Technical Newsletter

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IBM 5280
Distributed Data
System

IBM 5285 Programmable Data Station
Maintenance Information Manual

This technical newsletter provides replacement pages for the subject publication. Pages to be inserted and/or removed are:

v—viii	79 — 82	253, 254
37, 38	101, 102	257, 258
	175, 176	367, 368

Changes to the text and illustrations are indicated by a vertical line at the left of the change.

Summary of Amendments

- Addition of Buffer timer

Note: *Please file this cover letter at the back of the manual to provide a record of changes.*

IBM Corporation, Information Design and Development, Department 997, 11400 Burnet Rd., Austin, Texas 78758

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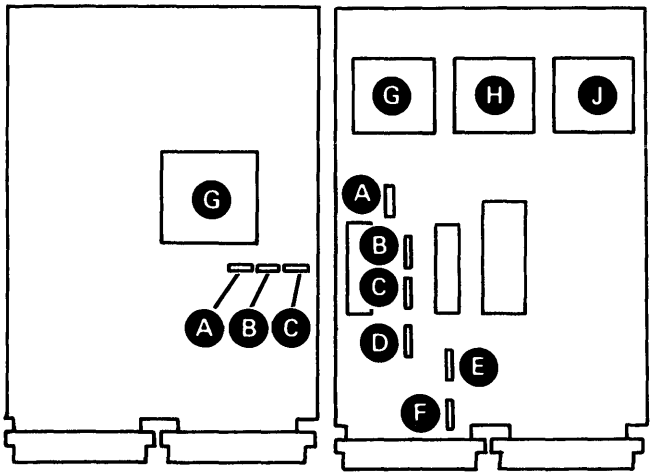
Contents

207 KEYBOARD/DISPLAY STORAGE CARDS (A-B7)

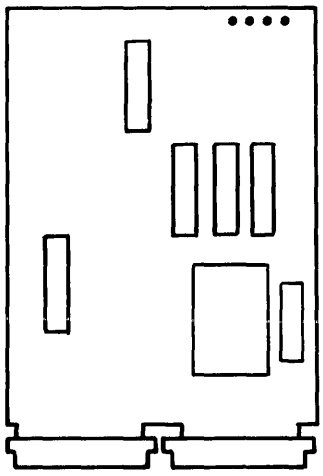
The IBM 5285 Programmable Data Station uses two types of keyboard/display storage cards: type B and type C. The following figure and Table shows the location of the jumpers and modules on the two cards, which card to use for each configuration, and the total storage available with each configuration.



Type B Type C

209 BUFFER TIMER CARD (A-B1)

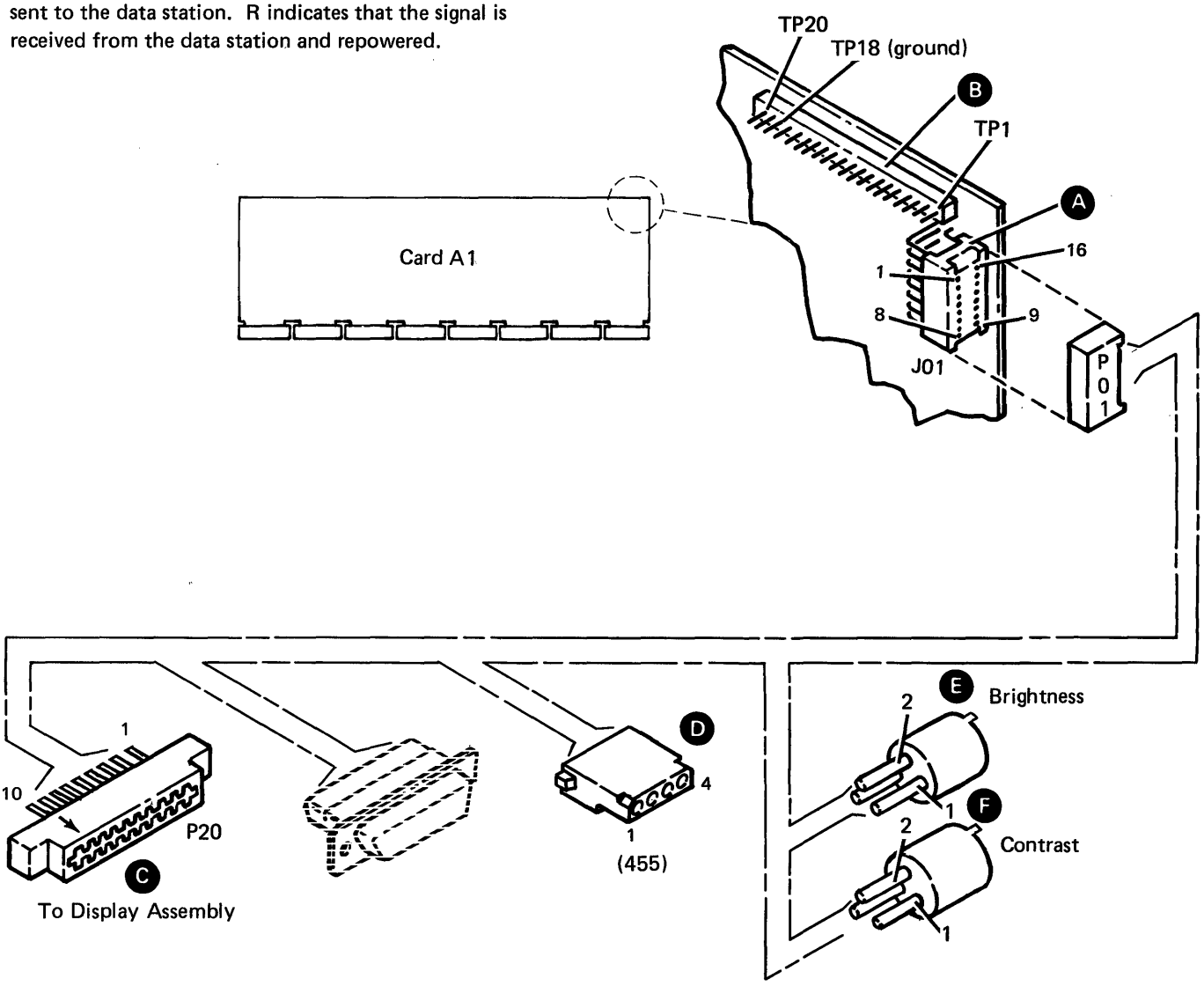
This diagram shows the location of the components on the buffer timer card.



Configuration		Keyboard/Display Storage Card				
Display Size	Auxiliary Data Station Attached	Type	Size	Modules Installed	Jumpers Installed	Total Keyboard/ Display Storage
6 lines 480 characters	None					2 K
	IBM 5281	C	2 K	G		4 K
	IBM 5282	C	3 K	G and H	D and E	5 K
12 lines 960 characters	None	B	1 K	G	A and B	3 K
	IBM 5281	C	3 K	G and H	D and E	5 K
	IBM 5282	C	4 K	G and H	B, C, and D	6 K
24 lines 1920 characters	None	B	2 K	G	C	4 K
	IBM 5281	C	5 K	G, H, and J	A, B, C, D, and F	7 K

217 DISPLAY CABLE DIAGRAM

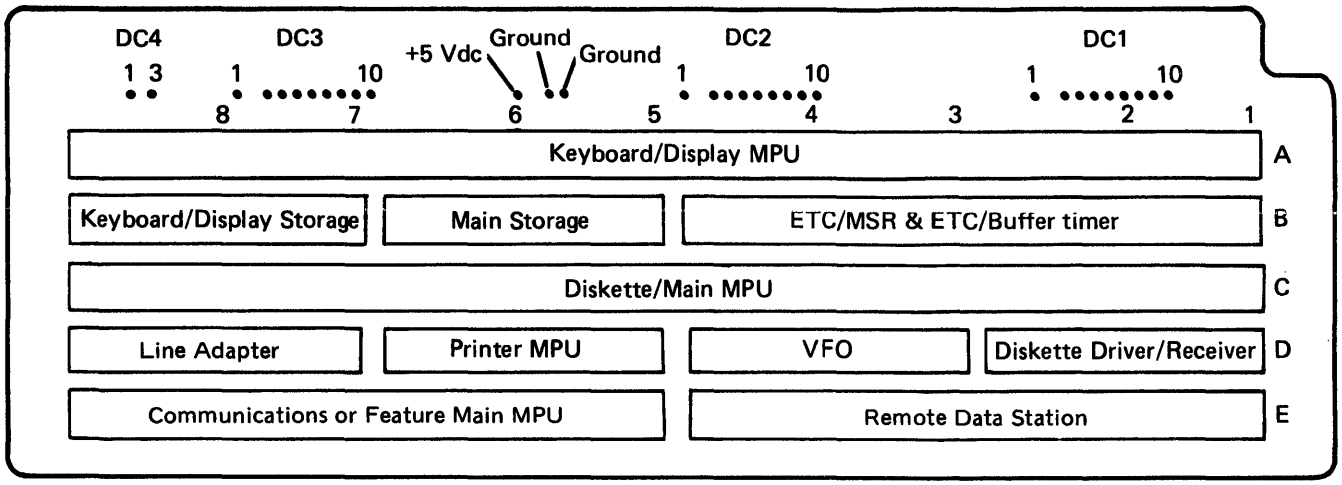
The following cable diagram and table shows the physical cable connections, each line name, and all of the associated connecting points. See 901 on how to use the cable diagram. The arrow (→) indicates the logical direction of the signal. D indicates that the signal is repowered and sent to the data station. R indicates that the signal is received from the data station and repowered.



Logic and Cards

501 CARD PLUG CHART

The card plug chart shows the card configurations for the IBM 5285 Programmable Data Station. To determine which card to use, see 503.



503 CARD OPTIONS

The card option table shows which cards to use for the different configurations available. See 501 for the card plug chart.

Card Location	Function	Size	Reference	Remarks
A1	Keyboard/display MPU	8-wide	200	Contains 2 K bytes of keyboard storage
B1	Elapsed-time counter	2-wide	771, 773	
B1	1-MSR and elapsed-time counter	2-wide	771	Communicating IBM 5285 only
B1	4-MSR and elapsed-time counter	4-wide	773	Non-communicating IBM 5285 only
B1	Buffer timer	2-wide	209	IBM 5285 w/o ETC
B5	Main storage	2-wide	403	Additional main storage
B7	Keyboard storage	2-wide	207	Additional keyboard storage
C1	Diskette/main MPU	8-wide	303	Contains 32 K bytes of main storage
D1	Diskette driver/receiver	2-wide	305	Non-communicating IBM 5285 only
D3	VFO	2-wide	501	
D5	Printer MPU	2-wide	731	
D7	EIA	2-wide	823	Communicating IBM 5285 only
D7	DDSA	2-wide	825	Communicating IBM 5285 only
D7	38LS World Trade switched	2-wide	821	Communicating IBM 5285 only
D7	38LS United States switched	2-wide	815	Communication IBM 5285 only
D7	38LS World Trade nonswitched	2-wide	819	Communicating IBM 5285 only
D7	38LS United States nonswitched, manual answer	2-wide	813	Communicating IBM 5285 only
D7	38LS United States nonswitched, SNBU, auto-answer	2-wide	817	Communicating IBM 5285 only
D7	38LS United States nonswitched, SNBU, manual answer	2-wide	813	Communicating IBM 5285 only
E1	Data station adapter	4-wide	201	Used when IBM 5281 is attached
E1	Dual data station adapter	4-wide	203	Used when IBM 5282 is attached
E5	BSC/SDLC communications attachment	4-wide	811	Communicating IBM 5285 only
E5	Feature Main MPU	4-wide	402	Non-communicating IBM 5285 only

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS

The following chart supplies the logic board part numbers and engineering change level and the logic card part numbers and engineering change levels for the IBM 5285 Programmable Data Station. If the part number of a card in the machine and the part number for that card in the chart do not agree, check the customer engineer memorandums (CEMs) to ensure that you have the correct card. If you do have the correct card, write the new part number and the new engineering change level for that card in the blank columns provided in the chart. The cards are listed with the oldest part number on the left and the newest part number on the right.

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

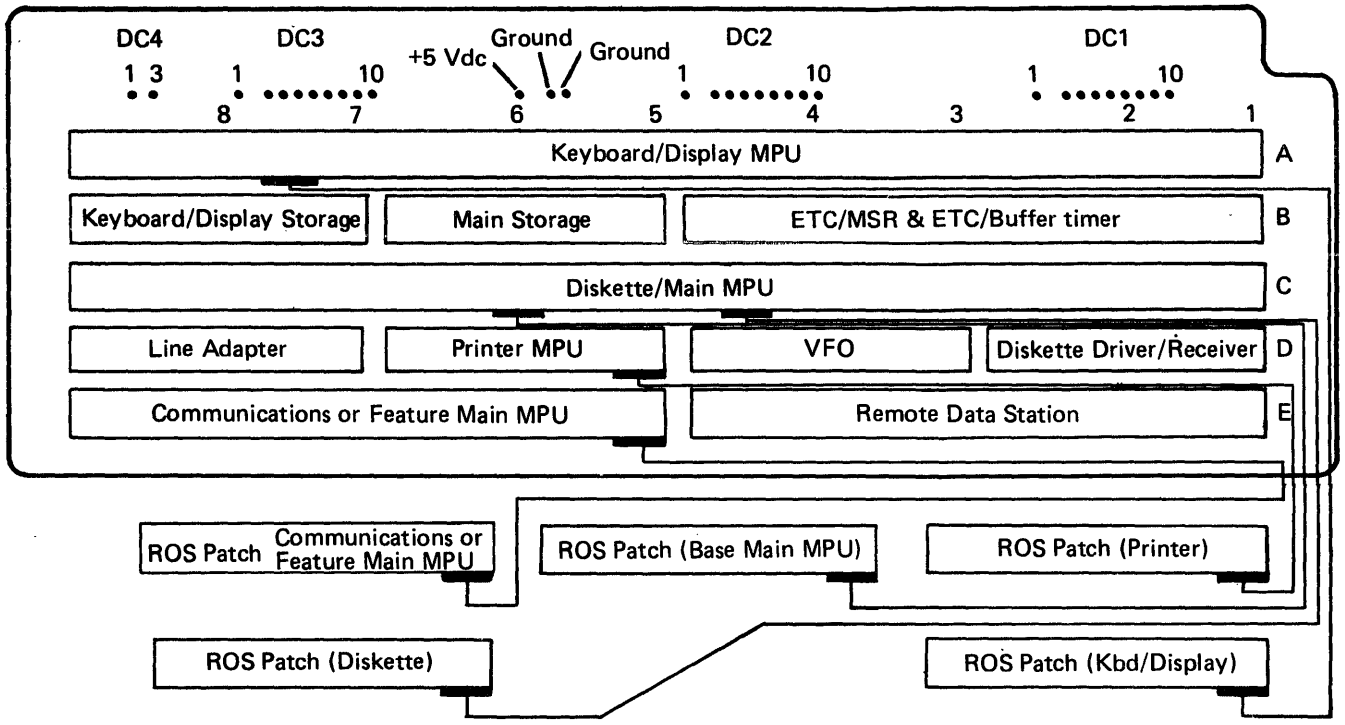
Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-Board		4177481 10-28946	4177481 838494	7364107 839753				
A-A1 8-Wide	Keyboard/ Display MPU	7364486 10-29792	6042977 10-29968	4177598 838447				
	ROS Patch for Keyboard/ Display MPU							
A-A1 8-Wide	Keyboard/ Display MPU Katakana*	6042978 10-29968	4177600 838449	7364426 10-29800				
	ROS Patch for Keyboard/ Display MPU Katakana*							
A-B1 2-Wide	Elapsed Time Counter*	1618152 837086						
A-B1 2-Wide	1MSR and Elapsed Time Counter*	7364620 840869						
A-B1 4-Wide	4MSR and Elapsed Time Counter*	4177924 10-28996	4177926 839709					
A-B1 2-wide	Buffer Timer	6043571 868440						
A-B5 2-Wide	16K Additional Main Storage*	4177563 10-28936	4177564 838415	1618110 839732				
A-B5 2-Wide	32K Additional Main Storage*	4177561 10-28936	4177562 838399	1618108 839730				

*Feature

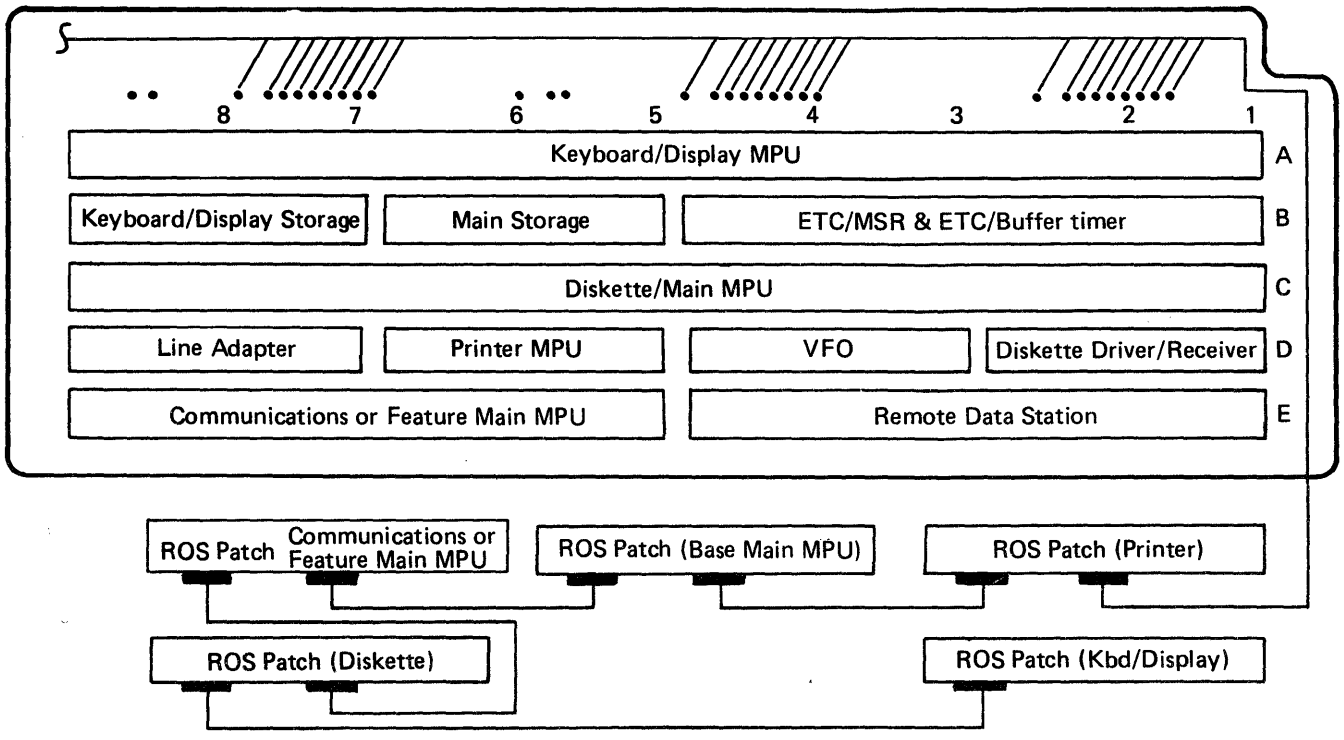
561 ROS PATCH CARD LOCATIONS AND CABLES

The following figure shows where the different ROS patch cards plug in on the logic board.

Signal Cable Connections



Power Cable Connections



563 ROS PATCH CARD REMOVAL AND REPLACEMENT

Removal

1. Power off.
2. Remove the data station covers (031).
3. Remove the logic card cover (513).
4. Disconnect the signal cable 1 from the ROS patch card.
5. Remove the retainer clip 4 and remove the power cable from J02 3.
6. If a power cable is present at J03 5, remove the retainer clip 6 and remove the cable.
7. Remove the ROS patch card.

CAUTION
The logic cards will overheat if patch cards (either ROS patch or dummy patch) are not installed.

9. If you are not going to install a ROS patch card in the same position as the one you just removed, install a dummy patch card in that position.

Replacement

For replacement of the ROS patch card, observe the following and reverse the steps in the removal procedure.

1. Align the corner cut on the signal cable connector 2 with the corner cut of the connector on the ROS patch card.
2. Route the cables correctly (561).

931 POWER-ON CHECKOUT AND IPL (continued)

Condition Code In Hex	Description
00	The keyboard/display attachment has no data station attached. The printer, communications, or diskette feature is not installed or the respective display checkout has been started.
04	The printer, communications, or diskette MPU check is complete.
08	Main storage check complete: the printer, communications, or diskette MPU completed a write and read at the main storage address assigned to the attachment by the main MPU in microcode.
0C	256-byte read/write main storage check complete: printer, communications, or diskette MPU completed a write and read of the first 256 bytes of main storage assigned to the attachment by the main MPU microcode.
10	The printer, communications, or diskette attachment check is complete. The diskette drive is attached to the diskette attachment but another diskette drive is doing an IPL.
14	VFO error.
18	The keyboard/display attachment has a data station attached. Index pulses are too slow from the diskette drive attached to the diskette attachment. **Note:** A diskette drive locking lever in the open position can also cause this condition.
1A	The keyboard/display attachment has a dual data station attached.
1C	The keyboard/display attachment has a data station attached and ready, but the timer is not working. Index pulses are too fast from the diskette drive attached to the diskette attachment.
1E	The keyboard/display attachment has a dual data station attached and ready, but the timer is not working.
20	Erase mismatch: the diskette attachment write or erase gate was active during a read operation, or write/erase sense was active during a read operation.
21	Storage overrun: the diskette MPU was unable to obtain the required storage cycles to transfer the data.
23	The diskette drive attached to the diskette attachment deactivated the ready status during a read operation.
24	No address mark detected: the diskette attachment detected no address mark on the diskette being read by this diskette drive.
26	CRC error: the diskette attachment detected a cyclic redundancy check (CRC) error on the diskette operation being performed.
27	Not used.
29	Media error: the diskette attachment cannot process the data from this diskette (damaged diskette or invalid type data [969]).

931 POWER-ON CHECKOUT AND IPL (continued)

Condition Code In Hex	Description
2A	Control address mark detected: the diskette attachment detected a control address mark on the diskette operation being performed when no control address mark was expected.
2C	ID mismatch: the diskette attachment found an ID on the diskette that did not match the ID that it was instructed to find.
	The keyboard/display attachment has a data station attached and ready and the timer is working.
2D	Sense 2 invalid: during a diskette read or write operation the bits set in the sense register 2 are invalid.
2E	Volume label error: the volume label format is not correct.
	The keyboard/display attachment has a dual data station attached and ready and the timer is working.
30	Non-IPL diskette: the diskette in this drive is not an IPL diskette.
32	Diskette type error: the diskette type (type 1 or 2D) on the volume label does not match the diskette being used.
34	Label error: the header label format is not correct.
38	IPL limits wrong: the IPL data set size is greater than the system main storage size.
3C	Not used.
FF	All diskette attachment checks are complete.

KEYBOARD/DISPLAY MPU

The keyboard/display MPU services each of the attached devices sequentially. For example, when a key is pressed on a keyboard, the MPU determines on which keyboard the key was pressed, analyzes the keystroke data, and processes the data. The MPU uses data in keyboard/display storage and main storage to process the data as specified by the application program. The following are some of the functions performed by the keyboard/display MPU:

- Translate keyboard scan code data to EBCDIC data.
- Access the appropriate main storage partition to process keyboard/display data.
- Translate keyboard or main storage data to display code and store the code in the appropriate area of keyboard/display storage.
- Activate the speaker on the keyboard when instructed by the application program.
- Move data, such as prompts, to the appropriate display buffer in keyboard/display storage.

Read only storage (ROS) in the MPU contains micro-instructions that are executed by the keyboard/display microprocessor to control the attached devices.

Keyboard/display storage is read/write storage that is used to store translate tables, display buffers, and control information for the keyboard and displays. This storage is described later in this section.

KEYBOARD ADAPTER

The keyboard adapter connects the keyboard to the keyboard/display MPU. The adapter contains two or three keystroke buffers to store data from the keyboard. The adapter for keyboard 0 has two buffers and can store two bytes of data. The adapters for keyboards 1 through 3 have three buffers and can store three bytes of data. The adapter also deserializes the data from the keyboard and signals the MPU when data is available.

The keyboard adapter interfaces with the keyboard/display MPU through I/O registers in the MPU. If a key is pressed while the keystroke buffers are full and the main MPU is not performing a keyboard service, the scan code for that key is stored in a buffer in main storage.

DISPLAY ADAPTER

The display adapter handles the physical functions of the display. The adapter performs the following functions:

- Transfers data from keyboard/display storage to the display screen
- Controls the timing of the horizontal and vertical movements of the electron beam on the display screen
- Provides video control for the characters displayed on the screen
- Controls the video for field attributes for data on the screen

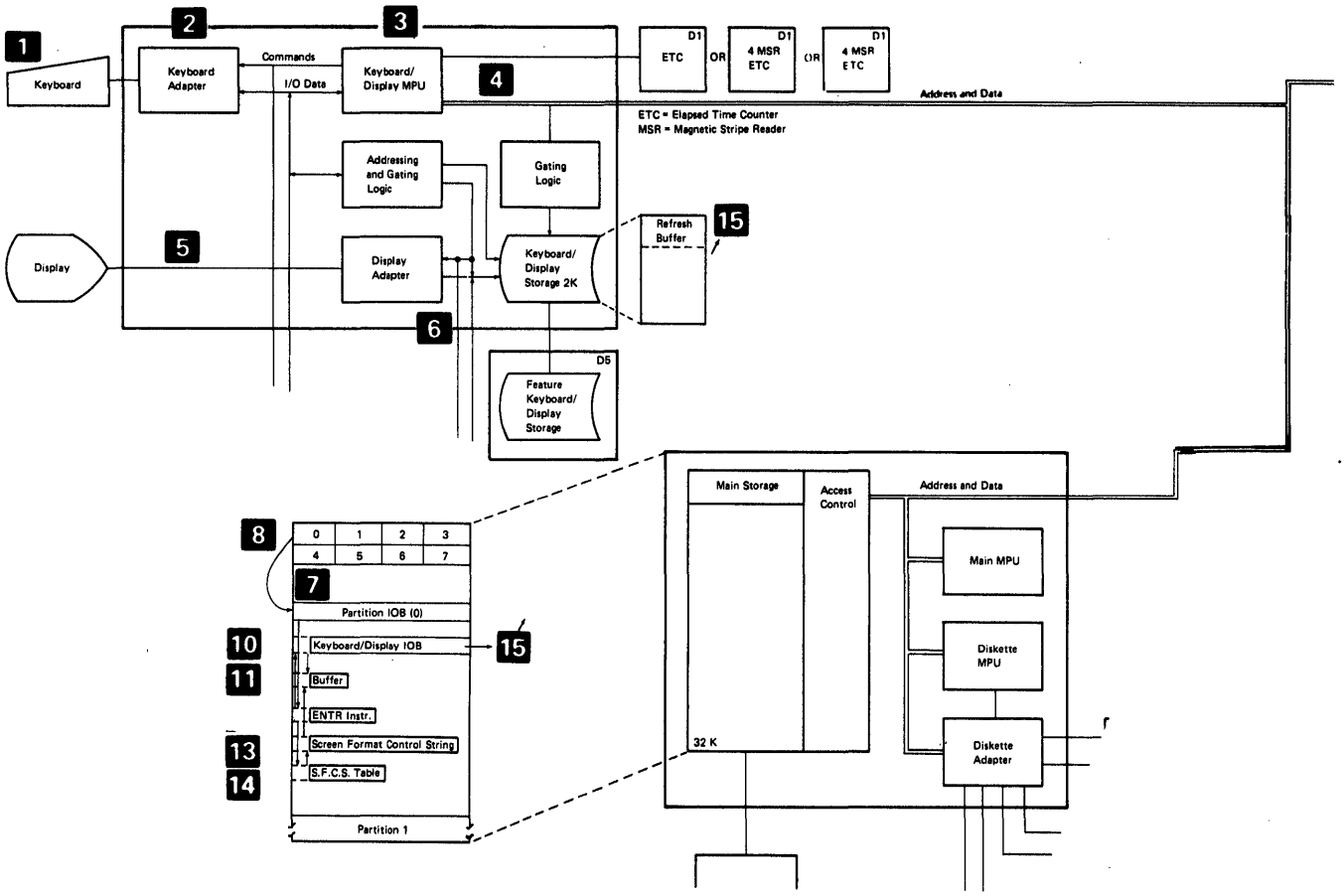
KEYBOARD/DISPLAY MPU I/O REGISTERS

There are four 1-byte I/O registers in the keyboard/display MPU. The registers and their functions are described as follows:

- A sense register (IOS) that the MPU polls to determine which keyboard activated service request. The IOS register is also used to receive the attention signal from the main MPU.
- A command register (EAR) that the MPU uses to send commands to the device adapters.
- A data register (IOD) that the MPU uses to send data to and receive data from the attached devices.
- A data buffer register (IODB) that the MPU uses to store the number of keyboards attached and to send the attention signal to the main MPU.

KEYBOARD/DISPLAY DATA FLOW

The following example shows how the keyboard/display attachment, main MPU, and a program in main storage read data from the keyboard, store it in the I/O buffer in main storage, and display it on the screen. Refer to the following diagram while you read the example:



1. When the main MPU executes a keyboard I/O instruction, it sets up the keyboard/display IOB **10** in the partition, and signals the keyboard/display MPU **3** (by the attention line) that it has work to do. The main MPU then flags the partition pointer **8** to indicate that a keyboard operation is pending for this partition.

2. The keyboard/display MPU checks the partition pointer to determine which partition has the keyboard operation pending. When it finds the partition, it resets the flag in the partition pointer and checks the keyboard/display IOB to determine the work required. If the operation does not require operator input (for example moving data from main storage to keyboard/display storage), the keyboard/display MPU performs the operation, signals the main MPU that the operation is complete, and checks other partitions for work.

3. If the operation requested requires operator input, the keyboard/display MPU sets bits in the partition pointer and keyboard/display IOB to indicate that there is a pending command requiring operator input. The keyboard display MPU then continues checking other partitions for work.

4. When the operator presses a key **1**, the scan code for the key is stored in the buffer in the keyboard adapter **2** (see *Keyboard* in this section for keyboard to buffer data flow).

Accessing Keyboard/Display Storage

The following example shows how a display adapter accesses keyboard/display storage to read data from the display buffer. For this example, assume a dual data station is attached to the IBM 5285. Therefore, a dual data station adapter card is installed in location E1 (Refer to logic diagram *LD00).* Refer to diagram *LD05-2* while reading the following description.

1. The raster timing and storage interface logic on the E1 card *(LD05-2)* requests a storage cycle by activating the '-bit req 3 I/O' line (see the chart on *LD05-2).*

2. Keyboard/display storage control (KB/disp on *LD05-1)* selects display adapter 1 by activating the '+sel dev 3 I/O' line.

3. The raster timing and storage interface logic *LD05-2* responds by activating the '-storage req (I/O)' line. The storage interface logic then puts the selected keyboard/display storage address on the storage address bus ('-I/O SAR bit 0 dot' through '-I/O SAR bit 15 dot' lines).

4. The '-storage req (I/O)' line initiates a storage cycle. During the cycle, the addressed data is put on the storage data bus (-I/O stg data bit P dot' through '-I/O stg data bit 7 dot' lines). At the end of the storage cycle, KB/disp storage control activates the '-T comp I/O' line. This signals the storage interface logic that the data is on the bus and ready to read.

5. The storage interface logic reads the data and deactivates the '-storage req I/O' line.

6. The KB/disp storage control deactivates the '-T comp I/O' line, which deactivates the '-dev sel 3 I/O' line. The storage cycle is complete and the KB/disp storage control can respond to another request.

KEYBOARD

The keyboard has three major parts: key modules, the pad printed circuit board, and the logic printed circuit board. Key modules contain the switches that are pressed by the operator. The pad printed circuit board below the key senses a pressed key by capacitive coupling. The logic printed circuit board, attached to the pad printed circuit board, contains a scan counter. The scan counter tests each position on the pad printed circuit board one position at a time. When a change of capacitance is detected, a scan code is generated for the key pressed. The scan code is sent serially to the data select logic in the keyboard adapter on the '+ serial data A' line. The keyboard also generates a clock signal and a strobe signal and sends them to the adapter on the '+ ser data clk A' and '+ strobe A' lines to synchronize the transfer of data from keyboard A.

The adapter then signals the keyboard/display MPU by activating a service request line. The service request line indicates to the keyboard/display MPU that a keyboard has data to be transferred. During the time the keyboard/display MPU is responding to the service request, the adapter is transferring the data to the serial to parallel register. The data is deserialized in this register then read by the MPU and processed as specified by the application program (see *Keyboard Data Flow* in this section).

The first keyboard adapter (adapter 0) contains two buffers. All other adapters contain three buffers. If a keystroke occurs and all buffers are full, the data in the first buffer is set to all 1's. This indicates to the keyboard/display MPU that a keystroke has been lost and the keyboard/display MPU detects an overrun condition. An overrun can occur from extra clock pulses or noise on the clock line. The MPU also detects an overrun condition if it receives a scan code with bits one through seven on. This can occur if the serial data line remains active during a serial keyboard data transfer.

MAGNETIC STRIPE READER

The magnetic stripe reader (MSR) allows rapid entry of data constants read from credit-card-like media. A maximum of four MSRs can be connected to a keyboard/display attachment. The reader contains a read head, amplifiers, and a card sensing photocell. The magnetic card contains data and control characters, which are read by the reader as follows:

- Start of message (SOM) character
- Users data
- End of message (EOM) character
- Longitudinal redundancy check (LRC) character

This information is coded using four bits to define a character and one bit to provide odd parity.

When a card is inserted into the magnetic stripe reader, the data is amplified, sent to the adapter, and stored in the adapter buffer. When the data is in the buffer, the adapter issues a service request to the keyboard/display MPU and waits for the MPU to service the request.

When the MPU detects that an MSR is waiting for service, the MPU determines which MSR is requesting service and reads a byte of data from the adapter buffer. After the MPU has processed the data, it reads another byte of data, and so on, until all the data has been read. When the final byte of data has been read, the adapter is reset to allow the reader to accept another card.

Refer to logic diagram *LD09*. *LD09* shows the logic for the MSR adapter. The keyboard/display MPU controls the adapter by sending commands on the '-EAR bit 0 dot' through '-EAR bit 7 dot' lines. The MPU reads data from the MSR on the '-IOD in bit 0 dot' through '-IOD in bit 7 dot' lines.

ELAPSED TIME COUNTER

The elapsed time counter is used to determine elapsed real time. The counter is attached to the keyboard/display MPU through an MPU I/O register.

The MPU reads the time and places it in the system control area in main storage. The counter is increased in increments of 1.6 seconds. An application program reads the time and calculates elapsed time.

Refer to diagram *LD09*. *LD09* shows the logic for the elapsed time counter. The keyboard/display MPU controls the counter by sending commands on the '-EAR bit 0 dot' through '-EAR bit 7 dot' lines. The MPU reads the counter data on the 'IOD in bit 4 dot' through '-IOD in bit 7 dot' lines.

BUFFER TIMER

The buffer timer provides a timeout to the keyboard/display MPU. If the main MPU has not serviced the keyboard before the timeout occurs, the keyboard/display MPU reads the buffer for a command key sequence. If a command key sequence has occurred, the keyboard/display MPU moves the scan code for the key to the keyboard/display IOB and signals the main MPU. If a command key sequence has not occurred, a keyboard overrun condition occurs.

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Technical Newsletter

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Previous Newsletters SN20-9543
SN20-9580

IBM 5280
Distributed Data System
IBM 5285 Programmable Data System
Maintenance Information Manual

This technical newsletter provides replacement pages for the subject publication. Pages to be inserted and/or removed are:

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1, 2	79—86	176.1, 176.2	235, 236
5, 6	86.1, 86.2 (added)	177, 178	239—244
11, 12	93, 94	178.1, 178.2 (added)	267—274
21, 22	101—106	189—192	274.1—274.10 (added)
43, 44	115—118	201, 202	275, 276
53, 54	118.1, 118.2 (added)	202.1, 202.2 (added)	358.1, 358.2 (added)
			367—374

Changes to the text and illustrations are indicated by a vertical line at the left of the change.

Summary of Amendments

- Add 3270 emulation feature
- Add start-stop printer attachment
- Add IBM 5224 printer and IBM 5222 printer
- Add 64K main storage card

Note: *Please file this cover letter at the back of the manual to provide a record of changes.*

IBM Corporation, Information Design and Development, Department 997, 11400 Burnet Rd., Austin, Texas 78758

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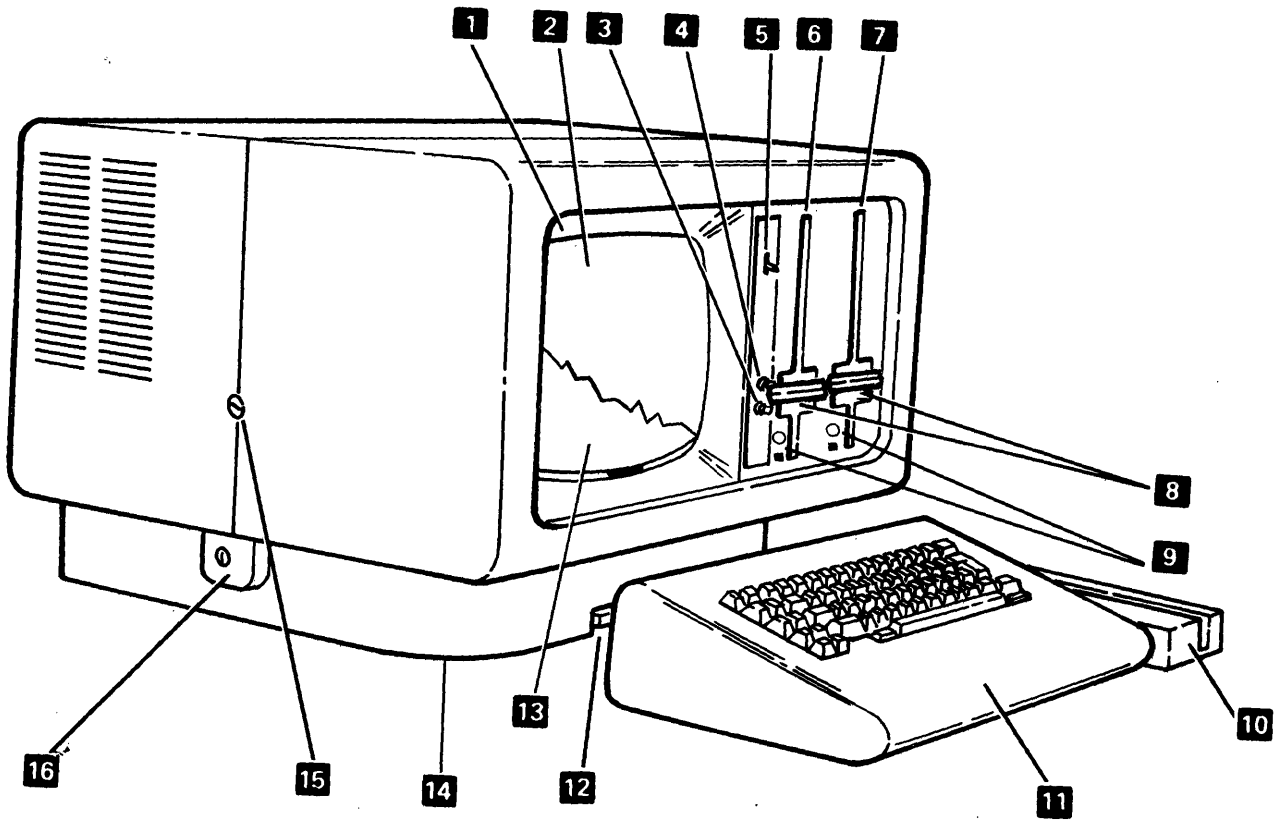
Base Machine Locations

001 FRONT VIEW

1. Bezel
2. Display screen
3. Contrast control
4. Brightness control
5. Power switch
6. Diskette drive A
7. Diskette drive B
8. Diskette locking levers (shown in the closed position)
9. Drive-in-use indicators
10. Magnetic stripe reader
11. Keyboard
12. Keyboard cable connector J101
13. Glare shield
14. Stamped serial number (located underneath)
15. Cover screws (one on each side)
16. Keylock

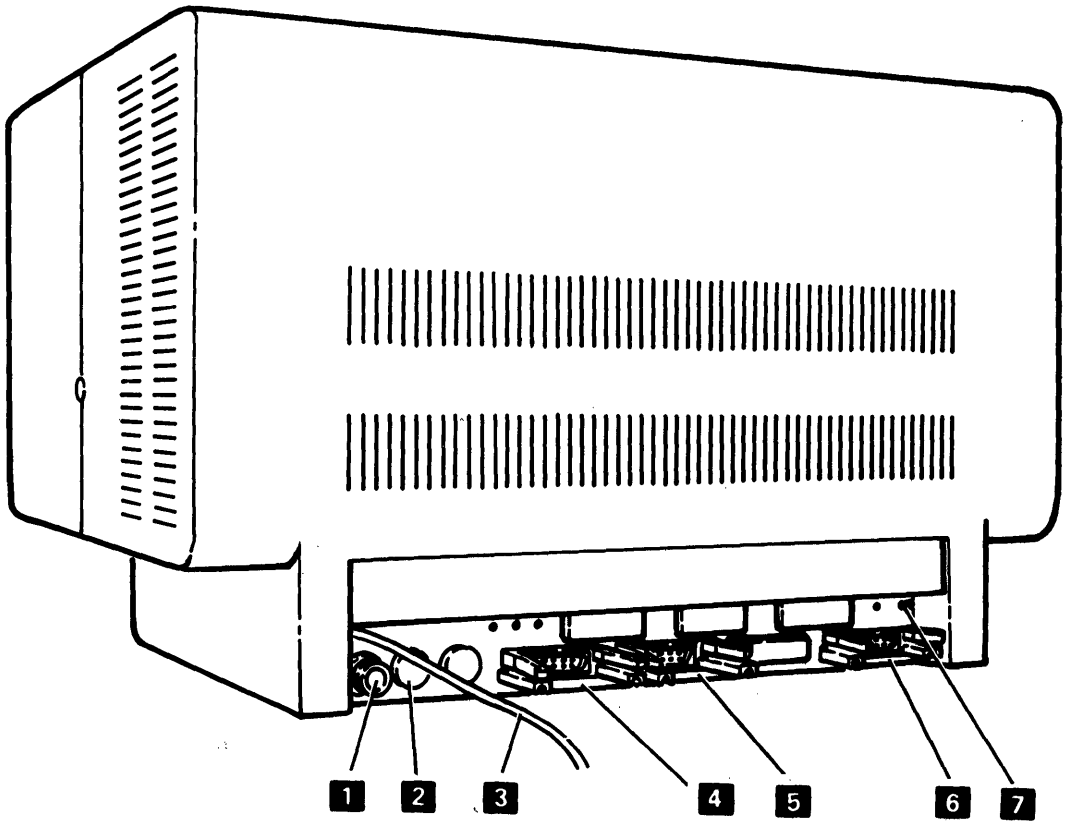


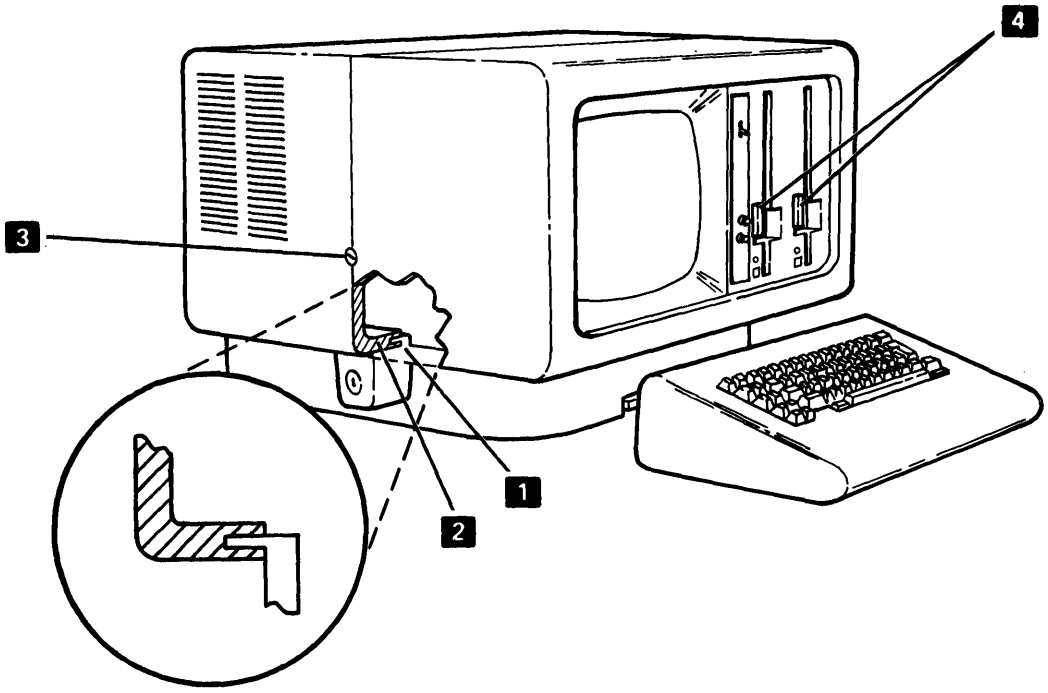
001

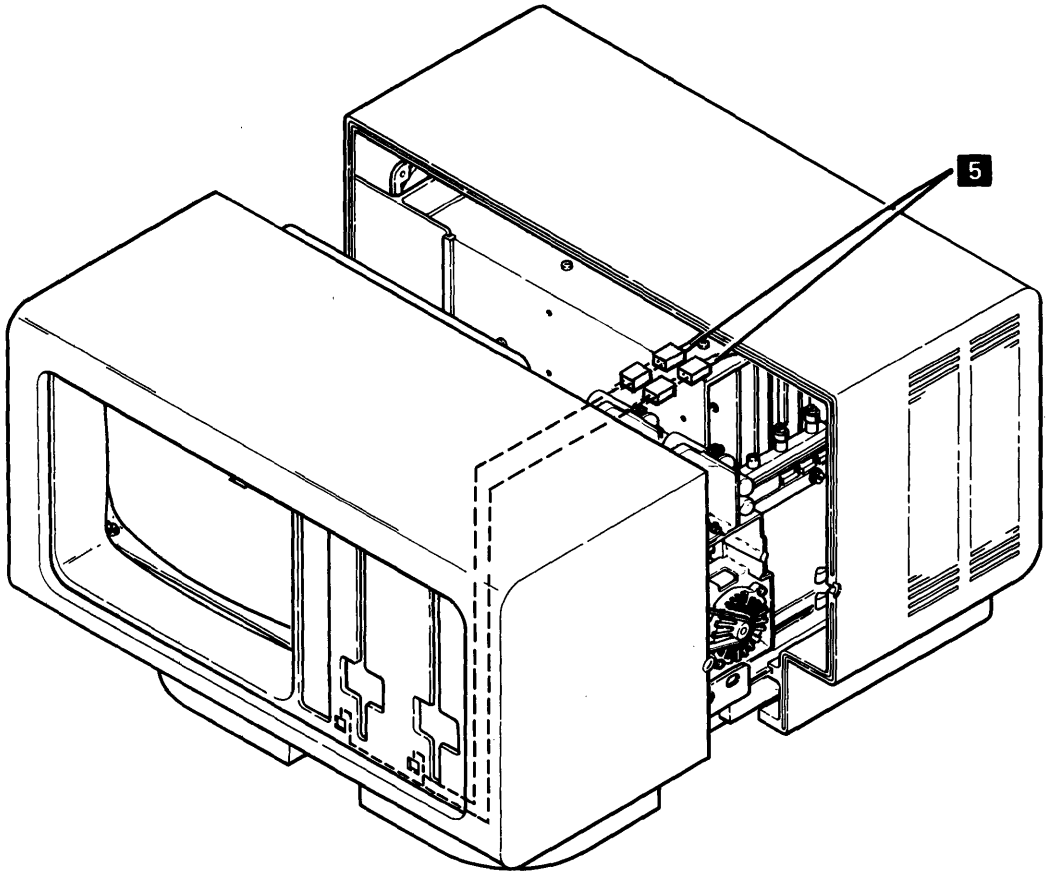
011 REAR VIEW

With Covers

1. Printer twinaxial cable connector J130
2. Printer start-stop cable connector J131
3. Power cord
4. Remote keyboard/display connector J103
5. Remote diskette drive connector J111
6. Communications support connector J140
7. Magnetic stripe reader cable access hole




4
3
1
2


5

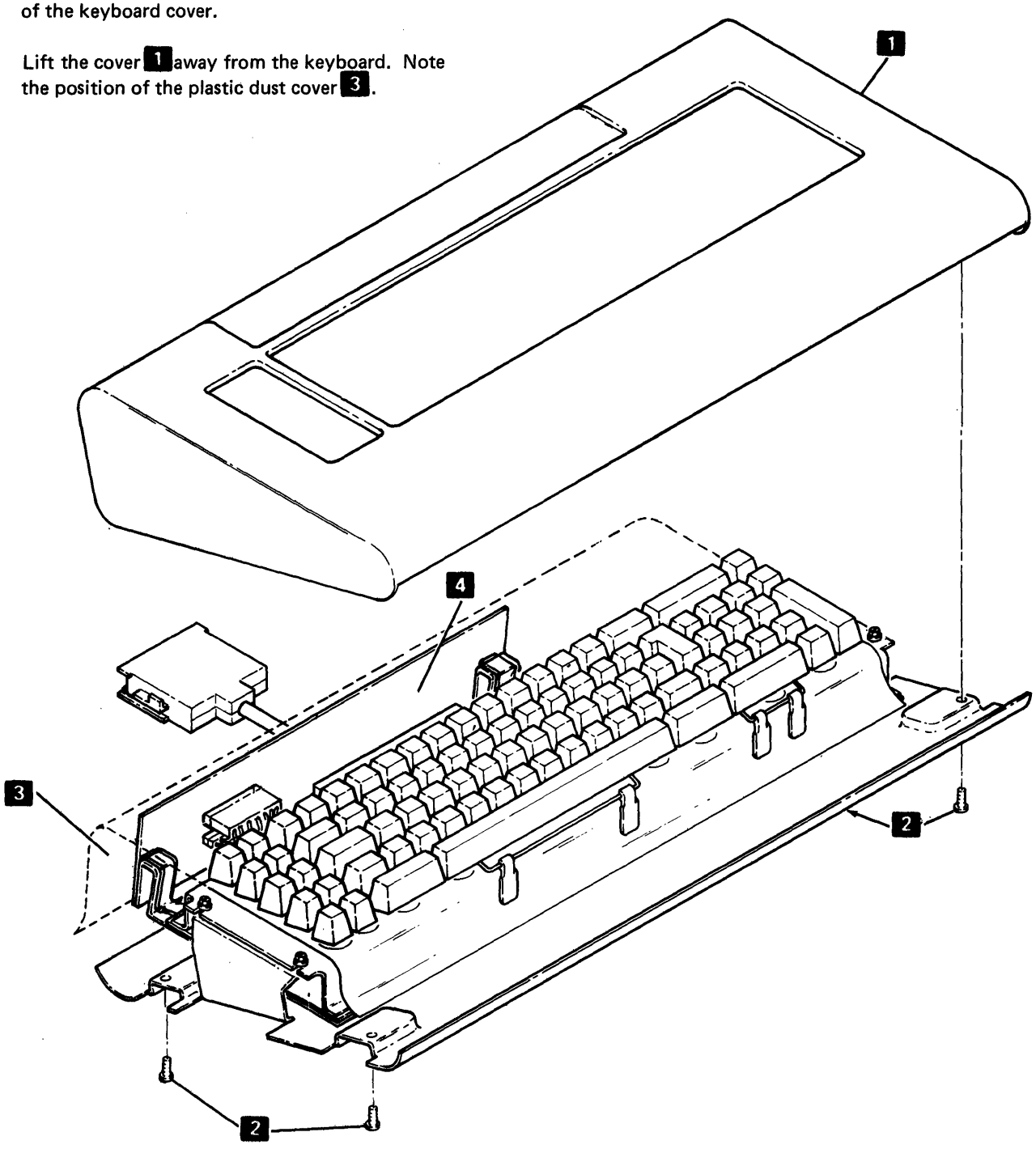
Keyboard

Removal

1. Power off.
2. Loosen the four corner screws 2 on the bottom of the keyboard cover.
3. Lift the cover 1 away from the keyboard. Note the position of the plastic dust cover 3.

Replacement

For replacement of the keyboard cover, reverse the steps of the removal procedure. Ensure that the keys do not rub against the cover and that the dust cover is placed over the logic card 4.



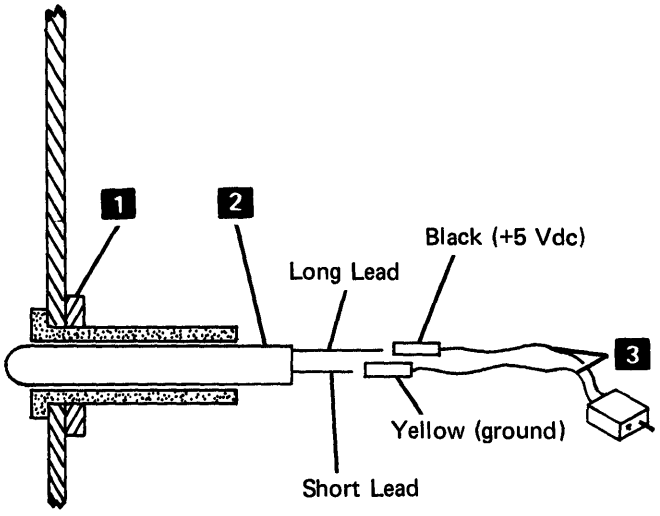
079 DRIVE-IN-USE INDICATOR REMOVAL AND REPLACEMENT

Removal

1. Power off.
2. Remove the data station covers (031).
3. Disconnect the drive-in-use indicator cable 3 from the drive-in-use indicator 2 .
4. Remove the retaining collar 1 .
5. Push on the drive-in-use indicator from the outside of the cover and remove the drive-in-use indicator through the inside of the cover.

Replacement

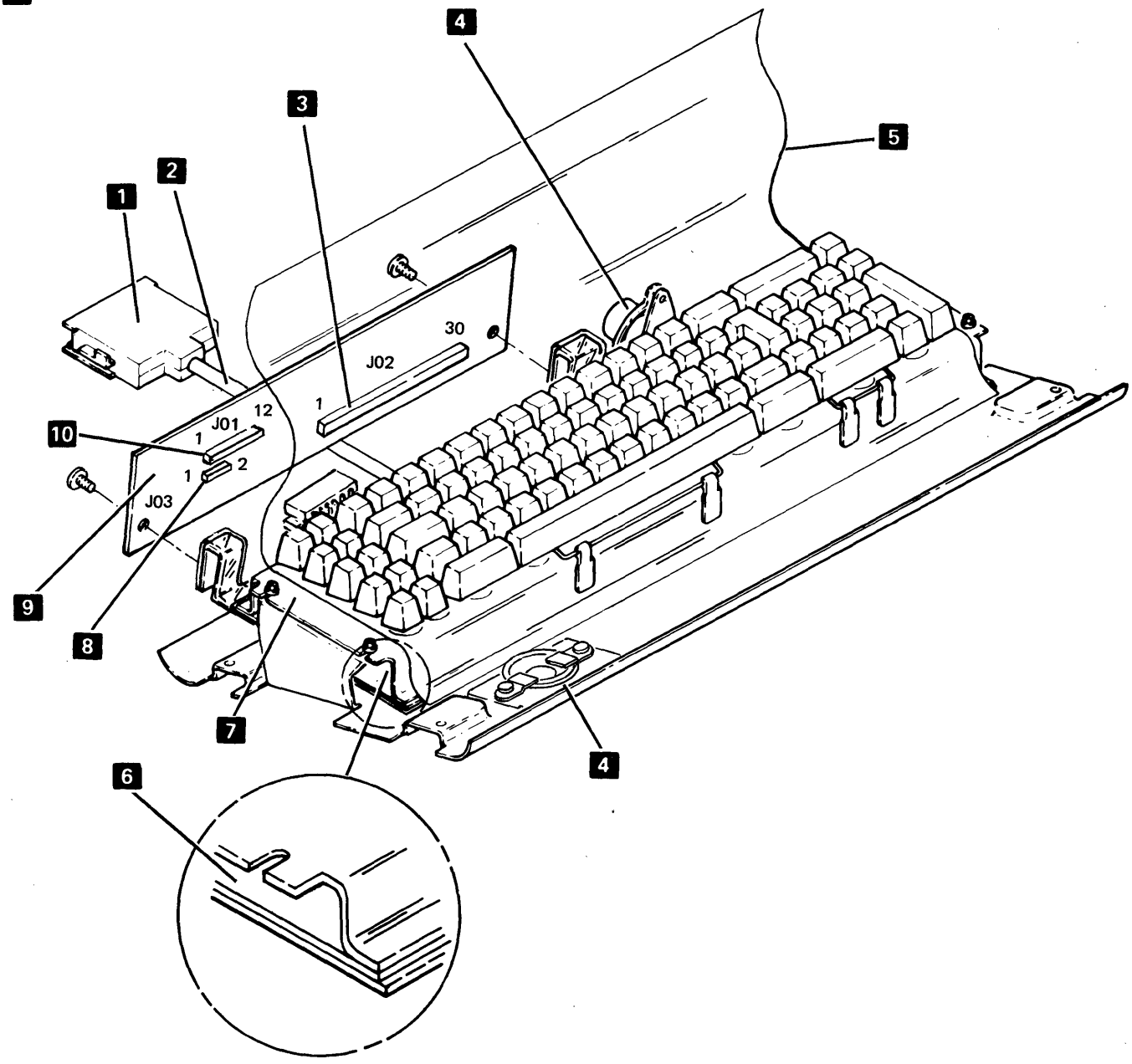
For replacement of the drive-in-use indicator, reverse the steps in the removal procedure.



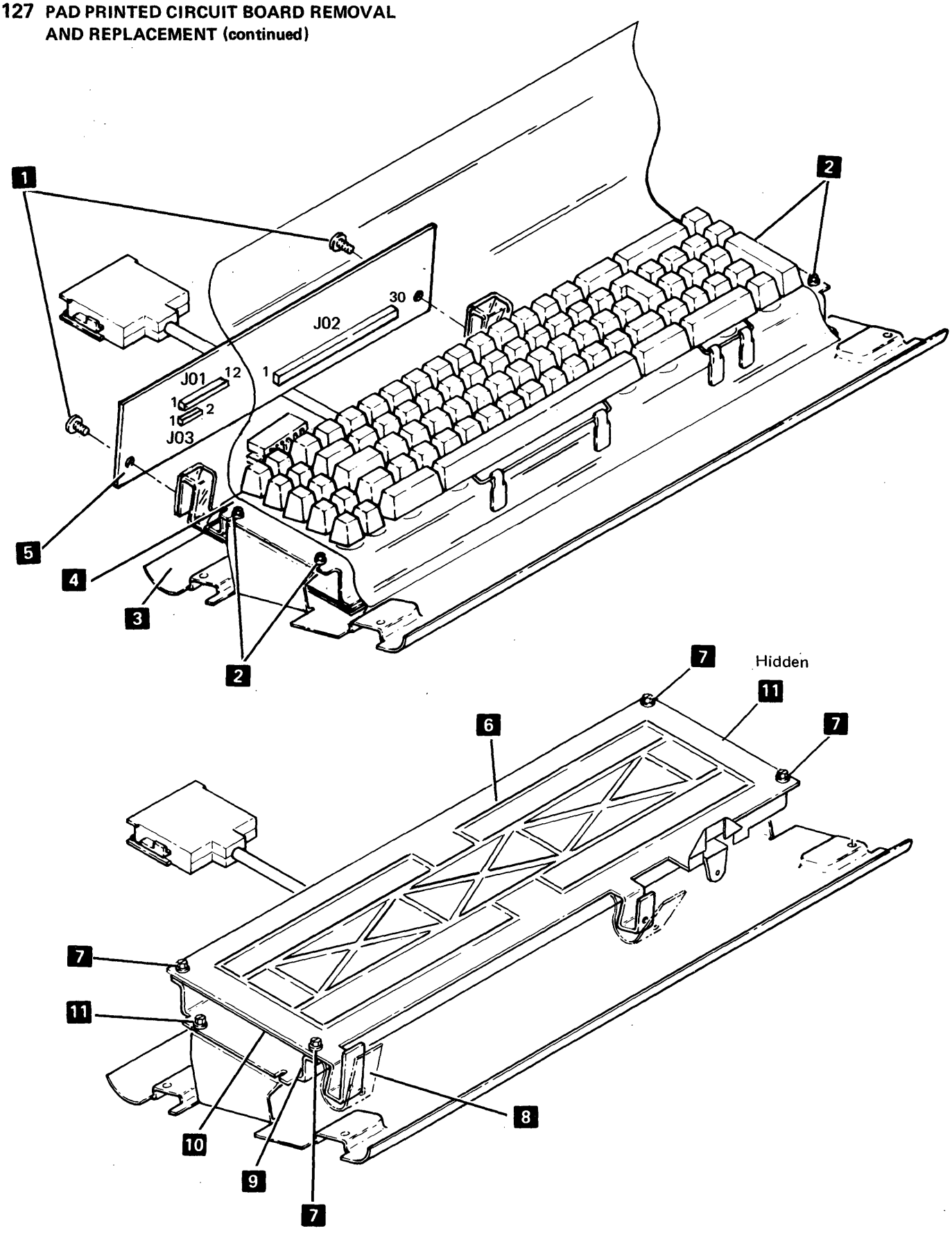
Keyboard

101 LOCATIONS

1. Connector P101
2. Keyboard signal cable
3. Connector J02
4. Speaker (might be in either location)
5. Dust cover
6. Pad printed circuit board
7. Key unit
8. Connector J03
9. Keyboard logic card
10. Connector J01



127 PAD PRINTED CIRCUIT BOARD REMOVAL AND REPLACEMENT (continued)



Display Assembly

141 LOCATIONS

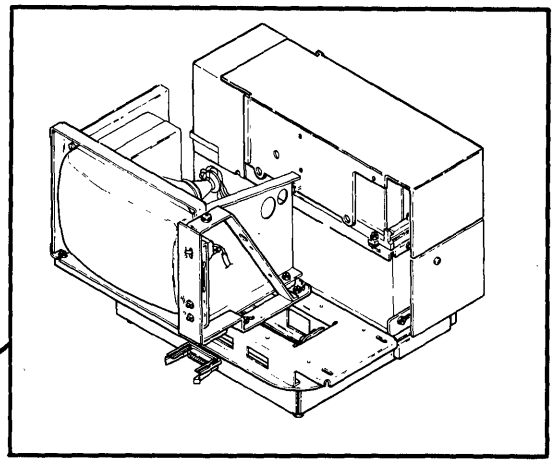
DANGER
The display assembly contains high voltages. For all internal adjustments, use only the fiber screwdriver.

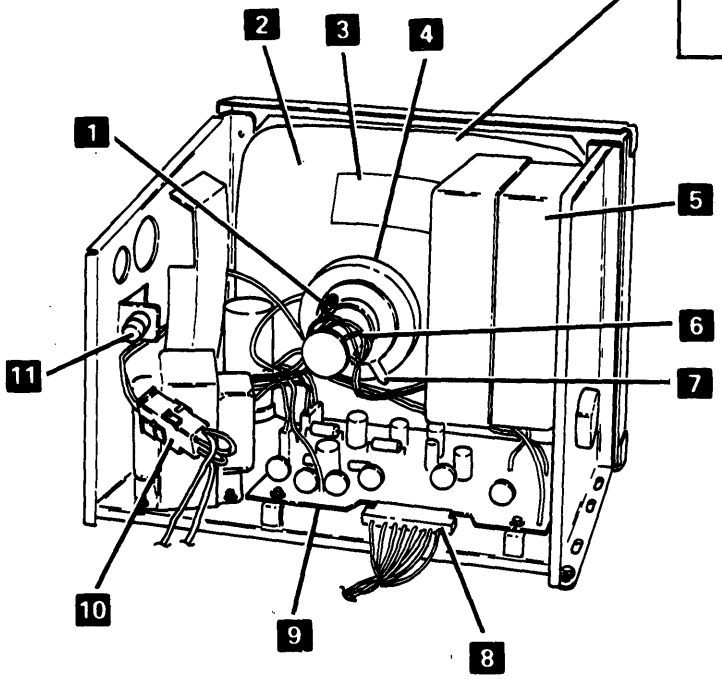
DANGER
The green wire in the display assembly is not at ground voltage.

The display assembly installed in your machine might not be the same as the one shown. Several manufacturers supply display assemblies. Although the display assemblies might look different, they are similar and accept the same signals and generate the same display images.

See the service information label on the cathode-ray tube to locate the adjustments on the printed circuit board.

1. Yoke clamp screw
2. Cathode-ray tube
3. Display assembly service information label
4. Yoke
5. High voltage transformer shield
6. Filament
7. Centering rings
8. Display signal connector P20
9. Printed circuit board
10. Display AC power connector J5/P5 (451 and 457)
11. Display fuse (If the fuse is not in this location, see the display assembly service information label for the correct location)



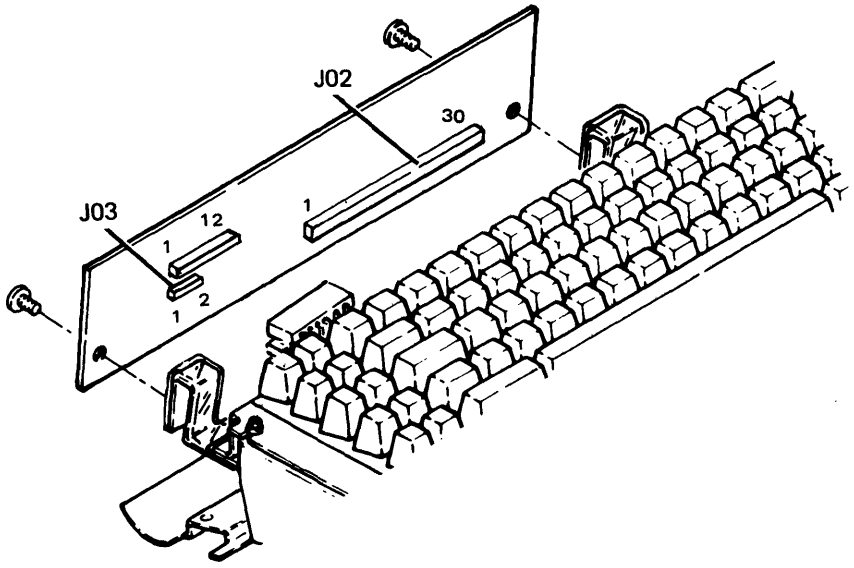


220 KEYBOARD LOGIC CARD
J02 AND J03 CONNECTOR

The J02 connector carries the signals from the keyboard pad printed circuit board to the keyboard logic card. The J03 connector carries the signal and drive voltage to the speaker.

J02 Signal Lines

1	ground
2	+drive 22
3	+drive 21
4	+drive 20
5	+drive 19
6	+drive 18
7	+drive 17
8	+drive 16
9	+drive 15
10	+drive 14
11	+drive 13
12	+drive 12
13	+drive 11
14	+drive 10
15	+drive 09
16	unused
17	+drive 08
18	+drive 07
19	+drive 06
20	+drive 05
21	+drive 04
22	+drive 03
23	+drive 02
24	+drive 01
25	+drive 00
26	matrix shield ground
27	-sense A
28	-sense B
29	-sense C
30	-sense D

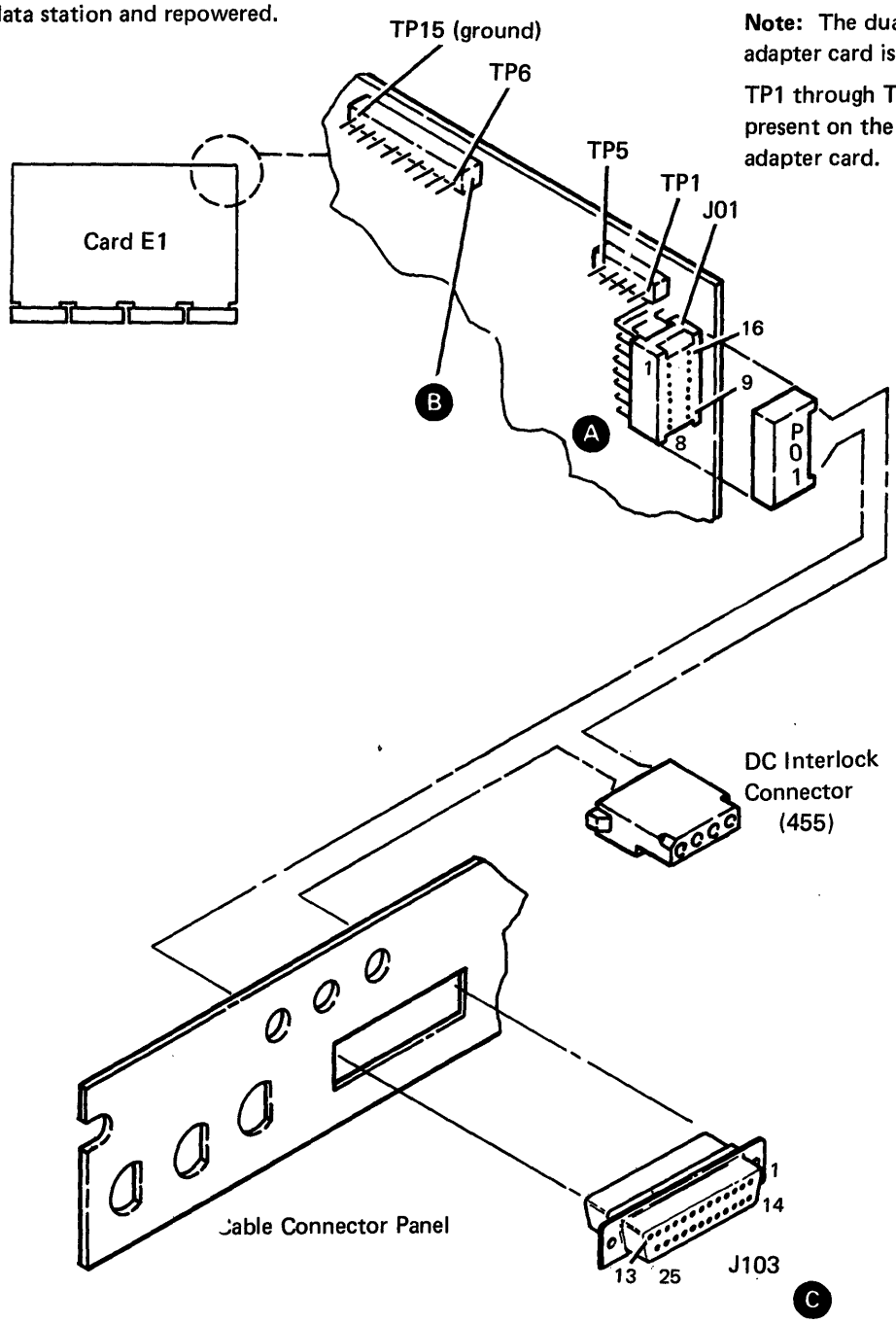


J03 Signal Lines

1	-click
2	+5 volt

227 IBM 5285 TO IBM 5281 OR IBM 5282 CABLE DIAGRAM

The following cable diagram and table shows the physical cable connections, each line name, and all associated connecting points. See 901 on how to use the cable diagram. The (→) indicates the logical direction of the signal. D indicates that the signal is repowered and sent to the data station. R indicates that the signal is received from the data station and repowered.

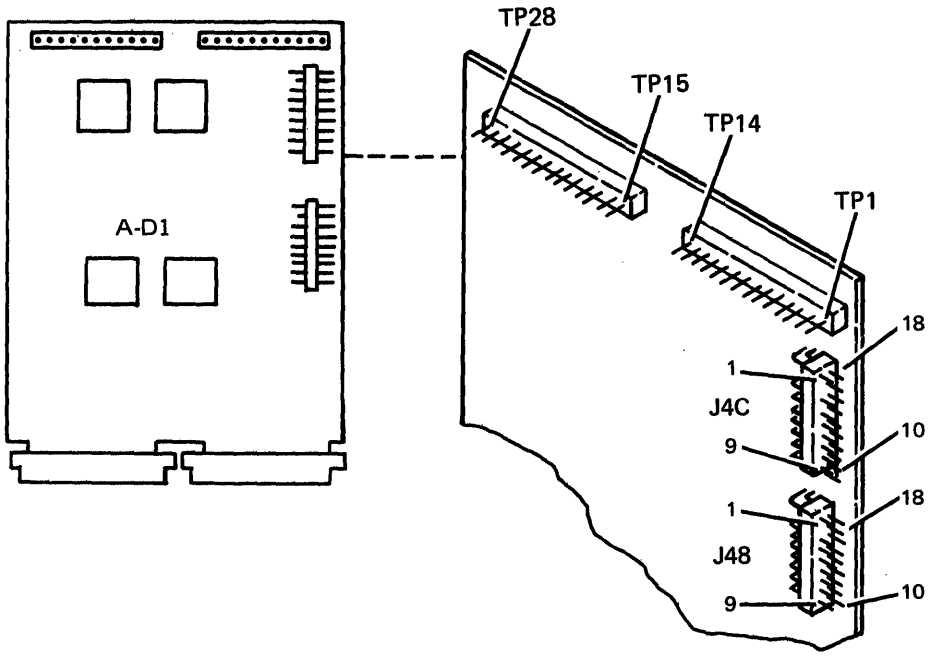


Note: The dual data station adapter card is shown.

TP1 through TP5 are not present on the data station adapter card.

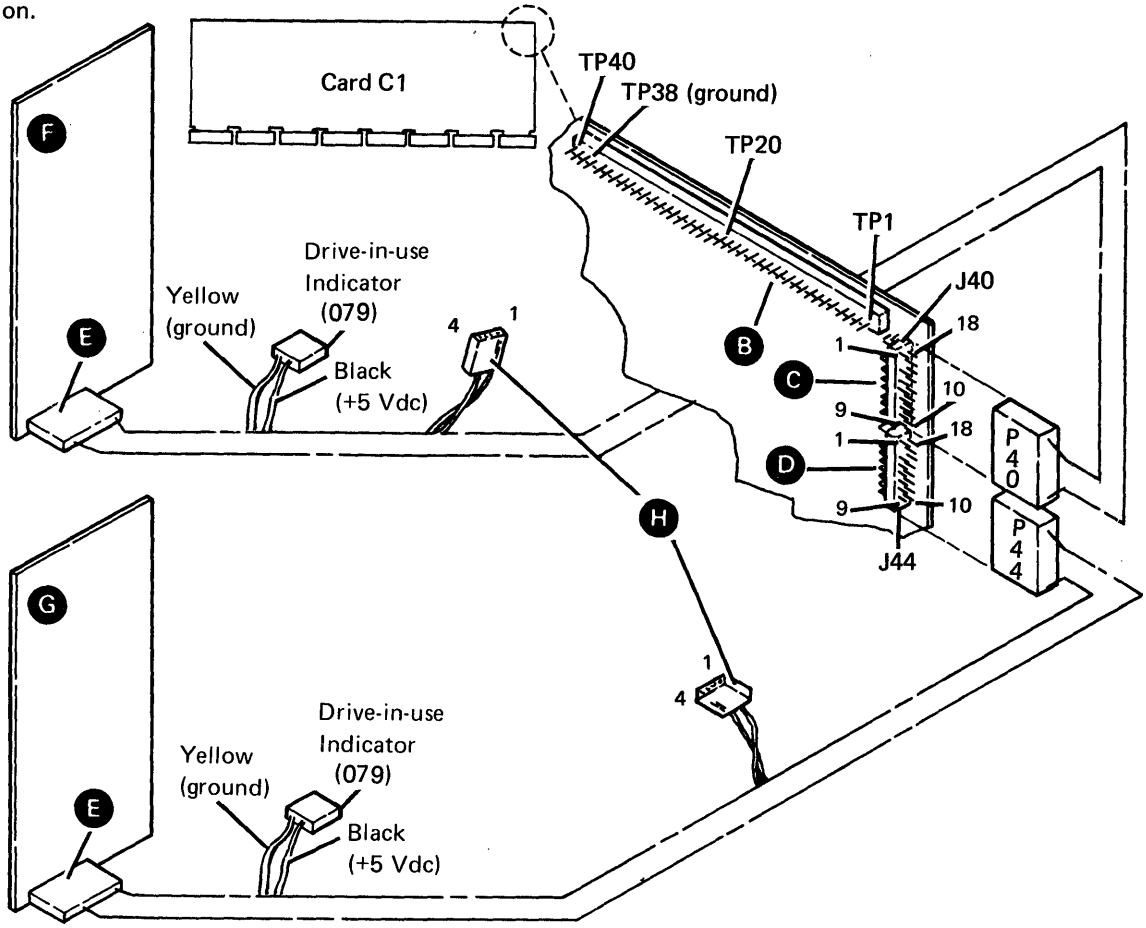
305 DISKETTE DRIVER/RECEIVER CARD (A-D1)

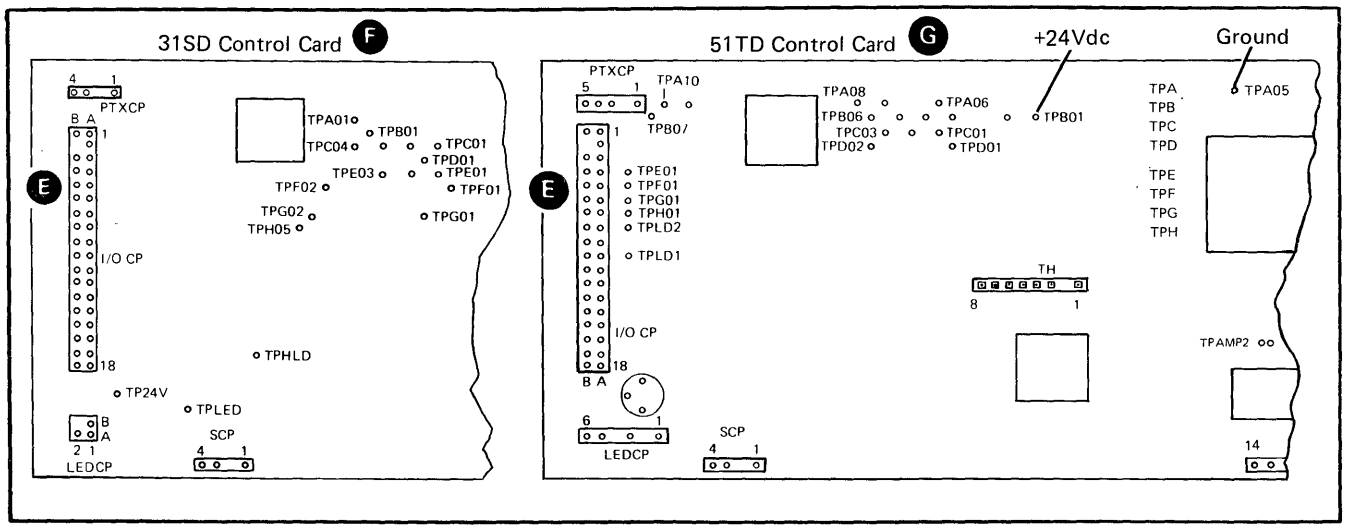
The diskette driver/receiver card figure shows the location of test pins and cable connectors. This card contains the logic to control two remote diskette drives (addresses 4800 and 4C00) located in the remote data station. See 303 for the MPU card used with these diskette drives.



313 IBM 5285 LOCAL DISKETTE DRIVES (ADDRESSES 4000 AND 4400)

This diagram and table shows the location of test pins and cable connectors, and calls out various probe points. The arrow indicates the logical direction of the signal.
D indicates that the signal is repowered and sent to the data station.





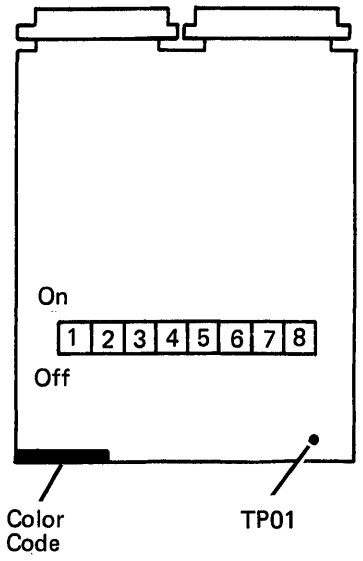
403 FEATURE MAIN STORAGE CARD (A-B5)

The diskette/main MPU card (303) contains 32 K bytes of main storage. Additional storage may be located on optional 16K, 32K, or 64K byte main storage cards. This optional storage is added in card location B5.

The storage capacity of each feature main storage card is indicated by a color marked on the end of the card. The blue code indicates a 16K byte card, the orange code indicates a 32K byte card, and the red code indicates a 64K byte card.

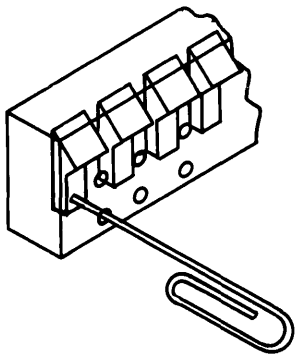
The switches on the storage card must be set to indicate the starting address of the storage on that card. Because the diskette/main MPU card contains the first 32K bytes of main storage, switch 5 (32K byte) must be set to the On position.

All other switches must be set to the Off position.



If the card has a removable plastic cover (part 8331528) over the switches, remove the cover to change the settings of the switches. After you have changed the settings of the switches, reinstall the cover over the switches.

If the card does not have a removable plastic cover over the switches, see the following illustration for an example of how to set the switches. Ignore the red indicator and set the switches to the desired setting.



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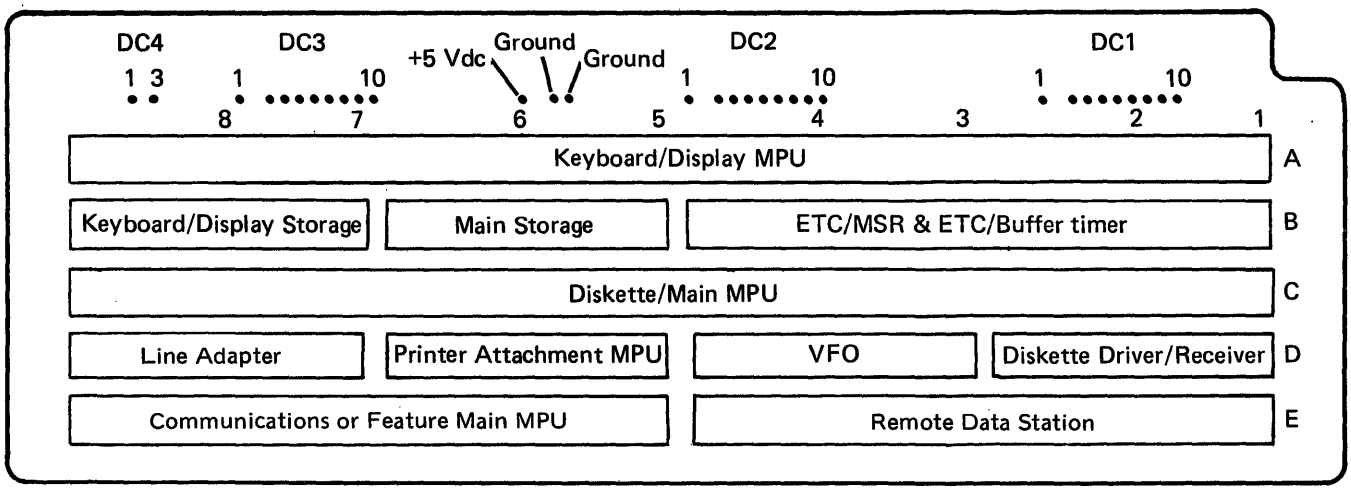
Logic and Cards

501 CARD PLUG CHART

The card plug chart shows the card configurations for the IBM 5285 Programmable Data Station. To determine which card to use, see 503.



503 CARD OPTIONS

The card option table shows which cards to use for the different configurations available. See 501 for the card plug chart.

Reference	Location	Function	Size	Comments
200	A1	Keyboard/display MPU with 3270 emulation	8-Wide	Contains 2K bytes of keyboard storage
200	A1	Keyboard/display MPU without 3270 emulation	8-Wide	Contains 2K bytes of keyboard storage
771, 773	B1	Elapsed-time counter	2-Wide	IBM 5285 W/O buffer timer
	B1	Buffer timer	2-Wide	IBM 5285 W/O elapsed-time counter
771	B1	1-MSR and elapsed-time counter	2-Wide	Communicating IBM 5285 only
773	B1	4-MSR and elapsed-time counter	4-Wide	Non-communicating IBM 5285 only
403	B5	16K Feature main storage	2-Wide	
403	B5	32K Feature main storage	2-Wide	
403	B5	64K Feature main storage	2-Wide	
207	B7	Keyboard Storage (2K, 3K, 4K, & 5K)	2-Wide	Additional keyboard storage
207	B7	Keyboard Storage (1K and 2K)	2-Wide	Additional keyboard storage
303	C1	Diskette/main MPU	8-Wide	Contains 32K main storage
305	D1	Diskette driver/receiver	2-Wide	Non-communicating IBM 5285 only
501	D3	VFO	2-Wide	
731	D5	Printer attachment MPU	2-Wide	
823	D7	EIA	2-Wide	Communicating IBM 5285 only
825	D7	DDSA	2-Wide	Communicating IBM 5285 only
821	D7	38LS World Trade switched	2-Wide	Communicating IBM 5285 only
815	D7	38LS United States switched	2-Wide	Communicating IBM 5285 only
819	D7	38LS World Trade nonswitched	2-Wide	Communicating IBM 5285 only
813	D7	38LS United States nonswitched, manual answer	2-Wide	Communicating IBM 5285 only
817	D7	38LS United States nonswitched, SNBU, auto-answer	2-Wide	Communicating IBM 5285 only
813	D7	38LS United States nonswitched, SNBU, manual answer	2-Wide	Communicating IBM 5285 only
201	E1	Data station adapter	4-Wide	Used when IBM 5281 is attached
203	E1	Dual data station adapter	4-Wide	Used when IBM 5282 is attached
811	E5	Communications MPU with 3270 emulation	4-Wide	Communicating IBM 5285 only
811	E5	Communications MPU without 3270 emulation	4-Wide	Communicating IBM 5285 only
402	E5	Feature main MPU	4-Wide	Non-communicating IBM 5285 only

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS

The following chart supplies the logic board part numbers and engineering change level and the logic card part numbers and engineering change levels for the IBM 5285 Programmable Data Station. If the part number of a card in the machine and the part number for that card in the chart do not agree, check the customer engineer memorandums (CEMs) to ensure that you have the correct card. If you do have the correct card, write the new part number and the new engineering change level for that card in the blank columns provided in the chart. The cards are listed with the oldest part number on the left and the newest part number on the right.

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-Board		4177481 10-28946	4177481 838494	7364107 839753				
A-A1 8-Wide	Keyboard/ Display MPU W/O 3270 Emulation	7364486 10-29792	6042977 10-29968	4177598 838447				
	ROS Patch for Keyboard/ Display MPU W/O 3270 Emulation							
A-A1 8-Wide	Keyboard/ Display MPU W/3270 Emulation*	6043426						
	ROS Patch for Keyboard/ Display MPU W/3270 Emulation							
A-A1 8-Wide	Keyboard/ Display MPU Katakana* W/O 3270 Emulation	6042978 10-29968	4177600 838449	7364426 10-29800				
	ROS Patch for Keyboard/ Display MPU Katakana* W/O 3270 Emulation							

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-A1 8-Wide	Keyboard/ Display MPU Katakana W/3270 Emulation*	6043427						
	ROS Patch for Keyboard/ Display Katakana MPU W/3270 Emulation							
A-B1 2-Wide	Buffer Timer	1618152 837086A						
A-B1 2-Wide	Elapsed Time Counter*	1618152 837086						
A-B1 2-Wide	1MSR and Elapsed Time Counter*	7364620 840869						
A-B1 4-Wide	4MSR and Elapsed Time Counter*	4177924 10-28996	4177926 839709					
A-B5 2-Wide	16K Additional Main Storage*	4177563 10-28936	4177564 838415	1618110 839732				
A-B5 2-Wide	32K Additional Main Storage*	4177561 10-28936	4177562 838399	1618108 839730				
A-B5 2-Wide	64K Additional Main Storage*	7364320 840815A						

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-B7 2-Wide	1K Keyboard/ Display Storage*	1618058 837027	4177550 838407	7364149 10-29012	4177948 839723			
A-B7 2-Wide	2K Keyboard/ Display Storage (W/O Aux Data Station)*	4177551 10-28933	4177554 838411	7364146 10-29012	7364144 839768			
A-B7 2-Wide	2K Keyboard/ Display Storage (W/ Aux Data Station)*	4177525 10-28927	4177526 838389					
A-B7 2-Wide	3K Keyboard/ Display Storage*	4177527 10-28928	4177528 838391	4177897 839725				
A-B7 2-Wide	4K Keyboard/ Display Storage*	4177529 10-28929	4177530 838393					
A-B7 2-Wide	5K Keyboard/ Display Storage*	4177531 10-28930	4177532 838395	4177898 839727				
A-C1 8-Wide	Diskette/ Main MPU	7364264 10-29589	7364266 10-29591	7364312 839645				
	ROS Patch for Diskette MPU	736447 840854 or 840823	736447 840854 or 840823					
	ROS Patch for Main MPU	4177910 839751	4177910 839751					
A-D1 2-Wide	Diskette Driver/ Receiver	4177669 10-28945	4177670 838483					

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-D3 2-Wide	Diskette VFO	8562949						
A-D5 2-Wide	Twinaxial Printer Attachment MPU One Port*	7364279 10-29592	7364283 10-29594	7364294 840811				
	ROS Patch for Twinaxial Printer Attachment MPU One Port							
A-D5 2-Wide	Start-Stop Printer Attachment MPU One Port*	6043314 868349						
	ROS Patch for Start-Stop Printer Attachment MPU One Port							
A-D7 2-Wide	38LS WT SW Modem*	8564479						
A-D7 2-Wide	38LS WT NonSw Modem*	8564418						
A-D7 2-Wide	38LS US SW AA/MA Modem*	8564508						
A-D7 2-Wide	38LS US SNBU AA Modem*	8564509						
A-D7 2-Wide	38LS US SNBU MA Modem*	8564510						
A-D7 2 Wide	DDSA Adapter*	8527032						
A-D7 2-Wide	EIA/CCITT Adapter*	5864668						

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-E1 4-Wide	Data Station Adapter*	7364457 26-01551	4177582 838431	7364443 10-29603				
A-E1 4-Wide	Data Station Adapter Katakana*	7364458 26-01551	4177584 838433	7364445 10-29603				
A-E1 4-Wide	Dual Data Station Adapter*	7364459 26-01551	4177586 838435	7364447 10-29604				
A-E1 4-Wide	Dual Data Station Adapter Katakana*	7364460 26-01551	4177588 838437	7364451 10-29604				

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Card	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-E5 4-Wide	Comm MPU W/Attenuator* W/O 3270 Emulation	7364201 10-29013	4177752 839614A	7364138 839755A				
	ROS Patch for Comm MPU W/Attenuator W/O 3270 Emulation		7364438 868243					
A-E5 4-Wide	Comm MPU W/O Attenuator* W/O 3270 Emulation	7364213 10-29013	4177754 839616A	7364140 839757A				
	ROS Patch for Comm MPU W/O Attenuator W/O 3270 Emulation		7364438 868243					
A-E5 4-Wide	Comm MPU W/Attenuator W/3270 Emulation*	6043351						
	ROS Patch for Comm MPU W/Attenuator W/3270 Emulation							
	Comm MPU W/O Attenuator W/3270 Emulation*	6043352						
	ROS Patch for Comm MPU W/O Attenuator W/3270 Emulation							
A-E5 4-Wide	Feature Main MPU*	6042996 868274A						
	ROS Patch for Feature Main MPU							

*Feature

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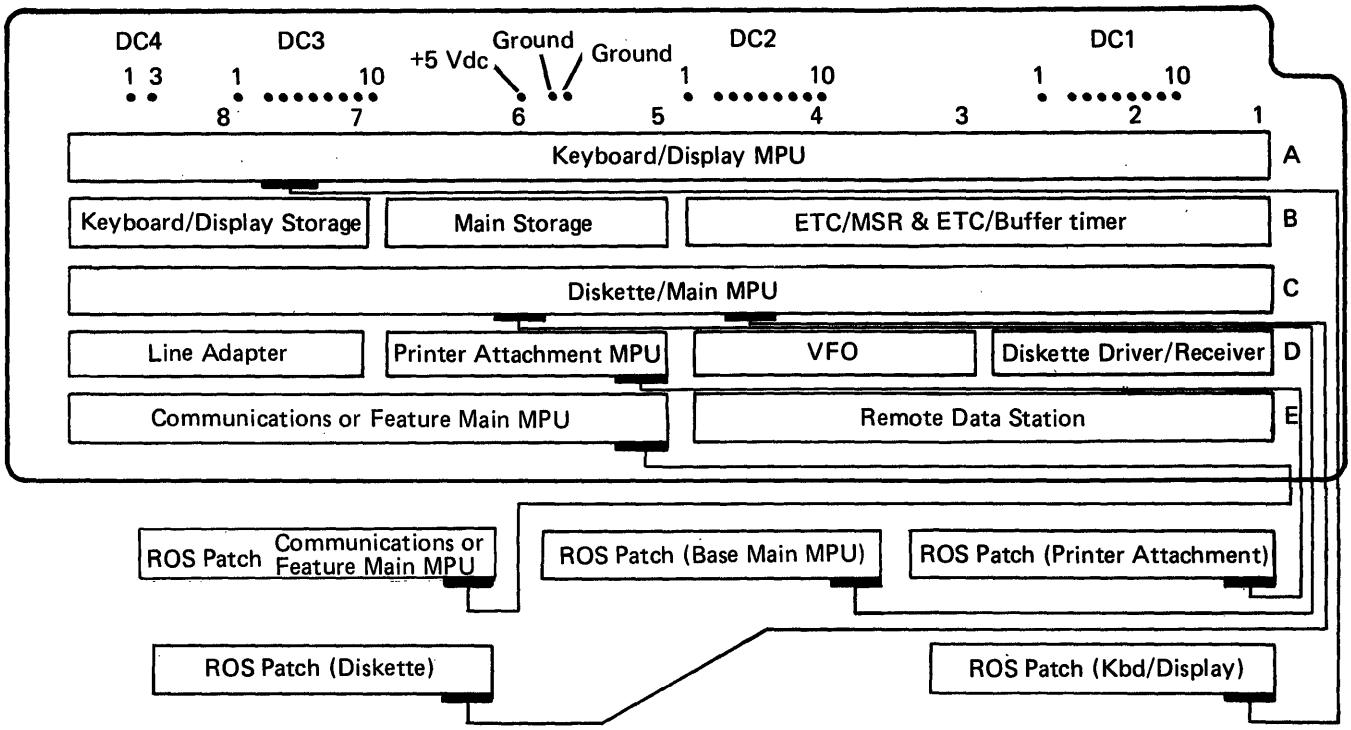
Line Name	Card Row A	B	C	D	Comm E	Feature Main MPU E
-bit req 8-1			8B07			7B09
-carrier det (DCE)				7B12	7B12	
-carrier det (cable)				8D12	8D12	
-chip select disable	4B13	7D07				
-chip select 1	4B12	7D05				
-chip select 2	4B09	7B05				
-clear storage	2B06	8D02				
-clear to send (DCE)				7D13	7D13	
-clear to send (cable) See note 1				8B10	8B10	
+coupler cut through (CCT) See note 1				8D09	8D09	
+CRT2 (+5 V)					3B03	3B03
+CRT3 (gnd)					3B08	3B08
+data modem ready (DA) See note 1				8D02	8D02	
-data set rdy (DCE)				7B13	7B13	
-data set rdy (cable) See note 1				8D09	8D09	
-data term rdy (DCE)				7B02	7B02	
-data term rdy (cable) See note 1				8D02	8D02	
data tip (DCE) See note 1				7D05	7D05	
data tip (cable)				7D06	7D06	
+dev sel 1			5B02			
+dev sel 2			7B13		5D04	
+dev sel 3			7B12			
+dev sel 3 (I/O)	2B09				1D06	
+dev sel 4			7B11	5D04		
+dev sel 4 (I/O)	3B02					
+dev sel 5	8B02		7B10			
+dev sel 5 (I/O)	3B03					
+dev sel 6			7B05			
+dev sel 7			7B08			
+dev sel 8			7B07			8D12
+dev sel 8-1			8D11			8D02
-diag break code	5B07				2B03	2B03
+diag force video	5B08				1B04	1B04
-diag serial data	5B05				2B04	2B04
+diag serial data clk	5B04				2B05	2B05

Line Name	Card Row A	B	C	D	Feature Comm E	Main MPU E
-diag strobe	5D09				2B02	2B02
+diskette 2 sense 4800			2D06	2B04		
+diskette 2 sense 4C00			2B03	2B03		
-display diag	4D11				1B03	1B03
+dual display	4D02				1B07	1B07
-EAR bit 0	2D13	2D13			2B09	2B09
-EAR bit 1	2B13	2B13			2B08	2B08
-EAR bit 2	2D12	2D12			2D12	2D12
-EAR bit 3	2B12	2B12			2B12	2B12
-EAR bit 4	2D11	2D11			2D11	2D11
-EAR bit 5	2D10	2D10			2D10	2D10
-EAR bit 6	2B10	2B10			2B10	2B10
-EAR bit 7	2D09	2D09			2D09	2D09
-EIA wrap See note 1				7D05	7D05	
+erase gate 4800			1B03	1B03		
+erase gate 4C00			1B02	1B02		
-extended sense bit	8B03	2B07				
-feat card installed	5D02	8D04				
-feat chip select	8D04	8B02				
-feat stor sel		5B03	7B02			
+file data in			2B10	3B12		
+file data 4800			2B06	2D05		
+file data 4C00			2D07	2B05		
-file in use 4C00			2D05	2B09		
-file in use 4800			1B08	2D09		
-force POR			3D12			
+head engage 4800			1D09	1D09		
+head engage 4C00			1B09	1B08		
+index 4800			1D04	1D13		
+index 4C00			1D02	1D02		
-inhibit req				6D02		
-inner tracks			1B11	1B13		
-IOD in bit 0 DOT	1D13	1D13			1D13	1D13
-IOD in bit 1 DOT	1B13	1B13			1B13	1B13
-IOD in bit 2 DOT	1D12	1D12			1D12	1D12
-IOD in bit 3 DOT	1B12	1B12			1B12	1B12

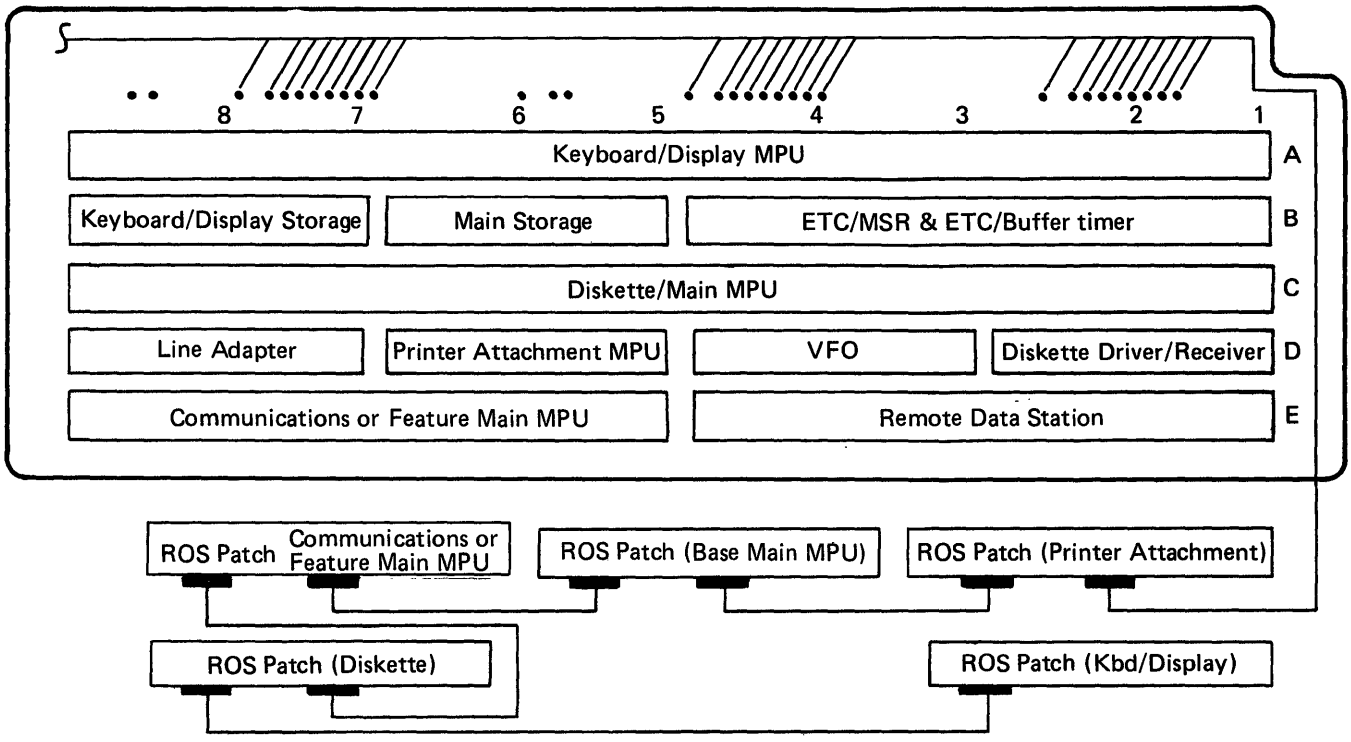
561 ROS PATCH CARD LOCATIONS AND CABLES

The following figure shows where the different ROS patch cards plug in on the logic board.

Signal Cable Connections



Power Cable Connections



563 ROS PATCH CARD REMOVAL AND REPLACEMENT

Removal

1. Power off.
2. Remove the data station covers (031).
3. Remove the logic card cover (513).
4. Disconnect the signal cable 1 from the ROS patch card.
5. Remove the retainer clip 4 and remove the power cable from J02 3.
6. If a power cable is present at J03 5, remove the retainer clip 6 and remove the cable.
7. Remove the ROS patch card.

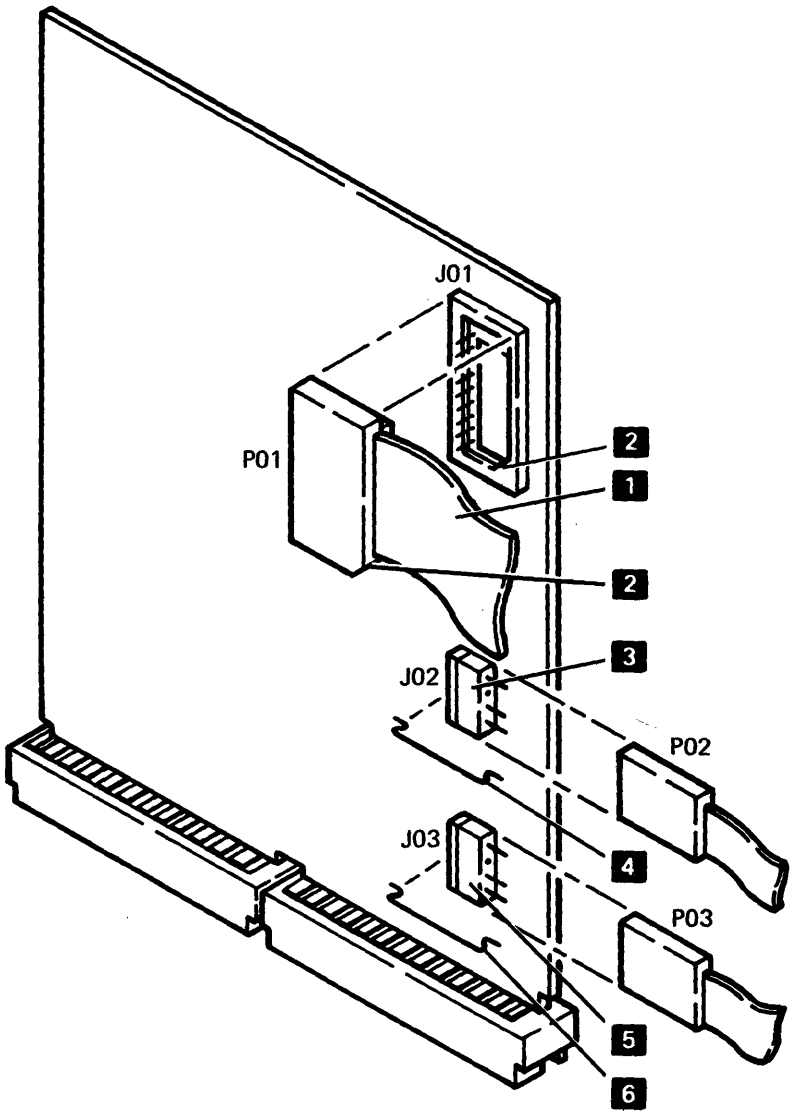
CAUTION
The logic cards will overheat if patch cards (either ROS patch or dummy patch) are not installed.

9. If you are not going to install a ROS patch card in the same position as the one you just removed, install a dummy patch card in that position.

Replacement

For replacement of the ROS patch card, observe the following and reverse the steps in the removal procedure.

1. Align the corner cut on the signal cable connector 2 with the corner cut of the connector on the ROS patch card.
2. Route the cables correctly (561).


J01
P01
2
1
2
3
J02
P02
J03
4
P03
5
6

565 ROS PATCH CARD IDENTIFICATION

All MPU modules that can have a patch installed have the following labels:

- Kx – Keyboard/display MPU
- M_Bx – Base Main MPU
- M_Fx – Feature Main MPU
- D_Bx – Base diskette MPU
- P_Tx – Printer Attachment MPU
- Cx – Communications MPU

The alphabetic character identifies the MPU module. The numeric character identifies the level of microcode in the module.

ROS patch cards also have a label. The label identifies the MPU with which that card is associated and when the card must be installed and removed.

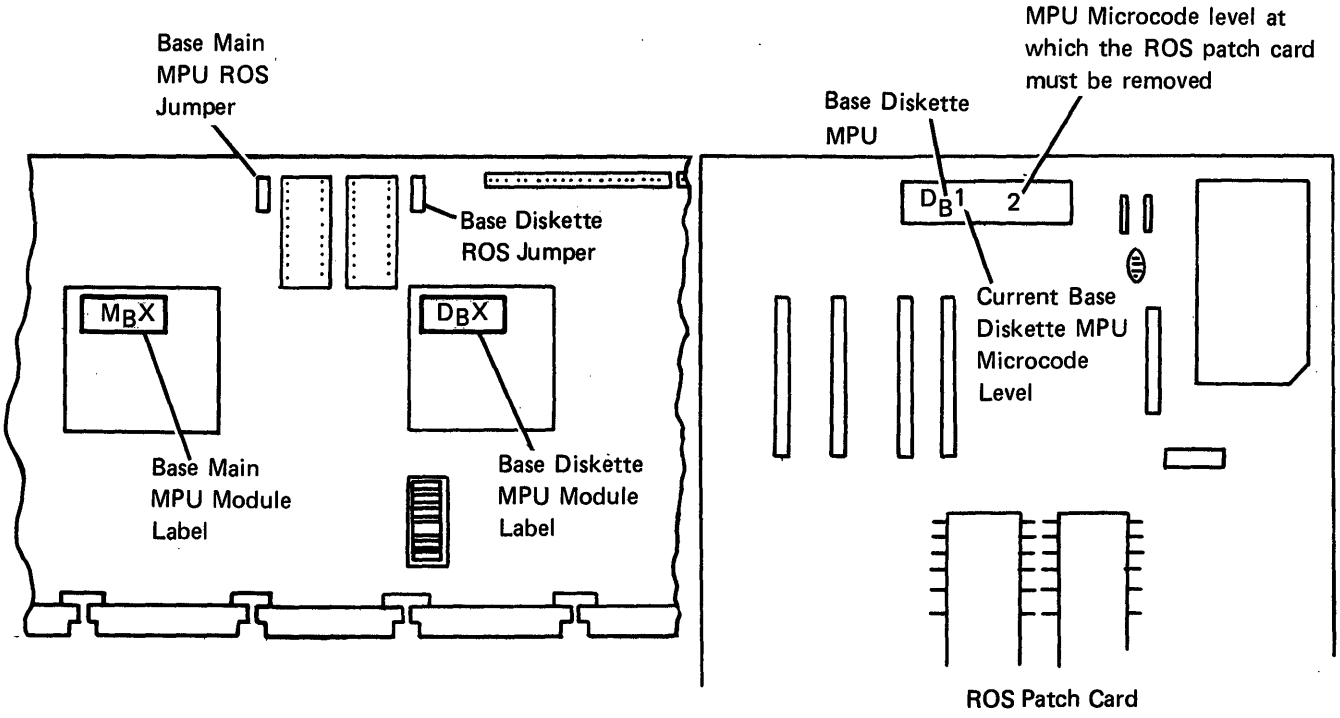
For example, a ROS patch card with a label of D_B12 is associated with the base diskette MPU (D_B). The 1 in the ROS patch card label denotes that the card must be used with an MPU that has a microcode level of 1.

The 2 in the ROS patch card label denotes that the card must be removed when an MPU card with a microcode level of 2 or higher is installed.

Do not install a ROS patch card if the microcode level on the MPU label is higher than the microcode level on the ROS patch card.

If a ROS patch card is installed, the ROS patch jumper on the associated MPU card must be removed before the ROS patch can be used.

When a ROS patch card is removed, the ROS patch jumper on the associated MPU card must be installed.



705 PRINTER ADDRESSES

Twinaxial Attachment

Printers with the Cable Thru feature have address switches. Printers without the Cable Thru feature do not have address switches. See the printer maintenance information manual for the location of the address switches and the Terminator switch.

The address for a printer without the Cable Thru feature is always 8000.

If the attached printer has the Cable Thru feature, the Terminator switch must be set to 1. The valid addresses and address switch settings for printers with the Cable Thru feature are shown in the following chart:

Start-Stop Attachment

The start-stop printer (IBM 5222) can not have the Cable Thru feature. The IBM 5222 attaches to port 21.

The address for the IBM 5222 must be 8008.

Port on Rear of Controller	Printer Address						
20	8000	8001	8002	8003	8004	8005	8006
5225, 5224, and 5256 Printer Address Switch Setting							

711 TWINAXIAL CABLE CONTINUITY AND POLARITY CHECK

Use the continuity and polarity check to test the twinaxial cable for open and shorted lines and for lines that have reversed polarity.

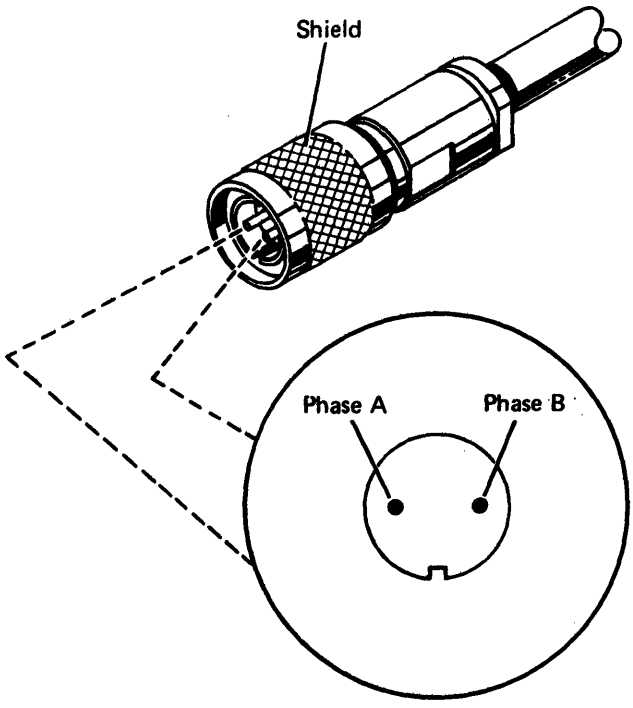
The total length of the cables cannot exceed 1524 meters (5000 feet).

To perform the continuity and polarity checks, you need an ohmmeter to measure resistance and jumpers to connect the signal lines (connector pins) to the cable shields (connector body).

Continuity Check

Perform the continuity check as follows:

1. Unplug both ends of the cable. The following resistance measurements must exceed 100 000 ohms.
   a. Phase A to phase B
   b. Phase A to shield
   c. Phase B to shield



2. Connect Phase A and Phase B to the shield at one end of the cable.

3. Perform the following resistance measurements at the other end of the cable:
   a. Phase A to phase B 110 ohms or less
   b. Phase A to shield 70 ohms or less
   c. Phase B to shield 70 ohms or less

Note: If the preceding checks show that the cable is open or shorted, see 713 to find the location of the open or shorted lines.

Polarity Check

Perform the polarity check as follows:

1. Connect phase A to the shield at one end of the cable.

2. Perform the following resistance measurement at the other end of the cable:

   Phase A to shield 70 ohms or less

Note: If the resistance exceeds 70 ohms, the lines are reversed.

715 STATION PROTECTOR SERVICE CHECK

The station protector must be installed at each exit and entry point on the twinaxial cable when that cable enters or exits a building.

The station protector is owned and maintained by the customer. The following procedure can be used to check an IBM-supplied station protector.

The cables to the station protector must be disconnected before the checks can be made. This will disconnect the printers from the controller.

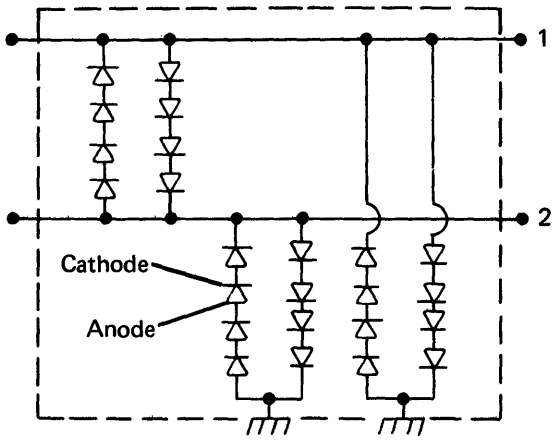
DANGER
Never hold or touch cables or connectors during an electrical storm.

Use only CE meter part 1749231. Use the Rx 100 scale.

1. Check each diode with the black lead of the CE meter connected to the anode and the red lead connected to the cathode. The resistance should be less than 2000 ohms.

2. Check each diode with the black lead connected to the cathode and the red lead connected to the anode. The resistance should exceed 10 000 ohms.

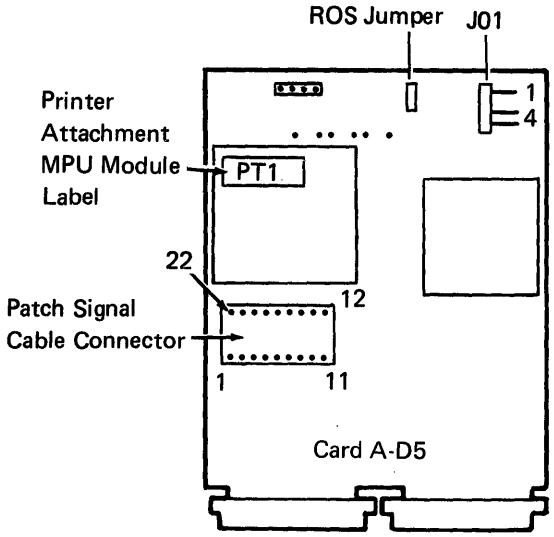
Station Protector Board



731 TWINAXIAL PRINTER ATTACHMENT MPU CARD (A-D5)

The following figure shows the location of test pins, cable connectors, jumpers, and the module label on the twinaxial printer attachment MPU card. This card contains the printer attachment MPU and the logic required to control one printer.

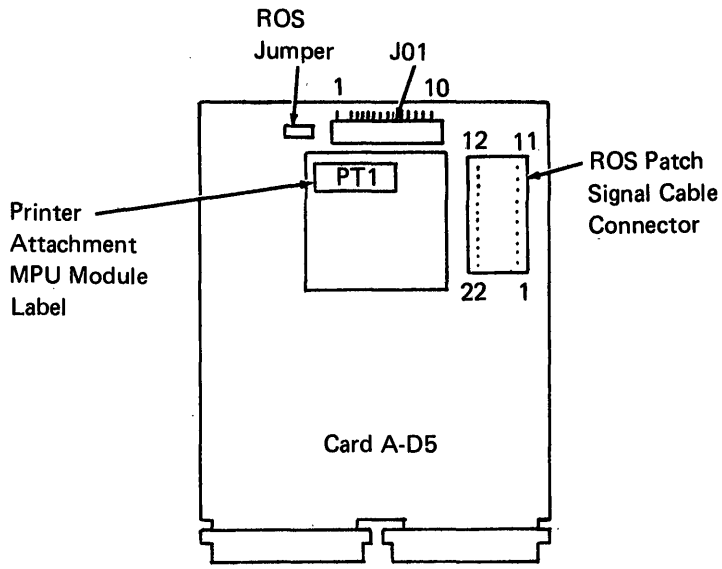
If you install a new twinaxial printer attachment MPU card, see 565 for information concerning the ROS jumper and the ROS patch cards.



733 START-STOP PRINTER ATTACHMENT MPU CARD (A-D5)

The following figure shows the location of test pins, cable connectors, jumpers and the module label on the start-stop printer attachment MPU card. This card contains the printer attachment MPU and the logic required to control one printer.

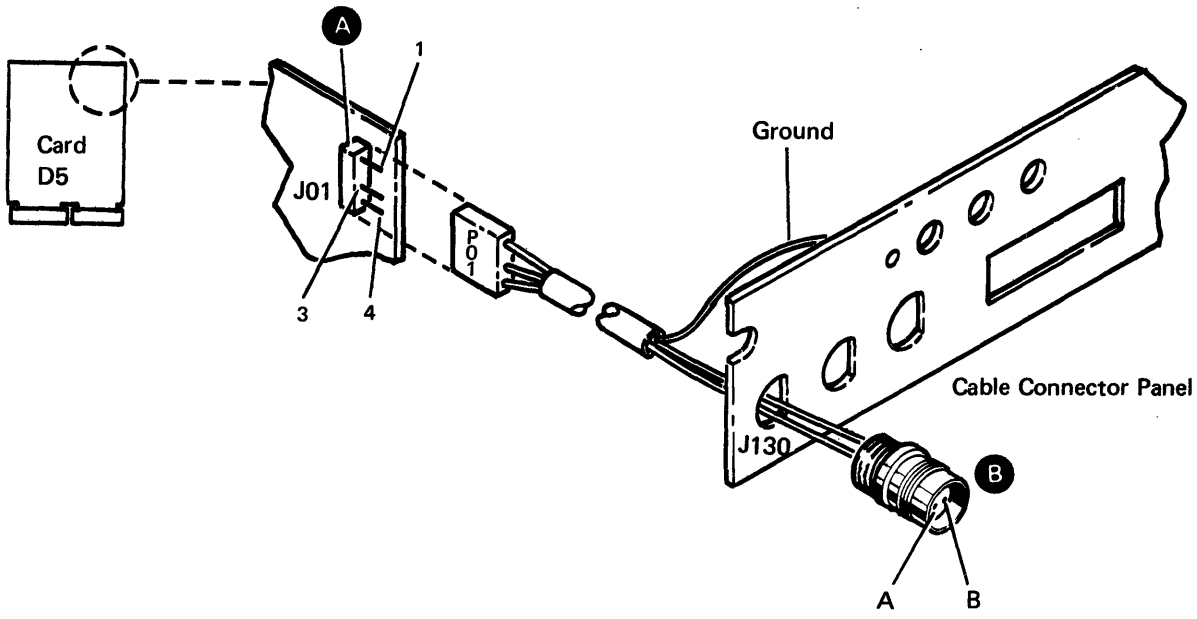
If you install a new start-stop printer attachment MPU card, see 565 for information concerning the ROD jumper and the ROS patch cards.



741 PRINTER ATTACHMENT CABLE DIAGRAMS

Twinaxial Printer Attachment Cable Diagram

The following cable diagram and table shows the physical cable connections, each line name, and all associated connecting points. See 901 for information on how to use the cable diagram



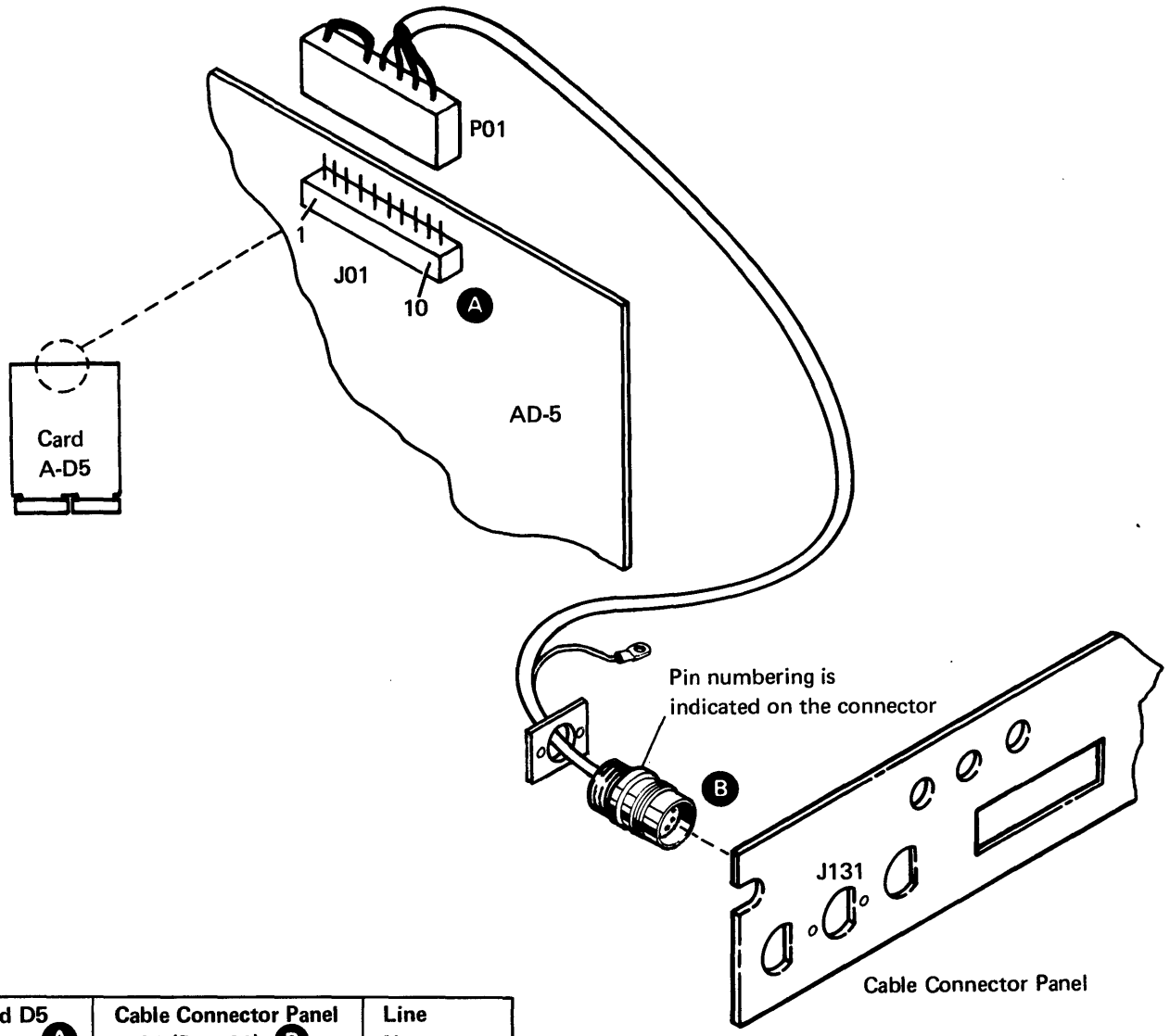
Card D5 J01 (A)	Rear Connector Panel J130 (B)	Line Name
1	A	Port 20-A
3		Ground
4	B	Port 20-B

Note: Pin B on J130 is identified by a dot on the rear of the connector.

741 PRINTER ATTACHMENT CABLE DIAGRAMS (continued)

Start-Stop Printer Attachment Cable Diagram

The following cable diagram and table shows the physical cable connections, each line name, and all associated connecting points. See 901 for information on how to use the cable diagram.



Card D5 J01 (A)	Cable Connector Panel J131 (Port 21) (B)	Line Name
10	1	TX data
9	2	TX data ret
8	3	RX data
7	4	RX data ret

Note: Baud rate jumper must be installed on P01 pin 1 to P01 pin 5.

Magnetic Stripe Reader

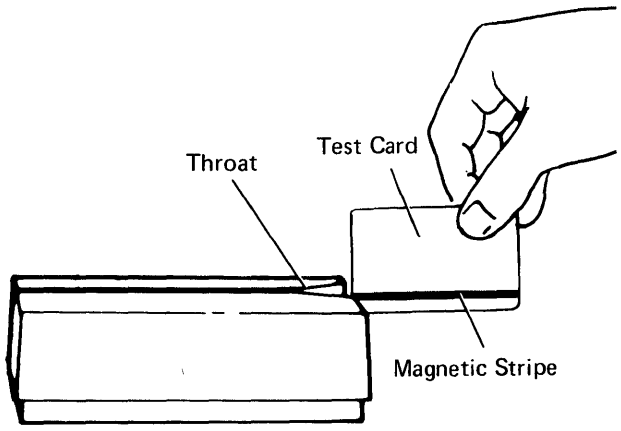
751 MAGNETIC STRIPE READER SERVICE CHECK

1. Power on.
2. Load the standalone program MSRTEST from the diagnostic diskette 1 (971). Use the keyboard associated with the MSR to be tested.
3. Hold the test card so the magnetic stripe is at the bottom of the card and is facing you.
4. Insert the test card into the throat.
5. Move the test card smoothly and continuously through the magnetic stripe reader from right to left at a rate of 120 millimeters to 1000 millimeters (5 inches to 40 inches) per second.

Note: The card must remain against the bottom surface of the throat.

6. The following characters should appear on the display screen:

   BB0123456789BACDE0123456789



761 MAGNETIC STRIPE READER REMOVAL AND REPLACEMENT

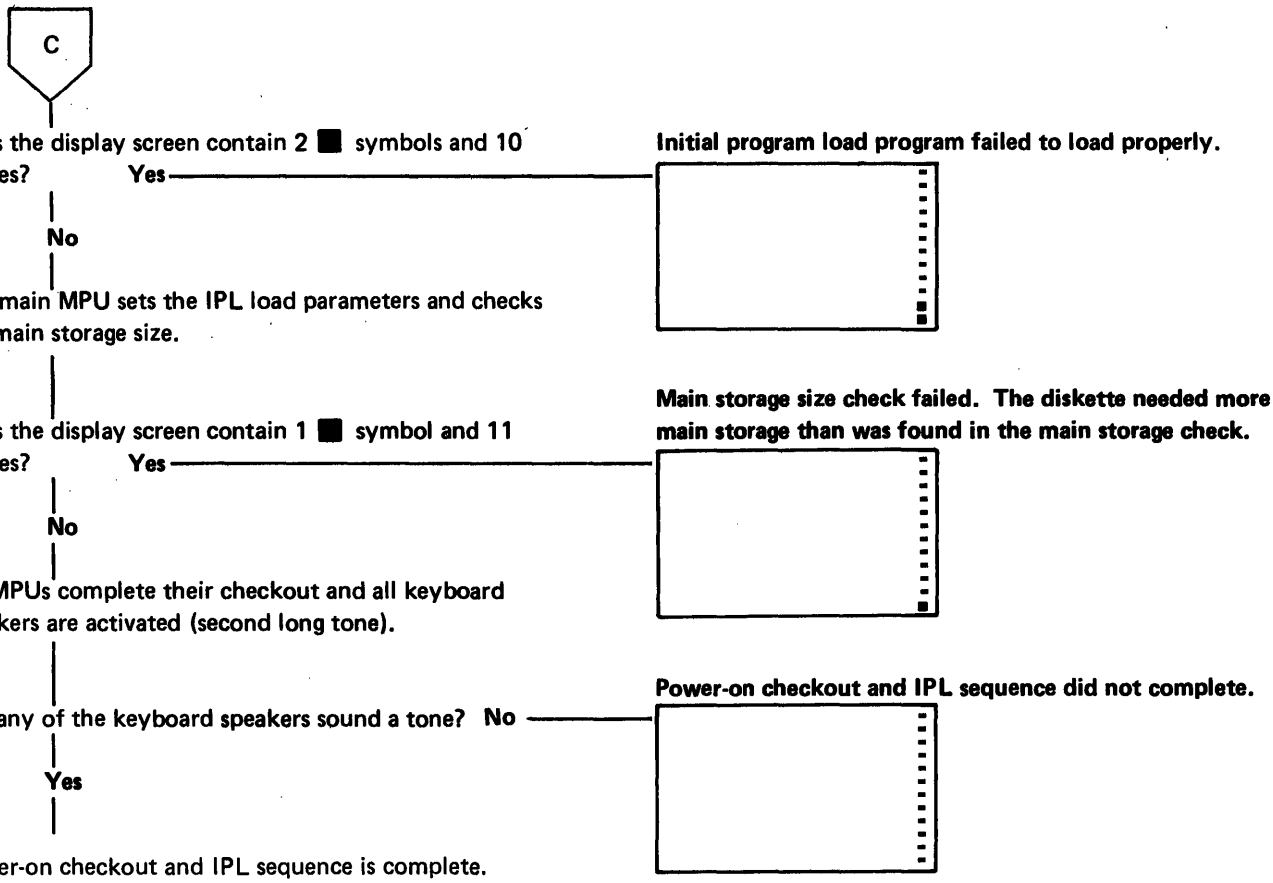
Removal

1. Power off.
2. Remove the data station covers (031).
3. Remove the logic board cover (521).
4. Disconnect the magnetic stripe reader cable from the MSR logic card (785).
5. Remove the power supply (470).
6. Remove the strain reliefs from the cable.
7. Remove the grommet from the cable access hole.
8. Fold the cable wires as shown:

9. Remove the MSR cable from the data station base. (Note the cable routing for the replacement procedure).

Replacement

For replacement of the MSR, reverse the steps in the removal procedure.


C
Does the display screen contain 2 ■ symbols and 10 dashes?
Yes
Initial program load program failed to load properly.
No
The main MPU sets the IPL load parameters and checks the main storage size.
Does the display screen contain 1 ■ symbol and 11 dashes?
Yes
Main storage size check failed. The diskette needed more main storage than was found in the main storage check.
No
All MPUs complete their checkout and all keyboard speakers are activated (second long tone).
Did any of the keyboard speakers sound a tone?
No
Power-on checkout and IPL sequence did not complete.
Yes
Power-on checkout and IPL sequence is complete.
A load prompt is displayed.

931 POWER-ON CHECKOUT AND IPL (continued)

Condition Code Table for Power-On Checkout and IPL Failures

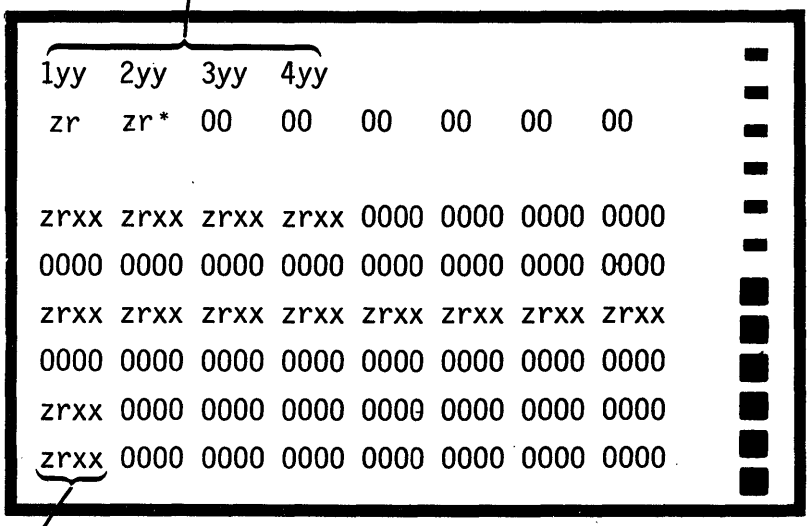
Use the displayed condition codes to determine the type of failure that occurred during a power-on checkout and IPL operation. To force a condition code display, leave the diskette locking lever of the drive containing the IPL diskette open. The scan code for any pressed key can now be observed on the display.

If the L key is the first key pressed at any time during the power-on checkout and IPL sequence, the display/alter function is started (991). To terminate the display/alter function, a power-on checkout and IPL must be done (turn the Power switch off and then on).

To terminate a scan code display function, close the diskette locking lever; the power-on checkout will continue.

The format of the display is as follows (the line positions are inverted for displays on the IBM 5282 and the IBM 5286):

The keyboard scan code is displayed in hexadecimal for each key pressed during power-on checkout. Entry 1yy is for keyboard 0, entry 2yy is for keyboard 1, and so on.



Line 1—Keyboard scan codes

Line 2—Main MPU status

Line 3—Reserved

Line 4—Keyboard/display MPU status

Line 5—Reserved

Line 6—Diskette MPU/drive status (drive 40 on left through 5C on right)

Line 7—Reserved

Line 8—Printer attachment MPU status

Line 9—Communications MPU status

z MPU number assigned by the microcode.

r MPU ROS engineering change and patch level. These numbers are generated by the microcode but are not used during normal maintenance procedures.

xx Device condition in hexadecimal. See the table on the next page for the meaning of each entry.

* Present only if the feature main MPU is installed.

931 POWER-ON CHECKOUT AND IPL (continued)

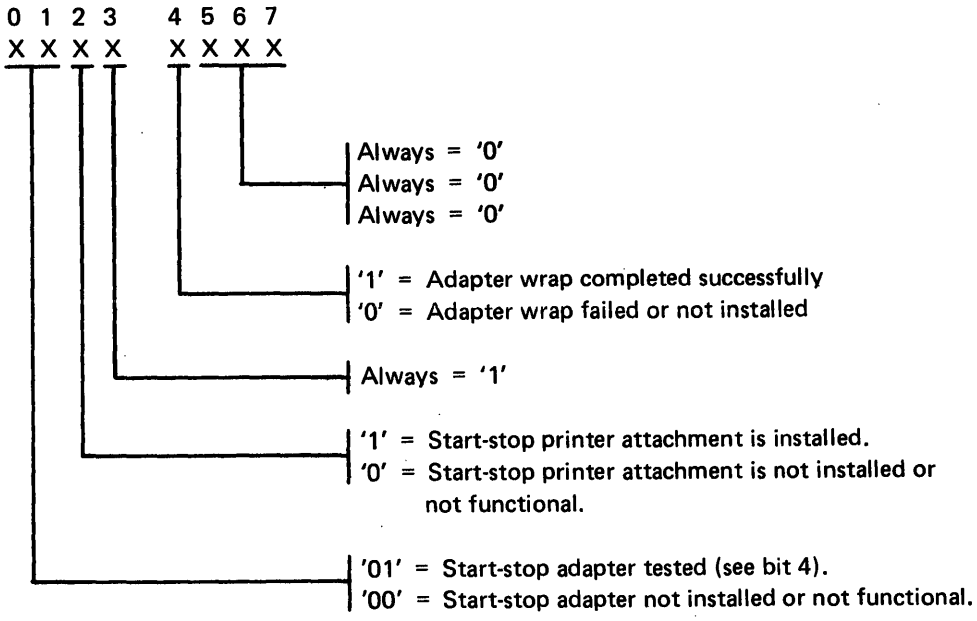
Condition Code In Hex	Description
00	The keyboard/display attachment has no data station attached. The printer attachment, communications, or diskette feature is not installed or the respective display checkout has been started.
04	The printer attachment, communications, or diskette MPU check is complete.
08	Main storage check complete: the printer attachment, communications, or diskette MPU completed a write and read at the main storage address assigned to the attachment by the main MPU microcode.
0C	256-byte read/write main storage check complete: printer attachment, communications, or diskette MPU completed a write and read of the first 256 bytes of main storage assigned assigned to the attachment by the main MPU microcode. The printer attachment, communications, or diskette attachment check is complete. The diskette drive is attached to the diskette attachment but another diskette drive is doing an IPL.
10	The printer attachment, communications, or diskette attachment check is complete. The diskette drive is attached to the diskette attachment but another diskette drive is doing an IPL.
14	VFO error.
18	The keyboard/display attachment has a data station attached. Index pulses are too slow from the diskette drive attached to the diskette attachment. **Note:** A diskette drive locking lever in the open position can also cause this condition.
1A	The keyboard/display attachment has a dual data station attached.
1C	The keyboard/display attachment has a data station attached and ready but the timer is not working. Index pulses are too fast from the diskette drive attached to the diskette attachment.
1E	The keyboard/display attachment has a dual data station attached and ready but the the timer is not working.
20	Erase mismatch: the diskette attachment write or erase gate was active during a read operation, or write/erase sense was active during a read operation.
21	Storage overrun: the diskette MPU was unable to obtain the required storage cycles to transfer the data.

931 POWER-ON CHECKOUT AND IPL (continued)

Condition Code In Hex	Description
23	The diskette drive attached to the diskette attachment deactivated the ready status during a read operation.
24	No address mark detected: the diskette attachment detected no address mark on the diskette being read by this diskette drive.
26	CRC error: the diskette attachment detected a cyclic redundancy check (CRC) error on the diskette operation being performed.
27	Not used.
29	Media error: the diskette attachment cannot process the data from this diskette (damaged diskette or invalid type data. See 969).
2A	Control address mark detected: the diskette attachment detected a control address mark on the diskette operation being performed when no control address mark was expected.
2C	ID mismatch: the diskette attachment found an ID on the diskette that did not match the ID that it was instructed to find. The keyboard/display attachment has a data station attached and ready and the timer is working.
2D	Sense 2 invalid: during a diskette read or write operation the bits set in the sense register 2 are invalid.
2E	Volume label error: the volume label format is not correct. The keyboard/display attachment has a dual data station attached and ready and the timer is working.
30	Non-IPL diskette: the diskette in this drive is not an IPL diskette.
32	Diskette type error: the diskette type (type 1 or 2D) on the volume label does not match the diskette being used.
34	Label error: the header label format is not correct.
38	IPL limits wrong: the IPL data set size is greater than the system main storage size.
3C	Not used.
XX	See the following figure for the meaning of this start-stop printer attachment condition code.
FF	All diskette attachment checks are complete.

Single Port Start-Stop Printer Attachment Condition Codes.

Note: For a successful checkout of a single-port start-stop adapter, the condition code is hex '78'.



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940 DIAGNOSTIC DISKETTE DESCRIPTIONS

Three diagnostic diskettes are provided with the IBM 5280 system. Programs are contained on two of these diskettes. The third diskette is a scratch diskette used by certain diagnostic programs.

Diagnostic diskettes 1 and 2 contain programs to:

- IPL the system and identify the keyboard type, assign program partitions, load the keyboard tables into the keyboard/storage, and display a load prompt.
- Load the Diagnostic Control Program (DCP) and run selected MAP Diagnostic Integration (MDI) programs.
- Load standalone programs to diagnose failures and to verify the operation after a repair action.
- Display or print out the error history log from the verification diskette.

The following shows the contents of each diagnostic diskette, and a description of diagnostic diskette 3, the scratch diskette.

Diagnostic Diskette 1

Program Name	Function
IPL and Diagnostic Loader Programs	*These programs are initiated by the hardware IPL function; they cannot be loaded from a load prompt.*
TIPL	IPL starter program
TPARTL	Partition loader program
TDDF	Definition file
TKBTBLS	Keyboard translate tables file

940 DIAGNOSTIC DISKETTE DESCRIPTIONS (continued)

Diagnostic Diskette 1

Program Name	Function
Standalone Programs	*These programs can be loaded from the diagnostic IPL load prompt*
SCANTEST	Keyboard scan code test
MSRTEST	Magnetic stripe reader test
CRTTEST	Display exerciser test
TMRTEST1	Elapsed time counter test 1
TMRTEST2	Elapsed time counter test 2
TSYSEREP	System error log recovery program.
TCOMEREP	Communications error log and data trap recovery program
TMEDIA	Diskette surface analysis program
TPRNT	Printer verification test
PGMLOAD	Load utility for most printer tests, SYSTEST, and communications utilities
	The following programs must be selected from the PGMLOAD load menu or a 3215 error will occur.
• PRTRPOLL	Twinaxial printer interface program
• IWRAP	Start-stop printer attachment adapter wrap
• XWRAP	Start-stop printer attachment signal cable wrap
• HTPRNT	Printer H/T over print pattern test
• SYSTEST *	System exerciser test

PGMLOAD (continued)

• SYSCLU*	Communications load utility
• SYSCCU*	Communications configuration utility
• SYSBSCBA	Communications access method
• SYSBOLT	BSC online test

* These programs will not run if the system has been IPLed with a customer diskette. To run these programs, you must IPL the system with the diagnostic diskette 1. (941)

See 971 for a description of Standalone Program Loading.

940 DIAGNOSTIC DISKETTE DESCRIPTIONS (continued)

Diagnostic Diskette 2

Program Name	Function
DCP	Diagnostic control program (loaded from a load prompt)
MDI test routines used by DCP	These routines are automatically loaded by DCP:
AMEMT01	Storage test
BMAINMP	Main microprocessor test
EKBDADP	Keyboard adapter test
EIOMCTL	Keyboard/display storage control test
EIOMEM	Keyboard/display storage test
GDSKT01	Diskette test
GDSKT02	Diskette test
GDSKT05	Diskette test
GDSKT10	Diskette test
GDSKT99	Diskette test
KPRNT01	Printer test
NCOMM01	Communications test
MDI9001	All diagnotic MDIs
ZMENSEL	Menu select program

Diagnostic Diskette 3

This diagnostic diskette is a scratch 2D diskette that has been initialized and formatted for 256 bytes per sector. The 51TD head stress test 1 (MD12520), the 51 TD head stress test 2 (MD12530), and the head resolution test (MD12540) uses this diagnostic diskette.

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961 MAP DIAGNOSTIC INTEGRATION (MDI) TESTS (continued)

MDI2540 51TD Head Resolution Test — writes a repeated pattern of hexadecimal FF FF FF FF AA AA AA AA on track 76. The test then goes into a continuous read loop. You can scope this data to determine head resolution. Head resolution is the ratio of the signal amplitude of hexadecimal FF to the signal amplitude of hexadecimal AA.

If the head resolution is more than 0.5, the head is probably good. If the head resolution is less than 0.4, the head is bad. When the head resolution is between 0.4 and 0.5, use the system error log report program (TSYSEREP) data to determine if the head is bad.

The head is bad if the TSYSEREP data indicates data failures on cylinders 64 through 76 and the head resolution is less than 0.5.

See 965 to check the head resolution.

Communication Area (MDI3001)

MDI3010 Communications Setup Test — specifies the type of communications installed on the system and the initialization of the communications control block (CCB) interface. You can select one of the following features and perform the communications test and wrap functions for that feature:

- EIA feature
- DDSA feature
- 38LS feature

If an encoding device is used, ensure that either the mode switch is in nonencode mode or the device is removed from the line before running the wrap test.

Printer Area (MDI7001)

MDI7010 Twinaxial printer attachment MPU Test - checks the twinaxial printer attachment MPU and the twinaxial printer adapter for a minimum print function and verifies the data transmitted to the printer. The following tests are run:

- Adapter wrap test
- Line quality test
- Minimum print operation/communications verification

For printer failures, see the maintenance document supplied with the printer.

963 DISKETTE MEDIA PROBLEMS

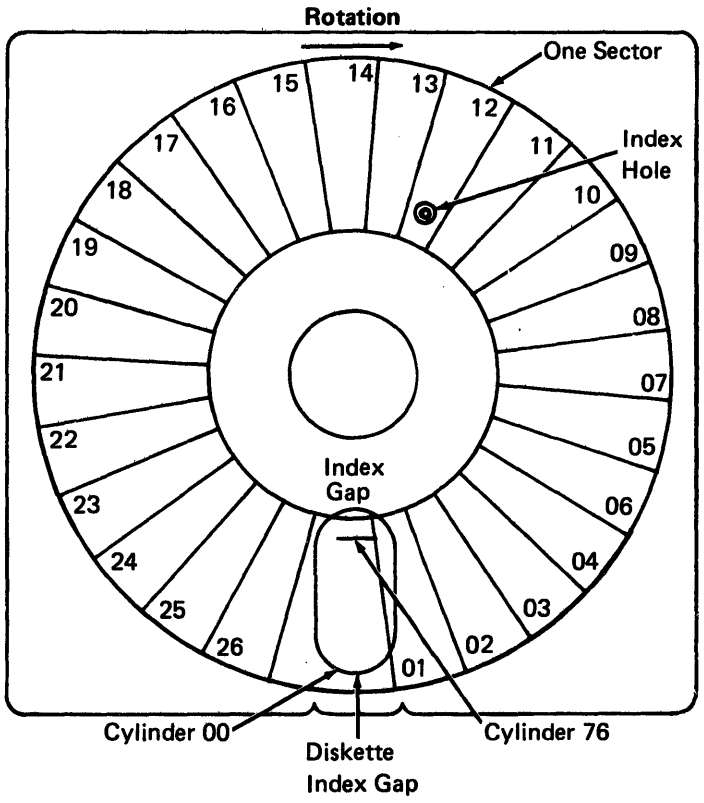
Conditions that affect the quality of the diskette are:

- A dent, scratch, crease, or fingerprint causes errors on the same sectors, usually across tracks that are next to each other.
- A larger center hole causes errors on sectors that are on opposite sides of the center hole. (Example: sectors 01 and 15 or sectors 06 and 19).
- Fibers from the diskette cover cause random errors.

To look for visible damage:

1. Align the index hole in the diskette with the hole in the diskette cover.
2. Use the following diskette figure to locate the physical sectors on the diskette. This figure shows a diskette 2D with 26 sectors and sequential sector sequence numbers. Sector 01 always has the same physical locations on the diskette regardless of the sector size or the sector sequence numbering.

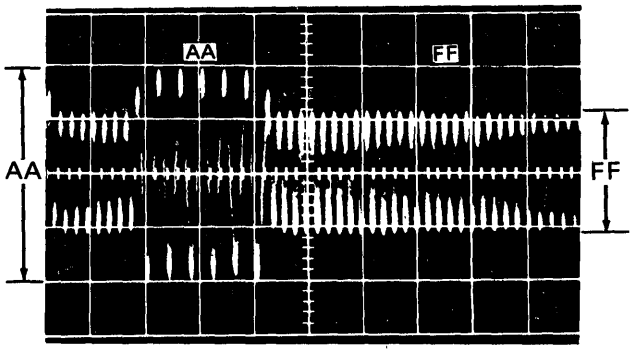
2D diskette with 26 sectors per track.



965 HEAD RESOLUTION SERVICE AID

Use the following to check the head resolution:

1. Use a diskette 2D (diagnostic diskette 3).
2. Select the 51TD Head Resolution Test (MDI2540) (961).
3. Enter the address of the diskette drive that contains the diskette 2D used in step 1.
4. Use a Tektronix 453, 454, or a similar oscilloscope with X10 probes. Use the chart for oscilloscope setting and lead connections.
5. Calculate the head resolution by dividing the hex FF signal amplitude by the hex AA signal amplitude.



AA = 4.2cm FF = 2.4cm

$$\text{Head Resolution} = \frac{2.4}{4.2} = 0.57$$

Control	Setting
A sweep mode	Normal Trig
Channel A level	Adj +
Channel A coupling	DC
Channel A slope	+
Channel A source	External
Trigger	Normal
Mode	Add
Channel 1 volts/division	5 mV/div
Channel 2 volts/division	5 mV/div
Channel 1 input	AC
Channel 2 input	AC
Invert	Pull out
Times per division	20 ms/div
Channel 1 probe	TPAMP1 (preamp TP1)
Channel 2 probe	TPAMP2 (preamp TP2)
Connect trigger to	TPE01 (+index)

971 STANDALONE PROGRAM LOADING

Standalone programs do not need the diagnostic control program (DCP). Therefore, each one is run as a separate program. A standalone program uses only one partition (7.25K bytes).

The following standalone programs are available on diagnostic diskette 1:

Program Name	Function
SCANTEST	Keyboard scan code test
MSRTEST	Magnetic stripe reader test
CRTTEST	Display exerciser test
TMRTEST1	Elapsed time counter test 1
TMRTEST2	Elapsed time counter test 2
TPRNT	Printer test
TSYSEREP	System error log recovery program
TMEDIA	Diskette surface analysis program
TCOMEREP	Communications error log and data trap recovery program
PRTRPOLL*	Twinaxial printer interface program
IWRAP*	Start-stop printer attachment adapter wrap
XWRAP*	Start-stop printer attachment signal cable wrap
HTPRNT*	Printer H/T over print pattern test
SYSTEST*	System exerciser test
SYSCLU*	Communications load utility
SYSCCU*	Communications configuration utility
SYSBOLT*	BSC online test

* These programs must be selected after loading PGMLOAD.
To run the test:
1. Load PGMLOAD from diagnostic diskette 1.
2. Select option.

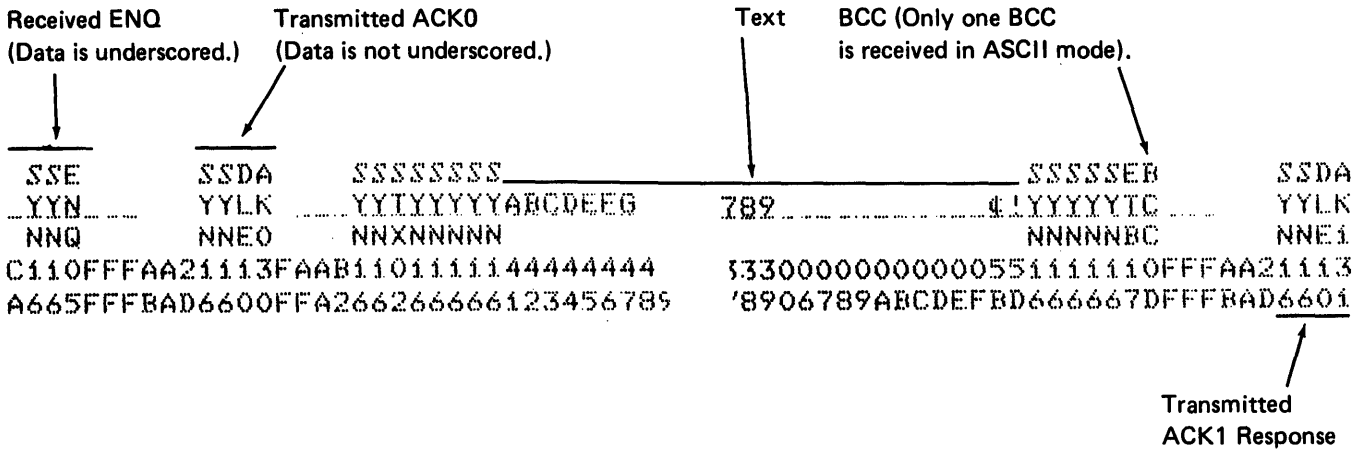
The twinaxial printer interface test (TPRNT) and the diskett surface analysis program (TMEDIA) are also on the verification diskette.

You can load a standalone program from either the load prompt displayed by the diagnostic diskette (prompt 50 00) or the user IPL program diskette (prompt 05 00). If you use the user IPL program diskette load prompt, check with the user to ensure that the partition is 7.25K bytes or larger. Make sure the test you are going to run will not interfere with other jobs running in the system.

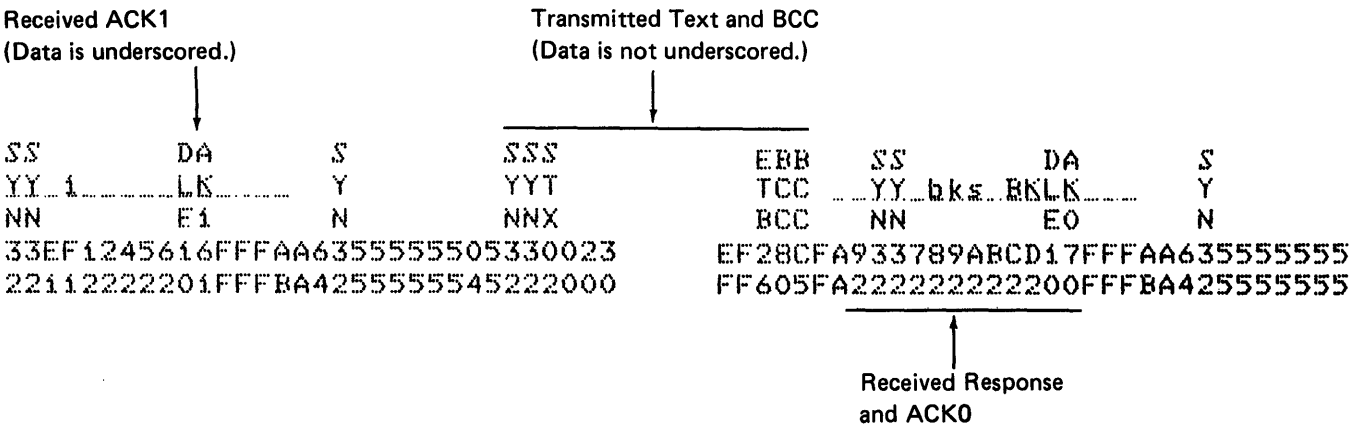
1. To load a standalone program, use one of the load prompts.
2. Insert diagnostic diskette 1 into one of the diskette drives.
3. Enter the program name from the preceding list.
4. Press the field Exit key.
5. Enter the address of the diskette drive that contains diagnostic diskette 1. You can leave blank the partition number assigned to the keyboard you are using. If you use a different keyboard, you must enter the partition number assigned to that keyboard.
6. Press the Enter key to load the program.

For additional information on each standalone program, see 975, Description of Standalone Programs.

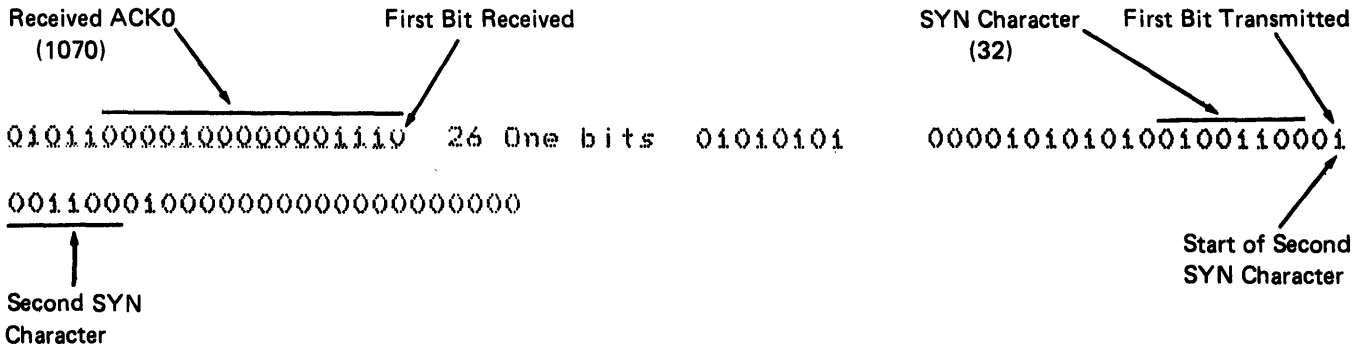
BSC ASCII



BSC EBCDIC



Binary BSC



975 STANDALONE PROGRAM DESCRIPTIONS (continued)

Keyboard Scan Code Test (SCANTEST):

The keyboard scan code test verifies the keyboard hardware interface to the adapter.

To conduct a valid test, load the program into the failing partition. If the failing keyboard does not permit you to answer a standard load prompt, you might have to load the failing partition from another data station.

To load the keyboard scan code test (SCANTEST), see 971.

To terminate this test, press the space bar six times.

Magnetic Stripe Reader Test (MSRTEST)

The magnetic stripe reader test reads the test card or a user card. The data from the card is displayed.

To load the magnetic stripe reader test (MSRTEST), see 971. See 751 for a description of how to run the MSRTEST test.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Display Exerciser Test (CRTTEST):

The display exerciser test permits you to adjust and verify the size and position of the display.

To load the display exerciser test (CRTTEST), see 971.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Elapsed Time Counter Test 1 (TMRTEST 1)

The elapsed time counter test 1 is a digital display of the elapsed time counter in hours, minutes, and seconds.

To load the elapsed time counter test 1 (TMRTEST1), see 971.

To terminate this test; either press the Sys Req key or press the Cmd key followed by the End of Job key.

Elapsed Time Counter Test 2 (TMRTEST2)

The elapsed time counter test 2 checks for hardware problems that TMRTEST1 cannot sense.

To load the elapsed time counter test 2 (TMRTEST2), see 971.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Printer Test (TPRNT):

The printer test operates the printer functions such as new line, and carriage return. The test also attempts to print nonprintable characters and verifies that they are not printed.

To terminate the printer test when in a loop mode (option 1 from prompt 54-02), either press the Sys Req key or press the Cmd key followed by the End of Job key. When terminating the printer test, the printer must finish unloading the buffer before a terminate screen is displayed. Therefore, there might be a delay of several seconds before any display screen prompt or message is indicated.

975 DESCRIPTION OF STANDALONE PROGRAMS (continued)

Start-Stop Printer Attachment Internal Adapter Wrap Test (IWRAP)

The start-stop printer attachment internal adapter wrap test (IWRAP) allows the operator to enter a data character and wrap it through the adapter. The character sent and received is displayed on the screen. This test runs continuously, until the operator presses the Print key. Another data character can then be entered and the test restarted.

To load the start-stop printer attachment internal adapter wrap test, (IWRAP) see 971.

To terminate this test, press the Sys Req Key or the Cmd key followed by the End of Job Key and then select the EXIT option (option 2) on the menu.

Start-Stop Printer Attachment External Cable Wrap Test (XWRAP)

The start-stop printer attachment external cable wrap test (XWRAP) allows the operator to enter a data character and wrap it through the printer signal cable. The signal cable must be in the wrap position at the printer (see Printer MIM). The test runs continuously until the operator presses the Print key. Another data character can then be entered and the test restarted.

To load the start-stop printer attachment external cable wrap test (XWRAP) see 971.

To terminate this test, press the Sys Req Key or the Cmd key followed by the End of Job Key and then select the EXIT option (option 2) on the menu.

Printer H/T Over Print Pattern Test (HTPRNT)

The printer H/T over print pattern test (HTPRNT) prints 5 lines of H's, skips 5 lines, then prints 5 lines of H's overstruck by T's to check the horizontal print alignment. The test then prints a pattern of H's and spaces with increased spacing between the lines to check head and forms movement. The test runs one time and stops unless continuous operation is selected by the operator.

To load the printer H/T over print pattern test (HTPRNT), see 971.

To terminate this test (when in continuous mode), press the Sys Req Key or the Cmd Key followed by the End of Job key. Then select the EXIT option (option 2) on the menu.

The test terminates automatically when not in continuous mode.

975 STANDALONE PROGRAMS (continued)

Twinaxial Printer Interface Test (PRTRPOLL)

The twinaxial printer interface test program (PRTRPOLL) exercises the twinaxial interface by repetitively transmitting a command when the twinaxial interface is failing.

To load the twinaxial printer interface test program, do the following:

1. With a load prompt displayed, insert diagnostic diskette 1 into a diskette drive.

2. Enter the name PGMLOAD.

3. When the PGMLOAD menu is displayed, select option 5 (PRTRPOLL).

If the PRTRPOLL program does not detect a twinaxial printer interface problem and no other error occurs while the program is running, the program will terminate and the following message will be printed:
'PRTRPOLL Test - interface did not fail - load and run TPRNT or go to the system entry MAPs'.

If the PRTRPOLL program does not detect a twinaxial printer interface problem, but another error occurs while the program is running, the program will terminate and the following message will be displayed:
'Hardware error-restart or run TPRNT or go to the system entry MAPs'

If PRTRPOLL program does detect a twinaxial printer interface problem, the program will not terminate. To terminate the continuously running program, do either of the following:

- Press the Print key. This will allow either a restart of the program or an exit from the program.

- Press the Cmd key followed by the End of Job key. This will terminate the program.

975 STANDALONE PROGRAM DESCRIPTIONS (continued)

BSC Online Test Program (SYSBOLT)

The BSC online test program (SYSBOLT) tests the communications link for proper operation. This utility aids in detecting and/or correcting malfunctions and can be run when you suspect problems in the communications link. This utility can be run with any BSC system with which the IBM 5280 can communicate, provided the host system has requester/responder capability and supports at least one of the tests that the IBM 5280 supports.

The SYSBSCBA communications access method (CAM) must be loaded into a background partition. Then the SYSBOLT program must be loaded into a foreground partition. This is accomplished by using the PGMLOAD program. After the programs are loaded, you respond to prompts that request data for the online test to be run and, if applicable, the test of the test. When the test is complete, the results of the test are displayed.

To run the BSC online test program, you need a communications configuration record that specifies the correct network information.

Creating a Communications Configuration Record

To create a communications configuration record, use the diagnostic diskette 1 and IPL the system (941). When prompt 50-00 is displayed, load the PGMLOAD program. When the menu is displayed, select option 3 (SYSCCU).

Use Option 3 to load a configuration record named BSC374 into storage. The prompts shown in the following prompt chart are then displayed. As each prompt is displayed, enter the correct value for your system. If the value shown in the BSC3741 column of the prompt chart is correct for your system, just press the Enter key. The program automa tically bypasses prompts that do not apply to your system.

You can, if you wish, change the value of selected prompts. to select a prompt, enter the question ID of the prompt.

Information about the configuration of your system can be obtained from either the user or from the *System Planning and Site Preparation Guide,* GA21-9351.

To the end the succession of prompts at any time, regardless of the mode of operation, press the End Input key sequence. SYSCCU then displays prompt 61-63, which asks where to save the configuration record. you must name the configuration record you have just created, and remember the name for future use of the record.

The configuration record you just created does not replace the BSC3741 configuration record. It is a separate record. The BSC3741 configuration record remains unaltered on the diagnostic diskette 1.

Note: For more information concerning SYSBOLT, see the *IBM 5280 Communications Reference Manual,* SC34-0247.

Prompt Chart

Prompt Number	Option	Entry or Action Taken	BSC3741 Default Record
(Question ID)			
61-01	Data set name Device address Configuration name	SYSDCCR 4000 BSC3741	
61-02		Press Enter	
61-03 (C1)	1. Nonswitched point-to-point 2. Switched point-to-point 3. Multipoint	Select option	2
61-04 (C2)	1. Integrated modem 2. EIA-external modem 3. DDSA	Select option	2
61-05 (C3)	For integrated modems only	Set to the value specified by the user	
61-06 (C4)	For integrated modems only	Yes for SNBU No for all others	
61-07 (C5)	1. Manual call/answer 2. Auto answer	Select option (see note 1)	1
61-08 (C6)	CDSTL	Select option 1	
61-09 (C7)	Answer tone origin	Select either option	
61-10 (C8)	Timer value	00	
61-11 (C9)	Answer tone origin	Select either option	
61-12 (C10)	1. IBM external modem 2. Non-IBM external modem	Select option	1
61-13 (C11)	1. Internal clocking 2. Modem clocking	Select option	2

Note 1: If you are using an acoustic coupler, select autoanswer. Prompts 61-08 through 61-11 will then be displayed.

993 COMMUNICATIONS ERROR TABLES (continued)

SDLC Error Codes

The following error codes are logged during SDLC communications only:

Hexadecimal Error Code	Meaning
50	Overrun; the data is being received too fast for the IBM 5280 MPU.
51	Underrun; the IBM 5280 cannot transmit fast enough for the line.
52	Not used.
53	Frame check sequence error.
54	The IBM 5280 received a frame with a transmit sequence error.
55	The IBM 5280 received a frame that contained less than four bytes between flags.
56	The remote station canceled the frame.
57	Not used.
58	The trailing flag was not on an 8-bit boundary.
59	Transmit timeout. The IBM 5280 cannot transmit a frame within the time specified in hexadecimal displacement 42 of the CCB.
5A-75	Not used.
76-80	Communications MPU errors.
80-9F	Communications MPU errors; for example, invalid buffer addressing. (Error codes 96 through 99 are probably MPU errors, error codes 9A through 9D may be caused by either the MPU or the CAM, and error codes 9E and 9F are probably MPU errors.

Modem Control Error Codes

The following error codes are logged for all communications:

Hexadecimal Error Code	Meaning
A0	When performing an MPU open operation, the data-set-ready line was already on or the data-set-ready line did not go off on a switched line when the line was disconnected.
A1	The data-set-ready line went off unexpectedly.
A2	Receive timeout; the IBM 5280 received nothing within the time specified in the activity timeout timer (hexadecimal displacement 43 in the CCB).
A3	The IBM 5280 detected the clear-to-send line on when attempting to turn on the request-to-send line.
A4	The data-set-ready line did not turn on.
A5	The clear-to-send line did not turn on.
A6-AF	Not used.

994 3270 EMULATION TEST

The 3270 Emulation feature can be tested using a host system that has the capability of performing the test. For information on the available tests and for set-up procedures, see *3270 Test Request Feature Guide,* GA27-2774. To perform the test, do the following:

1. Do one of the following:
   a. Press the Clear key, then press the Reset key.
   b. Press the Cmd key, then the Shift key, then the Dup/Skip key.

2. Type in the request for test message (contact the host system operator for the test message format).

3. Press the Test Request key.

4. The host system responds with a test pattern.

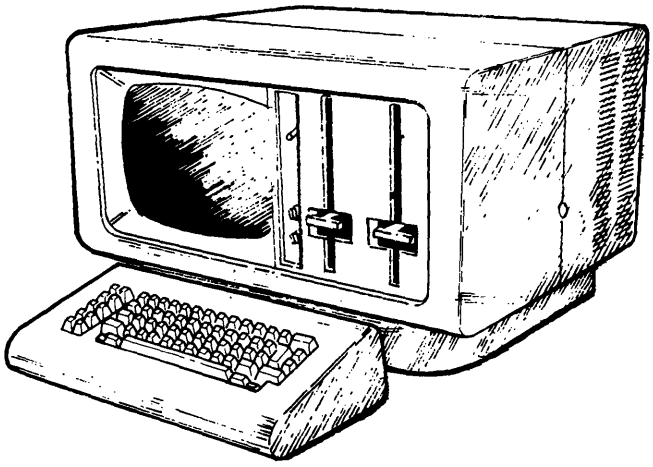
Introduction

The IBM 5280 is a diskette-based system. It includes several data stations and programmable units that can be connected in a variety of configurations. The programmable units contain the microcode needed for the system to operate. There are several devices that attach to the data stations and the programmable units.

DATA STATIONS

IBM 5281

The IBM 5281 is a tabletop data station that has one keyboard and one display assembly. The IBM 5281 must be connected to one of the programmable units before any function can be performed. A maximum of two diskette drives can be housed within the IBM 5281.

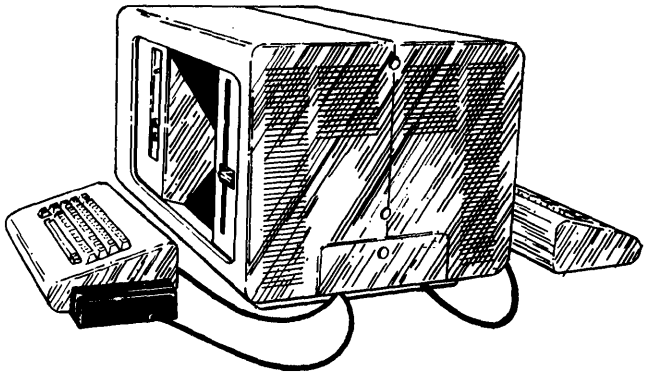


Specifications

- Display sizes are 480, 960, or 1920 characters. All displays on a system must be the same size.
- Storage is located in the programmable unit to which the IBM 5281 is attached.
- Keyboards available are data entry, data entry with proof arrangement, and typewriter.
- Diskette drives available are the 31SD and the 51TD. No diskette drives are required in the IBM 5281; however, a maximum of two diskette drives can be installed.
- One magnetic stripe reader can be attached, but it is not required.

IBM 5282

The IBM 5282 is a tabletop dual data station that has two keyboards and one display assembly. The display image is divided by mirrors to provide a separate display image for each operator. The IBM 5282 must be connected to one of the programmable units before any function can be performed. A maximum of two diskette drives can be housed in the IBM 5282.



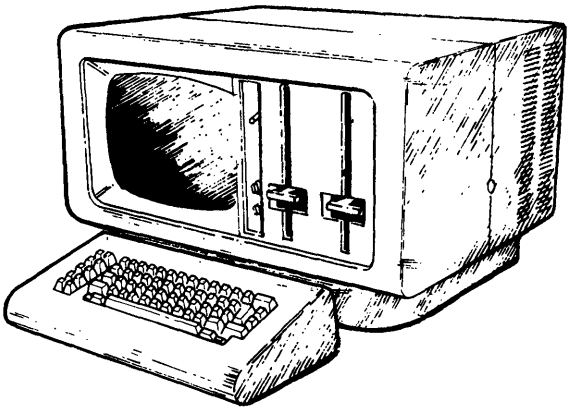
Specifications

- Display sizes are 480 or 960 characters. All displays on a system must be the same size.
- Storage is located in the programmable unit to which the IBM 5282 is attached.
- Keyboards available are data entry, data entry with proof arrangement, and typewriter. Both keyboards on the IBM 5282 must be the same type.
- Diskette drives available are the 31SD and the 51TD. No diskette drives are required in the IBM 5282; however, a maximum of two diskette drives can be installed. Both diskette drives must be the same type.
- Two magnetic stripe readers can be attached, but are not required.

PROGRAMMABLE UNITS

IBM 5285

The IBM 5285 is a tabletop programmable data station that has one keyboard, one display assembly, and one diskette drive. One additional diskette drive can be added.



Configuration

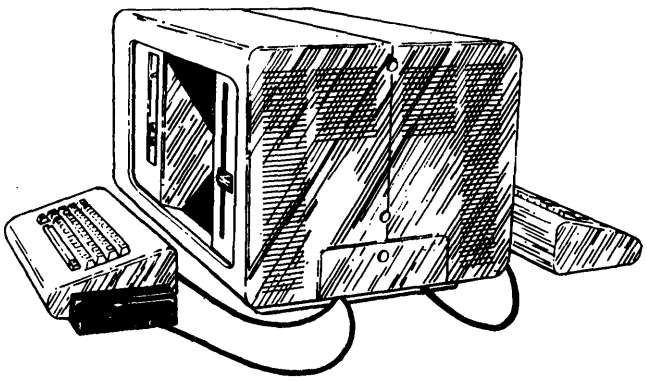
- Can have one auxiliary data station - either an IBM 5281 or an IBM 5282.
- Can have a maximum of four diskette drives.
- Can have one printer - either start-stop (IBM 5222) or twinaxial (IBM 5224, IBM 5225, or IBM 5256).
- Can have one keylock.
- Can have a maximum of three magnetic stripe readers.
- Can have one elapsed time counter.
- Can have one feature main MPU.
- Can have one communications line. If communications is installed, the feature main MPU and the auxiliary data station cannot be installed.
- Can have one 3270 emulation feature if communications is installed.

Specification

- Display sizes are 480, 960, or 1920 characters. All displays in the system must be the same size.
- If the communications line is installed, the minimum display size is 960 characters.
- If the 3270 emulation feature is installed, the minimum display size is 1920 characters.
- Storage sizes available are 32K, 48K, 64K, or 96K bytes.
- If the 3270 emulation feature is installed, the minimum storage size is 96K bytes.
- Keyboards available are data entry, data entry with proof arrangement, or typewriter.
- Diskette drives available are the 31SD and the 51TD.

IBM 5286

The IBM 5286 is a tabletop dual programmable data station that can be used by two operators simultaneously. The IBM 5286 has two keyboards, two diskette drives, and one display assembly. The display image is divided by mirrors to provide a separate display image for each operator.



Configuration

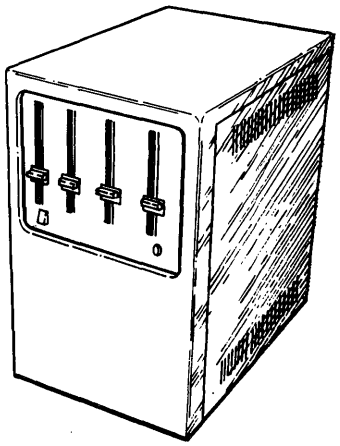
- Can have one auxiliary data station - either an IBM 5281 or an IBM 5282.
- Can have a maximum of four diskette drives.
- Can have one keylock.
- Can have a maximum of four magnetic stripe readers.
- Can have one elapsed time counter.
- Can have one feature main MPU.

Specifications

- Display size is 480 characters. All displays on the system must be the same size.
- Storage sizes available are 32K, 48K, 64K, or 96K bytes.
- Keyboards available are data entry, data entry with proof arrangement, or typewriter. Both keyboards attached directly to the IBM 5286 must be the same type.
- Diskette drives available are the 31SD and 51TD. Both diskette drives installed in the IBM 5286 must be the same type. If any diskette drives are installed in the auxiliary data station, they do not have to be the same type as the drives installed in the IBM 5286.

IBM 5288

The IBM 5288 is a floor-standing programmable control unit. It does not include a keyboard or a display assembly. The IBM 5288 has one diskette drive. Up to three additional diskette drives can be added.



Configuration

- Can have a maximum of four keyboards attached (for example, two IBM 5281s and one IBM 5282).
- Can have a maximum of eight diskette drives, six of which can be in the auxiliary data stations.
- Can have a maximum of eight printers. There can be a maximum of four start-stop printers (IBM 5222) (one per port). Start-Stop printers and twinaxial printers (IBM 5224, 5225, and 5256) can be installed on the same system (maximum of 7 twinaxial printers per port).
- Printer speed may be affected by the customer's programs, application load, forms design, and/or the number of printers attached to the system.
- Can have one keylock.
- Can have a maximum of four magnetic stripe readers.
- Can have one feature main MPU.
- Can have one elapsed time counter.
- Can have one communications line.
- Can have one 3270 emulation feature if communications is installed.

Specifications

- Display sizes are 480, 960, or 1920 characters. All displays in the system must be the same size.
- If the communications line is installed, the minimum display size is 960 characters.
- If the 3270 emulation feature is installed, the minimum display size is 1920 characters.
- Storage sizes available are 32K, 64K, 96K, 128K, 160K, 224K, or 288K bytes.
- If the 3270 emulation feature is installed, the minimum storage size is 96K bytes.
- Keyboards available are data entry, data entry with proc arrangement, or typewriter.
- Diskette drives available are the 31SD and the 51TD.

ATTACHMENTS AND FEATURES

Diskette Drives

The IBM 5280 system uses two types of diskette drives: the 31SD and the 51TD. The 31SD diskette drive uses only the type 1 diskette. The 51TD diskette drive uses the type 1 diskette, the type 2 diskette, and the type 2D diskette. Data is recorded only on one side of the type 1 diskette and on both sides of the type 2 diskette and the type 2D diskette. Each IBM 5280 system requires a minimum of one diskette drive.

The following chart shows the capacities of the diskette types that can be used on the IBM 5280 system.

Diskette Type	Physical Record Length in Bytes	Total Storage in Bytes	Exchange Type
Diskette 1	128	246272	Basic and I
Diskette 1	256	284160	I
Diskette 1	512	303104	I
Diskette 2	128	492544	Basic and I
Diskette 2	256	568320	I
Diskette 2	512	606208	I
Diskette 2D	256	985088	H and I
Diskette 2D	512	1136640	I
Diskette 2D	1024	1212416	I

Printers

The IBM 5280 system can use either the IBM 5222 Serial Matrix Printer, the IBM 5224 Line Printer, the IBM 5256 Serial Matrix Printer, or the IBM 5225 Line Printer. All of these printers except the IBM 5222 are attached to the IBM 5280 by twinaxial cable. The IBM 5222 is attached to the IBM 5280 by start-stop cable. One printer can be attached to the IBM 5285 and up to eight printers can be attached to the IBM 5288.

Keylock Feature

The keylock feature provides data security on the IBM 5280 system. It is a key-operated switch that can be instalied on the programmable units only. The switch has three positions: local, normal, and lock. One key is required to move the switch from the lock position to the normal position and a different key is required to move the switch from the lock position to the local position. The key cannot be removed from the switch in the local position or the normal position but can be removed in the lock position.

When the switch is in the local position, communications cannot be established. If the system is in communications mode when the switch is placed in the local position, communications proceed normally until the end of the current job.

When the switch is in the normal position, communications can be established and maintained.

When the switch is in the lock position, communications cannot be established. If the system is in communications mode when the switch is placed in the lock position, communications proceed normally until the end of the job. However, in the lock position, all keyboards are disabled, and no image can be displayed on the screen.

3270 Emulation

The 3270 emulation feature can be installed on the communicating models of the IBM 5280 only. This feature emulates a 3277 model 2 keyboard/display (1920 characters) attached to either a 3271 control unit (BSC protocol) or to a 3274 control unit (SDLC protocol). The printers attached to the IBM 5280 can be made to emulate a 1920 character buffer 3270 system printer.

Magnetic Stripe Reader Feature

The Magnetic Stripe Reader feature reads magnetically encoded data from documents such as credit cards or identification cards. This feature can be a security device to ensure that only authorized persons can use the system, or it can also speed up the entry of constant data such as a credit number or an identification number. There can be one magnetic stripe reader for each keyboard on the system.

Elapsed Time Counter Feature

The Elapsed Time Counter feature measures elapsed time to count keystrokes, to time the completion of a user's application, or to check operator performance.

Feature Main MPU

The feature main MPU provides additional interface to main storage. It works in parallel with the base main MPU to provide faster main storage accessing for attached devices.

Communications Feature

The Communications feature allows the IBM 5280 to communicate with another terminal or a host system using BSC (binary synchronous communications) or SDLC (synchronous data link control). Both SDLC and BSC can be used, although not simultaneously. Only programming changes are necessary to switch from one to the other.

In a BSC network, the IBM 5280 can appear to the remote station as an IBM 3741 Data Entry Station, an IBM 3780 Data Communications Terminal, or, to host RJE (remote job entry) systems, as a System/3 RJE data station.

With BSC, the IBM 5280 can transmit and/or receive using EBCDIC or ASCII transmission code and transparent or nontransparent data.

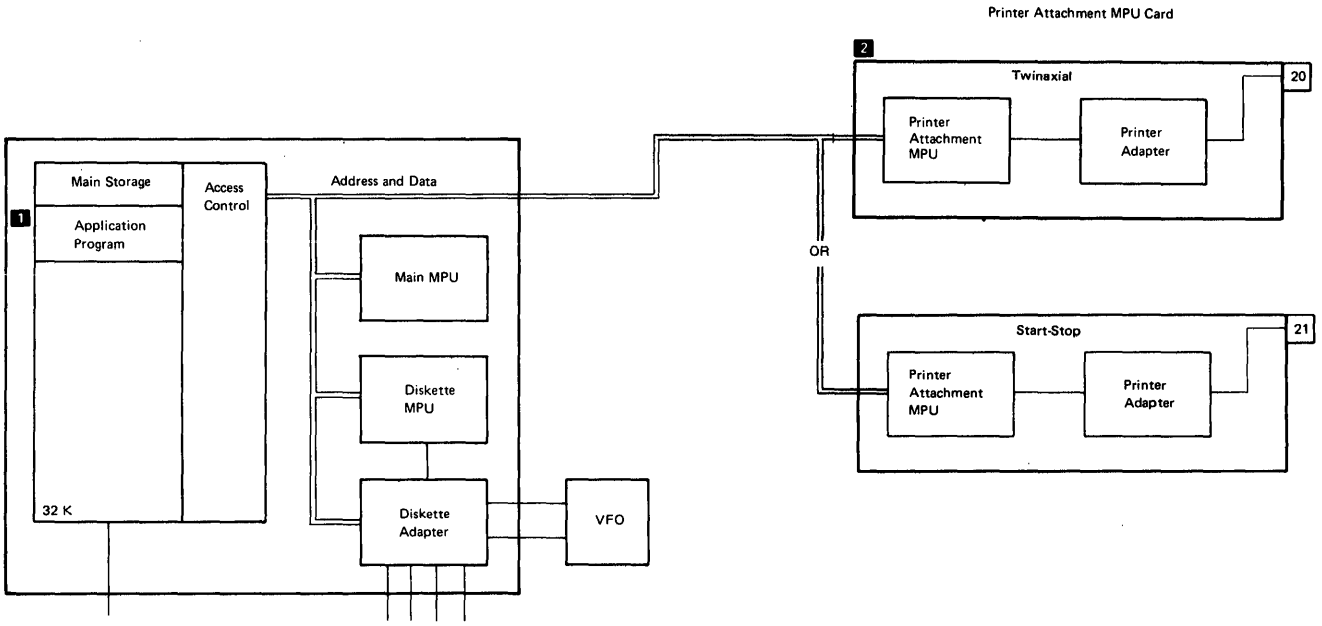
In an SDLC network, the IBM 5280 conforms to the SNA (systems network architecture) definitions. See *Systems Network Architecture Support* in this section for a list of these definitions and a description of commands and responses supported.

One communications line can be attached to the IBM 5280. The line can be point-to-point switched, point-to-point nonswitched, or multipoint. On a multipoint line, the IBM 5280 can be a tributary station only. On nonswitched lines, the IBM 5280 supports SNBU (switched network backup), which allows the user to use a switched line if the non-switched line is unavailable.

The IBM 5280 can communicate over either half duplex or full duplex lines; however, the IBM 5280 communicates in half duplex only. Full duplex lines can be used to reduce line turnaround time. The interface between the IBM 5280 and the line is provided by the EIA/CCITT, DDSA, or the 38LS feature. See *Line Adapter Cards* in this section for a description of these features.

Printer Attachment

The following diagram shows the components required to permit the IBM 5285 to print information on an attached printer.



The component required are an application program in main storage 1 and the printer attachment MPU card 2

The application program prepares the data to be printed. For example, the program might read data from diskette and send it to the printer to print a user's report.

The printer attachment MPU card is the interface between the application program in main storage and the printer. The card contains the printer attachment MPU and the printer adapter, which permit the system to control the printers.

PRINTER ATTACHMENT MPU

The printer attachment MPU controls the printer adapter by issuing commands to the adapter and by reading status from the adapter. The printer attachment MPU exchanges this information with the adapter in four I/O interface registers as follows:

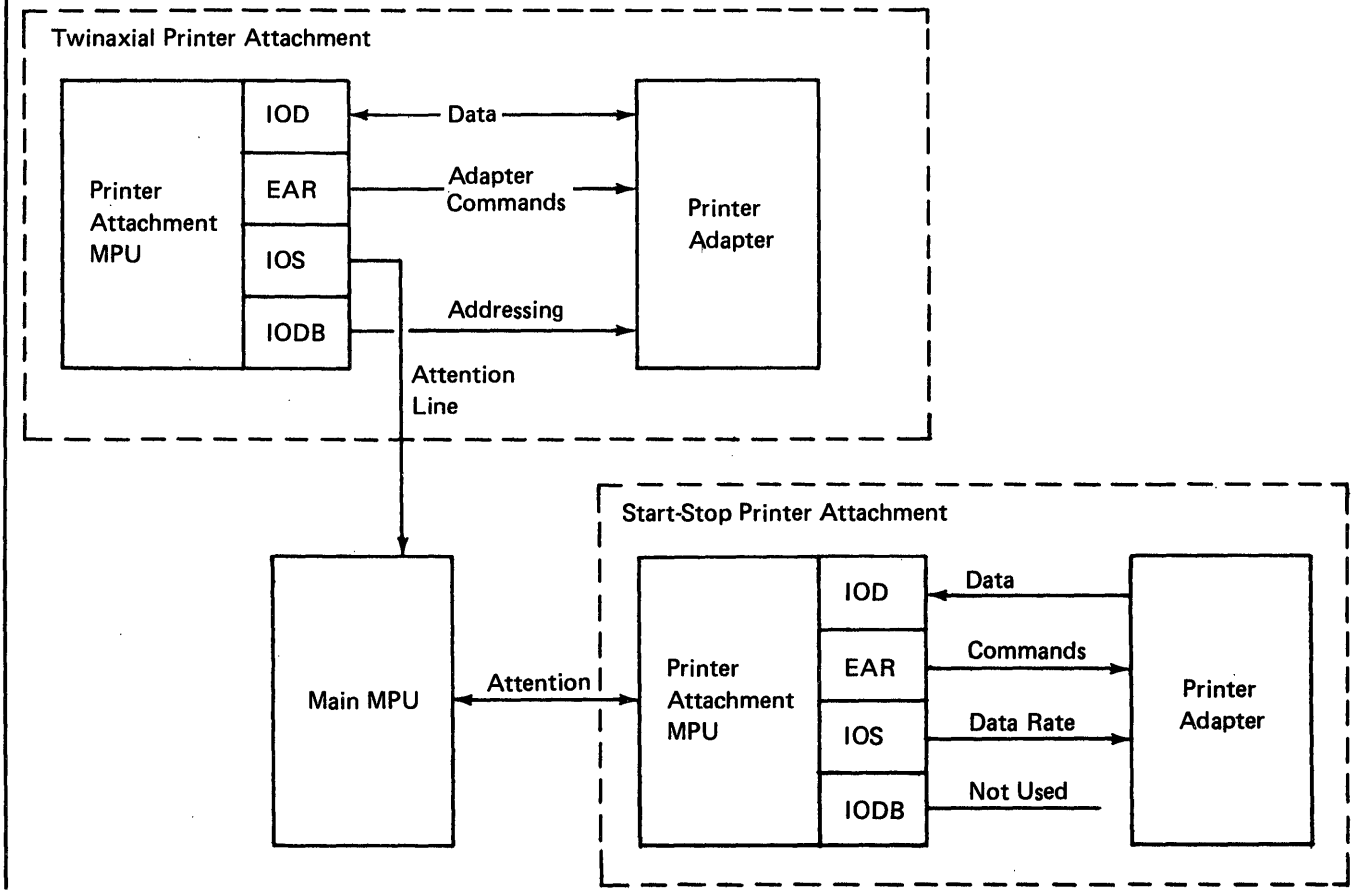
Twinaxial Printer Adapter

- The IOD (I/O data) register is used to send data to and read data from the adapter.
- The EAR (external address) register is used to issue commands to the adapter.
- The IOS (I/O sense) register is used to check the status of the adapter and to send the attention signal to and receive the attention signal from the main MPU.
- The IODB (I/O data buffer) register is used to provide the printer adapter with the port and printer station addresses.

Start-Stop Printer Adapter

- The IOD (I/O data) register is used to send data to and receive data from the adapter.
- The EAR (external address) register is used to issue commands to the adapter.
- The IOS (I/O sense) register is used to select the data rate (BAUD rate) for the interface.
- The IODB (I/O data buffer) is not used.

The following illustration shows the interface registers in the printer MPU and how they link the printer MPU to the main MPU and to the printer adapter.



TWINAXIAL PRINTER ATTACHMENT

The twinaxial printer attachment consists of the twinaxial printer adapter and the twinaxial printer attachment MPU. The twinaxial printer adapter controls the transfer of data and commands to the printer as instructed by the twinaxial printer attachment MPU. Printers are attached by twinaxial cable to the twinaxial printer adapter.

The twinaxial printer adapter sends commands and data to the printer and receives status information from the printer in a 16-bit frame. The 16-bit frame is described later in this section (see *16-Bit Frame Concept).*

Refer to logic diagram *LD07* in the *System Logic Manual* while you read the following description.

The components of the twinaxial printer adapter are as follows:

- Driver/receivers (one for each port)
- Timing logic
- Port control logic
- Transmit data multiplex logic
- Receive data multiplex logic
- Serdes (serializer/deserializer)
- Control logic

Driver/Receivers

The driver/receivers provide the interface between the twinaxial printer adapter and the twinaxial cable. One driver/receiver circuit is provided for each port. In transmit mode, the driver/receiver drives the twinaxial cable to the printers with data to be transmitted. In receive mode, the driver/receivers receive the data from the cable.

Timing Logic

The timing logic allows the attachment to synchronize with the printer by generating a clocking signal from the received data.

Port Control Logic

The port control logic provides the timing and control to convert binary data to bi-phase data for transmit operations or to convert bi-phase data to binary data during receive operations. This logic is driven by the 6 MHz signal on the '+6 MHz' line.

Transmit Data Multiplexor

The transmit data multiplexor prepares the printer adapter to transmit data by selecting the proper port when a transmit command is issued by the twinaxial printer attachment MPU.

Receive Data Multiplexor

The receive data multiplexor gates the adapter to receive data from the selected port when a receive command is issued by the twinaxial printer attachment MPU.

Serdes

The serdes (serial/deserializer) accepts data from the IOD register and converts the data from parallel to serial. The serdes also formats the data into a 16-bit frame by adding the printer station address, parity bits and sync bits on the data for transmission to the printer. The serdes converts the serial data received from the printer to parallel data.

Control Logic

The control logic uses the adapter commands to determine adapter functions. The logic provides adapter status and control functions for the multiplexors and the serdes.

EXAMPLE OPERATION OF THE TWINAXIAL PRINTER ATTACHMENT

The following example shows how data is sent from main storage to an attached printer:

1. When the main MPU reads a printer write instruction, it places the instruction in the printer IOB and turns on the attention line to the twinaxial printer attachment MPU.

2. The twinaxial printer attachment MPU senses the attention line and reads the instruction in the IOB (see *Main Storage Accessing* in this section for an example of how an MPU accesses main storage to read or write data).

3. The twinaxial printer attachment MPU issues a write-command-frame command to the adapter.

4. The control logic decodes the command and selects transmit mode by activating the transmit enable signal. After a delay, the control logic allows the port address to be selected through the transmit data multiplexor.

5. The contents of the IOD register and the station address from the IODB register are loaded into the serdes. The serdes serializes the data, converts it into a 16-bit frame, and sends it to the port control logic.

6. The port control module converts the data to bi-phase encoded data for transmission to the printer on the twinaxial cable. The port control logic provides a pattern of five 1-bits and a code violation to synchronize the printer with the adapter. The printer can then decode the bi-phase encoded data.

7. The driver/receiver (for the appropriate port) drives the data onto the twinaxial cable to the printer.

The following example shows how status is received from a printer:

1. The printer sends bi-phase encoded status data to the twinaxial printer adapter over the twinaxial cable.

2. The data is received by the driver/receiver in the adapter.

3. From the driver/receiver, the data goes to the receive data multiplexor. The multiplexor gates the data to the port control logic.

4. The port control logic converts the bi-phase data to binary and sends it to the serdes.

5. The timing logic uses the received data to generate a clocking signal to control the serdes.

6. The serdes stores the data until the twinaxial printer attachment MPU issues a receive-read command.

7. When the twinaxial printer attachment MPU issues the receive-read command, the contents of the serdes are loaded into the IOD register to be read by the twinaxial printer attachment MPU.

TWINAXIAL PRINTER ADAPTER COMMANDS

The following is a description of each command issued by the twinaxial printer attachment MPU to the twinaxial printer adapter.

Transmit Commands

Write-Command-Frame Command

This is the first command issued in a transmit operation. It initiates a transmission to the printer as follows:

1. Sets the adapter to transmit mode

2. Loads the serdes with the IOD register contents, the station address from the IODB register, and the synchronization bit for the frame

3. Transmits the contents of the serdes and adds a parity bit if needed

Write-Data-Frame Command

This command follows either the write-command-frame command or another write-data-frame command. It loads the serdes with data, the station address, and the frame synchronization bit. A parity bit is added if needed.

Write-Last-Frame Command

This command is the last of a series of transmit commands. It is the same as a write-data-frame command except that it sets the station address to all 1-bits. This indicates to the printer that this is the last frame to be transmitted by the twinaxial printer adapter. A parity bit is added if needed.

Receive Commands

Receive-Mode Command

This command sets the printer adapter into receive mode. The adapter is then ready to receive data from the printer.

Receive-Read Command

This command loads the contents of the serdes (received data) into the IOD register.

Reset and Diagnostic Commands

Reset Command

To the twinaxial printer adapter, this command performs the same function as power-on reset.

Diagnostic-Mode Command

This command starts a diagnostic test for the twinaxial printer attachment. Data is not transmitted during this test. The data from the output of the serdes is wrapped back to the input of the serdes, where it is checked as during a normal read operation. This checks the twinaxial printer adapter transmit and receive circuitry for proper operation.

Diagnostic-Reset Command

This command is used with the diagnostic mode command. It resets the serdes, but it leaves the twinaxial printer adapter in transmit mode.

TWINAXIAL PRINTER ADDRESSING

The twinaxial printer attachment MPU selects a printer by placing the printer address into the IODB register. The following are the meanings of the IODB register bits:

Bit(s)	Meaning
0-2	Not used.
3-4	Port address (used to select ports 20 through 23 for the four-port adapter; or port 20 for the one-port adapter).
5-7	Printer address: These bits are loaded into the serdes for each transmission. In receive mode, these bits are compared with the address received from the printer.

For a description of the printer addresses that can be assigned to each port, see 705 in the maintenance section.

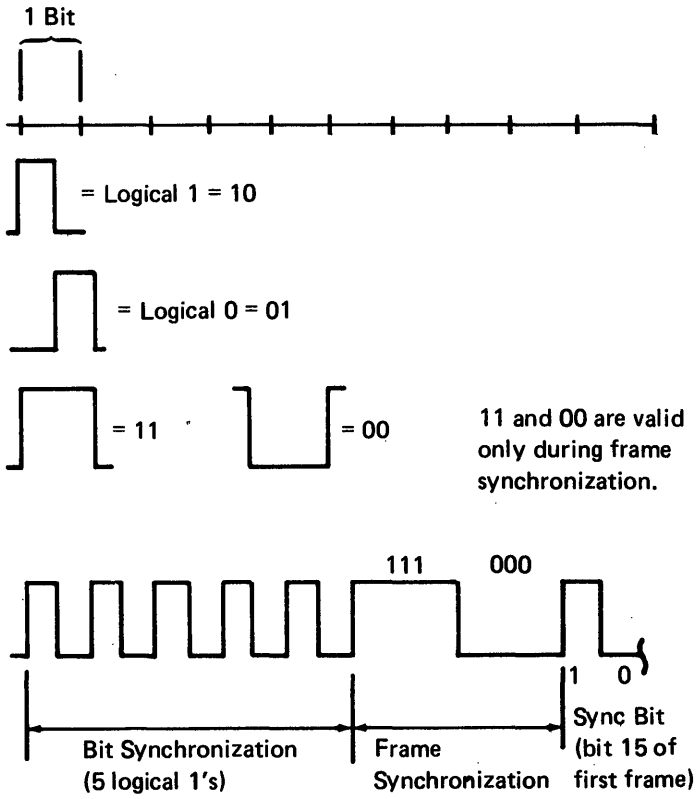
TWINAXIAL PRINTER ATTACHMENT 16-BIT FRAME CONCEPT

Information between the printer and the twinaxial printer adapter is transmitted by a 16-bit frame.

Bi-Phase Encoding

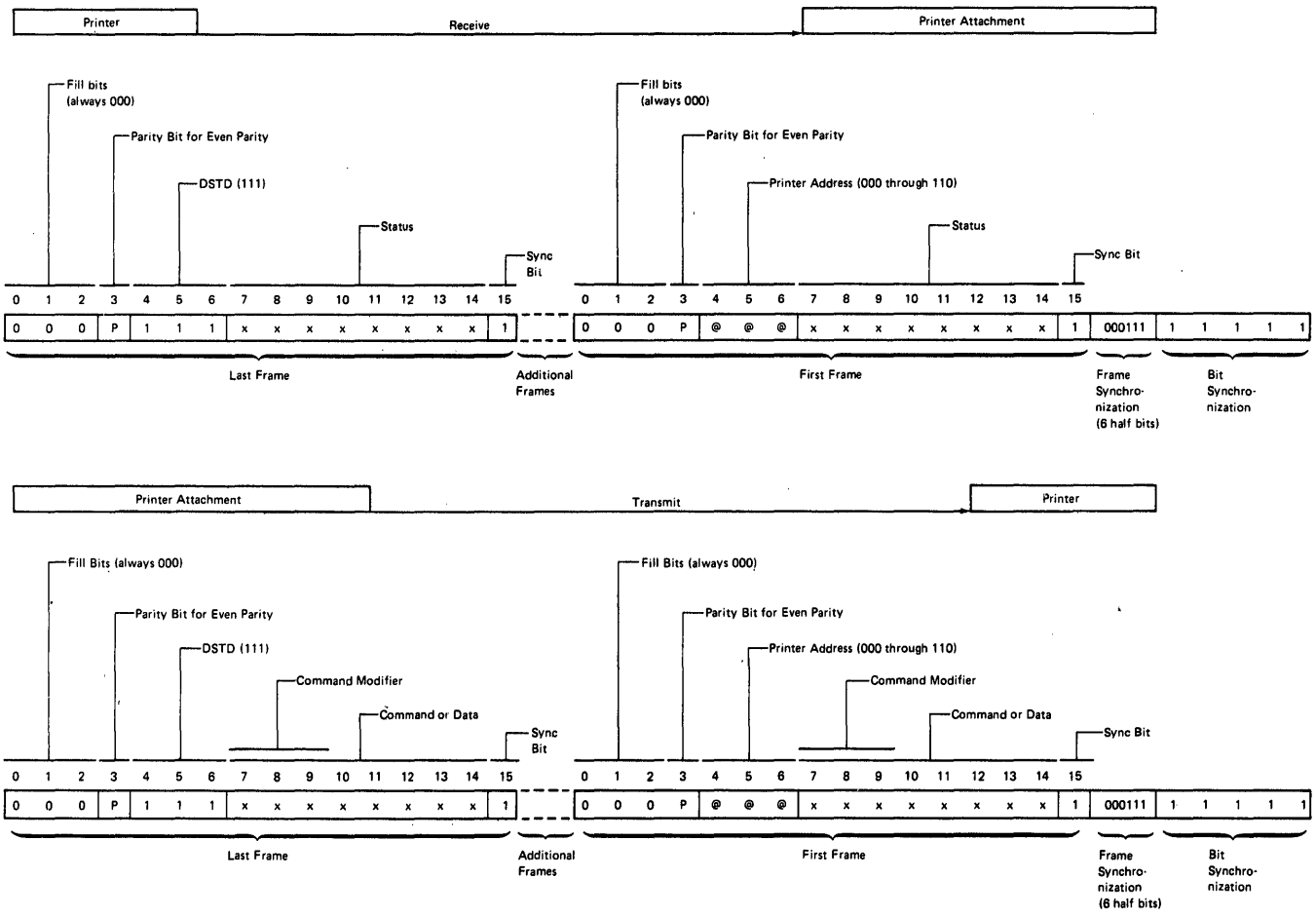
Each bit of the 16-bit frame to and from the printer is bi-phase encoded to ensure that a transition occurs during each bit time (a 0 to a 1 transition for a 0 bit and a 1 to a 0 transition for a 1 bit). Because the transition divides the bit into two parts, the term half bit is used in the following description. No transition during a bit time is called a *code violation.*

When information is to be sent on the twinaxial cable, a pattern of five 1-bits (1010101010 half bits) are sent to establish bit synchronization. Immediately after the 1-bits, the code violation (three half-bit 1's and three half-bit 0's) is sent to establish frame synchronization. After the frame synchronization, the frame is sent starting with the sync bit as shown in the following illustration:



Transmission Sequence

As shown in the following illustration, the 16-bit frame carries 12 bits of information:



The fill bits, always 000, act as a timing delay. The parity bit makes the number of active bits in the frame even. The printer decodes the address bits (4 through 6) and responds to the address by sending a response frame that contains the address. Printer address bits of 111 indicate a DSTD (data stream termination delimiter), which indicates the end of the message and causes a line turnaround. A line turnaround extends from the time a printer receives the last bit of a frame until the same printer starts sending bit and frame synchronization bits. Bits 7 through 14 are the data or command sent by the printer or the twinaxial printer adapter Bit 15 (always 1) is the synchronization bit for both the twinaxial printer adapter and the printer.

The transmission rate is 1.0 MHz (16 microseconds per frame). The frame bit assignment during both transmit and receive operations is shown in the previous illustration.

Twinaxial Printer Interface Commands

The following commands are generated by the twinaxial printer MPU and sent through the twinaxial printer adapter to the printer in the command frame. These commands are not programmed by the user.

Activate-Read Command (0000 0000)

The activate-read command is inserted between a read status command and the data frame that follows it. The activate-read command is issued when a not-busy, no-exception, and no-line-parity response is returned to a poll command following the read command.

Activate-Write Command (0000 0001)

The activate-write command is inserted between a write-data command and the data frames. This command initiates the start of the data transfer that follows a write-data command. The activate-write command is not issued until a not-busy, no-exception, and no-line-parity error response is returned to a poll command following the write command.

Clear Command (0001 0010)

The clear command is issued by the printer MPU to cause the printer to clear all printer buffers. This command does not move the forms.

Poll Command (xxx1 0000)

The poll command is issued by the printer attachment to the printer to initiate the transfer of two status words. At power-on time, a single frame response is made until the printer receives a set mode command. The *xxx* shown in the command bit configuration is a command modifier. The bit configuration of the command modifier bits is as follows:

Bit(s)	Meaning
0xx	Not used.
x1x	Acknowledges and resets the line parity error response bit in the printer. This bit is effective after a not-busy status is received from the printer.
xx1	Acknowledges the last status transmission to allow new status to be sent. With this bit on, updated responses from the printer will be transmitted when they are available.
xx0	Acknowledges the last status transmission to allow new status to be sent. With this bit off, the previous response frames from the printer are retransmitted.

Read-Status Command (1000 1000)

The read-status command initiates the transfer from the printer of one status word that contains information about the condition of the printer. If poll response frame 1 has bit 10 on (indicating outstanding status), the printer MPU responds with a read-status command.

Reset Command (0000 0010)

The printer MPU issues the reset command when the MPU detects an invalid combination of IOB bits. Printing is completed for any line that was being printed when the reset command was received. The printer responds as follows:

- Runs the power-on check
- Sets default options
- Clears the mode that was set
- Gates the twinaxial cable driver and receiver (printer goes on line)
- Sends the power-on transition status response to the printer attachment

Set-Mode Command (0001 0011)

The set-mode command causes the printer to accept one mode control byte that specifies the number of times an 8-bit fill increment will be repeated between frames. The printer MPU specifies nine bytes of fill between frames. The fill bytes are used to adjust response timing. The set-mode command is issued after power-on reset when the main MPU places an OPEN instruction in the printer IOB.

Write-Control-Data Command (0000 0101)

This command causes the printer to use the following frame to conditionally reset outstanding and exception status.

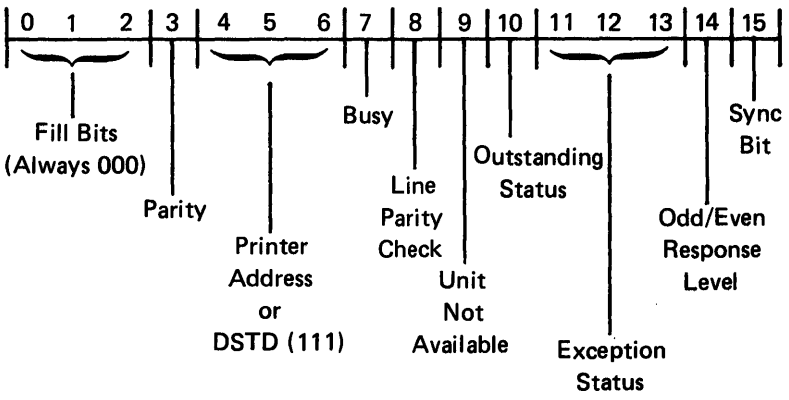
Write-Data Command (0001 1110)

The write-data command causes the printer to store all the data frames that follow the next activate-write command.

POLL RESPONSE FRAMES FROM THE PRINTER

Frame 1

Frame 1 is a one-frame response sent to the twinaxial printer adapter after the printer has been polled following a power-on reset. The twinaxial printer adapter receives frame 1 and the twinaxial printer attachment MPU returns a set-mode command. Poll response frame 1 contains the following information:



Bit 7: 0 = Not busy
1 = Busy

Bit 8: 0 = No line parity error
1 = Line parity error

Bit 9: 0 = Unit available
1 = Unit not available

Bit 10: 0 = No outstanding status
1 = Outstanding status (available by using the 'read status' command)

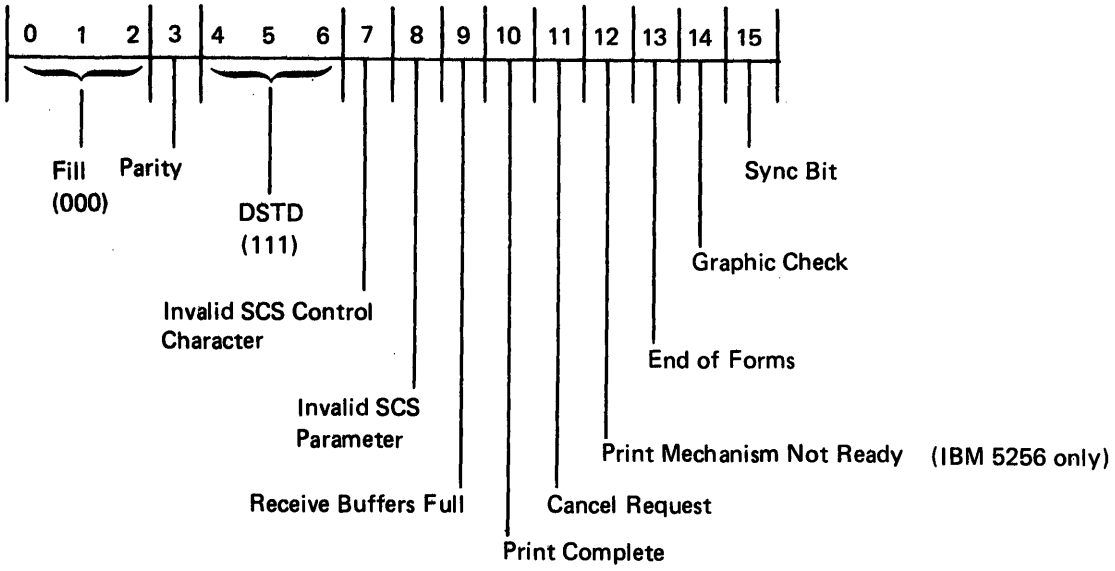
Bits 11, 12, and 13:

Bit 11	Bit 12	Bit 13	Meaning
0	0	0	No exception status
0	0	1	Activate lost (parity)
0	1	0	Invalid activate
0	1	1	Not used
1	0	0	Invalid command or device ID
1	0	1	Input queue or storage overrun
1	1	0	Not used
1	1	1	Power on transition

Bit 14: By analyzing bit 14, the twinaxial printer adapter determines whether the information in the response frame is the same as that in the previous response frame or if the information has changed. Bit 14 is turned off at power-on. Any change in the response frame changes bit 14 from its previous state.

Frame 2

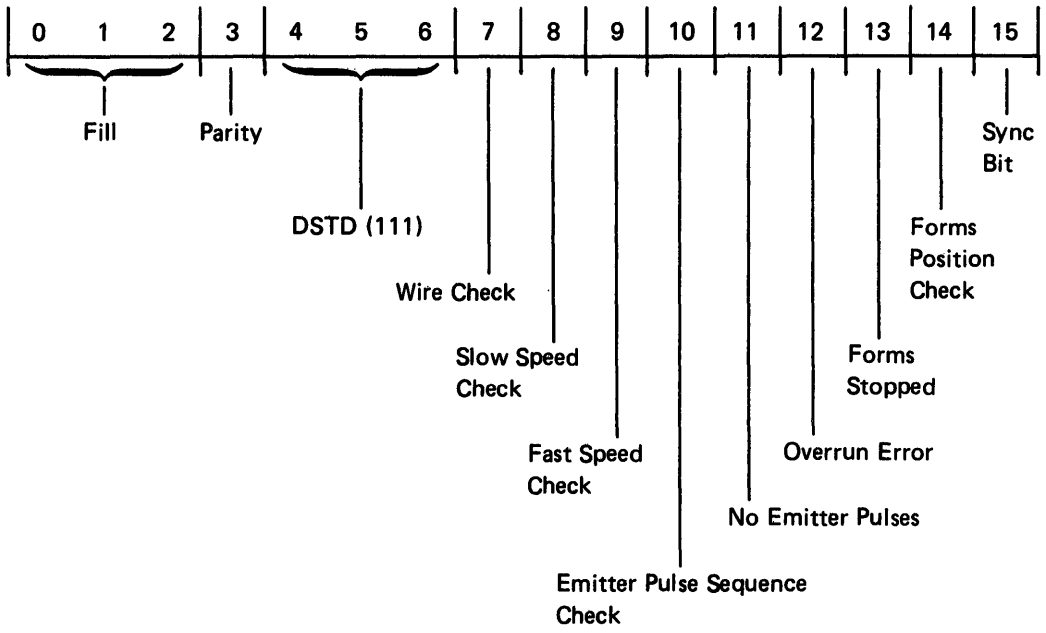
A frame 2 response is sent for every poll command following a set-mode command defining the interframe fill length. Poll response frame 2 contains the following information:



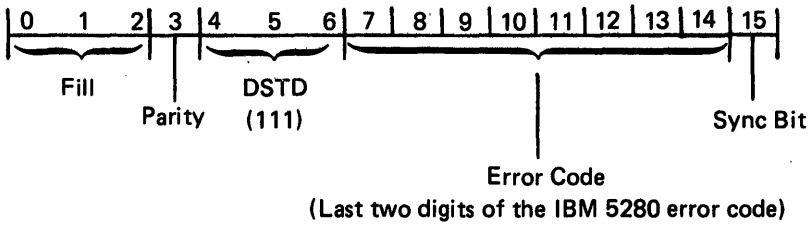
Read-Status Response Frame

One response frame is returned for every read-status command. The response frame, returned only after the activate-read command is received, contains the following information:

IBM 5256



IBM 5224 and IBM 5225



Start-Stop Printer Attachment

The start-stop printer attachment consists of the start-stop printer adapter and the start-stop printer attachment MPU. The start-stop printer adapter controls the transfer of data and commands to the printer as instructed by the start-stop printer attachment MPU. Each printer is attached by a four-wire, twisted pair, start-stop cable to a port of the start-stop printer adapter.

The start-stop printer adapter sends commands and data to the printer and receives status information from the printer in an 11-bit start-stop frame. The 11-bit start-stop frame is described later in this section (see *11-Bit Frame Concept).*

Refer to logic diagram LD18 in the *System Logic Manual* while you read the following description.

The components of the start-stop printer adapter are as follows:

- Driver/receivers (one for each port)
- Timing and control logic
- Port control logic
- Serdes (serializer/deserializer-asynchronous receive/transmit logic)

Driver/Receivers

The driver/receivers provide the interface between the start-stop printer adapter and the start-stop cable. One driver/receiver circuit is provided for each port. The receiver accepts incoming data from the receive pair of the four-wire start-stop cable and the driver transmits data on the transmit pair of the cable in a full duplex mode.

Timing and Control Logic

The timing and control logic provides the clocks for operation of the serdes. The control logic provides gating and control lines which operate as directed by commands issued by the start-stop printer attachment MPU.

Port Control Logic

The port control logic uses control lines from the control logic to select either internal wrap mode or gating to the start-stop cable.

Serdes

The serdes accepts data from the IOD register and converts the data from parallel to serial. The serdes also formats the data into an 11-bit frame by adding the proper start and stop bits to the data for transmission to the printer. The serdes converts the serial data received from the printer to parallel data and signals the start-stop printer attachment MPU that data is available from the printer.

START-STOP ADAPTER EXAMPLE OPERATION

The following example shows how data is sent from main storage to an attached printer:

1. When the main MPU reads a printer write instruction, it places the instruction in the printer IOB and turns on the attention line to the start-stop printer attachment MPU.
2. The start-stop printer attachment MPU senses the attention line and reads the instruction in the IOB (see *Main Storage Accessing* in this section for an example of how an MPU accesses main storage to read or write data).
3. The start-stop printer attachment MPU receives the data from the main MPU and transfers the data to the printer storage area in main storage. The start-stop printer attachment then performs calculations to determine how much data is to be sent to the printer in each block.
4. The start-stop printer attachment MPU issues a read status command to the start-stop printer adapter. The start-stop printer adapter loads the serdes status byte into the IOD register. The start-stop printer attachment MPU then reads and evaluates the contents of the IOD register. If no errors or "break received" indication is present, the start-stop printer attachment MPU prepares to send data to the printer by issuing write control information commands.
5. A byte of data to be transmitted to the printer is loaded into the IOD register. A write data command is then issued inthe EAR register to the start-stop printer adapter.

6. The control logic interprets the command and causes the serdes to be loaded from the IOD. The serdes adds the start bit, serializes the data byte, adds the parity bit and stop bit and sends the 11-bit frame through the driver to the port control logic.

7. The port control logic either gates the 11-bit frame to the transmit pair of the start-stop cable or wraps the frame back to the receiver as directed by the write data command.

8. Steps 4 through 7 will be repeated until 16 data bytes have been transmitted.

9. The start-stop printer attachment MPU then waits for a response from the printer. When the status byte in the IOD register indicates that the printer received the data, the start-stop printer attachment MPU checks for a resume response from the printer.

10. Steps 4 through 9 will repeated be until all of the data has been transmitted.

The following example shows how status is received from a printer:

1. The start-stop printer attachment MPU clears the IOD register and loads the read status command into the EAR register. This causes the control logic to load the serdes status byte into the IOD register.

2. The start-stop printer attachment MPU checks the IOD register for any errors of "break received" indication. If these are not present, the start-stop printer attachment MPU loads the IOD register with the break request parameter and issues a write control information command to the start-stop adapter.

3. The break request signal is sent to the printer.

4. The printer detects the break request signal and sends a break signal to the start-stop printer adapter. This break signalling sequence alerts the printer that the data frame received will be a printer command.

5. The start-stop printer attachment MPU clears the IOD register and issues a read status command to the start-stop adapter.

6. When the status byte in the IOD register contains a "break received" indication, the start-stop printer attachment MPU turns off break request and loads the transmit enable parameter into the IOD register.

7. The start-stop printer attachment MPU issues a write control information command.

8. The start-stop printer attachment MPU loads the start-stop printer command, status request, into the IOD register. The EAR register is then loaded with the write data command and the start-stop printer command is issued to the printer.

9. The start-stop printer attachment MPU loads the IOD register with the receive enable parameter and issues the write control information command to the start-stop adapter.

10. The IOD register is cleared and the read status command is loaded into the EAR register. The start-stop printer attachment MPU will repeat the read status command sequence until the status indicates "data received"

11. The printer receives the status request printer command and responds with a byte of read status as requested by the command.

12. The read status is received by the receiver and sent to the serdes where the start bit is detected and the data byte is accumulated. When the stop bit is detected, the serdes status bit for "data received" is set.

13. When the "data received" status is indicated, the start-stop printer attachment MPU clears the IOD register and issues a read data command to the start-stop adapter. This command causes the received data to be loaded into the IOD register.

START-STOP PRINTER ADAPTER COMMANDS

The following is a description of each command issued by the start-stop printer attachment MPU to the start-stop printer adapter.

Transmit Commands

Write Control Information

The start-stop printer attachment MPU controls the serdes functions by loading the desired function or control into the IOD register and issuing the write control information command to the EAR register. The control logic interprets the command and causes the indicated function to occur.

There are eight versions of the write control information command; two for each of the four ports. Four of the versions are used to gate the transmit/receive data to the start-stop cable. The other four versions are used to cause the data to wrap from the transmit driver to the receiver.

The functions available using the write control information (both transmit and wrap) command are:

- Internal reset of the start-stop printer adapter.
- Reset of start-stop printer adapter errors.
- Break request.
- Receive enable.
- Transmit enable

Write Data

The start-stop printer attachment MPU uses this command to cause data and printer commands to be transmitted to the printer. The data to be transmitted is placed in the IOD register. If a printer command is to be issued, the write data command must be preceded by an interface break command sequence.

There are eight versions of the write data command; two for each of the four ports. Four of the versions are used to gate data to the transmit pair of the start-stop cable. The other four versions are used to cause a wrap from the transmit driver to the receiver.

Receive Commands

Read Status

The start-stop printer attachment MPU issues this command to the start-stop printer adapter to read the status in the serdes. Wehn this command is placed into the EAR register, the start-stop printer adapter gates the serdes status into the IOD register.

There are eight versions of the read status command; two for each of the four ports. Four of the versions are used when the data transmit/receive function is gated to the start-stop cable. The other four versions are used when the data transmit/receive function is wrapped from the driver to the receiver.

Read Data

The start-stop printer attachment MPU issues this command (while receive enable is set) to access the printer response data in the serdes. When this command is loaded into the EAR register, the control logic causes the serdes data to be loaded into the IOD register.

There are eight versions of the read data command; two for each of the four ports. Four of the versions are used to gate the receive data from the start-stop cable into the receiver. The other four versions are used when the transmitted data is wrapped from the driver to the receiver.

Special Control Commands

There are two special control commands: set twinaxial mode and set start-stop mode. These commands are used to allow the start-stop adapter and the twinaxial adapter to be accessed by the same printer attachment MPU.

Start-Stop Printer Interface Commands

Diagnose (DIA) Hex 11

This command causes the start-stop printer to execute its internal diagnostics. After the internal diagnostics run, the start-stop printer returns an exception acknowledge response (EXCACK) and waits for the start-stop printer attachment MPU to request the status byte.

Sense (SEN) Hex 12

This command, when used with PRO command, requests a two-byte sense response from the start-stop printer. The first sense byte is sent in response to the SEN command. The second sense byte is sent in response to the PRO command.

Restart (RST) Hex 13

This command causes the start-stop printer to resume printing from its buffer following a device exception.

Receive Block Clear (RBC) Hex 08

This command causes the start-stop printer to clear the last partial block from the print buffer. If the integrity of the last block is questionable, the start-stop printer attachment MPU transmits an RBC command and the start-stop printer responds with RES command. Normal data transfer then continues with the start-stop printer attachment re-transmitting the interrupted data block.

Clear (CLR) Hex 3B

This command clears the print buffer and resets all internal printer error status except device check. If a printer operation is in progress, that operation is completed before executing the CLR command. The CLR command does not reset optional parameters.

Status Request (STR) Hex 3C

This command requests status information from the start-stop printer. The start-stop printer returns a one-byte status response.

Proceed (PRO) Hex 2C

This command is issued by the start-stop printer attachment MPU in response to a HLD command from the start-stop printer to obtain the second sense byte or to obtain the second read ID byte.

Resend (RSD) Hex 3E

This command causes the start-stop printer to resend the last byte transmitted to the start-stop printer attachment MPU.

Read ID (RID) Hex 1B

This command causes the start-stop printer to identify itself with a two-byte response. The first byte is sent in response to the RID command. The second byte is sent in response to a PRO command.

Hold (HLD) Hex 30

This command is used to pace the start-stop printer port data rate. It causes the start-stop printer attachment MPU to stop transmitting data until the start-stop printer issues a RES command. (An RES command can only be issued after a PRO command is received from the start-stop printer attachment MPU.)

Resume (RES) Hex 31

This command causes the start-stop printer attachment to resume transmitting data. It is issued by the start-stop printer following a HLD-BREAK-PRO sequence, in response to a CLR-RBC-RST sequence, or after successful reception of 16 bytes (1 data block) of data.

Exception Acknowledge (EXCACK) Hex 28

This command is issued in response to a DIA command from the start-stop printer attachment MPU to indicate that the diagnostics are complete and status is available. IF EXCACK is issued in response to any command other than DIA, it indicates that an error other than a transmission parity error has occurred in the start-stop printer.

Exception Negative Acknowledge (EXCNAK) Hex 29

This command is an unsolicited transmission from the start-stop printer to the start-stop printer adapter. It indicates that a data transmission error has occurred on the start-stop interface.

Start-Stop Printer Addressing

The start-stop printer attachment MPU selects a printer by selecting the port to be used. Only one start-stop printer can be attached to each port and the address for that printer is always 000. The port addressing is as follows:

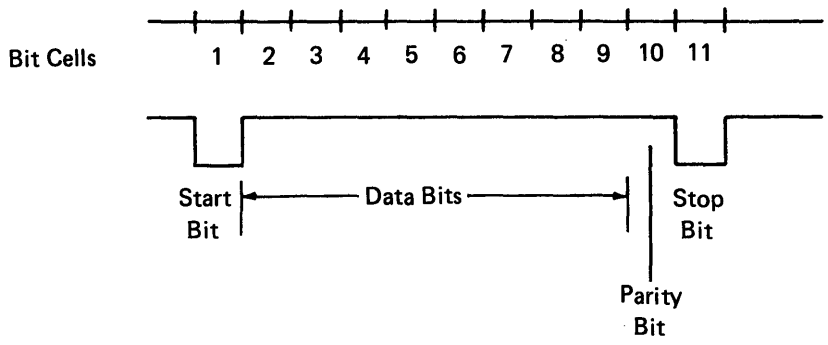
Bit(s)	Meaning
0-1	Not used
2-5	Printer address
6-7	Not used

For a description of the printer addresses that can be assigned, see 705 in the maintenance section.

START-STOP PRINTER ATTACHMENT 11-BIT FRAME CONCEPT

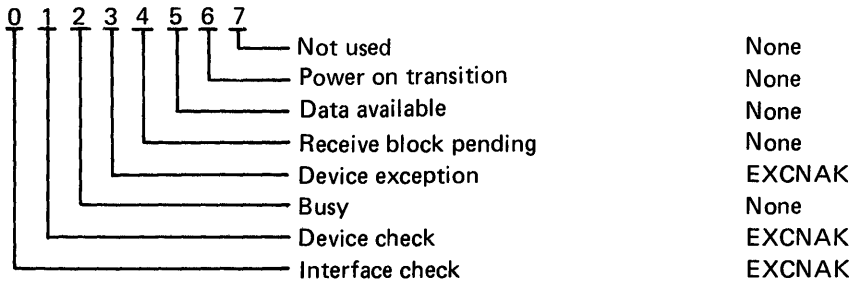
Information between the start-stop printer adapter and the start-stop printer is transmitted by an 11-bit frame.

Start-Stop Encoding



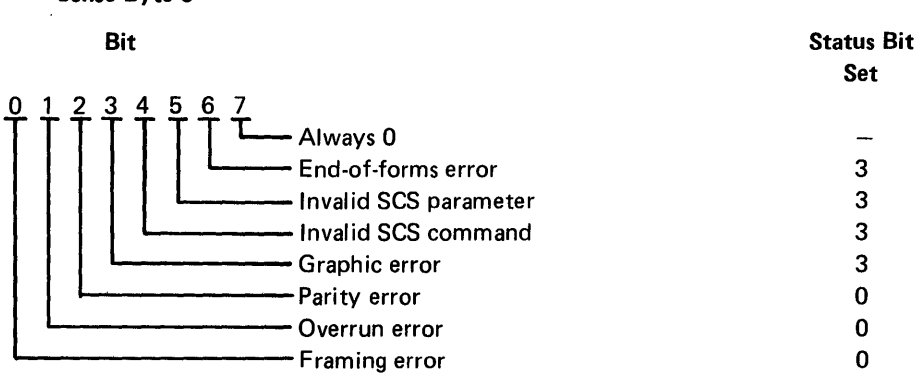
Status-Byte

The status byte is sent to the start-stop printer adapter in response to a STR command.

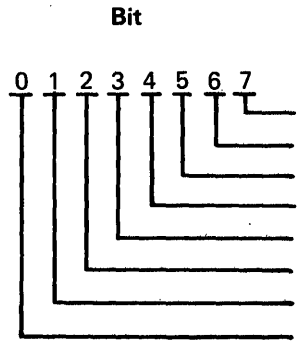


Sense Bytes

The two sense bytes are sent to the start-stop printer adapter in response to a SEN-PRO command sequence. The first byte is sent following the SEN command. The second byte is sent following the PRO command.



Sense Byte 1



Bit		Status Bit Set
7	Always 1	–
6	Incorrect switch setting	3
5	Buffer read error	1
4	CPI/LPI switch error	1
3	End-of-forms switch error	1
2	Left margin error	1
1	Power supply	1
0	Buffer overrun error	1

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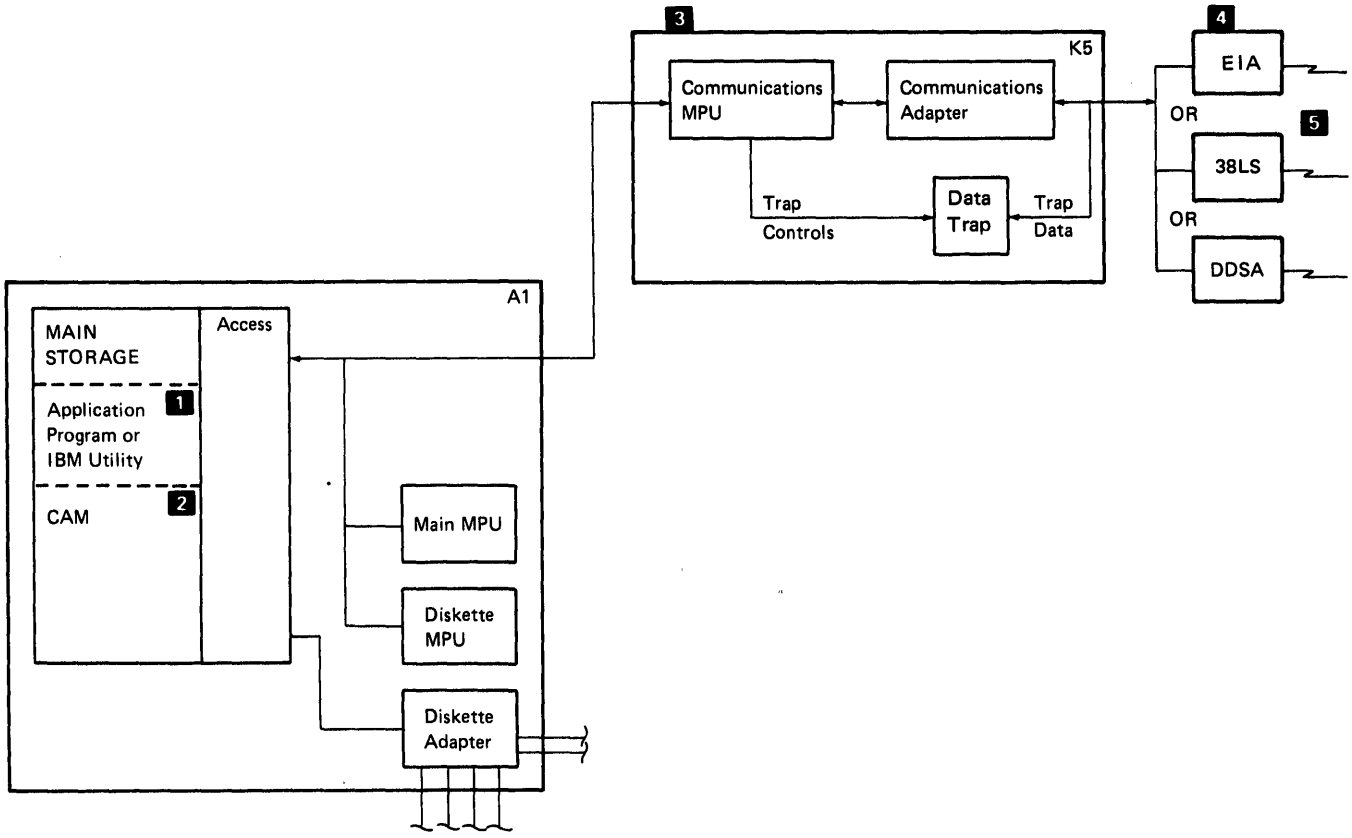
Communications Attachment

As shown in the following diagram, the major components required to permit the IBM 5280 to communicate with a remote station are:

1. An application program in main storage (user written or IBM utility)
2. A CAM (communications access method) program in main storage
3. A communications MPU card
4. A line adapter card
5. Data communications equipment



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Appendix A

RPQs

At the time this book was printed, there were no RPQs available for the IBM 5285. Future RPQs will include a page or pages to be inserted into appendix A.

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Index

Technical Newsletter

This Newsletter No. SN20-9580
Date February 27, 1981
Base Publication No. SY31-0600-1
File No.
Previous Newsletters SN20-9643

IBM 5280
Distributed Data
System

IBM 5285 Programmable Data Station
Maintenance Information Manual

This technical newsletter provides replacement pages for the subject publication. Pages to be inserted and/or removed are:

v, vi	192.1, 192.2 (added)	223 – 226
91, 92	193, 194	
143 – 152	215, 216	

Changes to the text and illustrations are indicated by a vertical line at the left of the change.

Summary of Amendments

- Correction of errors in the base manual
- Clarification of SYSTEST

Note: *Please file this cover letter at the back of the manual to provide a record of changes.*

IBM Corporation, Information Design and Development, Department 997, 11400 Burnet Rd., Austin, Texas 78758

Printed in U.S.A.

525 FAN REMOVAL AND REPLACEMENT

Removal

1. Power off.
2. Remove the data station covers (031).
3. Remove the fan shroud (515).
4. Disconnect the AC wires from the fan motor.
5. Remove the fan motor from the fan shroud.

Replacement

For replacement of the fan, reverse the steps in the removal procedure. Ensure that the fan is installed so the air moves away from the logic cards.

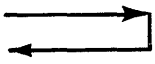
531 NET LIST

The net list shows all lines in alphabetic order and each logic pin to which the line is connected. This is not a point-to-point net list.

Line Name	Card Row A	B	C	D	Comm E	Feature Main MPU E
+access 0 dr 4800			1D06	1D06		
+access 0 dr 4C00			1D07	1D07		
+access 1 dr 4800			1B07	1B07		
+access 1 dr 4C00			1D05	1D05		
+advance bit ring			8D02	5B09		5B09
-allow comm	1B02				5D09	
-attn from comm			4B07			7D04
-attn from diskette			4D07			7D07
-attn from kbd/display	4D06		4D06			7B07
-attn from printer			4B09	5D02		7B02
-attn from 1 TP			4D09			7B03
-attn from 2 TP			4B08			7D02
-attn to comm See note 4			4D11		5B02	
-attn to diskette See note 5			4B13			7B08
-attn to diskette See note 4			4B13			
-attn 1 to diskette See note 5			5B09			7D05
-attn to kbd/display See note 4	4D13		4D13			
-attn to kbd/display See note 5	4D13					7D09
-attn 1 to kbd/display See note 5			4D13			7D10
-attn to printer See note 5				5B02		7B11
-attn to printer See note 4			4B12	5B02		
-attn 1 to printer See note 5			4B12			7B12
-attn to 1 TP			4D12			7D12
-attn to 2 TP			4D10			7D13
-bit req 1			5D02			
-bit req 2			7D13		5B04	
-bit req 3			7D12			
-bit req 3 (I/O)	3D02				1D05	1D05
-bit req 4			7D11	5B04		
-bit req 4 (I/O)	3B08					
-bit req 5	2B02		7D10			
-bit req 5 (I/O)	3B07					
-bit req 6			7D09			
-bit req 7			7D07			
-bit req 8			7D06			8B12

Communications Cable Diagrams

The communications cable diagrams show cable connections and probe points for the various IBM 5285 communications configurations. The tables associated with the diagrams show cable connector, board, and test point pin numbers. The tables also show level-2 and level-3 wrap paths for wrap tests. A level 2 wrap is an internal wrap on the EIA/CCITT, DDSA, or 38LS card. A level 3 wrap is an external wrap at the IBM 5285 connector panel; connector J140. The following legend is used to show signal direction and wrap paths.



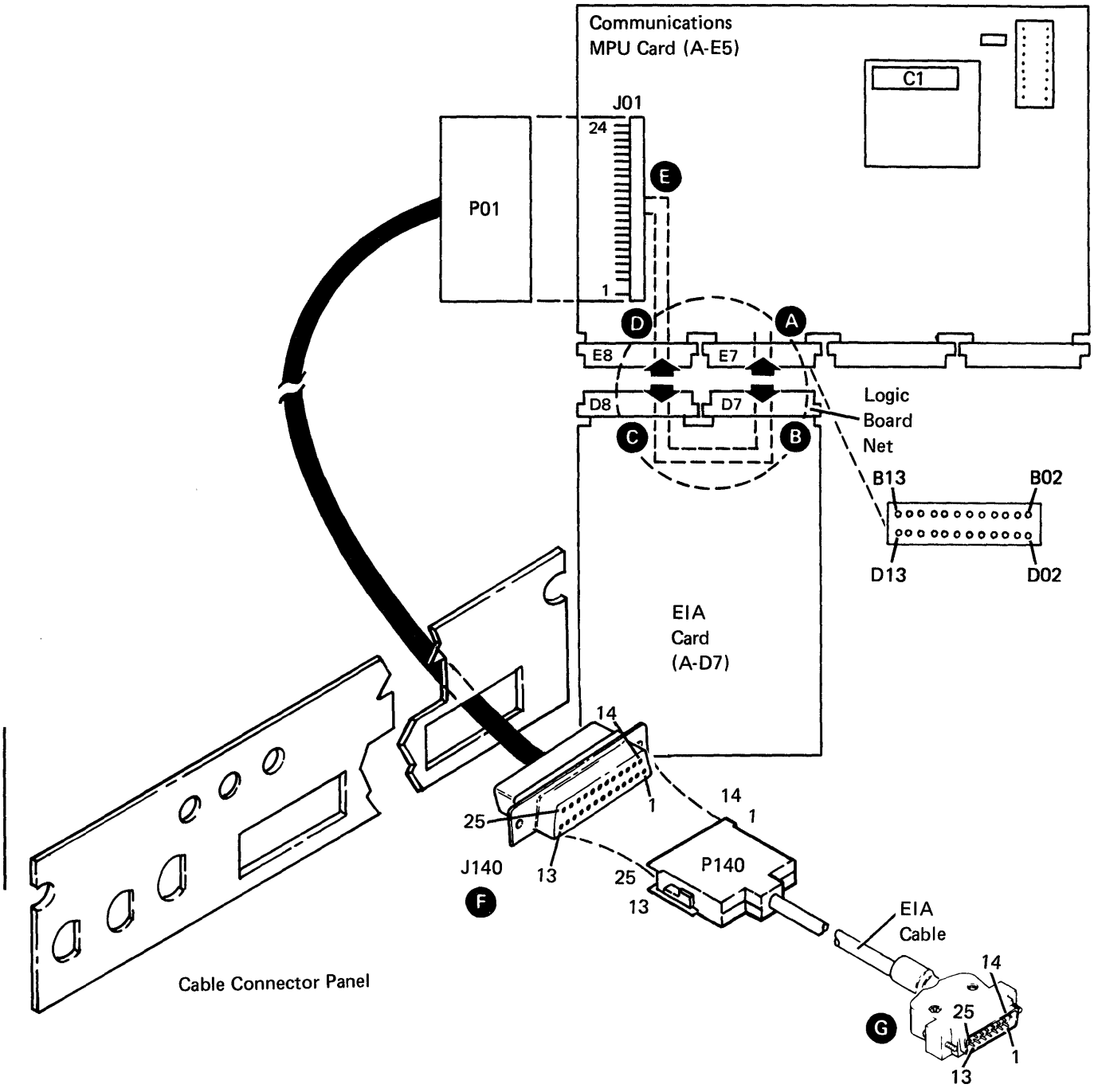
Signal is wrapped

Signal is not wrapped

Pins are common

861 EIA/CCITT CABLE DIAGRAM

The EIA/CCITT cable diagram and table shows the signal path from the communications MPU card to the connector panel. The table also indicates probe points that can be referenced by the MAPs. See 901 for information on how to use the cable diagram. The arrow (→) indicates the logical direction of the signal.



861 EIA/CCITT CABLE DIAGRAM (continued)

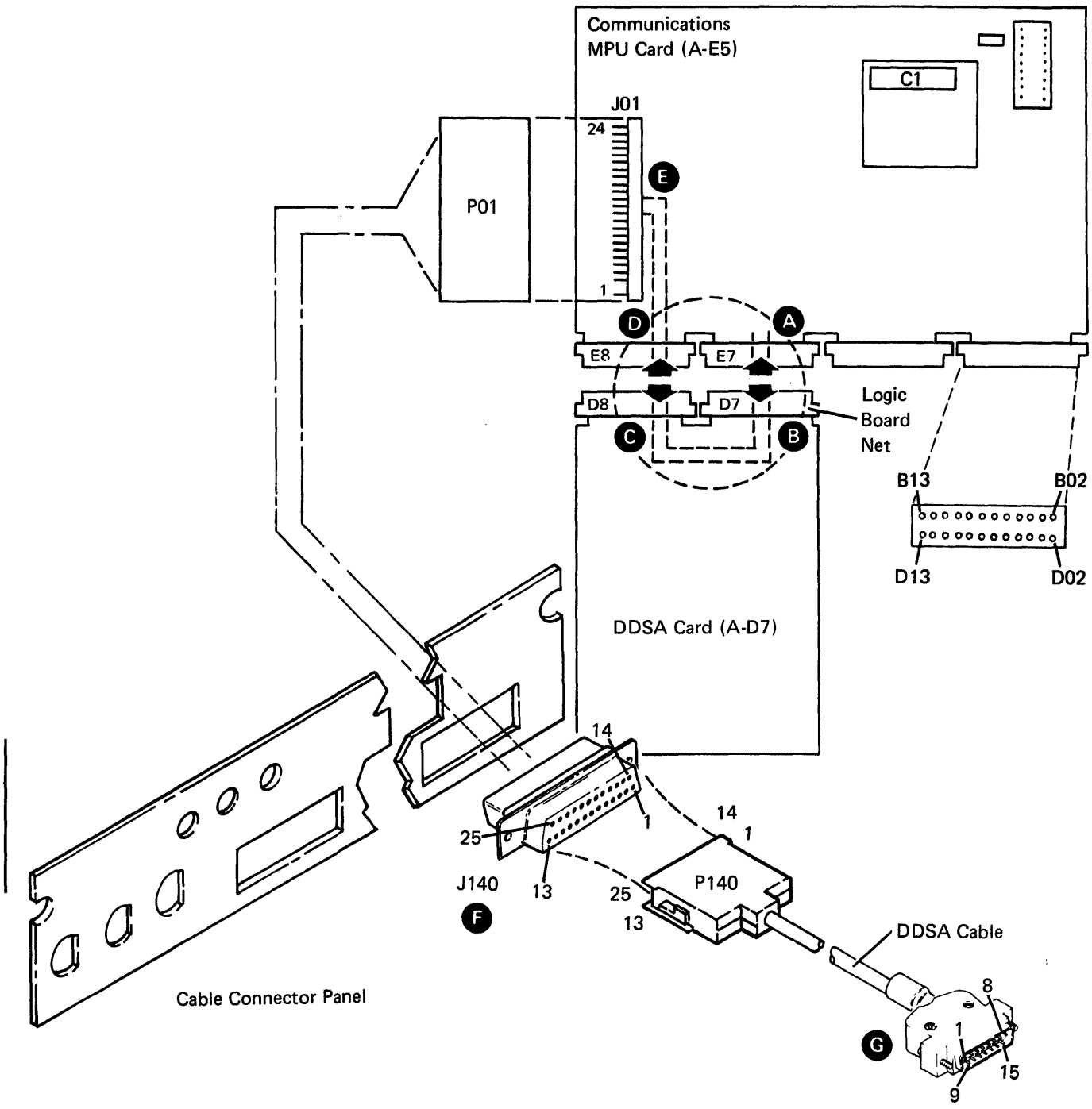
Line Name	Line Type	Comm MPU Card (A)	EIA Card (B)	EIA Level 2 Wrap	EIA Card (C)	Line Name - (see Note 2)	Comm MPU Card (D)	Comm MPU Card E5J01 (E)	Conn J140 (F)	Wrap Conn Level 3 Wrap
		Probe Points								
-data term rdy	Transmit	E7B02	D7B02	→	D8D02	+data term rdy (cable)	E8D02	15	20	→
-data set rdy	Receive	E7B13	D7B13	←	D8D09	+data set rdy (cable)	E8D09	06	06	←
-rate sel	Transmit	E7B04	D7B04	→	D8D06	+rate sel (cable)	E8D06	10	23	→
-xmit clk	Receive	E7B07	D7B07	←	D8D04	+xmit clk (cable)	E8D04	12	15	←
-rec clk	Receive	E7B08	D7B08	→	D8D10	+rec clk (cable)	E8D10	16	17	←
-sel standby	Transmit	E7B03	D7B03	→	D8B05	+sel standby (cable)	E8B05	11	11	→
-ring ind	Receive	E7D12	D7D12	←	D8B13	+ring ind (cable)	E8B13	21	22	←
-req to send	Transmit	E7D02	D7D02	→	D8B03	+req to send (cable)	E8B03	17	04	→
-clear to send	Receive	E7D13	D7D13	←	D8B10	+clear to send (cable)	E8B10	14	05	←
-carrier det	Receive	E7B12	D7B12	←	D8D12	+carrier det (cable)	E8D12	20	08	←
-test control	Transmit	E7B05	D7B05	→	D8D07	+test control (cable)	E8D07	09	18	→
-test ind	Receive	E7D10	D7D10	←		+test ind				
-EIA wrap	Transmit	E7D05	D7D05	→						
+xmit line data	Transmit	E7D04	D7D04	→	D8B07	-xmit line data (cable)	E8B07	08	02	→
+rec line data	Receive	E7B10	D7B10	←	D8B04	-rec line data (cable)	E8B04	13	03	←
-5 V	Power	E5B06 E7B06	Note 1 Note 1							
+8.5 V	Power	E6B11 E8B11	D8B11							
-8.5 V	Power		D7D07							
signal ground								22	7	

Notes:

1. This line is not used by the EIA/CCITT card.
2. The EIA/CCITT card inverts all EIA/CCITT signals and converts the signal levels at probe points C, D, E, and F to EIA RS-232-C/CCITT V.24-V.28 interface standards. Interface up voltage level is +3 V to +25 V. Down voltage level is -3 V to -25 V.
3. All D03 board pins are at a +5 V level. All D08 board pins are signal ground.

863 DDSA CABLE DIAGRAM

The DDSA cable diagram and table shows the DDSA signal path from the communications MPU card to the DDSA cable connector. The table also indicates probe points that can be referenced by the MAPs. See 901 for information on how to use the cable diagrams. The arrow (→) indictates the logical direction of the signal.



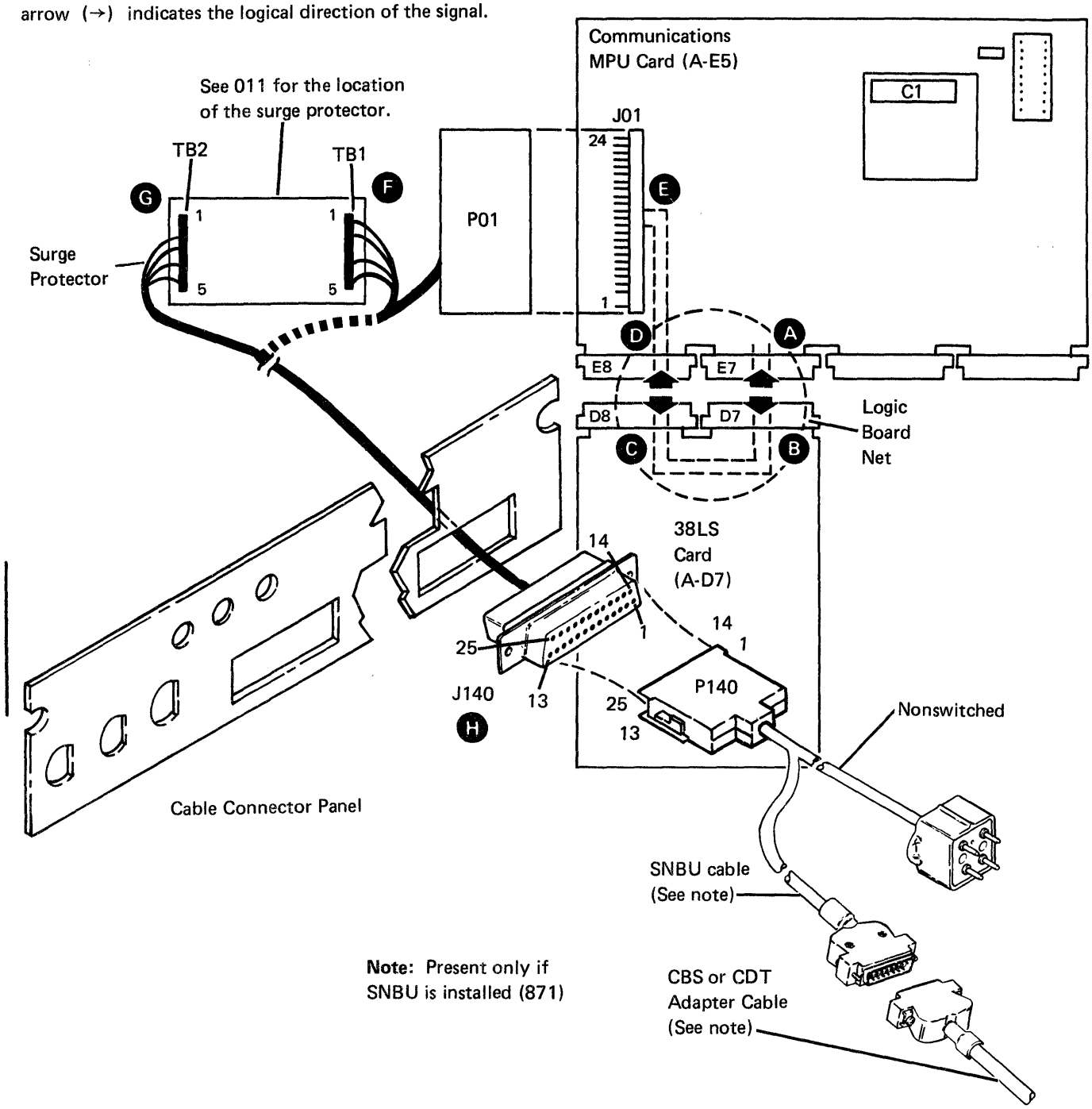
Line Name	Line Type	Comm MPU Card	DDSA Card	DDSA Wrap Level 2	DDSA Card	DDSA Line Names (See Note 2)	Comm MPU Card	Comm MPU CArd E5J01	Conn J140	Wrap Conn Level 3	DDSA Cable Conn
		Probe Points									
		A	B		C		D	E	F		G
-data term rdy	Transmit	E7B02	Note 1								
-data set rdy	Receive	E7B13	D7B13	←							
-rate sel	Transmit	E7B04	Note 1								
-xmit clk	Receive	E7B07	D7B07	←							
-rec clk	Receive	E7B08	D7B08	←							
-sel standby	Transmit	E7B03	Note 1								
-ring ind	Receive	E7D12	Note 1	←							
-req to send	Transmit	E7D02	D7D02	→							
-clear to send	Receive	E7D13	D7D13	←							
-carrier det	Receive	E7B12	D7B12	←							
-test control	Transmit	E7B05	D7B05	→							
-test ind	Receive	E7D10	D7D10	←							
+xmit line data	Transmit	E7D04	D7D04	→	D8B02	+xmit nonsw data	E8B02	03	13	→	5
					D8D05	-xmit nonsw data	E8D05	04	14	→	6
+rec line data	Receive	E7B10	D7B10	←	D8D09	+rec nonsw data	E8B09	01	10	←	3
					D8D13	-rec nonsw data	E8D13	05	12	←	4
-5 V	Power	E5B06	D7B06								
		E7B06									
+8.5 V	Power	E6B11	D8B11								
		E8B11									
-8.5 V	Power		Note 1								

Notes:

1. This line is not used by the DDSA card.
2. The DDSA card converts transmit signals to DDS standards for transmission by the DDS network. The DDSA card converts received DDS signals to IBM 5285 VTL signal levels.
3. All D03 board pins are at +5 V level. All D08 board pins are signal ground.

865 38LS–NONSWITCHED–CABLE DIAGRAM

The 38LS-nonswitched cable diagram and table shows the signal path from the communications MPU card to the connector (J140) on the cable connector panel. The table indicates probe points that can be referenced by the MAPs. Use this diagram for nonswitched networks in the United States and World Trade countries. If the nonswitched card has SNBU, see 867 for SNBU probe points. See 901 for information on how to use the cable diagrams. The arrow (→) indicates the logical direction of the signal.



Note: Present only if SNBU is installed (871)

865 38LS–NONSWITCHED–CABLE DIAGRAM (continued)

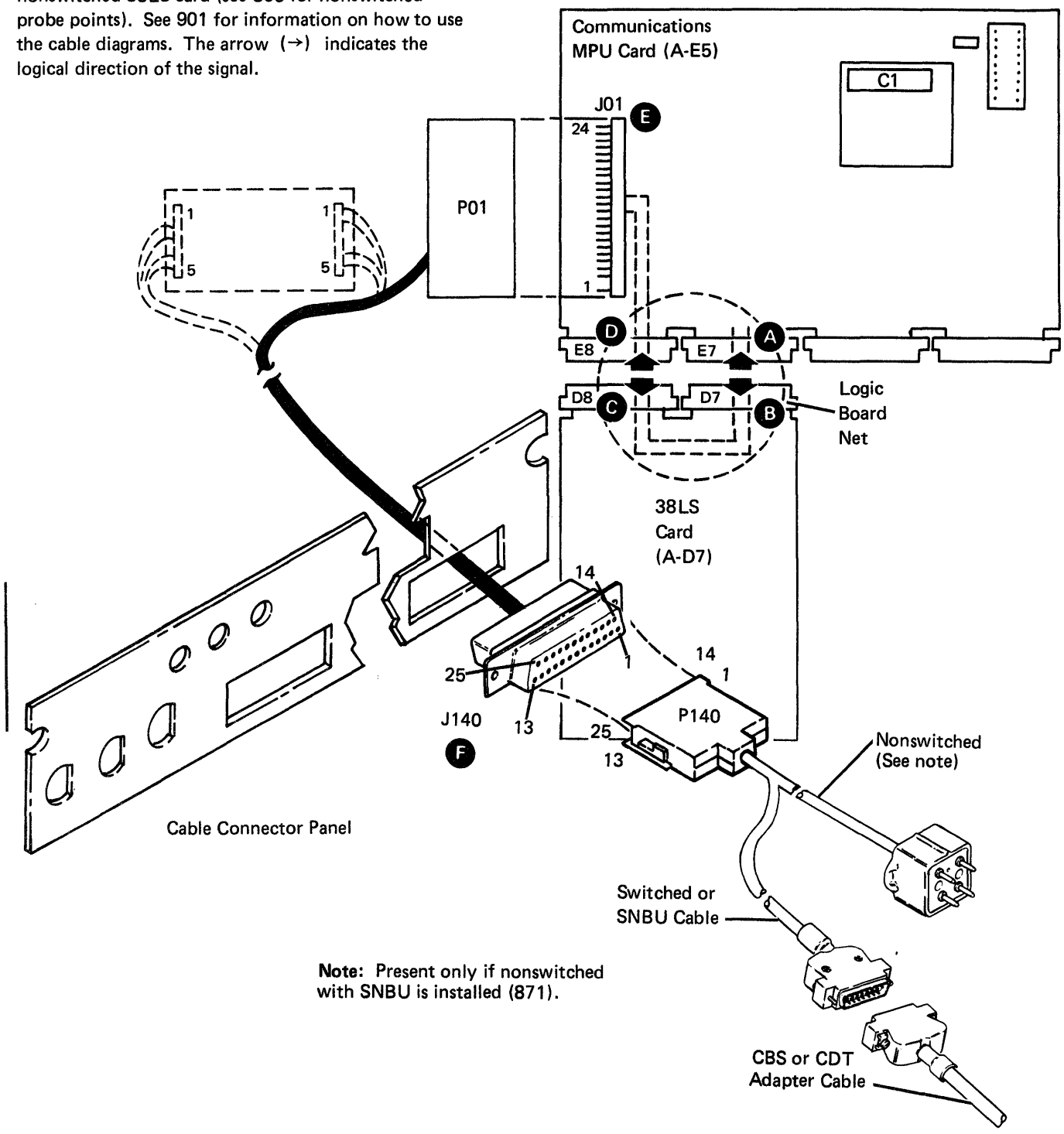
Line Name	Line Type	Comm MPU Card	38LS Card	38LS Wrap Level 2	38LS Card	38LS Lines (See Note 2)	Comm MPU Card	Comm MPU Card E5J01	Surge Protector TB 1	Surge Protector TB 2	Conn J140	Wrap Conn Level 3
		Probe Points										
		A	B		C		D	E	F	G	H	
-data term ready	Transmit	E7B02	D7B02	→								
-data set ready	Receive	E7B13	D7B13	←								
-rate sel	Transmit	E7B04	D7B04	→								
-xmit clk	Note 1	E7B07	D7B07									
-rec clk	Note 1	E7B08	D7B08									
-sel standby	Transmit	E7B03	D7B03	→								
-ring ind	Receive	E7D12	D7D12	←								
-req to send	Transmit	E7D02	D7D02	→								
-clear to send	Receive	E7D13	D7D13	←								
-carrier det	Receive	E7B12	D7B12	←								
-test control	Transmit	E7B05	D7B05	→								
-test ind	Receive	E7D10	D7D10	←								
+xmit line data	Transmit	E7D04	D7D04	→	D8B02	+xmit nonsw data	E8B02	03	4	4	13	→
					D8B05	-xmit nonsw data	E8D05	04	2	2	14	→
+rec line data	Receive	E7B10	D7B10	←	D8B09	+rec nonsw data	E8D09	01	5	5	10	←
					D8D13	-rec nonsw data	E8D13	05	1	1	12	←
-5 V	Power	E5B06 E7B06	D7B06									
+8.5 V	Power	E6B11 E8B11	D8B11									
-8.5 V Note 4	Power		D7D07									

Notes:

1. This line is not used by the 38LS card. However, the communications MPU card might fail if this line becomes shorted.
2. The 38LS card converts transmit signals to analog signals for the communications network. The card converts received analog signals to VTL levels for the communications attachment card.
3. All D03 board pins are at a +5 V level. All D08 board pins are signal ground.
4. On the 38LS card, -8.5 V is used for United States auto-answer only.

867 38LS–SWITCHED OR SNBU–CABLE DIAGRAM

The 38LS-switched or SNBU-cable diagram and table show the signal path from the communications MPU card to the connector (J140) on the cable connector panel. The table indicates probe points that can be referenced by the MAPs. Use this cable diagram for switched networks for the SNBU section of a nonswitched 38LS card (see 865 for nonswitched probe points). See 901 for information on how to use the cable diagrams. The arrow (→) indicates the logical direction of the signal.



Note: Present only if nonswitched with SNBU is installed (871).

867 38LS–SWITCHED OR SNBU–CABLE DIAGRAM (continued)

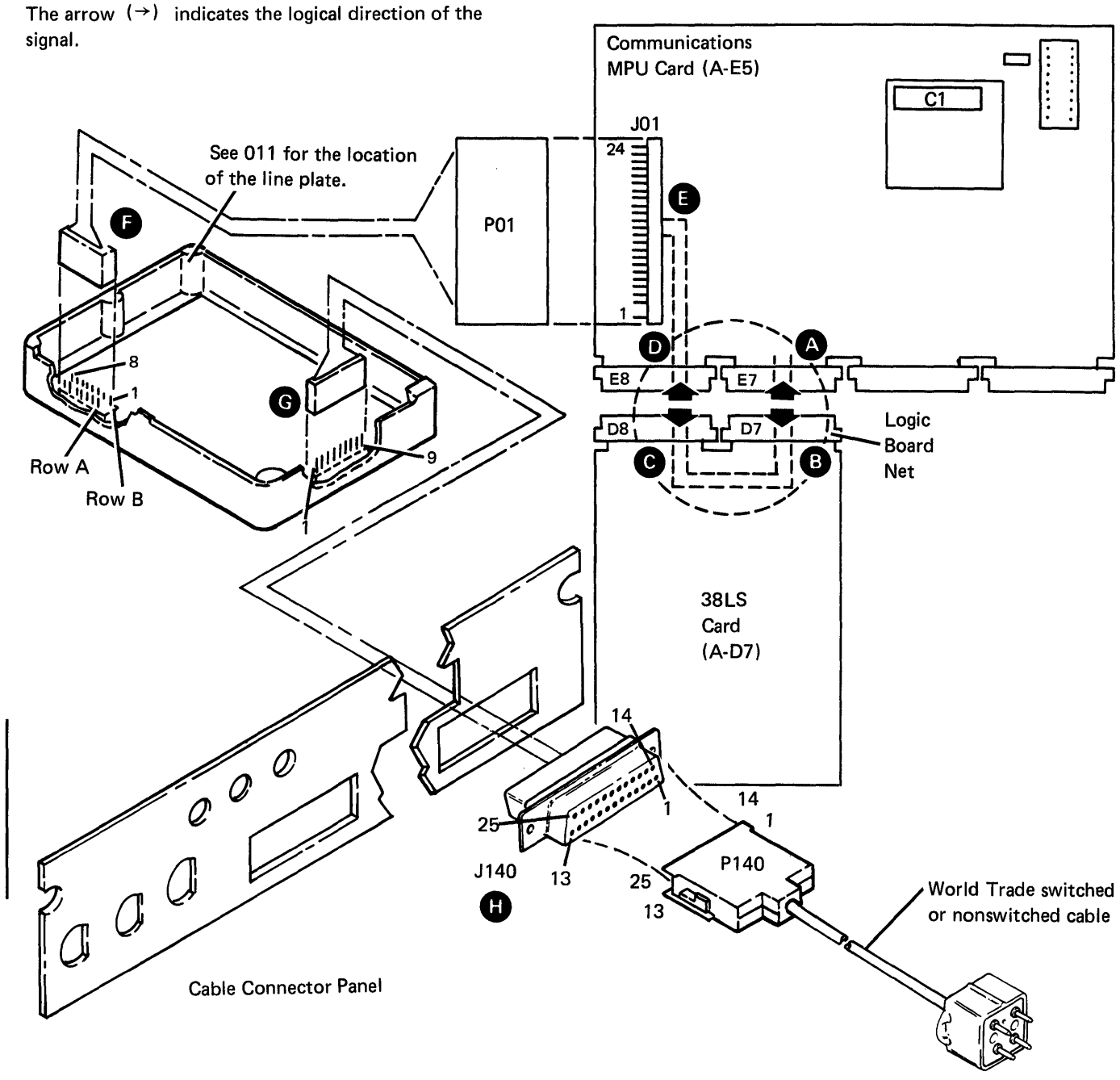
Line Name	Line Type	Comm MPU Card	38LS Card	38LS Wrap Level 2	38LS Card	38LS Lines (See Note 2)	Comm MPU Card	Comm MPU Card E5J01	Conn J140	Wrap Conn Level 3
		Probe Points								
		A	B		C		D	E	F	
-data term ready	Transmit	E7B02	D7B02	→						
-data set ready	Receive	E7B13	D7B13	←						
-rate sel	Transmit	E7B04	D7B04	→						
-xmit clk	Note 1	E7B07	D7B07							
-rec clk	Note 1	E7B08	D7B08							
-sel standby	Transmit	E7B03	D7B03	→						
-ring ind	Receive	E7D12	D7D12	←	D8B13	+ring indicate (RI)	E8B13	21	22	←
-req to send	Transmit	E7D02	D7D02	→						
-clear to send	Receive	E7D13	D7D13	←						
-carrier det	Receive	E7B12	D7B12	←						
-test control	Transmit	E7B05	D7B05	→						
-test ind	Receive	E7D10	D7D10	←						
+xmit line data	Transmit	E7D04	D7D04	→	D7D05	data tip (DT) Note 4	E7D05	07	09	→
+rec line data	Receive	E7B10	D7B10	←	D7D06	data tip (DT) Note 4	E7D06	07	09	←
					D8B03	+off hook (OH))	E8B03	17	04	→
					D8D02	+data modem ready (DA)	E8D02	15	20	→
					D8D09	+coupler cut through (CCT)	E8D09	06	06	←
					D8B10	+switch hook (SH)	E8B10	14	05	←
data ring gnd		E5D08				data ring (DR)		23	21	
-5 V	Power	E5B06 E7B06	D7B06							
+8.5 V	Power	E6B11 E8B11	D8B11							
-8.5 V Note 3	Power		D7D07							

Notes:

1. This line is not used by the 38LS card.
2. All D03 board pins are at a +5 V level. All D08 pins are signal ground.
3. On the 38LS card, –8.5 V is used for United States auto-answer only.
4. This line goes to the 38LS transmit level attenuators on the communications MPU card. If the attenuators are not present, pin E7D05 is jumpered to pin E7D06 on the communications MPU card.

869 38LS–WITH WT LINE PLATE–SWITCHED NETWORK CABLE DIAGRAM

This 38LS cable diagram and table shows the signal path from the communications MPU card through the 38LS card and the WT line plate to the connector (J140) on the cable connector panel. The table indicates probe points that can be referenced by the MAPs. Use this cable diagram when the WT line plate is installed. See 901 for information on how to use the cable diagrams. The arrow (→) indicates the logical direction of the signal.



975 STANDALONE PROGRAMS

System Exerciser Test (SYSTEST)

The system exerciser test verifies correct operation of the various devices on the system. This test should be run at the completion of all calls.

Loading Systest

1. IPL the system using diagnostic diskette 1.
2. When prompt 50-01 is displayed, press the X key; then press the Enter key.
3. If prompt 50-06 is displayed, choose the correct option.
4. When prompt 50-02 is displayed, press the Enter key.
5. When prompt 50-03 is displayed, select the NO option; then press the Enter key.
6. When prompt 50-04 is displayed, select the YES option; then press the Enter key.
7. When prompt 50-05 is displayed, enter the display size; then press the Enter key. (To determine the display size, refer to the system records and to 207.)
8. When prompt 51-05 is displayed, press the Sys Req key.
9. When prompt 50-01 is displayed, press the 2 key.
10. When prompt 50-02 is displayed, press the Z key; then press the Enter key.
11. When prompt 50-00 is displayed, enter PGMLOAD and the address of the diskette drive that contains diagnostic diskette 1; then press the Enter key.
12. When the test menu is displayed, select SYSTEST (option 4); then press the Enter key.

The message 'PROGRAM LOAD IN PROGRESS' will be displayed for approximately one minute.

Running Systest

1. When the date select option is displayed, enter the date in the format DD/MM/YY. For example, March 5, 1980 would be entered as 05/03/80. After you have entered the date, press the Enter key.
2. When the time select option is displayed, enter the time in the format HH:MM. For example, 7 minutes after 10 o'clock would be entered as 10:07. After you have entered the time, press the Enter key.
3. The next screen provides the following 2 options (the default on both options is YES):

   A. Stop on semi-hard error
   If you select the NO option, the test will run until you press the ATTN key. All errors encountered during the test will then be posted. In this mode, SYSTEST can be run overnight or for any length of time desired. If you select the YES option, the test will stop when the first error is encountered. To retry the test, press the Reset key. To exit the test, press the Cancel key. When you press the Cancel key, the option menu described in step 11 will be displayed.

   B. Display current disk ops
   If you select the NO option, the track and sector being tested will not be displayed. If you select the YES option, the track and sector being tested will be displayed.

   Enter your selection; then press the Enter key.
4. When the device select menu is displayed, enter an X in front of the device or devices to be tested; then press the Enter key.
5. The next screen shows the addresses of the devices selected for testing. You have the option of using these addresses or changing the addresses to test a different device. Press the Enter key to test the devices whose addresses are displayed, or, enter the address of the devices you want to test; then press the Enter key.
6. If you selected the printer as one of the devices to be tested, this screen will tell you to make the printer ready. Make the printer ready; then press the Enter key.

7. The next screen permits selection of the test options for the selected diskette drives. If the diskette drive(s) selected for testing are 51TD diskette drives, load a diskette 2 or a diskette 2d into the selected diskette drive(s).

   Option 1. Write/read/read
   Writes the complete diskette and then reads the diskette twice.

   Option 2. Write only
   Writes the complete diskette. This test will continue writing until you terminate the test. To terminate this test, press the ATTN key.

   Option 3. Read only
   You must have completed either the write/read/read test or the write only test before this test can be run. This test reads from the diskette the data that was written in one of the previous tests.

   Select one of the three options; then press the Enter key.

8. The next screen contains a warning that if the diskette drive selected for testing contains the IPL diskette, data on that diskette may be destroyed.

   At this time, insert a good scratch diskette into the drive(s) being tested; then press the Enter key.

9. If the keyboard display test was selected, the next screen permits testing of the keyboard/display unit. Press a key on the keyboard. The character associated with the pressed key will be written to the display screen. Only one character at a time can be tested. To test another character, you must restart the test. At the same time that the keyboard/display is being tested, the diskette drive and printer tests (if they were selected) will be displayed in the format TTHHSS (sector size). To interrupt these tests, press the Attn key.

10. If the keyboard/display option was not selected, the diskette drive(s) and/or printer test will begin and necessary test information will be displayed. The diskette track, head, sector, and sector size will be displayed in the format TTHSS (sector size). Press the ATTN key to terminate the test.

11. If the Attn key was pressed, the next screen provides the following options:

    Option 1. Get totals of write, read, and miscompare errors, and for total keystrokes.
    Option 2. Add devices to be tested.
    Option 3. Delete devices to be tested.
    Option 4. Exit the SYSTEST (provides a soft IPL).
    Option 5. Resume the test.

    Select an option; then press the Enter key.

975 STANDALONE PROGRAMS

Keyboard Scan Code Test (SCANTEST)

The keyboard scan code test verifies the keyboard hardware interface to the adapter.

To conduct a valid test, load the program into the failing partition. If the failing keyboard does not permit you to answer a standard load prompt, you might have to load the failing partition from another data station.

To load the keyboard scan code test (SCANTEST), see 971.

To terminate this test, press the space bar six times.

Magnetic Stripe Reader Test (MSRTEST)

The magnetic stripe reader test reads the test card or a user card. The data from the card is displayed.

To load the magnetic stripe reader test (MSRTEST), see 971. See 751 for a description of how to run the MSRTEST test.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Display Exerciser Test (CRTTEST)

The display exerciser test permits you to adjust and verify the size and position of the display.

To load the display exerciser test (CRTTEST), see 971.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Elapsed Time Counter Test 1 (TMRTEST1)

The elapsed time counter test 1 is a digital display of the elapsed time counter in hours, minutes, and seconds.

To load the elapsed time counter test 1 (TMRTEST1), see 971.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Elapsed Time Counter Test 2 (TMRTEST2)

The elapsed time counter test 2 checks for hardware problems that TMRTEST1 cannot sense.

To load the elapsed time counter test 2 (TMRTEST2), see 971.

To terminate this test, either press the Sys Req key or press the Cmd key followed by the End of Job key.

Printer Test (TPRNT)

The printer test operates the printer functions such as tab, new line, and carriage return. The test also attempts to print nonprintable characters and verifies that they are not printed.

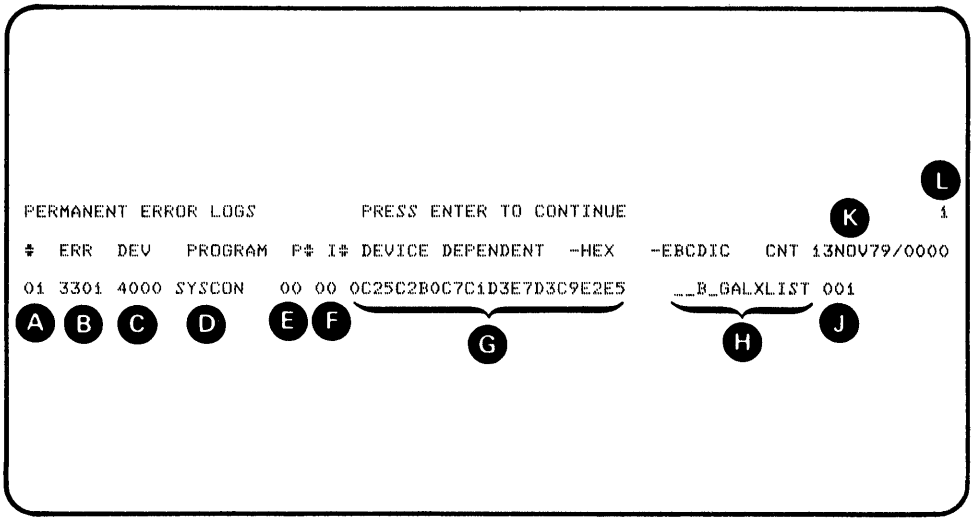
To terminate the printer test when in a loop mode (option 1 from prompt 54-02), either press the Sys Req key or press the Cmd key followed by the End of Job key. When terminating the printer test, the printer must finish unloading the buffer before a terminate screen is displayed. Therefore, there might be a delay of several seconds before any display screen prompt or message is indicated.

System Error Log Recovery Program (TSYSEREP)

The system error log recovery program processes the error history log (TLOGFILE) on the machine verification diskette and formats the output for either the display or the printer.

To load the system error log recovery program (TSYSEREP), see 971. To terminate this program, press the Sys Req key.

The following is an example of a permanent set of error logs displayed:



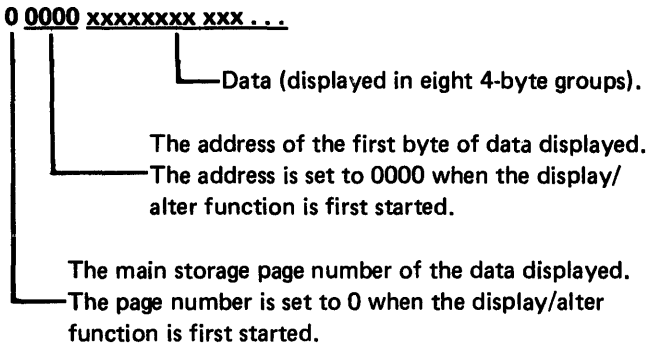
The following describes the permanent error log display:

- **A** (#) Position number inside the log area
- **B** (Err) Error Code
- **C** (Dev) Address of device in error
- **D** (Program) Program name
- **E** (P #) Partition number
- **F** (I #) IOB number
- **G** (Device Dependent-Hex) Device-dependent data shown in hexadecimal format. See 991, *Hard Error Table format,* bytes OD-19 for the meaning of this data.
- **H** (-EBCDIC) Device-dependent data shown in EBCDIC format. Nonalpha, nonnumeric and nonblank characters are shown as an underscore.
- **J** (Cnt) The number of times the error occurred.
- **K** Date and time the error log was dumped to diskette.
- **L** The number of the set of error logs being displayed.

Up to three errors can be displayed at a time. Press enter to display additional errors until the end of the log is reached.

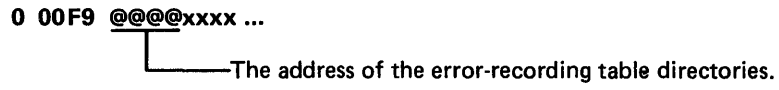
991 DISPLAY/ALTER FUNCTION (continued)

3. A line of data is displayed on the bottom of the screen as follows:



4. Press and hold the Shift key and press the 4 key.

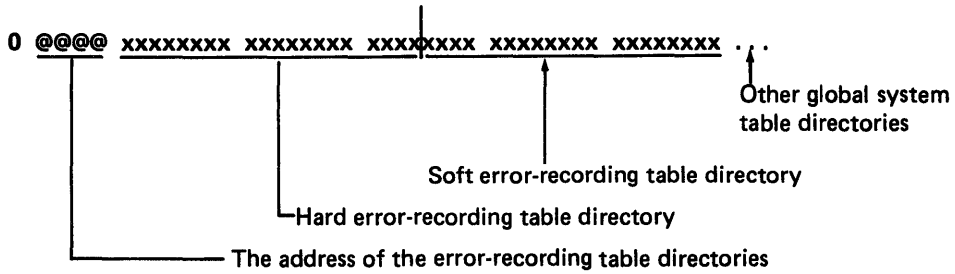
5. Release the Shift key and enter 00F9 to display the address of the error-recording table directories as follows:



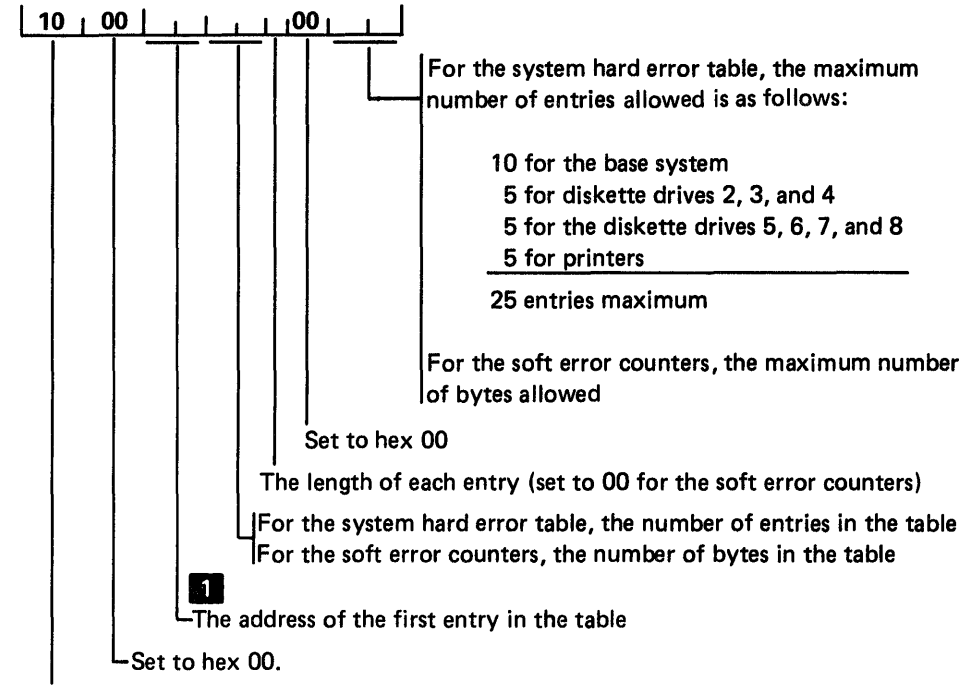
6. Record the address (@@@@) displayed in step 5.

7. Press and hold the Shift key and press the 4 key.

8. Release the Shift key and enter the address (@@@@) displayed in step 5. When you enter the address, the error-recording table directories are displayed as follows:



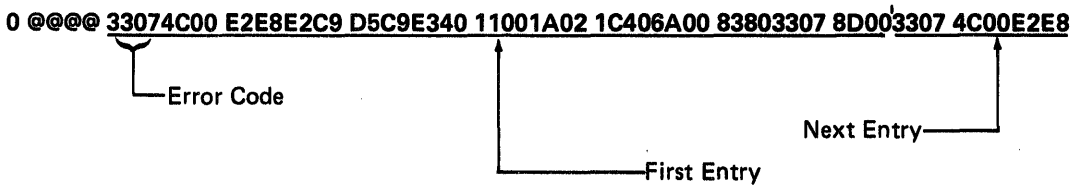
The following is the format of the error-recording table directories:



9. Record the addresses 1 from the error-recording table directories displayed in step 8.

10. Press and hold the Shift key and press the 4 key.

11. Release the Shift key and enter the address recorded in step 9 for the table to be displayed. When you enter the address, the first 32 bytes of the table are displayed on the screen. For example, if you displayed the hard-error table, and the latest error stored was a diskette error 3307, the entry is displayed as follows:

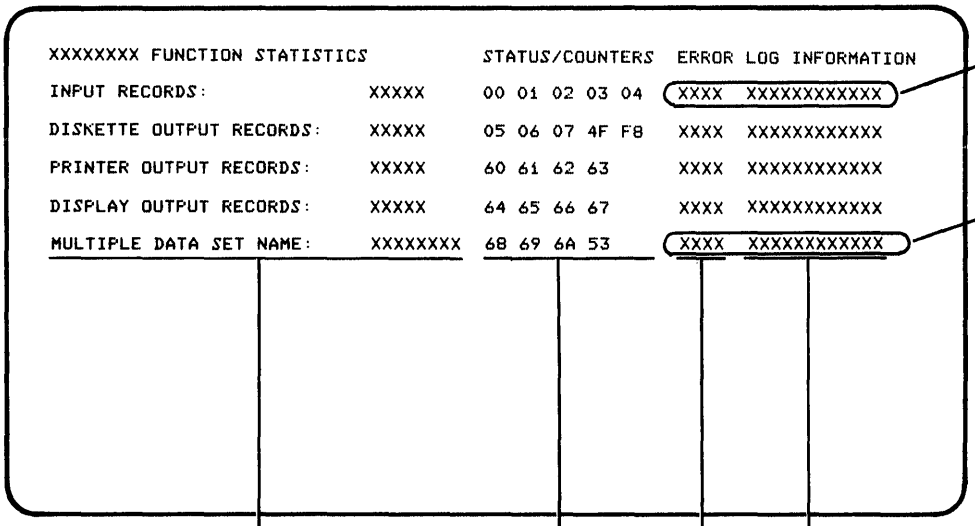


See *Hard Error Table Format* or *Printer Soft Error-Recording Table* in this section of the manual for a description of the displayed data.

993 COMMUNICATIONS ERROR TABLES

If an IBM communications utility is being executed, you can display communications status by pressing the Cmd key, then pressing the Shift key and pressing the Comm Status key. For all utilities except the BSC batch transfer utility, the following information is displayed. For the BSC batch transfer utility, only the function statistics are displayed.

Note: The three areas on the screen (function statistics, status/counters, and error log information) have no relationship with each other. For example, the status/counters 00, 01, 02, 03, and 04 have nothing to do directly with the input records, or with the error log information.



Function Statistics as Follows:

- *Input records* is the number of records read from I/O devices during execution of this utility.
- *Diskette output records, printer output records,* and *display output records* are the number of records written to these devices.
- *Multiple data set name* is the prefix of current multiple data sets if multiple data sets are used.

Output from the CAM error log; see the CAM Error Log Format in step 7 of the following procedure.

Output from the CCB error log; see CCB Error Log Format in step 7 of the following procedure and CCB Error Codes.

CCB status bytes and counters; the values shown on the screen are the hexadecimal values of the status bytes and counters from the CCB. However, for your reference, the hexadecimal values shown in this example are the displacements from the leftmost byte of the CCB to the respective byte shown on the screen. The displacement is used in the charts that describe the status bytes and counters, see *CCB Status Bytes and Counters.* In this section.

993 COMMUNICATIONS ERROR TABLES (continued)

Using the Display/Alter function to Display the Communications Error Tables

The display/alter keyboard function permits you to display, alter, and move the contents of main storage to keyboard/display storage and the contents of keyboard/display storage to main storage. In the following procedures, only the display function is described. For information about the other display/alter functions, see the *IBM 5280 Data Areas and Diagnostic Aids Handbook.*

To use the display/alter functions, you must use keyboard 0, and the keyboard/display MPU must be operational. While you are using display/alter, no other keyboard/display operations can be performed.

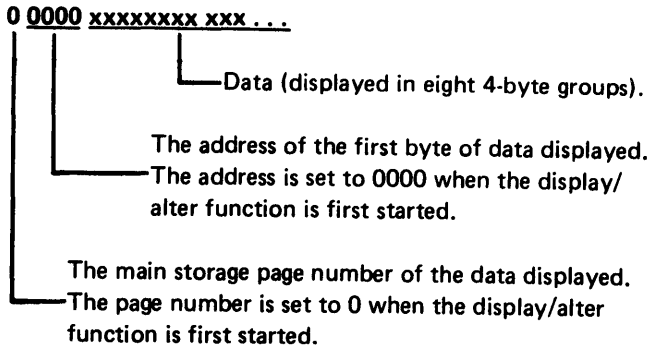
Use the following procedures to display the communications error tables. If you are using a typewriter keyboard, use the numeric key pad to enter the digits 0 through 9.

1. Perform the following steps to start the display/alter function after IPL has completed:
   a. Press the Cmd key.
   b. Press the L key.

   Once you start the display/alter function, you can cancel the function at any time by performing the following steps:
   a. Press and hold the Shift key.
   b. Press the E key.
   c. Press the Reset key.

2. If you are using a single display, go to step 3. If you are using a dual display or a keyboard with proof arrangement or both, enter the following:
   a. Press and hold the Shift key.
   b. Press the C key.
   c. Release the Shift key and enter one of the following:
      01 (nonproof arrangement keyboard and a dual display)
      10 (proof arrangement keyboard and a single display)
      11 (proof arrangement keyboard and a dual display)

3. A line of data is displayed on the bottom of the screen as follows:



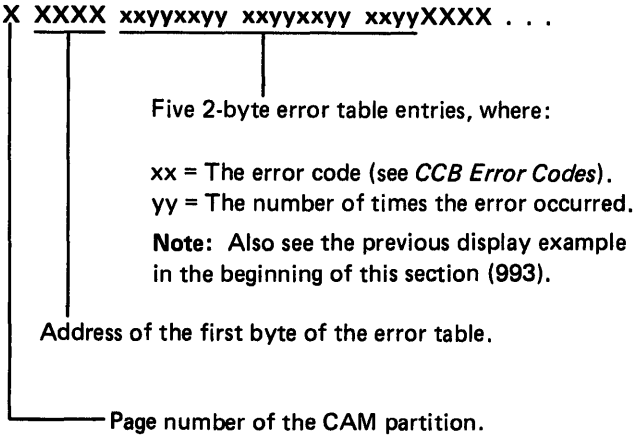
4. Press the hold the Shift key and press the B key.

5. Release the Shift key and enter 00A0. (00A0 is the address of the CCB pointer.) The CCB is then displayed.

6. Press and hold the Shift key and press the 3 key.

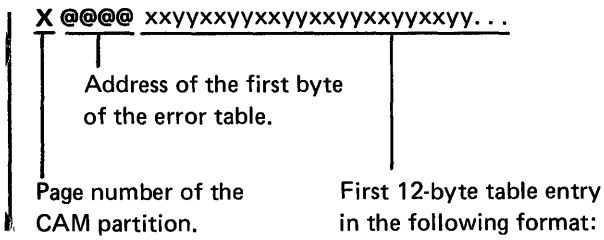
7. Release the Shift key and enter one of the following:
   a. 006C (to display the CCB error table [MPU logged errors])
   b. 015C (to display the CAM error table [CAM logged errors])
   c. The CCB *Hex Displacement value* from the CCB *Status Bytes and Counters Chart* in this section to display one of the status bytes or counters.

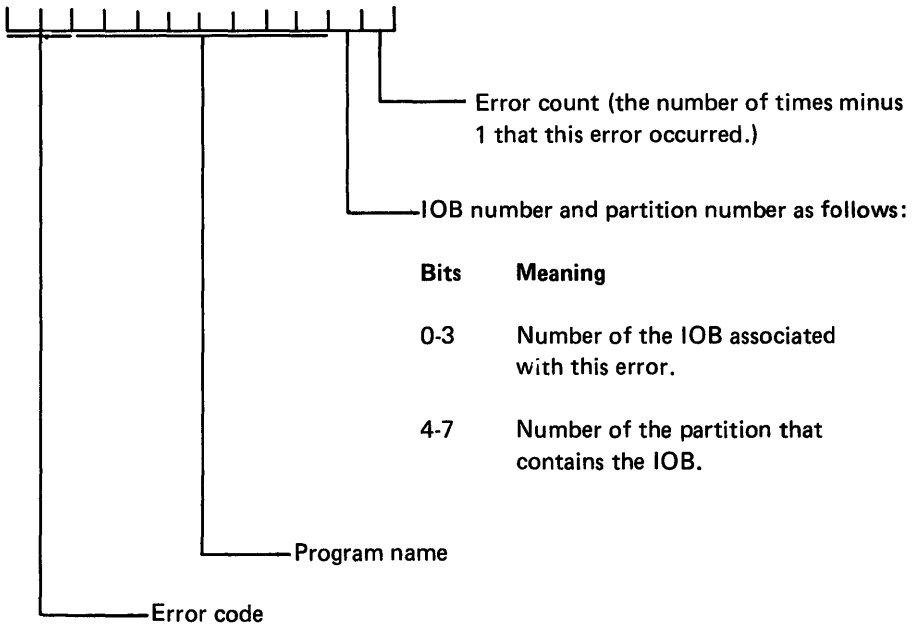
If you selected the CCB error table, it is displayed on the screen as follows:



993 COMMUNICATIONS ERROR TABLES (continued)

If you selected the CAM error log, it is displayed as follows:





Bits	Meaning
0-3	Number of the IOB associated with this error.
4-7	Number of the partition that contains the IOB.

Note: Also see the previous display example in the beginning of this section (993).

8. To display the next 12-byte entry, perform the following:
   a. Press and hold the Shift key and press the 4 key.
   b. Release the Shift key.
   c. Add hexadecimal C to the address of the entry now displayed (@@@@ in the above example).
   d. Enter the resulting address.

When you enter the address, the next 12-byte entry is displayed.

CCB Status Bytes and Counters

Hex Displ	Length in Bytes in Hex	Description
00	1	*Status Byte 1:* *Bit Meaning when 1* 0 The free queue is empty. 1 [1]The input queue is empty. 2 [1]The output queue is empty. 3 [1]The interim queue is empty. 4 Status information has been stored in the CCB at displacement 02, 03, 04, F9, F8 bits 1 and 2, or 00 bit 5, and has not been read by the CAM. 5 The communications link is down. 6 The OPEN command was successfully completed. 7 The CAM stored a command in the CCB. The MPU turns this bit off after the command is completed.
01	1	*Status Byte 2:* *Bit Meaning when 1* 0 Use nonreturn-to-zero (NRZI) mode (SDLC only). 1 Adapter diagnostics are being executed. 2 Use switched network backup (SNBU) 3 Adapter diagnostics detected an error. 4 The communications line is switched. 5 The communications line is multipoint. 6 Use connect-data-set-to-line mode. 7 The modem is operating at half speed.
02	1	*Status Byte 3:* *Bit Meaning when 1* 0 A valid EOT sequence was received while the MPU was in the control state. For MRJE, an EOT was received as a response to a line bid. 1 An EOT sequence has been transmitted (MPU has started control state). Not used for MRJE. 2 Invalid data was placed in the output buffer. 3 Receive retries exceeded; the MPU returns to control state. 4 Line bid retries have been exceeded. 5 Transmit retries exceeded; for BSC, the MPU sends an EOT and starts control state. For SDLC, the MPU stops the data trap. 6 An RVI has been received. Not used for MRJE. 7 The data link has been established.
03	1	*Status Byte 4:* *Bit Meaning when 1* 0 The message received is too long for the IBM 5280 buffer. 1 The IBM 5280 received a disconnect sequence. 2 The IBM 5280 transmitted a disconnect sequence. Not used for MRJE. 3 The IBM 5280 transmitted or received a normal termination sequence.

[1]The CAM sets this bit on when the CCB is initialized.

Technical Newsletter

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SN20-9588

IBM 5280
Distributed Data System
IBM 5285 Programmable Data Station
Maintenance Information Manual

This technical newsletter provides replacement pages for the subject publication. Pages to be inserted and/or removed are:

v—viii	86.1—86.2 (added)
49—52	193, 194
59, 60	239, 240
79, 80	275, 276
83, 84	367—374

Changes to the text and illustrations are indicated by a vertical line at the left of the change.

Summary of Amendments

- Addition of 64K Diskette/Main MPU card
- Discontinue the restriction that communications and the auxiliary data station may not be installed together.

Note: *Please file this cover letter at the back of the manual to provide a record of changes.*

IBM Corporation, Information Design and Development, Department 997, 11400 Burnet Rd., Austin, Texas 78758

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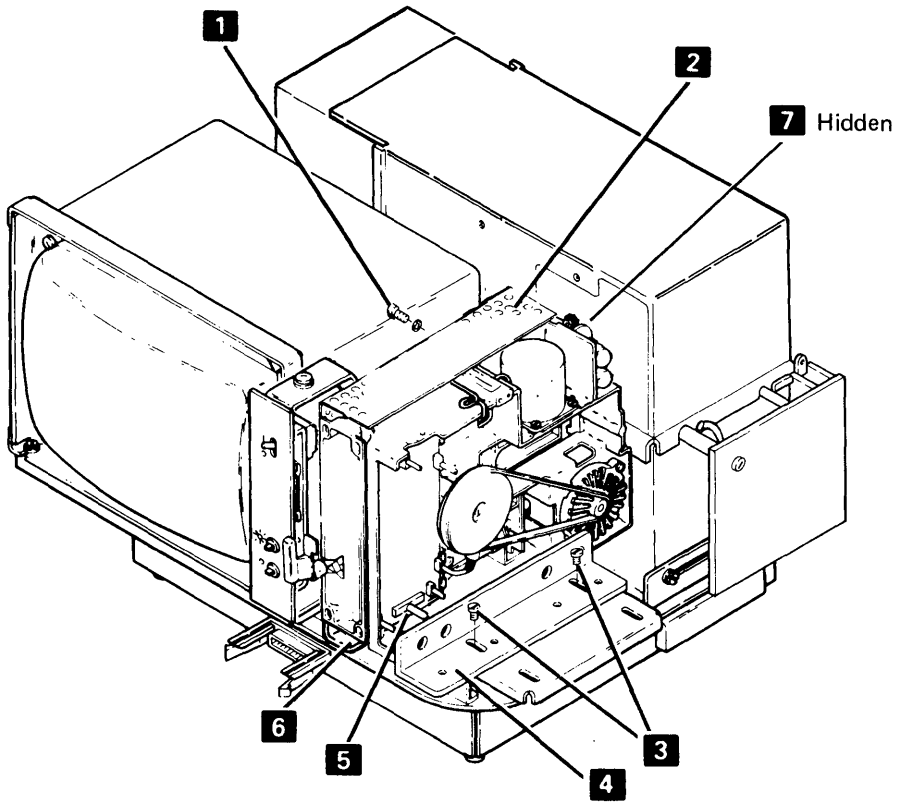
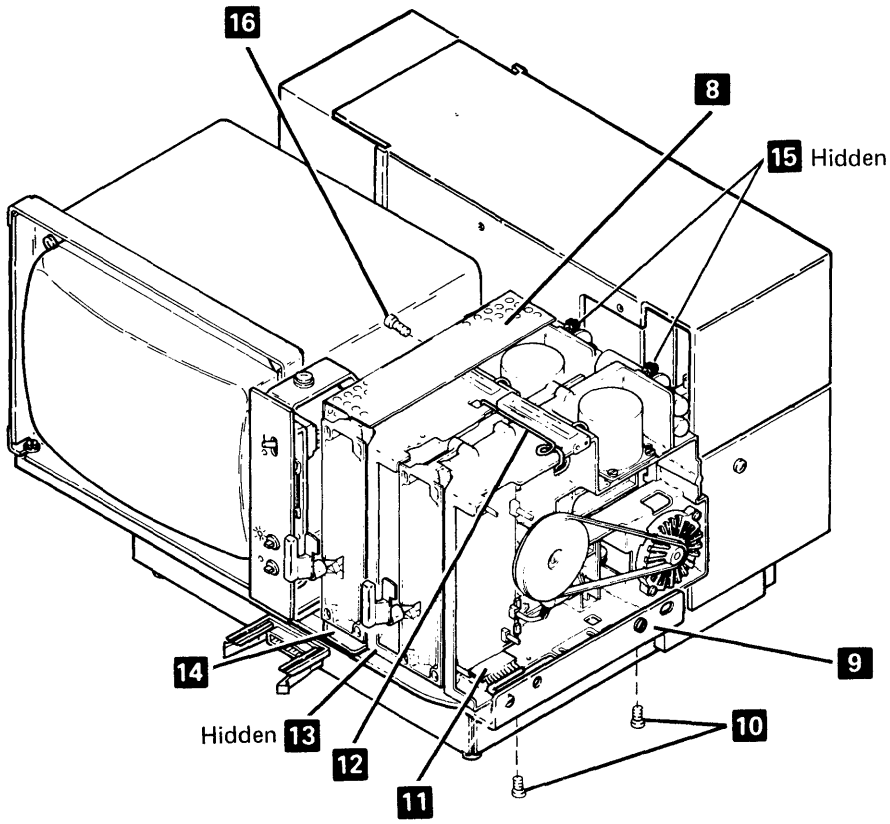
Contents

301 DISKETTE DRIVE REMOVAL AND REPLACEMENT (continued)





303 DISKETTE/MAIN MPU CARD (A-C1)

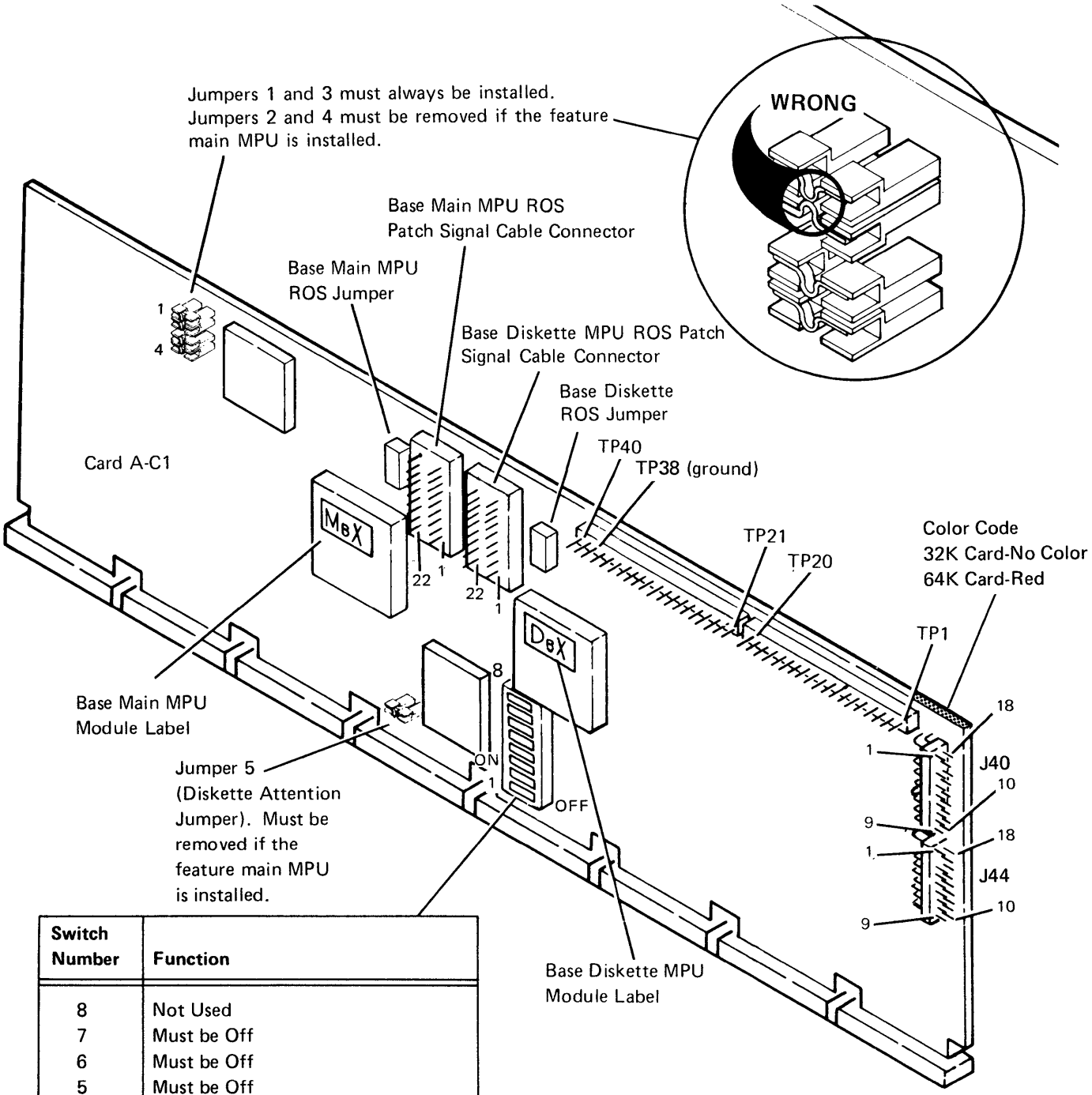
The diskette/main MPU card figure shows the location of test pins, cable connectors, jumpers, switches, module labels, and the storage size color code. This card contains a diskette MPU and the logic to control four diskette drives.

Two diskette drives are local (addresses 4000 and 4400) and two diskette drives can be remote (addresses 4800 and 4C00) located in a remote data station. Only four drives can be attached at one time.

The base main MPU and 32K bytes or 64K bytes of main storage are also on this card. A color code indicates the size of main storage on the card. A red color indicates 64K bytes of main storage; no color indicates 32K bytes of main storage.

If you install a new diskette/main MPU card, see 565 for information about the ROS jumper and ROS patch card.

303 DISKETTE/MAIN MPU CARD (A-C1) (continued)



Switch Number	Function
8	Not Used
7	Must be Off
6	Must be Off
5	Must be Off
4	On if diskette drive 4000 is installed
3	On if diskette drive 4400 is installed
2	On if diskette drive 4800 is installed
1	On if diskette drive 4C00 is installed

Note: Remove the plastic switch cover to change the settings of the switches. After you have changed the settings of the switches, reinstall the switch cover.

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403 FEATURE MAIN STORAGE CARD (A-B5)

The diskette/main MPU card (303) contains 32K bytes or 64K bytes of main storage. Additional storage may be located on an optional 16K, 32K, or 64K byte main storage card. This optional storage is added in card location B5.

The storage capacity of each feature main storage card is indicated by a color marked on the end of the card. The blue code indicates a 16K byte card, the orange code indicates a 32K byte card, and the red code indicates a 64K byte card.

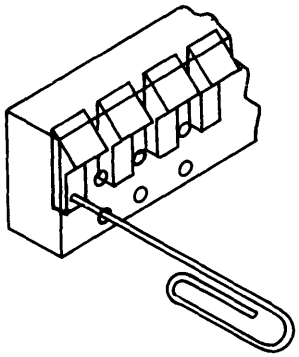
The switches on the storage card must be set to indicate the starting address of the storage on that card. If the diskette/main MPU card contains the first 32K bytes of main storage, only switch 5 (32K byte) must be set to the On position. If the diskette/main MPU card contains the first 64K bytes of main storage, only switch 4 (64K byte) must be set to the On position. See (303) to determine which card is used.

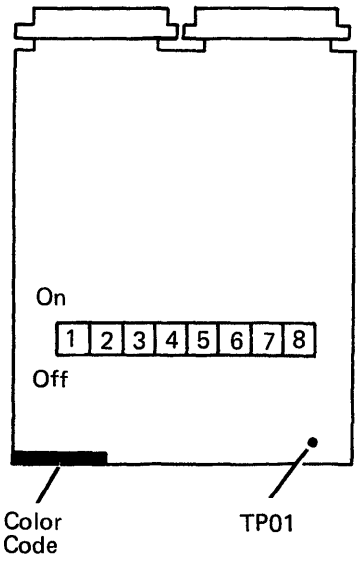
All other switches must be set to the Off position.

The MDIs for main storage (0520 and 0530) start testing at 32K and test through the end of storage. (The power-on checkout tests the first 32K bytes of main storage.) If the diskette/main MPU card (303) has a red color code (64K) replace the MPU card if the failing address is less than 64K.

If the card has a removable plastic cover over the switches, remove the cover to change the settings of the switches. After you have changed the settings of the switches, reinstall the cover.

If the card does not have a removable plastic cover over the switches, see the following illustration for an example of how to set the switches. Ignore the red indicator and set the switches to the desired setting.





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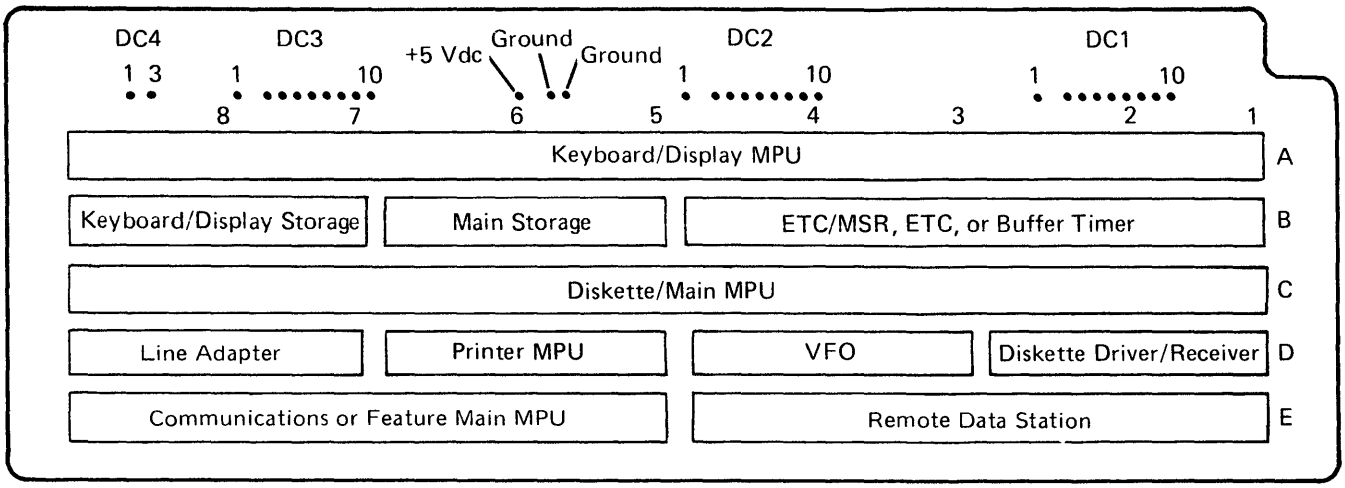
Logic and Cards

501 CARD PLUG CHART

The card plug chart shows the card configurations for the IBM 5285 Programmable Data Station. To determine which card to use, see 503.



503 CARD OPTIONS

The card option table shows which cards to use for the different configurations available. See 501 for the card plug chart.

Reference	Location	Function	Size	Comments
200	A1	Keyboard/display MPU with IBM 3270 emulation	8-Wide	Contains 2K bytes of keyboard storage
200	A1	Keyboard/display MPU without IBM 3270 emulation	8-Wide	Contains 2K bytes of keyboard storage
771, 773	B1	Elapsed-time counter	2-Wide	IBM 5285 W/O buffer timer
209	B1	Buffer timer	2-Wide	IBM 5285 W/O elapsed-time counter
771	B1	1-MSR and elapsed-time counter	2-Wide	
773	B1	4-MSR and elapsed-time counter	4-Wide	
403	B5	16K Feature main storage	2-Wide	
403	B5	32K Feature main storage	2-Wide	
403	B5	64K Feature main storage	2-Wide	
207	B7	Keyboard Storage (2K, 3K, 4K, & 5K)	2-Wide	Additional keyboard storage
207	B7	Keyboard Storage (1K and 2K)	2-Wide	Additional keyboard storage
303	C1	Diskette/main MPU	8-Wide	Contains 32K or 64K main storage
305	D1	Diskette driver/receiver	2-Wide	
501	D3	VFO	2-Wide	
731	D5	Printer attachment MPU	2-Wide	
823	D7	EIA	2-Wide	Communicating IBM 5285 only
825	D7	DDSA	2-Wide	Communicating IBM 5285 only
821	D7	38LS World Trade switched	2-Wide	Communicating IBM 5285 only
815	D7	38LS United States switched	2-Wide	Communicating IBM 5285 only
819	D7	38LS World Trade nonswitched	2-Wide	Communicating IBM 5285 only
813	D7	38LS United States nonswitched, manual answer	2-Wide	Communicating IBM 5285 only
817	D7	38LS United States nonswitched, SNBU, auto-answer	2-Wide	Communicating IBM 5285 only
813	D7	38LS United States nonswitched, SNBU, manual answer	2-Wide	Communicating IBM 5285 only
201	E1	Data station adapter	4-Wide	Used when IBM 5281 is attached
203	E1	Dual data station adapter	4-Wide	Used when IBM 5282 is attached
811	E5	Communications MPU with IBM 3270 emulation	4-Wide	Communicating IBM 5285 only
811	E5	Communications MPU without IBM 3270 emulation	4-Wide	Communicating IBM 5285 only
402	E5	Feature main MPU	4-Wide	Non-communicating IBM 5285 only

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-A1 8-Wide	Keyboard/ Display MPU Katakana W/3270 Emulation*	6043427						
	ROS Patch for Keyboard/ Display Katakana MPU W/3270 Emulation							
A-B1 2-Wide	Buffer Timer	1618152 837086A						
A-B1 2-Wide	Elapsed Time Counter*	1618152 837086						
A-B1 2-Wide	1MSR and Elapsed Time Counter*	7364620 840869						
A-B1 4-Wide	4MSR and Elapsed Time Counter*	4177924 10-28996	4177926 839709					
A-B5 2-Wide	16K Additional Main Storage*	4177563 10-28936	4177564 838415	1618110 839732				
A-B5 2-Wide	32K Additional Main Storage*	4177561 10-28936	4177562 838399	1618108 839730				
A-B5 2-Wide	64K Additional Main Storage*	7364320 840815A						

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Size	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-B7 2-Wide	1K Keyboard/ Display Storage*	1618058 837027	4177550 838407	7364149 10-29012	4177948 839723			
A-B7 2-Wide	2K Keyboard/ Display Storage (W/O Aux Data Station)*	4177551 10-28933	4177554 838411	7364146 10-29012	7364144 839768			
A-B7 2-Wide	2K Keyboard/ Display Storage (W/ Aux Data Station)*	4177525 10-28927	4177526 838389					
A-B7 2-Wide	3K Keyboard/ Display Storage*	4177527 10-28928	4177528 838391	4177897 839725				
A-B7 2-Wide	4K Keyboard/ Display Storage*	4177529 10-28929	4177530 838393					
A-B7 2-Wide	5K Keyboard/ Display Storage*	4177531 10-28930	4177532 838395	4177898 839727				
A-C1 8-Wide	Diskette Main MPU 32K	7364264 10-29589	7364266 10-29591	7364312 839645				
	ROS Patch for Diskette MPU	736447 840854 or 840823	736447 840854 or 840823					
	ROS Patch for Main MPU	4177910 839751	4177910 839751					
A-C1 8-Wide	Diskette/ Main MPU 64K	6044087 26-02907						
	ROS Patch for Diskette MPU							
	ROS Patch for Main MPU							
A-D1 2-Wide	Diskette Driver/ Receiver	4177669 10-28945	4177670 838483					

*Feature

505 LOGIC BOARD AND LOGIC CARD PART NUMBERS (continued)

Location Card	Name	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level	Part No. E.C. Level
A-E5 4-Wide	Comm MPU W/Attenuator* W/O 3270 Emulation	7364201 10-29013	4177752 839614A	7364138 839755A				
	ROS Patch for Comm MPU W/Attenuator W/O 3270 Emulation		7364438 868243					
A-E5 4-Wide	Comm MPU W/O Attenuator* W/O 3270 Emulation	7364213 10-29013	4177754 839616A	7364140 839757A				
	ROS Patch for Comm MPU W/O Attenuator W/O 3270 Emulation		7364438 868243					
A-E5 4-Wide	Comm MPU W/Attenuator W/3270 Emulation*	6043351						
	ROS Patch for Comm MPU W/Attenuator W/3270 Emulation							
	Comm MPU W/O Attenuator W/3270 Emulation*	6043352						
	ROS Patch for Comm MPU W/O Attenuator W/3270 Emulation							
A-E5 4-Wide	Feature Main MPU*	6042996 868274A						
	ROS Patch for Feature Main MPU							

*Feature

513 LOGIC CARD COVER REMOVAL AND REPLACEMENT

Removal

1. Power off.
2. Remove data station covers (031).
3. Push down on the top of the cover 2 and release the four latches 1 (two on each side of the cover) by pulling the cover away from the logic board 3.
4. Press down on the side of the logic card cover 2 and release the lower edge of the cover from its latch on the logic card frame. (Note the location of the logic card insertion tools on the logic cards.)
5. Press down on the other side of the logic card cover 2 and release that lower edge of the cover from its latch on the logic card frame. The cover can now be listed from the logic cards.

CAUTION
The logic cards will overheat if patch cards (either ROS patch or dummy patch) are not installed.

6. When no ROS patch cards are installed, install dummy patch cards to ensure correct air flow.

Replacement

For replacement of the logic card cover, observe the following cautions and reverse the steps in the removal procedure.

CAUTION
Ensure that all cables are properly placed to prevent the cover from cutting the cables.

CAUTION
Ensure that the card insertion tools are placed properly in the cover to prevent damage to the logic cards.

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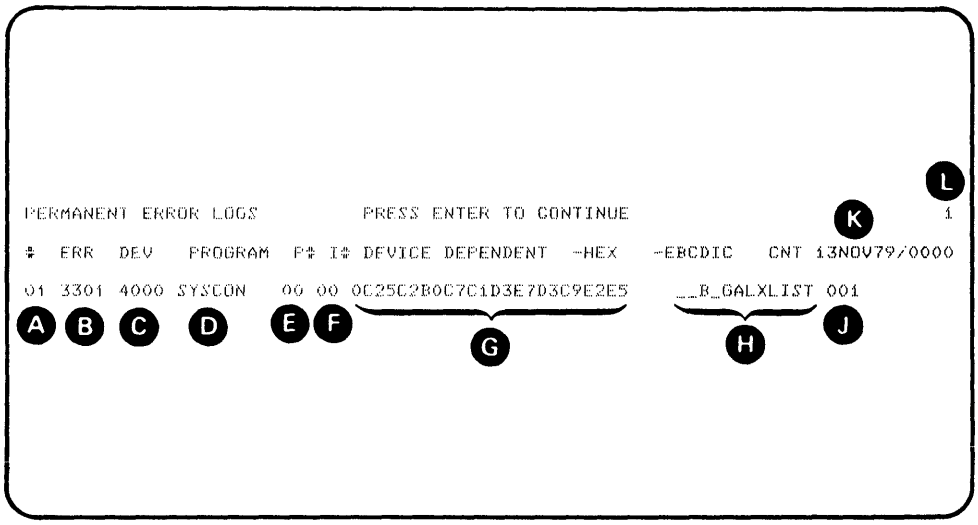
System Error Log Recovery Program (TSYSEREP)

The system error log recovery program processes the error history log (TLOGFILE) on the machine verification diskette and formats the output for either the display or the printer.

To load the system error log recovery program (TSYSEREP), see 971. To terminate this program, press the Sys Req key.

The following is an example of a permanent set of error logs displayed:



The following describes the permanent error log display:

- **A** (#) Position number inside the log area
- **B** (Err) Error Code
- **C** (Dev) Address of device in error
- **D** (Program) Program name
- **E** (P #) Partition number
- **F** (I #) IOB number
- **G** (Device Dependent-Hex) Device-dependent data shown in hexadecimal format. See 991, *Hard Error Table format,* bytes OD-19 for the meaning of this data.
- **H** (-EBCDIC) Device-dependent data shown in EBCDIC format. Nonalpha, nonnumeric and nonblank characters are shown as an underscore.
- **J** (Cnt) The number of times the error occurred.
- **K** Date and time the error log was dumped to diskette.
- **L** The number of the set of error logs being displayed.

Up to three errors can be displayed at a time. Press enter to display additional errors until the end of the log is reached.

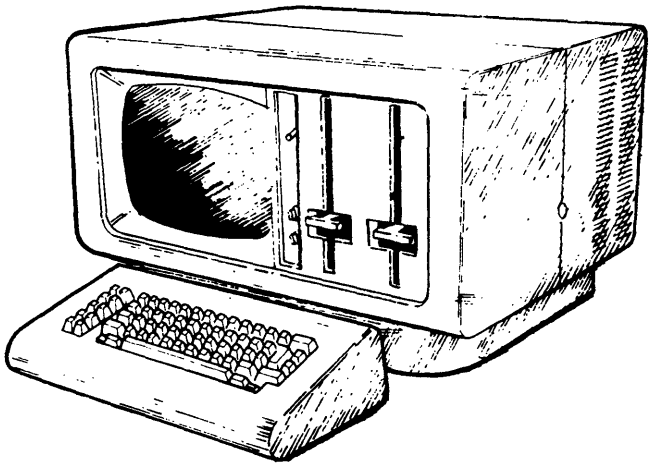
Introduction

The IBM 5280 is a diskette-based system. It includes several data stations and programmable units that can be connected in a variety of configurations. The programmable units contain the microcode needed for the system to operate. There are several devices that attach to the data stations and the programmable units.

DATA STATIONS

IBM 5281

The IBM 5281 is a tabletop data station that has one keyboard and one display assembly. The IBM 5281 must be connected to one of the programmable units before any function can be performed. A maximum of two diskette drives can be housed within the IBM 5281.

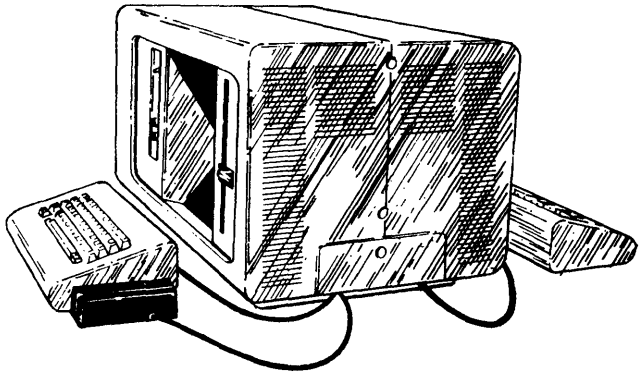


Specifications

- Display sizes are 480, 960, or 1920 characters. All displays on a system must be the same size.
- Storage is located in the programmable unit to which the IBM 5281 is attached.
- Keyboards available are data entry, data entry with proof arrangement, and typewriter.
- Diskette drives available are the 31SD and the 51TD. No diskette drives are required in the IBM 5281; however, a maximum of two diskette drives can be installed.
- One magnetic stripe reader can be attached, but it is not required.

IBM 5282

The IBM 5282 is a tabletop dual data station that has two keyboards and one display assembly. The display image is divided by mirrors to provide a separate display image for each operator. The IBM 5282 must be connected to one of the programmable units before any function can be performed. A maximum of two diskette drives can be housed in the IBM 5282.



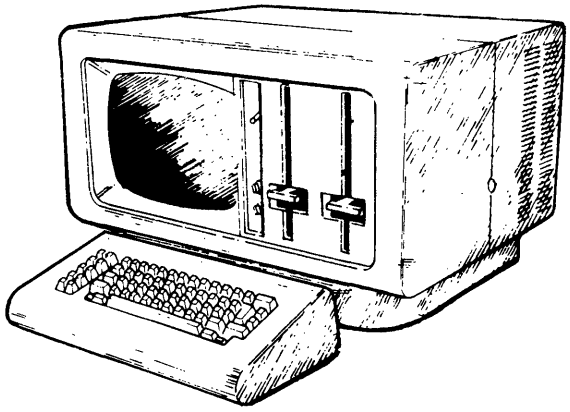
Specifications

- Display sizes are 480 or 960 characters. All displays on a system must be the same size.
- Storage is located in the programmable unit to which the IBM 5282 is attached.
- Keyboards available are data entry, data entry with proof arrangement, and typewriter. Both keyboards on the IBM 5282 must be the same type.
- Diskette drives available are the 31SD and the 51TD. No diskette drives are required in the IBM 5282; however, a maximum of two diskette drives can be installed. Both diskette drives must be the same type.
- Two magnetic stripe readers can be attached, but are not required.

PROGRAMMABLE UNITS

IBM 5285

The IBM 5285 is a tabletop programmable data station that has one keyboard, one display assembly, and one diskette drive. One additional diskette drive can be added.



Configuration

- Can have one auxiliary data station - either an IBM 5281 or an IBM 5282.
- Can have a maximum of four diskette drives.
- Can have one printer - either start-stop (IBM 5222) or twinaxial (IBM 5224, IBM 5225, or IBM 5256).
- Can have one keylock.
- Can have a maximum of three magnetic stripe readers.
- Can have one elapsed time counter.
- Can have one feature main MPU.
- Can have one communications line. If communications is installed, the feature main MPU cannot be installed.
- Can have one IBM 3270 emulation feature if communications is installed.

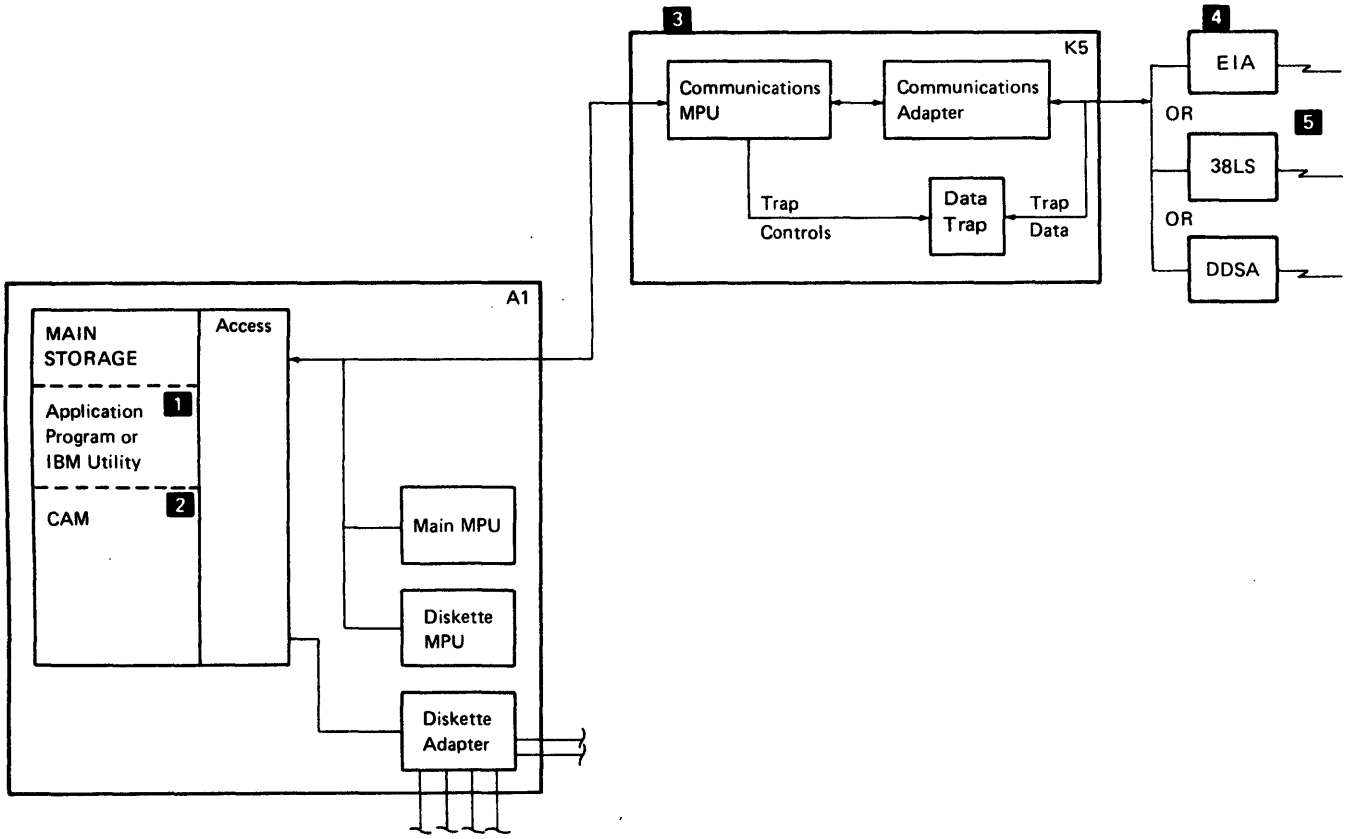
Specification

- Display sizes are 480, 960, and 1920 characters. All displays in the system must be the same size.
- If the communications line is installed, the minimum display size is 960 characters.
- If the IBM 3270 emulation feature is installed, the minimum display size is 1920 characters.
- Storage sizes available are 32K, 48K, 64K, 96K, and 128K bytes.
- If the IBM 3270 emulation feature is installed, the minimum storage size is 96K bytes.
- Keyboards available are data entry, data entry with proof arrangement, and typewriter.
- Diskette drives available are the 31SD and the 51TD.

Communications Attachment

As shown in the following diagram, the major components required to permit the IBM 5280 to communicate with a remote station are:

1. An application program in main storage (user written or IBM utility)
2. A CAM (communications access method) program in main storage
3. A communications MPU card
4. A line adapter card
5. Data communications equipment



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