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Systems Reference Library

IBM 1050 Data Communication System Principles of Operation

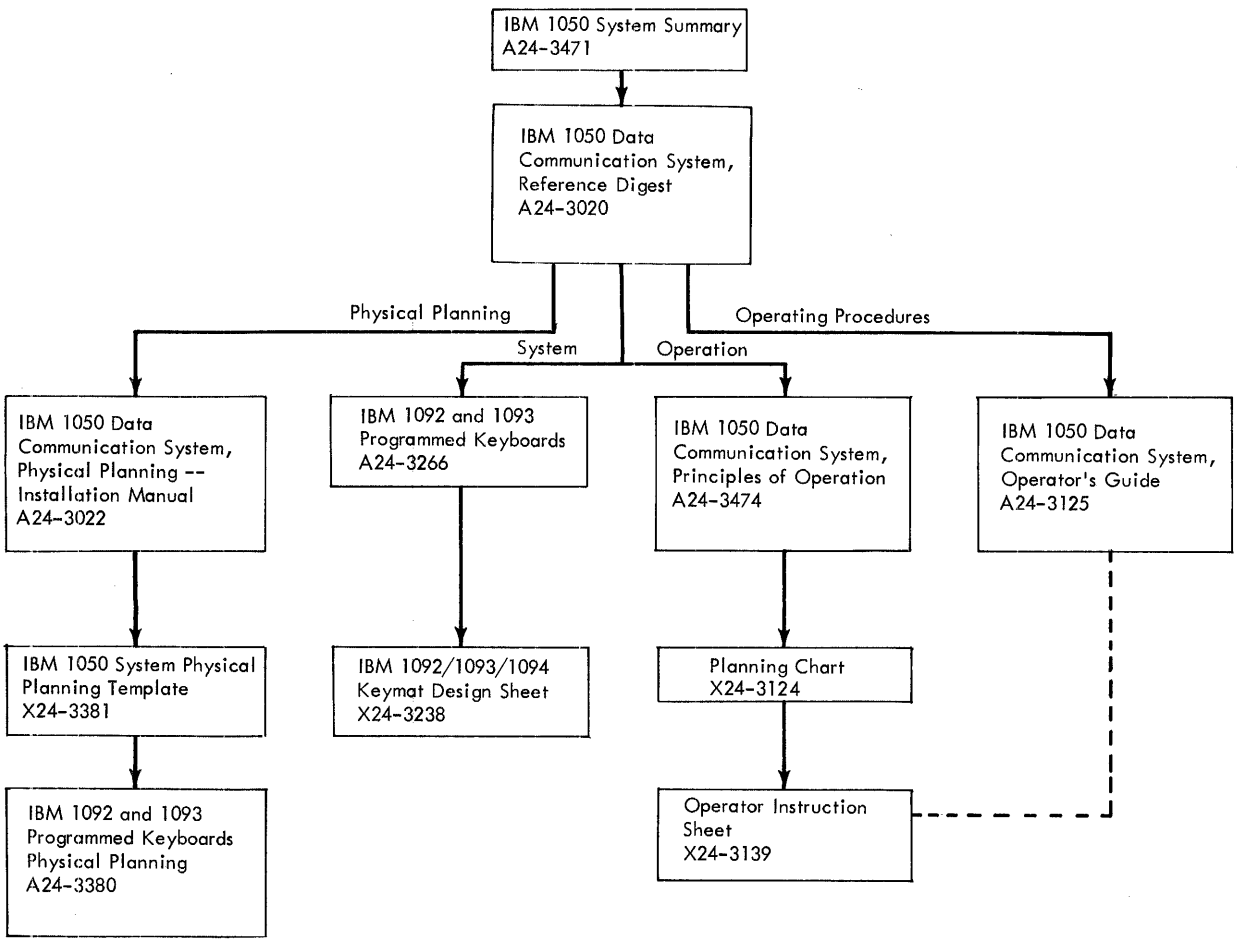
This reference publication provides a complete description of the operating principles of this IBM Teleprocessing system. The functional characteristics of the system and of each component is discussed in detail. Additional information, pertaining to the over-all system, is provided in the appendix.

For a list of related publications and their abstracts, refer to the IBM Teleprocessing Bibliography, Form A24-3089.

PREFACE

In this manual, major points are highlighted by bullets and by underlining in the text. Material called out in notes need be read only for detailed information.

The following diagram is provided as a guide to the 1050 section of the Teleprocessing System Reference Library. For other information on IBM Teleprocessing products, see IBM Teleprocessing Bibliography, Form A24-3089.



A form has been provided at the back of this publication for reader's comments. If the form has been detached, comments may be directed to IBM Product Publications, Raleigh, N. C. 27603.

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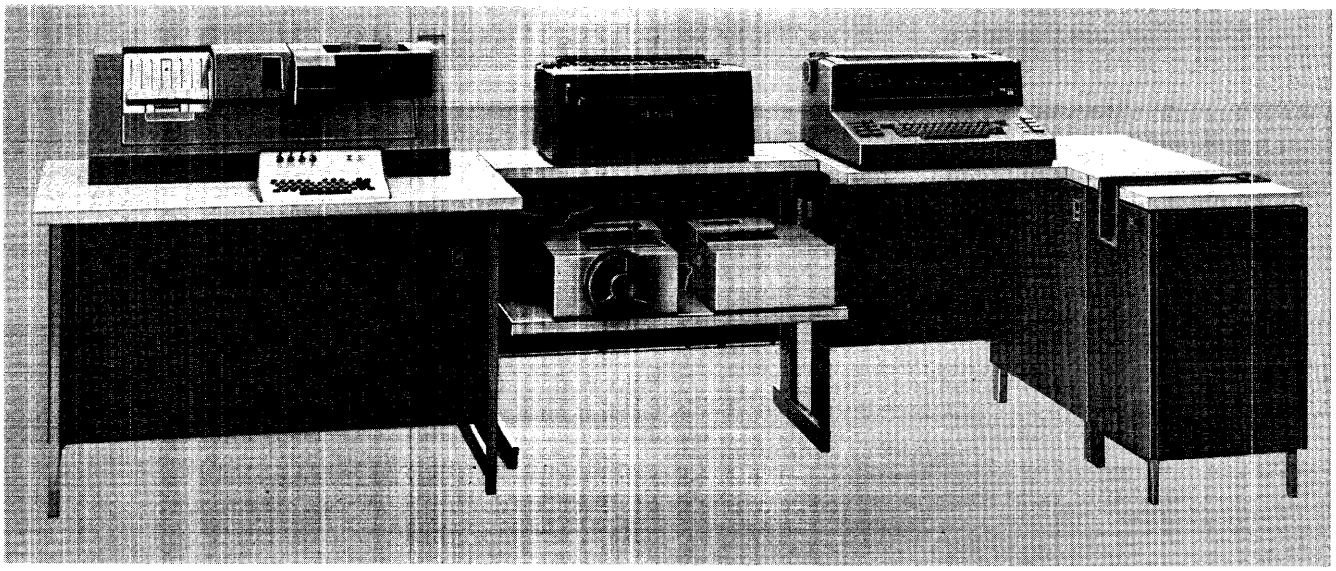


Figure 1. IBM 1050 Data Communication System

The 1050 Data Communication System (Figure 1) offers the flexibility and versatility necessary to encompass a broad range of applications. Efficient utilization of this system demands a thorough understanding of its principles of operation on the part of the systems analyst. The information needed by the customer's personnel is available in the 1050 Data Communication System library (see Preface of this manual).

The primary function of this manual is to present, in detail, the operating principles of the 1050 system in a reference format. As a reference manual, this publication is intended to facilitate the location and understanding of any particular item. A thorough understanding in depth can be obtained by reading this manual from beginning to end.

NOTE: The reader is assumed to be familiar with the IBM 1050 Data Communication System, System Summary, Form A24-3471.

SYSTEM CONFIGURATIONS

Home Loop – Models 1 and N1

In home-loop, data is keyed or read, sent to the 1051 control unit, and then punched or printed on an output unit attached to the same control unit. When data is keyed and printed, documents may be prepared. For efficient use of line time, messages may be keyed and punched in home-loop before transmission from a reader. Data conversion is a typical read-punch operation. If documents need to be generated from punched tape or cards, the home-loop capabilities of the 1050 offer an ideal solution.

A home-loop configuration of the 1050 system may include up to two printers, two punches, two readers and must include either a 1052 keyboard or a switch unit. The maximum configuration is shown in Figure 2.

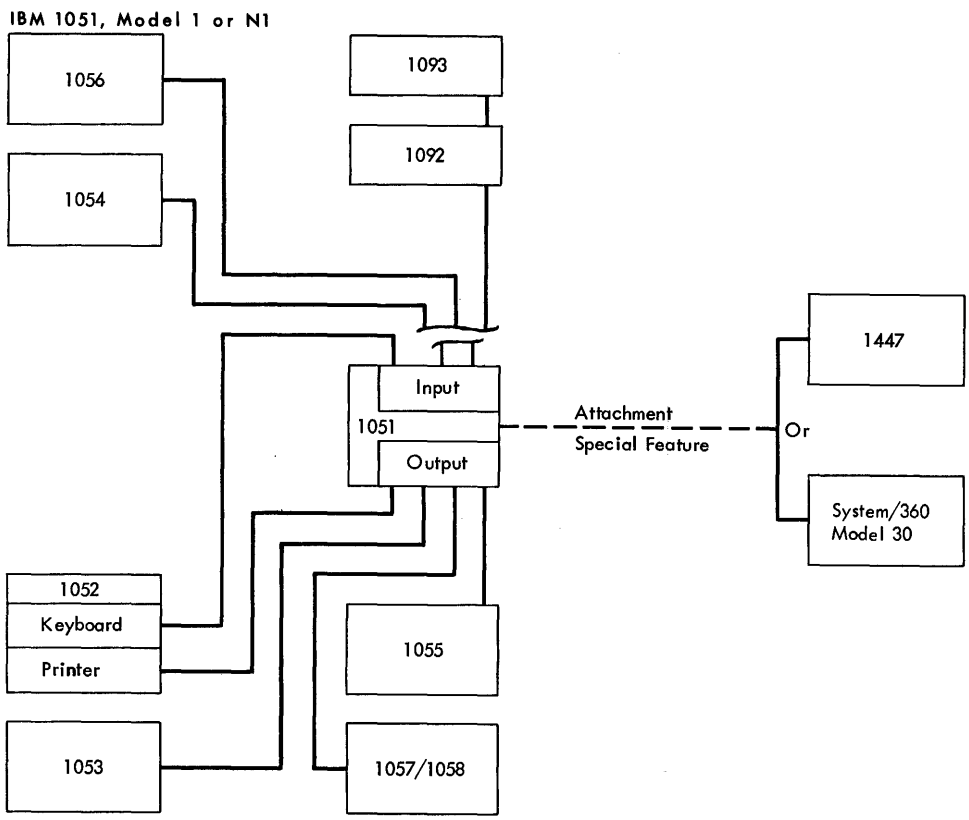


Figure 2. 1050 Home Loop Configuration

NOTE 1: A 1092 or a 1093, or a 1093 with a 1092 in tandem occupy one reader position. Only one 1056 Card Reader may be attached to a 1051 Control Unit.

A 1050 system with either a Model 1 or N1 control unit may be attached to a data processing system via the 1447 attachment feature or the System/360, Model 30 attachment feature. These features occupy one reader and one punch position.

Line Loop – Models 1 and 2

In line-loop, data is keyed or read, sent from the input unit to the 1051, serialized, modulated, and placed upon the communication line at the transmitting terminal location. At the receiving terminal location, the signals are demodulated, deserialized, and sent to the output unit(s).

The functions of document preparation, data conversion, and document generation may be performed in line loop if the output is required at a remote location, rather than locally.

Line loop configurations may include a wide range of components. The maximum configuration is shown in Figure 3. A minimal configuration might be a 1051 and a 1053 for receive-only printing.

The communication network connecting the 1050 terminals may have one of two general types of configurations: point-to-point or multipoint.

Point-to-Point

- When only two terminals are connected to a communication line, the operation is called point-to-point.
- A terminal with line control off cannot recognize polling or addressing responses.

The output punches may be:
A single 1055
A single 1057
A single 1058
Two 1057's
Two 1058's

Either one or two printers may be used, alone or in combination with one of the five punch configurations permitted. The installation of the Line Correction or Vertical Forms Control special features does not affect the possible configurations of receiving components. When only two terminals are connected to a communication line, the operation is termed point-to-point. All 1050 Systems connected

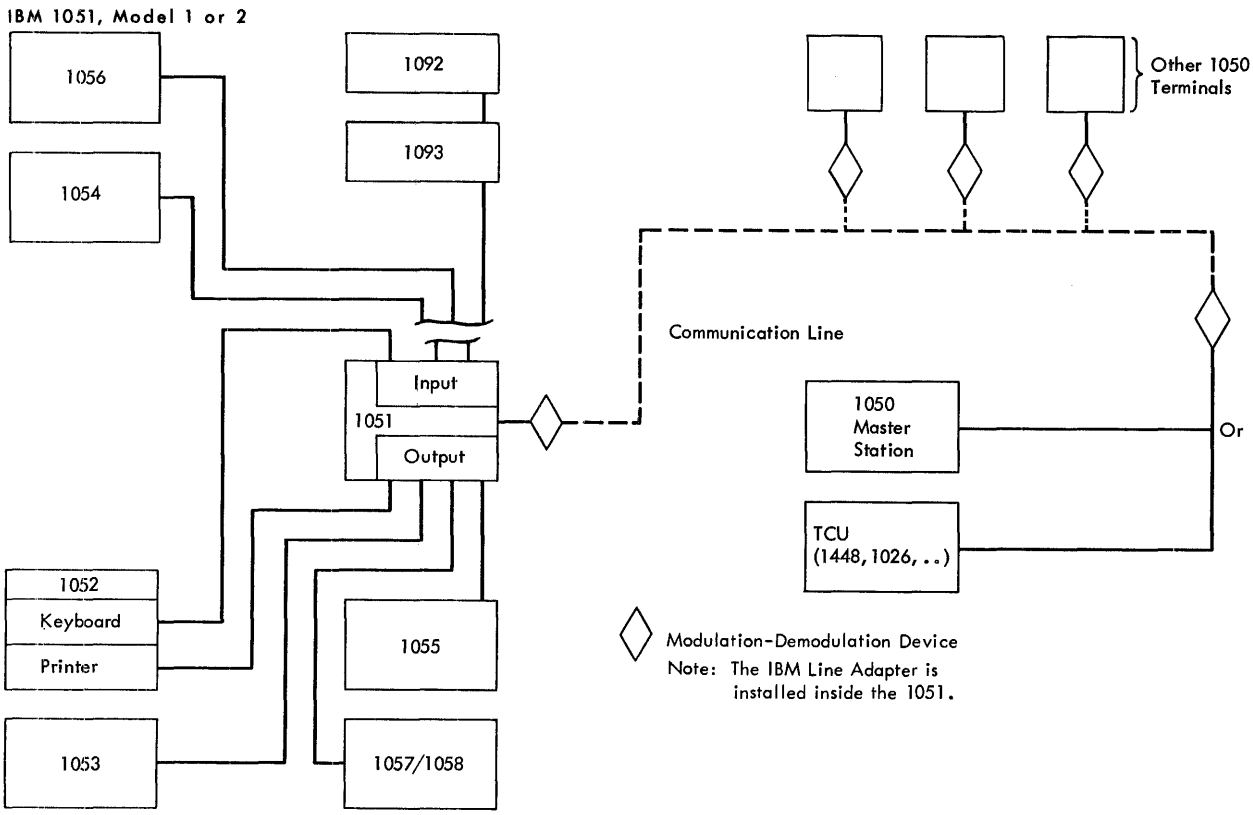


Figure 3. 1050 Line Loop Configuration

to public telephone, or leased-line switched networks operate point-to-point. This is distinguished from multipoint networks on leased or private non-switched lines. Possible network configurations for point-to-point communication are:

1.	Master or Transmission Control Unit	no voice Data Set Attachment, Telegraph Attachment or Line Adapter	1051 Line Control On
2.	Transmission Control Unit	voice Data Set Attachment	1051 Line Control Off
3.	Master or Transmission Control Unit	voice Data Set Attachment	1051 Line Control On
4.	1051 Line Control Off	voice or no voice Data Set Attachment, Telegraph Attachment or Line Adapter	1051 Line Control On
5.	1051 Line Control Off	voice or no voice Data Set Attachment, Telegraph Attachment or Line Adapter	1051 Line Control Off

In examples 1-3, either the master station or the transmission control unit always controls the line and, thus, the message traffic. Operation is similar to multipoint operation, (See the following section and Line Control in 1051 Control Unit – General Operation).

In Example 4, the terminal operating with line control off cannot recognize polling or addressing responses. When addressing, therefore, time must be allowed for the response before transmitting text. When polling, the transmission of text from the polled terminal must be delayed until the polling terminal transmit time-out (nominal 9-18 seconds) has ended. However, the waiting period at the polled terminal can be reduced by pressing the Resend button at the polling terminal after the polling address is sent (to reset the transmit time-out).

In Example 5, a contention system exists. With a no-voice line connection, a procedure must be established with the terminal operators providing the essential discipline over line utilization. (See Line Control in 1051 Control Unit – General Operation.) In this case, the terminal which transmits the first character controls the line. The receiving terminal cannot transmit until the end of its nominal 9-18 second receive time-out or until both Line Reset buttons are pressed. The only indication to the operator when the time-out occurs is the lack of further text reception, or by trying to send (keying or starting a reader).

For both Examples 4 and 5, receive units should always be assigned to line and ready, to ensure that all transmissions are received. With line control off, there is no way to determine at the sending terminal whether the receive units are ready to receive data before the first EOB response. If any EOB response occurs, the receive units were available.

Unattended operation at terminals with line control on is possible in point-to-point, as well as in multipoint operations. For maximum efficiency in such operations, the line correction and line correction release special features should be installed. Normally, if a sending terminal fails to transmit a message successfully, the Data Check and Resend lights are turned on and the terminal cannot send again until the Resend light is manually turned off.

With the line-correction feature, two additional attempts to transmit are made. If still unsuccessful, the line-correction-release feature turns off the Resend light and starts transmission of the next message. In this case, messages that failed to transmit correctly from the tape or card reader are not identified in any way at the sending terminal. However, at the receiving terminal, incorrect messages are indicated by printed hyphens, absence of an 11-punch in column 81 of the three punched cards, and three message deletions in the punched paper tape. These functions are not affected by turning line control off.

Multipoint

- In a multipoint network, several terminals are attached to a communication line.
- Each terminal can be addressed or polled by the controlling terminal.
- Up to 26 terminals may be attached to a single communication line.

In a multipoint, (or multidrop) network, several terminals are attached to a communication line. In this case, operation with line control off is not possible. Line contention is prevented because line

control is effective through the Master Station or Transmission Control Unit.

Each of the terminals on the line can be addressed or polled by the controlling terminal (Master Station or Transmission Control Unit). An address is a request that the remote terminal receive a message from the controlling terminal. A polling operation is a request that a remote terminal transmit if a message is ready to be sent. A remote terminal has no access to the communication line except when polled or addressed. Thus, the controlling terminal maintains discipline on the communication line and line contention is ruled out. All messages are sent to, from, or through the controling unit.

Within the station identification scheme of the 1050 system, up to 26 terminals may be attached to a single communication line (or channel, if the IBM Shared Line-Adapter is used). The communication line may be either a privately owned or a leased common-carrier line.

On a multipoint network, all line control, addressing, polling, unattend, component selection, and interlocking functions are as described in their respective sections of the Control Unit Operation section.

DATA FLOW

- The 1050 system is capable of simultaneous home-loop and line-loop operation.
- All data handled by the system must go through the 1051 control unit.

This system is capable of simultaneous home-loop and line-loop operation. This unique type of operation is possible because two independent data channels are provided (home loop and line loop channels – both provided on 1051 Model 1). Each component required for a specific operation must be assigned to the proper data channel by positioning the associated assignment switch on the 1052 switch console (or switch unit). In addition, recognition codes can be inserted in the text of a message to turn components on or off automatically.

The data flow for the 1050 system is detailed in Figure 4. This diagram shows how the system accepts input data from any one of three input units and records output data at any combination of four output units (See System Configurations for line-loop restrictions). To move data into or out of the system, as will as within the system, the data channels must be used. All data handled by the system must go through the 1051 control unit. Some of the significant features contained in this unit are:

Home	Line	Use
Home Register	Line Register	Character analyzing.
Home Clock	Line Clock	Internal timing.
Home-Component Recognition	Line-Component Recognition	Component on and off control.
	Serializer-Deserializer	Character breakdown and assembly to and from the data set.
	LRC Register	Longitudinal redundancy checking.
	VRC	Vertical redundancy checking.
	Oscillator	Speed control to and from the data set.
	Line Control	Communication line discipline for message control.

NOTE: If an IBM Line Adapter is installed, the modulation-demodulation function is performed inside the 1051 Control Unit.

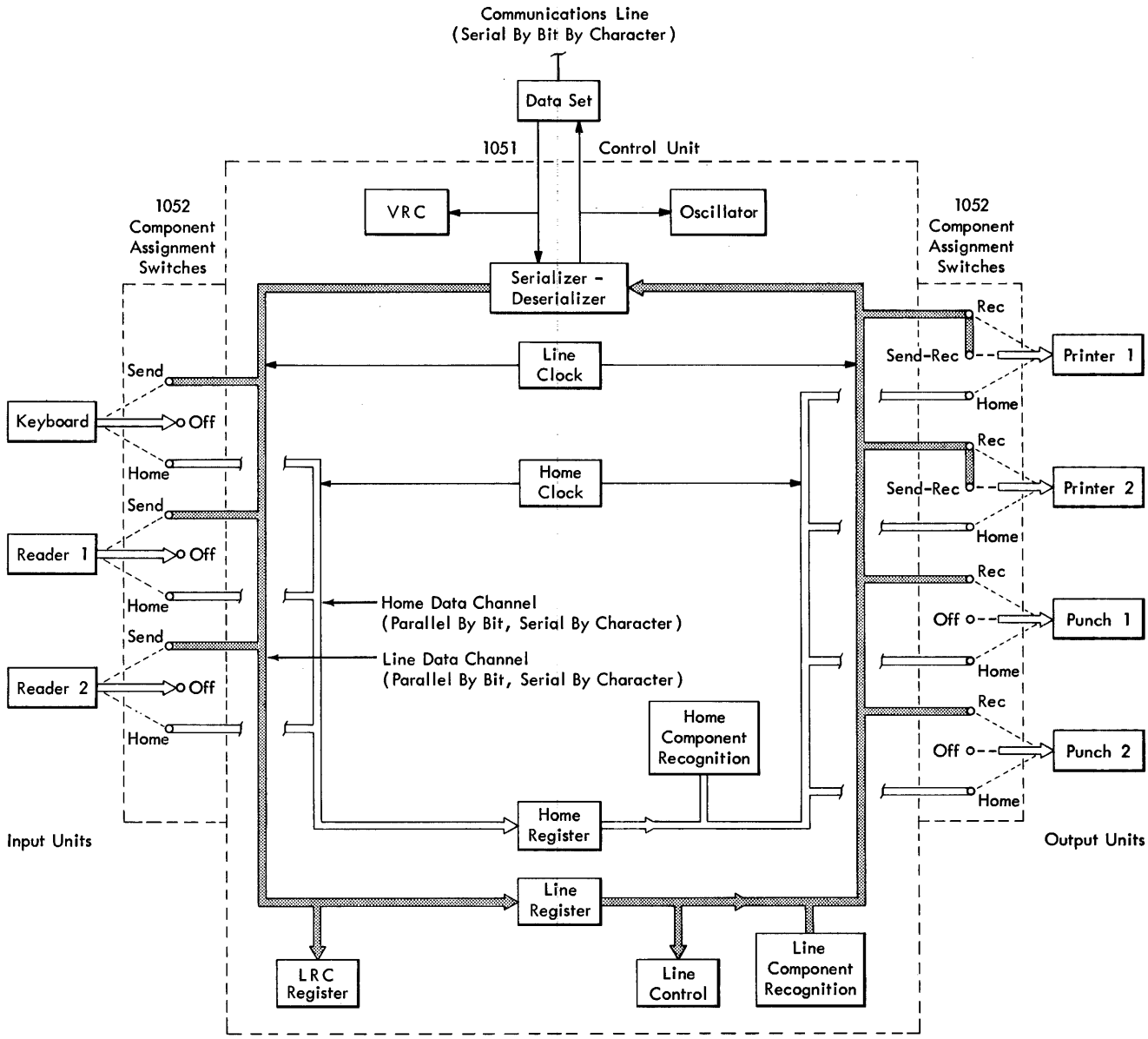


Figure 4. 1050 System Data Flow

CONTROL UNIT OPERATION – 1051

The features described in this section are all standard features of the 1051 (Figure 5) and are provided on the appropriate models. That is, features relating to line loop operations are provided on models 1 and 2, whereas home loop features apply to models 1 and N1. The additional features available for the 1051 are described under Special Features.

Line Control

- A system of discipline (line control) is required to maintain order in a communication network.
- 1050 terminals transmit in a text mode after certain control operations are performed in control mode.
- Discipline is maintained during control mode through addressing and polling by the master station or CPU.
- Control signals (specific characters) are used to coordinate the line control operations.

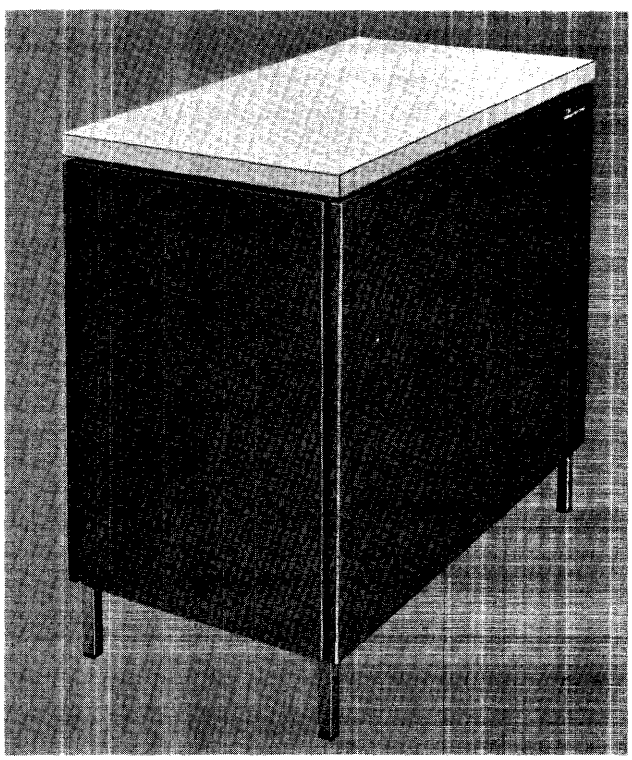


Figure 5. 1051 Control Unit

In multipoint operations, or point-to-point operations with a transmission control unit (without dial-up facilities), a control discipline is required on the communication line. This discipline is called line control, and it prevents two or more stations from attempting to use the line simultaneously (line contention). Line control is provided on models 1 and 2 of the 1051. This line-control discipline provides two distinct modes for all 1050 operations; control mode and text mode.

The messages (text or data) to be sent by 1050 terminals are transmitted during text mode, after certain control operations are performed in control code. All characters transmitted during text mode are either printable data characters or functional characters (not printable). The functional characters consist of such codes as CR/LF, delete, idle, LF, and tab. For a complete list of text codes refer to code charts in the Appendix.

All codes transmitted during control mode provide either terminal control or component selection for the remote terminal, and are neither printed nor punched. Refer to Multipoint Operation for exceptions. A line control signal (EOT), an alphabetic station identification character, and a numeric component select code, together with the appropriate response, are used to maintain discipline during control mode through polling and addressing. These procedures place the master station in control of the line. Messages transmitted from the master station are preceded by an address. Remote stations have the opportunity to transmit when polled. (See Master Station Operation.)

NOTE: The codes transmitted during control mode are:

1. Control signals. EOT, EOA, EOB, Yes, No, and Inquiry.
2. Polling characters. These consist of an alphabetic station-identification character (A-Z) followed by a numeric component select character (5, 6, 7, or 0). The polled terminal is requested to transmit, if the polled component is ready.
3. Addressing characters. These also consist of an alphabetic station-identification character (A-Z) followed by a numeric component-select character (1, 2, 3, 4, or 9). The addressed terminal is requested to receive, if the addressed component is ready.

Line-Control Signals

- Line control signals are represented in a shorthand form.

- The terms "response" and "answer" have restricted meanings.

The line control signals, EOT, EOA, EOB, Yes, No, and Inquiry, are represented in a shorthand form: Ⓒ, Ⓓ, Ⓑ, Ⓨ, Ⓝ, ⓓ, respectively. This form is used in programming as well as in communications and line-control discussions. Also, the terms "response" and "answer" are used in the following restricted manner:

1. Answer. The negative, positive, or no reply at all to an LRC compare.
2. Response. The negative, positive, or no reply at all to a component-select character (addressing or polling).

With line control turned off, the Ⓑ, ⓓ, Ⓨ, and Ⓝ characters retain the functions performed with line control; however, Ⓒ and Ⓓ are not applicable.

NOTE: The exact meaning of the line control characters is:

Ⓒ – End-of-Transaction (EOT). Upon receipt of this signal, the 1051 is placed in, or remains in, control mode and is in a nonselected status. This signal also indicates the conclusion of transmission, resets the LRC counters at both the sending and receiving terminals and deselects recognized send and receive components. (See Master Station Operation for exception.) This code is not punched by any receiving components.

Ⓓ – End-of-Address (EOA). Pound Sign Character. The EOA signal transfers the 1051 to a text mode and starts the LRC counters at both the sending and receiving terminals. The EOA signal is not included in the following LRC count.

The terminal that recognizes the preceding address is now placed in a selected text status. All other terminals in the multipoint network are placed in a nonselected text mode and inhibited from receiving data. Text characters following the EOA signal are directed to the selected output components.

This Ⓓ signal is also a positive response to polling and indicates that text characters follow. This signal is automatically generated by the 1051 as a polling response and is punched or printed in text mode only. (For exception, see Multipoint Operation.)

Ⓑ – End-of-Block (EOB). This signal indicates the end of a unit (block) of text. It indicates that the LRC character follows, and that an LRC check comparison at the receiving terminal is to be made. The EOB character is included in the LRC count and is punched by any ready, selected receiving punches (unless wired not to punch in the operator panel special feature on the 1057/1058, if installed. See 1057/1058 Card Punch – Special Features in this manual.) The transmitting terminal is halted by the EOB signal and waits for an answer from the receiving terminal.

Ⓨ – Positive Response (Yes) Period Character. When this signal is used as a response, it indicates that the addressed terminal is ready to receive. An addressed printer is placed in the downshift status with this response. The position of the keyboard shift key is not altered.

Any character or code other than the odd parity period (.) including Ⓒ is treated as a negative response. (Exception: When a CPU is the controlling system, the line control scheme may be modified by programming.)

When used as an answer to an EOB and LRC, this signal indicates that the block of text just received is correct. This character is neither printed nor punched in paper tape but is punched in column 81 of a card as an 11 by the card punch.

Without line correction, any character received as an answer to EOB, except ⓓ, Ⓨ, dollar sign ($), and comma (,), is recognized as a negative answer. It is printed and punched. With line correction, Ⓝ and Ⓒ are the only negative answers that initiate correction procedures. With line correction, Ⓝ causes a retransmission and a ⓒ causes the repolled terminal to retransmit after receiving its component select code. All other characters except Ⓨ, ⓓ, dollar sign, and comma are treated as data characters and are printed. However, these data characters turn on the data check light.

Ⓝ – Negative Response (No) Hyphen Character. When used as a response to an address, this signal indicates that the addressed terminal is not ready to receive data.

When used as a response to polling, Ⓝ indicates that the polled terminal has no data to send. Any character or code other than the Ⓓ, including the odd parity hyphen, is treated as a negative response. Response characters are not punched or printed. Exception: See Multipoint Operation.

When used as an answer to an EOB and LRC, Ⓝ indicates that the block of data just received is incorrect. In this case, the Ⓝ character is always printed by a selected and ready printer at the receiving terminal and on a monitor printer, if one is used. It may or may not be punched. If the receiving punch is a 1055 Paper-Tape Punch, there are two cases:

1. If line correction (special feature) is not installed, Ⓝ is punched.
2. If line correction is installed, Ⓝ is not punched, but a hole is punched into the 8th track.

If the punch is a 1057/1058 card punch, Ⓝ is not punched regardless of the installation of line correction, nor is an 11-punch punched in column 81.

ⓓ – Positive Answer (Inquiry). Pound Sign Character. This signal is used in alternate communication between a terminal and a transmission control unit at the central processing area. It is used for inquiry type applications. The ⓓ is transmitted by the transmission control unit only as a positive answer to an EOB.

All output components assigned to LINE are selected and all input components are deselected. An addressed printer is placed in lower case shift with this response. The ⓓ character is effective with line control off.

Point-to-Point Line Discipline Procedure

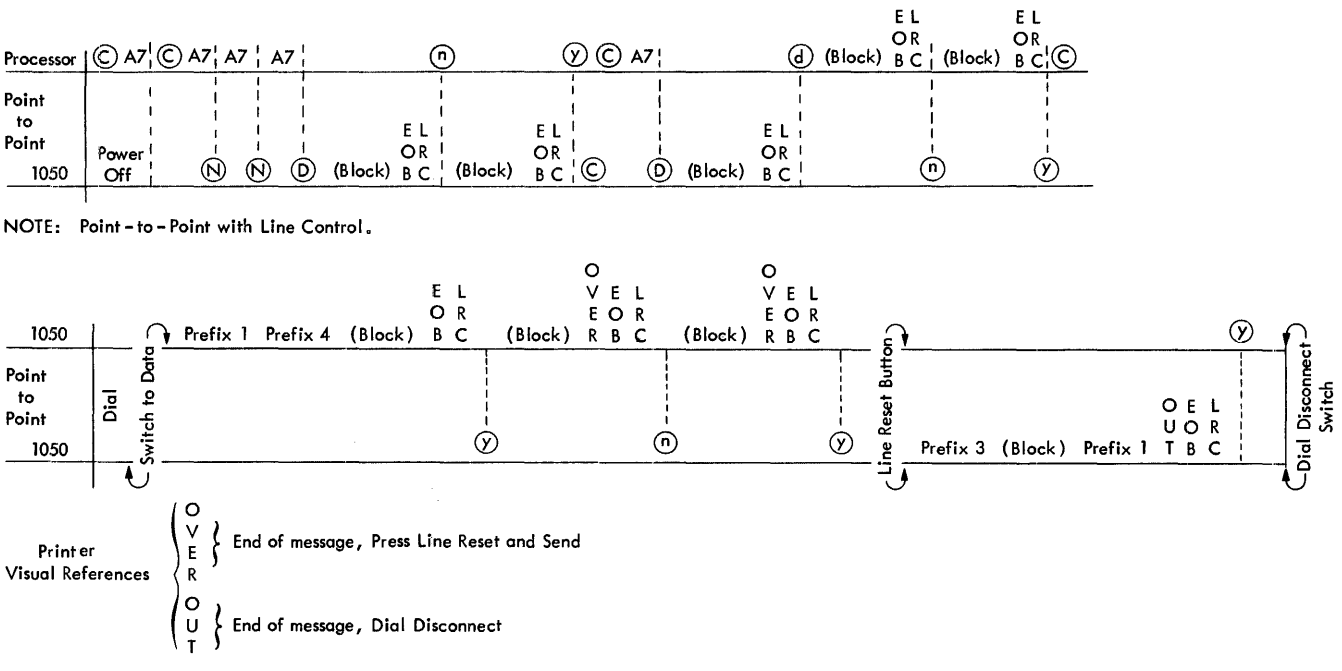
- These procedures vary depending on whether line control is ON at the terminal.
- Operation with a master station is essentially a multipoint network.
- Turning line control off renders Ⓒ and Ⓓ ineffective as line control signals.
- If line control is turned off, operator attention is required to perform the necessary functions.
- The inactive status of the terminals must be the nonselected status.
- A printed visual reference is necessary to inform the receiving operator of the sending operators intentions.

In point-to-point operation, line discipline can be maintained with several techniques. The procedures differ depending on whether line control is ON at both, one, or neither of the terminals.

Operation with a master station is essentially a multipoint network with only two terminals. Operation procedures are identical to multipoint procedures, as shown in the first schematic of Figure 6.

The effect of turning line control off is to render Ⓒ and Ⓓ ineffective at the terminal as line control signals. If one terminal has line control turned off, that terminal can no longer enter control mode. The terminal is placed in transmit mode by keying a character or starting a reader. If a character is received from the line when this terminal is in nonselected status, the terminal enters the receive mode. In either case, the terminal remains in transmit or receive mode until the Line-reset button is pressed or until the control unit times-out. The LRC function is not affected by turning line control off.

Therefore, when a terminal without line control addresses a terminal with line control, no response can be received and interpreted. A positive response must be assumed, and transmission is begun after enough time has been allowed for the addressed



NOTE: Point-to-Point with Line Control.

NOTE: Point-to-Point without Master Station and Line Control.

Figure 6. Point-to-Point Line Control

station to transmit a response and return to receive status. When a terminal with line control off polls a terminal with line control on, the polled terminal must wait until the polling terminal has timed out of transmit status and into a nonselected status. The first character transmitted places the polling terminal in receive status. The time-out period is nominally 9 to 18 seconds. This delay can be avoided if the Line-reset button at the polling terminal is pressed immediately after the polling address is sent. If this technique is employed, both operators must be familiar with the principles involved, or the procedure must be carefully prescribed.

If line control is turned off at both terminals, greater operator attention is required to perform the necessary functions. This line procedure is shown in the second schematic of Figure 6.

Since neither terminal reacts to Ⓒ or Ⓓ , it is important that the inactive status of both terminals be the nonselected status. After 9 to 18 seconds (nominal) without any activity on the line, the terminals automatically assume this status (time-out). If such a delay is undesirable, the Line-reset button(s) may be pressed.

When both terminals are in nonselected status, either can transmit. The act of keying a character or starting a reader places that terminal in transmit mode. The reception of the first character places the other terminal in receive mode.

Since the addressing and polling functions are not available, the desired output units must be recognized before the message can be received. After the recognition codes have been sent, text transmission can begin. An EOB code is sent after each message block. Operation of the Resend and Data-Check lights is not different, since the LRC function is independent of line control. When the sending station wishes to stop transmitting, a printed visual reference is necessary to inform the receiving operator. Any reference which is easily noticed may be employed. In the figure, the printed word "OVER" is used to indicate that the sender is finished and expects an immediate reply. The word "OUT" is used to indicate that the sender is finished and intends to disconnect the communication line. Any other words agreed upon by the operators will serve this purpose. The visual reference need not be printed. Three line-feed operations without a carrier return and three carrier returns would also accomplish the purpose of the visual references.

Whenever the operator stops sending and anticipates that the other terminal wishes to send, a visual reference is sent. If a printer has not been recognized, the prefix 1 (or 2) code must be sent. The remote operator must reply, if only to print the word "OUT". Whenever "OVER" (or equivalent) is sent, both operators must press LINE RESET (or wait for the time-outs to occur). The new sending operator must then recognize the new receiving components.

When "OUT" is sent, both terminal operators operate the System, Dial Disc switches. If the automatic disconnect features are installed on the common-carrier data sets (Western Electric Data Set 103A) operation of either System, Dial Disc switch terminates the connection. The "OUT" (or equivalent) reference must be followed by operation of the Line-reset buttons, a waiting period of 9 to 18 sec (nominally) or the transmission of a Ⓒ before the System, Dial Disc switch is operated. The dial disconnect signal is even parity. If the receiving terminal has not entered the nonselected status, the VRC function causes a hyphen to print.

Master Station Operation (Figures 7 and 8)

Polling

- The procedure for polling depends upon the master station components used.
- Keyboard. All polling characters are manually keyed.
- Paper-tape reader. Polling characters punched in an endless tape loop.
- Card reader. All polling characters are punched into a card.
- Printer-1 assigned to Send-Rec prints all polling responses and terminal addresses.

The procedure for polling depends upon the master-station input components used.

Keyboard. All the required polling characters must be manually keyed. The EOT ⓒ is keyed before each station poll or address: ⓒ A6, ⓒ B6, ⓒ C6, etc. Before polling, position the assignment switch of the #1 master station printer to Send-Rec. (This provides a monitor printer for recording the stations polled, polling responses and negative LRC answers.) A polled system responds within two seconds (nominally) if power is ON. If no response is received, the keyboard unlocks and polling can proceed.

Once the master station has transmitted a poll, the master-station keyboard is locked until the EOT Ⓒ code is received. This code unlocks the master-station keyboard to permit further polling. The keyboard is also unlocked after 19.8 seconds (minimum) without receiving a character. In this instance, the

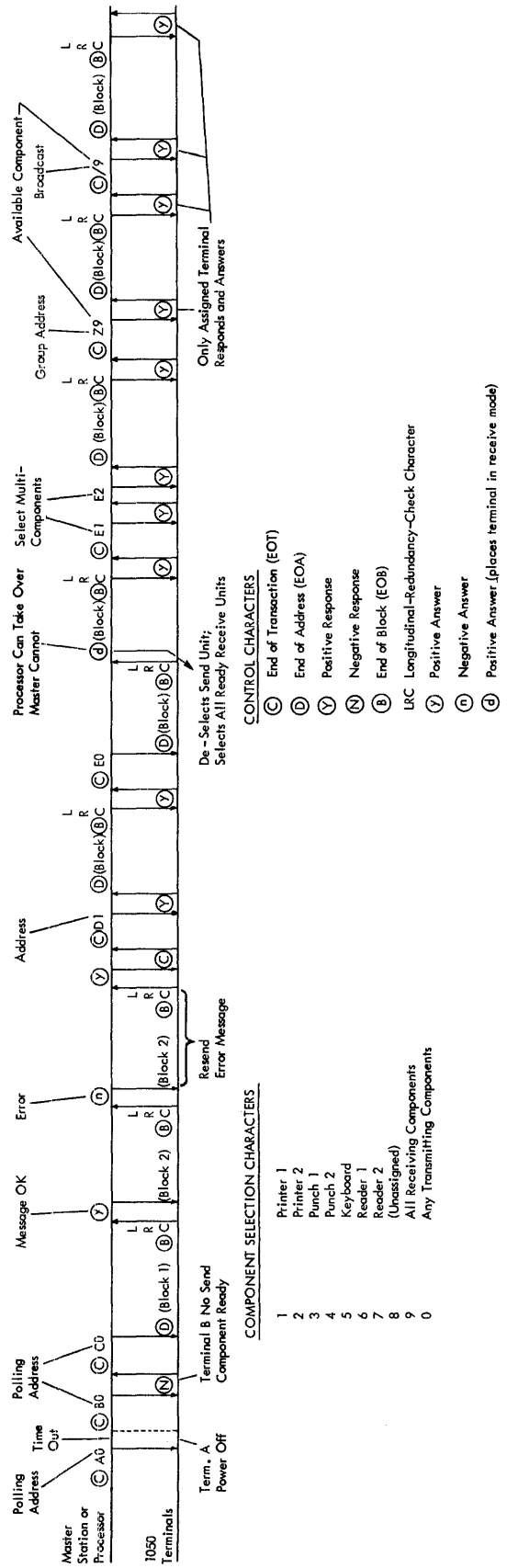


Figure 7. Line Control for Master Station or Processor

master station Data-check light is turned on. To continue polling, press the Data-check button (to turn out the associated light) and key another polling address. The third condition that causes the keyboard to unlock is an unsuccessful poll (negative response or no response within 2 seconds).

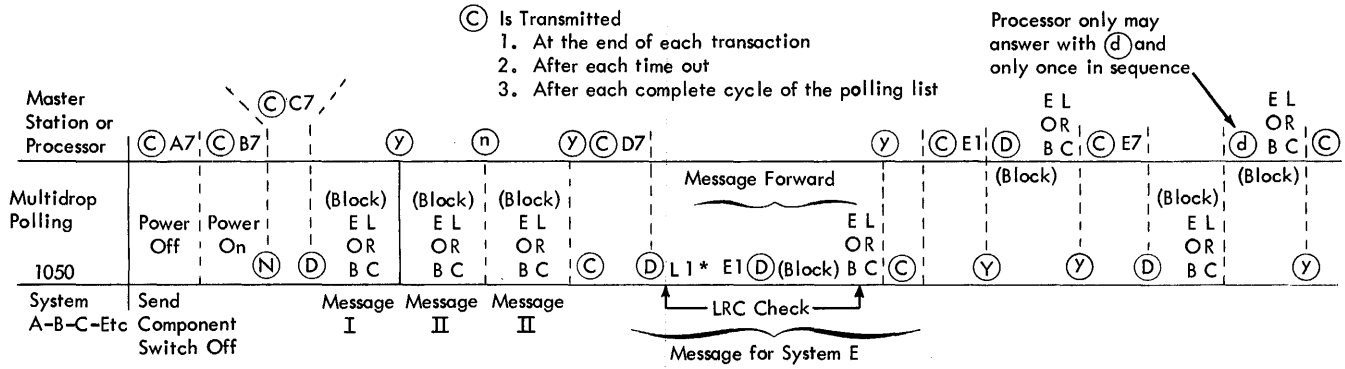
Paper-Tape Reader. The polling characters for all stations to be polled on a communication line are punched into an endless tape loop: Ⓒ A6, Ⓒ B6, Ⓒ 6, etc. (When preparing this tape loop, a Ⓒ A6 is punched after the last polling code, or a series of Ⓒ 's. Then the duplicate codes are overlapped, aligned and joined. Polling is continuous until manually interrupted.) The assignment switch for the reader with the polling tape is set to SEND. It is preferable to place the polling tape on reader-1 because this reader is automatically recognized when the Reset key is pressed.

To start the reader, press the Line – reader-start button. The first polling code (Ⓒ A6) is read. The reader stops immediately after reading the component select character (6). The master station automatically switches to a receive mode and waits for a polling response. If a negative response is received, the polling reader automatically restarts and reads the next polling code. Any character or code other than Ⓓ , (including Ⓒ) is interpreted as a negative response. If a positive response (EOA Ⓓ), is received:

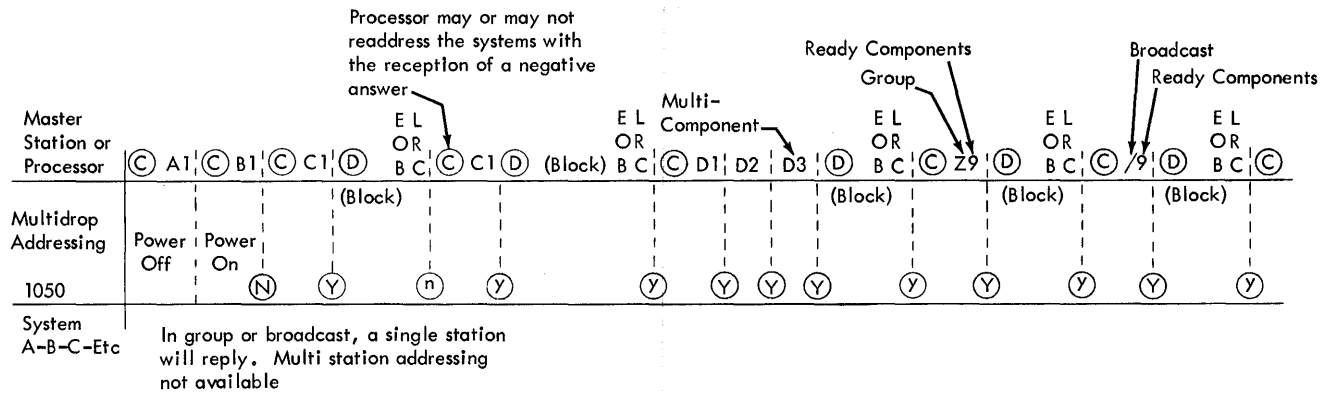
1. Any recognized master station printer with its assignment switch set to REC or SEND-REC and in a ready status prints the transmitted text; and
2. Any recognized master station punch with its assignment switch set to REC and in a ready status punches the transmitted text.

When an EOT Ⓒ is received, the normal EOT functions occur (the selected receive components are deselected) and the polling reader automatically restarts and polls the next station. If no polling response is received, the polling reader automatically restarts at the end of a two-second time-out. If the reception of text is interrupted for more than 19.8 seconds (minimum), a time-out occurs and the master station Data-check light is turned on. This interrupts the automatic polling operation. To restart, press the Data-check button (turning out the Data-check light) and the line – reader-start button.

A transmitted Ⓒ does not reset recognized receive components at a master terminal. This enables the master station to resume communication with terminals locked in resend mode. The master station must receive an EOT code or the line reset key must be operated to terminate an operation. If a transmission is not properly terminated before polling is continued, data will be received on the previously selected output units.



* Symbol determines which multipoint line on T C U is addressed. Specific symbol depends on T C U program.



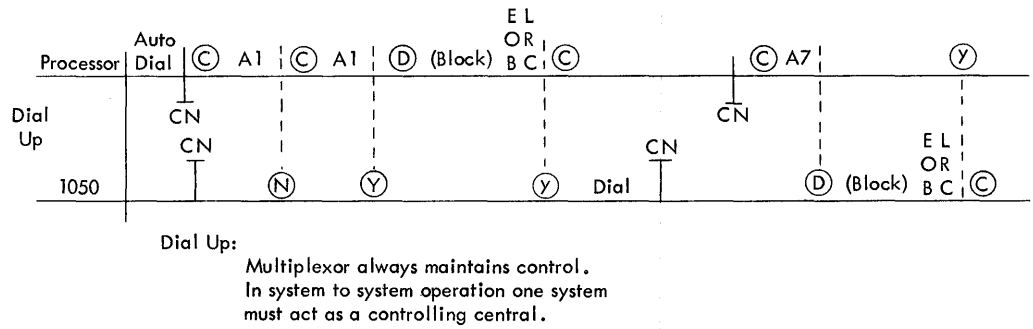


Figure 8. General Line-Control Operation

When the master station detects an LRC error, the Data-check light is turned on. The negative answer turns on the data-check light at the transmitting station. The Resend light at the transmitting station is turned on by the transmission of the EOB B code.

If the line-correction special feature is installed, the transmitting station makes three attempts to transmit the message correctly. To restart polling after a third incorrect attempt, press the Data-check button at the master station to turn off the Data-check light. Then press the Line – reader-start button. The reader starts after the nominal 20 second time-out period (beginning with the final negative LRC answer). This is also true after the first negative LRC answer if the line correction special feature is not installed.

Card Reader. All polling characters are punched into a card. An 80-column card has the capacity for 26 polling addresses. Position the assignment switch for the card reader to SEND. If the card reader is assigned to the Reader 2 position, the reader must be selected before the Line – reader-start button is pressed.

To eliminate the recognition operation, the card reader must be assigned to the Reader 1 position, because this reader is automatically recognized by the reset operation. All further operations and procedures are identical to the paper tape polling operation.

When operating as a master station, the card reader stops automatically after each polling address. When the master station is polling, an automatic ejection does not occur when an EOT Ⓒ code is resensed. The EOB B code may be punched in the column following the last polling character if further card reading is not desired.

The terminals being polled are in either control or non-selected text mode at this time; therefore an LRC answer is not received at the master station and the card reader does not advance. With the line-correction special feature installed, the card remains in the card path after the EOB is read. Pressing the card-reader eject button ejects the card to the stacker. Automatic ejection of the card is accomplished by installing the card-reader program special feature and punching a hole in the eject track of the program tape in the column following the last polling character.

If the line-correction special feature is not installed, the card is ejected from the read station when an EOB Ⓑ code is sensed. In either case, the eject must be pressed and reinserted in the card hopper to continue polling. The resend light turns on when a Ⓑ code is sensed and it must be turned off by pressing the resend button before the reader can be restarted by pressing the line – reader-start button. (See NOTE 1.)

Printer. The #1 printer (the printer cable-connected to the #1 printer position in the 1051) prints all polling responses and terminal addresses, when its assignment switch is set to the SEND-REC position. With this switch set to the SEND position, only addresses print. When set to the RECEIVE position, the printer prints only after it has been selected.

The #2 printer at this terminal prints neither the addresses nor responses when its assignment switch is set to the RECEIVE position. When this switch is set to either SEND or SEND-REC, terminal addresses print (only). In order to prevent a possible deselect of printer 1 when repolling, the Printer 1 switch must be set to Rec.

Component recognition for printer-1 occurs automatically without the use of the prefix-1 code when the terminal is a master station and is operating in the control mode. Printer-1 is deselected by polling responses. A remote terminal must transmit component-recognition codes to the master station for each receive component required. When a Ⓒ is received by the master station, all receive components previously recognized by the remote terminal are deselected. Monitor printers, located at any terminal (master station or other), do not have to be recognized to record transmitted data.

Summary of Master-Station Printer Performance:

Printer I

Switch Position	Result
Send	Monitors the line. Prints all transmitted characters.
Send-Rec	Monitors the line. Prints all transmitted characters, responses, and answers. Prints text if selected.
Rec	Must be selected to print.

Printer II

Switch Position	Result
Send	Same as Printer I.
Send-Rec	All transmitted characters are printed. No responses or answers are printed. Text is printed if the printer is selected.
Rec	Same as Printer I.

NOTE: If the system has only one printer, clean copy may be received by setting the printer assignment switch to Rec. The polling characters, responses, and any answers are not printed.

Addressing

- Keyboard. All addressing characters must be manually keyed.
- Paper-tape reader. The station address and the associated message are punched in a tape.
- Card reader. The address (Ⓒ , station identification, and select character) is punched in the card, and followed by Ⓓ .
- Printer-1 assigned to Send-Rec records all addressing response and terminal addresses.

The master station addresses other 1050 stations with these methods.

Keyboard. As with polling, all addressing characters must be manually keyed. Group and broadcast addressing, as well as individual station addressing, is possible. (See NOTE 2.)

A master station printer must have its assignment switch set to SEND-REC to provide monitoring of station addresses, responses and LRC (negative) answers. If response to addressing does not occur within the nominal two seconds time-out, or if the response is negative, the Data-check light is turned on. Keyboard addressing can continue after the two-second interval by turning the Data check light off. When a positive response is received within this interval, the keyboard is unlocked and text can then be keyed, starting with the EOA Ⓓ code.

Any character other than a period (positive response), including a Ⓒ , is interpreted as a negative response. Once a station has been addressed, the master station is in a receive mode and the keyboard is locked. The keyboard remains locked until the master station receives a response to addressing or until the two-second time-out occurs. The EOB at the end of a message locks the keyboard and turns on the Resend light awaiting the LRC answer.

If the receiving station fails to transmit an LRC answer, the master-station Resend light stays on. The operator must press the Resend button to turn off the light and unlock the keyboard. If a negative LRC answer is received by the master station, the Resend light stays on, and the Data-check light is turned on at the master station. To turn these lights off, press the associated button for each light. The message can then be keyed again, the same system may be readdressed, or another station can be addressed. (See NOTE 3.)

Paper-Tape Reader. The station address and the associated message are punched in a tape, and then placed on the tape reader in the Reader 1 position. This eliminates manual recognition of the reader because pressing the Reset button automatically recognizes Reader 1. The reader is started by pressing the line – reader-start button. The reader automatically stops after transmitting the station address (Ⓒ A4) and before transmitting the EOA code or text.

If a negative response is received or no response is received within two seconds, the addressing tape is removed from the reader. Another tape may be inserted, if desired. Each addressing operation requires a separate tape containing a message preceded by the desired station address.

If a positive response is received, the master station reader automatically restarts. The text is then transmitted, starting with an EOA Ⓓ .

A transmission error during text transmission causes the master station to attempt to transmit the message three times, if the line correction special feature is installed. After the third unsuccessful attempt, the master station tape reader stops, and the Resend and Data check lights are turned on. The operator must then change tapes in the reader and press the Resend and Data-check buttons to turn off the associated lights, depending on the particular system operating procedure used. Press the Line – reader-start button to restart the reader. If the master station does not receive an LRC answer, the message is retransmitted by manually repositioning the tape, pressing the Resend button to turn off the light, and pressing the Line – reader-start button. (See NOTE 3.)

Card Reader. An addressing operation using the card reader is basically identical to that with the tape reader. The same conditions exist as for the tape reader.

The address (Ⓒ , station identification, and select character) is punched in the card, and followed by Ⓓ . Text may then be punched.

The address is sent by loading the card(s) in the reader and pressing Line – reader-start. The reader automatically stops after the address is transmitted. The reader restarts automatically if a positive response is received. If the reader does not restart after two seconds, a negative response or no response has been received.

When a system has the line-correction special feature installed, the card is read up to three times in the event of negative answers to LRC. If the final

attempt is unsuccessful, manually stack the card by pressing the eject button.

If the line-correction special feature is not installed, the card is automatically ejected from the read station when the EOB code is read. (This code is punched in the column following the last text column or is automatically generated by the trailing edge of the card.) If further transmission attempts are desired, the operator must put the card in the hopper, press the Resend and Data-check buttons to turn off their associated lights, and press the Line – reader-start button.

Because the text of any message may require several cards, consider the cards comprising the station address and the complete text as one unit. When a negative LRC answer is received, retransmit this complete unit, unless the receiving unit is a card punch.

An alternative is to punch an EOB immediately after the EOA in the first card. Thus, a negative LRC answer does not cause the address characters (intended to be transmitted in control mode) to be transmitted with text. In this case the first LRC includes the EOB character only. Text does not appear on the first card. (See NOTE 3.)

Printer. The #1 printer (the printer cable-connected to the #1 printer position in the 1051) prints all addressing responses and terminal addresses, when its assignment switch is set to the SEND-REC position. With this switch set to the SEND position, addresses only print. When set to the RECEIVE position, the printer prints only after it has been selected.

The #2 printer at this terminal prints neither the addresses nor responses when its assignment switch is set to the RECEIVE position. When this switch is set to either SEND or SEND-REC, terminal addresses print.

Component recognition for printers-1 assigned to Send-Rec occurs automatically without the use of the Prefix-1 code when the terminal is a master station and is operating in the control mode. Printers are deselected by addressing responses. A remote terminal must transmit component recognition codes to the master station for each receive component required. When a © is received by the master station, all receive components previously recognized by the remote terminal, are deselected. If a © is not received, components must be deselected by pressing the Line-reset button. Monitor printers, located at any terminal (master station or other) do not have to be recognized, to record transmitted data.

Summary of Master-Station Printer Performance:

Printer I

Switch Position	Result
Send	Monitors the line. Prints all transmitted characters.
Send-Rec	Monitors the line. Prints all transmitted characters, responses, and answers. Prints text if selected.
Rec	Must be selected to print.

Printer II

Switch Position	Result
Send	Same as Printer I
Send-Rec	All transmitted characters are printed. No responses or answers are printed. Text is printed if the printer is selected.
Rec	Same as Printer I.

NOTE: If the system has only one printer, clean copy may be received by setting the printer assignment switch to Rec. The polling characters, responses, and any answers are not printed.

NOTE 1: When preparing cards in a 1057/1058 to be used in a card reader for either polling or addressing, they must be punched when the 1057/1058 Autopunch/Keypunch switch is set to KEYPUNCH.

NOTE 2: See Restrictive Considerations for Group and Broadcast Addressing.

NOTE 3: It is unnecessary for the master station to transmit an EOT © at the completion of a message because this is used at the start of each polling or addressing operation and before operation of the dial-disc switch. However, to turn off the motors at a down-line station that has been receiving in the unattended mode, an EOT is required.

Attend-Unattend Switch

This switch is a part of the line-control feature. With the switch set to UNATTEND (and the mainline switch on) all component motors are off. Receipt of the appropriate station identification turns all component motors on. When addressed, the system delays a positive response until all motors are up to speed. When polled, the system immediately transmits a positive response, but delays transmission of the first text character until the motors are up to speed. After the message is completed, an EOT code turns off all component motors, unless a vertical forms movement has not been completed. In this case, the motors are turned off when the movement is completed. (When this switch is set to ATTEND and the 1051 mainline switch is on, all component motors run the position of individual component switches. If the Line Control switch is turned OFF, the Attend-Unattend switch is not effective.)

Station Identification

- Each station (system) is assigned one of the 26 alphabetic characters as a permanent station identification.

- Each 1050 recognizes its unique station identification.

As many as twenty-six 1050 systems can be assigned to any one communication line. Each station (system) sharing this line is assigned one of the 26 alphabetic characters as a permanent station identification (address). This address character, specified by the customer, is wired by IBM personnel at installation time (See NOTE 1.)

The character assignment permits each 1050 system sharing a specific communication line to recognize its unique station identification. When this recognition occurs, the system participates in either a polling operation (transmitting) or an addressing operation (receiving) as designated by the component select character. The remaining systems are prevented from using the line until transmission is completed.

NOTE 1: A terminal can be wired for any one of the 64 codes as an address. However, the master station, when polling or addressing, recognizes only those address characters containing a zone bit (A, B, or AB), except the comma.

Group Addressing

- Secondary identification characters may be assigned for simultaneously addressing all stations in a group.

- A specified system in the group is required to generate responses and answers for the group.

A secondary identification character can be assigned to each station (system) in a designated group to permit group addressing (simultaneously addressing all stations in the group).
The specific group assignments are completely flexible within the system on any communication line. (See NOTE 1.)
When group addressing is used, a specific system in the group is required to generate responses and answers of the group:
1. When ready to receive, and
2. When making an LRC and VRC check.

NOTE 1: The group identification assigned must not conflict with the assigned standard identification characters on this communication line. A station is limited to one group identification character. (See Restrictive Considerations for Group and Broadcast Addressing.)

Broadcast Addressing

To address all systems on a specific communication line simultaneously, a broadcast character (/) preceded by a C is transmitted from the transmission control unit at the central-processing area. When this addressing method is used, a specified system is required to generate responses and answers for all the addressed systems:
1. When ready to receive, and
2. When making an LRC and VRC check.
(See Restrictive Considerations for Group and Broadcast Addressing.)

Restrictive Considerations for Group and Broadcast Addressing

When designing your 1050 system network for either group or broadcast addressing operations, you should be aware of the following limitations. The majority of these items, however, can be resolved by developing proper system procedures. For example, by

pre-addressing all desired components before performing either a group or broadcast operation all components are checked for a ready status. Next, prompt operator attention at all terminals ensures that each contains sufficient quantities of recording media. Finally, in group and broadcast operations it is desirable to eliminate all LRC checks and send only an EOT at the end of the transmission for all systems except those receiving on card punches.

a. If all messages are not received by all terminals in the same manner, then some messages have either been lost or duplicated. This can occur if any non-answering terminal is either not-ready initially, or runs out of recording media during the transmission.
b. The answering terminal may receive data correctly while non-answering terminals receive data incorrectly. Data recorded in punched tape, punched card and printed copy would be indicated as incorrect, resulting in lost messages in the non-answering terminals. With the line correction feature installed, incorrect messages received in a tape punch in a non-answering terminal would be deleted, and every message received thereafter would be incorrect, since the terminal would be out of step with the answering terminal. Also, the answering terminal may receive data incorrectly while non-answering terminals receive data correctly, resulting in duplicate recorded data in the non-answering terminals.
c. Any terminal with the master station feature installed, should not be assigned as the answering terminal for this type of operation.
d. If non-answering terminals revert to receive mode later than answering terminals after a checking EOB operation, data is lost, resulting in incorrect messages at the non-answering terminals. Also, non-answering terminals operating on single frequency, half duplex lines may see an EOB answer transmitted by the answering terminal and record it, or it may see a portion of the answer and record it as a hyphen if it is even parity. In either case, the following received message results in an incorrect message. These conditions restrict the type and combinations of receive units permitted at both the answering and non-answering terminals as follows.

Without the line correction special feature installed:

- Printers only at all terminals operating on FDX lines.
- Tape punch only at all terminals operating on FDX lines.
- Intermix of printers and a tape punch at all terminals operating on FDX lines.
- Card punch and printers at the answering terminal, printers or a tape punch or an intermix of both at non-answering terminals operating on a FDX line only.

With the line correction special feature installed:

- Printers only at all terminals operating on FDX lines.
- Tape punch and printers at the answering terminal, printers only at non-answering terminals operating on a FDX line only.
- Card punch and printers at the answering terminal, printers only at non-answering terminals operating on a FDX line only.

The vertical forms control special feature is permitted only on printers on an answering terminal operating on a FDX line. The feature is not permitted on any printer on terminals operating on a HDX line. (HDX – Half duplex; FDX – Full duplex.)

Component Select Characters

Component selection is accomplished by transmitting a specific numeric character following the station identification character during polling and addressing. This character selects the designated station components:

Polling

Select Character	Unit(s) Selected
5	Keyboard
6	Reader 1
7	Reader 2
0 (common polling character)	Any one input component of the polled system

Addressing

Select Character	Unit(s) Selected
1	Printer 1
2	Printer 2
3	Punch 1
4	Punch 2
9 (common addressing character)	Any or all output components of the addressed system

When a polled station receives a 0 (zero) select character, it causes:

1. A Ⓓ to be sent as a positive response to polling if any input component is assigned to LINE and is in a ready condition.
2. Reader-1 to transmit if assigned and ready.

NOTE: When both readers are assigned and ready, reader-1 takes precedence.

3. Reader-2 to transmit automatically when reader-1 is in a not-ready condition.

4. The keyboard is to be unlocked for transmitting if neither reader is assigned and ready. If a reader is operating and is stopped by a reader-stop code or by operation of the reader-stop switch, the keyboard is unlocked (provided it was initially set to line).

NOTE: The keyboard is not unlocked when a reader is polled by its individual select character and stopped by either the Stop switch or a stop code. Also, reader-1 is activated by pressing the reader-start button when the keyboard is polled with its respective select character. To operate reader-2, this reader must be polled with its respective select character or be recognized by its specific recognition code even if the common poll (0) was used.

Line Component Recognition

- Provides on-off control of input and output units during text transmission.

- Recognition codes consist of a prefix code followed by a numeric code.

This feature provides on-off control of the input and output units during text transmission. (Component selection is effective during polling and addressing.)

With this feature, the 1050 system recognizes and acts upon two-character recognition codes placed upon the line data channel by the keyboard or readers. Each two-character recognition code consists of a prefix code followed by an numeric code. The prefix code conditions the control unit to recognize the numeric code immediately following it and to provide the proper component control.

These two-character recognition codes are originated by holding down the Alternate-coding key while operating the Prefix key (8). After releasing both keys, press one of the numeric keys depending upon the specific component selection desired:

Numeric Code	Action
1	Printer 1 ON
2	Printer 2 ON
3	Punch 1 ON
4	Punch 2 ON
5	Printer 1 OFF
6	Printer 2 OFF
7	Punch 1 OFF
8	Punch 2 OFF
9	Reader 1 ON, Reader 2 OFF
10	Reader 1 OFF, Reader 1 ON

NOTE: When transmitted to a remote station, component-recognition codes for receiving units do not affect the receiving units at the sending station. Conversely, component-recognition codes for input units affect only those units at the sending station. Remote receiving components must be recognized by a terminal before they can receive. Recognized receive components are deselected when an EOT code is received.

A monitor printer assigned to SEND or SEND-REC is automatically recognized to receive transmitted data and is not affected by transmitted recognition codes. These codes are not punched or

printed by receiving components including a monitor printer if employed.

Exception: Codes are punched when the terminal is in the bypass mode.

NOTE: Multiple prefix codes do not affect the recognition function.

Character Parity Checking – Vertical Redundancy Check

- Each character used by the system must contain an odd number of bits.
- Parity checking of each transmitted character is performed by the receiving terminal.

The 1050 system uses the six-bit BCD code with an odd-parity check-bit. Transmitted, received, or generated characters used by the system must contain an odd number of bits (See Figure). As each even-bit character is generated at either the keyboard or the card reader, an additional bit (C-bit) is inserted. The parity checking of each transmitted character is performed by the receiving terminal.

If an even-bit code is recognized by the receiving terminal, it causes:

1. A hyphen character punch at all receiving punches.
2. A hyphen or underscore character (depending upon shift status) to print at all receiving printers.
3. The data-check light to turn on at the receiving terminal and remain on until it is manually reset.
4. The receiving terminal to generate a negative answer to the Longitudinal Redundancy Check.

NOTE: The transmitting terminal continues to send until an EOB followed by an LRC has been sent.

Character parity-checking is provided only for line-loop operation with both Models 1 and 2. VRC is not effective during control mode. If an even parity station identification character is received, no response is sent. If the select code is of even parity, a negative response is sent.

LRC (Longitudinal Redundancy Checking), Line-Loop Only

- LRC registers at sending and receiving terminals reflect each transmitted character bit value.
- EOB character initiates an automatic comparison of the LRC registers at the receiving terminal and turns on the Resend light at the sending terminal.
- Equal comparison allows transmission to continue from the sending terminal and turns off the Resend light.
- Unequal comparison stops the transmission, turns the Data Check light on at both terminals, causes a hyphen to print and conditions the Resend light to remain on at the sending terminal.

The LRC registers at both the sending and receiving terminals start recording the bit values of each transmitted character following an EOA (End of Address) character. The EOA character indicates the start of the text portion of the message and is not recorded. Recording continues until an EOB (End of Block) character is transmitted (see Note 1), and recorded. The EOB character conditions all terminals in the network (including listening terminals) to recognize the next character as an LRC character only. The contents of the sending terminal LRC register (LRC character) is then automatically transmitted and compared at the receiving terminal with the LRC character there.

An equal comparison of the LRC characters causes a positive answer (Y) to be returned to the sending terminal (see Note 2), turning off the Resend light there. This light was turned on when the EOB character was transmitted. The next message block can now be transmitted.

An unequal comparison turns on the Data-check light at receiving terminal and causes a negative answer (N) to be sent to the sending terminal (see Note 2). This stops transmission from the sending terminal, causes a hyphen character to be printed by this terminal, turns on the Data-check light, and conditions the Resend light to remain on. Without the line correction special feature, these lights must be manually turned off at both terminals before an attempt is made to retransmit the message.

With the line correction feature, two additional attempts are made to transmit this message correctly before transmission is stopped. If the third attempt is incorrect, manual resetting of the lights is required before transmission can continue. Refer to the Resend and Data-check lights in the System and Component Controls section of the 1050 Operator's Guide, A24-3125 for further information. Also, check the Line Correction and Line Correction Release special features in the 1051 Special Features section of this manual.

The LRC registers are reset at both ends of the line by the LRC answer (Ⓨ , Ⓝ or ⓓ), by operation of either the Resend or Line Reset buttons, or by an EOT code (End of Transaction).

NOTE 1: The EOB character can be placed anywhere in the text of the message, regardless of the message length. However, for maximum utilization of the transmission line, the EOB should be at the end of each printing line. For cards, the EOB should be at the end of each card.

NOTE 2: To transmit the answer to the LRC comparison, both terminals must be momentarily "turned around". This permits the normal receiving terminal to transmit the answer (either positive or negative) and the normal sending terminal to receive this answer. While "turned around", the normal sending terminal can only accept the LRC answer.

Line Bypass and Restore

These are single-character codes that alter the normal printer operation. When a bypass code is sensed during a line-loop operation, all printing is suspended until a restore code is sensed. These codes are effective at both the sending and receiving terminals.

The exact effect of the bypass and restore codes in line-loop is:

Bypass

When the bypass code is keyed or read,

1. it is not punched, unless it has been preceded by another bypass code.
2. the printer (including monitor) is placed in a non-print status.
3. all subsequent characters keyed or read are punched but not printed. All coded functions are punched but not acted upon. EOB and EOT functions occur.
4. a restore character must be keyed or read to return the terminal to the normal mode of operation (read, punch, and print). An EOT code or pressing the Line Reset button also returns the terminal to the normal mode.

Restore

This is used to terminate a bypass mode of operation. When a restore code is keyed or read,

1. the restore code is punched, but not printed.
2. the bypass operation is terminated and the printer is returned to a print status.

Home Bypass and Restore

These single-character codes alter the normal home-loop operation when in program mode. Sensing a bypass code, in this case, suspends all printing until a restore code is sensed. The codes are effective whether or not the system has home component recognition installed.

The exact effect of the bypass and restore codes in home-loop is:

Bypass

Bypass – Program Mode (Prog-Dup Switch set to PROG).

When a bypass code is keyed or read:

1. it is not punched, unless it has been preceded by another bypass code.
2. the printer is placed in a non-print status.
3. all subsequent characters keyed or read are punched but not printed. Any functions associated with these subsequent characters will not occur, except for the EOB and EOT codes which eject a card from the punch or reader. The CR/LF and Tab codes cause the card punch to skip according to the fields defined in the program card (unless wired not to function in the function panel or operator's panel).
4. a restore character must be keyed or read to return the terminal to the normal mode or operation (read, punch, and print).

Bypass – Duplicate Mode (Prog-Dup Switch set to DUP).

In this mode, input data is recorded by all selected punches and printers. All coded functions are punched but not acted upon, except the EOB and EOT codes, which eject a card from the punch or reader. The CR/LF and Tab codes initiate a card punch skip (unless wired not to function).

Restore

Restore – Program Mode (Prog-Dup Switch set to PROG).
When a restore code is keyed or read,

1. the restore code is punched, but not printed,
2. the bypass operation is terminated and the printer is returned to a print status,
3. all function codes except prefixed functions and the reader stop code are punched. All function codes, without exception, perform their function.

Restore – Dup Mode (Prog-Dup switch set to DUP). In this mode, input data is recorded by all selected punches and printers. All coded functions are punched, but not acted upon, except EOB and EOT codes, which eject a card from the punch or reader.

NOTE: The punching of function codes in the 1057/1058 depends on wiring of either the function panel or operator panel in the punch.

Receive Interlocks

Home Loop

If a receive interlock occurs when transmitting to tape or card punches from a reader or the keyboard (1052), the interlocked receive component(s) stop, but the sending unit (reader or keyboard) is not interlocked, and continues to operate. All home-loop printers continue to operate after the paper presence contact is activated. (See Home-Loop Input Component Interlock in Special Features – 1051 section for exception.)

Line Loop

When a polled terminal is transmitting to remote receive components and an interlock occurs at the receiving terminal, the Data-check and Receive-alarm lights turn on. If the interlock is momentary and is relieved by the time an EOB code is received, the Receive-alarm light automatically turns off, but the EOB answer is inhibited.

If the interlock condition continues, the Receive-alarm light is automatically turned off when the interlock is manually relieved. The resend light at the transmitting terminal is on awaiting an EOB answer and this terminal responds negatively to a poll until the Resend light is manually turned off.

The EOB answer is inhibited when a momentary or continued interlock occurs at addressed receive-components. If the interlock continues, the terminal responds negatively to an address until the interlock is manually corrected.

If a remote receive component is initially recognized by its recognition code and it is not ready or is not installed, the EOB answer is inhibited. If the initially recognized component is ready and a second recognized component is not ready or present, the EOB answer is inhibited.

See Keying Component Recognition Codes in the Keyboard Operation section.

1051 CONTROL UNIT – SPECIAL FEATURES

Auto- Fill-Character Generation

- Printer functions interlock the reader in home loop.
- With Auto-Fill ON, idle characters are punched during this interlock.
- During later transmission of the punched message, the idle codes allow time for printer functions to be executed at the remote terminal.

During the home-loop preparation of punched paper-tape printer functions (CR/LF, Tab, and LF) interlock the reader for the duration of the function. With this feature installed and switched on, the 1055 punches feed holes and idle characters in the tape during this interlock. (With the operator panel special feature installed and the auto-fill switch on, the 1057/1058 also punches idle characters for printer functions, if the panel is so wired.) The auto-fill switch on the 1052 is included in this special feature.

In a later transmission of the tape, the idle characters provide the time required for a receiving printer to complete the function when operating without a monitor printer at the sending terminal. A monitor printer (sending terminal) operating with a tape reader or card-reader interlocks the reader for sufficient time to permit the remote printer (receiving terminal) to execute CR/LF, LF, or Tab functions.

NOTE: When paper tape is punched in home-loop from a keyboard (1052) with the Auto-fill switch on and an error occurs, the print element must be manually tabbed to the end of the longest line for that format. Then the correct button is pressed to cause automatic deletion of the error record in paper tape. This procedure prevents a remote printer from printing on-the-fly when the tape is transmitted later. Also, if during this home-loop

tape punching operation, a short line precedes a long line, the print element must be manually tabbed to the maximum line length. This provides sufficient idle characters in the tape to prevent printing on-the-fly if rereading and retransmission (line correction special feature installed) of a long line is required during a later transmission of this tape to a remote printer. Refer to Timing Considerations in the Appendix for the number of fill characters required for various printer and punch functions.

Automatic Ribbon Shift and Line Feed Select

This special feature provides keyboard and reader control over the ribbon and line feed setting of the printer through two-character function codes. The feature is effective for both home- and line-loop operation. The function codes consist of the prefix code followed by an alphabetic character which initiates a specific printer function.

The codes are originated by holding down the Alternate-coding key while operating the prefix key (8). After releasing both these keys, press one of the alphabetic keys depending upon the function desired.

Alphabetic Code	Function
A	Ribbon Shift Up
B	Ribbon Shift Down
C	Single Line Feed
D	Double Line Feed

NOTE: With the Program-dup switch set to PROGRAM, these two-character function codes are neither printed nor punched, but the associated function is performed. However, if a function code occurs between a bypass code and a restore code, the function code is punched but not printed and the function is not performed. With this switch set to DUP, both characters of the function code are punched, the alphabetic character of the code is printed, and the function is not performed. (The prefix character is not a printable character.)

NOTE: A monitor printer does not react to ribbon-shift or line-feed select code when it is transmitted. No fill characters are required for these operations.

Audible Alarm

- Certain conditions occurring in line loop (only) which require operator attention, cause a buzzer in the 1051 to sound.
- The buzzer sounds continuously until reset by pressing the Data-check button.

With this special feature installed, a buzzer in the 1051, sounds when:

1. A polled component (except a keyboard) is assigned to line and is not ready.
2. An addressed component is either not assigned to line or not ready. If a common address is received and no receiving component is assigned to line and ready, the buzzer sounds.
3. An interlock condition at a receiving terminal is recognized.

This special feature does not apply to the 1052 keyboard, the 1092, or the 1093. It operates only in line loop when the system switch is set to ATTEND. This alarm sounds continuously until reset by pressing the Data-check button.

Automatic EOB

- When this feature is active, the Return key on the keyboard causes an EOB character to be generated before the CR/LF character.
- When the EOB switch is set to MANUAL, message blocks are defined by keying an EOB.

This special feature adds an EOB switch to the 1052 switch console. When this switch is set to AUTO, the Return key on the keyboard has a modified function. Pressing this key causes an EOB character to be generated before the CR/LF character. In home loop, the tape punch punches both codes and the card punch punches the EOB and then ejects the card (either the function panel or operator panel of the 1057/1058 must be wired for this action) and punches the CR/LF character in the next card. For line loop the LRC function is automatically completed before the CR/LF character is acted upon and transmitted.

When the EOB switch is in the MANUAL position, the return key functions as usual, causing the CR/LF code to be generated, acted upon, and in line loop, transmitted. Message blocks are defined by keying an EOB (Alternate-coding key- 5 key) before pressing the Return key. If the response is ⓓ, the CR/LF function is not performed.

Home Component Recognition

- Provides on-off control of components operating in home-loop.
- Two-character recognition codes consist of a prefix code followed by a numeric code.

This special feature provides on-off control of components operating in home-loop.

With this feature, the 1051 recognizes and acts upon two-character recognition codes placed on the home data channel by the keyboard or readers. Each two-character recognition code consists of a prefix code followed by a numeric code. The prefix code conditions the control unit to recognize the numeric code that immediately follows it and provide the proper component selection.

These two-character recognition codes are originated by holding down the alternate-coding key while operating the Prefix key (8). After releasing both keys, press one of the numeric keys depending upon the specific component desired:

Numeric Code	Action
1	Printer 1 ON
2	Printer 2 ON
3	Punch 1 ON
4	Punch 2 ON
5	Printer 1 OFF
6	Printer 2 OFF
7	Punch 1 OFF
8	Punch 2 OFF
9	Reader 1 ON, Reader 2 OFF
0	Reader 1 OFF, Reader 2 ON

NOTE: With the Program-Dup switch set to PROG, these two-character recognition codes are neither printed nor punched, but the associated function is performed. However, if a recognition code occurs between a bypass code and a restore code, the recognition code is punched but not printed (because Bypass turns off the printer) and the function is not performed. With this switch set to DUP, both characters of the recognition code are punched, the numeric character of this code is printed, and the function is not performed. (The prefix character is not a printable character.) In duplicate mode, all components are controlled only by their respective component assignment switches. Pressing the Home-reset button deselects all selected components.

Home Correction

- Provides the operator at the 1052 with an efficient means of correcting errors occurring during home-loop operations.
- Pressing the backspace key causes the tape punch to backspace rather than punch a backspace code.
- Delete codes can be punched in tape from the keyboard.
- Idle characters can be punched in the tape from the 1052 keyboard.
- A correct button provides automatic tape-error correction when tape is being punched.

This special feature provides the operator (at the 1052) with an efficient means of correcting errors which occur during home-loop operations. This feature includes:

1. The punch, normal-backspace switch.
2. The Punch-delete, Punch-feed, and Correct buttons.

Punch, Normal-Backspace Switch

This switch is used in home-loop operation for error correction of paper tape by altering the operation of the Backspace key.

Normal. Setting the switch to this position provides normal operation in which the Backspace key causes a printer backspace and records the backspace code in the tape of the selected tape punch.

Backspace (BKSP). When paper tape and printed copy are being prepared simultaneously and a recorded error is detected, the switch is set to BKSP. Pressing the Backspace key causes the printer to backspace and also causes the tape to backspace with the printer. Backspace codes are not punched in the tape with this switch position.

To complete the correction, the operator returns the switch to NORMAL and manually enters delete codes of sufficient quantity to delete the tape error. The correct information is typed beginning at the first character in error. The platen of the printer may be manually turned to prevent overprinting.

Punch Delete Button

Operating this button causes the recognized tape punch (or punches) in home loop to advance by punching a delete code and a feed hole in the tape. Delete codes can be punched continuously by pressing and holding down both the Punch-feed and Punch-delete buttons. (A delete button is standard on the tape-punch unit.)

Punch Feed Button

Operating this pushbutton causes the recognized tape punch (or punches) in home loop to advance by punching idle characters and feed holes. Holes are continuously punched by holding the button in the operative position. (A Feed button is standard on the punch unit.)

Correct Button

This pushbutton provides an automatic tape-error correction for data-recording operations when the tape is being punched. When this button is pressed:

1. The tape advances one additional column and punches a hole in the 8th-track of the tape.
2. The tape punch then feeds in the reverse direction until the previous 8th-track punch is sensed. (With this feature a punch is placed in the 8th-track with the CR/LF code when a carrier return is keyed. This 8th track is punched in the paper tape during home-loop operation providing the system has either home correction or line correction installed.)
3. The tape punch advances over the error item, punching delete codes through the entire error record including carrier return code with 8th-track punch until the 8th-track punch originated in step 1 is read. Feed holes are not over-punched in the deleting process. (See NOTE 1.)
4. If data is being recorded from a master tape, the reader reverse feeds until a carrier return (8th-track punch) is sensed and then rereads.
5. If a card reader is being used, the card in the reader is reread, if an EOB code or the last card column has not been read.
6. If cards are being punched, the card is released and a new card is fed in.

NOTE 1: The mechanism which inserts the 8th-track punch with the CR/LF character is active whether the tape punch is in home or line loop. Line correction is therefore effective when transmitting paper tape which was prepared in home loop even if home correction is not installed.

NOTE 2: If the Correct key operation is to be done in the duplicate mode, all components involved in the operation must be recognized in the program mode (if the home-component-recognition special feature is installed), before setting the Program-duplicate switch to the DUP position.

Without home-component recognition, the Correct button operates properly with the Program-dup switch in either position. If the Correct button is pressed with reader 1 assigned to HOME and the reader is not ready, the keyboard interlocks. To prevent this, any reader not ready should always be assigned to the OFF position. This keyboard locking occurs for both program and dup modes and regardless of whether the system does or does not have home-component recognition installed.

NOTE 3: For an explanation of the delete code, see the 1050 Character Set Information section in the Appendix of this manual.

Home-Loop Input Component Interlock

- Provides interlock control during home-loop operation if any output component is unable to operate.

- If an output unit is not-ready, input units are stopped (or prevented from starting) and the home-interlock light is turned on.

This special feature provides interlock control during home-loop operation to lock the keyboard, stop or prevent the start of any reader or programmed keyboard if any output component is unable to operate due to:

1. Lack of printing or punching media.
2. Taut tape condition (either momentary or prolonged) in the tape punch.
3. Full stacker, card jam, or a failure to feed in the card punch.
4. The paper-presence contact in the printer is operated.

When an interlock condition occurs, the input component is stopped (or prevented from starting) and the Home-interlock light is turned on. This light is directly above the Proceed light on the 1052, or at the bottom of the switch unit, if the system has no 1052. It is turned off, and operation is resumed by correcting the interlock condition, moving the Reader-stop switch to the home position (now labeled Home Interlock Reset), and pressing the Home – Reader Start button.

NOTE 1: The home-loop interlock feature does not recognize:

- Failure to manually assign a receive component to home-loop operation (component assignment switch not set to home).

- Failure to provide the proper component recognition code for recognizing a receive component (with the home-component recognition special feature installed). This code is normally read from either the tape or cards, or keyed from the keyboard. Any record partially completed when an interlock condition occurs should be deleted and rekeyed or reread. This precaution is recommended to ensure that the interrupted record is completely received, especially if a reader is used.

NOTE 2: With the home-correction feature installed, the Correct button can be properly operated only after the interlock condition is removed and the Interlock light is turned off. (This procedure is necessary to ensure deletion of the proper record, since the interlocked punch does not punch the 8th-track used as a reference for the operation.)

If the Home-reset button is pressed to reset the Interlock light (with the home-component feature installed), all home-loop components must be reselected.

Keyboard Request

- Provides keyboard polling which demands operator attention only when keyboard transmission is desired.

- When the terminal is polled, it responds with an end-of-address Ⓓ code. The Request light turns off.

This keyboard request special feature renders keyboard polling an efficient and positive operation demanding operator attention only when keyboard transmission is desired. With this feature a negative reply is sent to a keyboard poll or common poll unless the operator takes specific action. If the keyboard is not in request status (and the readers are not ready), polling is resumed with a minimum use of line time.

To place the keyboard in request status:

1. Position the assignment switch for the keyboard to SEND.
2. Press the Request button. The associated light turns on, indicating that the keyboard is ready to be polled.

When the Keyboard is polled, it responds with an end-of-address (EOA) Ⓓ code. The request light turns off, the keyboard unlocks and the Proceed light turns on. To extingush the Request light manually, press the Line-reset button.

NOTE: When this special feature is not installed, the keyboard assignment switch should never be set to SEND unless transmission is to be initiated from the keyboard at the next polling cycle. If this procedure is not followed, the response to the poll will be positive, whether transmission is desired or not. If there is no data to be transmitted, the master station or processor must wait to time-out period before polling can be resumed. If this occurs frequently, appreciable line time is consumed. This problem can be minimized (without this special feature) by instructing the operator to leave the keyboard assignment switch in the HOME or OFF position except when data is to be sent.

Line Adapters

Limited-Distance Line Adapter

A customer can attach either his privately owned, or common-carrier provided, on-premise communication line to an IBM 1050 System when using this line adapter. The feature provides the necessary signal modulation and demodulation to accommodate a communication line of up to 8 miles in length, and is installed within the 1051.

Leased-Line Line Adapter

This feature permits the customer to attach his privately owned communication line or a communication-company leased private line to an IBM 1050 System. This line adapter feature provides the necessary signal modulation and demodulation to accommodate a communication line of any length. This line adapter is installed within the 1051.

Shared-Line Line Adapter

This feature provides the 1050 System with the capabilities for operating either point-to-point or multipoint on one of four subchannels of a common-carrier leased private telephone line (schedule 4 line, or equivalent). Simultaneous data transmission on all four subchannels is possible, since each subchannel operates on a different assigned frequency.

NOTE 1: All terminals operating in the same network (and expected to communicate with each other) must be assigned to the same subchannel. Each 1051 Control Unit can only be assigned to one subchannel of the four available. Any transmission control unit

(multiplexor) expected to communicate within a specific network must be assigned to the same subchannel. However, since multiplexor can accept several networks, each network can terminate at the multiplexor with a different subchannel assignment.

NOTE 2: Intermixing of line adapters, or line adapters and common carrier data sets on the same line is not permitted.

Line Correction

- The system can delete and retransmit any message designated by the receiving station as being in error.
- A 1054 paper-tape reader reverse-feeds and retransmits the message.
- The 1056 recirculates the card and rereads it.
- The 1052 or 1053 printer prints a hyphen to indicate the error line.
- The 1055 paper tape punch reverse feeds, then punches delete codes over the error block, and punches the retransmitted message.
- A 1057/1058 card punch releases an error card without an 11-punch in column 81, and registers another card.

With this special feature the 1050 system can delete and retransmit any message designated by the receiving station as being in error. The transmitting terminal can resend the message two more times, if necessary, before manual intervention is required. Line correction must be installed at both the sending and receiving terminals to be effective. However, this feature is not required for systems containing only printers, only card punches, or only printers can card punches. This feature works with the following components when these units are part of the system:

IBM 1054 Paper-Tape Reader
IBM 1055 Paper-Tape Punch
IBM 1056 Card Reader
IBM 1092 and 1093 Programmed Keyboards

Sending

When a 1054 paper-tape reader is the sending unit, a negative LRC answer causes the reader to reverse-feed until the 8th-track punch of the last CR/LF code is sensed. It then automatically feeds forward and retransmits the message. After the third incorrect attempt to transmit the message, the tape reader stops and does not reverse feed again. Without the line-correction feature, the reader does not reverse-feed and operator intervention is required.

When transmitting to the line from a card reader and an EOB code is sensed, the reader stops in column 81 awaiting the LRC answer. If the answer is received before the card reaches column 81, the card continues to move. If the answer is positive, the card is ejected from the read station. If the answer is negative, the card is recirculated two additional times, if necessary. (See NOTE 1.)

If the line-correction feature is not installed, the card in the reader ejects from the read station when an EOB code is sensed. With the reception of a negative LRC answer, the reader remains stopped and operator intervention is required. (See NOTE 2.) Retransmission by a polled terminal locked in resend mode is possible by repolling the terminal. The following action takes place after the terminal receives its address and poll-select characters:

Reader Select. If the poll select character is a reader select character, a Ⓓ response is transmitted and the selected reader will reverse feed and retransmit the message.

Keyboard Select. If the keyboard is selected, the Proceed light turns on and the keyboard unlocks. The operator must rekey the message any time that the Data-check light is on and the Resend light turns off without manual intervention.

Request Feature. If the terminal is equipped with the request feature, the Proceed light will not turn on when the keyboard is repolled. The resend light turns off with the reception of the address character and the Data-check light turns on when the Ⓒ character is received. In this case, the operator must press the Request key and then rekey the message when a successful poll is made.

If the Ⓨ or Ⓓ response to an EOB is not received correctly, the transmission resulting from the repoll will be a repetition of the message. The Resend light must not be turned off manually; otherwise, an incorrectly received message will not be retransmitted but succeeding messages will be transmitted.

Receiving

When a 1052 or 1053 printer is receiving, a negative LRC compare prints as a hyphen (at the end of the line), and the LRC answer is transmitted to the sending system. A positive answer does not print. This operation is identical with or without the line-correction feature. (See NOTE 3.)

If a 1055 tape punch is the receiving unit, a negative LRC compare punches a hole in track 8. The tape then reverse-feeds until the previous CR/LF 8th-track punch is sensed. (With the line-correction feature, the 8th track is punched with every CR/LF.) The tape then feeds in the forward direction, punching delete codes over the previously punched information, including the last CR/LF code. Feed holes are not over-punched in the deleting process. When the deletion process is completed, a negative LRC answer is transmitted to the sending system. (See NOTE 4.)

If a 1057/1058 card punch is receiving data, the card is punched and skips to column 81 upon receiving an EOB code. If the LRC compare is negative, the card is ejected, and a new card is fed into the punch station. The 1051 then transmits the LRC answer to the sending system. If the LRC compare is positive, an 11-hole is punched in column 81, and the card is ejected. This hole is not read by a card reader. This operation is the same with or without the line-correction feature. (See NOTE 5.)

NOTE 1: After the third unsuccessful attempt to transmit from a card reader, the card must be manually ejected by operation of the eject button located on the card reader. Otherwise, a positive response is transmitted when the reader is repolled (providing the Resend light has been extinguished). However, the reader does not start, because it is still waiting for an LRC answer. (The 1056 does not receive the third negative answer; only the 1051 receives this.)

NOTE 2: Multiple-card groups should not be processed on a system with the line-correction feature installed. This is because only the last card of the group (card containing the EOB) is automatically recirculated following an error.

NOTE 3: When an error occurs when printing on preprinted forms, format errors result which will effect the following forms. To eliminate format errors, the transmitting terminal must resend all of the contents of that form whenever an error is detected (i.e., use one EOB code only at the end of each complete form). An alternate is to transmit from a 1054 tape reader to a 1055 tape punch, then to print from the paper tape in home-loop.

NOTE 4: If the line-correction feature is not installed, the hyphen code instead of the 8th-track hole is punched into the tape upon the reception of a negative LRC answer, and operator intervention is required. The system may receive the message again or be readdressed at a later interval.

NOTE 5: For an explanation of the use and meaning of the delete code, see Delete Code in the 1050 Character Set section.

Line Correction Release

This special feature modifies the line correction special feature for terminals that operate with the system switch in the unattended position. It is used only at terminals having line correction, and is required only at the sending terminal.

Line correction release permits resumption of data transmission after a third negative answer to the LRC. Instead of stopping after the third unsuccessful transmission attempt, the Resend light is automatically turned off, and the reader continues with the next message. The Data-check light remains on. There is no operator intervention.

If there is no answer at all the EOB/LRC signal, the line correction release does not operate and manual restart is required.

Master Station

This special feature provides a 1050 terminal with the line-control capabilities for polling and addressing other 1050 terminals. The master station can function in either a point-to-point operation (1050 to 1050) or a multipoint operation (1050 to several other 1050's). With this feature, a master switch is provided.

NOTE: With this feature, a 1050 station with the master switch on can also function as a temporary means of receiving or transmitting information from other 1050's on a multidrop line when the transmission control unit is removed from the line. See Multipoint Operation.

If group or broadcast addressing is to be used, only one terminal may have this feature.

Reader Stop – Prefix J

This special feature alters the termination of the reader skip operation. With this feature, a reader skip is still initiated by inserting a reader stop code at the desired point, and pressing the Reader skip button. This causes the reader to move the tape or cards and sense the data, but no characters are read. The skip is not terminated by a CR/LF, Tab, LF, or a reader stop code. Skipping is terminated only by a Prefix J code, after which reading is continued. This code consists of a prefix code followed by a J-character. As with the standard reader skip function, the Reader-Stop Prefix-J feature operates only in the home loop.

Telegraph Line Attachment

This special feature permits attachment to 75 bps telegraph facilities so that lower volume data transmission terminal can be linked into a common network . Using these facilities, the transmission rate can be up to 8.3 cps between:

- Two 1050's on a point-to-point basis, or a 1050 master station to remote: 1050's on a multidrop line or point-to-point basis.
- 1050 to 7740 point-to-point, 7740 to 1050's multidrop.
- 1050(s) to 2701, 2702, or 2703; 2701, 2702, or 2703 to 1050(s).

NOTE: All terminals expected to communicate directly require installation of this special feature to accommodate 75 bps facilities. With this feature installed, and operation in home-loop, the keyboard speed (1052) can be up to 14.8 cps.

Vertical Forms Control

- Provides vertical movement of forms in the 1052 and 1053 printers controlled with two-character codes and a bead-chain sensing device.
- Movement is initiated by the function codes received in either home-loop or line-loop.
- Two distinct operations are provided by vertical forms control.
- Each different vertical format requires one pair of bead chains.
- A nickel-plated bead locates the starting point of a form on the bead chain.
- The 1052 keyboard or reader is locked in home loop and, with a monitor printer, in line loop during form feeding.

This special feature provides controls for vertical movement of forms in the 1052 (Model 1 through 5) and 1053 (Model 1 only) printers. Vertical feeding of forms is controlled with two-character codes and a bead-chain sensing device mounted on the platen shaft. Reducing the keying required to skip several successive line decreases not only message length, but also the possibility of operator error. Forms output also increases.

The movement is initiated by the function codes that are received in either home-loop or line-loop mode, from a keyboard, tape reader, card reader, transmission control unit, or a processor. All form movement occurs at line-feeding speed. (See NOTE 1.)

Operation

The two distinct operations provided by vertical forms control are the skip to the first print line (used once for each form) and skip to the next body line (used for each vertical format stop after the first print line). Each operation is initiated by a two-character code consisting of a prefix character and a function character.

To originate the first character of the code, hold down the alternate-coding key while operating the prefix key (8). After releasing both keys, press one of these function keys for the operation desired:

Function Key	Operation
Line Feed	First Print Line
Spacebar	New Body Line

Once initiated by the proper code, the form feeding is stopped by the sensing of a large bead on the appropriate bead chain.

Each format, requires a pair of bead chains. The user designs the chains for his specific requirements. IBM supplies chains of various lengths and a special toop tool (pliers 343641) used for clamping the large beads in the desired places. (See NOTE 2 and 3.)

A nickel-plated bead locates the starting point of a form on the bead chain. The platen-disconnect knob of the 1052 and 1053 printers is used to manually line up the top of the forms document and the

nickel-plated bead. For proper alignment of continuous forms, a pin-feed platen is recommended. (See NOTE 4 and 5.) If double line feed is used, careful consideration of document format is necessary.

Vertical forms control incorporates various interlocks to ensure efficient performance. Normal printer functions of line feed and space codes are inhibited when preceded by a prefix code. The 1052 keyboard is locked (cannot operate) during form feeding. If a reader is used, it is locked during form feeding, in home loop and, if a monitor printer is used, in line loop. The reader stops when the form is feeding and starts again automatically when feeding is completed. (See NOTES 6 and 7.)

NOTE 1: Vertical Forms Control is required only at the receiving terminal for line operation, but may be installed at both terminals if desired.

NOTE 2: The first print line should usually be a minimum of three lines below the top of the form. If use of the top two lines is desired, the first-print line chain may be designed to accomplish this; however, the printing element must be positioned at the left-hand margin before printing begins. Initial CR/LF and prefix LF codes are omitted. In this case the printer is the only output unit.

NOTE 3: If the printer receives a prefix LF or prefix space code and no bead chains are in place, continuous line feeding begins and must be manually stopped by pressing the proper reset key.

NOTE 4: Special pin-feed platen widths available for the 1052 and 1053 printer must be used with vertical forms control. Forms up to 17 inches and 12 3/4 inches in length are used with the six and eight lines-per-inch options, respectively. Thirteen chains are available for 22 form lengths from 2 to 17 inches at six lines per inch. Eight chains are available for 16 form lengths from 2 to 12 inches at eight lines per inch. A special friction-feed platen (with extension) is required when used interchangeably with vertical forms control.

NOTE 5: When a remote terminal is polled, the forms skip must be completed within the transmit time-out (9 to 18 seconds nominally). The maximum skip, therefore, is 11 inches at six lines-per-inch or 8 inches at eight lines-per-inch. When keying, the maximum skipping length is reduced by the time required to transmit a character or code. For address operation, maximum skipping lengths can be used. In a point-to-point operation with line control off, the length of skip is limited by the 9-second time-out at the sending terminal.

NOTE 6: This special feature is compatible with these other features: home component recognition, automatic ribbon shift and line-feed select, home and line correction, automatic EOB, and auto fill character generation. If the home component recognition feature is installed, only the selected printer reacts to the function code. In line operation, printers must be selected to react to a function code.

NOTE 7: Auto fill character generation provides idle codes in punched tape or cards (with the operator panel special feature installed and wired), during form feeding when no monitor printer is used. To eliminate the need for idle characters or time-outs during form-feeding operations, use the following format.

Master Station or Processor	1050
Ⓒ	
A1 (terminal address)	
	Ⓨ
Ⓓ	
CR/LF (with 8-track punch)	
PREFIX	
LF	
EOB	
LRC	
	ⓨ
(text)	
EOB	
LRC	
	ⓨ

The receiving 1050 delays the LRC answer until the form feeding is completed. This procedure is also used for new-body-line operations within the document.

With this format and the line-correction feature installed, a transmission error causes the 1050 to operate as follows:

1. Message blocks containing no vertical-forms control codes reprint on the following line.
2. Message blocks containing prefix LF codes reprint on the first line of the next form.
3. Message blocks containing prefix space codes reprint on the following body-line location.

When such an error occurs, the information may appear on more than one form. However, the next complete form is not affected. To eliminate format errors, the transmitting terminal must resend all the contents of that form whenever an error is detected. An alternative is to transmit from a 1054 tape reader to a 1055 tape punch, then print while reading from the paper tape in home-loop operation.

Text Time-Out Suppression

- The normal text time-out feature (9-18 seconds) may be ignored to permit an unlimited period for transmission.

- The operator must terminate the sending operation by transmitting an EOT code.

Specific applications of the 1050, such as training operators or conversation with a CPU when processing scientific programs, may render the normal text time-out feature (9-18 seconds) undesirable. With this optional feature, the terminal is not deselected at the end of this time-out. The keyboard and readers are not locked. Instead, the terminal enters the nonselected status. Contention may take place. If the operator resumes keying or starts a reader, the terminal reenters transmit status. The terminal is locked when a Ⓑ or Ⓒ is generated or received. This permits an unlimited transmission period. Otherwise, the terminal would time-out after 9-18 seconds without a transmission, and would remain locked in receive mode until another poll.

If this option is specified, care must be taken to ensure that the operator terminate the sending operation by transmitting an EOT code.

NOTE: This option should only be specified for specialized point-to-point systems.

DETAILED SPECIFICATIONS

Interlocks – 1051

Information concerning the interlocks of the 1051 is contained in Receive Interlocks in the Control Unit Operation – 1051 section and in Home-Loop Input Component Interlock in the 1051 Control Unit – Special Features section.

Character Set – 1051

All codes shown in the PTTC/BCD code chart (See Figures 23 to 25) can be sent and received over either the home or the line data channel.

The code set contains 14 function codes. The function codes and space code are repeated in the upper case. Five codes are not used with the 1050 System: PF, PN, ≠ (record mark), MZ, and PZ.

Timing Considerations – 1051

1. a. System speed: 14.8 cps or (9 x 14.8) 133.2 bps (bits per second).
   b. Minimum 1051 bit rate for communication line: 134.89 bps.
   c. Character time: 67.5 ms* per character
   *(ms = milliseconds: 1000 ms = 1 second)
2. Delay time after turning the main-line switch on until ready to receive or transmit: 1 second.
3. Addressing time (single component):
   (5 x 67.5) + 330 + 20 = 687.5 ms

NOTE: This includes response time. For unattended operation see item 7.

(5 x 67.5 ms) = five character times (EOT, station identification, Component identification, response and EOA.)
330 ms = nominal delay before transmission of response and turn-around time (actual: 202 to 330 ms)
20 ms = maximum turn-around time for master to go from receive mode to transmit mode.

4. Addressing time (multiple components):
   ((5 x 67.5) + 330 + 20) + (N - 1)((3 x 67.5) + 61)

This includes response time. For unattended operation, see item 7.

330 ms = nominal delay before transmission of first response and turn-around time (actual – 202 to 330 ms)
20 ms = maximum turn-around time for master to go from receive mode to transmit mode.
N - 1 = number of additional components, where N is the number of components.
(3 x 67.5 ms) = three character times
61 ms = delay before transmission of additional responses.

5. Polling time for an individual terminal:
   (4 x 67.5) + 330 = 520 ms

For an unattended operation, see item 7.

(4 x 67.5 ms) = four character times
330 ms = nominal delay before transmission of response, and turn-around time (actual – 202 to 330 ms)

6. LRC time: (3 x 67.5) + 61 = 263.5 ms

This includes EOB, LRC, and the answer.

61 ms = delay before transmission of answer.

7. Unattended operation requires a delay time for polling or addressing to bring the motors (for the selected components) up to speed: 2.3 seconds.

KEYBOARD OPERATION

The 1052 keyboard permits operator keying speeds up to 14.8 characters per second. Above this speed, a momentary interlock occurs between key strokes to prevent exceeding the 14.8 cps. The shift status of the 1052 keyboard (Figure 9) is changed by either sensing a shift code or keying the opposite shift.

When transmitting to a remote printer, the ribbon-shift, line-feeding and print element status should be initially established by transmitting the appropriate codes. The printer is automatically placed in a downshift mode when a positive address response occurs or when a d LRC answer is received.

Keying Component-Recognition Codes

- Component-recognition codes provide on-off control of 1050 system units (home or line loop).
- The two-character codes consist of a prefix character and a numeric character.
- In home loop, component-recognition codes are effective in prog mode only.
- Line loop addressing operations must include component-select codes for all units to be manipulated with component-recognition codes.

Component recognition codes provide on-off control of I/O units from the keyboard or a reader. Line component recognition is a standard feature, effective only in text mode. Home component recognition is a special feature.

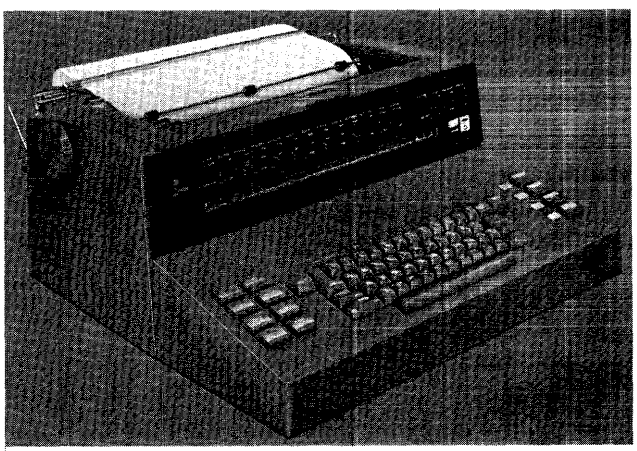


Figure 9. 1052 Printer-Keyboard

The component-recognition codes (home and line) are two-character codes consisting of a prefix character followed by a numeric character. The prefix character conditions the 1051 control unit to act upon the numeric character that immediately follows it and to provide the proper component control.

These two-character recognition codes are initiated by pressing the Prefix key (8) while holding down the Alternate-coding key. (See NOTE 1.) After releasing these keys, press one of the numeric keys, depending on the component control desired:

Numeric Code	Control
1	Printer 1 on
2	Printer 2 on
3	Punch 1 on
4	Punch 2 on
5	Printer 1 off
6	Printer 2 off
7	Punch 1 off
8	Punch 2 off
9	Reader 1 on, Reader 2 off
0	Reader 2 on, Reader 1 off

When operating in home loop, component-recognition codes are effective only when the prog-dup switch is set to PROG. (See NOTE 2.) When a two-character recognition code is generated (keyed or read), the particular component control is executed if the assignment switch is set to HOME. If the assignment switch is not properly positioned, the components will not operate. However, if the assignment switch is then properly positioned, the control will be executed without rekeying the recognition codes and system operation can continue. (See NOTE 3.)

During line-loop operation, component-recognition codes for receiving units do not affect the receiving units at the sending station. Conversely, component-recognition codes for input units affect those units at the sending station only.

An addressing operation should contain component-select codes for all receiving units to be used during the subsequent transmission. Including the component select characters after the station address ensures that the units are available for control when component-recognition codes occur in the text of the message.

NOTE 1: When component-recognition codes are keyed or read for more than one component, the prefix code must precede each numeric code. For example, if Printer 1 and Punch 1 are to be controlled, the code sequence is:

Code	KEY
ALTN Code Prefix	8
Printer 1 on	1
ALTN Code Prefix	8
Punch 1 on	3

If the second prefix code is not keyed, the numeric 3 is not recognized as a component-recognition code. Instead, a 3 is printed by Printer 1.

NOTE 2: When a component-recognition code is keyed or read with the Prog-dup switch set to DUP, the code is punched and/or printed (only the numeric digit is printed), depending upon the units assigned to home loop by the assignment switches. With this switch set to DUP, no component control is executed.

NOTE 3: In home loop, if a 1052 is not part of the system, the component-recognition codes must enter the system by means of a tape reader or card reader. In these instances, the tape or card input must be punched at another system.

Keying Bypass and Restore Codes

- A bypass code places the printer in a non-print status.
- A restore code terminates the bypass mode.
- If a component-recognition code is preceeded by a bypass code, the terminal can accept and punch the recognition code without executing the function.

When a bypass code is keyed (or read):
1. It is not punched.
2. The printer is placed in a non-print status.
3. The terminal remains in the bypass mode in which all subsequent characters (including other bypass codes) keyed or read are punched but not printed. (See NOTE .)
4. A subsequent restore character must be keyed or read to return the terminal to the normal mode of operation (read, punch, and print).

A restore code is used to terminate a bypass mode of operation. When this code is read or keyed:
1. It is punched but not printed, and
2. The bypass operation is terminated and the printer is returned to print status.

Therefore, a bypass code inserted immediately before a component-recognition code permits the terminal to accept and punch the recognition code without executing the function.

NOTE: To prepare a punched paper tape which will be read to prepare another punched paper tape, perhaps successively: Key one bypass code for the initial change to bypass mode plus one for each time the bypass mode is desired in a subsequent read/punch operation. This is necessary because the first bypass code read (in each read/punch operation) is acted upon and not punched.

Example of Line-Loop Keying

This example describes the use of component select character, component recognition codes, bypass and restore codes in an addressing operation. The affect of these codes on the output components at the receiving terminal is indicated under component action.

Control Mode

Message Received Control Mode	Component Action	Description
Printer 1 On, C A1	On and Ready	Terminal Address Select Character
	Yes	Positive Response
Punch 1 On, A3	On and Ready	Select Character
	Yes	Positive Response
Punch 2 On, A4	On and Ready	Select Character
	Yes	Positive Response
EOA		End of Address

Text Mode

Message Received Text Mode	Component Action	Description
Prefix 8 (Punch 2 Off)	No Print, No Punch 1, No Punch 2	Recognition Code
A	Print, Punch 1, No Punch 2	Text
B	Print, Punch 1, No Punch 2	Text
Bypass	No Print, No Punch 1, No Punch 2	
Prefix 4 (Punch 2 On)	No Print, Punch 1, No Punch 2	Component-Recognition Code: Note in bypass mode, this code is punched but the function is not executed
Restore	No Print, Punch 1, No Punch 2	

Message Received Text Mode	Component Action	Description
Prefix 4 (Punch 2 On)	No Print, No Punch 1, No Punch 2	Recognition Code
C	Print, Punch 1, Punch 2	Text
D	Print, Punch 1, Punch 2	Text
E	Print, Punch 1, Punch 2	Text
Bypass	No Print, No Punch 1, No Punch 2	
Prefix 1 (Printer 1 On)	No Print, Punch 1, Punch 2	Recognition Code
Prefix 8 (Punch 2 Off)	No Print, Punch 1, Punch 2	Recognition Code
F	No Print, Punch 1, Punch 2	Text
G	No Print, Punch 1, Punch 2	Text

Message Received Text Mode	Component Action	Description
H	No Print, Punch 1, Punch 2	Text
I	No Print, Punch 1, Punch 2	Text
Restore	No Print, Punch 1, Punch 2	
K	Print, Punch 1, Punch 2	Text
L	Print, Punch 1, Punch 2	Text
Etc.		

Bypass and restore codes used in a home-loop operation (with the prog-dup switch set to PROG) operate the same as when received in a line-loop operation.

1052 PRINTER-KEYBOARD AND 1053 PRINTER — SPECIAL FEATURES

Accelerated Carrier Return

This special feature permits the 1052 and 1053 (Figure 10) to accomplish a carrier return up to twice as fast as the normal speed. With this feature installed, the following timings apply:

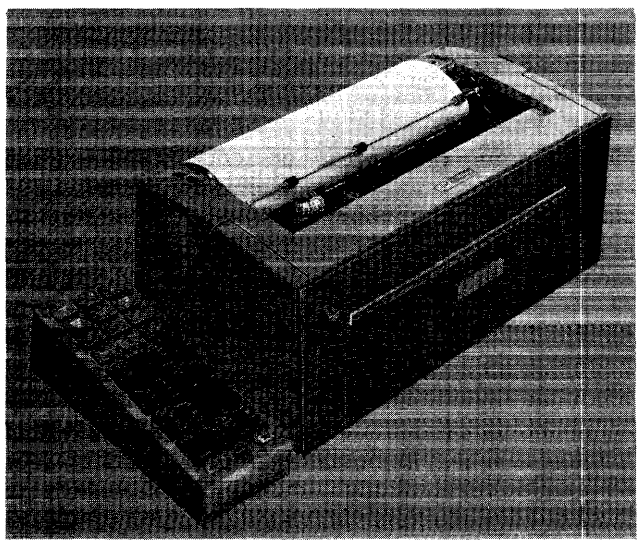


Figure 10. 1053 Printer

Length of CR in inches	Number of Idle Characters Required
0 - 2 1/2	3
2 1/2 - 5	4
5 - 7	5
7 - 10	6
10 - 13	7

NOTE: All printers in the same network should be equipped with this feature if communication directly with each other is expected. Otherwise, all communication must be centralized. (That is, must pass through a transmission control unit and processor when either coming from, or going to, another terminal.)

Pin-Feed Platen

A pin-feed platen, used for feeding forms with prepunched feed holes, is available for the 1052 and 1053 in a choice of twelve widths. (NOTE 1.)

NOTE 1: The available widths, pin to pin, are: 5 1/4", 6", 7 1/2", 8", 9", 9 3/8", 9 7/8", 10", 10 1/8", 11 1/4", 11 1/2", 13 1/8". The form width must be specified for each pin-feed platen.

When the vertical forms control special feature is installed, a special (extension) platen is required.

1052 PRINTER-KEYBOARD AND 1053 PRINTER — DETAILED SPECIFICATIONS

Interlocks — 1052/1053

Paper must be inserted in the printer to satisfy the interlock circuitry for the printer. Paper presence is indicated by a contact located about two inches from the print line. Printing is not interrupted when the bottom edge of the page passes this contact, but continues until the message block (EOB) is completed. The EOB answer is then inhibited when paper is out, and the printer is addressed again, a negative response is transmitted.

The keyboard is mechanically interlocked automatically whenever the accidental operation of a key would interfere with system operation. When interlocked, the keys cannot be depressed.

Keyboard Locked

During a home-loop operation the keyboard is automatically locked when:
1. a reader is operating,
2. either the 1054 paper-tape reader or 1055 paper-tape punch is reverse feeding during a reread or delete operation,
3. a card punch is skipping, releasing, or duplicating. The keyboard remains locked if an interlock condition, such as a card jam or empty hopper, occurs on the punch, or
4. a CR/LF (automatic or not), Tab, or LF function occurs on the printer.

During a line-loop operation (with Line Control operative) the keyboard is automatically locked when:
1. receiving from the line,
2. transmitting to the line from the reader. If a reader is stopped due to an interlock condition (out of tape, cards or a jam) the keyboard remains locked. Operating the Reader-Stop switch unlocks it. This condition is not altered by the position of the line-control switch.
3. the keyboard assignment switch is set to SEND, and until the system sends a positive response to the keyboard poll,
4. a (d) answer is received to an LRC,
5. an EOB code is sent and the system is in the resend status (Resend light ON),
6. and EOT code is received or transmitted, or
7. a non-master terminal transmission timeout ends (9-18 seconds).

During a line-loop operation (with Line-Control inoperative) the keyboard is automatically locked when:
1. receiving from the line or transmitting to the line with a reader, or
2. an EOB code is sent and the resend light is on.

The keyboard is also locked in line-loop with the master-station special feature when:
1. receiving from the line or transmitting to the line with a reader,
2. an EOB code is sent and the Resend light is on, or
3. the system is in a two-second timeout waiting period for a polling or addressing response.

Keyboard Unlocked

The keyboard is unlocked in home loop when:
1. neither reader is operating,
2. a reader stop code is recognized, or
3. the Reader-stop switch is operated.

With line-control operative the keyboard is unlocked when:

1. it is assigned to line and has recognized its assigned polling character or the common polling character "zero",
2. a reader is not in the ready condition (for a zero poll),
3. a positive answer (y) to an LRC is received,
4. the Resend light is turned off by pressing the Resend button after receipt of a negative answer to an LRC,
5. a reader is stopped upon sensing a reader stop code or by manual operation of the Reader-stop switch if the keyboard is selected by a common poll, or
6. during the execution of a carrier return (whether generated or automatic), tab, or line-feed at a remote terminal when keying without a monitor printer.

With line-control inoperative the keyboard is unlocked when:

1. a reader is in send mode and stopped upon recognition of a reader-stop code or by manual operation of the Reader-stop switch,
2. a positive answer (y) to an LRC is received,
3. the Resend light is turned off by pressing the Resend button after receipt of a negative answer to an LRC,
4. the Reset button is pressed,
5. executing a carrier return (whether generated or automatic), tab, or line-feed, or
6. a receive time-out (9-18 seconds) ends.

The keyboard is also unlocked during line-loop operation with the master station special feature when:

1. the Master switch is set to ON,
2. an EOT code is received,
3. after a two-second polling or addressing response time-out,
4. operation of the line-reset button, or
5. the 20-second receive time-put out ends.

Media Specifications — 1052/1053

Continuous Card-Stock Forms

Consistently high-quality printing is possible on all of the form area except for the area directly adjacent to the top and bottom edges (12-11 punching area and the 8-9 punching area). These areas are subject to some variation in print quality due to a tendency of the card to leave the platen as the card edge meets the printing line. The use of continuous forms with binder strips between the cards helps to alleviate this condition.

Single Card-Stock Forms

The single-card forms is subject to the same printing variation along the top and bottom edges as the continuous-card forms. Otherwise, consistently high-quality printing is possible on the remainder of the card.

Multiple-Copy Forms

When this type of form is used, the best form-feeding results are obtained: when the sheets are either stapled or glued together. Multiple-copy forms that are crimped together are not as satisfactory. The direction of the forms paper-grain should be parallel to the print line. Maximum forms weight should not exceed 12 lbs. per ream (mfg's. spec.). An original plus five carbons may be printed, depending on paper, carbon quality and thickness.

Roll Paper Specifications

Maximum width: 15"
Maximum outside diameter: 5 1/2"
Minimum diameter of center hole: 3/8"

Character Set — 1052/1053

Printers

The 1052/1053 printers act upon the following characters of the PTTC/BCD code:

The 44 printable characters in downshift.
The 44 printable characters in upshift.
The 7 function characters of Space, LF, CR/LF, Tab, Upshift, Downshift, and Backspace are recognized in both the upshift and downshift mode (See Figures 23 to 25).

Keyboard

Fifty-nine different graphics and codes in the lower case of the PTTC/BCD code set can be keyboard generated. Forty-two different graphics and codes in upper case (period and comma are duplicated),

can be keyboard generated. The cancel code (not shown in code charts) is an additional code that can be keyboard generated.

If the Home Correction special feature is installed, the delete and idle codes can be keyed, but to the home-loop data channel only (See Figure 23-25).

Timing – 1052/1053

1. Carrier return and line feed: (1.5 + T) x 67.5
   Does not include 67.5 ms for CR/LF code which initiates the function.
   T = travel in inches
2. Horizontal tab: (.75 + 1.1T) x 67.5
   Does not include 67.5 ms for HT code which initiates the function.
   T = travel in inches

To determine the number of fill characters required for a specific situation:

a. Compute the time in ms by using the proper formula.
b. Divide this time (in ms) by 67.5.
c. Round the result to the next higher whole number.

NOTE: When transmitting from an IBM 1448 to an IBM 1050 System the fixed time-out special feature (in the IBM 1448) provides a fixed delay of 1.225 seconds for each of these functions:

Carrier return and line feed
Line feed
Tab

3. Line feed: (2 x 67.5) = 135 ms
4. Keyboard speed: This varies with the operator's keying speed, with a maximum of 14.8 cps. (The maximum speed with the telegraph line attachment special feature installed is 8.3 cps.)

READER OPERATION – 1054 (Figure 11)

- Only one reader can operate in any one loop (Home or Line) at any one time. (See NOTE 1.)

- A reader can be transmitting to the line while the second reader is simultaneously operating in a home-loop.

- A reader does not start if the Assignment switch for the selected reader (reset or programmed by component recognition) is off when the Reader-start button (home or line) is pressed. However, if the Assignment switch is then properly positioned (home or line), reading starts automatically unless a reader-stop was initiated before the Assignment switch was positioned.

- A reader, assigned to a home-loop operation, and reading, is stopped by:
  1. Sensing a reader stop code when the Prog-dup switch is set to the PROG position. The Stop-code is not punched.

     NOTE: The setting of the stop-code switch has no effect in home-loop.

  2. Positioning the Reader-stop switch to HOME.
  3. Running out of tape.
  4. Reading a CR/LF, LF, or tab code, or during a release, Dup or skip operation on the card punch.
  5. A taut tape condition.

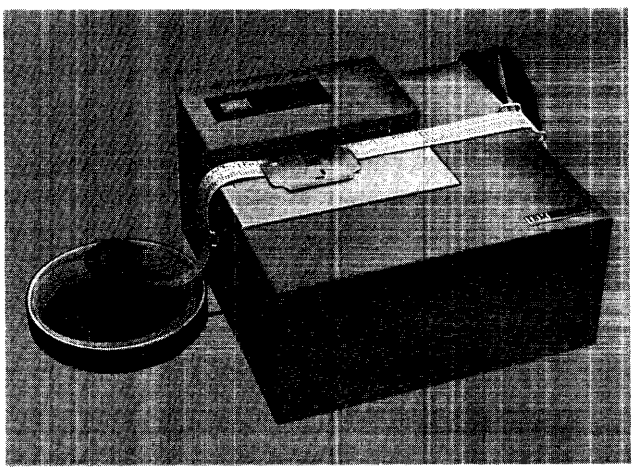


Figure 11. 1054 Paper-Tape Reader

- A reader assigned to a line-loop operation, and reading, is stopped by:
  1. Sensing a reader stop code with the stop-code switch set to SENSE (see Stop Code Switch in the 1052 Printer-Keyboard and 1053 Printer section of Operator's Guide, A24-3125),
  2. Positioning the reader-stop switch to the line position,
  3. Running out of tape, or
  4. A taut tape condition.

- When a reader reads a prefix code followed by the component-recognition code for the alternate reader it:

Home Loop:
1. Stops the reader and transfers reading to the alternate reader if the Prog-dup switch is set to PROG, with the home component recognition special feature installed.
2. Allows the reader to continue reading with the Prog-dup switch set to DUP. The prefix code is punched and the component recognition code can be punched and printed. In this case, reading is not transferred to the alternate reader.

Line Loop: Stops the reader and transfers reading to the alternate reader, except during Bypass mode.

NOTE 1: Avoid setting the assignment switches for two readers to HOME if the home-component-recognition special feature is not installed. Reader conflict occurs if the Home-reader start button is pressed with both readers assigned to HOME.

Polling a Tape Reader

- Tape presence makes the reader ready for polling.

- A stop code stops the reader if the Stop-code switch is set to SENSE.

- Use of the common polling character permits interspersed reading and keying.

Polling is a centrally controlled method (using a central unit such as a 1050 master station or a transmission control unit) which permits stations on a line to transmit without contending for the line.

The presence of tape in the tape reader of any 1050 system places the reader in a ready status for polling operations (if the assignment switch for that reader is positioned to SEND). When the component is polled, reading of the tape starts automatically and the keyboard is locked.

When the stop-code switch is set to SENSE and a reader-stop code is read from tape, the reader stops. If the poll was a common poll (component select character-0), the keyboard automatically unlocks to permit the entering of data. However, if the poll was for a specific reader (component select character-6 or -7) the keyboard remains locked. To restart the selected reader, the operator must press the Line-reader-start button.

Therefore, if interspersed reading and keying is desired, poll the station with the common polling character (0), or keyboard polling character (5). If the keyboard polling character 5 is used, reader 1 can be started by pressing the Line-reader-start button. Reader-2 must be recognized before it can start.

When the common polling character is used,

1. Reader-1 transmits if it is assigned (component assignment switch set to SEND) and READY.
2. Reader-2 transmits if it is assigned and ready and if reader-1 is not.
3. The keyboard is unlocked if neither reader is assigned and ready.

Reader-Stop Code

- The Prog-dup switch controls affect of the reader-stop code in home loop.

- The stop-code switch controls the affect of the reader-stop code in line loop.

If the Prog-dup switch is set to PROG, and a reader-stop code is sensed, the reader stops and the code is not punched (except in Bypass mode). It can be restarted by pressing the Reader-start-home button. If the reader-stop code is sensed when the Prog-dup switch is set to DUP, the code is punched, and the reader does not stop. (See NOTE.)

In line-loop operation, the action of a sensed reader-stop code is conditioned by the setting of the stop-code switch. With this switch set to SENSE, transmission from the reader to the line halts when a reader-stop code is sensed and is transmitted. To restart, the Reader-start-line button must be pressed. If the reader-stop code is preceded by a bypass code the reader will not stop, but the code is transmitted.

In the OFF position, the reader-stop code is transmitted without stopping the reader. Punches receiving from the line, punch the reader-stop code with this switch set to either SENSE or OFF.

NOTE: Check the Reader Stop – Prefix J under the 1051 Control Unit – Special Features.

Reader Skip

This operation is effective only in home loop and only after the reader has been stopped by sensing a reader-stop code punched in the tape. After such a stop, the reader-skip button on the keyboard starts advancing the reader, passing over punched data until a tab, CR/LF, or line feed code is sensed. At this point, the coded function occurs and reading resumes. If another reader-stop code is sensed, the reader stops again. Skipping can then be restarted by again pressing the Reader-skip button; reading can be resumed by pressing the Reader-start-home button.

Automatic Tape Reread

This operation requires either the home-correction special feature or the line-correction special feature. This permits the selected tape reader to backspace (after the proper signal) to the beginning of a record and then reread the record.

During line transmission, this operation is repeated two more times, if necessary. After the third read attempt, the reader stops and manual intervention is necessary.

NOTE: See Home Correction and Line Correction in the 1051 special features section.

1054 PAPER-TAPE READER – SPECIAL FEATURES

Center-Roll-Feed Reel and Take-Up Reel

This special feature permits the tape to be read in the same order in which it was punched, by feeding from the center of the punched tape roll. It also provides a power-driven take-up reel for the rewinding of tape after it has been read. The center-roll-feed and take-up reels are 6 inches in diameter.

Edge-Punch Read

This special feature permits edge-punched (chad type) documents to be read by the paper-tape reader. The documents can be paper, punched card, or ledger

card stock. Documents must be fed singly, except for specified fanfold documents, which can be fed in continuous form.

This feature does not preclude interspersed use of paper tape.

DETAILED SPECIFICATIONS

Interlocks – 1054

Tape Presence Contact

When tape runs out of the reader, this contact is activated to stop the reader. A minimum of 12 characters must follow the last punched character to ensure that the message is read completely before the reader stops.

Tape-Tension Lever

If a strain is placed on the tape so that it can no longer feed, this lever is activated, and the reader stops.

When tape is inserted in home loop, or if the taut tape condition is relieved, the reader automatically starts. The same is true for the line loop, unless the system has timed out. To avoid this, operate the Reader-stop switch.

Media Specifications – 1054

The 1054 Paper-Tape Reader (and 1055 Paper-Tape Punch) is capable of reading (and punching) paper tape, Mylar* laminated paper tape, Mylar coated aluminum tape, and edge-punched documents. These specifications apply:

Width:	Tape -	1" ± .003"
	Document -	12" Maximum 2" Minimum (Width may not exceed length)
Length:	Single Document -	4" to 16" (feeding edge, in increments of .100 inch)
Thickness:	Paper -	.004" ± .0003"
	Mylar -	.003" ± .0003"
	Document -	.004" to .010" (including folds)

Standard hole size and spacing is required for all code and feed-hole punching in both tape and documents. The length of continuously-fed fanfold documents must be evenly divisible by .100" for proper registration. The first feed hole must be .050" from the leading edge of the document. Documents greater than 8" long cannot be punched within .6" of the leading and/or trailing edges (leading edge of first and trailing edge of last with continuously-fed fanfold documents). The direction of feed for all documents must be identified by printing, corner cut (on corner away from punching), or some other identification.

Character Set – 1054

All 64 BCD codes in the lower case of the PTTC/BCD code set are recognized and transmitted to the assigned data channel. Sensing an upper-case function code preceding lower-case graphic codes provides upper-case graphics. (See Figures 23 to 25.)

Timing – 1054

Time required to reverse-feed a record for rereading is:

$$67.5 \times C$$

This time does not include LRC time or re-read time. C = number of characters in the record.

*Trademark of E. I. duPont deNemours Company

PUNCH OPERATION – 1055 (Figure 12)

Automatic Tape Delete

- A hole is punched in track 8 of the tape along with each CR/LF code.
- In home loop, the correct button causes the tape punch to reverse-feed to the 8th track punch and forward delete.
- In line loop, a negative answer causes the tape punch to reverse-feed to the previous CR/LF code and forward delete.

This operation requires either the home-correction special feature or the line-correction special feature. See Home Correction and Line-Correction in the 1051 Special Features section.

A hole is punched in track 8 of the tape along with the CR/LF code when this operation is performed. This punching in the tape identifies the start of a message block corresponding to one printed line, and the end of the previous line. The 8th track is punched:

1. When the CR/LF code is punched at the beginning of each data line within a message. This is also considered the end of the previous data line.
2. In a home-loop operation, when the operator presses the Correct button upon sensing an error that should be deleted. Pressing the Correct button also causes the tape punch to reverse-feed to the previous CR/LF code (with a punch in track 8). The tape then feeds forward, and delete characters are punched until the track-8 hole punched by the CORRECT button is sensed.
3. In a Line-loop operation, when an incorrect message is received, a negative answer is delayed until the tape punch reverse feeds to the previous CR/LF code and forward deletes until the 8th track punch is sensed.

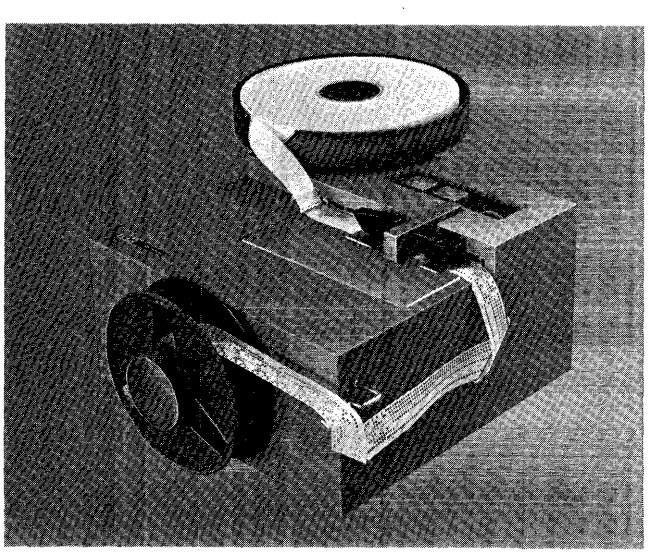


Figure 12. 1055 Paper-Tape Punch

1055 PAPER-TAPE PUNCH – SPECIAL FEATURES

Edge Punching

This special feature permits documents with prepunched feed holes to be fed and punched (chad type) by the paper-tape punch. Documents can be paper, punched card, or ledger stock.

This feature does not preclude the interspersed use of paper tape.

Take-Up Reel

This special feature provides a 6-inch power-driven take-up reel for the rewinding of tape after it has been punched.

DETAILED SPECIFICATIONS – 1055

Interlocks – 1055

Protective interlocks for the 1055 include a tape-tension interlock and a tape presence interlock. In the home loop, either of these interlock conditions causes the punch to stop punching; but the reader does not stop, and the keyboard does not lock. (Exception, see Home-Loop Input Component Interlock in the 1051 Special Features section of this manual.) In the line loop, either of these conditions stops the punch, and causes the Receive-alarm and Data-check lights to come on. See Receive Interlocks in the 1051 Control Unit section.

Media Specifications – 1055

The 1055 Paper-Tape Punch (and 1054 Paper-Tape Reader) is capable of punching (and reading) paper tape, Mylar* laminated paper tape, Mylar coated aluminum tape, and edge-punched documents. These specifications apply:

Width:	Tape -	1" ± .003"
	Document -	12" maximum 2" minimum (Width may not exceed length)
Length:	Single Document -	4" to 16" (feeding edge, in increments of .100 inch)
Thickness:	Paper -	.004" ± .0003"
	Mylar -	.003" ± .0003"
	Document -	.004" to .010" (including folds)

Standard hole size and spacing is required for all code and feed-hole punching in both tape and documents. The length of continuously-fed fanfold documents must be evenly divisible by .100" for proper registration. The first feed hole must be .050" from the leading edge of the document. Documents greater than 8" long cannot be punched within .6" of the leading and/or trailing edges (leading edge of the first and trailing edge of the last with continuously-fed fanfold documents). The direction of feed for all documents must be identified by printing, corner cut (on corner away from punching), or other identification.

*Trademark of E. I. duPont deNemours Company

Character Set – 1055

All 64 lower-case BCD codes of the PTTC/BCD code set are recognized and punched. The upper-case function code preceding the lower-case codes provides a means of punching upper-case graphic codes (see Figures 23-25).

The 8th track is punched with the CR/LF code only with either the home correction or the line correction special features installed. The EOT character is not punched when received from the line data channel with line control on.

NOTE: For information regarding the punching of the delete code see: 1050 Character Set Information in the appendix.

Timing – 1055

Automatic deletion of a tape message using the line-correction special feature: (135 ms + 67.5(2D) ms

Add the LRC time to complete the operation. The negative answer is not sent until the tape has been deleted.

D = Number of characters to be deleted (including EOB and CR/LF).

READER OPERATION – 1056 (Figure 13)

- Only one reader can operate in any one loop (Home or Line) at any one time. (See NOTE.)
- A reader can be transmitting to the line while the second reader is simultaneously operating in a home-loop.
- A reader will not start if the assignment switch for the selected reader (reset or programmed by component recognition) is off when the Reader-start button (home or line) is pressed. However, if the assignment switch is then properly positioned (home or line), reading will start automatically unless a reader-stop was initiated prior to the repositioning of the assignment switch.

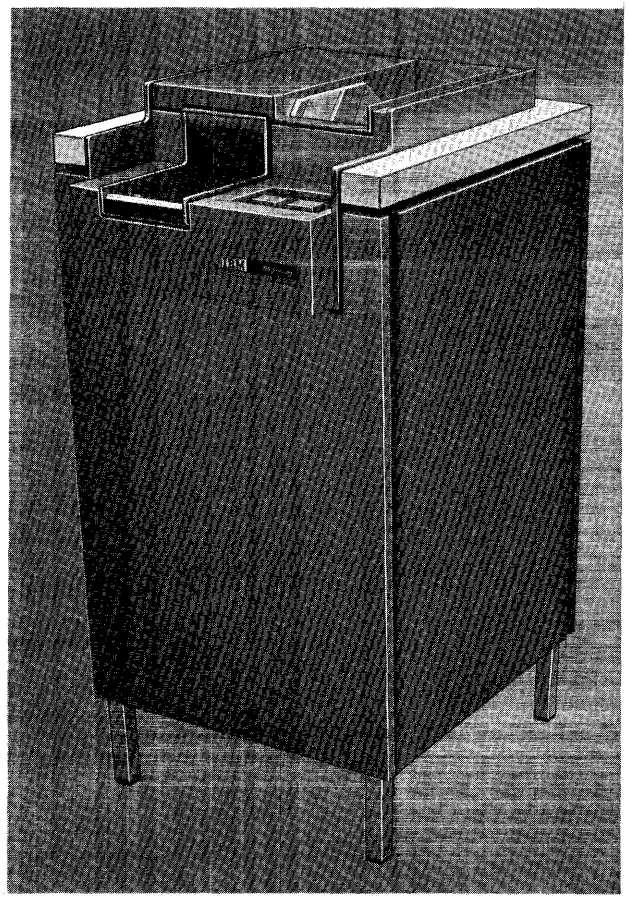


Figure 13. 1056 Card Reader

- A reader, assigned to a home-loop operation, and reading, is stopped by:
  1. Sensing a reader stop code when the Prog-dup switch is set to PROG. If this Prog-dup switch is set to the DUP position, reading the stop code results in the code being punched but, in this case, the code does not stop the reader. (The setting of the Stop-code switch has no effect in home-loop.)
  2. Positioning the Reader-stop switch to HOME.
  3. Running out of cards.
  4. A temporary interlock due to a CR/LF, LF, or tab on a printer, or to a release, DUP, or skip on the card punch.
- A reader assigned to a line-loop operation, and reading, is stopped by:
  1. Sensing a reader stop code with the Stop-code switch set to SENSE. See Stop-Code Switch in the 1053 Printer-Keyboard and 1053 Printer section of the IBM 1050 Operator's Guide, Form A24-3125.
  2. Positioning the Reader-stop switch to the line position.
  3. Running out of cards.

NOTE: Avoid setting the assignment switches for two readers to HOME if the home-component-recognition special feature is not installed. Reader conflict occurs if the home-reader start button is pressed with both readers assigned to HOME (if the system does not have this special feature).

Reader Control Recognition Codes

When a reader reads a prefix code followed by the component-recognition code for the alternate reader it:

Home Loop:

1. Stops the reader and transfers reading to the alternate reader if the Prog-dup switch is set to PROG, with the home component recognition special feature installed.
2. Allows the reader to continue reading but punches the prefix code and/or prints the component-recognition code with the prog-dup switch set to DUP. In this case, reading is not transferred to the alternate reader.

Line Loop: Stops the reader and transfers reading to the alternate reader.

EOB Generation

- The card reader automatically generates an EOB code at column 81.
- The EOB stops all reading from the card and program tape.
- In home loop, the card is ejected from the read station.
- In line loop, the card is ejected from the read station when a positive answer to the EOB is received.

Except during an eject operation, the card reader always emits an EOB character at column 81 (if the auto EOB switch is set to ON) for both home- and line-loop operations. Unless an EOB character is previously read from either the card program tape or a card column. The EOB character:

1. Stops all reading from the card, as well as the program tape.
2. For home-loop operations, the card is ejected and the next card is fed into reading position.
3. For line-loop operations, the card is ejected when a positive answer to the EOB is received. If a negative answer is received, the card recycles and is reread if the line-correction special feature is installed. A negative answer following the third transmission attempt stops the recycling of the card and the resend and data check lights remain on. Operator intervention is required. (See NOTE.)

If the line-correction special feature is not installed, the card does not recycle following the first negative answer to the EOB. Instead, the card is ejected from the read station (when the EOB code is read), and the next card is fed into the reading position. Operator intervention is required. (See NOTE.)

NOTE: With or without the line correction special feature, operator intervention is required when the Resend light is on. If this occurs, the operator must:

1. Remove the cards from the hopper.
2. Press the eject button to stack the error card.
3. Remove the card just stacked and correct it, if necessary.
4. Press the Feed button.
5. Place the corrected card in the hopper and replace the cards removed in step 1.
6. Press the Feed button to move the first card to the read station. Press the Resend and Data-check buttons to reset these lights. The reader can now respond automatically the next time it is polled.

Operating Techniques

- The EOB character punched in the card can be ignored by using the card-reader-program special feature.
- The EOT © character from the card is sent via a trailer card.

For card reading in either home-loop or line-loop operations, the EOB character punched in the card can be ignored by using the card-reader-program special feature. The program tape must have an eject code punched in the appropriate track and located in the tape column corresponding to the card column with the EOB code. The card is ejected and the EOB code is not read. This operation eliminates the EOB character and causes the card reader to continue in a read status (if cards are in the hopper, the next card is read). (See NOTE.)

The EOT © code must be transmitted from the card reader via a trailer card unless the EOB code is omitted. With unattended operation the c will turn off all component motors. The card is left in the card path of the reader. However, when the next polling occurs, the terminal responds positively, the trailer card is ejected and the next card is fed and read. If no card follows the EOT card, the terminal times-out and reverts to receive mode.

Polling a Card Reader

- Cards in the card reader of any 1050 system places the reader in a ready status for polling.
- A stop code stops the reader if the Stop-code switch is set to SENSE.
- Use of the common polling character permits interspersed reading and keying.

Polling is a centrally controlled method using a central unit such as a 1050 master station or a transmission control unit which permits stations on a line to transmit without contending for the line.

The presence of a card in the read station of the card reader of any 1050 System places the reader in a ready status for polling operations (if the assignment switch for that reader is positioned to SEND). When the component is polled, reading of the cards starts automatically and the keyboard is locked.

When the stop-code switch is set to SENSE and a reader-stop code is read from tape or card, the reader stops. If the poll was a common poll (component select character-0), the keyboard automatically unlocks to permit the entering of data. However, if the poll was for a specific reader (component select character-6 or -7) the keyboard remains locked. To restart the selected reader, the operator must press the line-reader-start button.

Therefore, if interspersed reading and keying is desired, poll the station with the common polling character (0), or keyboard polling character (5).

NOTE: If the keyboard polling character is used, reader 1 can be started by pressing the Line-reader-start button. Reader-2 must be recognized before it can start. When the common polling character is used,

1. Reader-1 transmits if it is assigned (component assignment switch set to SEND) and READY.
2. Reader-2 transmits if it is assigned and ready and if reader-1 is not.
3. The keyboard is unlocked if neither reader is assigned and ready.

Card Ejection – Home Loop

A card is ejected from the read station (at 60 cps) when:

1. An EOB code is read from the card, or generated by the trailing edge of the card as it passes under the read station.
2. The Eject key is pressed.
3. A hole punched in the eject-track of the card reader program tape is sensed.
4. An EOT code is read.

Card Ejection – Line Loop

A card is ejected (at 60 cps) when:

1. An EOB code is read from the card, or generated by the trailing edge of the card as it passes under the read station (if the line-correction feature is not installed).
2. The Eject key is pressed.
3. A hole punched in the eject-track of the card reader program tape is sensed.
4. An EOT code is sensed (unless the Master switch is ON).
5. A positive answer to an EOB/LRC is received (if the line-correction feature is installed). A negative answer recirculates the card and it is not ejected after the third negative answer.

Whether in the home or line loop, card ejection is accompanied by card feeding in a Model 1 loaded with a card pack. During ejection, no reading (from the card reader program tape or from the card) takes place, and an EOB is not generated by the trailing edge of the card.

Reader-Stop Code

- The Prog-dup switch controls affect of the reader-stop code in home loop.
- The Stop-code switch controls the affect of the reader-stop code in line loop.

If the Prog-dup switch is set to PROG, and a reader stop code is sensed, the reader stops and the code is not punched (except in Bypass mode). It can be restarted by pressing the Reader-start – home button. If the reader stop code is sensed when the Prog-dup switch is set to DUP, the code is punched and the reader does not stop. (See NOTE.)

In line loop operation, the action of a sensed reader-stop code is conditioned by the setting of the stop-code switch. With this switch set to SENSE, transmission from the reader to the line halts when a reader-stop code is sensed and is transmitted. To restart, the Reader-start – line button must be pressed. If the reader-stop code is preceded by a bypass code the reader does not stop, but the code is transmitted.

In the OFF position, the reader-stop code is transmitted without stopping the reader. Punches receiving from the line punch the reader-stop code with this switch set to either SENSE or OFF.

NOTE: Check the Reader Stop – Prefix J under 1051 Control Unit – Special Features.

Reader Skip

This operation is effective only in home loop and only after the reader has been stopped by sensing a reader-stop code punched in the card. After such a stop, the Reader-skip button on the keyboard starts advancing the reader, passing over punched data until a tab, CR/LF, or line feed code is sensed. At this point, the coded function occurs and reading

resumes. If another reader-stop code is sensed, the reader stops again. Skipping can then be restarted by pressing the Reader-skip button again: reading can be resumed by pressing the Reader-start-home button.

Automatic Card Reread

This operation requires either the home-correction special feature or the line-correction special feature. When transmitting to the line and an error is detected, this enables the card reader to reread the card, two more times, if necessary, and retransmit the message. If the message is still incorrect after the third transmission, the reader stops and manual intervention is necessary.

NOTE: See Home-Correction and Line-Correction in the 1051 special features section.

1056 CARD READER – SPECIAL FEATURES

Card Reader Program

- A punched paper-tape loop provides a means of reading constant data or control and instruction codes.
- Data punched in the tape can also be read, effectively doubling card capacity.
- A prefix code and its associated numeric or alphabetic character can be punched in the same tape column.

A punched paper-tape loop, physically the same as that for the IBM 407 tape-controlled carriage, provides a means of conserving card columns used either for constant data or for control and instruction codes. This feature eliminates the need for punching some, or all, of the control codes in the cards. A switch is provided to enable the operator to make this feature operative or inoperative as desired.

Data punched in the tape can be read, thereby doubling card capacity (to 160 columns) if necessary. The tape and the card move synchronously during the reading operation, a column of the tape and a column of the card being read alternately, starting with column 1 of the tape. If data is punched in a tape column, as well as in its corresponding card column, two reading cycles occur. If data is not punched in that tape column, only one reading cycle occurs.

If Extended Character Reading or High-Speed Skip (special features) are not installed, controls and data are punched in the tape (Figure #4) as follows:

Tape Track	Function	
1	B-Bit	Data and Function Code Punching (BCD)
2	A-Bit	
3	C-Bit	
4	8-Bit	
5	4-Bit	
6	2-Bit	
7	1-Bit	
8	Prefix	
9	Eject	
10	Field Skip Start	
11	Field Skip Stop	
12	Tape Homing Punch	

When the prefix track is punched, its associated (following) numeric or alphabetic character can be punched in the same tape column to conserve card columns. In this case, two tape-reading cycles occur for that column, and one for the associated card column.

When the eject track is punched, the card being read is ejected and no EOB code is generated.

Field skipping is controlled by tracks 10 and 11. Card data is ignored during skipping, but if data is punched into the tape, it is read and acted upon, including data in the skip-start column. A valid character code must be punched into the same tape column with the skip stop punch to ensure stopping. (NOTE 1.)

When skipping is stopped with an 11-track punch, the 1056 reverts to normal reading operation; the data in the corresponding card column is read. Skipping can also be stopped by an EOB or EOT code in the tape, an eject-track punch, or by pressing the Eject button. In these instances, except for EOB, reading is not resumed; rather, the card is ejected. When the EOB stops the skip, normal EOB functions apply. If the master station special feature is installed and turned on, Ⓒ is treated as a data character. The reader continues reading 2 more codes and stops; the card is not ejected by the Ⓒ, in line loop. (See NOTE 2.)

Each program tape must contain a punch in track 12. This tape-homing punch is used to maintain the proper relationship between the card columns and their associated tape columns. Also, any data punched in this column is read. Various length cards

require this hole to be punched into the following tape column areas (refer to Figure 14):

Card Length	Length of Tape Loop	Data Columns	Location of Track 12 Punch
80 col.	81 col.	1 - 80	56 - 80
51 col.	54 col.	1 - 51	29 - 51
22 col.	54 col.	1 - 22	2 - 22
		28 - 49	29 - 49
22 col.	81 col.	1 - 22	2 - 22
		28 - 49	29 - 49
		56 - 76	56 - 76

NOTE 1: The valid character punched in the same column as the skip stop code is read and acted upon. If no action is desired, use an idle or a delete code.

NOTE 2: For normal operation when an EOB is sensed, refer to Reader Operation — 1056 in this manual.

51-Column Card Feed (Single Card Feed), 1056 Model 2 Only

This feature provides the card reader with the ability to feed, read, and stack interspersed 51-, or 80-column cards.

Extended Character Reading

- Permits the 1056 to read and translate upshift as well as downshift characters punched in IBM card-code.
- The card-reader-program special feature has the added ability to generate shift codes for any BCD characters read from the program tape.

This special feature permits the 1056 (Model 1 only) to read and translate upshift as well as downshift characters punched in IBM card-code to PTTC/BCD bit values. The insertion of shift codes in the card is unnecessary since the shift status of each card-code character is recognized by the 1056, and a shift code is automatically generated for each change in the shift status. Also, an appropriate shift code is generated for the first character read (from either the card or program tape) for each record. This feature accommodates all punched card characters in the PTTC/BCD code (see Code Chart).

When this feature is installed on a 1056 containing the card-reader-program special feature, the card reader has the added ability to generate shift codes for any BCD characters read from the program tape. The extended-character reading special feature also modifies the 9 and 11 control codes as follows:

9-upshift. For this control code to be active, the same tape column must contain a valid character punched in BCD.

11-Skip Stop, Eject (if not skipping). This code now causes a skip stop if the card is in the process of skipping. However, if the card is not skipping, it is ejected when this code is read.

A track-9 punch must be placed in each column containing an upshift character to generate the upshift code. A 9-punch alone does not generate this upshift code. During generation of any shift code, reading is suspended from both the card and program tape. Shift codes are not generated for function codes, space code, or for the character immediately following a prefix code.

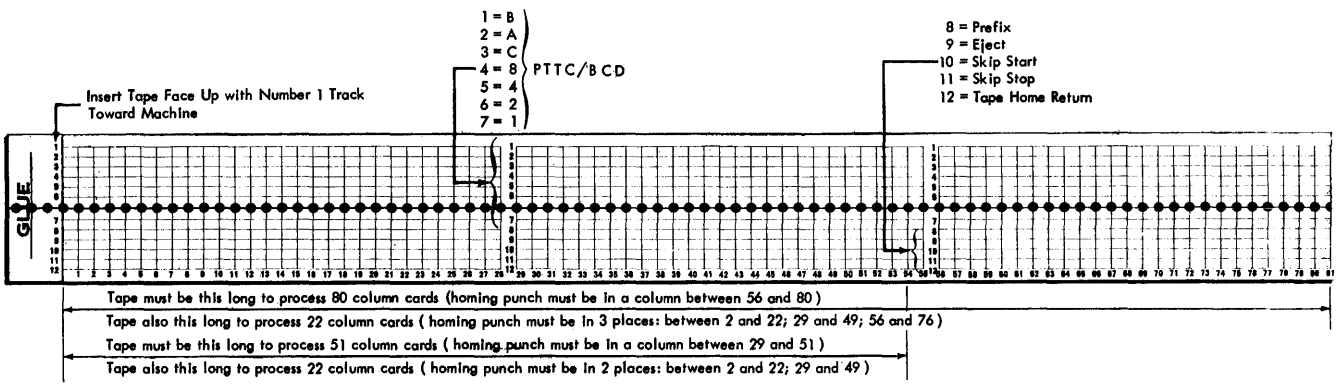


Figure 14. 1056 Program Tape

The standard card code and the extended card code are compatible for line-loop operation due to the identical bit configuration of the characters. However, for home-loop operations, the card readers and the card punches must all be equipped with extended character capability or all be without this capability. A card reader with the extended character reading special feature can, however, correctly process cards containing the standard card code.

High Speed Skip

With this special feature installed, skipping is accomplished at 60 columns per second (eject speed). The card reader program special feature is a prerequisite for installation of high-speed skip. Also, IBM recommends that plastic carriage-control tape (429754) and adhesive (419012) be used with the program tape feature.

Skipping is started and stopped by inserting a skip-start punch in the tape column corresponding to the first card column to be skipped, and a skip-stop punch in the tape column corresponding to the last card column to be skipped. Data punched in the skip-start and skip-stop columns of both the tape and the card as well as all data between these columns (in both the tape and the card), is not transmitted.

If a single card column is to be skipped, the corresponding tape column must contain both a skip-start and a skip-stop punch. Successive single card-column skips can be accomplished, if desired. Any BCD data or prefix-track punch in a tape column, which also contains a skip-start and a skip-stop (for single column skipping), will be read and transmitted.

If the first column or last column of the card is part of a skipped field, the following procedure is necessary:

First Column:

1. Skip-start and skip-stop punched in tape column 1.
2. Skip-start punched in tape column 2.
3. Skip-stop punched in last tape column skipped.

Last Column:

1. Skip-start punched in first tape column of skipped field.
2. Skip-stop punched in tape column 79.
3. Skip-start and skip-stop punched in tape column 80.

Short Card Pack Feed

With this feature, the 1056 (Model 1 only) can feed, read, and stack 22-, 51-, or 80-column cards. The hopper and stacker capacity is 300 cards. Adjustable card stops are provided to permit operator adjustment of the stacker to accommodate the three different lengths. In addition to pack feeding, these cards can be fed individually. However, in no case can cards of different lengths be interspersed.

DETAILED SPECIFICATIONS

Interlocks – 1056

The 1056 has several interlocks to check for proper operation. These include:

Card Lever 2: When this lever is activated, it indicates that a card is positioned at the reading station. If this lever is inactive, a negative response occurs when the 1056 is polled.

Card Lever 3: When this lever is active, it indicates that the card contains the proper corner-cut (C-1) to permit reading by the 1056. All cards are placed in the hopper face-down, column-one edge first.

A card containing an improper corner-cut is removed from the 1056 by pressing the Eject button.

Hopper Empty Lever: If cards are present in the hopper, the feed-knives feed another card from the hopper when a card is ejected from the read station. If the cards in the hopper are lifted, even momentarily, the next feed operation is inhibited. If this occurs and further reading is desired, press the Feed button.

In line-loop operations, the feed button must be pressed before the receiving terminal times-out (9-18 seconds).

Right-Side Cover Switch: This switch is active when the right-side cover is fully closed. When inactive, this switch prevents the 1056 from operating while the program tape is being changed or adjusted.

If the 1056 is polled while this cover is open, a negative response occurs. If this cover is inadvertently opened while a card is being read, an interruption in reading occurs. In this case, the 1056 is restored by pressing the eject and feed buttons.

Media Specifications – 1056

When designing a 22- or 51-column stub card for use in the 1056, it is desirable to place the stub portion in the first card columns rather than the last. This method provides the best stub-card characteristics for feeding. However, if it is necessary to place the stub in the last card columns, the score must be one of the following:
M-3, HM1-A, M-4, M-5, OM-1, OM-2, S-1 or S-5.

Character Set – 1056

The IBM punched-card codes for PTTC/BCD are read and translated into the proper bit values for transmission. The 14 function codes, Space code, and the graphic characters are recognized and properly translated. Upshift graphics must be preceded by an upshift code for PTTC/BCD (without extended character reading special feature). This permits the upshift graphics to be coded the same as their respective downshift graphics. (Exception: see Extended Character Reading in the 1056 Special Features section.) A blank column is read as a space and transmitted as a C-bit only. The following 5 codes can be read by the 1056 but are not used in the 1050 System: PN, PF, $\neq$, MZ, and PZ (see Figures 23 to 25).

Only valid BCD card codes result in valid transmission codes. Invalid card codes may result in transmission of invalid codes with incorrect parity, or in garbled transmission.

Timing – 1056

1. Card skip: 14.8 cps
   (60 cps with High Speed Skip special feature)
2. Card Eject: 60 cps
3. To calculate throughput (system interlocks not included): a + b + c + d
   a. Reading time: 67.5 R
      R = Number of columns read from card plus number of characters read from the program tape (if any).
   b. Feeding time (register):
      954 ms for 22-column cards
      708 ms for 51-column cards
      462 ms for 80-column cards
   c. Card ejection time: 16.7 (S - L + 1)
      16.7 = eject speed per card column at 60 cps
      S = size of card (80, 51, 22)
      L = last column read.
      1 = time required to initiate feeding of next card (column-81).

      NOTE: With the line-correction special feature: If the computed time is less than 205 ms, use 205 ms. If the computed time is greater than 205 ms, use the computed time.

      Without the line correction special feature: Use the calculated time.
      205 ms = LRC + answer + 70 ms
   d. If the card-reader-program special feature is used, and skipping occurs under program control, the rate is 67.5. (This is because each tape column must be read as skipping occurs.) For exception: see High Speed Skip in the 1056 special features section.
4. Card re-circulate to column 1:
   80-column card 1400 ms
   51-column card 1900 ms
   22-column card 2400 ms

PUNCH OPERATION – 1057/1058

The IBM 1057 Card Punch and the IBM 1058 Printing Card Punch (Figure 15) are output units for the 1050 system. The 1057 and 1058 may also be used off-line for card punching by an operator using the card-punch keyboard. Another function provided by the punches is code translation.

Independent card punching is possible under switch control. The 1057/1058 is "not ready" with respect to the 1050 system when being used off line. Since the punch position occupied by the card punch is effectively vacant, any address to the punch (component select) receives a negative response.

The circuitry in the card punch translates the characters received from the 1051 in BCD code into IBM card code for punching. See Code Sets in the Detailed Specifications – 1057/1058 section of this manual for details.

Keyboard

An alphameric keyboard is provided with the 1057/1058. This keyboard is similar to the keyboard on an IBM 24/26 card punch. (See IBM 24 Card Punch, IBM 26 Printing Card Punch, Form A24-0520, for detailed information.) This keyboard is unlocked only when the 1057/1058 is switched to the off-line mode. (See NOTE.)

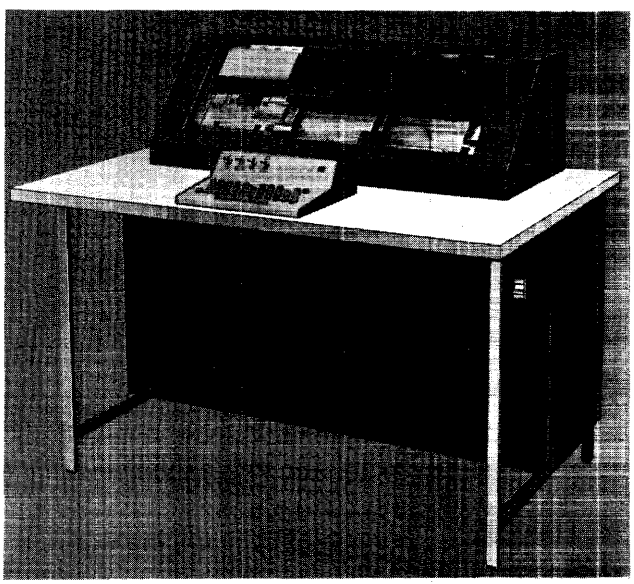


Figure 15. 1058 Printing Card Punch

Switches to control automatic feeding, automatic skipping, automatic duplication, and printing (1058 only) are on the keyboard. A main line power on-off switch is also provided.

NOTE: When the 1057/1058 is in Auto-punch mode, the character keys are locked. However, the Feed, Register, Release and other function keys needed to set up the punch for system operation are not locked.

Program Drum

The program drum on the card punches controls a number of functions. This device is effective whether the punch is on-line or off-line.

The alternate program feature (standard on 1057 and 1058) permits the program card to hold format control for two different cards. A key on the keyboard places the punch in the alternate program mode for the next card (or, the remainder of the card if already registered). When the punch is operating on-line, a sequence code is used to initiate alternate program operations.

The functions controlled by the program drum, and the program card punches used to control each, are:

Function	Normal Program	Alternate Program
Field Definition	12	4
Start Automatic Skip	11	5
Start Automatic Duplication	0	6
Alphabetic Control	1	7
Print Preceding Zeros (1058 only)	2	(unavailable)
Suppress Printing (1058 only)	3	9
Start Manual Field	blank	blank
Reader Interlock Time	8	8

Function Panel

A patch panel accessible to the IBM Customer Engineer permits the user to assign the function codes as a group to perform one of the following actions:

1. Function executed, no punching
2. Function suppressed, code punched
3. Function executed and code punched
4. Function suppressed, no punching.

NOTE: The function panel is functionally replaced by the operator's panel special feature when installed.

When the 1051 control unit transmits the BCD code for one of the functions listed in Figure 16 to the 1057/1058, the associated function occurs. The specific action initiated depends on the function panel or operator panel wiring, as indicated by the four columns on the right side of Figure 16.

Home-Loop Operation (Function Panel Wired to Punch and Function): An EOB or EOT code received from the 1051 is punched and causes the card to release to the read station. Any programmed duplication takes place.

Function Code	Line or Home	If Function Only Is Wired	If Punch Only Is Wired	Both Punch and Function	No Punch No Function
Tab	Both	Skip[1]	Tab	Tab	Yes
EOB	L	Skip to col 81	NA	EOB + Skip To col. 81	No
	H	Release	NA	EOB + Release	No
EOT	L	NA	NA	No	No
	H	Release	NA	EOT + Release	No
Reader Stop	Both	NA	Reader Stop	NA	Yes
Backspace	Both	NA	Backspace	NA	Yes
Upshift	Both	NA	Upshift	NA	Yes
Downshift	Both	NA	Downshift	NA	Yes
CR/LF	Both	Skip[1]	CR/LF	CR/LF + Skip[1]	Yes
LF	Both	NA	LF	NA	Yes
Bypass	Both	NA	Bypass[2]	NA	Yes
Restore	Both	NA	Restore	NA	Yes
Prefix F	Both	Duplicate[1]	Prefix F	Prefix F + Duplicate	Yes
Prefix G	Both	Alternate Program	Prefix G	Prefix G + Alternate Program	Yes
Prefix H	Both	Card Release	Prefix H	Prefix H + Card Release	Yes
Space	Both	Space	NA	Space	Yes

[1]Field defined by format of the program card.

[2]Punched only in bypass mode (after a previous bypass character).

NA - not applicable.

Figure 16. Function Panel Alternatives

Line-Loop Operation (Function Panel Wired to Punch and Function): An EOB code received at the 1057/1058 is punched and the card is released to Column 81 where it waits (Programmed duplication is retained.) A positive answer to an LRC from the 1051 Control Unit causes an "11" to be punched in column 81 indicating a correct card. The card then releases to the read station. A negative answer to an LRC causes the card to be released to the read station without an 11-punch in column 81 (indicating an error card).

In line loop, an EOT code received from the 1051 control unit is not punched and does not release the card to the read station.

SPECIAL FEATURES – 1057/1058

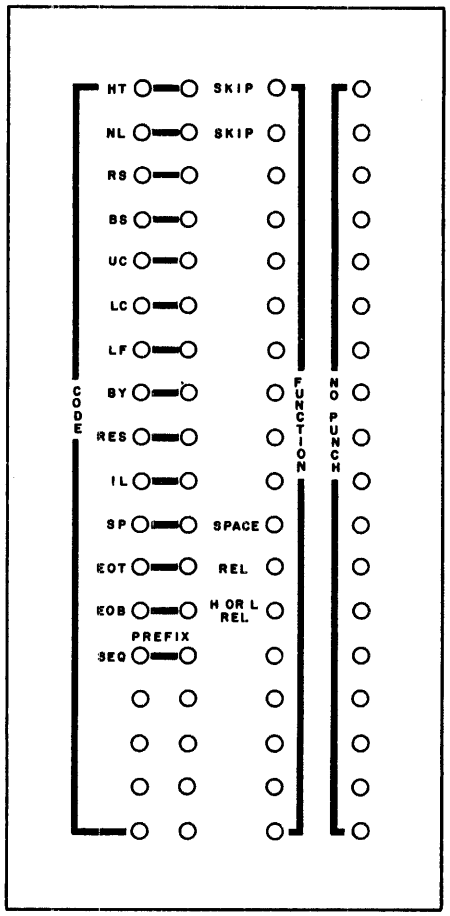
Extended Character Punching (1057 only)

This special feature permits the 1057 to punch both upshift and downshift card codes (see code chart in the Appendix). If the last shift code keyed or read was an upshift code, upper case card codes are punched, until another downshift code is encountered. All shift codes encountered during translation from the PTTC/BCD bit values to card code are automatically eliminated before punching. The translator is placed in downshift mode whenever the main power switch (punch), or by a downshift code.

NOTE: With this feature installed, the function panel of the 1057 should not be wired to punch shift codes. Refer to Principles of Operation – 1057/1058: Function Panel.

Operator Panel

This special feature overrides the function panel in the 1057/1058 with an operator accessible plugboard. This operator panel also increases versatility because each function code is individually wired and controlled. The operator's panel is located behind the left-hand side panel of the 1057 or 1058. It consists of four columns of wiring hubs (Figure 17), with the two left-hand columns common (code hubs). If there is no wiring for a code, it is punched, but no action is caused. If one of the common hubs is wired to the corresponding "function" hub, the function occurs. If a code hub is wired to the corresponding "no-punch" hub, the code is not punched. If both code hubs are wired, one to the function hub and the other to the no-punch hub, the function occurs but is not punched. This description applies to each code independently, subject to the restrictions shown in Figure 18. (The cover door must be closed to permit operation of the punch.)



HT - Horizontal Tab
NL - Carriage Return and Line Feed
RS - Reader Stop
BS - Backspace
UC - Upper Case
LC - Lower Case
LF - Line Feed
BY - Bypass
RES - Restore
IL - Idle
SP - Space
EOT - End of Transaction (Release Card in Home only)
EOB - End of Block (Home or Line - Release Card)
SEQ - Any Prefix - Sequence Code

Figure 17. 1057/1058 Operator Panel

Function Code	Corresponding Function	May Code Be Punched?	May Both Punch & Function Occur?	May No Action Be Specified?
TAB	Skip[1]	Yes	Yes	Yes
EOB	Line: release to column 81	Yes	Yes	Yes[2]
	Home: release	Yes	Yes	Yes
EOT[3]	Home: release	Yes[3]	Yes[3]	Yes[3]
	Line: NA	NA	NA	NA
Reader Stop	None	Yes	No	Yes
Backspace	None	Yes	No	Yes
Upshift	None	Yes	No	Yes
Downshift	None	Yes	No	Yes
CR/LF	Skip[1]	Yes	Yes	Yes
Line Feed	None	Yes	No	Yes
Bypass	None	Yes[4]	No	Yes
Restore	None	Yes	No	Yes
Space[5]	Space	No	No	Yes
Sequence (Prefix)	Card Punch Functions Only[6]	Yes	Yes[6]	Yes
Idle	None	Yes	No	Yes

[1]Skip field defined by program card.

[2]No answer transmitted.

[3]Home only.

[4]Punched in bypass mode or, in home loop, in Dup mode.

[5]Space must be wired to space.

[6]Applies only to sequence codes which control card punch functions: duplicate, alternate program, and card release.

Figure 18. Operator Panel Alternatives

DETAILED SPECIFICATIONS

Interlocks – 1057/1058

The following conditions must be satisfied in the 1057/1058 in order to constitute a ready status for line loop operations:

1. Selected to AUTO PUNCH.
2. A card must be at both the read and punch stations. The card at the read station is also used to detect card feed jam conditions.
3. The program card starwheels must be in the reading position.
4. The stacker must not be full.
5. The Main-line switch must be on (1057/1058).
6. The machine cover must be closed (with Operator Panel special feature).

A buzzer will sound if any of these conditions is not satisfied (except item 5). If the terminal is operating in unattended mode the buzzer sounds until a © code is received. After the buzzer has been silenced by a © code, the card punch remains "not ready" (responds negatively) until the interlock condition is corrected.

If any of these interlocks occur while the punch is operating in home loop, the punch stops punching. The reader does not stop in this case, nor does the keyboard lock. (Exception: see Home Input Component Interlock special feature.)

Program Card 8-Punch Interlock

An 8-punch must be placed in the program card, one column before the start of a programmed skip or duplication, to provide sufficient time to interlock the readers. This is required for home-loop operations with the 1057/1058 in either the normal or alternate program mode. (For line-loop operations, idle characters must be generated.)

This 8-punch is also required in column 80 of the program card to permit enough reader-interlock time for card feeding in the card punch. However, when an EOB or a card release occurs, no 8-punch is required, since an automatic interlock occurs for these situations. Also, when programmed skipping or duplication is initiated in column 1 of the card, the insertion of an 8-punch is unnecessary. The use of this 8-punch means that the program card function of printing zeros to the left of the first significant digit is not available for alternate program.

An EOB generated by the trailing edge of a card in the 1056 is punched in column 1 of the next card in the 1057/1058 (home loop operation, card reader to card punch). However, the program card must contain an 8-punch in column 80. The card containing this punched EOB is then ejected and the next data transmitted from the 1056 is punched in column one of the following card (1057/1058).

In home loop, the card is automatically ejected after column 80 has been punched. In line loop, an EOB must be received.

1. EOB received after column 81:
   Regardless of the panel wiring, the EOB is not punched, but the function takes place and the card is ejected.
2. EOB received after less than 80 columns of data:

Panel Wiring	Results
F and no P	Skip to col. 81, LRC, release, send LRC answer
F and P	EOB punched, LRC, release, send LRC answer
No F and no P	EOB not punched, no LRC, no release, no LRC answer sent, punch is Not Ready
No F and P	EOB is punched, no LRC, no release, no LRC answer sent, punch is Not Ready

Media Specifications – 1057/1058

Cards may have a normal upper-left or upper-right corner cut. A special corner cut (C3) must be used when designing a card with a lower-left or lower-right corner cut.

Character Set – 1057

The 1057 recognizes and punches 61 card codes of the PTTC/BCD code set (see Figure 23). The use of the upshift card codes requires the installation of the Extended Character Punching special feature. In this case, the 1057 can recognize and punch 110 different card codes in the PTTC/BCD code set (see Figure 23). The Idle code can be punched only if the operator panel special feature is installed.

The Idle and Delete (see Delete Code, in Appendix) codes are excluded from the character set. The EOT code is not punched (nor does it initiate a card release) when received from the line data channel. A space code (C-bit only) is not punched but is indicated by a blank column.

Character Set – 1058

The 1058 can punch and print the following codes in the PTTC/BCD code set (see Figure 23): 26 alpha characters A-Z, 10 numerics 0-9, and 8 special characters. The following codes received by a 1058 from the 1051 may be punched (depending on wiring of function or operator panel), but cannot be printed:

EOB	Bypass	Restore	Reader Stop
Line Feed	Tab	Punch On	Punch Off
Record Mark	CR/LF	Upper Case	Backspace
Lower Case	Prefix	Minus Zero	Plus Zero

EOT (home loop only)

Timing – 1057

1. Card to Card skip with auto feed and auto punch switches on
   a. Home-loop, column 80 to column 1
      85 ms + (8 x 12.5 ms) + 330 ms
   b. Line-loop, column 81 to column 1
      85 ms + (7 x 12.5 ms) + 330 ms
      85 ms = start time
      12.5 ms = 1 column at 80 cps
      8 = columns between 80 and 1
      7 = columns between 81 and 1
      330 ms = Card feed clutch cycle time
2. Skipping, home-loop or line-loop
   85 ms + 12.5N ms
   N = number of columns skipped
3. Releasing, home-loop or line-loop with auto feed and auto punch switches on
   85 ms + 12.5N ms + (8 x 12.5 ms) + 330 ms
   N = number of columns released
4. Punching:
   a. from the 1051 – 14.8 cps
   b. off-line – 20 cps (maximum)
5. Duplicating:
   a. 20 cps (50 ms/col)
   b. duplication started under program control:
      75 + 5ON (ms)
      75 ms = start time
      N = number of columns duplicated
   c. duplication started under 1051 control:
      165 + 5ON
      165 ms = start time

Timing – 1058

1. Card to card skip with auto feed and auto punch switches on
   a. Home-loop, column 80 to column 1
      85 ms + (8 x 12.5 ms) + 330 ms
   b. Line-loop, column 81 to column 1
      85 ms + (7 x 12.5 ms) + 330 ms
      85 ms = start time
      12.5 ms = 1 column at 80 cps
      8 = columns between 80 and 1
      7 = columns between 81 and 1
      330 ms = Card feed clutch cycle time
2. Skipping, home-loop or line-loop
   85 ms + 12.5N ms
   N = number of columns skipped
3. Releasing, home-loop or line-loop with auto feed and auto punch switches on
   85 ms + 12.5N ms + (8 x 12.5 ms) + 330 ms
   N = number of columns released
4. Punching:
   a. from the 1051 – 14.8 cps
   b. off-line — 18 cps (maximum)
5. Duplicating:
   a. 18 cps (55 ms/col)
   b. duplication started under program control:
      75 + 55N
      75 ms = start time
      N = number of columns duplicated
   c. duplication started under 1051 control:
      165 + 55N
      165 ms = start time

This section contains detailed information that is not related to specific components or that will be referred to only infrequently. The items included are:

- Glossary of Terms
- Data Set Operating Procedure
- 1050 Timing Considerations
- Special Techniques
- 1050 Planning and Operator Instruction Charts
- 1050 System Character Set Information
- Summary of Two-Character Function Codes
- Correction Procedures

GLOSSARY OF TERMS

ADDRESSING: The sending by a master station (or transmission control unit) of a code which specifies the remote terminal and associated output component which will receive the succeeding message.

ANSWER: The negative or positive answer to an LRC compare.

ASSIGNED: A component of the 1050 system is assigned when its assignment switch (on the 1052 switch panel or the switch unit) is positioned to the proper home-loop or line-loop setting.

CENTRALIZED HALF DUPLEX: A network of half-duplex terminals operating on full duplex communication lines. All terminals are centrally controlled with all transmissions passing through the controlling or central unit.

DATA SET: The term used when referring to the modulator-demodulator unit or equipment.

DEMODULATION: The conversion, at the data set, from audio signals off the communication lines to digital signals for the IBM 1050 System.

DESERIALIZE: The conversion at the 1051 (in the receive terminal) from a serial-by-bit, serial-by-character form, to a parallel-by-bit, serial-by-character form.

FULL DUPLEX (FDX): A four-wire communication channel capable of transmitting and receiving simultaneously.

HALF DUPLEX (HDX): A two-wire communications channel capable of either transmitting or receiving, but in only one direction at a time.

HOME LOOP: An operation involving only those input and output units associated with the local terminal. This operation uses the home data channel in the 1050 system.

LINE LOOP: An operation over a communication line between input units at one terminal and output units at a remote terminal. This operation uses the line data channel in the 1050 systems involved.

LRC TIME: The time required to send an EOB, and LRC, and receive the answer.

MODULATION: The conversion, at the data set, from IBM 1050 System digital signals to audio signals for transmission over communication lines.

MONITOR PRINTER: Any active printer at the sending terminal which records the data transmitted from that terminal.

NETWORK: A number of interconnected terminals.

OFF LINE: Not associated with a processor or transmission control unit.

ON LINE: Associated with a processor either directly or through a transmission control unit. The physical connection can be accomplished by either multiwire cable or a communication line.

POLLING: The sending by a master station (or transmission control unit) of a code which requests a particular remote terminal and associated input component to transmit any message ready to be sent.

RECOGNIZED: A component of the 1050 system is recognized when its specific component recognition code is detected on the proper data channel (home or line). This provides the component for the sending or receiving of a message. Generation of this code is accomplished by either keying or reading the code in the proper loop operation.

REMOTE TERMINAL: Any terminal in a communications network other than the terminal at which you are physically located.

RESPONSE: The negative, positive, or no response at all to a component select character (addressing or polling).

SERIALIZE: The conversion, at the 1051 (in the transmit terminal) from a parallel-by-bit, serial-by-character form, to a serial-by-bit, serial-by-character form.

TIME-OUT: The time interval allotted for functional operations to occur.

TURN-AROUND TIME: The time required to reverse the direction of transmission when using a half-duplex communication channel.

DATA SETS

The IBM 1050 Data Communications System can operate over transmission facilities using the following commercially available data sets or their equivalent:

WESTERN ELECTRIC DATA SET 103A: Point-to-point dial-up connections.
WESTERN ELECTRIC DATA SET 103F: Multi point or point-to-point leased line connections.
WESTERN UNION DATA SETS: In multipoint or point-to-point leased line connections.
IBM LINE ADAPTER: Multipoint or point-to-point privately owned line connections or common-carrier Leased Lines. The IBM Line Adapter and the Telegraph Line Attachment are each special features installed within the IBM 1051.

Western Electric Data Set 103F

After a text transmission time-out occurs, the line connection is automatically de-activated. This causes an invalid pulse to be transmitted to the controlling station; in turn, the transmission control unit, or the master station timer resets and times-out. This condition occurs once before controlling station reverts to polling or addressing operations.

103A Dial-up Data Set Procedures

The dial-up data set is used to connect two IBM 1050 terminals for point-to-point operation on either:
1. voice-grade common-carrier telephone channels at 200 bps, or
2. narrow-band common-carrier channel (TWX) at 150 bps. Each 1050 terminal is attached to the communication channel by means of a data set.

Voice-Grade (200 bps) Telephone Procedure

To establish a connection for the transmission of data:
1. Lift the handset at the sending terminal and press the TALK button to establish a dial-tone.
2. Manually dial the receiving terminal number. The ringing at the receiving terminal is heard on the line.
3. Lift the handset and press the TALK button at the receiving terminal to establish voice communication.

   NOTE: For proper operation the phone at the receiving terminal should complete at least one ring before the handset is lifted.

4. Switch to the data mode of operation by pressing the DATA button at the receiving terminal first. This causes a tone signal to be heard at the sending terminal and the DATA button can now be pressed at this terminal. The handsets at each terminal are now replaced and the data mode connection between terminals is maintained.
5. Press the reset key at each 1050 station to reset both sending and receiving stations prior to starting transmission of data.
6. To disconnect from the communication line at the end of the message, first transmit an EOT code to prevent a data check condition; then operate the System, Dial Disc switch on each 1050 system.

Voice-Grade (200 bps) Telephone Procedure, with Automatic Answering – Optional

The 103A data set provides, optionally, an automatic answer feature which operates in conjunction with the AUTO button on the data set. When this button is active (self-locking in the active position) the terminal is automatically connected to the communication line in response to any call from another terminal.

When automatic answer occurs at the receiving terminal, a tone signal is immediately returned to the sending terminal. Pressing the DATA button at the sending terminal establishes a data mode of operation between terminals. This feature must be requested by the user from the common-carrier prior to installation of the data set.

Narrow-Band (150 bps) Dial Procedure for use with TWX

The data set used with TWX has no voice transmission capabilities. All stations have the automatic answer feature. To establish a connection between two 1050 terminals on the TWX network:
1. Press the DIAL button to establish a dial-tone.
2. Manually dial the receiving terminal number. The remote terminal ringing will be momentarily heard through a speaker located in the handset.

3. When connection is established (the receiving station answers), a tone is automatically sent to the sending terminal and the DATA button must be pressed to place this terminal in the data mode.
4. The operator at each 1050 station presses the reset key before transmitting data.
5. To disconnect from the communication line at the end of the message, first transmit an EOT code to prevent a data check condition; then operate the System, Dial Disc switch on each 1050 system.

Automatic Disconnect Feature

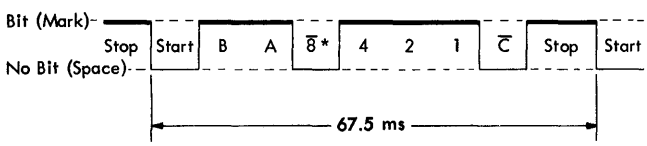
With the 103A type data set, this optional feature automatically disconnects both terminals from the communication line when the System, Dial Disc switch at either 1050 terminal is operated. This feature is designed to permit the disconnect operation for both stations to be manually initiated at either terminal. This feature must be requested from the common-carrier prior to installation of the data set.

NOTE: To be effective, this feature requires that both data sets have the "Initiate Disconnect" and the "Respond to Disconnect Option".

1050 TIMING CONSIDERATIONS

To compute the data handling capacity of the IBM 1050 system, certain basic timings are first necessary. The following basic timings, listed by machine are average timings based on the wide variety of system configurations and applications.

The 1050 system has a speed of 14.8 cps (characters-per-second). Therefore, the basic character time is 67.5 ms per character. Each character consists of a start bit, 1-6 data bits, a check bit (for odd parity), and a stop bit (Figure 19).



*$\overline{8}$ Indicates no 8-bit

Figure 19. Bit Configuration of a "G" Character (Serialized)

1051 Control Unit

1. a. System Speed: 14.8 cps or (9 x 14.8) 133.2 bps (bits per second).
   b. Minimum 1051 bit rate for communication line: 134.89 bps.
   c. Character time: 67.5 ms* per character.
   *(ms = milliseconds: 1000 ms = 1 second)
2. Delay time after turning the main-line switch on until ready to receive or transmit: 1 second.
3. Addressing time (single component):
   (5 x 67.5) + 330 + 20 = 687.5 ms.

   NOTE: This includes response time. For unattended operation, see item 7.

   (5 x 67.5 ms) = five character times (EOT, station identification, component identification, response, and EOA).
   330 ms = nominal delay before transmission of response and turn-around time (actual: 202 to 330 ms).
   20 ms = maximum turn-around time for master to go from receive mode to transmit mode.
4. Addressing time (multiple components):
   $[(5 \times 67.5) + 330 + 20] + [N - 1]\,[(3 \times 67.5) + 61]$

   NOTE: This includes response time. For unattended operation, see item 7.

   330 ms = nominal delay before transmission of first response and turn-around time (actual: 202 to 330 ms)
   20 ms = maximum turn-around time for master to go from receive mode to transmit mode
   N - 1 = number of additional components, where N is the number of components
   (3 x 67.5 ms) = three character times
   61 ms = delay before transmission of additional responses.
5. Polling time for an individual terminal:
   (4 x 67.5) + 330 = 520 ms

   NOTE: For unattended operation, see item 7.

   (4 x 67.5 ms) = four character times
   330 ms = nominal delay before transmission of response, and turn-around time (actual 202 to 330 ms).

6. LRC time: (3 x 67.5) + 61 = 272.5 ms

   NOTE: This includes EOB, LRC, and the answer.

   61 ms = delay before transmission of answer.
7. Unattended operation requires a delay time for polling or addressing to bring the motors (for the selected components) up to speed: 1 to 1.68 seconds.

1052-1053 Printers

1. Carrier return and line feed: (1.5 + T) x 67.5
   Does not include 67.5 ms for CR/LF code which initiates the function.

   T = carrier travel in inches

2. Horizontal tab: (.75 + 1.1T) x 67.5
   Does not include 67.5 ms for HT code which initiates the function.

   T = carrier travel in inches

To determine the number of fill characters required for a specific situation:
a. Compute the time in ms by using the previous formula.
b. Divide this time figure by 67.5.
c. Round the result to the next whole number.

NOTE: When transmitting from an IBM 1448 to an IBM 1050 System the fixed time-out special feature (in the IBM 1448) provides for a fixed delay of 1.225 seconds for each of these functions:

Carrier return and line feed
Line Feed
Tab

3. Line feed: (2 x 67.5) = 135 ms
4. Keyboard speed: This varies with the operator's keying speed, with a maximum of 14.8 cps. (The maximum speed with the telegraph line attachment special feature installed is 8.3 cps.)

1054 Paper-Tape Reader

1. Positioning the tape for re-read: 67.5 C

   NOTE: This time does not include LRC time or re-read time.

   C = The number of characters in the tape message.

1055 Paper-Tape Punch

1. Automatic deletion of a tape message using the line-correction special feature: (2 x 67.5) + 67.5(2D)

   NOTE: Add the LRC time to complete the operation. The negative answer is not sent until the tape has been deleted.

   D = Number of characters to be deleted (including EOB and CR/LF).

1056 Card Reader

1. Card skip: 14.8 cps (when skipping less than 8 columns during card punch duplicating, a delete code must be punched in the program tape.)
2. Card eject: 60 cps
3. To calculate throughput (system interlocks not included): a + b + c + d
   a. Reading time: 67.5R

      R = Number of columns read from card plus number of characters read from the program tape.

   b. Feeding time (register):
      954 ms for 22-column cards
      708 ms for 51-column cards
      462 ms for 80-columns cards
   c. Card ejection time: 16.7 (S - L + 1)

16.7 ms = eject speed per card column at 60 cps
S = size card (80, 51, 22)
L = last column read
1 = time required to initiate feeding of next card (Column 81).

NOTE: With the line-correction special feature:

If the computed time is ≤ (less than or equal to) 205 ms, use 205 ms.
If the computed time is >(greater than) 205 ms, use the calculated figure.

Without the line correction special feature:
Use the calculated time.
205 ms = LRC + answer + 70 ms.

d. If the card-reader-program special feature is used, and skipping occurs under program control, the rate is 67.5. (This is because each tape column must be read as skipping occurs.)

4. Card re-circulate to column 1:
80-column card = 1400 ms
51-column card = 1900 ms
22-column card = 2400 ms

1057/1058 Card Punch

1. Card to card skip with auto feed and auto punch switches on
   a. Home-loop, column 80 to column 1
      85 ms + (8 x 12.5 ms) + 330 ms
   b. Line-loop, column 81 to column 1
      85 ms + (7 x 12.5 ms) + 330 ms.
      85 ms = start time
      12.5 ms = 1 column at 80 cps
      8 = columns between 80 and 1
      7 = columns between 81 and 1
      330 ms = Card feed clutch cycle time
2. Skipping, home-loop or line-loop
   85 ms + 12.5N ms
   N = number of columns skipped
3. Releasing, home-loop or line-loop with auto feed and auto punch switches on
   85 ms + 12.5N ms + (8 x 12.5 ms) + 330 ms
   N = number of columns released
4. Punching:
   a. 1057/1058 from the 1051 — 14.8 cps
   b. 1057 independent — 20 cps (maximum)
      1058 independent — 18 cps (maximum)
5. Duplicating:
   a. 1057 — 20 cps (50 ms/col)
      1058 — 18 cps (55 ms/col)
   b. When duplication is started under program control:
      1057: 75 + 50n
      1058: 75 + 55n

      75 ms = start time
      n = number of columns duplicated.
   c. When duplication is started under 1051 control:
      1057: 165 + 50n
      1058: 165 + 55n

      165 ms = start time.

1050 System Time-Outs

Interruption of text transmission: 9.84 to 18.25 seconds (9 to 18 nominal)

Master station, addressing or polling response: 1.8 to 2.4 seconds (2 nominal)

Master station text interrupted: 19.8 to 37.7 seconds (19 to 37 nominal)

Terminals with line control operative have a transmit time-out of 9-18 seconds. If a character or code is not transmitted within this period, the terminal reverts to a receive mode. The terminal cannot transmit again until it is polled. There is no receive time-out.

The master station has a receive time-out of 19-37 seconds but no transmit time-out. If text is not received within this receive time-out period, the polling reader must be manually restarted.

Terminals with line control inoperative have both a transmit and receive time-out of 9-18 seconds. Following a transmit time out, the terminal reverts to receive mode. It can return to transmit mode by keying or starting a reader providing a remote terminal has not started to transmit. Keyboards and readers are locked while a terminal is receiving data. When terminals receive an answer to an EOB, the transmit time-out does not start until a character or code is sent. If transmitting from a keyboard, a character should be sent before the receiving terminals or processor time-out. Otherwise, a contention condition can exist.

IBM 1448 Transmission Control Unit Time-Outs

Response to addressing: 2.3 seconds.

Interrupted text or answer to LRC: 23 seconds.

Delay for carrier return and line feed, tab or line feed (fixed time-out special feature): 1.125 seconds (average).

Response to polling: 680 ms.

SPECIAL TECHNIQUES

Data Packing – Home Loop (Using the Card Reader Program Special Feature)

General Outline

The high degree of flexibility possible with the IBM 1050 System is demonstrated by the wide range of applications it can process. One of these applications is the packing of several card records into one printed and punched record, with one EOB per packed line. The 1050 components required are: 1051-1052 (or 1053) 1054-1055-1056.

Suppose the first twenty columns of each card are punched with data to be printed and punched. Card columns other than the first twenty can be used; however, the program tape must contain the proper skip start and skip stop codes to permit this. Any number of card columns can be packed, but the number of columns used per card must remain constant. The punching for the input cards and program tape is as follows:

Program Tape	Input Cards
Column 80 – Homing Position (12-track)	Columns 1-20 – Data
Column 21 – Prefix (8-track punch)	Column 21 – Component-recognition code -9 (Reader 1 on, Reader 2 off)
Column 22 – Eject	Columns 22-80 – data not to be used for this application

The program tape and the card are read alternately column for column, starting with column one of the tape. The component-recognition code (9) could have been punched in column 21 in PTTC/BCD form along with the 8-track punch (prefix) presently there. However, this requires additional planning to prevent any data punched in card column 21 from punching.

The master paper-tape in the tape reader is punched as follows:

	Code	Description
Start Portion	Prefix One	Printer 1 On
	Prefix Three	Punch 1 On
	CR/LF	Restores Print element to left margin.
First Card	Prefix Zero	Reader 2 On, Reader 1 Off (transfer reading to the card reader from the tape reader)
Second Card	Prefix Zero	
Third Card	Prefix Zero	
Fourth Card	Prefix Zero	
	EOB	End-of-Block
	CR/LF	Carrier-Return and Line Feed
	Prefix Zero	
	Prefix Zero	
	Prefix Zero	
	Prefix Zero	
	EOB	
	CR/LF	
	etc.	

The number of cards to be packed per line determines the number of prefix zero codes per EOB. If this tape is spliced into a continuous tape-loop, the splice should occur after the last EOB code. The starting position of the tape is that section containing:

Code	Description
Prefix One	Printer 1 on
Prefix Three	Punch 1 on
CR/LF	

Detailed Description

The necessary setup procedures are:

1. Place all required components in a ready status and assign to HOME.
2. Place program tape in the card reader with column one of the tape under the brushes and turn on the program tape switch. (See Installing

A Program Tape in the 1056 Card Reader section.)

3. Place cards in card reader and master tape in tape reader (and align).

Now the operator should:

1. Press the reset button to restore the terminal and place reader 1 in a selected status.
2. Press the home-reader start button:
   a. Tape reader reads from the master tape:
      Prefix, one – Printer 1 On,
      Prefix, three – Punch 1 On (tape punch),
      CR/LF – Restores print element to the left margin and line spaces vertically,
      Prefix, zero – Reader 2 On, Reader 1 Off (transfers reading to card reader from the tape reader). This code is used as a means of controlling the number of cards packed per line.
   b. Card reader reads from the program tape and cards:
      Columns 1-20 (tape and cards) are read alternately starting with the program tape. The significant information is the data contained in columns 1-20 of the card. This data is read and then it is both punched (by punch 1) and printed (by printer 1).
      Column 21 of the program tape contains the prefix code (8th-track punch).
      Column 21 of the card contains the component-recognition code (9) which transfers reading to the tape reader from the card reader.
   c. Tape reader reads from the master tape:
      Prefix, zero – this transfers reading to the card reader from the tape reader.
   d. Card reader reads:
      Column 22 of the tape containing an eject code (9-track punch). This code causes the first card to eject and stack. The second card is then fed and read (repeat steps b, c, and d).

This operation continues until the fourth transfer to the tape reader. At this time the EOB in the master tape is read and punched. This is followed by the reading and execution of the CR/LF code. The reading of cards and the punching of data into tape then continues for the second packed line.

Data Packing – Home Loop (Without the Card Reader Program Special Feature)

General Outline

The same type of packing operation can be performed with the same 1050 units and without the use of the card-reader program special feature. In this operation, however, each card must contain the control information that was previously punched in the program tape. Also, the tape punch must now be turned off prior to reading the EOB from the card. This permits packing the desired number of cards per line (as specified by the number of prefix zeros, per EOB in the master paper-tape). The card column assignment for all input cards used in this method of packing is:

Card Columns	Description
Column 1 – prefix	
Column 2 – three	Punch 1 on (tape punch)
Column 3-22 – Data	
Column 23 – prefix	
Column 24 – nine,	Reader 1 on, Reader 2 off (transfer to the tape reader)
Column 25 – EOB	Card eject and stack
Columns 26-80	Data not to be used for this application.

The master paper-tape is punched as follows:

	Code	Description
Start Portion	Prefix	
	One	Printer 1 on
	CR/LF	Carrier Return and Line Feed
First Card	Prefix	
	Seven	Punch 1 off (tape punch)
	Prefix	
	Zero	Reader 2 on, Reader 1 off (transfers reading to the card reader from the tape reader)
Second Card	Prefix	
	Seven	
	Prefix	
	Zero	
Third Card	Prefix	
	Seven	
	Prefix	
	Zero	
Fourth Card	Prefix	
	Seven	
	Prefix	
	Zero	
	EOB	End-of-Block
	CR/LF	Carrier Return and Line Feed
	Prefix	
	Seven	
	Prefix	
	Zero	
	etc.	(Fifth card begins second line print out.)

NOTE: The number of cards to be packed per line determines the number of prefix seven and prefix zero codes necessary in this tape per EOB. If this tape is spliced into a continuous tape-loop, the splice should occur after the last EOB code. The starting position of the tape is always the portion indicated in the example.

Detailed Description

The setup procedures are the same as for the previous packed-card operation (except for the program tape). After these setup procedures are completed, the operator must:

1. Press the reset button to restore the terminal and place reader 1 in a selected status.
2. Press the home-reader start button to cause:
   a. Tape reader to read from the master tape:
      Prefix, one – Printer 1 on,
      CR/LF – Restore the print element to the left margin and line space vertically,
      Prefix, seven – Punch 1 off. This prefix seven code is a precautionary code placed in this position to ensure that an extra EOB is not punched into the tape at this point. When the tape is spliced, the tape reader starts to reread the START portion of the tape before the previous card is ejected and a new one is fed and read.
      Prefix, zero – Reader 2 on, Reader 1 off (transfers reading to the card reader from the tape reader). This code is used as a means of controlling the number of cards packed per line.
   b. Card reader to read from the card:
      Columns 1-2 contain the prefix three code to turn the tape punch on.
      Columns 3-22 contain data to be packed.
      Columns 23-24 contain the prefix nine code which transfers reading to the tape reader from the card reader.
   c. Tape reader to read from the master tape:
      Prefix seven code which turns off the tape punch prior to returning to the card to read EOB. This prevents the tape punch from placing an EOB code in the tape following the data from each card. Therefore, it is possible to pack several cards into one line of data with one EOB per line.
      Prefix zero code transfers reading to the card reader from the tape reader.
   d. Card reader to read from the card:
      Column 25 contains an EOB code which causes the card to eject and a new card to feed and read (repeat steps b, c and d).

This operation continues until the fourth transfer to the tape reader. At this time the EOB in the master tape is read and punched. This is followed by the reading and execution of the CR/LF code. The reading of cards and the punching of data into tape then continues for the second packed line.

1050 PLANNING AND OPERATOR INSTRUCTION CHARTS

Two charts are provided in pad form to assist in both planning and performing an application on the IBM 1050 Data Communications System:

1. Application Planning Chart, and the
2. Operator Instruction Sheet.

Application Planning Chart (Form X24-3124)

This chart is designed to permit complete permanent-type documentation of an application (Figures 20 and 21). When completed, this chart (or charts, if necessary) should become part of the user's application reference file. Thus, a total record of an application is easily accessible within the installation at all times. The specific areas provided on this chart are:

1. 1052 Switch Panel
2. Margins and Tab Stops
3. Setup Instructions
4. Operating Instructions
5. Programming (reverse side).

1052 Switch Panel: The position of each switch on this panel should be indicated for the specific application. If it is necessary to change a switch position indicate this in the operating instructions area. Several switches have two names assigned to the lower position of the switch. The actual assigned name depends on the model of control unit (1051) used with the system.

Margins and Tab Stops: This area is scaled to actual size. Therefore, for accurate positioning it is only necessary to place the printed form just below this area and mark the exact margins and tap stops desired.

Setup Instructions: Each unit has a specific area where details pertaining to job setup can be listed. This area should include such information as:

1. Type of forms,
2. Master tape name,
3. Cards to use,
4. Keyboard shift status, etc.

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INTERNATIONAL BUSINESS MACHINES CORPORATION

PLANNING CHART

IBM 1050 DATA COMMUNICATION SYSTEM

Form X24-3124
Printed in U. S. A.

1052 SWITCHES

JOB _____

SYSTEM	MASTER	PRINTER 1	PRINTER 2	KEYBOARD	RDR 1	RDR 2	PUNCH 1	PUNCH 2	STOP CODE	AUTO FILL	PUNCH	SYSTEM	E O B	SYSTEM	TEST	SINGLE CY	RDR STOP
Attend	On	Rec	Rec.	Send	Send	Send	Rec	Rec	Sense	On	Normal	Program	Manual		On	Line	Line
		Send Rec.	Send Rec														
Un-attend	Off	Home / Send	Home / Send	Home	Off	Off	Off	Off								Off	Off
					Home	Home	Home	Home	Off	Off	Bksp	Dup	Auto	Dial Disc	Off	Home	Home

Margins

Tab Stops

10 20 30 40 50 60 70 80 90 100 110 120 130

SETUP INSTRUCTIONS

Printer 1

Printer 2

Reader 1

Reader 2

Punch 1

Punch 2

Keyboard

Fold to Here

OPERATING INSTRUCTIONS

Step	Operation	Description	Step	Operation	Description

Figure 20. Application Planning Chart – Front

Figure 21. Application Planning Chart – Back

Operating Instructions: This area should be used to provide the operator with a step-by-step procedure for the job. If necessary, additional sheets can be used to expand this area. This documentation should remain as a part of the application planning chart to provide for permanent documentation.

Programming Chart: This area occupies the entire back of the pad and provides for both input and output. A detailed description of the entire program should be developed in this area. The entire program (input and output) can be written, on a column-by-column basis with additional sheets used when needed. Several of the areas are multiple-purpose areas (example, 1057/1058 program and output cards) and can be assigned as desired.

Operator Instruction Sheet (Form X24-3139)

This sheet (Figure 22) is designed to provide information which will assist the operator in processing a specific job. This sheet, when completed, should become a part of each operator's operating procedures notebook (located with the system). The information contained on this sheet is a duplicate of the information contained on the front of the Application Planning Chart. However, if this sheet(s) is lost or damaged, it can be replaced by obtaining the necessary information from the planning chart located in the permanent document file (see Application Planning Chart).

1050 CHARACTER SET INFORMATION

The Perforated Tape and Transmission Code/Binary Coded Decimal code is shown in Figures 23, 24, and 25. This code is divided into two codes: basic and extended.

Basic PTTC/BCD

The bit values of the basic PTTC/BCD printable characters are shown in the center column of Figure 23. The lower-case printed graphics and card codes, and the upper-case printed graphics are included in this code. With a 1056, Model 1 or 2, a 1057, Model 1, a 1058, and no Extended Character Reading or Extended Character Punching special features, the upper-case card codes are not available. Upper-case printing is provided by the upper-case function code. The PTTC/BCD function codes are shown in Figure 24. Figure 25 shows codes which can be read and punched as data codes, but initiate no function, may not be keyed, and are not printable.

Extended PTTC/BCD

If the 1056, Model 1 or 2 and the 1057 Model 1 with the Extended Character Reading and Extended Character Punching special features respectively are used, the system uses the Extended PTTC/BCD code (see Figure 23). When an upper-case function code is received, the card punch enters an upshift status, and remains there until the next lower-case function code is encountered. When in upshift status, each BCD code received results in the punching of an upper-case card code. The upper-case and lower-case function codes are not punched. When the card reader senses an upper-case card code after a lower-case card code, an upper-case function code is automatically generated. When a lower case card code follows an upper code-case card code, the lower-case function code is generated. The function codes for the extended PTTC/BCD are shown in Figure 24. Figure 25 shows codes which may be read and punched as data, but initiate no function, may not be keyed, and are not printable.

(The distinction between basic and extended PTTC/BCD is confined to the card codes used. If no card reader or punch is used, the distinction need not be made.)

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INTERNATIONAL BUSINESS MACHINES CORPORATION

OPERATOR INSTRUCTION SHEET

IBM 1050 DATA COMMUNICATION SYSTEM

Form X24-3139
Printed in U. S. A.

JOB _____

SYSTEM	MASTER	PRINTER 1			PRINTER 2			KEYBOARD			READER 1			READER 2			PUNCH 1 or CPU			PUNCH 2		
		1	2	N1	1	2	N1	1	2	N1	1	2	N1	1	2	N1	1	2	N1	1	2	N1
Attend	On	Rec	Rec	On	Rec	Rec	On	Send	On	On	Send	On	On	Send	On	On	Rec	On	On	Rec	On	On
		Send Rec	Send Rec		Send Rec	Send Rec		Off			Off			Off			Off			Off		
Unattend	Off	Home	Send	Off	Home	Send	Off	Home	Off	Off	Home	Off	Off	Home	Off	Off	Home	Off	Off	Home	Off	Off

STOP CODE	AUTO FILL	PUNCH	SYSTEM	EOB	SYSTEM	TEST	SINGLE CY			RDR STOP		
							1	2	N1	1	2	N1
Sense	On	Normal	Program	Manual		On	Line	On	On	Line	Stop	Stop
							Off			Off		
Off	Off	Bksp	Dup	Auto	Dial Disc	Off						
							Home	Off	Off	Home		

SETUP INSTRUCTIONS

OPERATING INSTRUCTIONS

Step	Description

Figure 22. Operator Instruction Sheet

Lower Case		Bit Value							Upper Case	
Symbol	Card Code	B	A	C	8	4	2	1	Card Code*	Symbol
1	1							1	8-6	=
2	2						2		12-8-4	¤
3	3			C			2	1	11-8-6	;
4	4					4			8-2	:
5	5			C		4		1	0-8-4	%
6	6			C		4	2		8-5	'
7	7					4	2	1	8-1	"
8	8				8				11-8-4	*
9	9			C	8			1	12-8-5	(
0	0			C	8		2		11-8-5	)
a	12-1	B	A					1	12-0-1	A
b	12-2	B	A				2		12-0-2	B
c	12-3	B	A	C			2	1	12-0-3	C
d	12-4	B	A			4			12-0-4	D
e	12-5	B	A	C		4		1	12-0-5	E
f	12-6	B	A	C		4	2		12-0-6	F
g	12-7	B	A			4	2	1	12-0-7	G
h	12-8	B	A		8				12-0-8	H
i	12-9	B	A	C	8			1	12-0-9	I
j	11-1	B		C				1	12-11-1	J
k	11-2	B		C			2		12-11-2	K
l	11-3	B					2	1	12-11-3	L
m	11-4	B		C		4			12-11-4	M
n	11-5	B				4		1	12-11-5	N
o	11-6	B				4	2		12-11-6	O
p	11-7	B		C		4	2	1	12-11-7	P
q	11-8	B		C	8				12-11-8	Q
r	11-9	B			8			1	12-11-9	R
s	0-2		A	C			2		11-0-2	S
t	0-3		A				2	1	11-0-3	T
u	0-4		A	C		4			11-0-4	U
v	0-5		A			4		1	11-0-5	V
w	0-6		A			4	2		11-0-6	W
x	0-7		A	C		4	2	1	11-0-7	X
y	0-8		A	C	8				11-0-8	Y
z	0-9		A		8			1	11-0-9	Z
Space	Blank			C					Blank	Space
#	8-3				8		2	1	0-8-7	±
&	12	B	A	C					12-8-6	+
.	12-3-8	B	A		8		2	1	12-8-1	.
-	11	B							0-8-6	—
$	11-8-3	B		C	8		2	1	11-8-2	!
@	8-4		A						11-8-7	¢
,	0-8-3		A	C	8		2	1	0-8-1	,
/	0-1		A	C				1	12-8-2	?

*With extended character punching and reading special features installed in 1056 and 1057.

Figure 23. PTTC/BCD Code Chart

Function Symbol	Card Code	Bit Value							Meaning
		B	A	C	8	4	2	1	
BY	0-9-4		A		8	4			Bypass
RES	11-9-4	B			8	4			Restore
RS	9-5				8	4		1	Reader Stop
LF	0-9-5		A	C	8	4		1	Line Feed
NL	11-9-5	B		C	8	4		1	New Line
HT	12-9-5	B	A		8	4		1	Horizontal Tab
UC	9-6				8	4	2		Upper Case
EOB	0-9-6		A	C	8	4	2		End of Block
BS	11-9-6	B		C	8	4	2		Backspace
LOC	12-9-6	B	A		8	4	2		Lower Case
EOT	9-7			C	8	4	2	1	End of Transmission
PRE	0-9-7		A		8	4	2	1	Prefix
IL	11-9-7	B			8	4	2	1	Idle
DEL	12-9-7	B	A	C	8	4	2	1	Delete

Figure 24. Function Codes

Symbol	Lower Case Card Code	Bit Value							Upper Case Card Code	Meaning
		B	A	C	8	4	2	1		
PN	9-4			C	8	4			9-4	Punch ON
PF	12-9-4	B	A	C	8	4			12-9-4	Punch OFF
PZ	12-0	B	A	C	8		2		8-7	Plus Zero
MZ	11-0	B			8		2		0-8-5	Minus Zero
‡	0-8-2		A		8		2		12-8-7	Record Mark

Note: These codes have no function in the 1050 System, but are valid data codes. They are not printable.

Figure 25. Codes Unused by the 1050 System

Code Summary

Components	Number of Characters	Remarks
1051 1052/1053 Printers	64 Downshift 44 + 7 Upshift 44 + 7	(print and function)
1052 Keyboard	59	
1054	64	
1055	63	62 characters from the line.
1056	64	
1057	61 or 62	61 or 62 characters from the line. The idle code can be punched with the operator panel installed.
1058	61 or 62	61 or 62 characters from the line. The idle code can be punched with the operator panel installed. With line control on EOT is not punched. 44 characters interpret.

Delete Code

The delete code is a 7-bit (all bits) code which is:

1. Generated by the 1050 system when initiated either manually or automatically, depending on the operation. This code is also transmitted during line-loop operations.
2. Punched when either the either of the delete buttons or the correct button is pressed to initiate a tape deletion for a home-loop operation.
3. Punched by any receiving 1055 when a line-correction operation is initiated by a negative LRC compare following a line-loop transmission. The line-correction special feature must be installed to permit this operation.
4. Not punched by any receiving 1055 in either a home-loop or line-loop operation. This code is never punched by any 1057 or 1058.

SUMMARY OF TWO-CHARACTER SEQUENCE CODES (PREFIX AND ALPHABETIC CHARACTER)

The following two-character code initiated functions are available for the 1050 system; the availability of each code is indicated (standard or special feature):

Code	Function and Unit	Standard/ Special Feature
Prefix A	Ribbon Shift Up – 1052/1053	Special
Prefix B	Ribbon Shift Down – 1052/ 1053	Special
Prefix C	Single Line Feed – 1052/1053	Special
Prefix D	Double Line Feed – 1052/ 1053	Special
Prefix F	Duplicate – 1057/1058	Standard
Prefix G	Alternate Program – 1057/ 1058	Standard
Prefix H	Card Release – 1057/1058	Standard
Prefix J	Reader Stop – 1054/1056	Special
Prefix Space	Skip to Next Body Line – 1052/1053	Special
Prefix Line Feed	Skip to First Print Line – 1052/1053	Special

NOTE: Sequence codes (prefix and the following code, as a unit) initiate the function. Multiple prefix codes do not affect sequence or recognition functions. Extra prefix codes are punched if applicable (see Character Set for the applicable unit, and Operator Panel in the 1057/1058 special features section).

CORRECTION PROCEDURES

Single Cycle Operations

Single-cycle or single-step reading (one character or one card column) at a time is performed by setting the single-cycle switch to the appropriate home or line position. This position must correspond with the assignment switch setting for the selected reader. Press the home or line-reader-start button. As the reader-start button is released, the selected reader reads one character or card column and stops. This operation continues until the single-cycle switch is set to its OFF position. When the single-cycle switch is off, normal reading occurs, when the appropriate reader-start button is pressed.

The reader-stop switch should always be used to stop the reader before setting the single-cycle switch to the proper position.

The following procedure illustrates the proper single-cycling technique. A single-character error is discovered in a paper-tape prepared during home loop operation. The character in error is in the second printed line of data and is the middle of the line. The character is a numeric six; it should be an eight. A new tape containing the proper character is to be punched.

The proper procedure for this operation is:

1. Turn the power on.
2. Set Printer 1 (assignment switch) to HOME.
3. Set Reader 1 (assignment switch) to HOME.
4. Set Punch 1 (assignment switch) to HOME.
5. Insert the incorrect tape in Tape Reader 1 and align for reading the first character.
6. Prepare the tape-leader in the tape punch by pressing the feed key.
7. Set the system switch to PROG.
8. Press the reset button.
9. Key the proper component-recognition codes (home component recognition installed) – Prefix and 1 (Printer 1 ON).
   Prefix and 3 (Tape Punch 1 ON)
10. Set system switch to DUP.
11. Press the home – reader-start button.
12. Visually follow the printed line of data until the carrier executes its return for printing the second line, then
13. Operate the reader-stop switch to HOME (this will stop all reading, printing and punching).
14. Set the single-cycle switch to HOME (all home-loop reading, printing and punching is now on a single-cycle basis).
15. Consecutively, press and release the home – reader-start button until the last correct character before the error character is printed.
16. Key the correct character (8).
17. Advance the tape in tape reader one character position, by operating the tape advance wheel. This prevents reading of the error character.
18. Set the single-cycle switch OFF.
19. Press the home – reader-start button. Normal reading, printing, and punching will now resume.

The correction procedure for either adding or eliminating characters is the same as previously described, except for step 17. If characters are to be added, no tape advance is required after the additional characters are keyed after step 16. If characters are to be eliminated, the tape is advanced over the characters to be eliminated. No keying is required.

Single-cycling for line-loop operations is accomplished in a manner similar to home-loop. The major difference is that the switch settings are made to accommodate the line-loop operation and the line – reader-start button is used. Because single-cycle operation reduces throughput, corrections should be made in home loop to reduce line time whenever possible.

Both home-loop and line-loop correction procedures are based on the use of only one reader and one punch for any particular application.

Correction Procedure for Home-Loop Operation

The CORRECT button (home-correction special feature) provides an automatic tape-error-correction procedure when tape is being punched. If data from a reader is interspersed with keyed data in the output record, pressing this button causes the reader to automatically reread. When the CORRECT button is pressed:

1. The tape advances one additional column and a hole is punched in the 8th track of the tape.
2. The tape punch feeds in the reverse direction until the previous 8th track punch is sensed (a CR/LF code is also punched in this tape column).

   NOTE: With the home or line correction special feature, a punch is placed in the 8th track whenever a carrier return and line feed occurs.

3. Starting with the CR/LF code, the tape punch advances over the error item, punching delete codes over the entire error record. (If the card punch is used, the error card is ejected and a new card is registered at the punch station.)
4. When the tape punch completes deleting the error record in the tape,

a. the card reader automatically recycles and the card is reread (if neither an EOB code nor the last card column has been read), or
b. the tape reader automatically backspaces to the previous 8th track punch and then reread the tape.

NOTE: If home-component-recognition is installed, and the system is operating in the DUP mode, the readers and punches that are in use must have been initially selected in the program mode using the component-recognition codes.

The tape punch identifies the start of each new line by the presence of a CR/LF code. The punching of this code into tape is initiated by either reading or keying of the CR/LF code. Therefore, column one of each document to be transmitted should contain this code. This technique provides a carriage return and line feed operation for each new line and ensures the correct positioning of the print element for each corrected line.

NOTE: Exercise care to insure that the correct button is pressed after the last keystroke, not with this keystroke.

If the data line to be corrected contains data transmitted from two readers, the CORRECT button should not be used. Because operating the CORRECT button will control only the reader operating at that specific time, only a portion of the line in error will be retransmitted. If a data line contains information transmitted from two readers, the manual correction procedure is:

1. Reposition both readers to the end of the last correctly transmitted line. For a card reader, press the eject button and place the ejected card in the hopper as the first card to be read.
2. Reposition the punched paper tape to the start of the line in error. This is identified by the last 8th track punch.
3. Delete the entire error line punched in the paper tape. This is accomplished by simultaneously pressing and holding down both the feed and delete buttons (on either the 1052 or 1055).
4. Restart by keying the prefix and component-recognition code for the reader containing the initial data for this retransmitted line. (The home-component-recognition special feature must be installed; otherwise control is exercised by only the component assignment switches.)
5. Operate the home – reader-start button.

Correction Procedure for Line-Loop Operation

When transmitting to the line from a card reader and an EOB code is sensed, the card moves to column 81, and waits for an LRC answer. If the answer is positive, the card is ejected to the stacker.

When the answer is negative, the card is recirculated two additional times, if necessary. After the third attempt, the card must be manually ejected by pressing the eject button, 1056. (Otherwise a positive response is transmitted when the reader is again polled, if the resend button has been pressed. However, the reader will not start because it is still awaiting an LRC answer.) Then remove the error card from the stacker; correct it, if necessary, and replace in the hopper in front of cards not yet transmitted.

If a 1057/1058 card punch is receiving data, the card is punched and skips to column 81 upon receiving an EOB code. If the LRC compare is negative, the card is ejected and a new card is fed into the punch station. The 1051 then transmits the LRC answer to the sending system.

After the third negative answer, the reader does not reverse-feed. To retransmit, the tape must be manually repositioned (with tape-advance wheel) and the indicator lights extinguished. The reader can then be repolled. Without the line-correction special feature, the reader does not reverse-feed and operator intervention is required.

Correction Procedure for Line-Loop Keying

Any error detected during the line-loop keying of inquiry or data messages and prior to the EOB for that specific line can be canceled. The procedure for canceling this error is:

1. Press the cancel key (0), while holding down the alternate-coding key.
2. Release the cancel key, and while still holding down the alternate-coding key, press the EOB key (5).
3. Release both keys.

If the LRC compare is positive, an 11-punch is placed in column 81 and the card is ejected. This punch is not read by a card reader. This operation is the same with or without the line-correction special feature. After the entire transmission is complete, the punched cards can be visually checked, or needled to remove error-cards.

If a 1055 tape punch is the receiving unit, a negative LRC compare causes a punch in track eight. The tape reverse-feeds until the last CR/LF code (with its 8th-track punch) is sensed. The tape then feeds in the forward direction, punching delete codes over the previously punched information, including the last CR/LF code. When the deletion process is completed, a negative LRC answer is transmitted to the sending system. A positive LRC answer is not punched.

If two paper-tape punches or a paper-tape punch and a card punch are assigned to the line to receive, the line-correction feature is not effective. However, two card punches operate properly when used in such situations.

When a 1052 or 1053 printer is receiving, a negative LRC compare prints a hyphen and the LRC answer is transmitted to the sending system. If line correction is installed, the sending reader retransmits the line (card), causing the printer to execute a carriage return and line feed and print the line again, up to a total of three times, if necessary. A positive LRC answer does not print. This operation is identical with or without the line-correction special feature.

When a 1054 tape reader is the sending unit, a negative LRC answer causes the reader to reverse-feed until the 8th-track punch of the last CR/LF code is sensed. It then automatically feeds forward and retransmits the message two more times if necessary.

The operation of the cancel key signals the receiving station that the message is in error. The receiving station then replies with a negative answer to the EOB, LRC. This condition turns on the data-check and resend lights at the transmitting terminal when the answer is received. Also, either a hyphen or underscore character (depending on the shift status) prints at the transmitting terminal printer. This character indicates that the processor recognized and accomplished the cancellation operation. If the receiving station is another 1050 system, normal correction procedures prevail. The data-check and resend lights are then to be turned off by pressing their associated buttons. The message is then rekeyed correctly.

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To bring your publication up to date, please replace the following pages with those attached to this Newsletter. New information is indicated by a vertical line at the left of the affected text. A bullet (●) to the left of the figure number indicates a change in that figure.

Pages
19 and 20
27 and 28
33 and 34
39 and 40
59 and 60
69 and 70

Please insert this cover page to indicate that your publication now includes the modified pages issued with this Technical Newsletter:

Form	Pages	Date
N27-3013	19, 20	May 1, 1967
	27	
	33.1, 33.2, 33.3	
	40	
	59, 60	
	69	

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Attend-Unattend Switch

This switch is a part of the line-control feature. With the switch set to UNATTEND (and the mainline switch on), all component motors are off. Receipt of the appropriate station identification turns all component motors on. When addressed, the system delays a positive response until all motors are up to speed. When polled, the system immediately transmits a positive response, but delays transmission of the first text character until the motors are up to speed. After the message is completed, an EOT code turns off all component motors, unless a vertical forms movement has not been completed. In this case, the motors are turned off when the movement is completed. (When this switch is set to ATTEND and the 1051 mainline switch is on, all component motors run regardless of the position of individual component switches. If the Line Control switch is turned OFF, the Attend-Unattend switch is not effective.)

Station Identification

- Each station (system) is assigned one of the 26 alphabetic characters as a permanent station identification.

- Each 1050 recognizes its unique station identification.

As many as twenty-six 1050 systems can be assigned to any one communication line. Each station (system) sharing this line is assigned one of the 26 alphabetic characters as a permanent station identification (address). This address character, specified by the customer, is wired by IBM personnel at installation time (see NOTE 1).

The character assignment permits each 1050 system sharing a specific communication line to recognize its unique station identification. When this recognition occurs, the system participates in either a polling operation (transmitting) or an addressing operation (receiving) as designated by the component-select character. The remaining systems are prevented from using the line until transmission is completed.

NOTE 1: A terminal can be wired for any one of the 64 codes as an address. However, the master station, when polling or addressing, recognizes only those address characters containing a zone bit (A, B, or AB), except the comma.

Group Addressing (See "Restrictive Considerations for Group and Broadcast Addressing")

- Secondary identification characters may be assigned for simultaneously addressing all stations in a group.

- A specified system in the group is required to generate responses and answers for the group.

A secondary identification character can be assigned to each station (system) in a designated group to permit group addressing (simultaneous addressing of all stations in the group). The specific group assignments are completely flexible within the system on any communication line (see NOTE 1).

When group addressing is used, a specific system in the group is required to generate responses and answers of the group:

1. When ready to receive, and
2. When making an LRC and VRC check.

NOTE 1: The group identification assigned must not conflict with the assigned standard identification characters on this communication line. A station is limited to one group-identification character.

Broadcast Addressing (See "Restrictive Considerations for Group and Broadcast Addressing")

To address all systems on a specific communication line simultaneously, a broadcast character (/) preceded by a © is transmitted from the transmission control unit at the central-processing area. When this addressing method is used, a specified system is required to generate responses and answers for all the addressed systems:

1. When ready to receive, and
2. When making an LRC and VRC check.

Restrictive Considerations for Group and Broadcast Addressing

The installation of Specify (feature #9190) is mandatory for IBM 1050 Data Communication Systems that perform either group- or broadcast-addressing type applications. This feature, available on an as-required basis, eliminates the more severe restrictions that formerly existed when performing this type of application. The following limitations exist when feature #9190 is installed.

- Lost or duplicate messages are possible at non-answering terminals if the EOB check character

of a non-answering terminal and answering terminal are not in agreement.

- Data is not recorded initially in non-ready non-answering terminals (e.g., lack of recording media), or if the terminal runs out of recording media during transmission. There is no indication of this condition at the transmitting terminal.
- Vertical Forms Control (special feature) will not operate satisfactorily throughout the group- or broadcast-addressing operation. Unified printing format cannot be maintained between non-answering terminals, or between answering and non-answering terminals. The Vertical Forms Control feature operates correctly when addressing individual terminals only.
- The first character in text following an EOB LRC check sequence cannot be a period or hyphen, as these will not be recorded in non-answering terminals. If the printing or punching of a period or hyphen is required, it must be transmitted a second time.
- If a non-answering terminal is operating in unattend mode, the answering terminal must operate in the same mode to allow all motors to attain full speed. However, the answering terminal can operate in unattend mode with the non-answering terminal operating in the attend mode.
- If the Master Station (special feature) is installed on a terminal, that particular terminal cannot be assigned as the answering terminal for any group of terminals.
- If a 1057/1058 is used at a non-answering terminal, then a 1057/1058 must be operating at the answering terminal. The type and model of the card punches used must be alike at both the non-answering and answering terminals with one exception: a 1058 can be used at an answering terminal with 1057's at non-answering terminals.
- If the 1057/1058 Function Panel (accessible to IBM Customer Engineers) or the Operator Panel (special feature) are wired differently at the various terminals for codes received, the answering-terminal panel must be the only one wired for codes received that require more than one punch-cycle time--that is, codes for skipping, releasing, duplicating, etc.
- The program-card format for punches used at the non-answering and answering terminals should be identical. If not, the answering terminal must perform card-punch functions requiring the longest execute time.

Component-Select Characters

Component selection is accomplished by transmitting a specific numeric character following the station-identification character during polling and addressing. This character selects the designated station components:

Punch Feed Button

Operating this pushbutton causes the recognized tape punch (or punches) in home loop to advance by punching idle characters and feed holes. Holes are continuously punched by holding the button in the operative position. (A Feed button is standard on the punch unit.)

Correct Button

This pushbutton provides an automatic tape-error correction for data-recording operations when the tape is being punched. When this button is pressed:

1. The tape advances one additional column and punches a hole in the 8th-track of the tape.
2. The tape punch then feeds in the reverse direction until the previous 8th-track punch is sensed. (With this feature a punch is placed in the 8th-track with the CR/LF code when a carrier return is keyed. This 8th track is punched in the paper tape during home-loop operation providing the system has either home correction or line correction installed.)
3. The tape punch advances over the error item, punching delete codes through the entire error record including carrier return code with 8th-track punch until the 8th-track punch originated in step 1 is read. Feed holes are not over-punched in the deleting process. (See NOTE 1.)
4. If data is being recorded from a master tape, the reader reverse feeds until a carrier return (8th-track punch) is sensed and then rereads.
5. If a card reader is being used, the card in the reader is reread, if an EOB code or the 80th card column has not been read.
6. If cards are being punched, the card is released and a new card is fed in.

NOTE 1: The mechanism which inserts the 8th-track punch with the CR/LF character is active whether the tape punch is in home or line loop. Line correction is therefore effective when transmitting paper tape which was prepared in home loop even if home correction is not installed.

NOTE 2: If the Correct key operation is to be done in the duplicate mode, all components involved in the operation must be recognized in the program mode (if the home-component-recognition special feature is installed), before setting the Program-duplicate switch to the DUP position.

Without home-component recognition, the Correct button operates properly with the Program-dup switch in either position. If the Correct button is pressed with reader 1 assigned to HOME and the reader is not ready, the keyboard interlocks. To prevent this, any reader not ready should always be assigned to the OFF position. This keyboard locking occurs for both program and dup modes and regardless of whether the system does or does not have home-component recognition installed.

NOTE 3: For an explanation of the delete code, see the 1050 Character Set Information section in the Appendix of this manual.

Home-Loop Input Component Interlock

- Provides interlock control during home-loop operation if any output component is unable to operate.
- If an output unit is not-ready, input units are stopped (or prevented from starting) and the home-interlock light is turned on.

This special feature provides interlock control during home-loop operation to lock the keyboard, stop or prevent the start of any reader or programmed keyboard if any output component is unable to operate due to:

1. Lack of printing or punching media.
2. Taut tape condition (either momentary or prolonged) in the tape punch.
3. Full stacker, card jam, or a failure to feed in the card punch.
4. The paper-presence contact in the printer is operated.

When an interlock condition occurs, the input component is stopped (or prevented from starting) and the Home-interlock light is turned on. This light is directly above the Proceed light on the 1052, or at the bottom of the switch unit, if the system has no 1052. It is turned off, and operation is resumed by correcting the interlock condition, moving the Reader-stop switch to the home position (now labeled Home Interlock Reset), and pressing the Home – Reader Start button.

NOTE 1: The home-loop interlock feature does not recognize:

- Failure to manually assign a receive component to home-loop operation (component assignment switch not set to home).

- Failure to provide the proper component recognition code for recognizing a receive component (with the home-component recognition special feature installed). This code is normally read from either the tape or cards, or keyed from the keyboard. Any record partially completed when an interlock condition occurs should be deleted and rekeyed or reread. This precaution is recommended to ensure that the interrupted record is completely received, especially if a reader is used.

NOTE 2: With the home-correction feature installed, the Correct button can be properly operated only after the interlock condition is removed and the Interlock light is turned off. (This procedure is necessary to ensure deletion of the proper record, since the interlocked punch does not punch the 8th-track used as a reference for the operation.)

If the Home-reset button is pressed to reset the Interlock light (with the home-component feature installed), all home-loop components must be reselected.

Keyboard Request

- Provides keyboard polling which demands operator attention only when keyboard transmission is desired.

- When the terminal is polled, it responds with an end-of-address Ⓓ code. The Request light turns off.

This keyboard request special feature renders keyboard polling an efficient and positive operation demanding operator attention only when keyboard transmission is desired. With this feature a negative reply is sent to a keyboard poll or common poll unless the operator takes specific action. If the keyboard is not in request status (and the readers are not ready), polling is resumed with a minimum use of line time.

To place the keyboard in request status:

1. Position the assignment switch for the keyboard to SEND.
2. Press the Request button. The associated light turns on, indicating that the keyboard is ready to be polled.

When the Keyboard is polled, it responds with an end-of-address (EOA) Ⓓ code. The request light turns off, the keyboard unlocks and the Proceed light turns on. To extingush the Request light manually, press the Line-reset button.

NOTE: When this special feature is not installed, the keyboard assignment switch should never be set to SEND unless transmission is to be initiated from the keyboard at the next polling cycle. If this procedure is not followed, the response to the poll will be positive, whether transmission is desired or not. If there is no data to be transmitted, the master station or processor must wait to time-out period before polling can be resumed. If this occurs frequently, appreciable line time is consumed. This problem can be minimized (without this special feature) by instructing the operator to leave the keyboard assignment switch in the HOME or OFF position except when data is to be sent.

Line Adapters

Limited-Distance Line Adapter

A customer can attach either his privately owned, or common-carrier provided, on-premise communication line to an IBM 1050 System when using this line adapter. The feature provides the necessary signal modulation and demodulation to accommodate a communication line of up to 8 miles in length, and is installed within the 1051.

Leased-Line Line Adapter

This feature permits the customer to attach his privately owned communication line or a communication-company leased private line to an IBM 1050 System. This line adapter feature provides the necessary signal modulation and demodulation to accommodate a communication line of any length. This line adapter is installed within the 1051.

Shared-Line Line Adapter

This feature provides the 1050 System with the capabilities for operating either point-to-point or multipoint on one of four subchannels of a common-carrier leased private telephone line (schedule 4 line, or equivalent). Simultaneous data transmission on all four subchannels is possible, since each subchannel operates on a different assigned frequency.

NOTE 1: All terminals operating in the same network (and expected to communicate with each other) must be assigned to the same subchannel. Each 1051 Control Unit can only be assigned to one subchannel of the four available. Any transmission control unit

Text Time-Out Suppression

- The normal text time-out feature (9-18 seconds) may be ignored to permit an unlimited period for transmission.

- The operator must terminate the sending operation by transmitting an EOT code.

Specific applications of the 1050, such as training operators or conversation with a CPU when processing scientific programs, may render the normal text time-out feature (9-18 seconds) undesirable. With this optional feature, the terminal is not deselected at the end of this time-out. The keyboard and readers are not locked. Instead, the terminal enters the nonselected status. Contention may take place. If the operator resumes keying or starts a reader, the terminal re-enters transmit status. The terminal is locked when a Ⓑ or Ⓒ is generated or received. This permits an unlimited transmission period. Otherwise, the terminal would time out after 9-18 seconds without a transmission, and would remain locked in receive mode until another poll.

If this option is specified, care must be taken to ensure that the operator terminate the sending operation by transmitting an EOT code.

NOTE: This option should be specified only for specialized point-to-point systems.

Open-Line Detection (1051 Models 1 and 2)

This feature provides a line-carrier indicator light on the 1052 (or on the switch unit, if the 1052 is not used) to indicate a closed transmission line. Operation of the line-carrier light varies depending on the type of data set or IBM Line Adapter used. (See below.) With this Open-Line Detection feature, an automatic disconnect results with any of the following conditions:

1. The 1050 is erroneously dialed by a non-using party.
2. If the talk keys at both terminals are not depressed when switching from data to talk mode.
3. The carrier on the transmission line is lost.

In all these disconnect conditions, the disconnect will occur within 20-30 seconds.

In addition to the automatic disconnect, detection of an incomplete message (no character received in 19.8-37.7 seconds, or an EOB character or an EOT code not received) will cause the following operations to occur at the affected components:

Automatic printing of a hyphen character on a 1052/1053 Printer.

Automatic punching of a hyphen character on a 1055 Paper Tape Punch

Automatic ejection of the card from the 1057/1058 Card Punch. (The ejection of the card is accomplished without the punching of an "11" hole in column 81.)

With the Line Correction feature installed, an incomplete message received by the 1055 Paper Tape Punch will be automatically deleted. Upon receipt of the incomplete message, both the data-check and the receive-alarm indicators will be turned on. If the Audible Alarm feature is installed, an alarm sounds. If the receiving terminal is addressed during the incomplete message routine, the terminal will not respond.

Pressing the data-check key silences the audible alarm and extinguishes both the data-check and receive-alarm indicators. With the data-check key depressed, only the master station transmits a negative Ⓝ answer to the polled terminal.

As a guide to operating a 1050 with open-line detection, note the following characteristics of the feature:

1. Terminals that are automatically disconnected via the Open-Line Detection feature must be redialed, repolled, or re-addressed to return to normal operation.
2. Open transmission lines cause incomplete messages. The actions listed above resulting from open-line detection will occur immediately. If the data sets or IBM Line Adapters do not have the capability of detecting open lines or loss-of-carrier conditions, a receive time-out of 19.8 to 37.7 seconds initiates the above-listed actions. (See your IBM systems engineer to determine type(s) of data sets or line adapters used.)
3. When the 1050 is operated as a master station or when it is used with the line-control switch set to OFF, keying delays of greater than 9.84 seconds between characters cause the receiving 1050 to execute the incomplete message routine (when operating with IBM long-line adapters or shared-line adapters).
4. In group or broadcast transmission operations, non-answering 1050 terminals can time out before the answering 1050 terminals because of variations in time-out considerations of the different terminals. Therefore, delays between transmitted text characters should not exceed 19.8 seconds.
5. To avoid executing the incomplete message routine at a receiving terminal, the EOT code must be transmitted prior to the dial-disconnect switch operation.

6. Keyboards will be locked for approximately four seconds if the EOT code is used to control the deselection of receive components.
7. To avoid executing the incomplete message routine, an EOT or EOB code must be sent before operating the talk key on Western Electric Data Set 103A (or equivalent).

The line-carrier light comes on at different times, depending on the data set or IBM Line Adapter used. These variations are:

1. With Western Electric 103A Data Set, the light is on at both terminals when the connection is established.
2. With the Western Electric 103F Data Set, the light is always on at the non-master terminal (except with an open line). At the master terminal, the light turns on whenever it receives a positive response to a poll or address from a remote terminal. It remains on until an EOT code is received or transmitted. The light is on only for the duration of the negative responses.
3. With Western Union Data Set 1180 (or equivalent), the light is on at all terminals, if their local loops are closed. If the transmission line between the central facilities opens, it is not detected at the terminals and the light remains on. A break in a local loop is detected only by the terminal in that loop.
4. With 150-Baud Service, the light performs in the same manner as the Western Union Data Set.
5. With IBM limited-distance line adapter, Type 2, light is always on. It has no open line detection, because it has no carrier detection lead.
6. With a telegraph line attachment, the light turns off at both terminals when a break occurs in the transmission line.
7. With an IBM leased line adapter, Type 1, the light turns on whenever the terminal is in receive mode and is receiving.
8. With an IBM shared-line adapter, Type 1, the light performs in the same manner as with an IBM leased-line adapter.
9. The data-check key at the master station should not be pressed until the line-carrier light reappears, when operating with a Western Electric 103A or 103F Data Set, or an IBM Telegraph Line Attachment (special feature).

DETAILED SPECIFICATIONS

Interlocks--1051

Information concerning the interlocks of the 1051 is contained in Receive Interlocks in the Control Unit Operation--1051 section and in Home-Loop Input Component Interlock in the 1051 Control Unit--Special Features section.

Character Set--1051

All codes shown in the PTTC/BCD code chart (See Figures 23 to 25) can be sent and received over either the home or the line data channel.

The code set contains 14 function codes. The function codes and space code are repeated in the upper case. Five codes are not used with the 1050 System: PF, PN, ≠ (record mark), MZ, and PZ.

Timing Considerations--1051

1. a. System speed: 14.8 cps or (9 x 14.8) 133.2 bps (bits per second)
   b. Minimum 1051 bit rate for communication line: 134.5 bps.
   c. Character time: 67.5 ms* per character
   *(ms = milliseconds: 1000 ms = 1 second)
2. Delay time after turning the main-line switch on until ready to receive or transmit: 1 second.
3. Addressing time (single component):
   (5 x 67.5) + 330 + 20 = 687.5 ms

NOTE: This includes response time for attended operation. For unattended operation response time, see item 7.

(5 x 67.5 ms) = five character times (EOT, station identification, Component identification, response and EOA.)
330 ms = nominal delay before transmission of response and turn-around time (actual: 202 to 330 ms)
20 ms = maximum turn-around time for master to go from receive mode to transmit mode.

4. Addressing time (multiple components):
   ((5 x 67.5) + 330 + 20) + (N - 1)((3 x 67.5) + 70)

This includes response time for attended operation. For unattended operation response time, see item 7.

330 ms = nominal delay before transmission of first response and turn-around time (actual--202 to 330 ms)
20 ms = maximum turn-around time for master to go from receive mode to transmit mode.
N - 1 = number of additional components, where N is the number of components.
(3 x 67.5 ms) = three character times
70 ms = delay before transmission of additional responses.

5. Polling time for an individual terminal:
   (4 x 67.5) + 330 = 600 ms
   For an unattended operation, see item 7.
   (4 x 67.5 ms) = four character times
   330 ms = nominal delay before transmission of response, and turn-around time (actual--202 to 330 ms)
6. LRC time: (3 x 67.5) + 70 = 272.5 ms
   This included EOB, LRC, and the answer.
   70 ms = delay before transmission of answer.
7. Unattended operation requires a delay time for polling or addressing to bring the motors (for the selected components) up to speed: 2.3 seconds.

KEYBOARD OPERATION

The 1052 keyboard permits operator keying speeds up to 14.8 characters per second. Above this speed, a momentary interlock occurs between key strokes to prevent exceeding the 14.8 cps. The shift status of the 1052 keyboard (Figure 9) is changed by either sensing a shift code or keying the opposite shift.

When transmitting to a remote printer, the ribbon-shift, line-feeding and print element status should be initially established by transmitting the appropriate codes. The printer is automatically placed in a downshift mode when a positive address response occurs or when a d LRC answer is received.

Keying Component-Recognition Codes

- Component-recognition codes provide on-off control of 1050 system units (home or line loop).
- The two-character codes consist of a prefix character and a numeric character.
- In home loop, component-recognition codes are effective in prog mode only.
- Line loop addressing operations must include component-select codes for all units to be manipulated with component-recognition codes.

Component recognition codes provide on-off control of I/O units from the keyboard or a reader. Line component recognition is a standard feature, effective only in text mode. Home component recognition is a special feature.

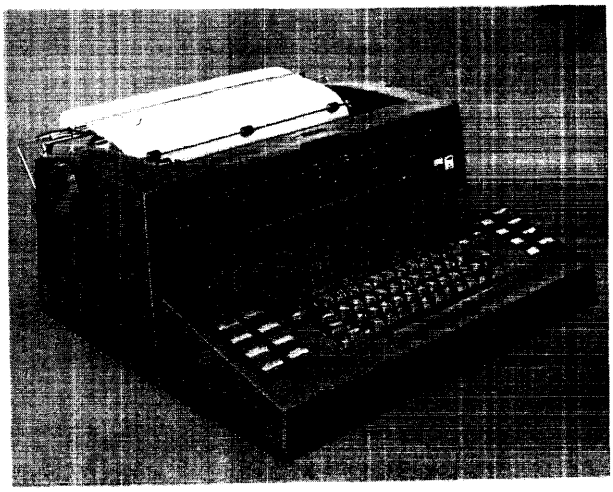


Figure 9. 1052 Printer-Keyboard

The component-recognition codes (home and line) are two-character codes consisting of a prefix character followed by a numeric character. The prefix character conditions the 1051 control unit to act upon the numeric character that immediately follows it and to provide the proper component control.

These two-character recognition codes are initiated by pressing the Prefix key (8) while holding down the Alternate-coding key. (See NOTE 1.) After releasing these keys, press one of the numeric keys, depending on the component control desired:

Numeric Code	Control
1	Printer 1 on
2	Printer 2 on
3	Punch 1 on
4	Punch 2 on
5	Printer 1 off
6	Printer 2 off
7	Punch 1 off
8	Punch 2 off
9	Reader 1 on, Reader 2 off
0	Reader 2 on, Reader 1 off

When operating in home loop, component-recognition codes are effective only when the prog-dup switch is set to PROG. (See NOTE 2.) When a two-character recognition code is generated (keyed or read), the particular component control is executed if the assignment switch is set to HOME. If the assignment switch is not properly positioned, the components will not operate. However, if the assignment switch is then properly positioned, the control will be executed without rekeying the recognition codes and system operation can continue. (See NOTE 3.)

During line-loop operation, component-recognition codes for receiving units do not affect the receiving units at the sending station. Conversely, component-recognition codes for input units affect those units at the sending station only.

An addressing operation should contain component-select codes for all receiving units to be used during the subsequent transmission. Including the component select characters after the station address ensures that the units are available for control when component-recognition codes occur in the text of the message.

can be keyboard generated. The cancel code (not shown in code charts) is an additional code that can be keyboard generated.

If the Home Correction special feature is installed, the delete and idle codes can be keyed, but to the home-loop data channel only (See Figure 23-25).

Timing – 1052/1053

1. Carrier return and line feed: (1.5 + T) x 67.5
   Does not include 67.5 ms for CR/LF code which initiates the function.
   T = travel in inches
2. Horizontal tab: (.75 + 1.1T) x 67.5
   Does not include 67.5 ms for HT code which initiates the function.
   T = travel in inches

To determine the number of fill characters required for a specific situation:

a. Compute the time in ms by using the proper formula.
b. Divide this time (in ms) by 67.5.
c. Round the result to the next higher whole number.

NOTE: When transmitting from an IBM 1448 to an IBM 1050 System the fixed time-out special feature (in the IBM 1448) provides a fixed delay of 1.225 seconds for each of these functions:

Carrier return and line feed
Line feed
Tab

3. Line feed: (2 x 67.5) = 135 ms
4. Keyboard speed: This varies with the operator's keying speed, with a maximum of 14.8 cps. (The maximum speed with the telegraph line attachment special feature installed is 8.3 cps.)

1054 PAPER-TAPE READER

READER OPERATION – 1054 (Figure 11)

- Only one reader can operate in any one loop (Home or Line) at any one time. (See NOTE 1.)

- A reader can be transmitting to the line while the second reader is simultaneously operating in a home-loop.

- A reader does not start if the Assignment switch for the selected reader (reset or programmed by component recognition) is off when the Reader-start button (home or line) is pressed. However, if the Assignment switch is then properly positioned (home or line), reading starts automatically unless a reader-stop was initiated before the Assignment switch was positioned.

- A reader, assigned to a home-loop operation, and reading, is stopped by:
  1. Sensing a reader stop code when the Prog-dup switch is set to the PROG position. The Stop-code is not punched.

     NOTE: The setting of the stop-code switch has no effect in home-loop.

  2. Positioning the Reader-stop switch to HOME.
  3. Running out of tape.
  4. Reading a CR/LF, LF, or tab code, or during a release, Dup or skip operation on the card punch.
  5. A taut tape condition.
  6. Reading and sending an EOT code to the card punch. The paper-tape reader restarts automatically when the next card is positioned for punching at the receiving card punch.
  7. Punching data in the 80th column of the card at the receiving card punch. An 8 punch in column 80 of the program card is sensed at this time which stops the paper-tape reader until the next card is fed into position at the card punch (see Program Drum in the 1057 Card Punch and 1058 Printing Card Punch section of this manual).

- A reader assigned to a line-loop operation, and reading, is stopped by:
  1. Sensing a reader stop code with the stop-code switch set to SENSE (see Stop Code Switch in the 1052 Printer-Keyboard and 1053 Printer section of Operator's Guide, A24-3125),
  2. Positioning the reader-stop switch to the line position,
  3. Running out of tape, or
  4. A taut tape condition.

- When a reader reads a prefix code followed by the component-recognition code for the alternate reader it:

Home Loop:

1. Stops the reader and transfers reading to the alternate reader if the Prog-dup switch is set to PROG, with the home component recognition special feature installed.
2. Allows the reader to continue reading with the Prog-dup switch set to DUP. The prefix code is punched and the component recognition code can be punched and printed. In this case, reading is not transferred to the alternate reader.

Line Loop: Stops the reader and transfers reading to the alternate reader, except during Bypass mode.

NOTE 1: Avoid setting the assignment switches for two readers to HOME if the home-component-recognition special feature is not installed. Reader conflict occurs if the Home-reader start button is pressed with both readers assigned to HOME.

Polling a Tape Reader

- Tape presence makes the reader ready for polling.

- A stop code stops the reader if the Stop-code switch is set to SENSE.

- Use of the common polling character permits interspersed reading and keying.

Polling is a centrally controlled method (using a central unit such as a 1050 master station or a transmission control unit) which permits stations on a line to transmit without contending for the line.

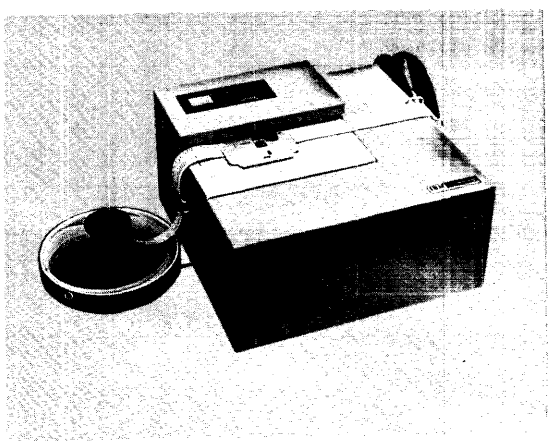


Figure 11. 1054 Paper-Tape Reader

3. When connection is established (the receiving station answers), a tone is automatically sent to the sending terminal and the DATA button must be pressed to place this terminal in the data mode.
4. The operator at each 1050 station presses the reset key before transmitting data.
5. To disconnect from the communication line at the end of the message, first transmit an EOT code to prevent a data check condition; then operate the System, Dial Disc switch on each 1050 system.

Automatic Disconnect Feature

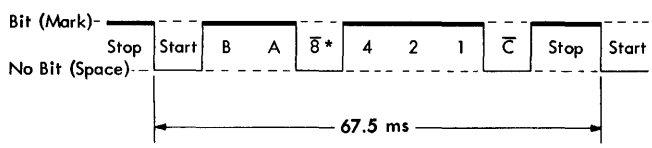
With the 103A type data set, this optional feature automatically disconnects both terminals from the communication line when the System, Dial Disc switch at either 1050 terminal is operated. This feature is designed to permit the disconnect operation for both stations to be manually initiated at either terminal. This feature must be requested from the common-carrier prior to installation of the data set.

NOTE: To be effective, this feature requires that both data sets have the "Initiate Disconnect" and the "Respond to Disconnect Option".

1050 TIMING CONSIDERATIONS

To compute the data handling capacity of the IBM 1050 system, certain basic timings are first necessary. The following basic timings, listed by machine are average timings based on the wide variety of system configurations and applications.

The 1050 system has a speed of 14.8 cps (characters-per-second). Therefore, the basic character time is 67.5 ms per character. Each character consists of a start bit, 1-6 data bits, a check bit (for odd parity), and a stop bit (Figure 19).



*8 Indicates no 8-bit

Figure 19. Bit Configuration of a "G" Character (Serialized)

1051 Control Unit

1. a. System Speed: 14.8 cps or (9 x 14.8) 133.2 bps (bits per second).
   b. Minimum 1051 bit rate for communication line: 134.5 bps
   c. Character time: 67.5 ms* per character.
   *(ms = milliseconds: 1000 ms = 1 second)
2. Delay time after turning the main-line switch on until ready to receive or transmit: 1 second.
3. Addressing time (single component): (5 x 67.5) + 330 + 20 = 687.5 ms.

NOTE: This includes response time for attended operation. For unattended operation response time, see item 7.

(5 x 67.5 ms) = five character times (EOT, station identification, component identification, response, and EOA).
330 ms = nominal delay before transmission of response and turn-around time (actual: 202 to 330 ms).
20 ms = maximum turn-around time for master to go from receive mode to transmit mode.

4. Addressing time (multiple components): $[(5 \times 67.5) + 330 + 20] + [N - 1][(3 \times 67.5) + 70]$

NOTE: This includes response time for attend operation. For unattended operation response time, see item 7.

330 ms = nominal delay before transmission of first response and turn-around time (actual: 202 to 330 ms)
20 ms = maximum turn-around time for master to go from receive mode to transmit mode
N − 1 = number of additional components, where N is the number of components
(3 x 67.5 ms) = three character times
70 ms = delay before transmission of additional responses.

5. Polling time for an individual terminal: (4 x 67.5) + 330 = 600 ms

NOTE: For unattended operation, see item 7.

(4 x 67.5 ms) = four character times
330 ms = nominal delay before transmission of response, and turn-around time (actual 202 to 330 ms).

6. LRC time: (3 x 67.5) + 70 = 272.5 ms

NOTE: This includes EOB, LRC, and the answer.

70 ms = delay before transmission of answer.

7. Unattended operation requires a delay time for polling or addressing to bring the motors (for the selected components) up to speed: 1 to 1.68 seconds.

1052-1053 Printers

1. Carrier return and line feed: (1.5 + T) x 67.5
Does not include 67.5 ms for CR/LF code which initiates the function.

T = carrier travel in inches

2. Horizontal tab: (.75 + 1.1T) x 67.5
Does not include 67.5 ms for HT code which initiates the function.

T = carrier travel in inches

To determine the number of fill characters required for a specific situation:

a. Compute the time in ms by using the previous formula.
b. Divide this time figure by 67.5.
c. Round the result to the next whole number.

NOTE: When transmitting from an IBM 1448 to an IBM 1050 System the fixed time-out special feature (in the IBM 1448) provides for a fixed delay of 1.225 seconds for each of these functions:

Carrier return and line feed
Line Feed
Tab

3. Line feed: (2 x 67.5) = 135 ms
4. Keyboard speed: This varies with the operator's keying speed, with a maximum of 14.8 cps. (The maximum speed with the telegraph line attachment special feature installed is 8.3 cps.)

1054 Paper-Tape Reader

1. Positioning the tape for re-read: 67.5 C

NOTE: This time does not include LRC time or re-read time.

C = The number of characters in the tape message.

1055 Paper-Tape Punch

1. Automatic deletion of a tape message using the line-correction special feature: (2 x 67.5) + 67.5(2D)

NOTE: Add the LRC time to complete the operation. The negative answer is not sent until the tape has been deleted.

D = Number of characters to be deleted (including EOB and CR/LF).

1056 Card Reader

1. Card skip: 14.8 cps (when skipping less than 8 columns during card punch duplicating, a delete code must be punched in the program tape.)
2. Card eject: 60 cps
3. To calculate throughput (system interlocks not included): a + b + c + d
   a. Reading time: 67.5R

      R = Number of columns read from card plus number of characters read from the program tape.

   b. Feeding time (register):
      954 ms for 22-column cards
      708 ms for 51-column cards
      462 ms for 80-columns cards
   c. Card ejection time: 16.7 (S - L + 1)

Lower Case		Bit Value							Upper Case	
Symbol	Card Code	B	A	C	8	4	2	1	Card Code*	Symbol
1	1							1	8-6	=
2	2						2		12-8-4	¤
3	3			C			2	1	11-8-6	;
4	4					4			8-2	:
5	5			C		4		1	0-8-4	%
6	6			C		4	2		8-5	'
7	7					4	2	1	8-1	"
8	8				8				11-8-4	*
9	9			C	8			1	12-8-5	(
0	0			C	8		2		11-8-5	)
a	12-1	B	A					1	12-0-1	A
b	12-2	B	A				2		12-0-2	B
c	12-3	B	A	C			2	1	12-0-3	C
d	12-4	B	A			4			12-0-4	D
e	12-5	B	A	C		4		1	12-0-5	E
f	12-6	B	A	C		4	2		12-0-6	F
g	12-7	B	A			4	2	1	12-0-7	G
h	12-8	B	A		8				12-0-8	H
i	12-9	B	A	C	8			1	12-0-9	I
j	11-1	B		C				1	12-11-1	J
k	11-2	B		C			2		12-11-2	K
l	11-3	B					2	1	12-11-3	L
m	11-4	B		C		4			12-11-4	M
n	11-5	B				4		1	12-11-5	N
o	11-6	B				4	2		12-11-6	O
p	11-7	B		C		4	2	1	12-11-7	P
q	11-8	B		C	8				12-11-8	Q
r	11-9	B			8			1	12-11-9	R
s	0-2		A	C			2		11-0-2	S
t	0-3		A				2	1	11-0-3	T
u	0-4		A	C		4			11-0-4	U
v	0-5		A			4		1	11-0-5	V
w	0-6		A			4	2		11-0-6	W
x	0-7		A	C		4	2	1	11-0-7	X
y	0-8		A	C	8				11-0-8	Y
z	0-9		A		8			1	11-0-9	Z
Space	Blank			C					Blank	Space
#	8-3				8		2	1	0-8-7	±
&	12	B	A	C					12-8-6	+
.	12-3-8	B	A		8		2	1	12-8-1	.
-	11	B							0-8-6	—
$	11-8-3	B		C	8		2	1	11-8-2	!
@	8-4		A						11-8-7	¢
,	0-8-3		A	C	8		2	1	0-8-1	,
/	0-1		A	C				1	12-8-2	?

*With extended character punching and reading special features installed in 1056 and 1057.

● Figure 23. PTTC/BCD Code Chart (Standard Character Set Arrangement)

Function Symbol	Card Code	Bit Value							Meaning
		B	A	C	8	4	2	1	
BY	0-9-4		A		8	4			Bypass
RES	11-9-4	B			8	4			Restore
RS	9-5				8	4		1	Reader Stop
LF	0-9-5		A	C	8	4		1	Line Feed
†NL	11-9-5	B		C	8	4		1	New Line
HT	12-9-5	B	A		8	4		1	Horizontal Tab
UC	9-6				8	4	2		Upper Case
EOB	0-9-6		A	C	8	4	2		End of Block
BS	11-9-6	B		C	8	4	2		Backspace
LOC	12-9-6	B	A		8	4	2		Lower Case
EOT	9-7			C	8	4	2	1	End of Transmission
PRE	0-9-7		A		8	4	2	1	Prefix
IL	11-9-7	B			8	4	2	1	Idle
DEL	12-9-7	B	A	C	8	4	2	1	Delete
Cancel Key		B		C					

†The eighth track of the tape is punched with the NL code when the 1050 system has either the Line Correction or Home Correction special feature (or both) installed. This punch is not included in the parity check of the NL character and therefore is not transmitted.

● Figure 24. Function Codes and Cancel Key

Symbol	Lower Case Card Code	Bit Value							Upper Case Card Code	Meaning
		B	A	C	8	4	2	1		
PN	9-4			C	8	4			9-4	Punch ON
PF	12-9-4	B	A	C	8	4			12-9-4	Punch OFF
PZ	12-0	B	A	C	8		2		8-7	Plus Zero
MZ	11-0	B			8		2		0-8-5	Minus Zero
‡	0-8-2		A		8		2		12-8-7	Record Mark

Note: These codes have no function in the 1050 System, but are valid data codes. They are not printable.

Figure 25. Codes Unused by the 1050 System

Code Summary

Components	Number of Characters	Remarks
1051 1052/1053 Printers	64 Downshift 44 + 7 Upshift 44 + 7	(print and function)
1052 Keyboard	59	
1054	64	
1055	63	62 characters from the line.
1056	64	
1057	61 or 62	61 or 62 characters from the line. The idle code can be punched with the operator panel installed.
1058	61 or 62	61 or 62 characters from the line. The idle code can be punched with the operator panel installed. With line control on EOT is not punched. 44 characters interpret.

Delete Code

The delete code is a 7-bit (all bits) code which is:

1. Generated by the 1050 system when initiated either manually or automatically, depending on the operation. This code is also transmitted during line-loop operations.
2. Punched when either the either of the delete buttons or the correct button is pressed to initiate a tape deletion for a home-loop operation.
3. Punched by any receiving 1055 when a line-correction operation is initiated by a negative LRC compare following a line-loop transmission. The line-correction special feature must be installed to permit this operation.
4. Not punched by any receiving 1055 in either a home-loop or line-loop operation. This code is never punched by any 1057 or 1058.

SUMMARY OF TWO-CHARACTER SEQUENCE CODES (PREFIX AND ALPHABETIC CHARACTER)

The following two-character code initiated functions are available for the 1050 system; the availability of each code is indicated (standard or special feature):

Code	Function and Unit	Standard/ Special Feature
Prefix A	Ribbon Shift Up – 1052/1053	Special
Prefix B	Ribbon Shift Down – 1052/ 1053	Special
Prefix C	Single Line Feed – 1052/1053	Special
Prefix D	Double Line Feed – 1052/ 1053	Special
Prefix F	Duplicate – 1057/1058	Standard
Prefix G	Alternate Program – 1057/ 1058	Standard
Prefix H	Card Release – 1057/1058	Standard
Prefix J	Reader Stop – 1054/1056	Special
Prefix Space	Skip to Next Body Line – 1052/1053	Special
Prefix Line Feed	Skip to First Print Line – 1052/1053	Special

NOTE: Sequence codes (prefix and the following code, as a unit) initiate the function. Multiple prefix codes do not affect sequence or recognition functions. Extra prefix codes are punched if applicable (see Character Set for the applicable unit, and Operator Panel in the 1057/1058 special features section).