Systems Reference Library

IBM System/360 Model 25
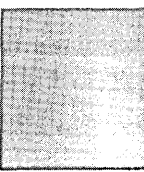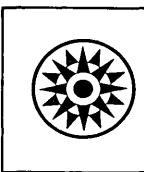# High-Speed Channel–2314 Attachment Feature
RPQ E69109

This publication describes the operation of the 2314 attachment
feature used with the IBM System/360 Model 25. Programming and
operating information is provided in the form of instruction timing,
error indications, and CPU indicators as applicable to high-speed
channel operation.

The reader should have a knowledge of the IBM System/360 described
in the *IBM System/360 Principles of Operation,* GA22-6821.

For additional information relating to the Model 25, refer to:

IBM System/360 Model 25 Functional Characteristics, GA24-3510

IBM System/360 Model 25 Operating Procedures, GA24-3523.

Preface

This manual provides a description of the Integrated High-Speed Channel–2314 Attachment Feature used on the System/360 Model 25. Addressing, command usage, programming restrictions, error indications, and CPU indicators applicable to this feature are presented.

The reader should have a knowledge of the System/360 as defined in the *IBM System/360 Principles of Operation,* GA22-6821.

For additional information on the System/360 Model 25 operating and programming procedures, refer to:

IBM System/360 Model 25 Functional Characteristics, GA24-3526

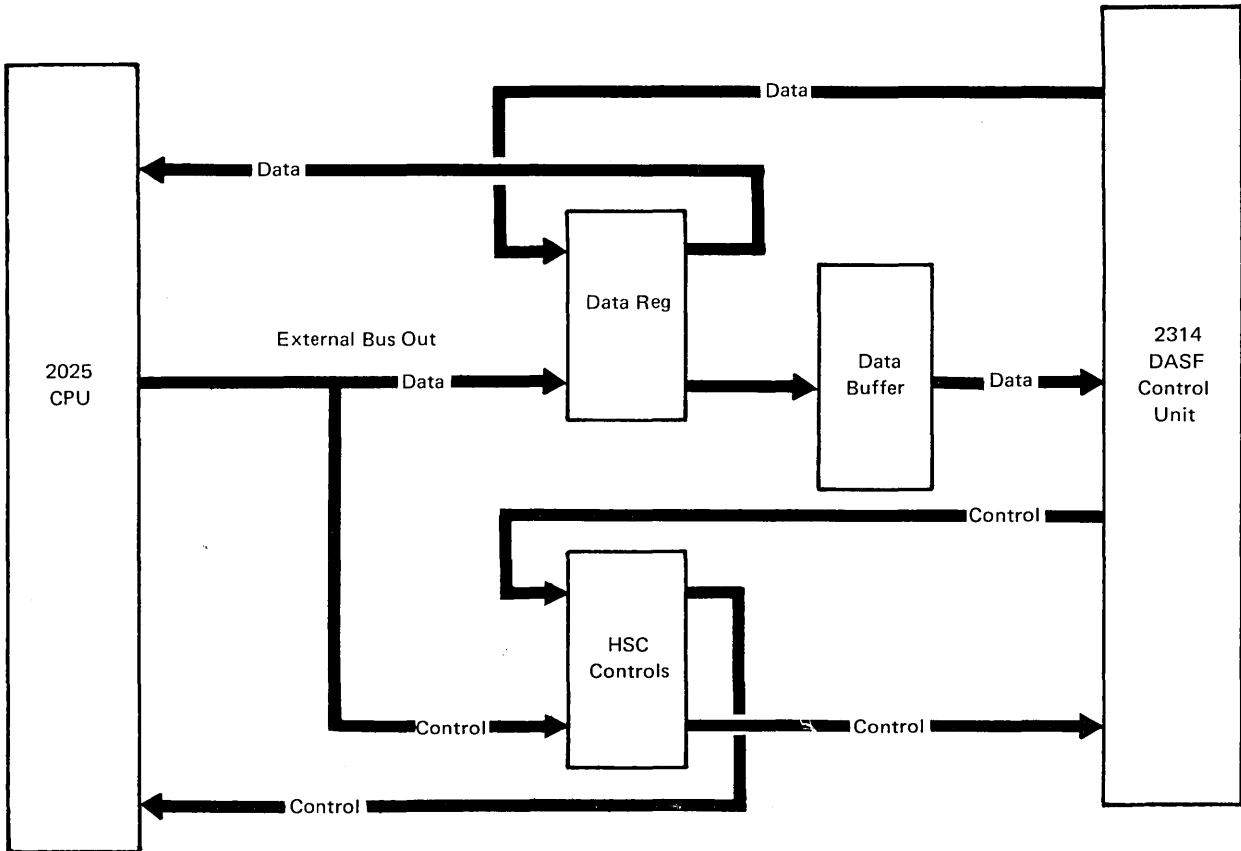*IBM System/360 Operating Procedures,* GA24-3523.

Contents

Figure 1. Data Flow

The Integrated High-Speed Channel (HSC) attachment to the System/360 Model 25 provides the capability of attaching a 2314 Direct Access Storage Facility (DASF) control unit. The DASF controls up to 9 disk drives, 8 of which may be operational (on-line) at any one time.

The HSC attachment provides data transfer between the DASF and the CPU at a rate of 312 kb/second over a standard I/O interface.

SYSTEM/360 MODEL 25 STORAGE REQUIREMENTS

The high-speed channel attachment can be attached to the following models of the System/360 Model 25.
1. D
2. DE
3. E
4. ED

Hardware and microprogram space allotted for the integrated 2311 attachment is used for the high-speed channel attachment.

DATA FLOW

Data flow for the high-speed channel attachment is shown in Figure 1. The data bus-in to the high-speed channel attachment originates from the CPU to external bus-out lines and is used to transfer data to the high-speed channel attachment under hardware-generated share cycles. The data is buffered in the HSC attachment and sent to the 2314 DASF control unit upon request. Control information is transferred on the same bus-out system but under microprogram control.

Information entering the CPU is on two separate bus-in systems. Data from the 2314 DASF control unit is transferred to the high-speed channel attachment, which generates a request to the CPU to handle the data. This data transfer from the high-speed channel attachment is by hardware-generated share cycles. Control information from the 2314 DASF is transferred to the HSC attachment and to the CPU under microprogram control.

LOCAL STORAGE

Local storage is used for the intermediate storage of CCW count, CCW data addresses, and data being operated upon by the control program.

AUXILIARY STORAGE

Auxiliary storage module 0 is used to store unit address, device address, next CCW address, and status byte information. Auxiliary storage assignments are as follows.

8E/8F	Status/Active Byte-Unit Address
98/99	Next CCW Address
9A/9B	Address Interrupt Buffer
9C/9D	Status Interrupt Buffer
F5	Control Unit Address

HIGH-SPEED CHANNEL ADDRESSING

The high-speed channel is addressed as channel 1. System/360 Model 25 selector channel operations and high-speed channel operations are mutually exclusive.

2314 DASF Addressing

Standard 2314 DASF control unit and module addressing is used as described in *IBM System/360 Component Descriptions--2314 Direct Access Storage Facility,* GA26-3599.

COMMANDS

All commands listed in *IBM System/360 Component Descriptions--2314 Direct Access Storage Facility,* GA26-3599 are used by the high-speed channel attachment. The following I/O instructions and decodes are acceptable.

Start I/O	9C
Test I/O	9D
Halt I/O	9E
Test Channel	9F

CHAINING

Command and data chaining are handled by the HSC attachment with the following restriction. Because of the high data rate, data chaining is not allowed within a field and may be used only with multifield operations where each CCW defines a complete data field with a correct length count. The chain data command then defines the next field for the original command.

ERROR DETECTION

During high-speed channel operation, the interface, the channel and the CPU are checked for errors.

Detected errors and the channel status bit in the CSW are shown in Figure 2.

Error Indication	Cause of Error		Action
Incorrect Length	Long record on input or output	SLI flag off, CCW reduced to zero and service-in is received	Set channel status bit 1. End operation
	Short record on input or output	1. SLI flag is off, and the 2314 DASF ends operation before the CCW count is zero. 2. Halt I/O is issued, SLI flag is off and CCW count is not zero.	
Program Check	1. Memory wrap (Invalid data address)	Data address greater than memory size	Set channel status bit 2. End operation
	2. Invalid count	Not TIC and CCW count is zero	
	3. Invalid format	Three low-order flag bits CCW not zero	
	4. Invalid command	Command not applicable	
	5. Invalid CCW address	CCW address not on valid boundaries	
Protection Check	Protect key mismatch	Memory protect keys do not match and protect key is not zero	Set channel status bit 3. End operation
Channel Data Check	Channel parity error	Parity error detected on data by the channel (in the data buffer)	Set channel status bit 4. End operation when current CCW is finished
Channel Control Check	A CPU-detected error during high-speed channel operation	Parity error detected by the CPU during high-speed channel operation	Set channel status bit 5. End operation
Interface Control Check	Bus-in parity check	Parity error detected on unit address or status byte	Set channel status bit 6. End operation
	Address mismatch	Address on bus-out and device do not match	
	Timeout	Response to an outbound tag not received within time limit	
	No response on command chaining	Select-in is received in response to address-out and select-out	
	Busy on command chaining	Control unit responds with busy bit during status-in	

Figure 2. Error Detection

TIMING CONSIDERATIONS

The following instruction timings are approximate and are expressed in microseconds.

	Condition Code	Comments	Microseconds
Start I/O	0	I/O operation initiated and channel proceeding with its execution	114.3 + T1
	1	CSW stored; immediate operation initiated or command rejected	127.8 + T1
	2	Busy	36.9
	3	Device not operational	122.4 + T1
	3	Channel or subchannel not operational	29.7
Test I/O	0	Channel and device available	67.5 + T1
	1	CSW stored; device-end status only	94.4 + T1
	1	CSW stored; channel-end interruption in subchannel	68.4
	2	Channel or subchannel busy	26.1
	3	Device not operational	81 + T1
	3	Channel or subchannel not operational	26.1
Halt I/O	0	Interrupt pending in subchannel	26.1
	1	CSW stored	71.1 + T1
	2	Burst operation ended	39.6 + T2
	3	Device not operational	70.2 + T1
	3	Channel not operational	18.0
Test Channel	0	Channel available	19.8
	1	Interrupt pending in channel	15.3
	2	Channel operating in burst mode	19.8
	3	Channel not operational	16.2

T1 = Select-out delay + device delay.
T2 = Device delay for Halt I/O instructions.

HSC INTERFERENCE

For system interference characteristics, refer to *IBM System/360 Model 25 Channel Characteristics and Functional Evaluation,* SA24-3528. The following information pertains to the high-speed channel attachment.

Nominal data rate	312 kb/sec	
Gap or cycle time	25.0 ms	
Data load	73.1	
Priority load Time (ms)	A	B
.055	5.5	-
.110	–	50.0

Channel Overrun

Any device on selector channel 1 or any burst mode/burst byte device on multiplexer channel 0 will be subject to overrun if simultaneous operation with the 2314 DASF is attempted. Therefore, the following channel considerations will be effective during 2314 DASF operations.

1. 2314 DASF and selector channel operations are mutually exclusive with each other.
2. A Start I/O instruction issued to a burst mode/burst byte device on channel 0 while 2314 DASF is in operation may result in data overrun.
3. 2314 DASF data operations may overlap CPU and channel 0 operations. The maximum tolerable aggregate interference data rates for the multiplexer channel are shown in Figure 3.

CPU INTERFERENCE

The following data shows CPU interference time in microseconds.

Data Transfer	Start I/O	Command Chaining	Data Chaining	Transfer In Channel
1.8n	*147	51	31	12.6

n = number of bytes transferred

* Includes channel-end and device-end trap times of 32 microseconds to successfully complete a Start I/O operation.

Degree of Overlap	Data Chaining	
	Without	With
No Overlap with integrated attachments	18.5 kb	8.9 kb
Overlap with integrated Reader/Punch/Printer/1052 only	10.4 kb	5.0 kb
Overlap with 2314 Disk File only	5.8 kb	3.2 kb
Overlap with integrated Reader/Punch/Printer/1052/2314 Disk File	3.7 kb	2.1 kb
Overlap with integrated Communications	4.2 kb	2.1 kb
Overlap with integrated Reader/Punch/Printer/1052/Communications	3.0 kb	1.5 kb
Overlap with 2314 Disk File and Communications	1.7 kb	.9 kb
Overlap with integrated Reader/Punch/Printer/1052/2314 Disk File/Communications	1.3 kb	.7 kb

Figure 3. Maximum Tolerable Aggregate Interface Data Rates for the Multiplexer Channel
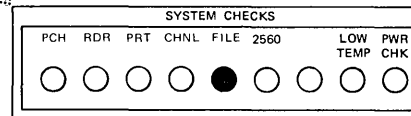
CPU INDICATORS and FILE KEY

Data Cycle File

This light indicates that a byte of information is being
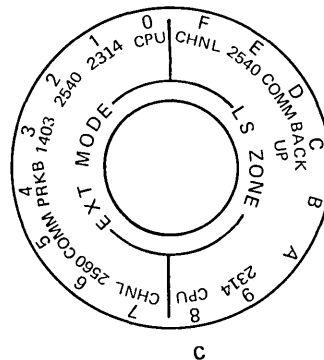transferred between main storage and a 2314.
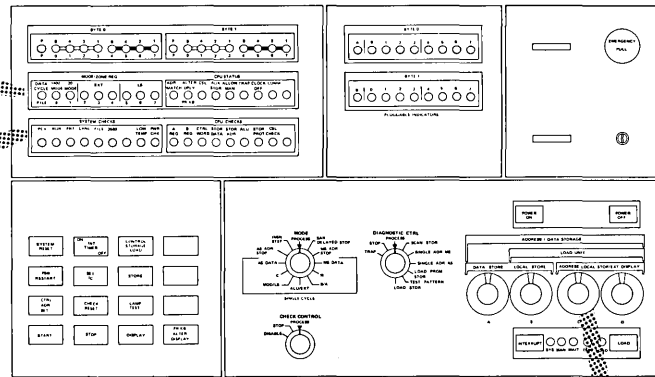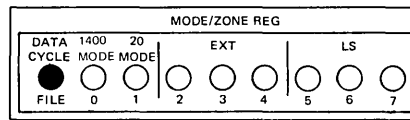
File

This light indicates that an error has been detected
during a high-speed channel operation.

Switch C

This switch is used for external and local storage display.

READER'S COMMENT FORM

IBM System/360 Model 25
2314 Functional Characteristics

GA24-3547-0

● How did you use this publication?

As a reference source ☐

As a classroom text ☐

As . . . . ☐

● Based on your own experience, rate this publication . . .

As a reference source:

. . . .	. . . .	. . . .	. . . .	. . . .
Very Good	Good	Fair	Poor	Very Poor

As a text:

. . . .	. . . .	. . . .	. . . .	. . . .
Very Good	Good	Fair	Poor	Very Poor

● What is your occupation? . . . .

● We would appreciate your other comments; please give specific page and line references where appropriate. If you wish a reply, be sure to include your name and address.

NAME . . . .

STREET . . . .

CITY . . . .

STATE . . . .

● Thank you for your cooperation. No postage necessary if mailed in U.S.A.

YOUR COMMENTS, PLEASE ....

This SRL is part of a library that serves as a reference source for systems analysts,
programmers, and operators of IBM systems. Your answers to the questions on the
back of this form, together with your comments will help us produce better pub-
lications for your use. Each reply will be carefully reviewed by the persons responsi-
ble for writing and publishing this material. All comments and suggestions become
the property of IBM.

Please note: Requests for copies of publications and for assistance in utilizing your
IBM system should be directed to your IBM representative or to the IBM branch
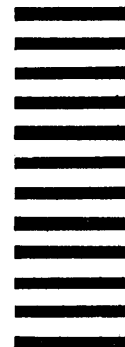office serving your locality.

Fold   Fold

- -

FIRST CLASS
PERMIT NO. 170
ENDICOTT, N. Y.

B U S I N E S S   R E P L Y   M A I L
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY . . .

IBM Corporation

P. O. Box 6

Endicott, N. Y.   13760

Attention: Product Publications, Dept. 171

- -

Fold   Fold

IBM

International Business Machines Corporation
Data Processing Division
112 East Post Road, White Plains, N.Y. 10601
[USA Only]

IBM World Trade Corporation
821 United Nations Plaza, New York, New York 10017
[International]

GA24-3547-0

IBM