ECPS:VSE mode will operate on the 4361 Processors, when it follows the above rules.

For more details, see the *IBM System/370 Principles of Operation*, GA22-7000, and the *IBM 4300 Processor Principles of Operation for ECPS:VSE Mode*, GA22-7070.

Processor Components

The IBM 4361 Processor is made up of an instruction processor, a support processor, and - for Model Groups 4 and 5 - also a channel processor. Further components are: the processor storage, byte and block multiplexer channels, and facilities for direct attachment of Input/Output devices.

Instruction Processor

The instruction processor has the general control over the system. Instructions read out of the processor storage are executed, operations of the I/O devices initiated and controlled.

Most frequently used instructions and the floating-point multiply accelerator are implemented in hardware. This increases the performance of all model groups of the 4361 Processor.

Channel Processor

Model Groups 4 and 5 of the IBM 4361 are equipped with a channel processor. The channel processor enhances overall system performance by relieving the instruction processor from I/O-dependent control functions.

Support Processor

The support processor controls the operator console, loads the microcode, performs the manual operations, and supports the use of diagnostic and configuration tools. The communications link required by the remote service facility and the remote operator console facility is also provided by this processor.

The support processor automatically analyses failure symptoms and generates a *reference code* which contains information to guide the customer engineer to the failing unit. This code is logged on the system diskette, and displayed on the console to alert the operator.

Extended problem determination, which is performed through the support processor, is available to you in the form of a Problem Finder facility.

I/O Adapters and Channels

For connection of the I/O devices, a variety of channels and adapters are available. They are either standard features or have to be ordered separately depending on the processor's model group. Further details are described under "Features Available" on page 10.

Operator Console

The processor is controlled from the operator console which is either a 3278 Model 2A Display Console, a 3279-2C Color Display Console, or a Color Display Console 3205. The console is a prerequisite and is needed for operation and maintenance.

The console allows you to:

- Perform initial microcode load (IML)
- Perform initial program load (IPL)
- Start processor operations
- Stop processor operations.

The console also allows you to manually control such functions as:

- Storage and register display
- Storage and register alter
- Storage address compare
- Normal processing
- Instruction stepping.

On the *display screen*, the console indicates proper operations and error information of the 4361 Processor in four of the 25 lines. In the bottom line messages unique to the display console are shown.

For maintenance and service support, the console can display and store the status of the processor complex and other service information. The console also allows you to use diagnostic tools.

Two console modes are available: *Display mode* and *printer/keyboard emulation* mode. Display mode supports the operator consoles and an optional printer. Printer/keyboard emulation mode allows the processor to run operating systems and programs designed for devices such as the 1052, 3210, or 3215.

Diskette Drives

Two diskette drives are installed in the processor box:

- A system diskette drive provides storage for system and service microcode, also errors are recorded for diagnosis on one of the diskettes.

- An I/O diskette drive is provided as a standard feature. Except for Initial Microcode Load (IML), and when the Problem Finder Facility is used, this I/O diskette drive is available to the user.

Storages

Besides the processor storage, a high speed buffer storage, a fast reloadable control storage, and with Model Group 3, also a read-only storage are provided.

Maintenance Features

Remote Support Facility (RSF)

This permits the IBM customer engineer (after customer authorization) to establish a connection of the 4361 Processor to remote IBM service support locations. In these locations extended test and diagnostics facilities are available.

When the connection is established, activities as:

- Reading error logs from the system diskette
- Initiation of diagnostic programs
- Performing manual operations

can be executed remotely.

The Remote Support Facility also allows the IBM customer engineer to access the IBM Remote Service System for latest service information.

Remote Operator Console Facility (ROCF)

The Remote Operator Console Facility is an extension of the Remote Support Facility (RSF). When ROCF is in use, the RSF cannot run.

In a Distributed Data Processing environment, the ROCF allows personnel at the host site to dial up and control the remote system from the host site. This control is accomplished through system operation functions such as IML, IPL, Reset, Restart, and manual display/alter requests.

Communication with the ROCF is through an IBM 3275 Display Station or through a 3275 Emulating Device (e. g. IBM Personal Computer). IBM program products are designed to furnish remote console communication capability.

Problem Finder Facility

This provides detailed information on machine failures. It also contains procedures which enable the operator to diagnose and solve certain problems before calling for service. When IBM service is necessary, the customer-reported error data allows the IBM service location to identify suspected parts remotely. This eliminates on-site verification and waiting time for required parts.

Assist and Accelerator Features

For certain applications, performance or function is improved by features as:

- Elementary Mathematical Library EML assist (for Model Group 3 only)
- High accuracy arithmetic facility (ACRITH)
- Floating point multiply accelerator
- ECPS:MVS assist (not available with Model Groups 3 and 4)
- ECPS:VM/370 assist
- Floating Point Multiply Accelerator

Other Features and Functions

External Signals: This feature provides the possibility for connection of up to six external lines creating an 'interrupt' in the 4361 Processor when activated.

S/3 Data Import: This feature is available for Model Groups 4 and 5. With the appropriate program 3348 data modules, which have been written on a S/3-3340, can be read onto any directly attached 3340 drive.

Personal Computer Attachment: The Personal Computer, attached via a 3270 to the Display/Printer Adapter or to the Workstation Adapter, supports concurrent operation of Host and Personal Computer programs. The Personal Computer with 3270 emulation may be used with its native functions, or it may be used as a host-connected, emulated 3278/3279. Concurrent operation of Host and PC programs is possible.

Extended Precision Floating Point Arithmetic: The function consists of seven additional instructions to further improve the Floating Point precision.

Storage Protection: This facility protects the contents of the main storage from destruction, misuse or changing by erroneous or unauthorized programs. It is formed by seven storage key bits in the program status word.

Monitoring: A programmed "Monitor Call" will cause the change of control from the currently running program to a monitoring program. The monitoring program records designated events in the execution of a program.

Time-of-Day Clock: The time-of-day (TOD) clock provides a consistent measurement of elapsed time that can be used for indicating the time of day.

Clear I/O Instruction: The Clear I/O function causes a channel or an adapter to discontinue its current I/O operation with an addressed I/O device and makes the associated subchannel available.

Clock Comparator: The clock comparator provides for an interruption when the Time-of-Day (TOD) clock reaches a value specified by the program.

Channel Command Retry: Command retry allows a subchannel to retry a command without causing an I/O interruption. The retry is initiated by a control unit.

Conditional Swapping: Conditional swapping makes available the instructions Compare and Swap (CS), and Compare Double and Swap (CDS).

CPU Timer: The timer measures central-processor elapsed time and causes an interruption at the end of the period that is specified by the program.

Data Streaming: Data streaming is available on the block-multiplexer channels. It permits higher data rates and is initiated by the control unit.

Interval Timer: The interval timer provides external interruptions on a program-controlled basis. The value, stored at a specified storage location, is automatically decremented and generates an external interruption request when it goes from 0 to a negative value. The range of the interval timer is approximately 15.5 hours.

Auto Start Feature: This feature allows pre-programmed power-on, remote power-on via telephone call and re-power-on after a power net drop. It then loads the microcode, sets the TOD clock from a battery operated clock, and performs Initial Program Load (IPL).

DASD String Switch Capability: Allows sharing of 3340-A2 and/or 3370-A1/A2 and associated drives with another IBM processor or control unit that support the DASD and string switching. It provides the ability for strings of 3340/3344s or 3370s to be accessed from DASD adapters or control units on the same or two different processors. The 3340-A2 or 3370-A1/A2 must have the String Switch feature installed. 3340/3344s are not attachable to Model Group 3.

Direct Access Storage Compatibility: This feature for Model Groups 4 and 5 provides emulation of 231X data formats on 3310 or 3370 Direct Access Storage

and emulation of 3330 or 3340 formats on 3370 Direct Access Storage. Programs written for use with 231X, 3330 or 3340/3344 DASDs can be executed with only Job Control modifications. For details see "*IBM 4361 Processor, DASD Compatibility Feature,* GA33-1569".

Program-Controlled Power Off: An instruction is available by which the main power of the processor can be dropped. Therefore, when the processor runs in an unattended environment, the system may be orderly shut down by job stream events or depending on the time of day.

Floating-Point Multiply Accelerator: This feature executes frequently used floating-point multiply instructions in hardware, resulting in an improvement of execution speed. When this feature is installed in the Model Group 3, the performance for the functions supported by the Elementary Mathematical Library is improved, too.

Elementary Mathematical Library Assist: For Model Group 3, execution of functions supported in the Elementary Mathematical Library is assisted by microcode. This results in higher performance of engineering/scientific programs.

High-Accuracy Arithmetic Facility: This feature allows computational procedures with maximum accuracy and algorithmic verification of the results.

Field-Selectable Language Option: The national language of keyboard character sets for devices attached to the DPA/WSA can be selected from a list of about 20 languages. For details see *"IBM 4361 Functional Characteristics"* , GA33-1566. Two languages may be selected from that list to be used with the operator console and/or data entry keyboards.

Processor Storage

Storage Cycle Time

For all model groups of the IBM 4361, the time needed for a

- Read cycle is 1.6 microseconds (64 bytes)
- Write cycle is 2.2 microseconds (64 bytes)

Storage Access Width

For all model groups of the IBM 4361, the storage access width is up to 64 bytes over an 8-byte path (4-byte path for Model Group 3) for read and write cycles.

Storage Capacities

The IBM 4361 model groups are available with various storage capacities. However, part of processor storage is occupied by microcode and is, therefore, not available to the user.

Storage Capacity Coding Model Group			Capacity (Bytes)
3	4	5	
K3	K4	K5	2,097,152
L3	L4	L5	4,194,304
--	LK4	LK5	6,291,456
--	M4	M5	8,388,608
--	ML4	ML5	12,582,912

Channels and I/O Adapters

The channels and I/O adapters are incorporated in the 4361 Processor's housing. No separate box exists.

The block multiplexer channel, the high-speed block multiplexer channel, and the DASD/8809 adapter have the *command retry feature*.
For attachable local I/O devices see "Input/Output Configurator" on page 13. For the maximum number of installable channels and I/O adapters see "Features Available" on page 9.

Byte Multiplexer Channel

The byte multiplexer channel has 256 addresses for allocation to shared and/or non-shared subchannels. A shared subchannel is formed by one or more groups of eight contiguous device addresses. The data transfer rate in single byte mode is up to 36 kilobytes per second, depending on the configuration. The data transfer rate in burst mode is 500 kilobytes per second. It is used for low-speed I/O devices. Up to eight control units can be serviced.

Block Multiplexer Channel

The block multiplexer channel has 256 addresses for allocation to shared and/or non-shared subchannels. A shared subchannel is formed by one or more groups of eight contiguous device addresses. The data transfer rates are up to 1.25 megabytes per second, depending on the configurator version chosen. It is used for medium-speed I/O devices. Up to eight control units can be serviced.

High-Speed Block Multiplexer Channel

The high-speed block multiplexer channel performs similar to the block multiplexer channel with a higher data transfer rate. For Model Groups 4 or 5, the first two of the high-speed block multiplexer channels have a data transfer rate of up to 3.0 megabytes per second in data streaming mode. The high-speed multiplexer channel for Model Group 3, or the third high-speed multiplexer channel for Model Group 5, have a transfer rate of up to 1.86 megabytes per second. Up to eight control units can be serviced.

DASD/8809 Adapters

The DASD/8809 adapters allow the direct attachment of IBM 3310, 3370, 3340/3344 *Direct Access Storage Devices* or IBM *8809 Magnetic Tape Units*. 3340/3344s are not attachable to Model Group 3.

The data rate is up to 1.86 megabytes per second. A DASD adapter can control up to four strings of direct access storage devices. For Model Groups 4 and 5 a maximum of two strings can be 3340/3344s, the other two strings can be any combination of 3310s or 3370s. 3340/3344s are not attachable to Model Group 3. The four strings can also be all 3370s or all 3310s, or any combination of both. Only one type of disk is allowed within a string.

The DASD/8809 adapter also allows the direct attachment of up to six 8809 Magnetic Tape Units Model 1A, 2, or 3. Direct access storage devices and magnetic tape units cannot be mixed on one adapter.

Display/Printer Adapter (DPA)

The display/printer adapter controls the *operator console* and up to fifteen devices. Keyboard types for the attachable display stations are:

- Typewriter keyboard with 75/76 or 87/88 keys
- Data Entry keyboard with 75/76 keys.

If the Work Station Adapter is installed, the number of devices attachable to the DPA, is reduced to eight.

For information on the attachable devices, see "Attachment Chart for Local I/O Equipment" on page 19.

Work Station Adapter (WSA)

The work station adapter allows the connection of up to 32 work stations as display units, matrix printers, and intelligent workstations, including Personal Computers. They are connected in groups of eight via an IBM 3299 Terminal Multiplexer to the work station adapter. Hence 32 terminals would require four 3299s.

Keyboard types for the attachable display stations are:

- Typewriter keyboard with 75/76 or 87/88 keys
- Data Entry keyboard with 75/76 keys.

Serial OEM Interface Adapter (SOEMI)

The Serial Original Equipment Manufacturers Interface Adapter (SOEMI) allows to attach a wide variety of OEM subsystems and devices to the DPA or WSA. These subsystems and devices attach to the SOEMI by an appropriate OEM adapter which provides the serial to parallel conversion and vice versa, and also the control functions. The DPA supports up to two SOEMI with an aggregated data rate of up to 15 kbytes per second on inbound operations, or up to 32 kbytes per second on outbound operations. The WSA supports up to four SOEMI with an aggregated data rate of up to 25 kbytes per second on inbound operations or up to 42 kbytes per second on outbound operations.

Communications Adapter (CA)

Communication Lines and Transmission Modes

The CA allows the direct attachment of up to eight communication lines. The transmission mode (line protocol) used with these lines may be any combination of Start/Stop (S/S), Synchronous Data Link Control (SDLC), Binary Synchronous Control (BSC), or High-Level Data Link Control (HDLC)(X.25) line protocol.

Two start/stop protocols are available: IBM Terminal Control-Type 1 and US Telegraph Terminal Control-Type 2.

Line Interfaces
Eight line interfaces are available. These are:

- EIA/CCITT interface (V.24/V.28, RS-232C)
- High-speed digital interface (HSDI)
- High-speed modem adapter (V.35)
- Digital data service adapter (DDSA) for non-switched lines
- Local attachment interface (LA)
- X.21 adapter for non-switched (leased) lines (X.21L)
- X.21 adapter for switched lines (X.21S)
- Autocall unit interface (V.25/V.28-EIA RS-366)

The dependencies on line protocols, and clocking, the max. data rate, and the maximum number of communication lines served is shown in the chart below.

Up to two Autocall unit interfaces (Working in combination with V.24/V.28, RS-232C lines only) are available.

Diskette Drive

All model groups have a diskette drive for use by the customer as an I/O device in 3540 mode as a standard feature.

Programming Support

Support is provided on all model groups by SSX/VSE, VM/SP, OS/VS1, VSE/SP, VSE, and for Model Group 5 also MVS. See the appropriate programming publications.

At Initial Program Load time the 4361 Processor can be conditioned to be viewed by the operating system as a 4331-2. Thereby, previous releases of the operating system can be used and migration to 4361 is eased.

	Line Interfaces						
	EIA: RS 232C CCITT: V.24/28 CCITT: X.21bis	HSDI	CCITT V.35	DDSA	Local Attm.	X.21 Switched	X.21 Leased
Maximum Number of Lines S/S, BSC, SDLC: X.25:	8 7	1 -	1 -	8 -	8 -	8 -	8 7
Start/Stop (S/S) (IBM-1,TTY-2) data rate: clocking:	75...2400 int.	- -	- -	- -	- -	- -	- -
Binary Synchronous Control (BSC) maximum data rate: clocking:	9600 int./ext.	56000 ext.	64000 ext.	56000 ext.	9600 ext.	- -	- -
Synchronous Data Link Control (SDLC) maximum data rate: clocking:	9600 int./ext.	56000 ext.	64000 ext.	56000 ext.	9600 ext.	9600 ext.	48000 ext.
Packet-Switched X.25, HDLC (X.21 interface) maximum data rate: clocking:	9600 int./ext.	- -	- -	- -	- -	- -	48000 ext.

The Processor Model Groups

The 4361 Processors are powerful further developments of the 4331-2. Three model groups are available, 4361-3, 4361-4 and 4361-5. The main differences between these groups are:

	Model Group 3	4	5
High Speed Buffer	8KB	8KB	16KB
Implementation of SIOF instruction with queuing of I/O request	No 1)	No 1)	Yes 1)
Implementation of Clear Channel instruction	Yes 2)	Yes 2)	Yes 2)
Assist Features	VM/370	VM/370	VM/370 MVS

1) Executed as Start I/O (SIO) instruction with Model Groups 3 and 4, and also with Model Group 5 when 4331 mode is set at initial program load time.
2) Executed as Test Channel (TCH) instruction when 4331 mode is set at initial program load time.

Functions Available

The following listing shows functions available with the 4361 Processors. These functions are described either in this manual or, more commonly known functions, in the *"IBM 4300 Principles of Operation for ECPS:VSE Mode,"* GA22-7070, or in *"IBM System /370 Principles of Operation"* , GA22-7000.

- Virtual storage capability by two-level Dynamic Address Translation in /370 mode
- Single virtual storage by one-level addressing in ECPS:VSE mode
- ECPS:VSE mode (EC and BC mode)
- System/370 mode (EC and BC mode)
- Channel virtual addressing in ECPS:VSE mode
- Channel indirect addressing in System/370 mode

- Reloadable control storage
- High-speed buffer storage
- Interval timer
- Time-of-day-clock
- CPU timer
- Clock comparator

- System/370 universal instruction set
- Move inverse instruction
- Start I/O fast release instruction with queuing (executed as SIO with Model Groups 3 and 4, and with Model Group 5 in 4331 mode)
- Multiply-and-add instruction (for compatibility)
- Conditional swapping

- Data Streaming
- Extended precision floating-point arithmetic
- High-accuracy arithmetic facility (ACRITH)
- Elementary mathematical library microcode assist (Model Group 3 only)
- Error checking and correction in processor storage
- Maintenance subsystem
- Remote support facility
- Problem finder facility
- Monitoring
- Machine check handling including Recovery Extension Feature
- Clear I/O instruction
- Clear channel instruction (executed as TCH when 4331 mode is set)
- Channel command retry on block multiplexer channels, high-speed block multiplexer channels, and DASD/8809 adapters
- Program-controlled power off

Features Available

In the following table, standard and optional features are listed for the various model groups. The figures in the columns represent the maximum number of the respective feature installable.
For restrictions, see "Maximum Configurations" on page 11.

Feature	Model Group 3 S	3 O	4 S	4 O	5 S	5 O	Note
Display/Printer Adapters	1	-	1	-	1	-	
Block Multiplexer Channels	-	1	1	-	2	-	
Byte Multiplexer Channels	-	1	-	1	1	-	
High-Speed Block Multiplexer Channels	-	1	-	2	-	3	1
Diskette Drives	2	-	2	-	2	-	
DASD/8809 Adapters	-	2	-	2	-	4	1
Communications Adapters	-	1	-	1	-	1	2
Work Station Adapters	-	1	-	1	-	1	
Floating-Point Multiply Accelerator	-	1	1	-	1	-	
External Signals	1	-	-	1	-	1	
Remote Operator Console Facility	1	-	1	-	1	-	
ECPS:VM /370 Assist	1	-	1	-	1	-	
ECPS:MVS Assist	-	-	-	-	1	-	
VS1 Assist	-	-	1	-	1	-	
Storage Protection	1	-	1	-	1	-	
Machine Check Handling	1	-	1	-	1	-	
Field-Selectable Language Options	1	-	1	-	1	-	
Channel Indirect Data Addressing in System /370 Mode	1	-	1	-	1	-	
Channel Virtual Addressing in ECPS:VSE Mode	1	-	1	-	1	-	
Channel Command Retry	1	-	1	-	1	-	3
Direct Access Storage Compatibility							
2311/2314 on 3310/3370	-	-	1	-	1	-	
3330/3340 on 3370	-	-	1	-	1	-	
Serial Original Equipment Manufacturer Interface Adapter (SOEMI)	-	1	-	1	-	1	
Auto Start Feature	-	1	-	1	-	1	
String Switch Capability	-	1	-	1	-	1	

Legend: 'S' means 'Standard Feature'.
'O' means 'Optional Feature'.
The figures in the columns represent the maximum number of features installable.

Notes:

1. For restrictions, see "Maximum Configurations" on page 11.
2. For supported transmission modes and line interfaces, see "Communications Adapter (CA)" on page 7.
3. Available for block multiplexer channel, high-speed block multiplexer channel, and DASD/8809 adapter.

Maximum Configurations

The installation of one of the channels or adapters listed under "Features Available" is in general possible.
However, in some cases it is possible to install even more than one of the same adapter or channel types.

Mutual exclusiveness or restriction exists with high-speed multiplexer channel and DASD/8809 adapter.
Each column in this chart shows a valid combination.

Feature	Max. Configurations Model Group							
	3		4		5			
High-Speed Block Multiplexer Channel	1	0	2	1	3	2	1	0
DASD/8809 Adapter	1	2*	1	2	0	1	2	4

* The first adapter is for DASDs only.

Input/Output Configurator

This configurator gives information about the attachment of the most commonly used local I/O equipment to 4361 Processors.

For details on I/O equipment not mentioned in this chapter, contact your IBM representative.

Also, a great variety of remote I/O equipment is available. For detailed information on these devices attachable via telecommunication lines, see *IBM Input/Output Device Summary*, GA32-0039.

The following three diagrams provide an overview over the channel and adapter configurations for the three 4361 Model Groups.

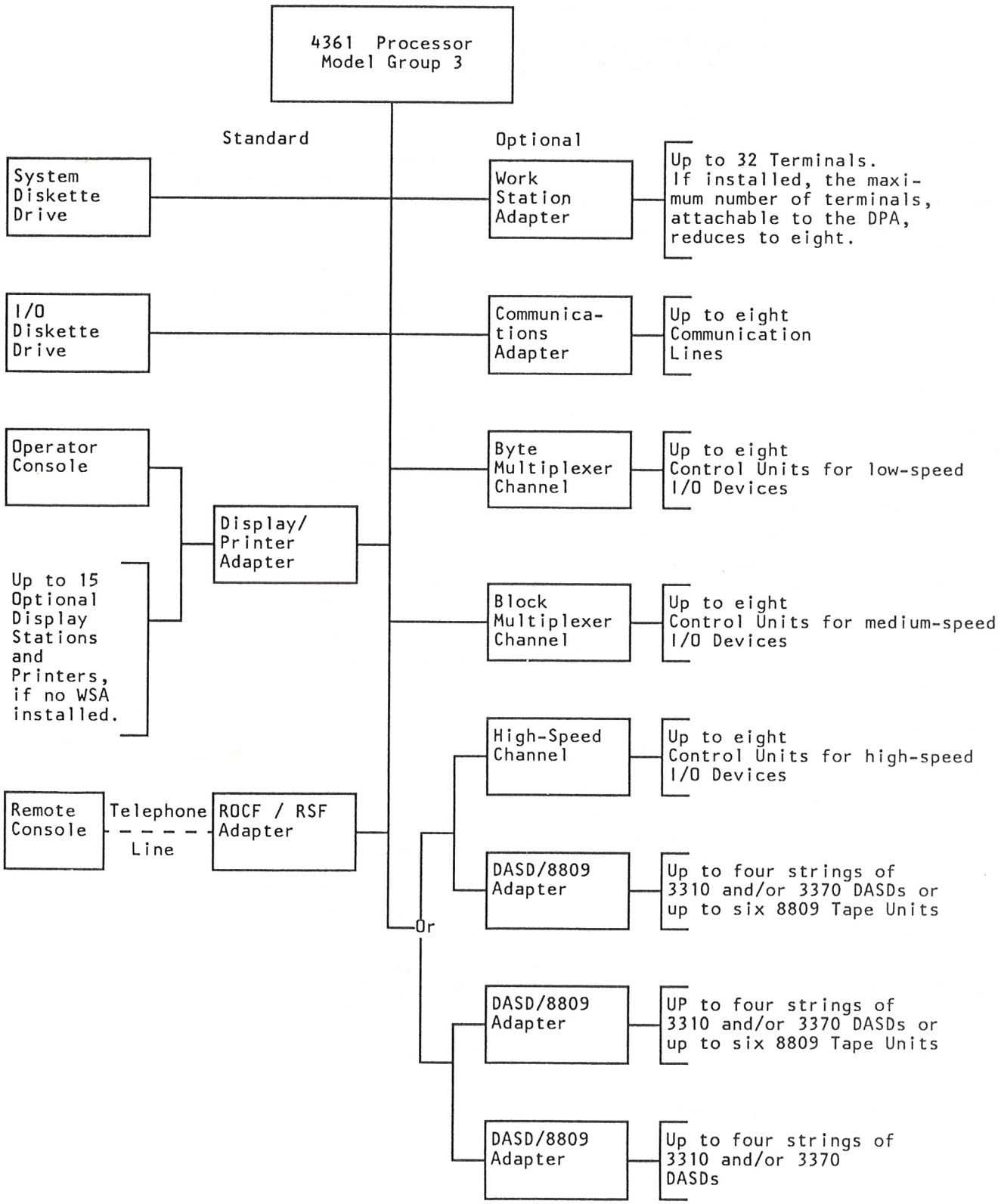

Figure 2. 4361 Processor Model Group 3. Configuration of Channels and Adapters

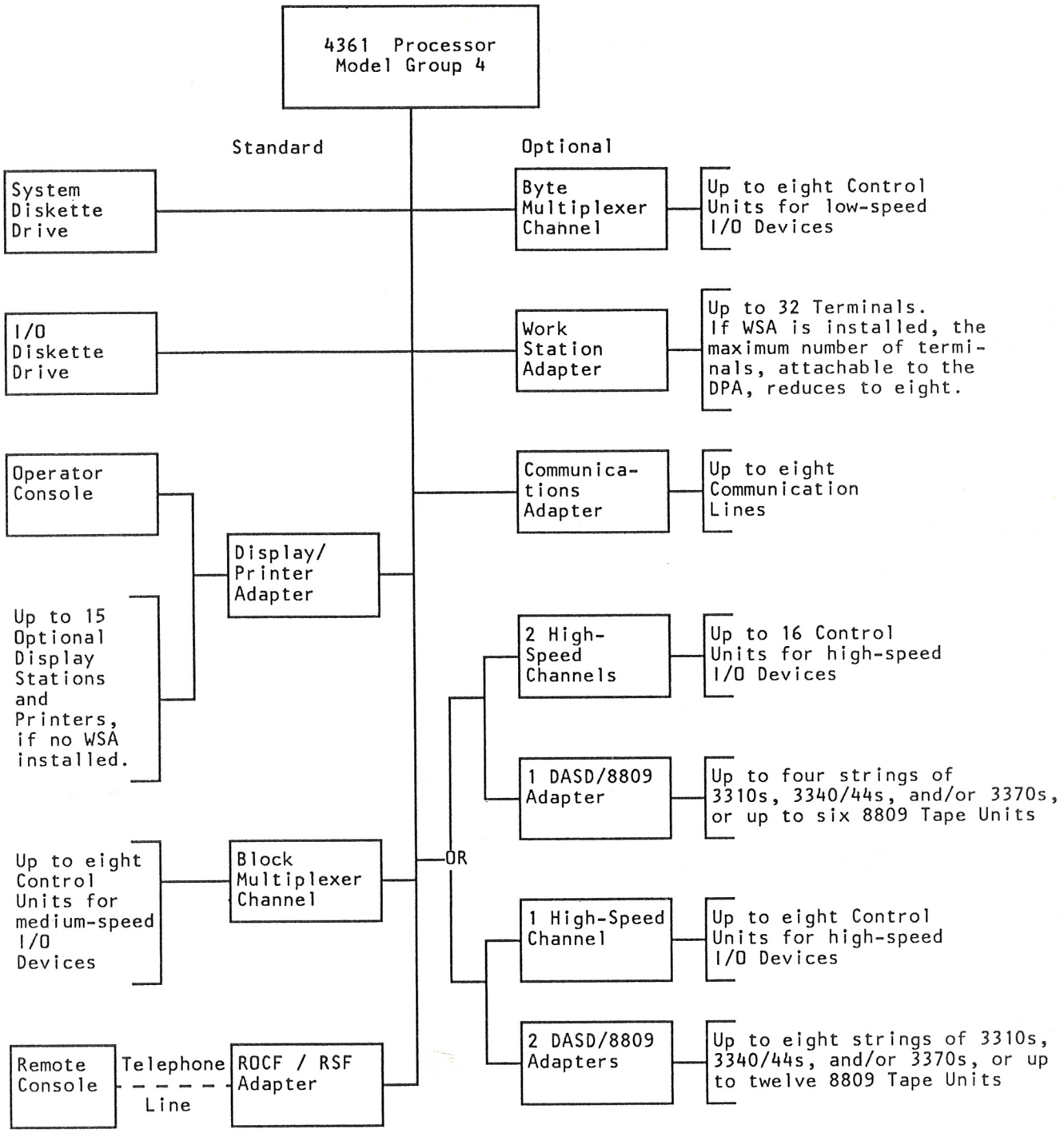

Figure 3. 4361 Processor Model Group 4. Configuration of Channels and Adapters

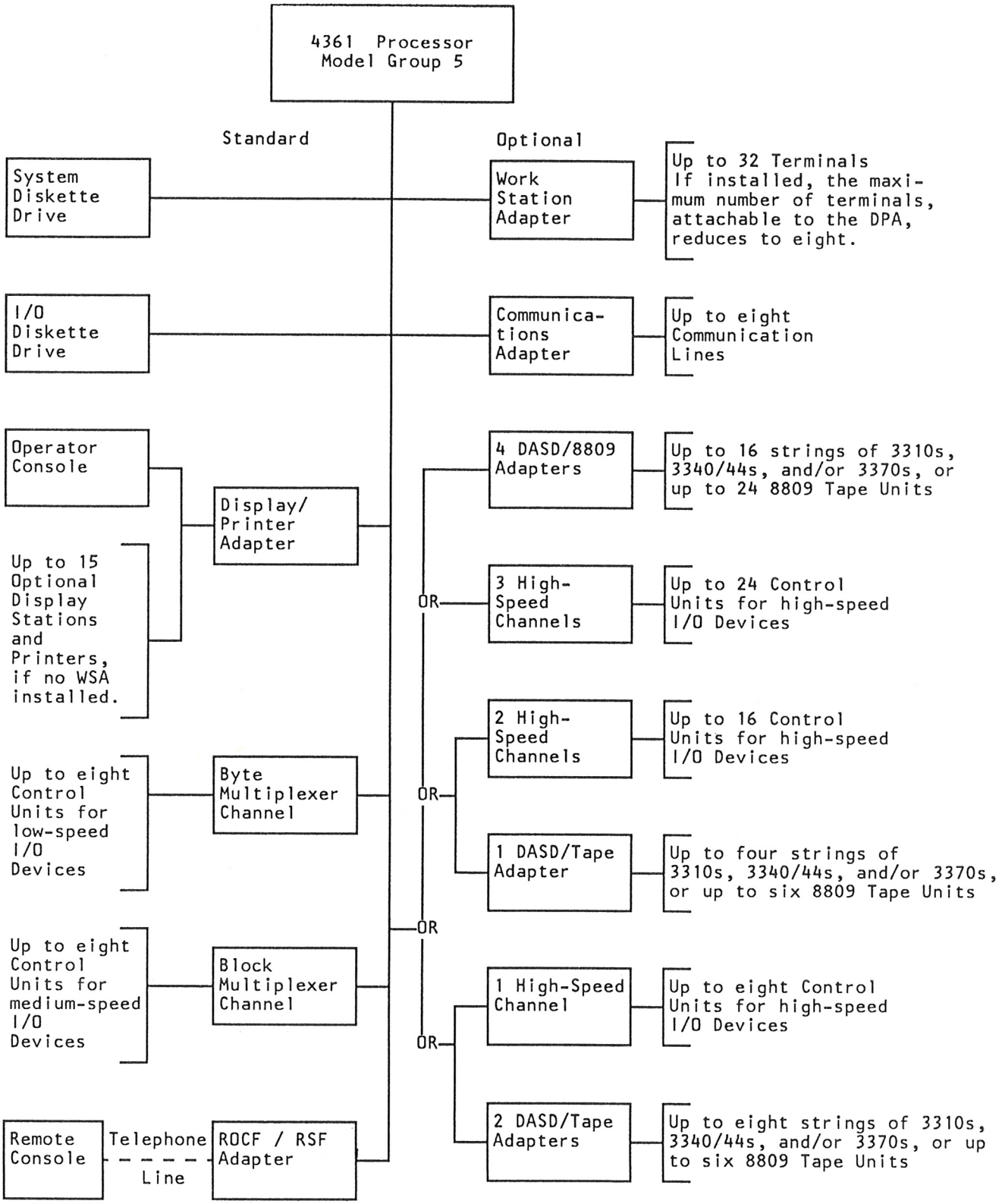

Figure 4. 4361 Processor Model Group 5. Configuration of Channels and Adapters

Local Input/Output Equipment

The following I/O devices, control units and systems can be operated locally as part of the IBM 4361 system. The equipment is arranged first by category, and then in charts by machine or system number.

Auxiliary Processors

3838 Array Processor Models 1-3

Character Recognition Devices

1255 Magnetic Character Reader Models 1-3
1287 Optical Reader Models 1, 3, and 5
1288 Optical Page Reader Model 1
1419 Magnetic Character Reader Model 1

Control Units

2314 Storage Control
2821 Control Unit Models 1, 2, 3, and 5
3088 Multisystem Channel Communication Unit Models 1 and 2
3255 Display Control Model 1
3258 Unit Model 1 Control
3274 Control Unit Models 1A, 1B, 1C, 1D, 21A, 21B, 21C, 21D, 31A, 31C, 31D, 41A, 41C, 41D, 51C, 52C, and 61C
3803 Tape Control Models 1 and 2
3811 Control Unit Model 1
3830 Storage Control Model 2
3880 Storage Control Models 1-4 and 13

Data Encryption Devices

3848 Cryptographic Unit Model 1

Data Transmission Multiplexers/Controllers

2701 Data Adapter Unit Model 1

Direct Access Storage Devices

2314 A-Series and B-Series Direct Access Storage Facility
3310 Direct Access Storage Models A1, A2, B1, and B2
3333 Disk Storage and Control Models 1 and 11
3340 Direct Access Storage Facility Models A2, B1, and B2
3344 Direct Access Storage Models B2 and B2F
3350 Direct Access Storage Models A2, A2F, B2, B2F
3370 Direct Access Storage Models A1, A2, and B1, B2
3375 Direct Access Storage Models A1, B1, and D1
3380 Direct Access Storage Models A4, A4F, AA4, and B4 (not for Model Group 3)

Diskette Input/Output Devices

3540 Diskette Input/Output Unit Models B1 and B2

Display Devices

3178 Display Stations
3179 Color Display Station (Note)
3180 Display Station
3250 Graphics Display System
3277 Display Station
3278 Display Station
3279 Color Display Station
3290 Information Panel Model 1
3732 Text Display Station Model 1

Note: The 3279 Color Display Station is available in a number of additional models designed for the needs of users in various countries. Ask your IBM service representative for details.

Magnetic Character Inscribers

(See Character Recognition Devices.)

Magnetic Character Readers

(See Character Recognition Devices.)

Magnetic Tape Devices

3410 Magnetic Tape Unit Models 1-3
3411 Magnetic Tape Unit and Control Models 1-3
3420 Magnetic Tape Unit Models 3-8
3430 Magnetic Tape Unit Models A1 and B1
8809 Magnetic Tape Unit Models 1A, 2, and 3

Optical Readers

(See Character Recognition Devices.)

Printers

1403 Printer Model N1
3203 Printer Model 5
3211 Printer Model 1
3262 Printer Models 1, 5, and 11
3268 Printer Model 2 and 2C
3284 Printer Models 1 and 2
3287 Terminal Printer Models 1 and 2
3289 Line Printer Models 1, 2, and 4
3800 Printing Subsystem Models 1, 3, 6, and 8
4245 Line Printer, Model 1
4250 Printer Model 1
5210 Printer Models G1, G2

Punched Card Devices

1442 Card Read Punch Model N1
1442 Card Punch Model N2
2501 Card Reader Models B1 and B2
3505 Card Reader Models B1 and B2
3525 Card Punch Models P1, P2, and P3

Systems, Subsystems, Processors

3250 Graphics Display System
3270 Information Display System
3730 Distributed Office Communication System
3814 Switching Management System A1-A4, B1-B4, C1-C4
3838 Array Processor, Models 1 - 3
4321 Processor (Note 1)
4331 Processor Model Groups 1, 2, 4, 5, and 11 (Note 1)
4341 Processor Model Groups 1, 2, 9, 10, 11, and 12 (Note 2)
4361 Processor Model Groups 3, 4, 5 (Note 1)
4381 Processor (Note 2)
5080 Graphics System
6580 Display Writer System Models A04, A06, A08, A10,
IBM Personal Computers
System/370 Models 145, 145-3, 148, 158, 168, and 3031, 3032, 3033, 3081, 3083, and 3084 Processors (Note 2)
System/7 (Note 3)
Series/1 (Note 3)

Notes:

1. String switching is available on the DASD adapter to create a data path over a shared DASD string.

2. Channel-to-channel adapters are available to interconnect two channels (4341 Processor, System/360, System/370). One control unit position is required on each connected channel.

3. A channel attachment is available for connecting the system to a 4300 Processor and operating the system as a control unit.

Attachment Chart for Local I/O Equipment

Legend

WSA	Work Station Adapter
DASD/8809	DASD/8809 Adapter
DPA	Display/Printer Adapter
BL	Block Multiplexer Channel
BY	Byte Multiplexer Channel
HS-BL	High-Speed Block Multiplexer Channel
i	Internal attachment

I/O Unit			Attachable		
Type	Name	Model	to Channel or Adapter	via Control Unit	Note
1255	Magnetic Character Reader	1-3	BY,BL	S/360/370 Adapter	-
1287	Optical Reader	1,3	BY,BL	-	D
		5	BY,BL	-	D
1288	Optical Page Reader	1	BY,BL	-	D
1403	Printer	N1	BL,BY	2821-1,2,3,5	L,P
1419	Magnetic Character Reader	1	BY	S/360/370 Adapter	D
1442	Card Read Punch	N1	BY	-	D
	Card Punch	N2	BY	-	D
2314	Direct Access Storage Facility	A-Series	HS-BL	-	G
		B-Series	HS-BL	-	H
2501	Card Reader	B1,B2	BY	-	D
2701	Data Adapter Unit	1	BY,BL	-	-
2821	Control Unit	1,2,3,5	BL,BY	-	P
3088	Channel Communicator	1,2	BL	-	D
3178	Display Station	all	BL,BY	3274	-
		C1, C2	DPA,WSA	i	-
3179	Color Display Station	-	BL,BY	3274	-
			DPA,WSA	i	W
3180	Display Station	1	BL,BY	3274	-
			DPA,WSA	i	W
3203	Printer and Control	5	BL,BY	-	-
3211	Printer	1	BL,BY	3811-1	-
3250	Graphics Display System	-	BL	3255-1 3258-1	F
3262	Printer	1,11	DPA	i	D
		5	BL,BY	-	-

I/O Unit Type	Name	Model	Attachable to Channel or Adapter	via Control Unit	Note
3268	Printer	2,2C	DPA,WSA	i	-
			BL,BY	3274	-
3270	Inform. Display System	-	DPA,WSA	-	-
			BL,BY	3274	M
3274	Control Unit	all	BL,BY	-	M
3277	Display Station	2	BL,BY	3274	L,M
3278	Display Station	002 (2)	BL, BY	3274	X
		S02	DPA, WSA	i	X
		A02 (2A)	DPA	i	X
		003 (3) 004 (4) 005 (5)	BL,BY	3274	X
		S03 S04 S05	WSA	i	X
3279	Display Station	A02 (2A) S2A 02X	BL, BY	3274	X
			DPA,WSA	i	X
		C02 (2C)	DPA	i	X
		B02 (2B) S2B A03 (3A)	BL, BY	3274	X
		S3A B03 (3B) S3B 03X	WSA	i	X
3284	Printer	1,2	BL,BY	3274	L,M
3287	Terminal Printer	1,2	DPA,WSA	i	-
			BL,BY	3274	M
	Color Printer	1C,2C	DPA,WSA	i	-
			BL,BY	3274	M
3289	Printer	4	DPA	i	-
		1,2	BL,BY	3274	M
3290	Information Panel	1	BL,BY	3274	L
3310	Direct Access Storage	A1,A2,B1 B2	DASD/8809	i	E
3333	Disk Storage and Control	1,11	HS-BL	3830-2	C
				3880-1,2	S
3340	Direct Access Storage	A2,B1, B2	DASD/8809	i	A,B,T
			HS-BL	3830-2	B,T
			HS-BL	3880-1,2	S,T
3344	Direct Access Storage	B2,B2F	DASD/8809	i	B,T
			HS-BL	3830-2	B,T
				3880-1,2	S
3350	Direct Access Storage	A2,A2F B2,B2F	HS-BL	3830-2	J
				3880-1,2	S
3370	Direct Access Storage	A1,A2,B1 B2	DASD/8809	i	E
			HS-BL	3880-1,2,4	E,S
3375	Direct Access Storage	A1,B1,D1	HS-BL	3880-1,2,4	S

I/O Unit Type	Name	Model	Attachable to Channel or Adapter	Attachable via Control Unit	Note
3380	Direct Access Storage	A4,A4F AA4,B4	HS-BL	3880-2,3	S,U
3410	Magnetic Tape Unit	1,2,3	BL	3411	-
3411	Magnetic Tape Unit and Control	1,2,3	BL	-	D
3420	Magnetic Tape Unit	3,5,7	BL,BY	3803-1	K
		4,6,8	BL	3803-2	K
3430	Magnetic Tape Unit	A1,B1	BL,BY	-	D
3505	Card Reader	B1,B2	BL,BY	-	D,L
3525	Card Punch	P1,P2,P3	BL,BY	3505-B1,B2	D,L
3730	Distributed Office Communication System	-	BL,BY	3291-11C, 12A,12B	D
3790	Communication System	-	BL,BY	1C,2A,2B	-
3800	Printing System	1,3,6,8	BL,BY	-	D
3803	Tape Control	1	BL,BY	-	K
		2	BL	-	K
3811	Control Unit	1	BL,BY	-	-
3814	Switching Management System	A1-4,B1-4,C1-4	BL,BY	-	-
3830	Storage Control	2	HS-BL	-	J
3838	Array Processor	1,2,3	HS-BL	-	D
3848	Cryptographic Unit	1	BY	-	D
3880	Storage Control	1,2,3,4, 13	HS-BL	-	S,T
4245	Line Printer	1	DPA, WSA	i	-
			BL, BY	3274	-
4250	Printer	1	DPA, WSA	i	-
			BL,BY	3274	M
5080	Graphics System	-	BL, HS-BL	5088	-
5150	Personal Computer	-	DPA,WSA	i	-
			DPA,WSA	3278,3279	-
			BL,BY	3274	-
5160	Personal Computer	-	DPA,WSA	i	-
			DPA,WSA	3278,3279	-
			BL,BY	3274	-
5210	Printer	G1, G2	DPA,WSA	i	-
			BL,BY	3274	D
5271	Personal Computer	A11	DPA,WSA	i	-
			BL,BY	3274	-
6580	Display Writer System	A04,A06, A08,A10	DPA,WSA	i	-
			BL,BY	3274	M
8809	Magnetic Tape Unit	1A,2,3	DASD/8809	i	-
BA00	SOEMI Adapter	-	DPA, WSA	i	V

Notes

A When the DASD attachment with System/3 data import capability is installed in the 4361 Processor, 3348 data modules recorded on an IBM System/3, Model 12 or 15 can be read into storage. Writing on the 3348 modules is not possible.

B The 3340-A2 and -B2 each have two disk drives; the 3340-B1 has one. The 3344-B2 and -B2F each have two disk drives. Generally, a 3340-A2 can attach a total of three 3340-B1s and/or -B2s and, in certain configurations, 3344-B2s and/or -B2Fs, for a maximum of eight drives per string. As many as four 3340-A2s with the associated 3340 B-units (maximum of 32 drives) or four 3340-A2's with 3340 and 3344 B-units, which together use a maximum of 64 logical device addresses, can be attached to a 3830 Model 2. The 3344 B-units may be used in only the first and third of four possible strings.

Up to four 3340-A2s can be attached to each data path of the 3880. For configurations attaching 3340/3344s, the storage director uses 64 contiguous device addresses irrespective of the number of drives attached. The 3340 Model A2s on the first and third strings may attach up to three 3340 Models B1s/B2s and/or 3344s in any combination. The 3340 Model A2 on the second string may attach up to three 3340 Model B1s/B2s. The 3340 Model A2 on the fourth string may attach one 3340 Model B1 or B2.

Up to two 3340/A2s can be attached to each DASD Adapter of the 4361. 3340/3344s are not attachable to Model Group 3.

C The 3330 and 3333 Models 1 and 11 have two disk drives, and the 3330 Model 2 has one. One 3333 can attach up to three 3330s for a maximum of eight drives per 3333. Up to four 3333/3330 and/or 3350 strings can attach to a 3830-3.

D No special restrictions for the number of devices attachable. It depends on the number of available system channel control unit positions and, for some units, on channel loading considerations.

E A maximum of four 3310 and/or 3370 strings can be attached to the DASD Adapter of the 4361. A 3310 string can consist of up to four devices, a 3370 string can consist of up to eight devices ("device" means a separately addressable unit). The 3370-A1,A2 contains the string controller and two devices. The 3370-B1,B2 is attached to the -A1,A2 and contains two devices.

For a storage director on the 3880 controlling 3370 DASD, a maximum of four 3370-A1,A2s, each with up to three 3370-B1,B2s, may be attached.

F Operates in selector mode, not in block multiplex mode.

G A 2314 A-Series Direct Access Storage Facility (DASF) consists of a 2314 Storage Control Model A1 and combinations of Model A1 units of 2312, 2313, and 2318 Disk Storage, forming a single interconnected unit. Each 2312-A1 provides one disk storage drive, each 2313-A1 four drives, and each 2318-A1 two drives. A full-configuration 2314 A-Series, which consists of two 2313s and one 2312, has eight drives and one spare.

H A 2314 B-Series Direct Access Storage Facility consists of a 2314 Storage Control Model B1, one 2319 Disk Storage Model B1, and up to two units of 2319 Disk Storage Model B2, forming a single interconnected unit having three, six, or nine (eight active, one spare) disk drives. Each 2319-B1 and -B2 has three drives.

J The 3350-A2, -A2F, -B2, and -B2F each have two drives. A 3350 string can be formed by attaching one of the following combinations to a 3350-A2 or -A2F for a maximum of eight drives: (1) up to three 3350-B2 or -B2F units or (2) one or two 3350-B2 or -B2F units. As many as four 3350 strings can be attached through the 3830-2 or -3 Storage Control or through a storage director of the 3880-1 or -2 Storage Control.

K Up to eight 3420-4, -6, -8 per 3803-2. The 3803 tape switching features permit switching of as many as sixteen 3420s among two, three, or four 3803s.

L The order of preference for attaching *buffered* devices to the 4361 is:

1. To the block multiplexer channel
2. To the byte multiplexer channel with the device set to:
   a. burst mode
   b. multibyte mode

M The 3270 Information Display System is either attached to the DPA, or WSA, or has a 3274 Control Unit that directs the operation of various combinations of display stations and printers.

N The 3274 does not require a contiguous range of 32 addresses when controlling 32 terminals.

P One 1403 and one 2540 per 2821-1.
One 1403 per 2821-2.
Two (or, with a third printer control, three) 1403s per 2821-3.
Two (or, with a third printer control, three) 1403s and one 2540 per 2821-5.

S A 3880 provides two independent data paths called storage directors and is connected to the high-speed block multiplexer channel.

On the 3880-1, each storage director provides for attachment of either up to four 3340-A2s, or up to four 3370-A1,A2s, or up to four 3333s (any model) and/or 3350-A2/A2Fs in any combination, or up to four 3775-A1s. On the 3880-2 one storage director allows attachment as described above, while the other storage director allows attachment of either up to two 3380-A4/A4Fs, or two 3380-AA4/AAFs. Only one storage director of a 3880-2 can be attached.

The 3880-4 provides a single storage director for attachment of 3370 or 3375 DASD. A maximum of four 3370-A1,A2s, or four 3375-A1s can be attached. Mixing of 3370s and 3375s is not allowed.

For configurations attaching 3340/3344 DASD, the storage director uses 64 contiguous addresses irrespective of the number of drives attached. The 3340-A2s on the first and third strings may attach up to three 3340-B1s/B2s and/or 3344s in any combination. The 3340-A2 on the second string may attach up to three 3340-B1s/B2s. The 3340-A2 in the fourth string may attach one 3340-B1/B2.

For a storage director attaching 3370 DASD, a maximum of four 3370-A1,A2s, each with up to three 3370-B1,B2s may be attached.

For a storage director attaching 3375 DASD, a maximum of four 3375-A1s, each with up to three 3375-B1s, or two 3375-B1s and one 3375-D1, can be attached. The 3375-D1 performs a dual controller function and data path for a further string of 3375s. The 3375-D1 can be connected to the same 3880 as the 3375-A1, but not to the same storage director on the 3880, and not to the same processor channel through the 3880. Alternatively, the Model D1 can be connected to a different 3880 or a different processor from the Model A1.

For a storage director attaching 3380 DASD, a maximum of two A4s/A4Fs or two AA4s/AAFs, each with up to three 3380-B4/B4Fs, can be attached.

For a storage director attaching 3330/3333/3350 DASD, the maximum is four 3333-1s, 3333-11s, and/or 3350-A2s/A2Fs in any combination. Each string with a 3333-1 or -11 may attach up to three 3330-1s/2s or -11s. Each string with a 3350-A2/A2F may attach up to three 3350-B2s/B2Fs, or up to two 3350-B2s/B2Fs, and a 3350-C2/C2F.

Both storage directors can be attached to the same channel, to different channels on the same processor, or to channels on two separate processors.

T 3340, 3344 attachment and Count Key Data (CKD) Emulation is not available for Model Group 3.

U 3380 Direct Access Storage cannot be attached to Model Group 3.

V The SOEMI adapter uses BA00 as pseudo machine type for configuration purposes.

W 3179 or3180 Display Stations connected to the WSA operate in printer/keyboard emulation mode only.

X Model numbers in parenthesis were formerly used, e.g. 3279-A02 and 3279-2A is the same model. -1 at the end of the model number (e.g. 3279-S2A-1) means: no manual color convergence.

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