GA09-1600-2
File No. S360/S370/S3-14

IBM 3270 Information Display System Custom Feature Description 129-3270 Attachment RPQ 8T0093 RPQ 8K1011

Systems

IBM

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Preface

This manual acquaints customer executives, programmer personnel, data processing supervisors, and operators with the IBM 129 Card Data Recorder used as a card reader/punch in a 3270 Information Display System.

The first section contains a summary of the 129's application as a teleprocessing device. The middle section deals with software considerations, and the final section considers the actual operation of the 129 as an online device. It includes system data flow information as well as operating instructions.

The reader should have a general knowledge of teleprocessing concepts and be acquainted with the 3270 Information Display System. The following publications are prerequisite reading:

An Introduction to the IBM 3270 Information Display System, GA27-2739

IBM 129 Card Data Recorder Operator's Reference Manual, GA22-6968

IBM 3270 Information Display System, 3271 Control Unit, 3272 Control Unit, 3275 Display Station Description and Programmer's Guide, GA23-0060

IBM 3270 Information Display System, 3274 Description and Programmer's Guide, GA23-0061

The programming information in Section 2 assumes that the reader has programming knowledge of the 3270 system.

Third Edition (March 1981)

This is a major revision of, and obsoletes, GA09-1600-1. Information has been added describing the attachment of the 129 to the 3274 Control Unit. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Changes are periodically made to the information herein; any such changes will be reported in subsequent revisions or Technical Newsletters. Before using this publication in connection with the operation of IBM systems, refer to the latest System/360 and System/370 SRL Newsletter, Order No. GN20-0360, for the editions that are applicable and current.

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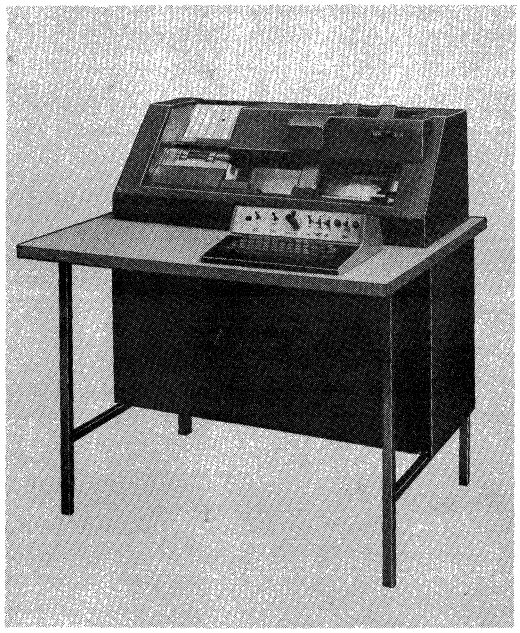
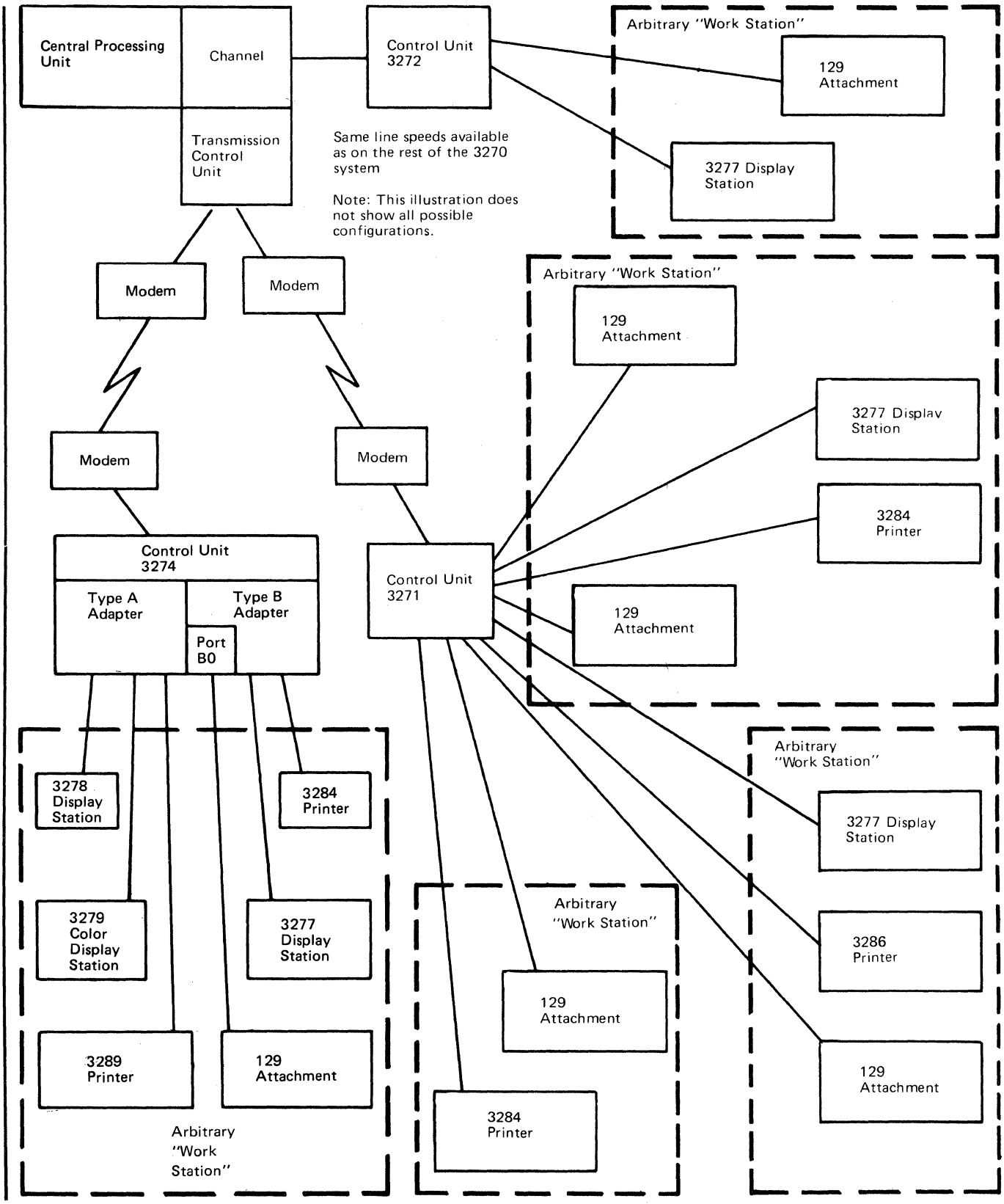




Frontispiece. System Configuration

DEFINITION OF "129 ATTACHMENT"

The IBM 129 Card Data Recorder is now modified to serve as an online card reader/punch attachment for the IBM 3270 Information Display System (Frontispiece). The word "attachment" here refers to the entire 129 input/output device as attached to a 3270 system. The terms "attachment hardware" or "attachment RPQ" (Request for Price Quotation) used in this manual indicate "something added to a 129, enabling it to function as an input/output device."

129 ATTACHMENT HIGHLIGHTS

IBM 129 Model 2 with RPQ 8T0093

- Reads or punch-prints 80-column cards online.
  - Reads at 50 cards per minute.
  - Punches or punch-prints at 12 to 50 cards per minute, depending on the number of columns to be punched (50 cards per minute for 80 blank columns of punch-out).
- Optional Formatted Read allows the selective reading of data fields under control of one of four program levels.
- Optional Compressed Data removes attributes (field description characters) from punched output.
- Compatible with Skip/Read Double Speed RPQ (Z04771); permits all skipping and reading to occur at double speed.
- For 129 internal configuration, see "Features and Options."
- Acts as a conventional 129 when offline.

RPQ 8T0093 must be specified at the time of order; it is not field-installable. It is available for the 129 Data Recorder Model 2 (print, non-verify) only. 3271 and 3272 Model 1 and 2 Control Units, and 3274 Model 1A, 21A, 31A, 1C, 21C, 31C, and 51C Control Units accommodate the 129 Attachment. Use with the 3274 models requires the 8K1011 RPQ diskette, explained under "3274 RPQ 8K1011," and Configuration Support C at EC level 389202 or higher. The 3271 and 3272 Control Units allow connection of up to thirty-one 129 Attachments via standard coaxial cable (maximum length of 2,000 feet or 609.6 meters). The 3274 Control Units allow connection of one 129 Attachment. This attachment must be connected to the B0 port on the Type B Adapter. The 3270 requirement of at least one display station with a keyboard attached to each control unit for diagnostic and customizing purposes applies. On the 3274 models, this display station must be a Category A device attached to port A0.

3274 RPQ 8K1011

The RPQ 8K1011 feature contains the microcode support for the 3274 Control Unit to allow attachment of the 129 Data Recorder, as modified by RPQ 8T0093, via the 3274 Type B Adapter.

RPQ 8K1011 is supplied via a 3274 RPQ diskette. It is installed during the standard 3274 customizing procedure, as described in the *IBM 3270 Information Display System, 3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827.

APPLICATIONS

Figure 1 suggests applicability of the 129 attachment to card-oriented data processing.

FUNCTIONS

The RPQ provides a switch for selecting offline or online operation. Online, the 129 supplies card data to a central processor (CPU) via the 3271, 3272, or 3274 Control Unit; it also receives data from the central processor, again via the control unit. The 129 emulates a 3277 Model 1 (3277-1) Display Station when the 129 is used to read cards; it emulates a 3284-1 or 3286-1 Printer when it is punching data cards. The central processing unit's command sequence to a 129 in punch mode is the same as to a 3284-1 or 3286-1 Printer. In read mode, the 129 receives the same sequence of commands from the central processor as does a 3277-1 Display Station during a typical entry. For detailed description of this aspect of the 3270 Information Display System, refer to *IBM 3270 Information Display System, 3271 Control Unit, 3272 Control Unit, 3275 Display Station Description and Programmer's Guide,* GA23-0060, and *IBM 3270 Information Display System, 3274 Description and Programmer's Guide,* GA23-0061. The word "device" in those publications includes the 129.

Copy

With appropriate programming, the devices (including the 129) connected to a 3271 Control Unit may communicate with each other directly. This is known as copying (or copy). In essence, the central processor receives a request to copy and issues a copy command. Then it is free to execute other orders while the actual transfer of one buffer of data from one device to another takes place. Copying reduces the central processor's total message transmission to the remote 3270 display system. Also, because the internal operating rate of the 3270 is far faster than the remote transmission rates, much shorter response times can be achieved. Copy is not supported on the 3272 or 3274 Control Units.

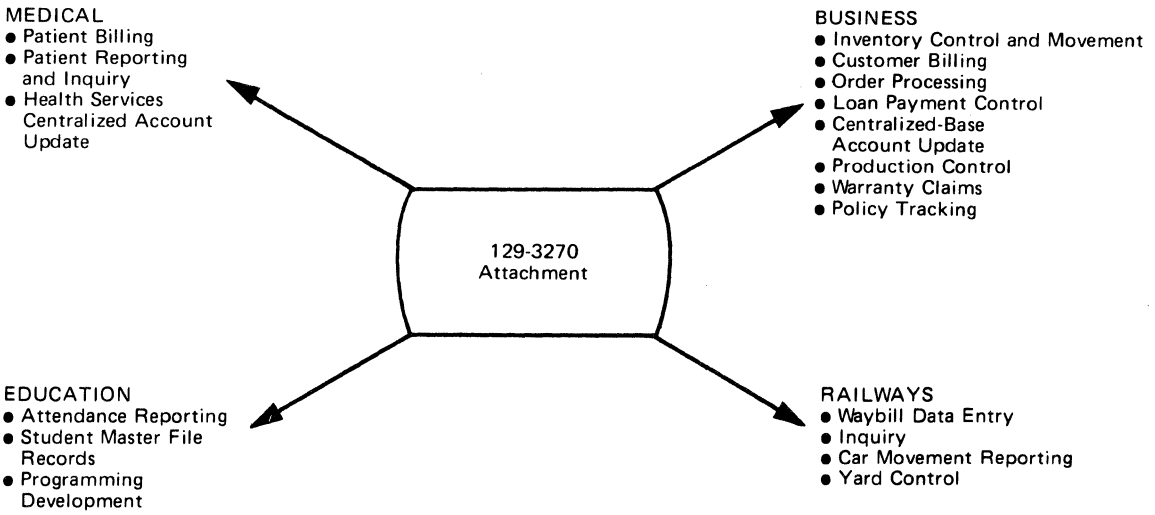


Figure 1. Suggested Applications of the 129-3270 Attachment

Online Operations (Read and Punch): Timing

When online, the 129 has two types of operation, read and punch. Reading must be initiated by the device operator, and it continues at the rate of 50 cards per minute. Cards are read in groups of as many as 480 columns of data, and then the data is made available to the central processor. An additional card is pre-read and half stacked in preparation for the next read operation. Central processor and software response times determine the duration between groups of cards processed. When the last card is read, the read operation terminates automatically.

Punching is initiated by a command from the central processor. The punch-out rate, including punch-printing, is 12 cards per minute when all 80 columns are punched. However, if more than two adjacent blank columns are encountered during a punch-out, these blank columns are skipped at read-speed until a punched column is encountered again.

FEATURES AND OPTIONS

Special Features

The following 129 features are compatible with the attachment RPQ 8T0093:

- Expansion Feature FC 3610
- Feed, Variable Length FC 3950
- Reading Board Extension FC 6065
- Self-Checking, Modulus 10 FC 7061
- Self-Checking, Modulus 11 FC 7062
- Skip/Read Double Speed RPQ ZO 4771
- Keyboard Entry RPQ 8T0105

Self-checking, Modulus 10 and Modulus 11 are not compatible with each other. The Self-Checking feature is inoperative when the 129 attachment is online. If there are self-check (or verification) OK punches in columns 81, they do not affect online operation.

RPQ Z04771, Skip/Read Double Speed, is compatible with the 129 attachment and with all the features listed above except Feed, Variable Length, FC 3950. Skip/Read Double Speed is useful in terminal environments where even faster card-reader speed than 50 cards per minute is desirable. This function increases the 129 data throughput, both online and offline. Although the effective system throughput rate depends on the frequency at which the 129 is serviced by the central processing unit, the speed for continuous reading is approximately 90 cards per minute. In punch mode, the 129 begins to skip at twice the normal speed whenever two or more consecutive blank columns are sensed, and skipping continues at the increased rate until two or three (depending on whether the column-count is odd or even) columns prior to reaching the next column to be punched.

Specify Options

Two options are available for the 129 attachment RPQ 8T0093, Formatted Read and Compressed Data. The control that switches between online or offline operation (LINE MODE) has a position marked SPEC, which selects one or both of these options.

Some user applications require neither Compressed Data nor Formatted Read; others may have use for only one of the options. In this situation, operator effort is reduced if the unneeded function is inoperative.

During installation of the 129, the IBM marketing representative instructs the field service representative which options, Compressed Data or Formatted Read, are to remain active.

The Formatted Read Option: Gives the user the possibility of preventing portions of data cards from being read into the 3270 system. In addition, the 129 attachment circuitry automatically inserts an attribute character (a field description character) ahead of each field programmed to read and an NL (new line) character at the end of each card; these control characters "format" the data. The user who intends to perform copy commands is advised to specify the Formatted Read option. Formatted Read also allows more efficient use of the transmission line in remote applications by permitting the user to select only those data fields that he wishes to transmit.

The Compressed Data Option: In operation drops attribute (field descriptive) characters from the data stream. Normally, each attribute character punches as a blank column, but with the Compressed Data option, the 129 still is able to punch 80 columns of data into a single data card even though attribute characters (for formatting the printer or display station) are imbedded in the data.

Keyboard Options: The expanded sets of 64 characters available for the 129 Card Data Recorder are compatible with System/360 and System/370. The EL arrangement (FC9677) provides keys and a print character set compatible with the 3270 English data entry character set. The ASCII arrangement (FC9671) provides the alternate characters for compatibility with the 3270 ASCII character set A. UK English and French QWERTY are available and are compatible with 3270 data entry keyboards. Appendix B, "World Trade Special Characters," illustrates the IBM input/output card codes and character assignments to ensure compatibility with French AZERTY and German QWERTZ data entry keyboards. Data may be entered from the keyboard only when the 129 is being used offline, unless the 129 is equipped with Keyboard Entry, RPQ 8T0105.

OPERATIONAL CHARACTERISTICS

The 129 Attachment as an Online Card Reader

The operator sets the appropriate 129 console switches and loads the 129 program levels if he desires to use the Formatted Read option. There is a momentary switch marked RESET/CLEAR. It is essential that the operator use RESET/CLEAR every time he readies the 129 for reading or punching, not only to clear the card path, but also to reposition the cursor in the 129 attachment buffer. When the operator presses READ, he switches the 129 attachment from its default status (punch mode) and causes cards to be read. The read operation continues with possible periodic brief pauses for data transfer.

The 129 Attachment as an Online Card Punch

To be used as an online punch, the 129 console controls are left in the same positions as for read mode. The operator clears the 129 card transport, feeds two cards, and the 129 attachment is ready to punch. There is a console switch marked REC ADV/CARD FEED; as long as REC ADV/CARD FEED is in the AUTO position, the 129 feeds a new card following every punch-out, after the last record is punched out cards are registered for the next punch operation.

This section discusses the system programming considerations for the 129 Data Recorder; it assumes that the reader is familiar with the 3270 Information Display System programming considerations as described in *IBM 3270 Information Display System, 3271 Control Unit, 3272 Control Unit, 3275 Display Station Description and Programmer's Guide,* GA23-0060, and *IBM 3270 Information Display System, 3274 Description and Programmer's Guide,* GA23-0061. In this section, only the differences between programming for the 129 and programming for the 3270 devices are highlighted. For a full description of 3270 commands and orders, consult the above manual.

3274 Considerations

1. When the 129 is attached to a 3274, the 3274 must be customized as an SNA device, specifying at least four Category B devices (at least one Type B Adapter must be installed on the 3274). See the *IBM 3270 Information Display System, 3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827, for specifics on customizing.
2. If a Printer Authorization Matrix (PAM) (either initiated by the central processor, or customized at the control unit) is being used, the 129 cannot be defined in the PAM.
3. If the 129 is powered on before the 3274 is IML'ed, the 129 must be in punch mode before a successful 3274 IML will be performed. If the 129 is in read mode (READ button pushed), during the 3274 IML, the IML will fail and "1000" will be displayed in the 8 4 2 1 indicators on the 3274 control panel.
4. The 3274 supports the 129 as a Category B device, and only when attached to port B0 on the 3274 Type B Adapter. This port, with RPQ 8K1011, is dedicated to the 129; any other Category B device attached to this port will not function properly. The 129 will not function properly if attached to a port other than B0. Other Category B devices may be attached to any remaining Type B Adapter ports.
5. When attached to a properly customized 3274, the 129 appears to the central processor as a 3277 Model 1 (LU Type 2), regardless of the mode of operation in which the 129 is being used. Data traffic between the central processor and the 129 must be active before the READ button is pressed (i.e., the device LU must be active and bound, and a "Start Data Traffic" must have been received). If a read operation is attempted before data traffic is active, the contents of the first buffer (first six cards read at the device) will not be transferred to the central processor. See Appendix E for the flow of data and commands between the 129, the 3274, and the central processor.

READING CARDS

A 129 read operation generates a PF10 AID when the 129 buffer is full. A full buffer indication means that one of the following has occurred:

1. Six cards have been read, filling the 480-position buffer during an unformatted read.
2. 96 positions or less remain in the 480-position buffer during a formatted read operation.
3. REC ADV/CARD FEED on the 129 is turned to MANUAL. Card reading terminates after completion of the record in process.
4. A transport jam has occurred on the 129.
5. The 129 has a hopper-empty, hopper-jam, or stacker-full condition.
6. An end of message (EM) character is encountered in the data. (Prepunched cards contain an EM character.)

For conditions 2 through 5, the remainder of the 480-position buffer is filled with nulls following the last card successfully read. For condition 6, nulls are written following the EM character to the end of the buffer. Any data following an EM character (in the same card record) is ignored. (See Appendix C.) The cursor is located in address 0 of the 480-position buffer.

The card immediately following the last card read into the 480-position buffer is pre-read and half stacked. Data from this card is stored for the next read operation.

A new line (NL) character embedded in a card record is stored as an NL character. There is no interruption in the data stream:

Transfer of data from the 129 to the 3270 takes place when the program for 3270 operation issues a read modified command (not supported on the 3274), a read buffer command, or as a result of a poll to remote devices.

Read Modified Command: During a read modified command operation, all 129 data fields are transferred to the central processing unit (CPU). This command is not supported on the 3274.

Read Buffer Command: A read buffer command results in the transfer of all data from the 480-position buffer to the CPU.

Programming Note: Once a buffer-full condition has occurred and a subsequent transfer of data to the CPU is finished, the 129 does not continue reading cards until it receives a write command (either write or erase/write) with a write control character (WCC) having the keyboard restore bit turned on. This waiting period allows a programmed copy

command (not supported on the 3272 or 3274) to be issued to the 3271 (remote) Control Unit. The copy command allows 129 data to be printed on a 3284/3286 Printer, displayed on a 3277 Display Station, or punched on a different 129. The availability of the copy command saves the programmer the need of a write command to the 3284/3286 Printer along with the data just received from the 129. This is possible only if the devices are connected to the same 3271 Control Unit, and the copy feature (FC 1550) is installed in the 3271.

Unformatted Read

Read mode on the 129 is initiated when READ is pushed and all switches are in the proper position (section 3). Card reading continues until a buffer-full condition exists. (See "Reading Cards.") Reading is then temporarily suspended until the CPU issues to the 129 a write command with the keyboard restore bit on. Card reading terminates when the 129 runs out of cards or an error condition occurs. Card reading may be resumed by resolving the cause of termination and pressing READ.

Formatted Read

Formatted read is under control of the 129 program levels. The 129 operator must set up for a formatted read operation by entering the proper 129 program cards and setting all switches to their proper positions. (Section 3.)

When data is being transferred into the 480-position buffer, an attribute character is inserted before each field in the card. Fields of the card that are programmed for skipping are not transferred to the 480-position buffer.

The attributes assigned for each read field are: unprotected, alphameric, displayable/non-detectable/ punchable/printable, and modified data tag.

An NL character is inserted at the end of each card (Figure 2).

Program Level Selection

Four program levels are available: three that the user may program; the fourth is a fixed 80-column read. The method of creating and entering programs is identical to that of the standard 129 and is performed in offline mode.

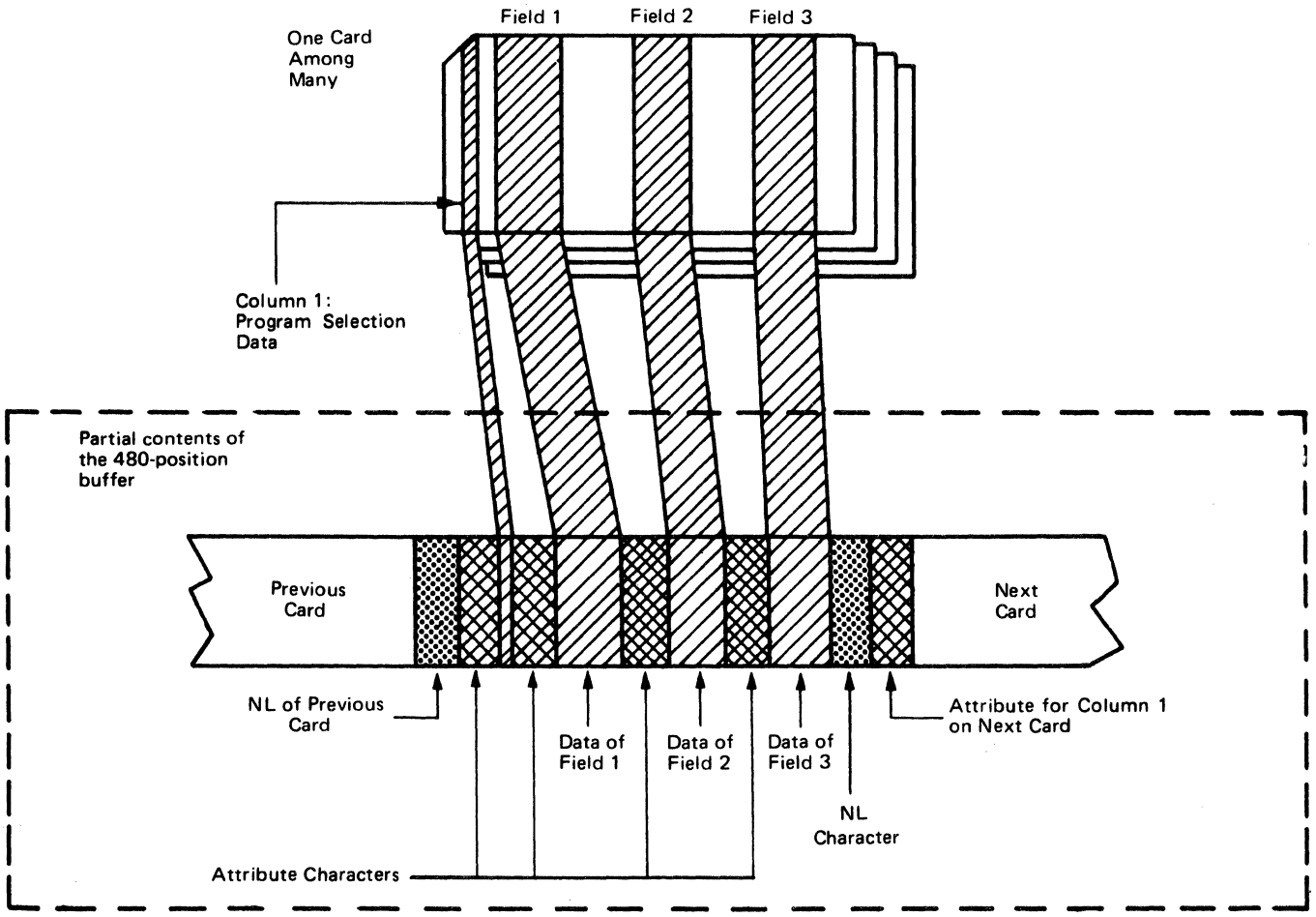


Figure 2. How Card Fields Transfer to the 480-Position Buffer in Formatted Read

The program level selection is accomplished by the first column of each card that is read. The following chart shows the IBM card code required to select each program level:

IBM Card Code	Program Level
1	1
2	2
3	3
4	4

These codes must be used to ensure predictable results.

The program level remains unchanged if the cards following contain a "blank" in column one.

Program levels 1, 2, and 3 are all programmable. Program level 4 is a fixed program consisting of an 80-column read field. The reset-clear operation following a change to on-line mode or a card feed cycle without a card registering resets the 129 to program level 4.

Program Card Codes

This RPQ uses the following 129 program card codes in the online mode.

IBM Card Code	Definition
12	Field definition: used for all columns of a field except the high-order position.
11	Skip: used in the high-order position of a field to be skipped. When fields are skipped, no entry is made into the 480-position buffer.
blank	Used in the high-order position of a field to signify a read field.

The remaining Standard 129 programming codes cause unpredictable results, and are not to be used in online mode.

Programming Considerations: Since column 1 is used to designate the program level, this column must always be in a read field. This condition forces column 1 of a program card to be blank. A skip field may be programmed to start in column 2.

It is essential that the total number of columns programmed to be read plus the number of read fields does not exceed 96 per card.

Punching Cards

Punching cards on the 129 is analogous to printing on the 3284/3286 Printer. For the 129 to punch data into cards, the CPU, via the control unit, must follow the same procedure as for the 3284 or 3286 to print data. The two methods for online punching data on the 129 are: non-compressed and compressed. These methods are discussed later.

Minor differences exist in the write control character (WCC) and the copy control character (CCC) for the 129. Table 1 lists the write control character; Table 2 the copy control character. (Table 2 appears in the next subsection, "Copy Operations.")

Table 1. Write Control Character (WCC) for 129 Operation

Bit	Explanation
0, 1	Determined by the contents of bits 2-7 as shown in Appendix A.
2, 3	Defines the punchout format as follows: If 00, the NL and EM characters in the data stream determine the amount of data to be punched in the card; If 01, 10, or 11, the standard 80-character card records are punched out.
4	Start punch bit. When set to 1, it initiates a punchout operation at completion of the write operation.
5	Not used by the 129.
6	Keyboard restore bit. When set to 1, it resets the input inhibited indicator (column indicator at 88) and allows the 129 to continue reading cards.
7	Reset modified data tag (MDT) bits. Not used by the 129.

The transfer of data to be punched into cards takes place after the issuance of the write command or the erase/write command.

1. If commands are being chained, the write or erase/write command with the start punch WCC bit set must be the last command in the chain. If it is followed by a chained command:
   (a) The 3272 aborts the write or erase/write command that specifies start punch.
   (b) The 3271 and 3274 perform the punch operation and abort the next command.
2. The punchout format bits are honored only if the start punch bit is set in the same WCC.

Copy Operations (3271 only)

The copy control character (CCC) identifies the type of data to be copied from the buffer of one device to another device attached to the same 3271. The CCC can also, at the "to" device, start punch operations and specify the punchout format for those operations.

Table 2. Copy Control Character (CCC) for copying to a 129 Device.

Bit	Explanation
0, 1	Determined by bits 2-7 (Appendix A).
2, 3	Defines the punchout format as follows: If 00, NL and EM characters determine the number of columns punched in the record. If 01, 10, or 11, the standard 80-character card records are punched out.
4	The start punch bit. When set to 1, it initiates a punchout operation at the "to" device after buffer transfers are completed.
5	Not used by the 129.
6, 7	Define the type of data to be copied as follows: 00: Attribute characters only are copied. 01: Attribute characters and unprotected alphameric fields (including nulls) are copied. Nulls are transferred for the alphameric characters not copied from the protected fields. 10: All attribute characters and protected alphameric fields (including nulls) are copied. Nulls are transferred for the alphameric characters not copied from the unprotected fields. 11: The entire contents of the storage buffer (including nulls) are copied.

Programming Notes:

- The erase all unprotected (EAU) command, applied to the 129, resets all fields (both protected and unprotected) in the buffer to nulls.
- Unlike the 3284 and 3286, which always start printing from position 1 of the buffer, the 129 starts a punch-out from whatever position the cursor is located. The programmer must therefore ensure that the cursor is positioned at the start of the data to be punched out.
- If the 129 is not actually reading cards, a read modified or a read buffer command returns an AID character of hexidecimal E8 (a printer AID).
- Do not use the attribute character (1D) in position 480 of the buffer.

Punching Modes

Non-Compressed Mode–The entire content of the control unit buffer is transferred to the 129 specified by the CPU. The cursor position is retained and is transferred to the 129's 480-position buffer. For each card record, transfer of 480-position buffer data to cards starts at the cursor position and ends with the recognition of an NL character, EM character, or the transfer of the 480th byte of data.

After the data has been written into the 480-position buffer, the 129 must receive a WCC or a CCC with the start punch bit set (same as start print for 3284/3286). One complete buffer search is made before any transfer of data from the 480-position buffer to the 129 input buffer. This initial search serves to determine if the buffer character at the cursor position is within a wrapped, non-display/non-print/non-punch field, or if the buffer contains characters to be punched.

When the start punch bit is initially decoded, the busy bit is turned on.

Busy is turned off when:

1. An EM character is recognized with WCC or CCC bits (2 and 3) set to 00.
2. The last punchable data is transferred out of the 480-position buffer.
3. A transport jam occurs.

The cursor is positioned at the next position of the 480-position buffer.

Attribute (field description) characters NUL, EM, and NL, space, and all alphameric characters in data fields designated as non-punchable are punched as spaces. If an entire card record consists of NUL, EM, NL characters and unpunchable fields, a card feed is suppressed, and no blank card appears in the card deck. If the card record contains one or more spaces, and the rest of the record is NUL, EM, NL and unpunchable fields, a punchout of a blank card occurs.

After concluding the punchout of the last card, the 129 initiates a card feed.

Compressed Data Mode

In this mode, attribute characters are not transferred to the card. Consequently, adjacent fields are not separated by spaces, and data is compressed. Data designated as unpunchable (by the non-display attribute character) and spaces (EBCDIC 40) are transferred to the 480-position buffer as normal data. These do create spaces on the card during punch-out.

Local and Remote (Teleprocessing) Operations

The sections in the 3270 description and programmer's guides (Forms GA23-0060 and GA23-0061) dealing with local and remote operations also apply to 129 devices attached to a 3271, 3272, or 3274 Control Unit. Whenever those sections of the manuals use the term "devices," note that this term includes the 129 device, in addition to the display and printer. Whenever the various tables on status and sense conditions mention the terms "printing" or "print operation," the conditions described also apply to "punching" or "punch operation" on the 129.

Some material in this section is reproduced from the 3270 description and programmer's guides, highlighting the 129 changes. These are up-to-date with regard to the 129 material only. Refer to the appropriate 3270 manual for the latest information.

Sense Information

The sense command is valid for the 3272 and 3274 only. It should be issued in response to unit check status for further

definition of the unit check condition. The 129 presents two conditions:

- Equipment check (EC) bit setting (bit 3) indicates that a 129 transport jam has occurred.
- Operation check (OC) bit (bit 7) is set when a write or erase/write command with the start punch bit set in the WCC and chained to the next command is issued. The punch operation is suppressed.

Status Information

Attention (A) can occur when sufficient cards have been read by a 129 to fill the 129 attachment buffer and the 129 is ready for a data transfer to the control unit.

Status "DE, UC" with sense conditions "IR, EC, US" can occur when a 129 transport jam has occurred in punch mode.

Status "UC" with sense conditions "EC, US" can occur with a 129 transport jam in read mode.

Remote Status and Sense

The equipment check (EC) bit is set by a transport jam status on the 129.

Remote Error Status and Sense Response

Refer to the 3270 description and programmer's guides for remote error status and sense response information. Whenever the explanation column includes EC in the response, remember that the explanation might be a transport jam status on the 129. The combination "EC, US" is an indication of a transport jam in read mode.

Whenever the 3274 detects a transport jam while the 129 is either in read or punch mode, a sense code of 082B is sent to the central processor.

Error Recovery Procedures

The error recovery procedures in the 3270 description and programmer's guides also apply to the 129 as long as the following points are kept in mind.

- When a transport jam occurs, the 129 buffer data is not in error; however, cards may be damaged during the jam.

Location of the cursor following a transport jam (determined by performing a read-buffer operation):

- Cursor is in position 0 of attachment buffer.
  - Jam occurred on one of the last two records of the current block of data, or
  - Jam occurred on last record of the previous block of data (already transferred for punch-out).
- Cursor is in column 1 of the second record following that record when the transport jam was indicated.

To avoid loss of records damaged during the jam, resend the previous block for punch-out. The printer, the display, or a sequentially numbered field (sequence field) in each record may be used to guide the 129 operator to check for possible duplication of records.

Receipt of a start-punch bit, after the 129 operator has cleared the jam and readied the machine, resets the transport jam status.

- The card record last received from the 129 was the last card successfully read before the transport jam. Reading may be continued after the jam has been cleared (129 Operator removes the card jam, operates RESET/CLEAR, presses READ) and a write command is sent to the 129. The write command clears the transport jam status.
- When a transport jam occurs in read mode, cards read prior to the jam indication were read and transferred to the CPU. The 129 operator must reassemble the card deck to restart read mode. The card that caused the transport jam could be already in the 129 stacker. The program should check for duplicate records after restart.

Programming Note:

- After the operator removes the jam, activates RESET/CLEAR, and feeds two blank cards (or presses READ to cause cards to feed), a start-punch bit from the central processor can ready the 129 attachment.

SYSTEM GENERATION (SYSGEN)

The 129 Data Recorder must be listed as a 3277 Model 1 during system generation time.

3274 IML

For a 3274 to be properly IML'ed with a 129 Data Recorder attached, the 3274 must have been customized as follows:

- SNA
- At least 4 specified in sequence number 111
- RPQ 8K1011 installed

3274 Device Summary Test

Once the 3274 is successfully IML'ed, device attachment can be checked by use of the /3 test at the display station attached to port A0. See the *IBM 3270 Information Display System, 3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827, Appendix D, for instructions.

The current mode of the 129 can be determined by use of this test. When the device is in read mode, the /3 test entry for port B0 will have a "d" (display) in the TYPE field. When the 129 is in punch mode, the TYPE field entry will be a "p" (printer).

When switched online, the 129 attachment reads alphameric card data to a central processing unit; similarly, it receives data from the central processor for punching 80-column cards. When switched offline, the 129 attachment operates as a normal card data recorder. Refer to the *129 Card Data Recorder, Machine Description,* GA22-6980 for operation of the 129 in the offline mode.

The 129 contains areas of storage for data and operating-programs. To these has been added a 480-position buffer (the attachment buffer) to enable the 129 to operate as an input output, online device, and to make it conform to the requirements of the IBM 3270 Information Display System. The attachment buffer has a cursor bit position; the cursor acts as a point of reference in the system's data manipulations. Although the 129 responds differently according to its input/output status, it remains within the bounds of the devices that are available to be connected to the 3271, 3272, or 3274 Control Units. When punching, the 129 emulates the response of the 3284-1 or 3286-1 Printer; when reading, it emulates the response of the 3277-1 Display Station.

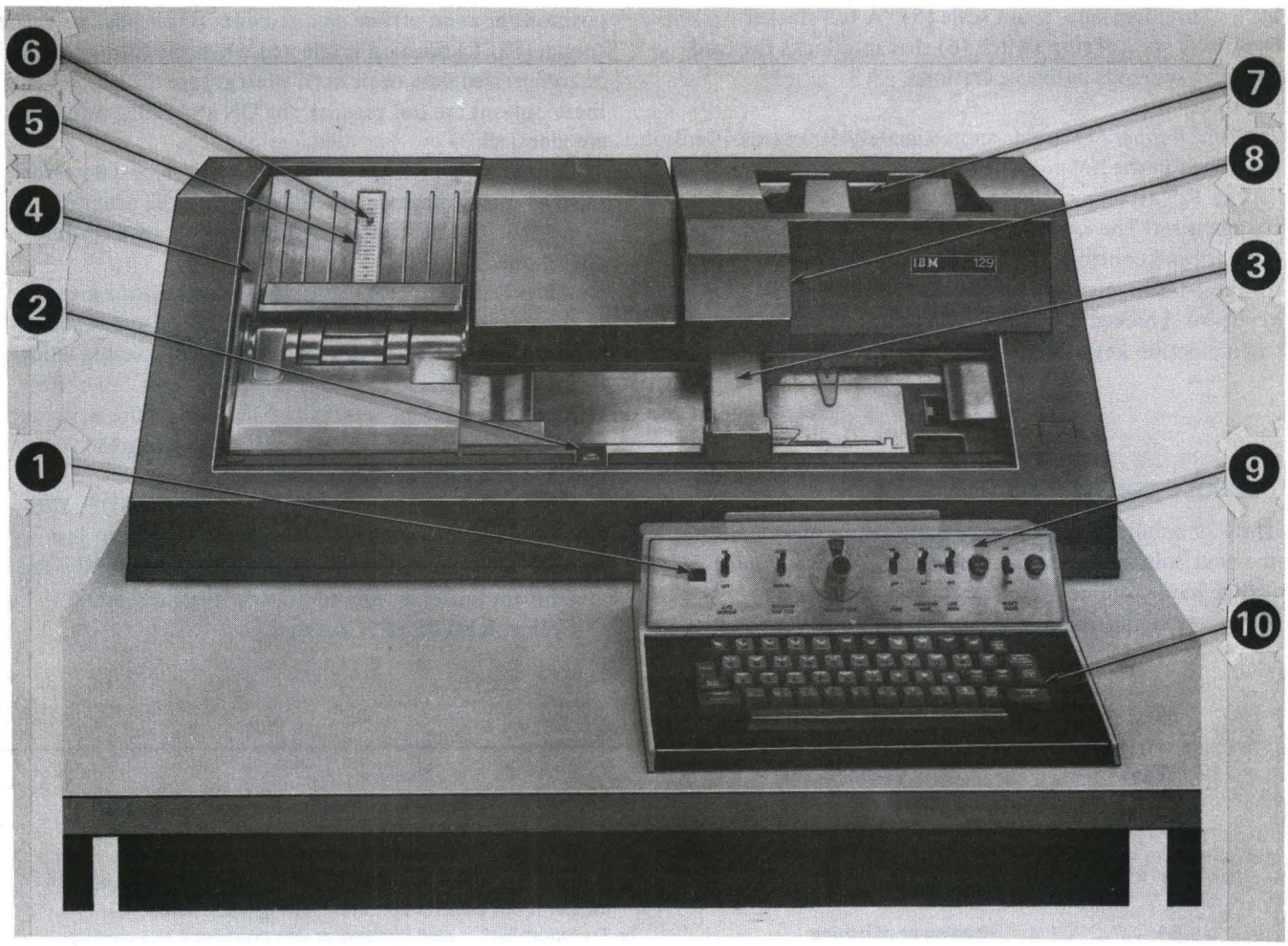


Figure 3. Components of the 129-3270 Attachment

DESCRIPTION OF COMPONENTS

The principal components of the 129 attachment are (Figure 3): column indicator, combination punch-read unit, card stacker, card count scale, stacker stop switch, card hopper, print unit, keyboard console and keyboard. The components should be studied for operation with the 3270 system and are described below.

The column indicator (1): on the keyboard console shows the next card column to be keyed, when the 129 is used offline. Online, the column indicator (discussed further below) indicates the status of the attachment hardware.

The card release pushbutton (2): permits manual removal of a card from the punch-read station. The 129 attachment has a combination punch-read station (3).

The card stacker(4): holds approximately 500 cards and has a convenient card count scale (5). A full stacker operates a stacker stop switch (6) that interlocks the card feed and suspends online operations.

The card hopper (7): holds approximately 500 cards. Cards are placed in the hopper face forward with the 9-edge down.

The 129 attachment has a print unit (8) with the 64-character set. The keyboard console (9) contains operating switches and controls. The keyboard (10) contains keys for the 64-character set and for control of the 129. The keyboard is locked during online operation, except for the three function keys: MULT PCH, FEED, and REG.

CONSOLE CONTROLS (Figure 4)

The 129 column indicator does more than simply indicate the next column into which information may be keyed in offline mode; online it is a system and device status indicator, as illustrated in the following table:

When LINE MODE is turned to ON, the switch marked AUTO SKIP/DUP is inactive.

During punching, if REC ADV/CARD FEED is set to MANUAL, punching is suspended after completion of the record in process. To resume punching, set REC ADV/CARD FEED to AUTO and register a blank card.

During reading, if REC ADV/CARD FEED is set to MANUAL, the read operation terminates after completion of the record in process. To resume reading, set REC ADV/CARD FEED to AUTO and press READ.

When online, PROGRAM MODE must be set to DATA READ. Do not use the other positions of the program mode dial in online mode.

When PRINT is set to ON, the characters to be printed are the same as those punched in the card.

Online, CHARACTER MODE is inactive.

LINE MODE selects whether the 129 attachment is used as an online device with the 3270 Display System (ON position) or as an offline data recorder (OFF position). The special (SPEC) position is selected when the formatted read or compressed data options (if present) are desired; where these options are not present, the ON and SPEC positions are identical.

Offline, when READ is pressed, program or data cards are read into storage, in conjunction with the program mode dial. Online, it is pressed to start the card reading operation.

When RESET/CLEAR is turned on, all cards move out of the transport into the stacker, and the column indicator returns to 01. Holding the MULT PCH key pressed while turning on RESET/CLEAR causes a "dc reset" to occur, resetting the machine internally. This procedure may be required when internal circuits prevent clearing the transport and restoring a ready status.

Program storage is not reset. With LINE MODE set to ON, however, any information about to be sent or just received is wiped out by this operation. (Technically, the attachment buffer is reset to nulls during a dc reset.)

Online, REC BKSP is inactive.

Indication	When Encountered	Meaning
00	Punching	• The last two records have been transferred for punch-out.
01	Anytime except during reading	• 129 is available to the operator. • Operator intervention is permissible.
01	Reading	• No error condition is present (Note: an empty or jammed hopper is not an error condition during read operations).
8A	Reading or punching	• Transport jam: a card jammed or was impeded while passing through the punch-read station.
88	Reading	• 129 has data ready to transfer to the CPU.
88	Reading or punching	• The stacker is full. • 129 is communicating with the control unit.
88	Punching	• 129 has data to be punched or is punching. • The hopper is empty or jammed.

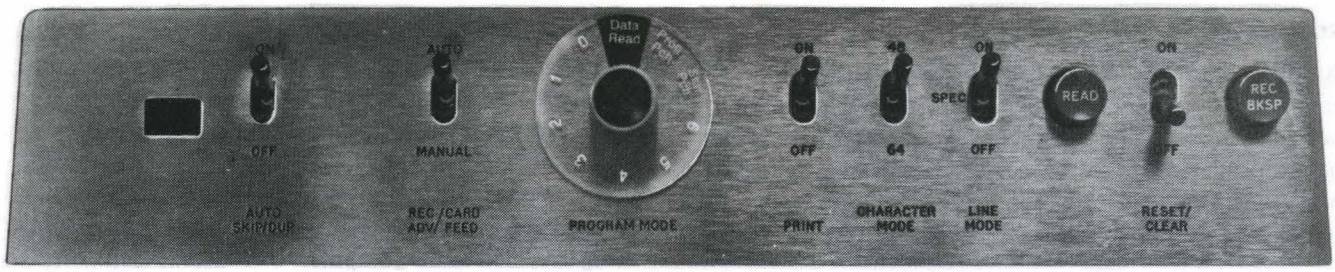


Figure 4. Keyboard Console

PROBLEMS, SUSPENDED OPERATION, AND RECOVERY TECHNIQUES

In general, if the performance of any equipment varies from the specified performance, the operator should know what to expect to be able to cope with it. The following conditions could occur on the 129-3270 Attachment:

- unable to IML 3274 Control Unit
- transmit check
- device check
- transport jam
- hopper-empty
- hopper-jammed
- stacker-full

Unable to IML 3274 Control Unit

If the 3274 fails to IML and a "1000" is displayed in the 8 4 2 1 indicators on the 3274 control panel, the following action should be taken.

- Power the 129 off and back on (this puts the 129 in punch mode)
- IML the 3274

Transmit Check (No Indication to the Operator)

The 129 attachment checks incoming information; each character must be acceptable to the 129 (have correct "parity"). If it is not, the 129 transmits a "transmit check response to the control unit. To the operator, there is no apparent malfunction.

Device Check

Internally, the 129 attachment checks its own storage. Incorrect "parity" or cursor errors in the attachment buffer cause a device check signal to go to the control unit. During punching, the only operator-recognizable device check indication is that the punch-out stops at the end of a buffer transfer with the column indicator showing 88. A blank is inserted for each data character found to be in error during punch-out. If this condition persists, the user should notify the IBM customer engineer.

Transport Jam

In either punch or read mode, if a card does not leave the punch-read station in the allotted time, the column indicator shows 8A to signal a transport jam. In all cases the operator removes the jam and sets RESET/CLEAR momentarily to ON. In read mode there are three error recovery options:

1. The application program can be fashioned to cause the data of the last card successfully read to be displayed on the display station.
2. The operator may determine the last card read successfully, repair any damaged cards, and restart the read operation from that point. The last card fully stacked is read properly (provided a RESET/CLEAR has not been performed).
3. The operator could reread all cards in the stacker.

In all cases, the operator *must follow* the error recovery technique indicated by the application program.

During a punch operation, further punching is inhibited as soon as the transport jam is detected. After removing the jam, and by operating RESET/CLEAR, the operator enables the punching to continue by ensuring that fresh cards are registered. The only error recovery necessary is to examine the cards punched, for possible duplication.

Hopper-Empty or Hopper Jammed

The no-card-registered condition is not *specifically* indicated on the 129 attachment; however, a jammed or empty hopper is readily apparent even without the column indicator. To resume operation in read mode:

1. Remove the jam, or fill the hopper with pre-punched cards.
2. Switch RESET/CLEAR momentarily to ON.
3. Press READ.

To resume operation in punch mode:

1. Remove the jam, or fill the hopper with blank cards.
2. Press FEED; feed two cards.

Stacker-Full

A full stacker, like an empty hopper, is not an error condition; it is apparent to the operator even without 88 being displayed on the column indicator. After the stacker has been emptied and a new card fed, a punching operation may resume without further operator intervention. To resume reading, the operator must press READ.

For information regarding errors or problems not originating in the 129, see the *IBM 3270 Information Display System, Problem Determination Guide,* GA27-2750, or *IBM 3270 Information Display System, 3274 Control Unit Problem Determination Guide,* GA27-2850.

RESET OPERATIONS

The 129 attachment reset operations involve RESET/CLEAR being operated either alone or simultaneously with MULT PCH (multipunch key).

Clear Operation

Using RESET/CLEAR in online mode positions the cursor to byte 1 of the 480-position attachment buffer and clears cards out of the 129 transport. A clear operation in punch mode and with a transport jam does not, however, reposition the cursor, which remains to indicate those positions in the attachment buffer not yet transferred to the appropriate 129 storage area. A clear operation must follow any change in line mode (ON/OFF/SPEC) and must precede any change of operation (read, punch, formatted read, compressed data).

DC Reset

Turning on RESET/CLEAR, while holding MULT PCH on the 129 keyboard depressed, acts as a general reset to the 129 attachment; 129 status is cleared of error conditions, the attachment buffer is reset to nulls, and the card transport is cleared. For any apparent "hang-up" of the 129 attachment, perform a dc reset; this resets its internal circuits without losing the stored programs.

OPERATOR TESTS

In cases of malfunction, often the operator can determine whether the 129 is the failing component, and sometimes he can even define the nature of the failure. For example, by using the 129 attachment in offline mode, the operator can establish whether the 129 attachment is troublefree as a "keypunch". Before placing a service call, test whether the 129 attachment is operating properly in the offline mode. (Appendix D.)

If the 129 is attached to a 3274, the operator can perform a /3 test at the display station to determine if the 129 is communicating with the 3274. See the *3270 Information Display System, 3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827, Appendix D, for specifics on this test.

An online facility, Request-for-Test or RFT, (see *Note*) also may be used to test 3270 devices (including the 129) attached to a 3271 or 3272. RTF does not apply to the 3274. The operator requests these tests from a display station. RFT tests are useful problem-determination tools. For example, a successful test verifies that the operating-system program and the BTAM-application program are being executed in the computer, that there is continuity in the data-transmission path which links the requesting device to the computer, and that the tested device is capable of performing the test function.

Note: RFT is available for System/360 and System/370 only.

Four RFTs using the extended binary coded decimal interchange code (EBCDIC) and four using the American National Standard Code for Information Interchange (ASCII) are available for testing the 129 attachment. The ASCII patterns may be used for remote devices only.

The following section, "Operating Procedures," contains instructions for requesting RFT.

OPERATING PROCEDURES

Online Operations

Card Reading (Unformatted)

The column indicator must show 01, indicating that the 129 is available to the operator.

1. Set the 129 console switches as follows:
   PROGRAM MODE to DATA READ
   REC ADV/CARD FEED to AUTO
   LINE MODE to ON
   RESET/CLEAR momentarily to ON.
2. Place the cards to be read in the hopper.
3. Press READ.

Seven cards are read; the last card is half-stacked. Six records (480 columns) completely fill the attachment buffer and the seventh circulates in the storage of the basic 129 until it too can be transferred to the attachment buffer. There is a slight pause during which the 129 waits for the central processor to accept its information (the column indicator shows 88 during this time); reading without operator intervention resumes when the buffer transfer is complete; the column indicator shows 01 and reading continues until one of the following conditions occurs:

- REC ADV/CARD FEED set to MANUAL.
- A feeding failure (a hopper jam).
- A transport jam.
- A full stacker.
- Last card (The hopper is empty).

Note: For column indication see "Console Controls."

If several consecutive messages are being transmitted, and if an end-of-message (EM) character (IBM card code 11-1-8-9) separates messages, card reading is suspended

temporarily; the column indicator displays 88, the remaining buffer positions are filled with nulls, and the buffer's contents are available to the central processing unit. Card data punched in columns beyond the EM is ignored.

Card Punching (Non-Compressed)

The column indicator must show 01, indicating that the 129 is available to the operator.

1. Set the 129 console switches as follows:
   PROGRAM MODE to DATA READ
   REC ADV/CARD FEED to AUTO
   LINE MODE to ON
   RESET/CLEAR momentarily to ON
2. Ensure that blank cards are in the hopper.
3. Press FEED (located on the 129 keyboard). Feed two cards.

When punching begins, the column indicator shows 88, and the operation continues under system control. If at the completion of punching the column indicator still displays 88, this indicates that punching of data remains to be executed. At this time, check for an empty hopper or a full stacker, since these conditions are accompanied by an 88 column indication. Add, remove, or register cards as required.

Options

Formatted Read

The 129's internal program storage accepts up to three programs for the formatted read option. Program cards may be supplied to the operator, or they may be punched or duplicated by the operator in accordance with the following table to conform to the demands of the application program:

IBM Card Code	Definition
12	Field Definition. This code is used in all columns of a field except the high-order position.
11	Skip. This code is used in the high-order position of a field to be skipped.
Blank	Used in the high-order position of a read field.

In offline mode, read the appropriate program cards into levels 1, 2, and 3. Do not load programs into level 4, since the 129 ignores program information in levels 4, 5 and 6 in online operation. Program level 4 is a fixed, 80-column-read program. Program levels are selected by each data card in a formatted read operation; each card has an IBM card code punch, 1, to 4, in column 1. The 129 selects the program corresponding to the punch in column 1.

IBM Card Code	Program Level	Program Type
1	1	Operator Programmable
2	2	Operator Programmable
3	3	Operator Programmable
4	4	Fixed Program: 80-column-read

If column 1 is left blank, the 129 maintains the program level of the card previously read. If the first card read and following cards have no program selection punches, the 129 assumes program level 4.

Set the console switches as follows:
REC ADV/CARD FEED to AUTO
PROGRAM MODE to DATA READ
LINE MODE to SPEC
RESET/CLEAR momentarily to ON

Press READ. The operation runs as with unformatted read. In this case, however, a data transfer occurs when 96 positions or less remain in the attachment buffer at the end of a card read cycle. It is imperative, therefore, that the total number of columns read plus the total number of read fields not exceed 96.

Compressed Data

In normal online operation, attribute (field description) characters are retained in the data stream but are punched as blanks in the card. With the compressed data option, attribute characters are not punched and a full 80 columns of data can be punched into a card record.

1. Place blank cards in hopper.
2. Set the 129 console switches as follows:
   REC ADV/CARD FEED to AUTO
   PROGRAM MODE to DATA READ
   LINE MODE to SPEC
   RESET/CLEAR momentarily to ON
3. Press FEED; feed two cards.

Punching begins, the column indicator displays 88, and the operation continues under system control with possible periodic short pauses for buffer transfers. The column indicator displays 01 as punching ends. If punching is suspended with the column indicator showing 88, check for an empty hopper or a full stacker. Add, remove, or register cards as required to ready the 129 for further punching.

TEST PROCEDURES (RFT) (3271 and 3272 only)

Request-For-Test Procedures

The BTAM application program (under VS, OS or DOS) provides an online test facility known as request-for-test or RFT (see *Note*); it may be used to test the 129 with RPQ 8T0093. The operator requests these tests from a display station. There are four EBCDIC test patterns and four ASCII patterns available to the 129 attachment. If the 129's control unit has an EBCDIC I/O interface, the EBCDIC tests (XX = 23, 24, 26, 28) are used; if the control unit is equipped with the ASCII interface, the operator requests the ASCII tests (XX = 29, 30, 32, 34).

Note: RFT is available for System/360 and System/370 only.

1. Before requesting RFT, set the console switches as follows:
   REC ADV/CARD FEED to AUTO
   PROGRAM MODE to DATA READ
   LINE MODE to ON or SPEC
   RESET/CLEAR momentarily to ON
2. Place blank cards in the hopper.
3. Feed two cards.

4a. Request-for-test from a display station connected to a 3271 Control Unit:

- Position the cursor at the top left of an unformatted screen:
  - Press the CLEAR key.
  - Press the RESET key.
- Key the RFT message in the following format:
  XXYYNMMDD, where:
  - XX is the number of the test desired
  - YY is 01
  - N is 4
  - MMDD are selection addresses for the control unit (MM) and of the device (DD).

Note: Type all alphabetic characters in uppercase only. Ascertain from your system programmer or supervisor whether MMDD is a hexidecimal number or in graphic characters.

- Press TEST REQ; INPUT INHIBITED comes on.

If INPUT INHIBITED stays on with no RFT occurring in 30 seconds, ensure that each step of the above procedure is followed correctly, and request the test again. Confirm with the system operator that the appropriate program is indeed being executed in the computer.

4b. Request-for-test from a display station connected to a 3272 Control Unit:

- Position the cursor at the top left of an unformatted screen:
  - Press the CLEAR key.
  - Press the RESET key.
- Key the RFT message in the following format:
  XXYYNCUU, where:
  - XX is the number of the test desired.
  - YY is 01.
  - N is 3.
  - CUU are channel (C) and unit (UU) addresses as a hexidecimal number.

Note: Type all alphabetic characters in uppercase only.

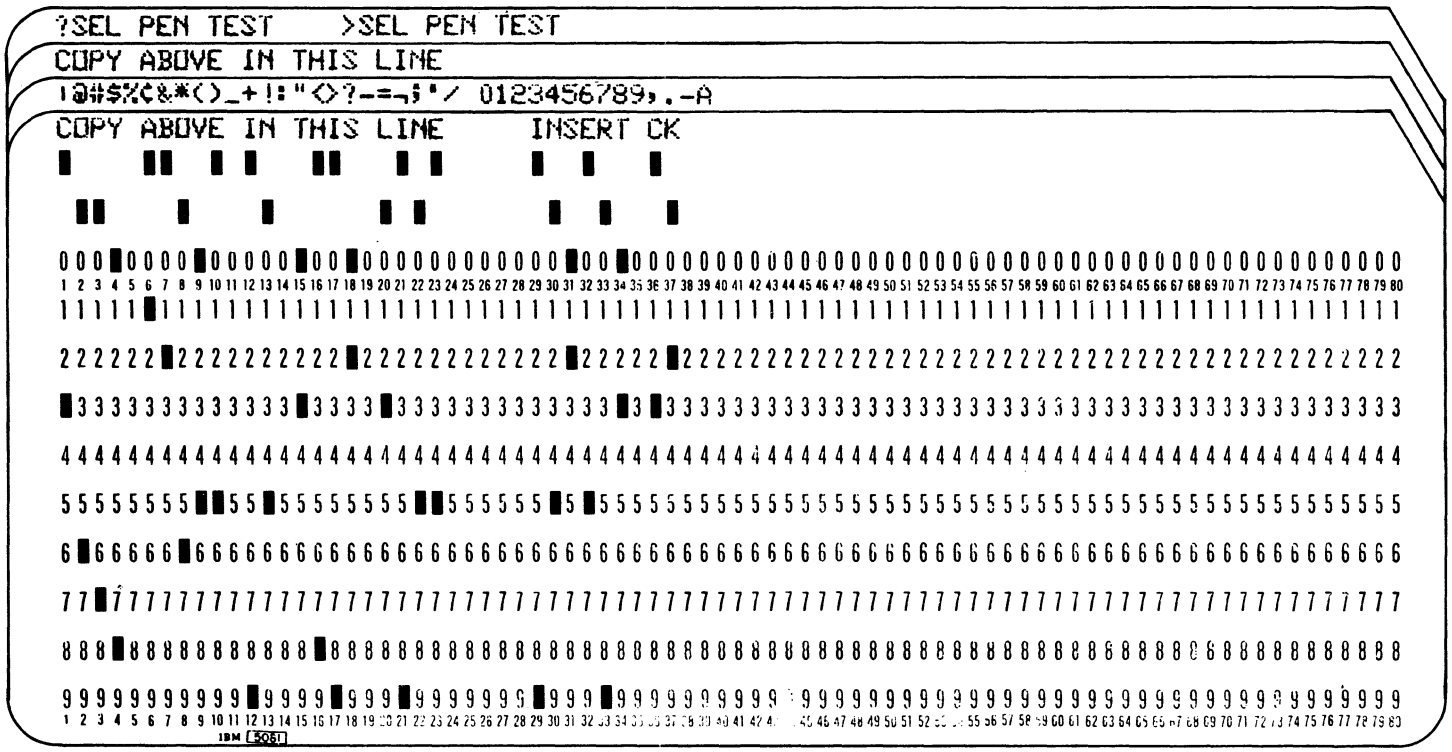
- Press TEST REQ; INPUT INHIBITED comes on.

If within 15 seconds INPUT INHIBITED is still on and no test has occurred, check and obtain the confirmations as described above.

Compare the punched results with the test patterns, Figures 5 and 6. Punched results illustrated in Figure 6 only apply if the Compressed Data option is installed.

EBCDIC TEST XX=23

ASCII TEST XX=29*



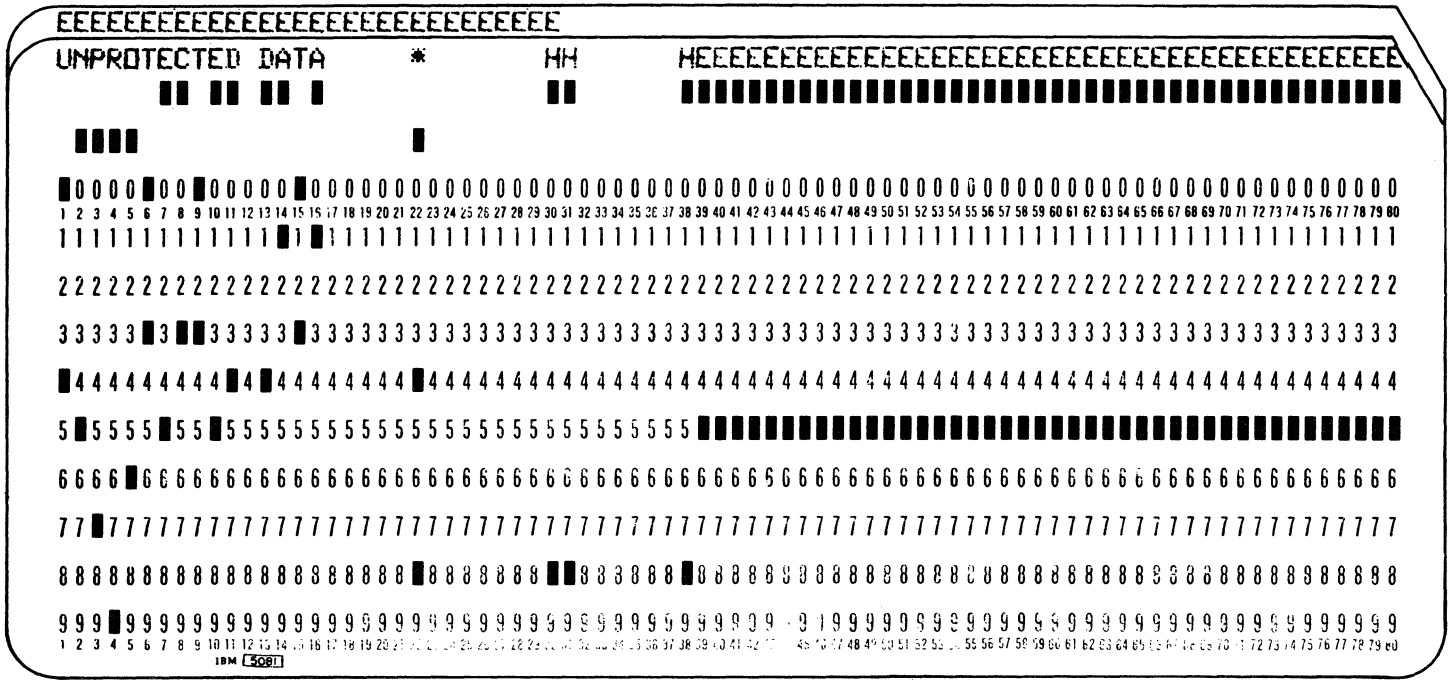
*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

Figure 5. RFT Test Patterns with Line Mode Switch Set to ON. (Part 1 of 4)

Figure 5. RFT Test Patterns With Line Mode Switch Set to ON. (Part 2 of 4)

EBCDIC TEST XX=24

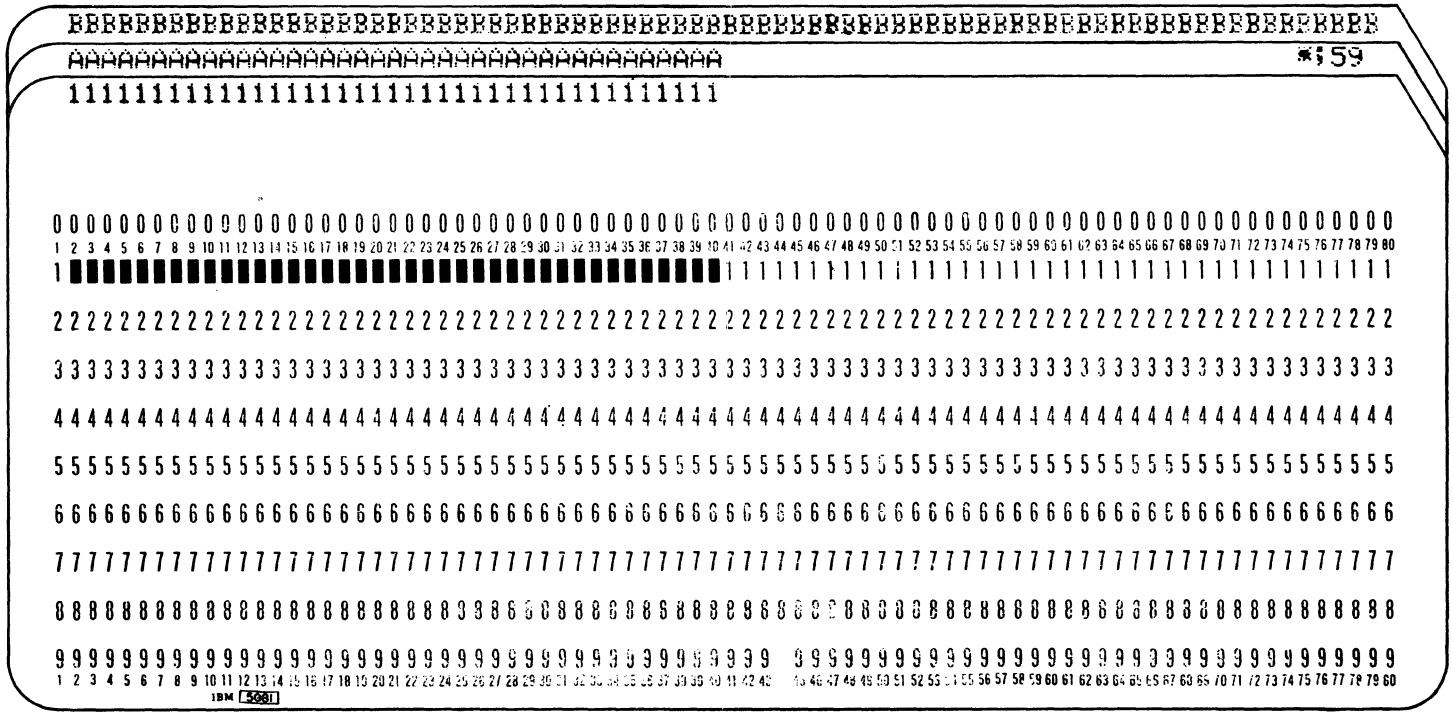
ASCII TEST XX=30*



*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

EBCDIC TEST XX=26

ASCII TEST XX=32*

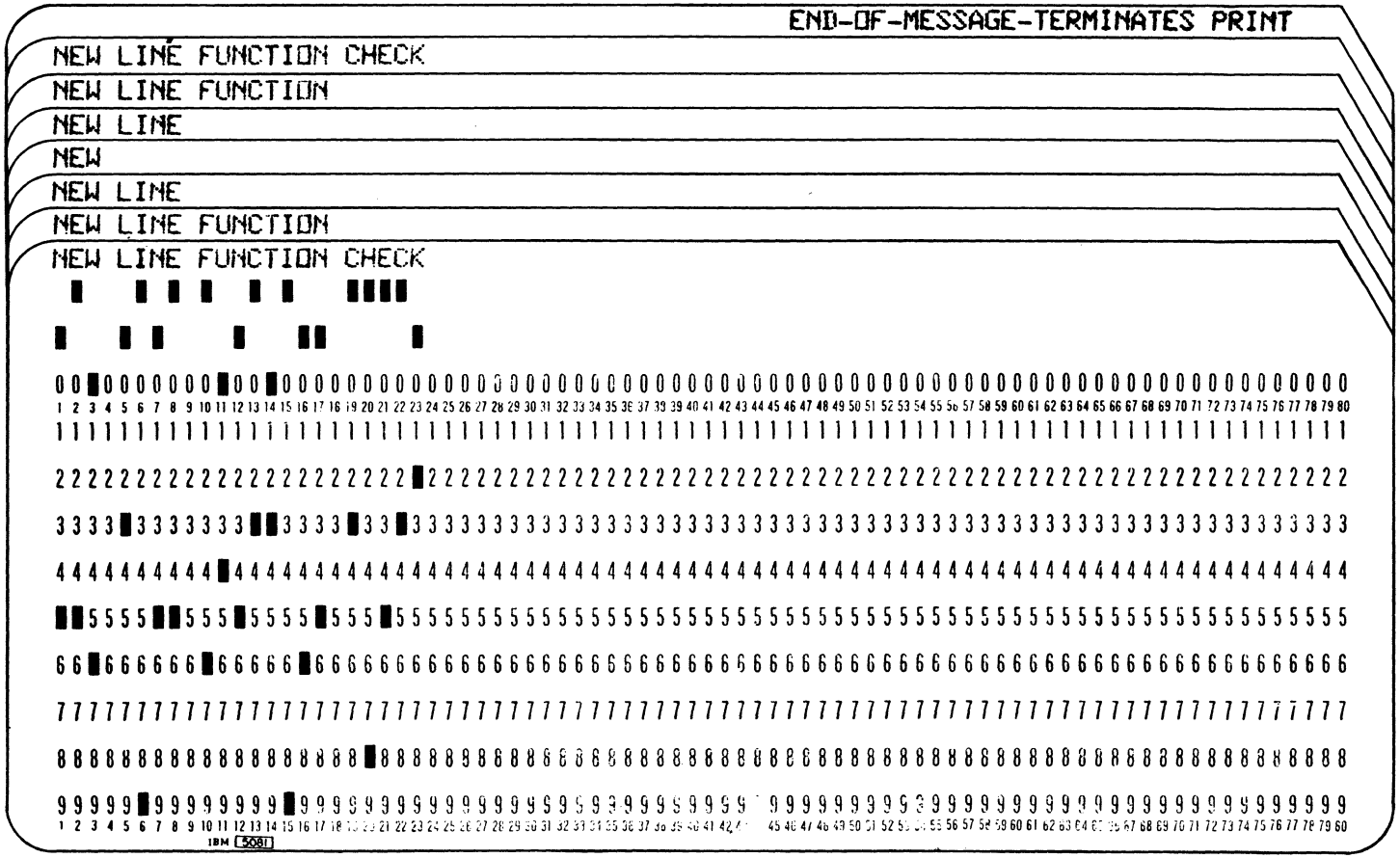


*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

Figure 5. RFT Test Patterns With Line Mode Switch Set to ON. (Part 3 of 4)

EBCDIC TEST XX=28

ASCII TEST XX=34*

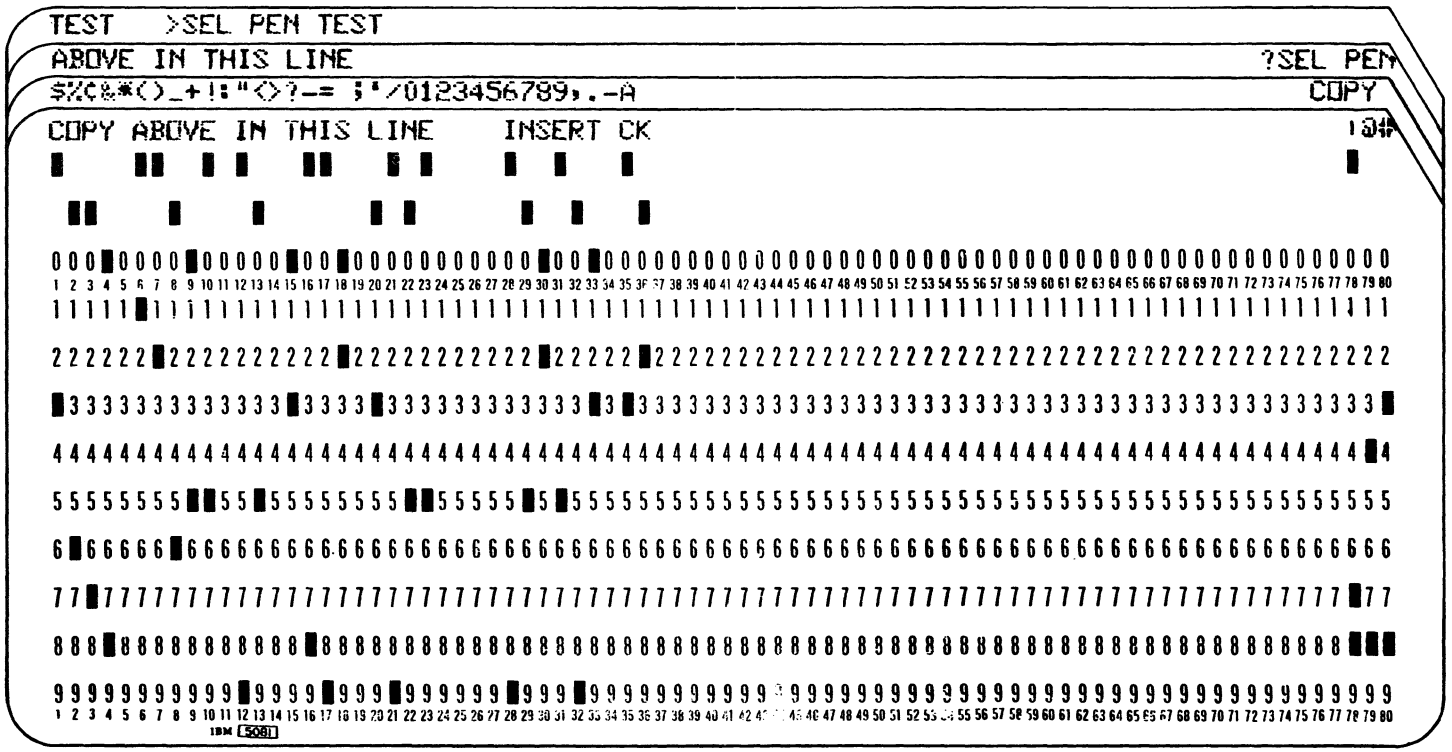


*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

Figure 5. RFT Test Patterns With Line Mode Switch Set to ON. (Part 4 of 4)

EBCDIC TEST XX=23

ASCII TEST XX=29*



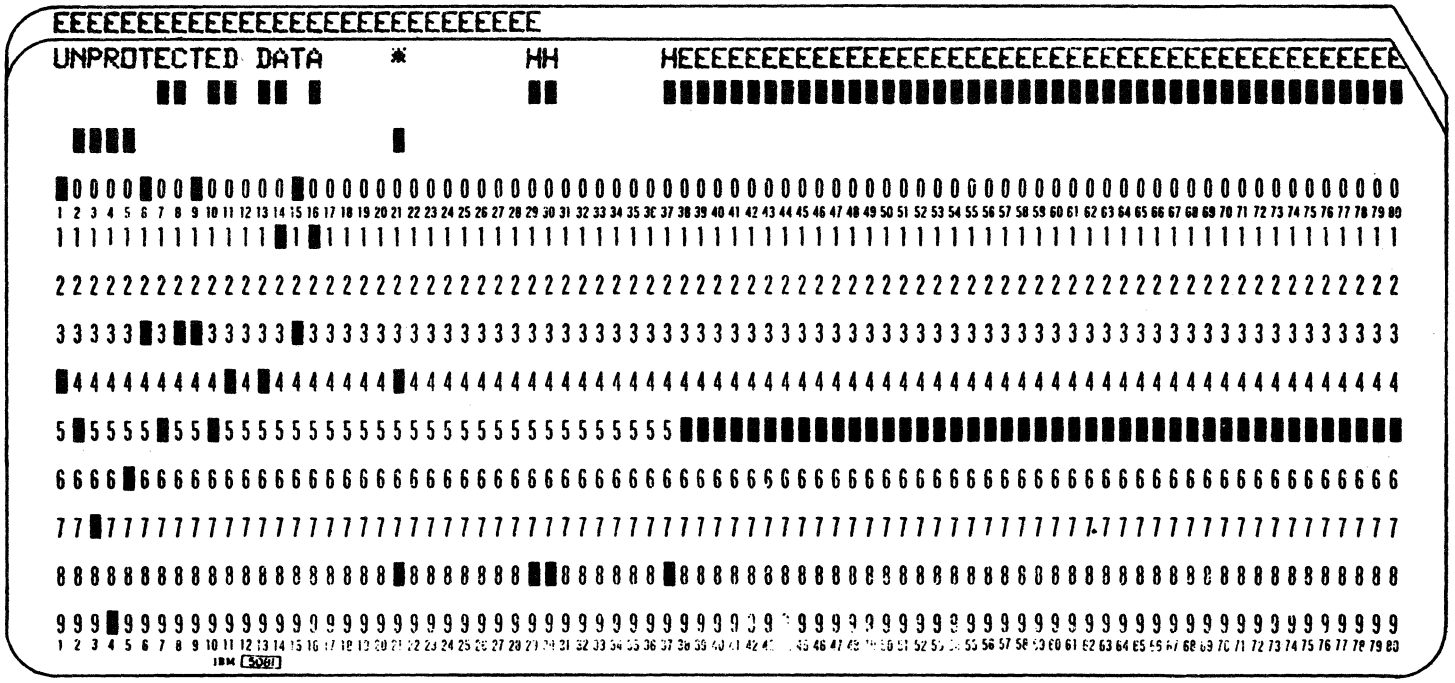
*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

Figure 6. RFT Test Patterns with Line Mode Switch Set to SPEC. (Part 1 of 4)

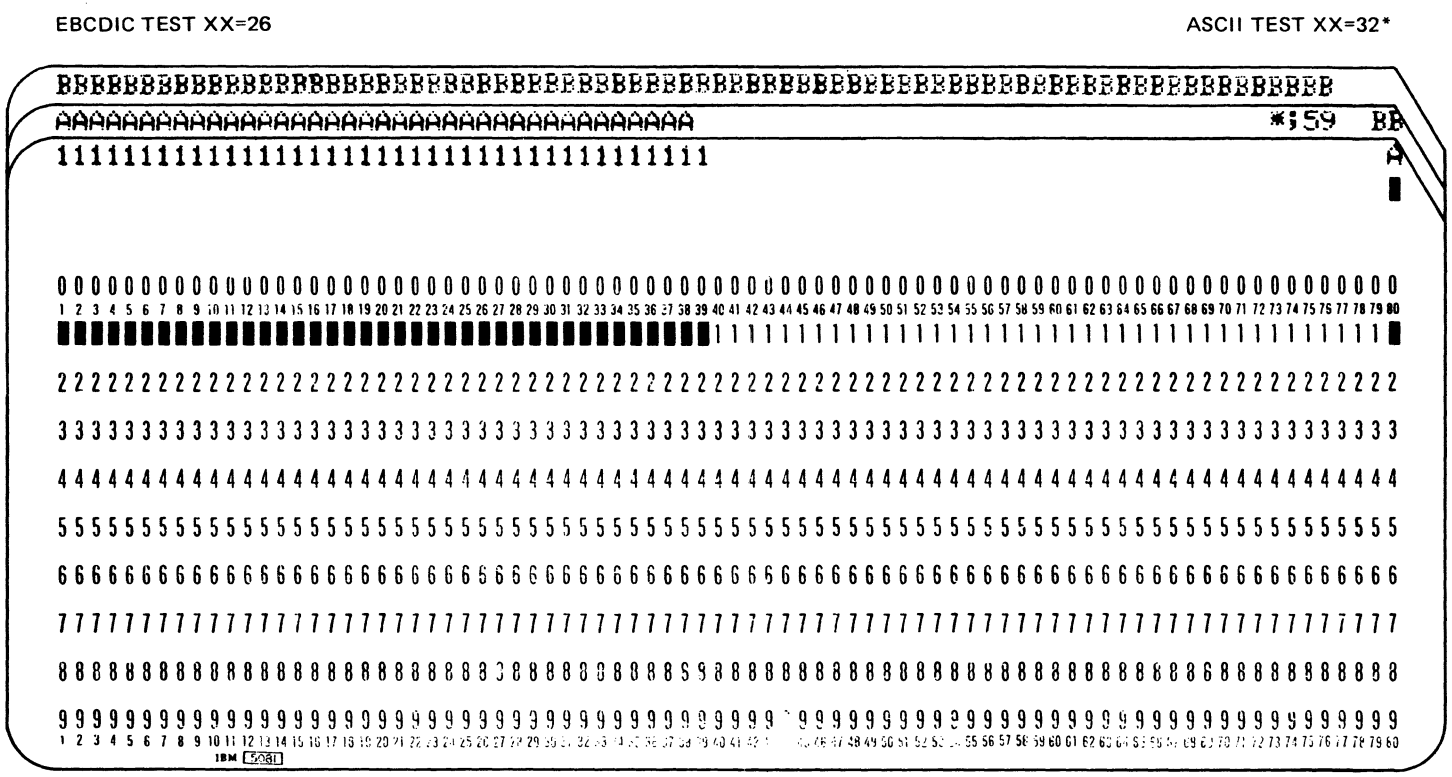
Figure 6. RFT Test Patterns with Line Mode Switch Set to SPEC. (Part 2 of 4)

EBCDIC TEST XX=24

ASCII TEST XX=30*



*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

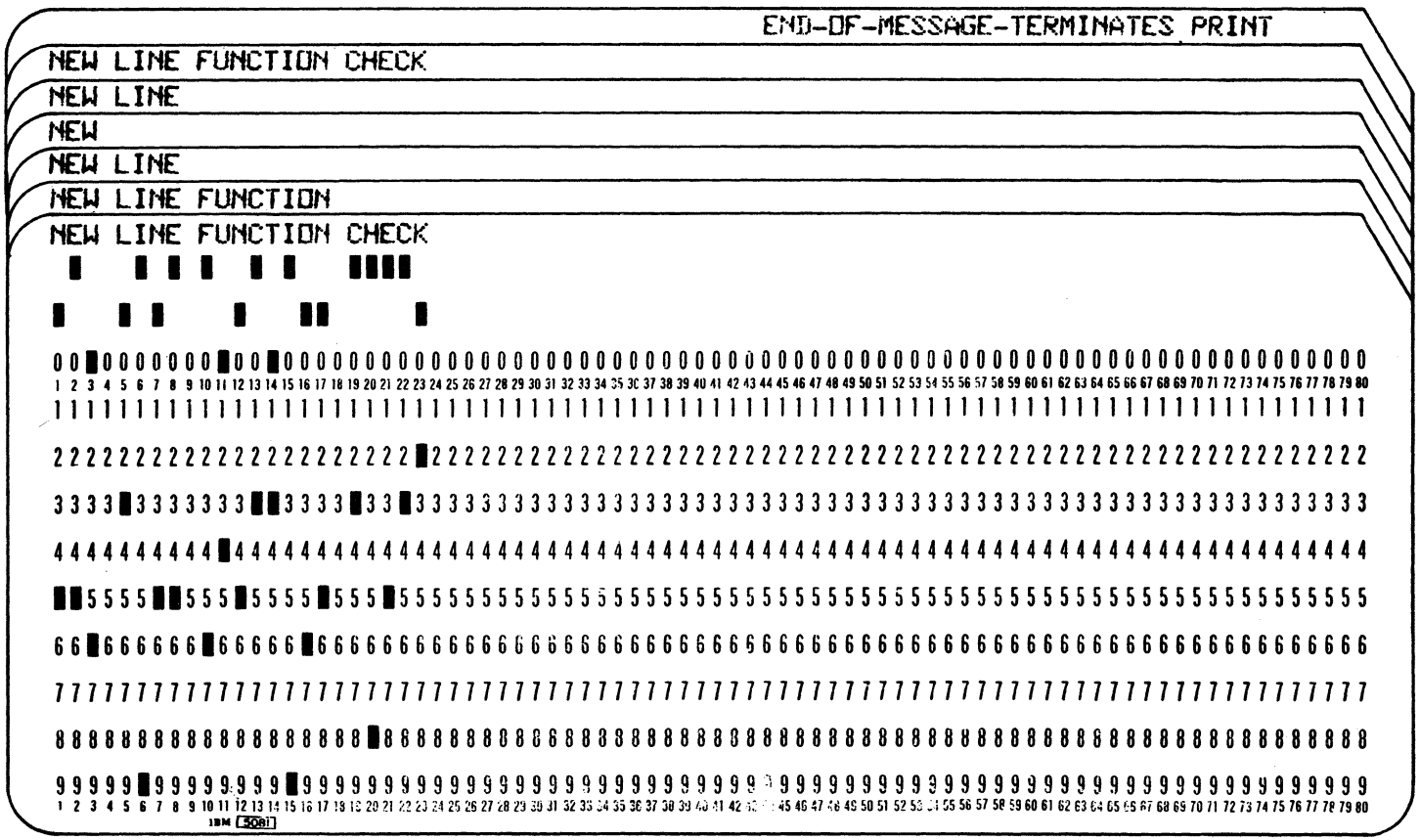


*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

Figure 6. RFT Test Patterns with Line Mode Switch Set to SPEC. (Part 3 of 4)

EBCDIC TEST XX=28

ASCII TEST XX=34*



*For the 129 Attachment equipped with ASCII, (feature code 9671) the characters ¢ and ! punch as [and] respectively.

Figure 6. RFT Test Patterns with Line Mode Switch Set to SPEC. (Part 4 of 4)

Appendix A. Assignments for Internal 6-Bit Structured Data

Bits 2 – 7	129 Graphic	EBCDIC	ASCII
00 0000	SP	40	20
00 0001	A	C1	41
00 0010	B	C2	42
00 0011	C	C3	43
00 0100	D	C4	44
00 0101	E	C5	45
00 0110	F	C6	46
00 0111	G	C7	47
00 1000	H	C8	48
00 1001	I	C9	49
00 1010	¢ [	4A	5B
00 1011	.	4B	2E
00 1100	<	4C	3C
00 1101	(	4D	28
00 1110	+	4E	2B
00 1111	I	4F	21
01 0000	&	50	26
01 0001	J	D1	4A
01 0010	K	D2	4B
01 0011	L	D3	4C
01 0100	M	D4	4D
01 0101	N	D5	4E
01 0110	O	D6	4F
01 0111	P	D7	50
01 1000	Q	D8	51
01 1001	R	D9	52
01 1010	!]	5A	5D
01 1011	$	5B	24
01 1100	*	5C	2A
01 1101	)	5D	29
01 1110	;	5E	3B
01 1111	¬	5F	5E

Bits 2 – 7	129 Graphic	EBCDIC	ASCII
10 0000	-	60	2D
10 0001	/	61	2F
10 0010	S	E2	53
10 0011	T	E3	54
10 0100	U	E4	55
10 0101	V	E5	56
10 0110	W	E6	57
10 0111	X	E7	58
10 1000	Y	E8	59
10 1001	Z	E9	5A
10 1010	\	-	5C
10 1011	,	6B	2C
10 1100	%	6C	25
10 1101	_	6D	5F
10 1110	>	6E	3E
10 1111	?	6F	3F
11 0000	0	F0	30
11 0001	1	F1	31
11 0010	2	F2	32
11 0011	3	F3	33
11 0100	4	F4	34
11 0101	5	F5	35
11 0110	6	F6	36
11 0111	7	F7	37
11 1000	8	F8	38
11 1001	9	F9	39
11 1010	:	7A	3A
11 1011	#	7B	23
11 1100	@	7C	40
11 1101	'	7D	27
11 1110	=	7E	3D
11 1111	"	7F	22

Note: The following characters are internally handled as 6-bit structured data: graphic, attribute, AID, write control (WCC), copy control (CCC), CU and device address, buffer address, status, and sense. When any character is received by the CU, only the low-order 6 bits are used. When any of these characters is transmitted to the program, the CU assigns the appropriate EBCDIC code. If transmission is in ASCII, the CU translates the EBCDIC code to ASCII code prior to transmission.

For example, to use this table to determine the hex code transmitted for an attribute character, first determine the values of bits 2 – 7. Select this bit configuration in the table under "Bits 2 – 7". The hex code that will be transmitted (either in EBCDIC or ASCII) is to the right of the bit configuration.

Use this table also to determine equivalent EBCDIC and ASCII hex codes and their associated graphic characters. Where two graphic characters are shown, the left character is the EBCDIC graphic and the right character is the ASCII graphic.

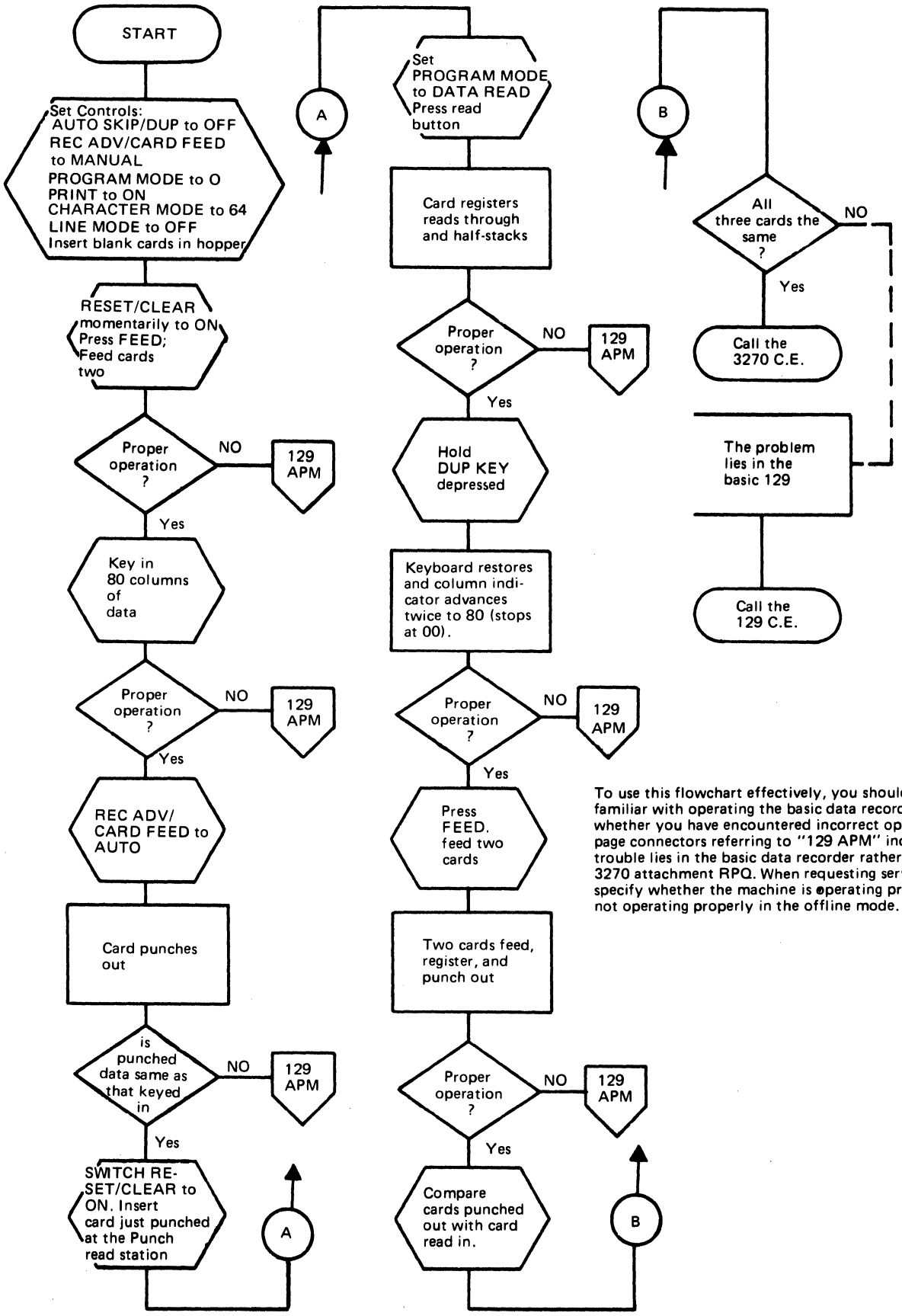
Appendix B. World Trade Special Characters

Keybutton/Print Character Graphic				IBM Card Code Input/Output
United States (Arrangement EL)	United Kingdom	French (AZERTY)	German (QWERTZ)	
¢	$	¢	Ö	12-8-2
!	!	!	Ü	11-8-2
$	£	$	Ü	11-8-3
#	#	#	Ä	8-3
@	@	@	Ö	8-4
"	"	"	Ä	8-7

Character	EBCDIC	ASCII	IBM Card Code in cards being read	IBM Card Code punched out
EM	19	19	11-9-8-1	9
NL	15	OA	11-9-5	5
NUL	00	00	Note	Blank
DUP	1C	1C	Note	11-8-4
FM	1E	1E	Note	11-8-6

Note: NUL, DUP, and FM characters are not within the 129 character set.

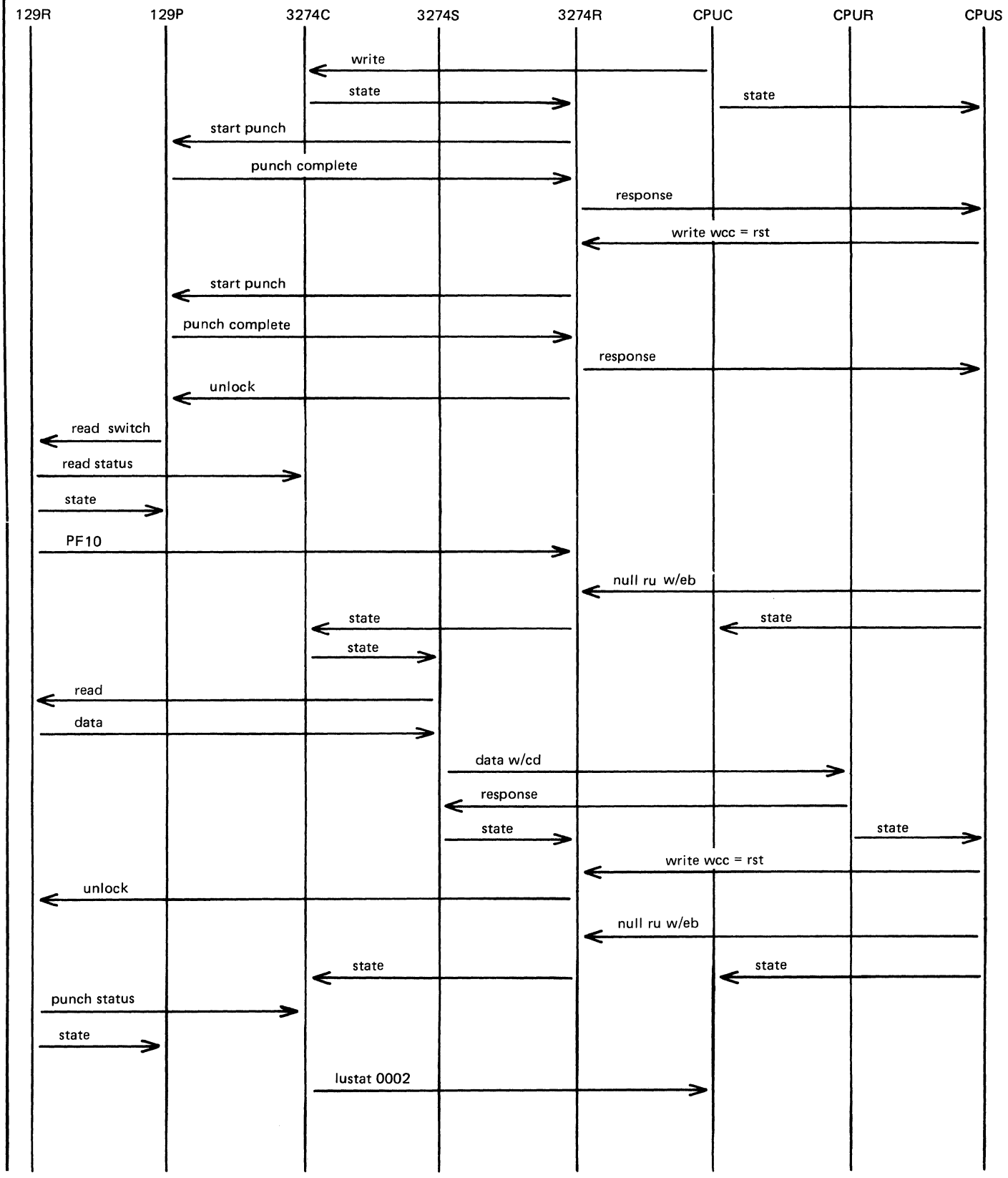
Appendix D. Operator Test in Offline Mode



To use this flowchart effectively, you should be sufficiently familiar with operating the basic data recorder to determine whether you have encountered incorrect operation. Off-page connectors referring to "129 APM" indicate that the trouble lies in the basic data recorder rather than in the 3270 attachment RPQ. When requesting service from IBM, specify whether the machine is operating properly or not operating properly in the offline mode.

Appendix E. 3274 Control Unit State Diagram

The following state diagram shows the normal communication flow between the 129, the 3274, and the central processor.



Legend:

129R	– 129 in read mode
129P	– 129 in punch mode
3274C	– 3274 in contention state
3274S	– 3274 in send state
3274R	– 3274 in receive state
CPUC	– central processor in contention state
CPUR	– central processor in receive state
CPUS	– central processor in send state
state	– state/mode transition
rst	– keyboard restore bit on
ru	– request unit
w/eb	– with end bracket
w/ed	– with change direction

Notes:

1. At attempt to initiate a read operation by pressing the READ button on the 129 when the device is in receive state will cause a 082A sense code to be sent to the central processor.
2. When the 129 is transferred from read mode to punch mode, an LUSTAT = 0002 is sent to the central processor.

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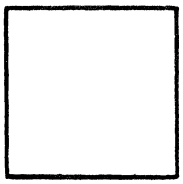

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