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## **System Operation Reference Manual IBM 1050 Data Communication System**

This reference publication is divided into two sections: general information and detailed information. It provides the proper level of IBM 1050 System information to the widest possible audience. A complete description of the components available with this IBM Tele-processing System is presented, including the capabilities, controls, and special features of each. 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 Tele-processing Bibliography* (A24-3089).

## Preface

This publication is written in two sections to provide both the basic information necessary to acquire an initial understanding of the IBM 1050 System and the detailed information, in depth, of each component and over-all system operation. The general information section, designed primarily for individuals unfamiliar with the IBM 1050 System, provides information on the components of the system and a summary of the special features. The detailed information section is designed for those requiring reference information and specific details on component features, setup procedures, operation, and special techniques. An appendix provides detailed information pertaining to the over-all system.

The information contained in this publication describes the functional characteristics of the IBM 1050 System as of the date of this edition. All significant changes to the IBM 1050 system after this date will be covered by technical newsletters and subsequent revisions.

For individuals requiring only general operating information on the IBM 1050 System, the *IBM 1050 Basic Operating Information* publication, Form A24-3125, is available.

*Major Revision, January 1965*

This edition, A24-3020-3, obsoletes the previous edition, A24-3020-2, and includes Technical Newsletters N24-0194, N24-0237, and N24-0278. Significant changes have been made throughout this manual, and the entire publication should be completely reviewed.

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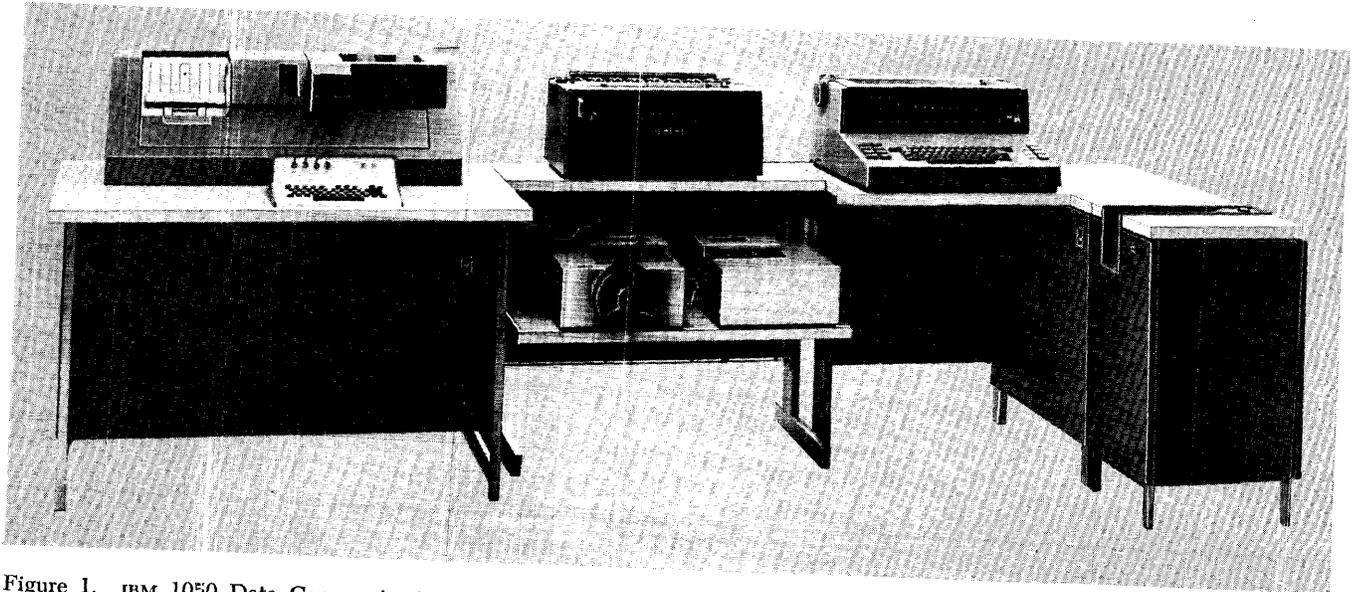


Figure 1. IBM 1050 Data Communication System

## IBM 1050 Data Communication System

The IBM 1050 Data Communication System is a multi-purpose, data recording and data transmission system. This Tele-processing system (Figure 1) provides a high degree of input-output flexibility due to the various input-output media available and the numerous system configurations possible. Data is entered into this system by manual keying, by punched cards, by punched paper tapes, and by edge-punched documents. While output from the system is in printed form, in punched cards, in punched paper tape, and in edge-punched documents. The system is capable of simultaneous home-loop operation (local operation between units of the same terminal) and line-loop operation (over communication lines to another 1050 or central processing unit—cpu).

The IBM 1050 meets the unique requirements of a wide range of businesses, large and small. The system configurations available range from the receive-only line-loop printer (see Figure 3A) to the more complex and versatile configuration of a home-loop and transmit-receive line-loop system (see Figure 5).

Operating over communication lines, the IBM 1050 provides rapid, dependable communication between remote locations and a central data processing location. The communication lines can be either leased private, common-carrier switched telephone networks, or privately owned networks. Transmission can be either directly between locations, through switching centers, or through message exchanges.

Transmission is half-duplex (two ways alternately). Point-to-point operation can be accomplished with this system, or communication can be between a central terminal and remote multidrop terminals.

Operation over communications lines can be performed simultaneously with independent home-loop operations. Any combination of the input-output components of the system, not being used for communication line operation, is available for independent home-loop operation. Records can be composed from any combination of input media. As records are composed, the data can be transmitted simultaneously (using a keyboard and a monitor printer) or can be stored in machine readable media (paper tape and cards) for later transmission.

In local home-loop operations or line-loop operations over communications lines, the 1050 can perform such functions as:

- Source recording,
- Media converting,
- Document writing,
- Automatic typing,
- Printing of transmitted data, and
- Preparing machine readable media for transmission.

### System Components

The IBM 1050 Data Communication System is available with various component combinations in numerous system configurations (see Figures 3A, 3B, 4 and 5). These modular control, input, and output components are:

- IBM 1051 Control Unit (Models 1, 2 and N1)
- IBM 1052 Printer-Keyboard
- IBM 1053 Printer
- IBM 1054 Paper-Tape Reader
- IBM 1055 Paper-Tape Punch
- IBM 1056 Card Reader (Models 1 and 2)
- IBM 1057/1058 Card Punch or Printing Card Punch
- IBM 1092 and 1093 Programmed Keyboards

Thus, the organization of the terminal is truly modular and the components can operate in a variety of combinations with complete flexibility. The control unit is essential to each configuration and provides the controls for the components, in addition to home-loop and line-loop operations. All components are electrically connected through the control unit.

The printer and keyboard, unlike a standard typewriter, are only electrically, not mechanically, connected. They are cable-connected to the control unit so that they can be operated independently.

Configurations are available with a maximum of two machine-readable inputs, one of which can be a card reader and with a maximum of two machine-readable outputs, of which one, or both, can be card punches. Each reader can be replaced by a programmed keyboard, if desired.

The maximum character rate of the system is 14.8 characters per second. The maximum keying speed is also 14.8 characters per second, but it can be less because of various operator keying speeds.

### System Applications

The IBM 1050 Data Communication System is a highly versatile member of an ever-expanding family of IBM Tele-processing systems. This versatility permits the 1050 system to be used for a wide range of applications in such industries as:

Transportation	Distribution
Manufacturing	Insurance
Research	Refining

These industries, in addition to numerous others, provide a broad basis of data communication requirements which the 1050 system is specifically designed to fill. The capabilities of the 1050 are ideally suited for the processing of such applications as:

- *Document writing* of sales orders, purchase orders, insurance policies, accounts payable, payrolls, engineering specifications and manufacturing orders.
- *Direct entry* into a central processor (for updating and storage) of all data associated with sales orders, insurance policies, accounts payable, payroll, engineering specifications or manufacturing orders. These entries can originate from either local or remote locations.  
Also, direct inquiry and response operations are provided for. This means that all inquiries are answered on the basis of data current to that particular instant when the inquiry is received at the processor (real-time operation).
- *Exception reporting* of data from the central data processing area to remote locations. This type of application provides remote locations with information on work orders, credit ratings, inventory adjustments, traffic movements, etc.
- *Remote printing* of such items as shipping orders, invoices, payroll drafts and registers, production records, inventory listings and mathematical calculations can be accomplished. This provides a means of supplying full documentation at remote locations for all desired records, notices, bills, etc.
- *Intra-company communication* can be handled on a faster and more accurate distribution basis by remote printing of administrative messages, reports, directives, memorandums, etc.

## Component Description

This section provides a general description of all IBM 1050 components, as well as the 1092 and 1093 keyboards. A more detailed description of the basic components of the 1050 (1051-1058) is provided in the principles of operation section of this manual. For detailed information on the 1092 and 1093, refer to the publication, *IBM 1092 and 1093 Programmed Keyboards*, Form A24-3266.

### 1051 Control Unit

The control unit (Figure 2) controls and coordinates the input and output components. The control unit is required in all configurations and contains the power supplies, printer code translator, data channels, and control circuitry for the system. The cabinet that houses the control unit is free standing with a height equivalent to that of a normal typewriter table. Because the input and output units are self-contained and cable-connected to the control unit, they can be ar-

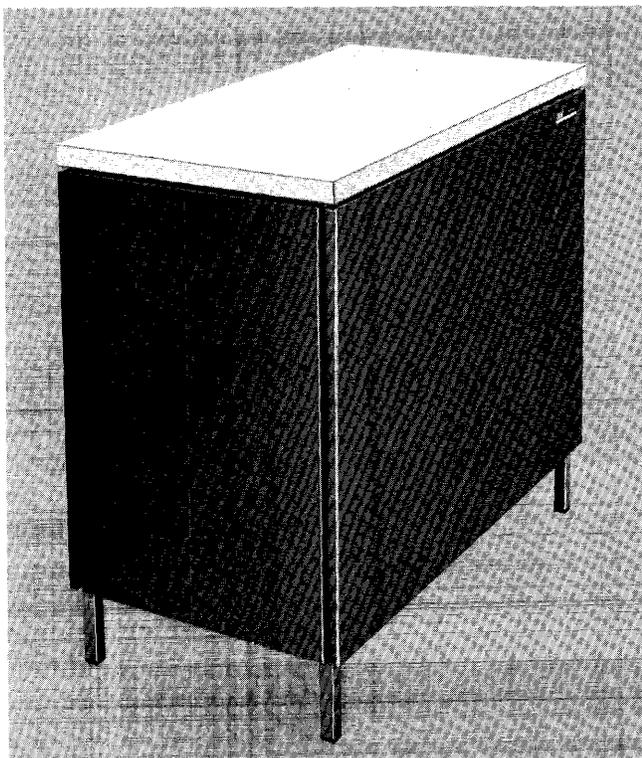


Figure 2. IBM 1051 Control Unit

ranged in a position to accommodate their intended use.

The top surface of the control unit is the basic size shown in Figures 2 and 3A, or this size can be increased by the addition of a permanently attached typing table (Figure 3B) to accommodate the 1052 printer-keyboard. To accommodate additional 1050 components, an auxiliary table (Figures 4 and 5) is available as an accessory item. The control unit is available in three models (Models 1, 2, and N1). The model used is dictated by the application requirements of the system.

Switches that control the various input and output units are considered a part of the control unit. For those configurations using a 1052 printer-keyboard, the switches are located in the keyboard housing. Otherwise they are located in a separate switch unit (see Figures 3A and 7).

These switches assign the input and output units to the desired line-loop or home-loop operation. They also

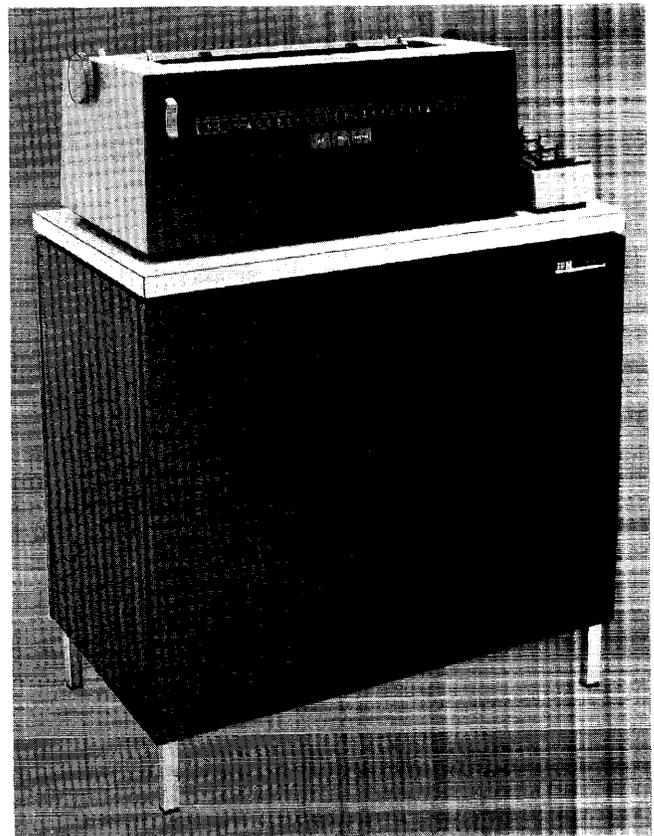


Figure 3A. Printer Configuration (Receive Only)

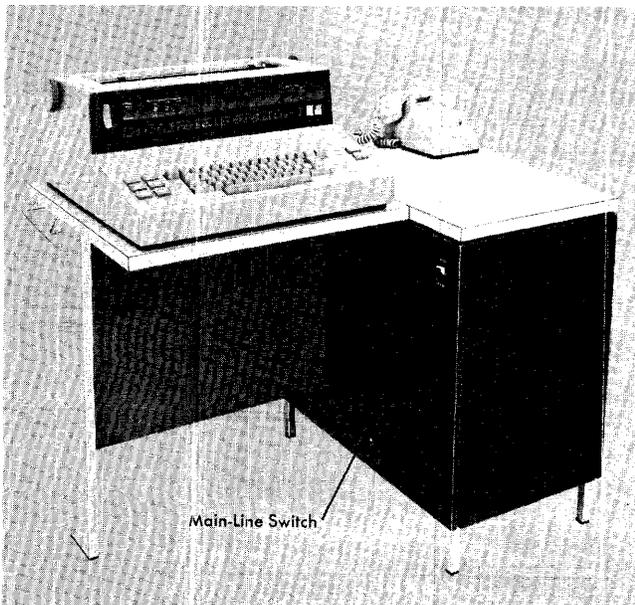


Figure 3B. Printer-Keyboard Configuration (Send-Receive)

connect interlocks of the printer and other input-output components (paper-tape, forms, etc.) to the data channel (line or home) assigned by the operator. This results in each assigned group of units operating as an integral system. This requires that every component of the group be in a ready state before that group operates. Refer to *Interlocks and Setup Procedures* for each component in the *Principles of Operation* section.

### Communication Control

Data is transmitted over communication lines serial-by-bit, serial-by-character. The parallel-by-bit characters from the sending units are serialized at the sending terminal for the communication line and then deserialized at the receiving terminal for the receiving units. This conversion operation is accomplished by the 1051 control unit at each end of the line. These terminals use the IBM standard PTT code/6 (Perforated Tape and Transmission code/for 6-bit environments. See Figure 44.)

The input and output components are attached to the communication lines via the line data channel of the control unit and the manual selection switches. Component ON and OFF control is by manual switch, or by the component-recognition features. (Refer to the *Principles of Operation* section, *1051 Control Unit*.) All models used on communication-company lines operate with the communication-company data sets to control signals, interconnections, signal levels, etc. For operation on other than communication-company lines,

an IBM Line Adapter is available as a special feature. Refer to the *1051 Control Unit—Special Features*.

The control unit includes data-bit converters (parallel-to serial and serial-to-parallel) that provide half-duplex send and/or receive capabilities for line-loop operation. For home-loop operation data is transferred serial-by-character, parallel-by-bit from input units to output units over the home data channel.

### Communication Facilities

The 1050 operates in a half-duplex mode over:

1. Common-carrier switched telephone networks,
2. Common-carrier switched 150 bits-per-second (bps) Teletypewriter Exchange (TWX) networks,
3. Common-carrier leased private line telephone networks,
4. Common-carrier leased private line (180 bps) networks,
5. Common-carrier leased private line (75 bps) telegraph networks, and
6. Privately owned communication networks.

When the 1050 system is used on common-carrier switched networks, common-carrier data sets must be used. For common-carrier leased private line telephone networks, or privately owned communication networks, other commercially available data sets can be used if they present the proper interface to the 1051. For common-carrier leased private line telegraph networks, the modulation-demodulation equipment is contained in the central office of the common-carrier.

Point-to-point or multipoint data communication is possible on all of the networks except switched voice-grade, which is limited to point-to-point operation.

### Data Sets

The IBM 1050 operates over transmission facilities using the following commercially available data sets or their equivalent:

Western Electric Data Set 103A—for use in point-to-point dial-up connections.

Western Electric Data Set 103F—for use in multidrop or point-to-point leased line connections.

Western Union Data Sets—for use in multidrop or point-to-point leased line connections.

IBM Line Adapter—for use in multidrop or point-to-point privately owned line connections. The IBM Line Adapter and the Telegraph Line Attachment are each special features installed within the IBM 1051.

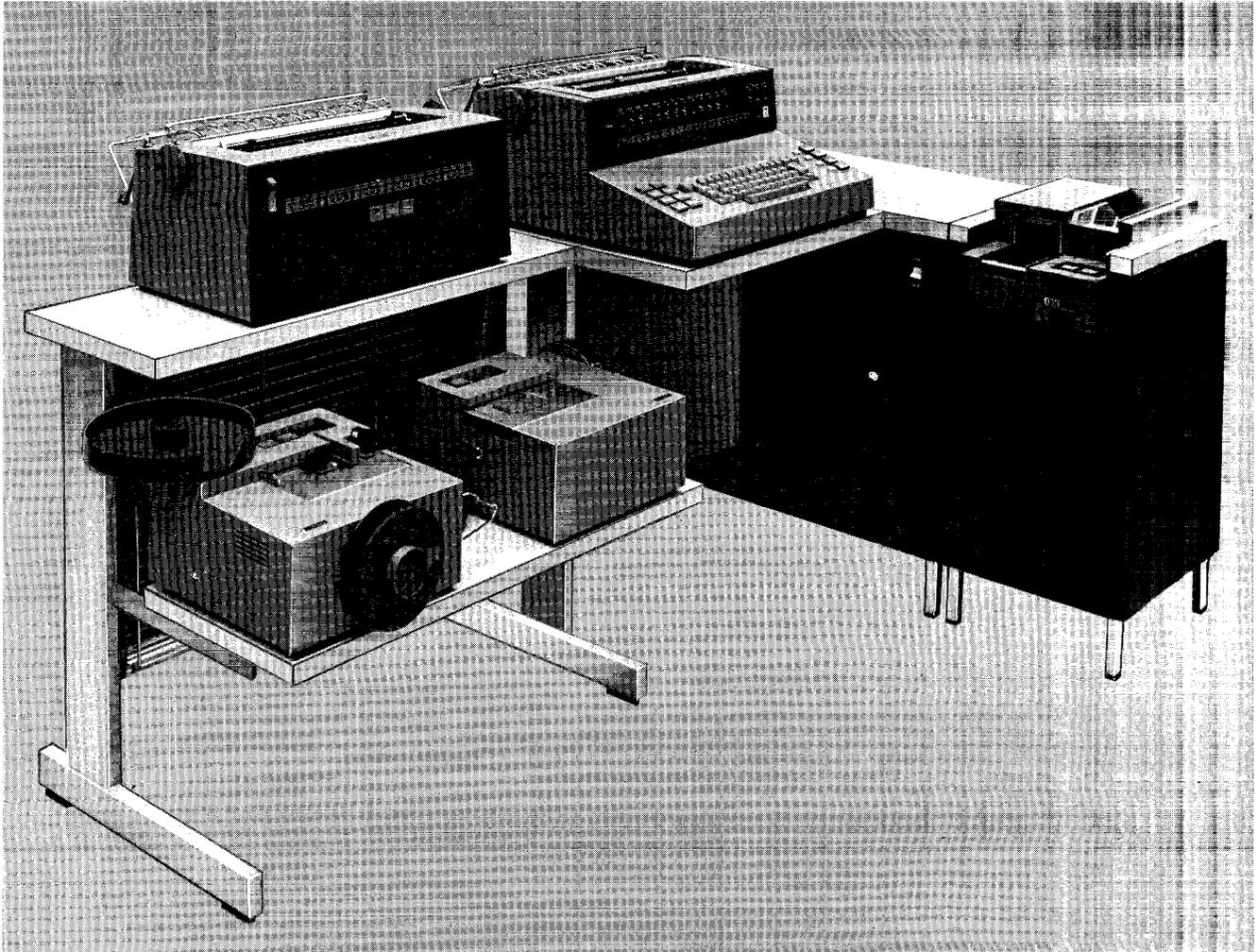


Figure 4. Home-Loop Configuration (without Maximum Number of Input/Output Units)

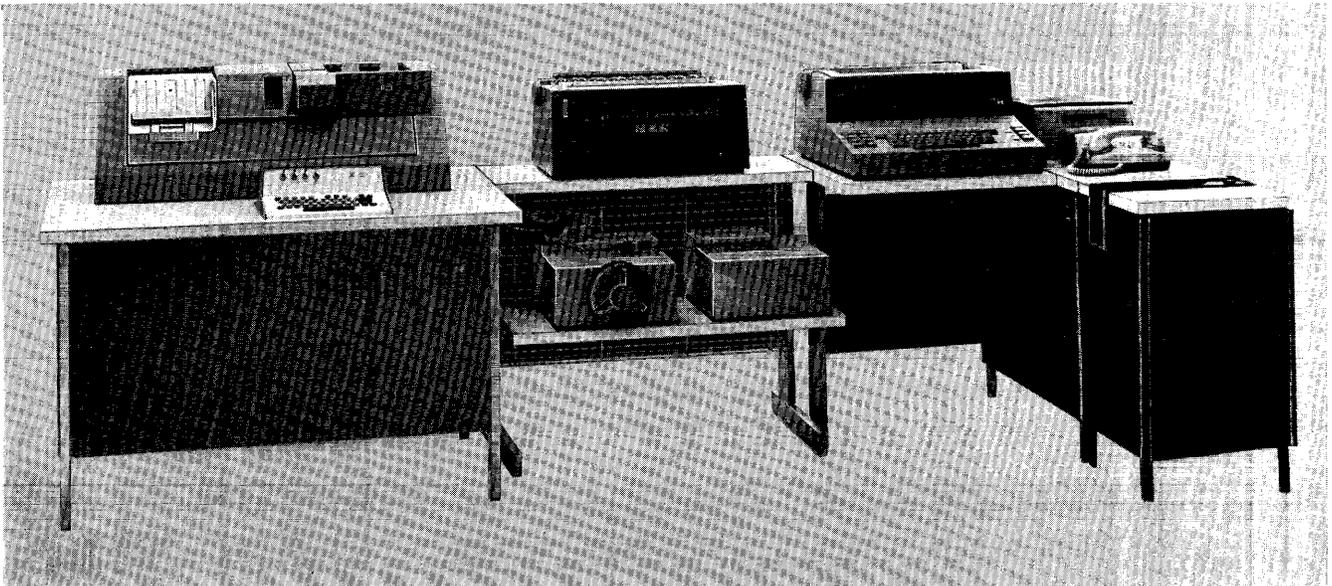


Figure 5. Communication Line and Home-Loop Configuration (with Maximum Number of Input/Output Units)

## Control Unit Models

The control unit is available in three models:

Model 1 (for communication line-loop and home-loop configurations)

Model 2 (for communication line-loop only configurations)

Model N1 (for home-loop only configurations)

### Model 1

This model is used for communication line- and/or home-loop configurations. It provides a flexible means for attachment of the input and output components to either the home data channel or the line data channel. The Line Component-Recognition feature is standard for this model. The Home Component-Recognition special feature is also available for this model. Therefore, for both home-loop operation and line-loop operation, component assignment is by manual switching arrangement and by the component-recognition features.

For applications where data is to be prepared in the home loop, while the system is transmitting or receiving, the component assignment switches permit home-loop operation independent of line-loop operation.

The maximum number of input and output units attachable to this model is:

- 2 printers (only one 1052)
- 2 readers (only one 1056), either or both readers can be replaced by programmed keyboards, and
- 2 punches.

The Model 1 can also attach directly to an IBM System/360 by means of a CPU Attachment special feature. If the 1051 has the master station special feature installed, the 1050 system can accomplish line-loop operations, on the line data channel, with up to 25 remote 1050 systems on either a point-to-point or multi-point basis. Simultaneously, the 1050 system can accomplish System/360 program checking and correction, and job logging by means of the home data channel manually assigned to the CPU.

### Model 2

The Model 2 is used for line-loop only configurations. The configurations possible with this model range from a receive-only printer or a send-receive printer-keyboard to a fully complemented line-loop configuration (two printers, two readers, and two punches). All configurations require a 1051 control unit.

*Note:* A maximum of one 1052 printer-keyboard and one 1056 card reader can be attached to any one 1051. Also, each reader can be replaced by a programmed keyboard, if desired.

The input and output components available on a system are assigned to the line data channel for line-loop operation by component assignment switches and line component recognition codes. For monitor printing, the printer at the sending station is automatically recognized when the assignment switch is set to SEND or SEND/RECEIVE. The receiving printers must be recognized by recognition codes transmitted from the remote sending terminal. See *Special Techniques—Multi-point Operation*, for exceptions.

### Model N1

This model is used for home-loop-only configurations, and can contain a maximum of:

- two printers (one of which can be a 1052),
  - two readers (one of which can be a 1056),
- Note:* Either or both readers can be replaced with programmed keyboards, and
- two punches.

These units provide for data recording and data preparation on the home data channel with either manual or automatic control. Manual control is exercised through the component assignment switches, while automatic control is by the home-component-recognition special feature, when installed.

The Model N1 can also attach directly to an IBM System/360 by means of a CPU Attachment special feature. This permits the 1050 system, Model N1 to accomplish on-line (to the CPU) program checking and correction, and job logging, or off-line home-loop operations. When installed, the CPU Attachment special feature occupies the reader-1 and the punch-1 positions and thus limits the maximum configuration of two printers, one reader (or programmed keyboard) and one punch.

### 1051 Control Unit — Special Features

The following is a summary of all special features available for the 1051. A detailed description of each feature is contained in the Principles of Operation section under *1051 Control Unit*.

#### *Auto Fill Character Generation (Models 1 and N1).*

Included with this feature, which is for only home-loop operation, is a two-position switch. When on, this switch provides for the automatic generation of fill (idle) characters during such printer functions as carrier return and line feed, tabulate, and line feed. Fill characters are punched into tape (or cards if the operator panel special feature is installed and wired), and provides a time factor when this tape (or cards) is later transmitted to a remote printer. This time interval permits completion of any printer function

initiated from the tape, before further data is received.

*Note:* Idle characters are also punched into tape (only) for the card punch functions of dup, skip and release.

*Automatic Ribbon Shift and Line Feed Select (Models 1, 2 and N1).* This provides for ribbon shifting or single and double line feeding when the control unit recognizes certain two-character function codes. These codes, which accomplish ribbon shift up or down, and single- or double-line feeding, consist of a prefix code followed by an alphabetic character (A, B, C, or D).

*Audible Alarm (Models 1 and 2).* A buzzer in the 1051 is sounded when a condition requiring operator attention (component not assigned or ready, or an interlock) arises within the system during line-loop operations.

*Automatic EOB (Models 1, 2 and N1).* A two-position switch is provided with this feature, which (when set to AUTO) causes an EOB and CR/LF codes to be generated whenever the return key (1052) is pressed in either home-loop or line-loop operation.

*Home Component Recognition (Models 1 and N1).* This feature provides for the on-off control of all system components (operating in home loop) through the use of certain two-character codes. These codes consist of a prefix code followed by a numeric character (0-9).

*Home Correction (Models 1 and N1).* This provides the operator with an efficient means for error correction during home-loop operations. Included with this feature is the punch (normal-backspace) switch, punch feed button, delete button, and the correct button.

*Keyboard Request (Models 1 and 2).* The request button provided with this feature permits the operator to place the terminal in a request status during line-loop operations when it is desired to transmit data from the keyboard (assignment switch set to send). When the keyboard is polled, transmission from the keyboard can start.

*Line Adapter (Models 1 and 2).* This provides modulator-demodulator equipment (within the 1051) to permit attachment of the 1050 to customer-owned, on premise, lines.

*Line Correction (Models 1 and 2).* This provides for the retransmission of a message following a negative LRC answer (line-loop operation). Retransmission of the message up to two additional times following an error is provided for with this feature.

*Line Correction Release (Models 1 and 2).* With this feature, the automatic stop after the third unsuccessful attempt to transmit is bypassed. Instead of stopping at this point, the resend light is automatically turned off and the reader proceeds to the next message.

*Master Station (Models 1 and 2).* When the master switch, provided with this feature, is on, the terminal has the capabilities for polling and addressing 1050 terminals on either a multipoint or point-to-point operation.

*Reader Stop—Prefix J (Models 1 and N1).* This two-character code (prefix followed by a J character) stops a reader-skip operation, and permits reading to continue. This is used for home-loop operation in program mode.

*Telegraph Line Attachment (Models 1 and 2).* Operation of the 1050 system at 8.3 cps over 75 bps telegraph facilities (line-loop operation) is possible with this feature installed.

*Vertical Forms Control (Models 1, 2, and N1).* The controlled movement of forms is provided for with this feature. This is accomplished through the use of two function codes and bead chains designed for each form.

## **1052 Printer-Keyboard**

This printer (Figure 6) accepts data that has been received from a remote terminal, CPU, or from the local keyboard, paper-tape reader, or card reader. Typical operations of the printer include recording incoming data, recording data being transmitted to another lo-

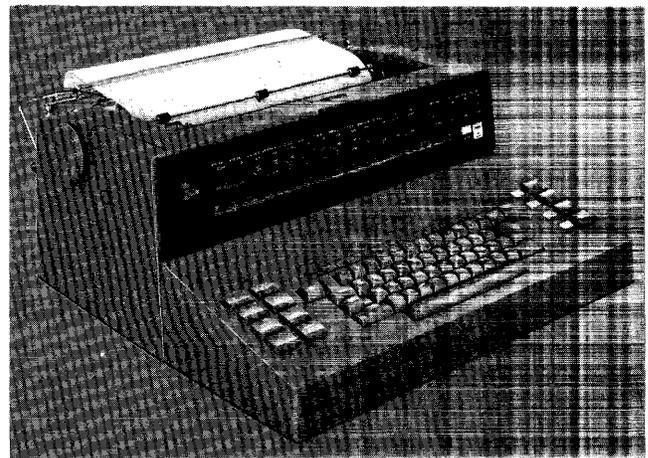


Figure 6. IBM 1052 Printer-Keyboard

cation (monitoring the line), preparing forms in home-loop, and visual auditing of home-loop tape punching.

This is a page printer with printing mechanism similar to that of the IBM SELECTRIC\* typewriter. The paper or form remains stationary during the printing of each line. A single printing element, shaped like a ball, contains the entire set of characters that the IBM 1050 is capable of printing. This element is readily changeable by the operator.

The printer operates in either the normal shift or upper shift mode. This provides 88 printable characters, 44 in each shift. See Figure 44. In addition to the printed characters, the printer responds to the following function codes: space, backspace, carrier (printing element) return and line feed (next line), line feed only, upper shift, normal shift, and tabulate.

The horizontal spacing of the printed characters is either ten or twelve characters per inch, as specified by the customer. Either six or eight lines-per-inch vertical spacing is also available as specified by the customer. Vertical line spacing can be manually set to double space to provide either three or four lines per inch.

Provision is made for printing on cut forms, for feeding and stacking continuous pin-feed forms, and for feeding and manual tearing of continuous roll single thickness paper. Pin-feed platens are available in certain specified widths as a special feature. See 1052 Printer-Keyboard and 1053 Printer-Special Features. Also, a combination stand and stacker for continuous-forms is available for both the 1052 and 1053 as a special feature.

The maximum print line for pin-feed platens is 126 characters at 10 characters per inch spacing. While the maximum print line for friction-feed platens is 130 characters (or 13 inches) at 10 characters per inch spacing. The maximum form width for friction-feed platens is 15 inches.

*Note:* Regardless of the platen type used, or the length of the printing line, one printing position (at the end of each line) must be reserved for the printing of a hyphen character in case a negative answer is received following an EOB and LRC.

An original, plus five carbons, may be printed, depending upon paper and carbon quality and thickness.

Margins, tab stops, and ribbon shift (color) are manually set by the operator. However, automatic ribbon shift and line-feed select is available as a special feature. See *IBM 1051 Control Unit Special Features*.

A signal bell operates when the printing element carrier moves to within twelve character positions from the right margin. A carrier return or tabulation normally suppresses printing. However, when operating in line-loop, if the carrier reaches the right margin without a carrier return, the carrier automatically returns

\* IBM trademark

without suppressing printing during the return operation. This automatic return is a safety feature only and should not be relied upon for normal data field control. Instead the message should contain a CR/LF code at the conclusion of each line. Refer to *Setting the Right Margin Stop (1052 and 1053)* in the *Principles of Operation* section.

Two printers (1052, 1053) are available for the 1050 system. In the 1052, the printer and the keyboard are enclosed in the same cover. The 1053 does not include a keyboard and is used as a receiving-only or auxiliary printer. Both printers are designed for table-top mounting and are cable-connected to the 1051 control unit.

For operator convenience, the component switches, control buttons, and indicating lights for the 1050 system are mounted on the 1052 cabinet (for those models having a 1052). Only those switches are provided to properly control the system with its special features and attached components.

The component switches, control buttons, and indicating lights for the system are located in a separate switch unit adjacent to the printer in systems using a 1053 printer in place of a 1052 printer-keyboard (see Figures 3A and 7).

### Keyboard

Although enclosed in the same cover as the primary printer (see Figure 6), the 1052 alphameric keyboard is electrically connected to the printer. The keyboard is similar in appearance and operation to the standard IBM typewriter keyboard. The 53 keys place at the finger tips of the operator not only 88 different printable characters and symbols, but also the codes and controls necessary for the operation of the system. Seven of the 53 keys are function keys: space, backspace, line feed, carrier return and line feed (CR/LF), tab, shift, and shift lock. Pressing any of these 53 keys generates the code associated with the function or character of the key. When the shift key is pressed, the upshift code is generated; and when it is released, the downshift code is generated. If the lock is pressed, it has the same effect as pressing the shift key. To unlock and generate a downshift code, press the shift key.

By pressing and holding the alternate coding (ALTN CODING) key while also pressing one of the numerical keys, the operator originates a single-character code such as restore, bypass, reader stop, end of block (EOB), end of address (EOA), prefix, end of transaction (EOT), or cancel. All keys are mechanically interlocked to prevent the depression of two or more keys simultaneously, except for the following:

1. Alternate coding;
2. Return key and line-feed key (with each other only);

3. Z key and tab key (with each other only); and
4. the two shift keys (locked together).

*Note:* The alternate coding key must *not* be pressed simultaneously with the numeric key desired. The alternate coding key is pressed, held down, then the numeric key is operated as usual. The alternate coding key is then released.

The output from the keyboard is a six-bit (plus a parity bit) PTT code/6, that is used throughout the system. See Figure 44.

The outstanding advantage of this component is in local source recording. When using the keyboard, the operator can enter data manually to be transmitted to a central terminal, or to be recorded locally on the printer, paper-tape punch, or the card punch.

### 1053 Printer

The 1053 printer (Figure 7) provides printed page output for the 1050 system. The functions of this printer are identical to the functions of the 1052 Printer-Keyboard, and the features are similar.

The 1053 printer is used in those configurations requiring a second printing unit and in those configurations not requiring a keyboard. The 1052 printer-keyboard and the 1053 printer can be separately controlled. The 1053 printer can be a part of any 1050 system configuration on an optional basis.

Controls incorporated in the 1053 are the Tab, Space and Return buttons. Also, provided are the left and right margin stops, plus a set and clear tab key.

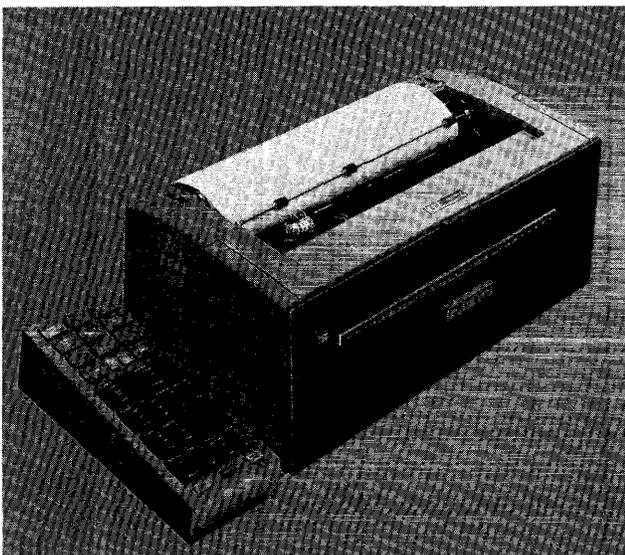


Figure 7. IBM 1053 Printer

### 1052 Printer-Keyboard and 1053 Printer — Special Features

The special features for the 1052 and 1053 are summarized here. A detailed description is contained in the Principles of Operation section.

*Pin-Feed Platen:* Pin-feed type platens are available in various lengths to accommodate forms with pre-punched holes. A special extension platen is required when the vertical forms control special feature is installed.

### 1054 Paper-Tape Reader

The 1050 system provides for the entering of punched paper-tape data during line-loop or home-loop operations through the 1054 paper-tape-reader. This paper-tape reader (Figure 8) can be used alone or in combination with a card reader, programmed keyboard or a second paper-tape reader. Data read from paper-tape can be printed locally (but not punched) while transmitting the same data to a central location.

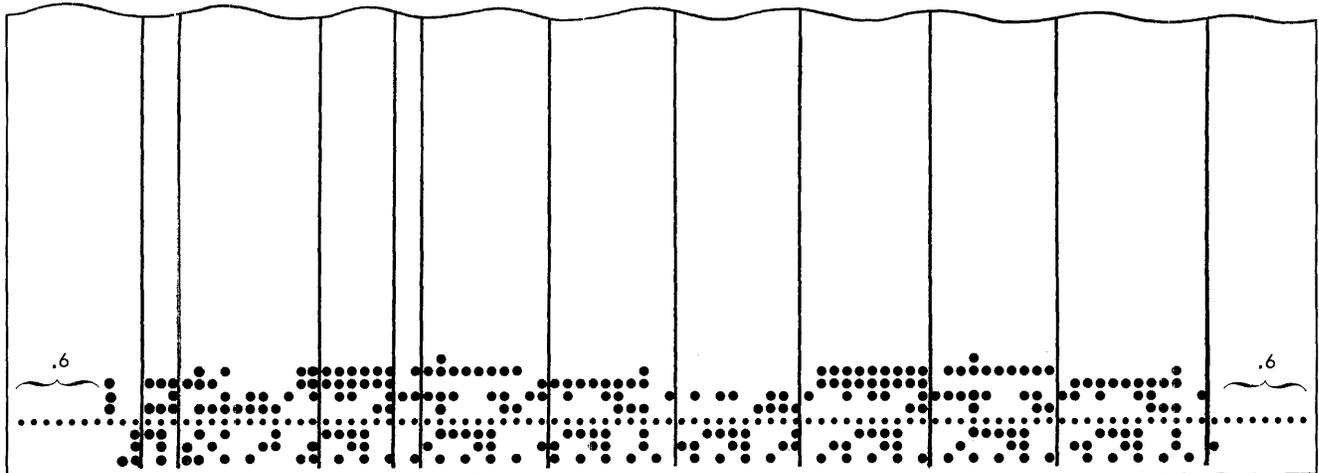
The paper-tape readers are capable of reading chad (fully punched-holes) paper tape, or chad edge-punched documents (special feature). The code is six-bit PTT code/6 with a parity bit (see Figure 44) punched in one-inch 8-track tape or along the edge of a document (Figure 9). Reading is accomplished by sensing pins.

When used with a printer, the paper-tape reader is interrupted by functions such as tab, CR/LF and line feed. The reader is also interrupted by a reader-stop code, by operation of the reader-stop switch, or when the end of the tape is reached. The operator can move the tape manually either forward or in reverse without reading by operating the tape advance wheel.

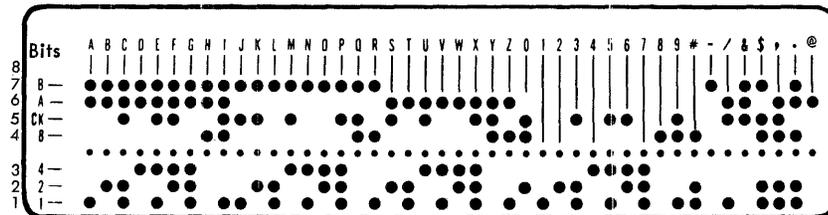


Figure 8. IBM 1054 Paper-Tape Reader

PART NUMBER		PART NAME		MFG. QTY.	SCRAP	STD. UNIT COST	ENG. CHG. NO.	NO.			
PART NUMBER		DATE	REFERENCE NO.	QTY. AUTH.	PART NUMBER	DATE	REFERENCE NO.	QTY. AUTH.			
TR. CODE PLANNED									TR. CODE UNPLANNED		
R=REQUIREMENT									B=BALANCE OR SUM. CARD		
O=ON ORDER									X=MISC. ISSUE		
I=ISSUE									W=CREDIT ISSUE		
D=RECEIPT									A=INVTY ADJ. PLUS		
K=CANC. REQNT									X=INVTY ADJ. MINUS		
C=CANC. ON ORDER									E=MISC. RECEIPT		
REFERENCE DATA				ACTUAL TRANSACTIONS			PLANNED TRANSACTIONS			REMARKS	
PART NO.	U/M	ORDER OR REFERENCE NO.	DATE	T R	RECEIPTS	WITHDRAWALS	ON HAND	REQUIRED	ON ORDER	AVAILABLE	



Tracks



Note

- To insert these records in the IBM 1054 for reading:
1. Turn the record over so that tracks 1, 2 and 3 are at the top (toward the machine).
  2. Insert the right-hand edge of the record from the left side of the machine. The direction of feeding for both the IBM 1054 and 1055 is from left to right.

Figure 9. Edge-Punched Document and Punched Paper Tape

The program-duplicate (PROG-DUP) switch, located on the switch console, selects the reader's mode of operation in the home-loop. In the program mode, a number of functions can be performed. In the duplicate mode, the reader reads all characters, but is not controlled by prefix codes or the reader stop code.

**1054 Paper-Tape Reader – Special Features**

A summary of the special features for the 1054 is provided here. Detailed information concerning these fea-

tures is contained in the *Principles of Operation* section.

*Center-Roll-Feed Reel and Take-Up Reel.* This feature permits feeding from the center of the tape roll, thus reading the tape in the same order punched. Rewinding is also provided for.

*Edge-Punch Read.* This provides for the feeding and reading of edge-punched ledger cards, punched cards, and paper documents.

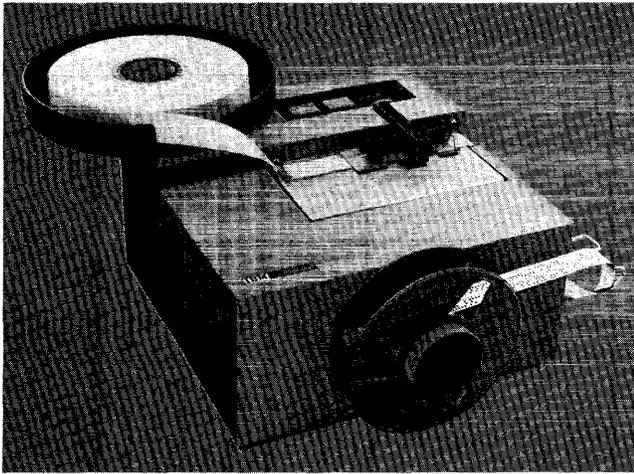


Figure 10. IBM 1055 Paper-Tape Punch

### 1055 Paper-Tape Punch

To further the advantages and flexibility of the 1050 system, paper-tape punches (Figure 10) can operate as another means of output of the terminal. One or two paper-tape punches receive data through the control unit from a central terminal or from the local keyboard, card reader, and/or paper-tape reader. Up to two of these units can be used in a system, or one of these units can be used with a card punch.

The paper-tape punch is capable of punching chad paper tape (holes completely punched) or edge-punched documents having prepunched feed holes (special feature). See Figure 9.

Each paper-tape punch has its individual controls. Each unit operates in the standard fashion, which includes manual backspace and deletion in case of error.

*Note:* The tape punch (or card punch) cannot be used to monitor line-loop operations.

### 1055 Paper-Tape Punch — Special Features

The special features for the 1055 are summarized here. Detailed information on these features is provided in the Principles of Operation section.

*Edge Punching.* This feature provides for the feeding and edge-punching of ledger cards, punched cards, and paper documents containing pre-punched feed holes.

*Take-Up Reel.* The rewinding of punched paper tape is provided by this feature.

### 1056 Card Reader

The IBM 1050 Data Communications System also offers the convenience of punched-card input to a data-transmission line. The card reader can be used as the only reader in the system or as one of two readers in the system. The second reader must be a tape reader (or a programmed keyboard).

The communication terminal with a card reader accepts punched-card data for transmission to remote locations, as well as for printing locally. With the card reader, any punched-card output, using the 1050 character set, can be transmitted readily to the central terminal without converting to another type of input.

The Model 1 card reader (Figure 11), reads 80-column cards singly or from a pack of up to 300 cards, while the Model 2 accepts cards individually. The Model 1 can be equipped with a special feature to permit 22-, 51-, and 80-column cards to be fed in separate packs. For the Model 2, a 51-column feed is available as a special feature to permit the single card feeding of 51-, and 80-column cards.

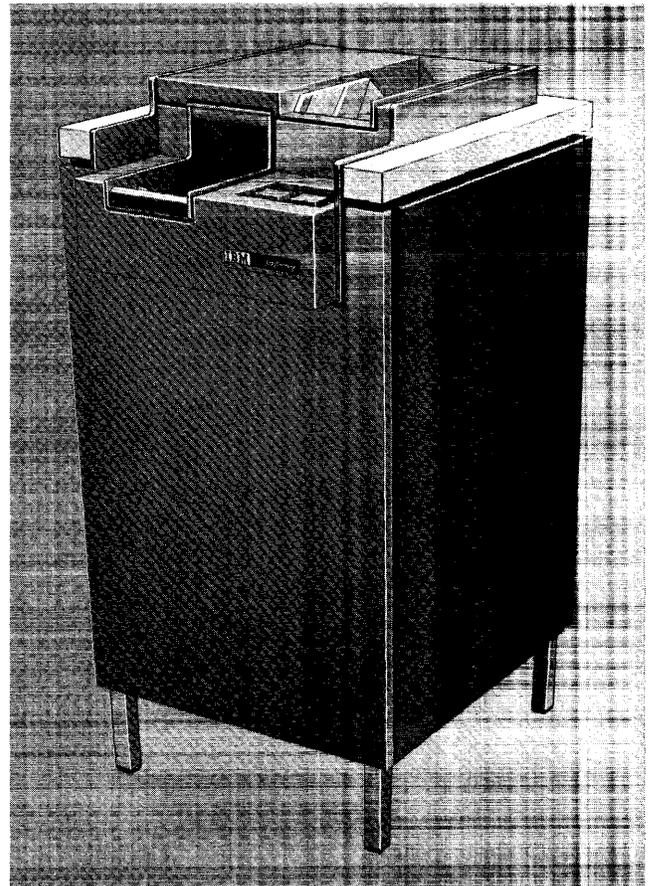


Figure 11. IBM 1056 Card Reader, Model 1

Reading is done serially by column, beginning with column one. Cards to be read by a 1056 must have a standard upper-left corner cut (C-1). Cards without this cut cannot feed properly.

The card reader only operates when a card is at the read station. The operator controls the reader with the reader start-home button, reader start-line button, stop switch, feed button, and the eject button. When operating with a printer, the reader is interrupted by tab, CR/LF, and line feed. The reader is also interrupted by operation of the reader stop switch, or by the end of the last card. The trailing edge of each card causes the EOB code to be generated automatically, unless the Auto EOB switch (1056) is off.

The program-duplicate switch, located on the 1052 switch console, selects the reader's mode of operation in the home-loop. In the program mode, a number of functions can be performed. In the duplicate mode, the reader reads all characters, but is not controlled by prefix codes or the reader stop code.

### 1056 Card Reader -- Special Features

All 1056 special features considered pertinent are summarized in this section. The *Principles of Operation* section contains a detailed description of these features.

*Card Reader Program.* This feature provides a 12-track paper tape and the associated reading mechanism located within the 1056. This tape can be punched with function codes and data, and is read alternately with the card, column for column. Thus, the number of columns of information available from each card is effectively doubled with this feature.

*51-column Card Feed (1056 Model 2 only).* Provides for the feeding of 51-column cards interspersed with 80-column cards.

*Extended Character Reading (1056 Model 1 only).* With this feature, the 1056 can read the PTT code/6 basic and extended card codes and translate them to BCD codes.

*Short Card Pack Feed (1056 Model 1 only).* Provides for the feeding of 22-, 51-, or 80-column cards from a pack of up to 300 cards. Cards of different lengths cannot be interspersed in the pack.

### 1057/1058 Card Punch

The flexibility of the IBM 1050 system is further increased with the addition of a 1057 card punch or a 1058 printing card punch (Figure 12). One or two card

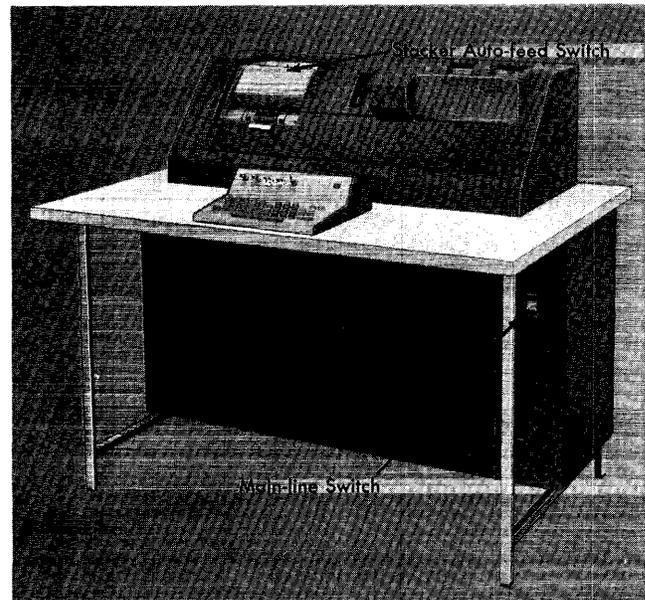


Figure 12. IBM 1058 Printing Card Punch

punches can be used in the system. The addition of a card punch to a system makes possible the direct card punching (and printing) of data received. The punch operates from either the line-loop data channel, the home-loop data channel or it can be used independently as a keypunch.

The punch is similar in appearance and operation to the standard IBM keypunch. 80-column cards are punched at a maximum rate of 14.8 columns per second when the 1057/1058 is used in the 1050 system. Normal keying speeds are attained when operating as a keypunch. Skipping is accomplished at 80 cps, in all cases.

Alternate program is standard for this unit.

### 1057/1058 Card Punch -- Special Features

The following pertinent special features for the 1057/1058 are summarized here but are described in detail in the *Principles of Operation* section.

*Extended Character Punching (1057 only).* With this feature, the 1057 translates upshift and downshift characters into unique card codes and punches them.

*Operator Panel.* This panel is accessible to the operator and permits individual wiring and control of the various function codes.

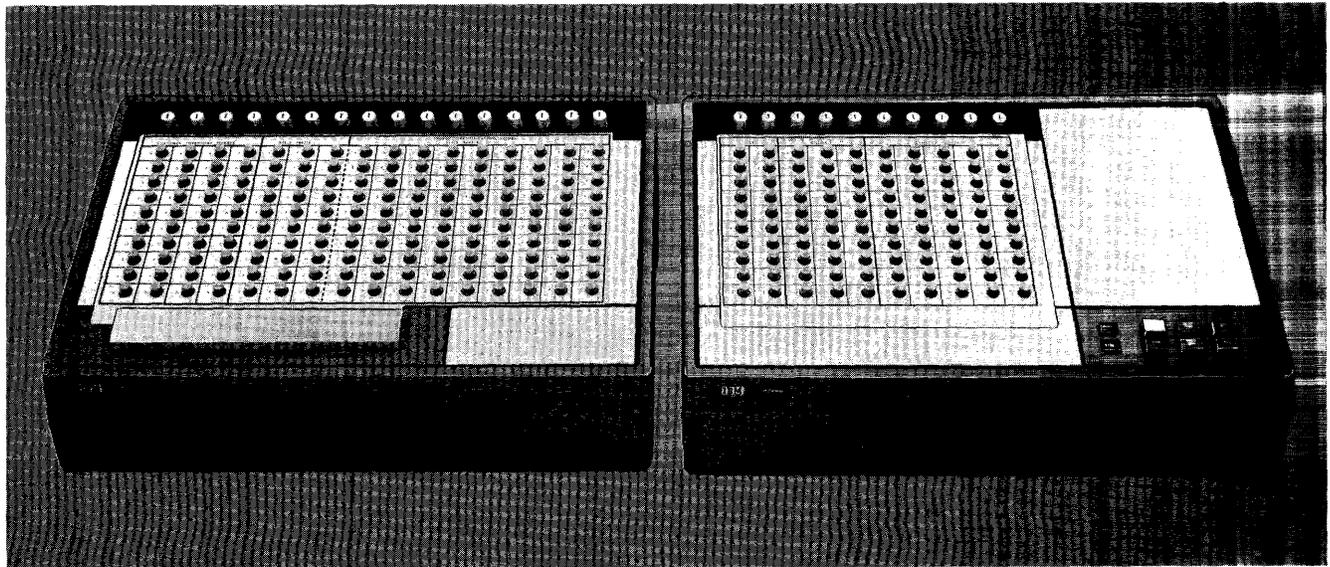


Figure 13. IBM 1092 and 1093 Programmed Keyboards

### 1092 and 1093 Programmed Keyboards

These programmed keyboards (Figure 13) provide for the input of keyed numeric data to the 1050 system for either a home-loop or line-loop operation. When attached directly to a 1050 system, these keyboards are available in the following configurations:

- 1092 alone,
- 1093 alone, or
- 1092 and 1093 in tandem.

All data entered from these keyboards can be visually checked before it is entered into the system, because the data keys pressed (one per column) remain latched until manually restored. Scanning and transmission of the keyed data occurs when the terminal is polled, following pressing of the start button. Transmission is at 14.8 cps from any programmed keyboard configuration, when attached to either a Model 1, 2, or N1 1051 Control Unit. When a keyboard configuration is attached to the control unit, this attachment is made in the reader-1 position. A second configuration

can be attached in the reader-2 position, if desired.

The IBM 1092 and 1093 Programmed Keyboards are similar in design and operation. Their basic difference is in the number of columns of data keys provided by each. Both keyboards are designed to accept vinyl plastic keymats (templates) with prepunched key locations, and lettered with the proper key identification and field designations. The 1092 and 1093 are each available in two models. The 1092, Model 1, provides 15 columns of data keys and keymat ring supports which can accommodate up to ten loose-leaf type keymats. The 1093, Model 1, provides ten columns of data keys and does not have keymat ring supports.

Model 2 of both the 1092 and 1093 provides a sensing unit on the keyboard directly below the data keys. This unit senses up to 48 differently coded keymats which can each be used individually with these Model 2 keyboards. In addition to having this sensing unit, the 1092, Model 2, provides 16 columns of data keys and does not have keymat ring supports. Additional information on these keyboards is available in, *IBM 1092 and 1093 Programmed Keyboards*, Form A24-3266.

## Principles of Operation

The IBM 1050 Data Communications System provides considerable flexibility and versatility for the handling of data-recording and data-transmission applications. To utilize the system capabilities most effectively, it is essential that a thorough understanding of the system be acquired. This should include controls, setup procedures, operating principles, and special features for both the over-all system and the individual components. All of these areas are contained in this detailed information section. In addition, special techniques for the processing of advanced applications are described.

### 1050 System — General Operation

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 (one for home and one for line). Each component required for a specific operation must be assigned to the proper data channel by positioning the associated component assignment switch on the 1052 switch console. In addition, component-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 14. This diagram shows how the system accepts input data from any one of three input units and records output data at any one, or all four output units. To move data into or out of the system, as well as within the system, the data channels must be used. This means that 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-Deserialzer	Character breakdown and assembly to and from the data set
	LRC	Longitudinal redundancy checking
	VRC	Vertical redundancy checking
	Oscillator	Speed control to and from the data set
	Line Control	Communication line discipline for message control

### 1051 Control Unit

The features described in this section are all *standard features* of the 1051 and are provided on the appropriate models. For example, Line Control is provided with Models 1 and 2, while Home Bypass and Restore is provided on Models 1 and N1. The additional features available for the 1051 are described under *Special Features*.

#### Line Control (Models 1 and 2)

The IBM 1050 System transmits and receives in a half-duplex mode in the following line configurations:

1. Point-to-point—1050 to 1050, with the master switch off at one terminal; 1050-to-1050 with line control off at both terminals; or 1050 (with master switch off) to a transmission control unit (and processor).
2. Multipoint—1050 master (master switch on), or a transmission control unit (and processor) to as many as 25 additional 1050 systems. One additional 1050 system can be added to the network when a transmission control unit is used. Thus, the maximum total for 1050 systems in any given network is 26. In a multipoint network, terminals cannot communicate directly with each other. Terminal-to-terminal messages must be relayed through the master terminal or transmission control unit (and processor).

In multipoint operations, or point-to-point operations with a transmission control unit (without dial-up line 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.

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* in the Special Techniques section for exceptions. The codes transmitted during control mode are:

*Control Signals:* EOT, EOA, EOB, Yes, No, and Inquiry.

*Polling characters.* These consist of an alphabetic station-identification character (A-Z) followed by a numeric component-select character (5, 6, 7, or 0).

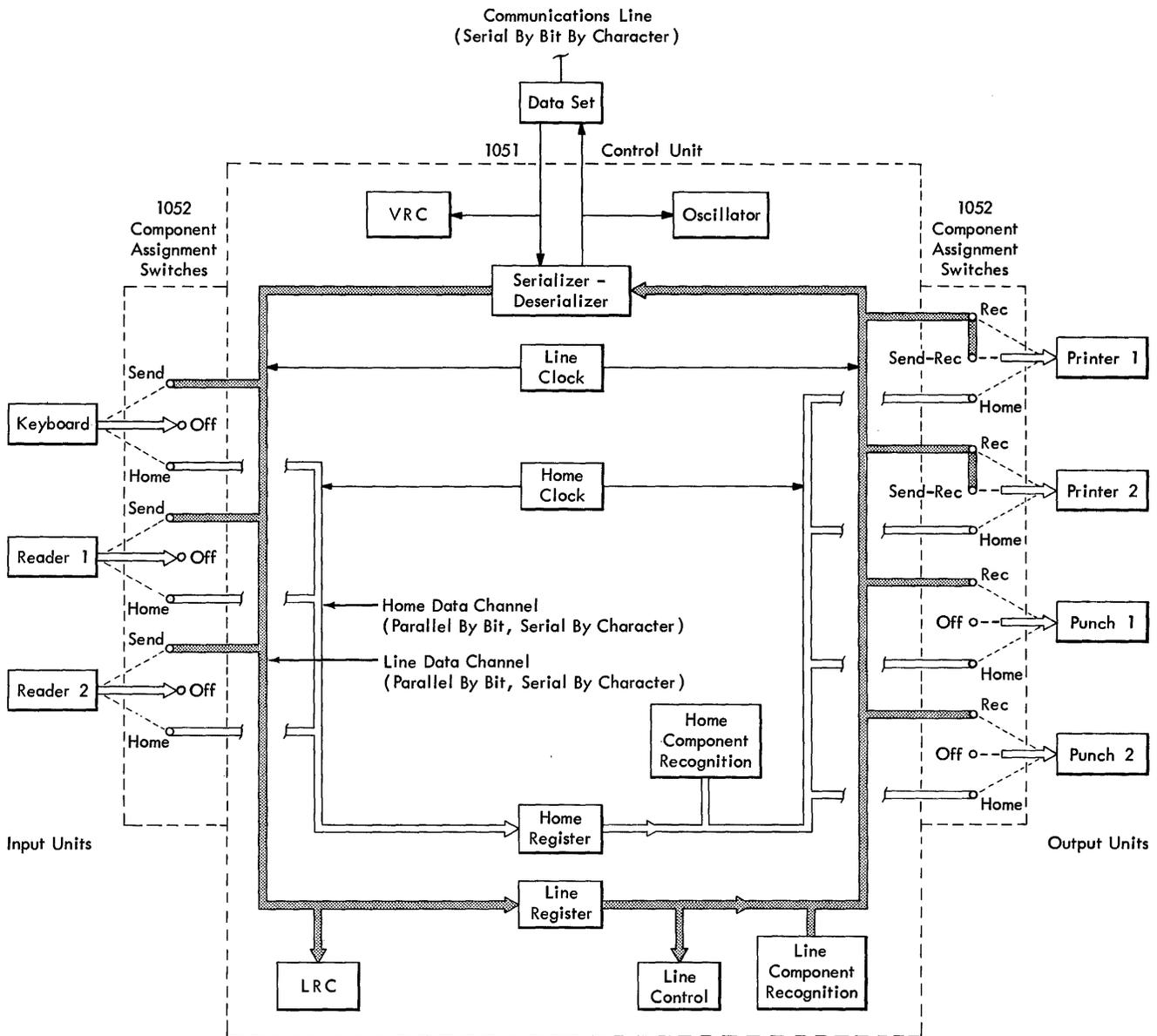


Figure 14. 1050 System Data Flow

The polled terminal is requested to transmit, providing the polled component is ready.

**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, providing the addressed component is ready.

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 these codes refer to Figure 44.

#### Line Control Signals

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

With line control turned off, the **(B)**, **(d)**, **(Y)**, and **(N)** characters retain the functions performed with line control; while **(C)**, and **(D)** are not applicable. The exact meaning of the line control characters is:

**(C)**—*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 and resets the LRC counters at both the sending and receiving terminals. This code is not punched by any receiving components.

**(D)**—*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.

Also, 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 **(D)** 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*).

**(B)**—*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 required. 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 or function panel on the 1057/1058. See *1057/1058 Card Punch—Special Features* in the Principles of Operation section.) The transmitting terminal is halted by the EOB signal and waits for an answer from the receiving terminal.

**(Y)**—*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 **(C)** is treated as a negative response.

*Exception:* A single alphabetic character may be assigned as a response to addressing provided the control system can accept it. (The 1050 master station cannot accept a single

response character.) Response characters are not printed or punched. For exceptions refer to *Multipoint Operation*.

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 **(d)** and **(Y)**, is recognized as a negative answer. It is printed and punched. With line correction, **(N)** or any even-parity character is a negative answer. All other characters except **(Y)** and **(d)** are treated as data characters.

*Note:* When polled, the 1051 automatically generates an EOA signal as a positive response.

**(N)**—*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, **(N)** indicates that the polled terminal has no data to send. Any character or code other than the **(D)**, 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, **(N)** indicates that the block of data just received is incorrect. In this case, the **(N)** character is always printed by a selected and ready printer at the receiving terminal and on a monitor printer if installed. 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, **(N)** is punched.
2. If line correction is installed, **(N)** is not punched, but a hole is punched into the 8th track.

If the punch is a 1057/1058 card punch, **(N)** is not punched regardless of the installation of line correction, and an 11-punch is not punched in column 81.

**(d)**—*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 **(d)** is transmitted by the transmission control unit as a positive answer to an EOB.

All receiving components assigned to LINE are selected and all transmitting components are deselected. This **(d)** character is effective even with line control off.

### 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 address 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 has been received, an EOT code turns off all component motor(s).

When this switch is set to ATTEND, and the 1051 mainline switch is on, all component motors run irrespective of the position of individual component switches.

### 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 is specified by the customer and is wired by IBM personnel at installation time.

*Note:* 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), with the exception of the comma.

This character assignment permits each 1050 system sharing a specific communication line to recognize its unique station identification. When this recognition occurs, this 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 the present transmission is completed.

### Group Addressing

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 systems on any one communication line. However, 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.

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

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

*Note:* If all the receiving units in a group of terminals are not printers or card punches, exercise care to insure that the answering terminal does not transmit the EOB answer until all receive units in the group are ready to receive.

### 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.

*Note:* If all the receiving units in a group of terminals are not printers or card punches, exercise care to insure that the answering terminal does not transmit the EOB answer until all receive units in the group are ready to receive.

### Component Select Characters (Polling and Addressing)

Component selection is accomplished by transmitting a specific numeric character following the station identification character. This character selects the designated station component(s):

#### 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 will take precedence.

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

### Line Component Recognition (Models 1 and 2)

This feature operates with the control unit to provide recognition of input and output units during text transmission.

With this feature, the 1050 system recognizes and acts upon certain 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 a numeric code. The prefix code conditions the control unit to recognize the numeric code that immediately follows it and provides 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 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
0	Reader 2 ON, Reader 1 OFF

When they are 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 termi-

nal before they can receive. Recognized receive components are deselected by a received EOT code.

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 will not be punched or printed by receiving components including a transmitting monitor printer if employed.

*Exception:* Codes will be punched when the terminal is in the bypass mode.

### Character Parity Checking – Vertical Redundancy Check (VRC)

The 1050 system uses the IBM Standard Perforated Tape and Transmission code for 6-bit environments (PTT code/6). This is a six-bit BCD code, plus an odd parity-check bit. Each transmitted, received, or generated character used by the system must contain an odd number of bits (see Figure 44). 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 to 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 (LRC).

*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.

### Longitudinal Redundancy Checking (LRC)

During transmission, each terminal (transmitting and receiving) records the bit structure of each character as it is transmitted.

An LRC counter is started by the transmission of an End of Address (EOA) character which signals the start of a message. The bits of all the characters of the message which then follow are recorded at both terminals until the EOB character is transmitted. This causes the contents of the transmitting terminal LRC counter to be sent to the receiving terminal.

*Note:* The EOB character is included in the LRC count, but the EOA code is not. The EOB character conditions all receiving terminals (and all listening terminals) to recognize the next character as an LRC character only.

At the receiving terminal the two LRC characters are compared. If these LRC characters are equal, a positive answer is sent to the transmitting terminal to turn off the Resend light (this light is turned on when the EOB is transmitted). This permits the transmission of further message blocks. To handle the answer to the LRC compare, both terminals must be momentarily "turned around." This permits the normal receiving terminal to transmit the answer, and the normal transmitting terminal to receive this answer. During this interval the normal transmitting terminal can only receive an answer to the LRC.

If the LRC characters are unequal, the data-check light at the receiving terminal is turned on and a hyphen character is sent to the transmitting terminal. If the transmitting system has the line-correction special feature, three attempts will be made to transmit the message correctly. Without this feature the system stops after the first error. The resend light and data-check light are on (See *Resend* light and also *Line Correction Release Special Feature* in the Principles of Operation section.)

The EOB character can be placed at any point in the text of the message, regardless of the length of message. However, for maximum transmission line utilization, EOB should be at the end of each printing line. For cards, EOB should be at the end of each card. Resetting of the LRC counters at either end of the line is accomplished by the reset key, LRC answer ((y), (n), or (d)), EOT, and operation of the resend key.

LRC is provided only for line-loop operation with both Models 1 and 2.

### Line Bypass and Restore (Models 1 and 2)

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 subsequent restore code is sensed. These codes are effective at both the sending and receiving terminals.

#### 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. the terminal then remains in this bypass mode in which all subsequent characters keyed or read will be punched but not printed. All coded functions are punched but not acted upon. EOB and EOT functions occur.

4. a subsequent 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 (Models 1 and N1)

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

#### Bypass

*Bypass—Program Mode (Prog-Dup Switch Set to Prog).*

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 is placed in a non-print status.
3. the terminal then remains in this bypass mode in which all subsequent characters keyed or read can be 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.
4. a subsequent RESTORE character must be keyed or read to return the terminal to the normal mode of 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 for the EOB and EOT codes, which eject a card from the punch or reader.

#### Restore

This is used to terminate a bypass mode of operation.

*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—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 for 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.

### 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 condition 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.

## 1051 Control Unit — Special Features

### Auto Fill-Character Generation (Models 1 and N1) Home Loop Only

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

In a later transmission of the tape, the idle characters provide the time required for a receiving printer to complete the functions 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:* Idle characters are also punched into tape (only) for the card punch functions of dup, skip and release.

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 tabed to the end of the longest print 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 this same tape is later transmitted. Also, if during this home-loop tape punching operation a short line should precede a long line, the print element must be manually tabed 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 (Models 1, 2, and N1)

This special feature recognizes certain two-character function codes originated by the keyboard or readers and placed on the home-loop or communications line data channel. These 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 this code is printed, and the function is not performed. (The prefix character is not a printable character.)

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 (Models 1 and 2)

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. The reception of text is interrupted by an interlock condition.

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 (Models 1, 2, and N1)

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 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.

### Home Component Recognition (Models 1 and N1)

This special feature provides for the on and off control of all components operating in home-loop.

With this feature the 1050 system recognizes and acts upon two-character recognition codes placed upon 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 provides 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 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
0	Reader 2 ON, Reader 1 OFF

*Note:* With the Program-Dup switch set to PROGRAM, these two-character recognition codes are neither printed or 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.) Also during duplicate mode, all components are controlled only by their respective component assignment switch.

### Home Correction (Models 1 and N1)

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

1. the punch, normal-backspace switch, and
2. the punch delete, punch feed, and correct buttons.

### **Punch, Normal-Backspace Switch**

This switch is used in home-loop operation for error correction 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 now, 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 error information is then overprinted and the correct information is typed beginning at the first character in error.

### **Punch Delete Button**

Operating this button causes the selected tape punch (or punches) in the 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 selected tape punch (or punches) in the 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 along with the CR/LF code when a carrier return is

keyed. This 8th track is punched in 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.

*Note:* 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.

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 will be 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.

If the correct key operation is to be done in the duplicate mode, all components involved in the operation must be selected 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 situation, 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:* 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 delete button 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 when receiving from a reader. This code is *never* punched by any 1057 or 1058.

### Keyboard Request (Models 1 and 2)

The keyboard request special feature renders keyboard polling an efficient and positive operation which demands 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 terminal is polled, it responds with an end of address (EOA)  $\text{\textcircled{D}}$  code. The request light turns off, the keyboard unlocks, and the proceed light turns on.

To extinguish the request light manually, press the line-reset button.

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 the 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 Adapter (Models 1 and 2)

This special feature permits the customer to use his privately owned, on premise communication lines (rather than communications-company lines) for attachment of IBM 1050 systems. This feature provides the necessary modulation and demodulation (see data set in the *Glossary of Terms*) of 1050 signals for communication line operation. This equipment is installed within the 1051.

### Line Correction (Models 1 and 2)

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 and 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. Manual intervention is required. 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 to the stacker. If the answer is negative, the card is recirculated two additional times, if necessary. After the third attempt, 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.)

If the line-correction feature is not installed, the card in the reader ejects to the stacker when an EOB code is sensed. With the reception of a negative LRC answer, the reader remains stopped and operator intervention is required.

*Note:* 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.

### Receiving

When a 1052 or 1053 printer is receiving, a negative LRC compare prints 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.

*Note:* When an error occurs while printing on preprinted forms, format errors result which will effect 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 alternative is to transmit from a 1054 tape reader to a 1055 tape punch, then print from the paper tape in home-loop.

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 last 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.

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 re-addressed at a later interval.

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.

*Note:* 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 also transmitted during line-loop operations.
2. Punched when either the delete button 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 when receiving from a reader. This code is *never* punched by any 1057 or 1058.

#### **Line Correction Release (Models 1 and 2)**

This special feature modifies the line correction special feature for terminals that operate with the system switch in the unattend 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 trans-

mission 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 to the EOB/LRC signal, the line correction release does not operate and manual restart is required.

#### **Master Station (Models 1 and 2)**

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.

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*.

#### **Reader Stop — Prefix J (Models 1 and N1) Home Loop Only**

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. However, 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 (Models 1 and 2)**

This special feature permits attachment to 75 bps telegraph facilities so that lower volume data transmission terminals 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.

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

## Vertical Forms Control (Models 1, 2, and N1)

This special feature provides controls for vertical movement of forms in the 1052 and 1053 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 lines 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.

Vertical forms control is required only at the receiving terminal, but can be installed at both terminals if desired.

### 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 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:

<i>Function Key</i>	<i>Operation</i>
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 tool (pliers 343641) must be used for clamping the large beads in the desired places.

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.

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.

The 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.

Special pin-feed platen widths available for the 1052 and 1053 printers must be used with vertical forms control. Forms up to 17 inches and 12- $\frac{3}{4}$  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.

When a remote terminal is polled, the forms skip must be completed within the transmit time-out (9 seconds). 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 addressing operations, maximum skipping lengths can be used.

*Note:* 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.

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, as well as when the readers are in operation. The reader stops when the form is feeding and starts again automatically when feeding is completed.

### Compatibility

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 is installed, only the selected printer reacts to the function code. In line operation, printers must be selected to react to a function code.

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 print 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 (Models 1 and 2) Optional Feature

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. Therefore, as an *optional feature* this time-out may be suppressed to permit an unlimited period for transmission. 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 *does indeed* terminate the sending operation by transmitting an EOT code.

*Note:* To be effective, there must be no time-out feature at either terminal. Also, this option should only be specified for specialized point-to-point systems.

## 1052 Printer-Keyboard and 1053 Printer

### Controls and Indicator Lights

The number of control switches, buttons, and indicator lights vary according to the model of the system and depend upon the number of input and output components, and the features installed.

*Note:* The following descriptions pertain directly to the controls and lights for a Model 1 control unit. However, the controls and lights for the Model 2 and Model N1 function essentially the same.

IBM 1050 systems using a 1052 printer-keyboard have these controls installed at the keyboard location (Figures 15, 16 and 17) for operator convenience. For systems without a keyboard, the controls are installed in a separate switch unit (Figures 3A, 7 and 18), which is placed beside the printer.

### Switches

#### System, Attend-Unattend (Models 1 and 2) Line-Loop Only

This switch provides for component motor control, and is a part of the line-control feature.

*Attend.* In this position, turning power ON for the system also provides power to all associated component

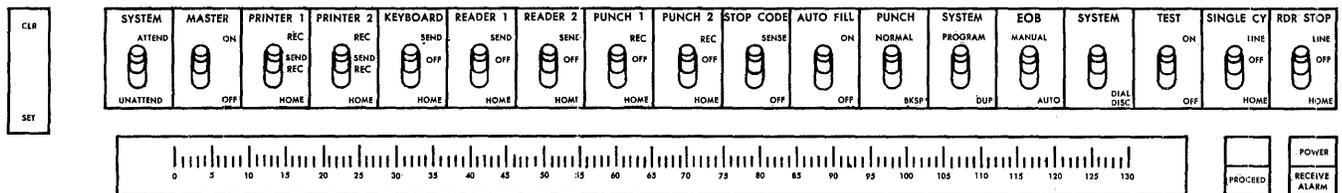


Figure 15. 1052 Switch Panel (for Model 1 1051)

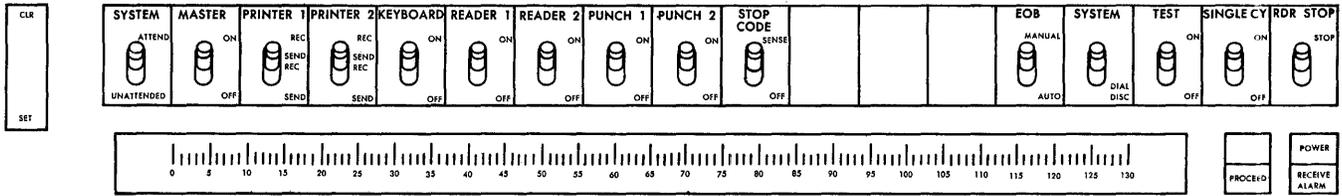


Figure 16. 1052 Switch Panel (for Model 2 1051)

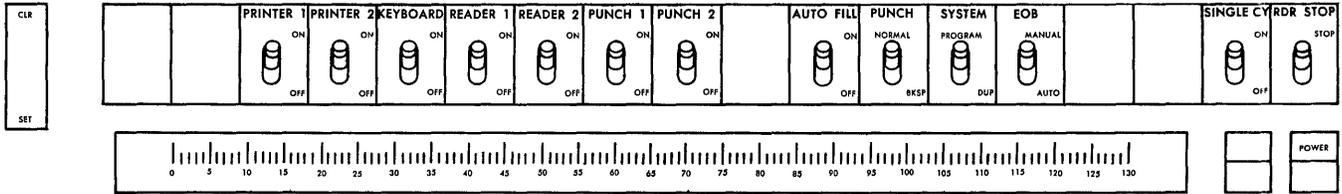


Figure 17. 1052 Switch Panel (for Model N1 1051)

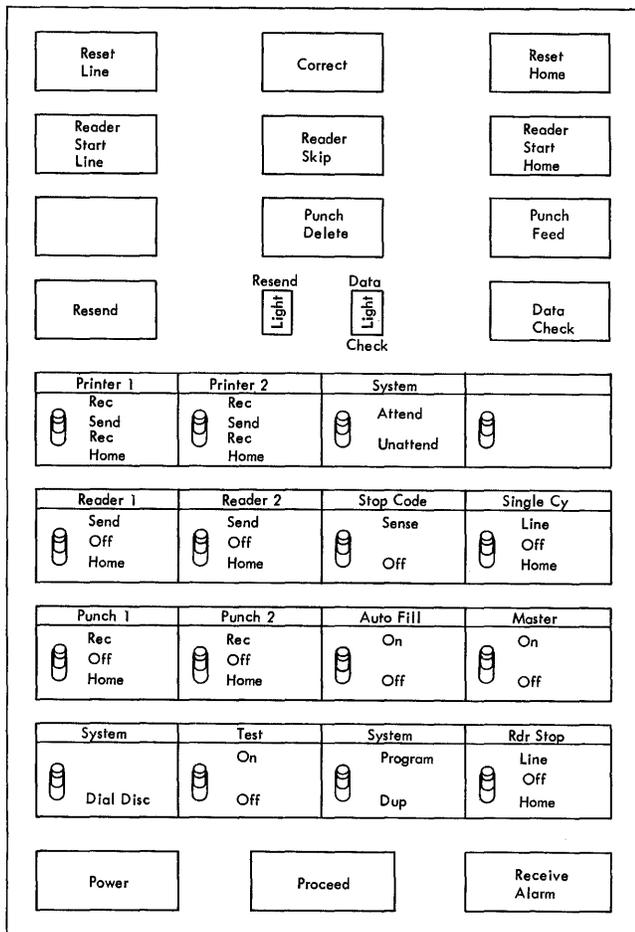


Figure 18. Switch Unit for Model 1, 1051 (required for any system without a 1052. Each model of the 1051 — 1, 2 and N1 requires a different unit).

motors. The main-line switch on the 1057/1058 card punch must also be on.

*Unattend.* With the switch set to this position, the main-line switch for the 1050 must be on. The 1057/1058 main-line switch must also be turned on at this time. In either a polling or an addressing operation, *all* component motors are turned on with a positive response, irrespective of the position of the individual component assignment switches. When a system is addressed, it delays the positive response until component motors are running at operating speed. When polled, a system responds normally but delays transmission of the first bit, of the first text character, until motors are up to speed. After the message has been received, an EOT code turns off all component motor(s). Refer to *Line Control* under Principles of Operation, 1051 Control Unit.

**Master, On-Off (Special Feature — Models 1 and 2)  
Line-Loop Only**

*On.* With the switch in this position:

1. The station becomes a master station, controlling the polling and addressing operations to all other 1050's in either a point-to-point or multipoint operation.
2. Only one station on the transmission line can operate as a master station at any one time. All other stations on the line controlled by the master must operate with their line-control switch on. If one of

the controlled stations has master station capability, its master switch must be set to the OFF position.

3. The master station keyboard is unlocked.
4. The master station operates on a 19.2-second (minimum) time-out for an interruption of text while receiving.
5. The d LRC answer cannot be sent to a remote station from the master station.

*Off.* With the switch in this position, the line-control standard feature is active and the master station special feature is inactive. This switch setting permits the station to operate on either a point-to-point or multipoint line with a transmission control unit, or with another IBM 1050 system whose master switch is turned on. When repositioning this switch from ON to OFF, the line reset button must be pressed. This places the station in a normal starting condition ready to be polled or addressed. The master station functions with the line-control switch positioned to either on or off. When the master switch is positioned to OFF, the station will operate in the mode dictated by the line-control switch position.

*Note:* The line-control switch is located on the CE panel.

In the OFF position, the standard line-control feature is inactive, which permits point-to-point operation when neither station is a master.

In the ON position, the line-control feature is active, permitting point-to-point or multipoint operation with a master station or a transmission control unit.

### Component Assignment Switches

These switches assign the input and output units to a line-loop (send or receive) operation, home-loop operation, or they completely disconnect the units in some instances from the system.

All interlocks for a component are in effect when the component is assigned for operation by one of these switches:

	ALTERNATE, LINE & HOME-LOOP (1051 Model 1)	LINE-LOOP ONLY (1051 Model 2)	HOME- LOOP ONLY (1051 Model N1)
Printer 1	Rec, Send-Rec, Home	Rec, Send-Rec, Send	On, Off
Printer 2	Rec, Send-Rec, Home	Rec, Send-Rec, Send	On, Off
Keyboard	Send, Off, Home	On, Off	On, Off
Reader 1	Send, Off, Home	On, Off	On, Off
Reader 2	Send, Off, Home	On, Off	On, Off
Punch 1	Rec, Off, Home	On, Off	On, Off
Punch 2	Rec, Off, Home	On, Off	On, Off

*Note:* When the keyboard is not being used, its assignment switch should be set to the OFF position. In this position, the

keyboard is locked. Thus, if the keyboard is polled, the terminal will reply with a negative response, indicating the keyboard has nothing to transmit. The transmission control unit and processor can then continue through the polling list.

If, however, this switch is left in the SEND position, the keyboard will reply to the poll with a positive response. The transmission control unit will then wait for a message transmission from the keyboard. Transmission time-outs in both the 1050 terminal and the transmission control unit are involved in this operation causing considerable unnecessary line time, and should be avoided if at all possible. For additional information on timings, see the section on *Timing Considerations*.

When readers or punches are physically disconnected from the 1051, their assignment switches *must* be placed in the OFF position for the correct operation of the system.

*Printer Switch Operation (Terminal Send).* If a printer switch is positioned to SEND-REC or SEND, data transmitted by the 1050 system will be printed by that monitoring printer during transmission. This occurs without the necessity of the printer being recognized with its recognition code. If the switch is positioned to REC or HOME, data transmitted by the 1050 will not be printed.

*Printer Switch Operation (Terminal Receive).* If a printer switch is positioned to REC or SEND-REC, all text data will be printed by the printer(s) that have been selected by the component select characters. See *1051 Control Unit, Line Control—Component Select Characters*.

With the line component-recognition feature, component-recognition codes can control the ON and OFF functions of printer(s) while they are in a text mode. However, all printers used during a message should be addressed (using component select characters) so that the printer(s) are in a *ready* status before the message is sent.

*Note:* The same operation applies to all output units on the system.

### Stop Code, Sense-Off (Models 1 and 2)

#### Line-Loop Only

This switch controls the action of any reader-stop code sensed during line transmission. With the switch set to,

*Sense:* Transmission from the reader to the line is halted by a reader-stop code. The reader-stop code is transmitted.

*Off:* A reader-stop code is transmitted without stopping the reader.

*Note:* Selected receiving punches will punch this code with the switch in either position.

**Auto Fill, On-Off (Special Feature —  
Models 1 and N1) Home-Loop Only**

This switch conditions the system to automatically insert idle characters and feed holes in paper tape (or in cards if the operator panel special feature—1057/1058, is installed and wired). This occurs during the time any of the following printer functions are being performed; tab, CR/LF, or LF.

These idle characters are automatically inserted during any home-loop operation (with the auto-fill switch on) when a printer and a card punch and/or a tape punch, is used as output. When switching from standard program to alternate program (on the card punch), enough idle characters are inserted in the tape to provide the necessary switching time.

Paper tape, thus prepared, can be transmitted to a remote printer without the necessity of a monitor printer at the transmitting end.

*Note:* Idle characters are also punched into tape (only) for the card punch functions of dup, skip and release.

**Punch, Normal-Bksp (Special Feature —  
Models 1 and N1) Home-Loop Only**

This switch is used in a home-loop operation for error correction in paper tape by altering the operation of the backspace key (1052 keyboard). This switch is part of the home-correction special feature.

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

*BKSP (Backspace).* When paper tape and printed copy are prepared simultaneously and a recorded error is detected, the switch is set to BKSP. Pressing the backspace key now 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 error information is then overprinted and the correct information is typed beginning at the first character in error.

**System, Program-Dup (Models 1 and N1)  
Home-Loop Only**

The program-dup switch governs the activity of the home component-recognition special feature, as well

as the home-loop functions of the bypass, restore, reader skip, and reader-stop codes.

*Program* is used when the functions of home component recognition, home bypass and restore, reader skip, or reader stop are to be activated. Also when printer and card punch functions are to be controlled by their respective two-character codes (prefix and alphabetic character). *Dup* is used when paper tape or cards are to be reproduced.

*Program.* When the switch is set to PROGRAM and a two-character component-recognition code (prefix code plus a numeric character) is recognized, the system performs the proper component recognition, but this two-character code is neither printed nor punched. Components recognized in this mode (program) may be turned on or off by their assignment switches without losing their selected status. To be initially recognized, however, components must first be assigned by the proper switch setting.

*Dup (Duplicate).* When the switch is set to DUP, the home component-recognition special feature is inactive, and none of the two-character codes cause component control. (Component assignment is accomplished through manual operation of the assignment switches.) However, both characters of each two-character code is punched and the recognition code is printed (by all active components). Bypass, restore, reader stop, and reader skip cannot be initiated in this mode.

Because the assignment switches control component operation in this mode, two readers can be operated at the same time. However, this situation should be avoided.

**EOB, Manual-Auto (Special Feature —  
Models 1, 2 and N1)**

When this switch is positioned to,

*Manual:* 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 and 5 key) before pressing the return key.

*Auto:* The return key is modified to cause an EOB character to be generated before the CR/LF character. In home loop, the tape punch punches both codes and the card punch ejects the card and punches the CR/LF character in the next card. For line loop, the LRC function is completed before the CR/LF character is acted upon and transmitted.

**System, Dial Disc (Disconnect),  
Models 1 and 2**

This two-position switch provides for an automatic return to neutral from a momentary Dial Disc position. This switch is used to disconnect the line in a point-to-point dial-up line connection. The EOT (C) should be transmitted prior to operating this switch, to prevent printing or punching a hyphen. This can occur because the no-bit pulse transmitted in the disconnect operation is an even parity.

Operating this switch following the end of a message (EOT) releases the terminal from the communication line connection. However, this switch must be operated at both terminals, if both ends of the connection are to be released following the EOT. If the automatic disconnect feature is installed, operation of this switch at either terminal will disconnect the line at both ends.

*Note:* To establish the connection, normal dial-up procedures are used. See the 103-A Dial-up Data Set Procedures in the Appendix.

**Test, On-Off (Models 1 and 2) Line Loop Only**

This two-position switch provides a "wrap-around" feature which permits the terminal to check itself in a closed-loop type operation. With this switch on, the printable characters and all printer function codes are automatically generated internally (63 of the 64 codes are generated, MZ is not generated. Refer to the PTT code/6 chart, Figure 44.) These characters and functions pass through the line-loop data channel, up to the data set attached to the terminal. They are then looped back to permit printing the characters and performing the functions on the printer at the terminal (Figure 19).

To initiate this test operation,

1. Position the test switch ON.
  2. Position the assignment switch for Printer-1 (or Printer-2) to SEND/REC.
- Note:* Printers should not be used in home-loop operation during this test.
3. Position the assignment switch for the keyboard to OFF.
  4. Press the line reset switch to initiate the test.

*Note:* For proper test operation, the master switch should be off, or the Q-character will not print. Also, because the keyboard is not locked during this test, exercise care to avoid operating the keyboard.

•9

mftyLHJ"A  
 :G?'CZP+ =      ← TAB →      K Printed Over Q  
 %EVUWS)/ ±ROB,\*\_3indx@q

Figure 19. Test Pattern.

The EOB function is the last code generated and turns on the resend light. Because all generated codes are added into the LRC counter, this accumulated character q is now printed, and the data-check light is turned on at the completion of a correct test (this is due to an even-parity condition). If a printer is not assigned for printing during this test, a correct test is signaled by the resend and data-check lights on at the completion of the test. Press the reset and data-check buttons to turn off the respective lights and restore the terminal.

**Single Cy (Cycle), Line-Off-Home**

*Line.* With the switch set to this position, the reader assigned to line will single-cycle when the line-reader start button is pressed.

*Off.* This switch position permits readers assigned to line and/or home to operate normally when their corresponding reader start button is pressed.

*Home.* With the switch set to this position, the reader assigned home will single-cycle when the home-reader start button is pressed.

**Rdr Stop, Line-Off-Home**

This switch is a double-throw momentary switch with an automatic return to center (OFF) position. It provides manual intervention to automatic input.

*Line.* With switch set to LINE, the reader stops when transmitting to the line.

*Home.* With the switch set at HOME, the reader stops when operating in the home loop.

*Note:* To restart a reader, press either the reader start-home or the reader start-line button.

**Buttons (Figures 18 and 20)**

**Reset Home**

Operating this pushbutton resets (to a non-operating status) all units that have been selected through home-component recognition. All selected components are de-selected except for the reader plugged into the reader 1 position. This button also resets all 1051 circuitry associated with the home loop.

**Reader Start — Home**

This button is used to:

1. Provide an initial start to the reader, and
2. Restart a reader stopped by a reader-stop code, or by the reader stop switch.

*Note:* Any reader stopped by an interlock condition will restart automatically when the condition causing the interlock is corrected.

To prevent this automatic restart, the reader stop switch should be operated (to HOME) prior to correcting the condition causing the interlock.

After the reset button is pressed, pressing the home-reader start button:

1. Without the home component recognition special feature installed, causes either or both readers to start, depending upon whether they are both ready and assigned (component assignment switches set to HOME). To prevent incorrect reader operation, only one reader should be assigned to HOME at any one time.
2. With the home-component recognition special feature installed,
  - a. causes Reader 1 to start if it is ready and assigned (component assignment switch set to HOME), or
  - b. causes Reader 2 to start if 1 is not ready, and 2 is ready, assigned, and selected (by keying or reading the proper component recognition code with the Prog-Dup switch set to PROC). With the home-component recognition special feature installed, only one reader can operate at any one time.

**Punch Delete (Special Feature — Home-Loop Only)**

This button is part of the home-correction special feature. Operating this button causes the selected tape punch (or punches) in the 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 also located on the tape-punch unit.) Delete codes cannot be punched into cards.

*Note:* With the home-component recognition special feature installed, the punch must first be recognized before punching can start. Without this feature, the punch must only be assigned by proper switch setting. This operation is only necessary when operating the punch delete button on the 1052. This button on the 1055 is always active.

**Punch Feed (Special Feature — Home-Loop Only)**

This pushbutton is part of the home-correction special feature. When operated, it causes the selected tape punch (or punches) in the 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 also located on the punch unit.)

*Note:* With the home-component recognition special feature installed, the punch must first be recognized before punching can start. Without this feature, the punch must only be assigned by proper switch setting. This operation is only necessary when operating the punch feed button on the 1052. This button on the 1055 is always active.

**Reader Skip (Home-Loop Only)**

Pressing this button causes the selected reader to advance over tape or card columns ignoring all codes until it senses a reader-stop, CR/LF, tab or line-feed code. (A reader-stop code must be inserted in the card or tape at the point where the reader-skip function is to start so that a reader skip is only effective following the sensing of a reader stop code.)

When one of these codes is sensed, the coded function occurs, and the reader is restored to a normal reading operation. (Tab, CR/LF, or LF will punch if the components were recognized or assigned prior to the start of skipping.)

If a reader-stop code is sensed during a skipping operation, it is not punched, but it terminates the skip and stops the reader. The reader-start home button

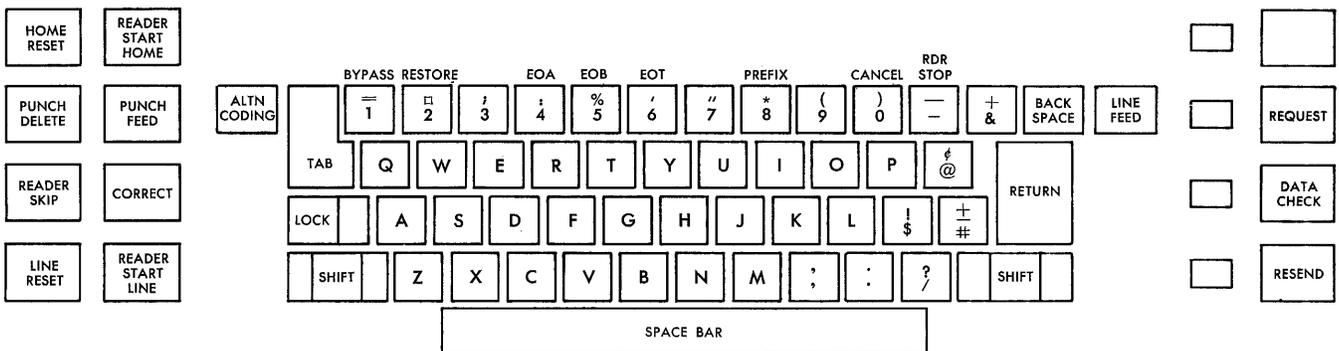


Figure 20. 1052 Keyboard and Controls (Standard Character Arrangement)

must be operated to start the reader. Skipping occurs at the normal reading speed. Refer to the *Reader Stop-Prefix J special feature* in the 1051 Control Unit-Special Features section.

#### **Correct (Special Feature — Home-Loop Only)**

This pushbutton is part of the home-correction special feature. It provides an automatic tape-error correction for data-recording operations when the tape is being punched. The following functions are performed by pressing this pushbutton:

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, or the line correction special feature installed, a punch is placed in the 8th-track along with the CR/LF code when a carrier return is keyed).
3. The tape punch advances over the error item, punching delete codes through the entire error record. (Feed holes are not overpunched in this deleting process.)  
*Note:* The CORRECT button *must not* be operated simultaneously with a keyboard operation, to avoid a failure to punch the 8th track.
4. If data is being recorded from a master tape, the reader will backspace until an 8th-track punch is sensed and normal reading is resumed.
5. If the card reader is being used, the card in the reader will be re-read unless an EOB code or column 80 has been read.
6. Card is ejected from the punch station.

#### **Reset Line**

Operating this pushbutton:

1. Resets (to a non-operating status) all units that have been selected through line-component recognition. All selected components are deselected except for the reader plugged into the reader-1 position.
2. Resets the LRC counter to zero.
3. Resets all 1051 circuitry associated with the line loop.
4. Puts terminal in a text non-selected mode with line control operative.
5. Resets the transmit time-out control.
6. Turns out the resend, receive alarm and proceed lights.

*Note:* The data-check light is not turned off with this button.

#### **Reader Start — Line**

This button

1. provides an initial start to a master station reader, or to a reader in a terminal with line control turned off.
2. restarts a reader which has been stopped by a reader-stop code or by the reader stop switch.
3. restarts a polling reader if text is not received by the master station within its receive time-out. Also, after either a single or the third unsuccessful transmission attempt by the polled station (depending on whether the line correction special feature is installed).

The proper start procedure is to first press the reset button to restore the terminal and automatically select reader-1. Then press the line-reader start button to:

- a. Cause reader-1 to start if it is ready and assigned (component assignment switch set to LINE), or
- b. Cause reader-2 to start if it is ready, assigned, and selected (by the proper component recognition code). The line-component recognition feature permits only one reader to operate at any one time.

*Note:* Any reader stopped by an interlock condition will restart automatically when the condition causing the interlock is corrected. To prevent this automatic restart, the reader stop switch should be operated (to LINE) before correcting the condition causing the interlock.

If the terminal is a master station, the reader start line button restarts a polling reader, after first turning off the data check light. This procedure is used whenever a receive time-out occurs during this type of operation.

#### **Request (Special Feature — Line-Loop Only)**

This pushbutton and associated light initiates a request for polling to permit a transmission from the keyboard. Polling requests from each of the other transmitting units of the terminal are controlled strictly by their respective assignment switches.

When keyboard transmission is desired:

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.

*Note:* The assignment switch for the keyboard must be properly positioned before a keyboard request can be initiated.

When the terminal is polled, and recognizes its address it:

1. Automatically responds with a  $\textcircled{D}$  EOA code.
2. Turns on the proceed light.
3. Turns off the request light.
4. Unlocks the keyboard.

*Note:* If the keyboard assignment switch is not positioned to send, or the request button is not pressed, the polled terminal sends a negative response  $\textcircled{N}$ .

Pressing the line-reset button when the request light is on:

1. Turns off the request light.
2. Drops the terminal from request status.

#### Data Check (Line-Loop Only)

This pushbutton and associated light is operative during line-loop operation. The light is turned on:

1. At both the sending and receiving terminals when an LRC error is detected.
2. When a VRC error occurs at the receiving terminal.
3. With a dial-disconnect procedure at the remote terminal, unless an EOT code is transmitted first.
4. When power is switched on.
5. When the master station times-out in receive mode.
6. Following a negative response or no response at all to addressing at the master station.
7. When an interlock condition occurs at a receiving terminal.
8. Following a completed correct test pattern after operation of the test switch.

The data-check light is only turned off by pressing its associated button.

#### Resend (Line-Loop Only)

This pushbutton and its associated light is used during LRC block checking.

The resend light turns on at the transmitting terminal when the EOB character is transmitted and the reader is halted. The EOB character requests the receiving terminal to acknowledge correct receipt of the transmission.

The resend light turns off and the reader restarts upon receipt of a positive answer  $\textcircled{Y}$ , which indicates the message was correctly received. If the message

contains an error, the receiving station sends a negative answer  $\textcircled{N}$  to the transmitting terminal. The data-check light is turned on at both terminals and the resend light at the sending terminal remains on. In this case, operator intervention is necessary, and the lights must be turned off manually.

If the line-correction special feature is installed, the resend and data-check lights are automatically turned off after the first and second attempts.

After a third transmission with error indication, the data-check light comes on, the resend light remains on, and the transmission is halted. Operator intervention is then required, and the lights can be manually extinguished by pressing their respective pushbuttons. Pressing the resend button also resets the LRC counter. (When the resend light is on, a positive answer to a poll is inhibited, but a positive answer to addressing is not.)

If an LRC answer is not received at a remote terminal, pressing the RESEND button unlocks the keyboard (if it was polled) and permits further keying. The readers may be started by operating the line-reader-start button.

#### Keys (Figure 20)

Eight of the keys at the top of the 1052 keyboard are assigned function codes in addition to their normal-shift and upper-shift character assignments. These function codes (bypass, restore, EOA, EOB, EOT, prefix, cancel and reader-stop) are keyed by pressing the associated key for the desired code, while holding down the ALTN CODING key.

Reference to all but the cancel code is found in the following sections:

Bypass, Restore:	Home Bypass and Restore; Line Bypass and Restore
EOA, EOT, EOB:	Line Control
Prefix:	Home-component recognition; Auto Ribbon Shift & Line Feed Select Line-Component Recognition Card Punch Functions
RDR Stop:	Stop-Code Switch

The cancel code is an *even* parity character to notify the receiving terminal that this message is in error and should be ignored. The printable character for the cancel code is the hyphen (-). An EOB code should be keyed directly following the cancel code.

*Note:* The alternate coding key must *not* be pressed simultaneously with the numeric key desired. The alternate coding key is pressed, held down, then the numeric key is operated as usual, then the alternate coding key is released.

## Lights (Figures 15, 16, 17, and 18)

### Receive Alarm (Line-Loop Only), for Systems with Receiving Components

When on alone, this light signifies that at least one of the receive units is not assigned or is not in a *ready* status (lacks forms, cards, tape, power, or taut tape or card jam condition) causing an interlock when the 1051 main-line switch is turned on. This light turns off when the non-ready status is corrected.

*Note:* For additional information, refer to *Receive Interlocks* in the 1051 Control Unit section.

### Proceed (Line-Loop Only)

This light turns on when:

1. A positive response to polling is received. It turns off when an EOT (c) is transmitted, or when a (d) is received as an LRC answer.
2. The line connection is established on a dial-up line, with line control turned off on both 1051's.
3. The mainline power switches are turned on at each terminal in a point-to-point connection with permanently attached communication lines.

### Power

This light remains on as long as the mainline switch is turned on.

## Printer Controls (Figures 20 and 21)

*Line Feed Key.* Press this key to vertically line space the platen.

*Backspace Key.* Press this key to cause the print-element carrier to move one space toward the left margin. It is necessary to successively press and release this key for each space required.

*Shift and Shift Lock Keys.* Press either shift key to position the print-element for upper-case printing. To hold the print-element in upper-case shift, press the shift lock key. If the print-element is presently locked in upper case, pressing the shift key returns the print-element to lower-case shift.

*Note:* For a system with a 1053 printer and without a 1052 printer keyboard, case shifts must be generated from either a reader or from the line.

*Left and Right Margin Set Levers.* These levers provide for positioning the left- and right-margin stops.

To change these stops:

1. Turn the mainline switch on (located on the side of the 1051).
2. Move the print-element carrier to the center of the line by pressing either the space bar or the tab key.
3. Turn the mainline switch off.
4. Lift the top cover and tilt the hinged switch-panel toward the operator.

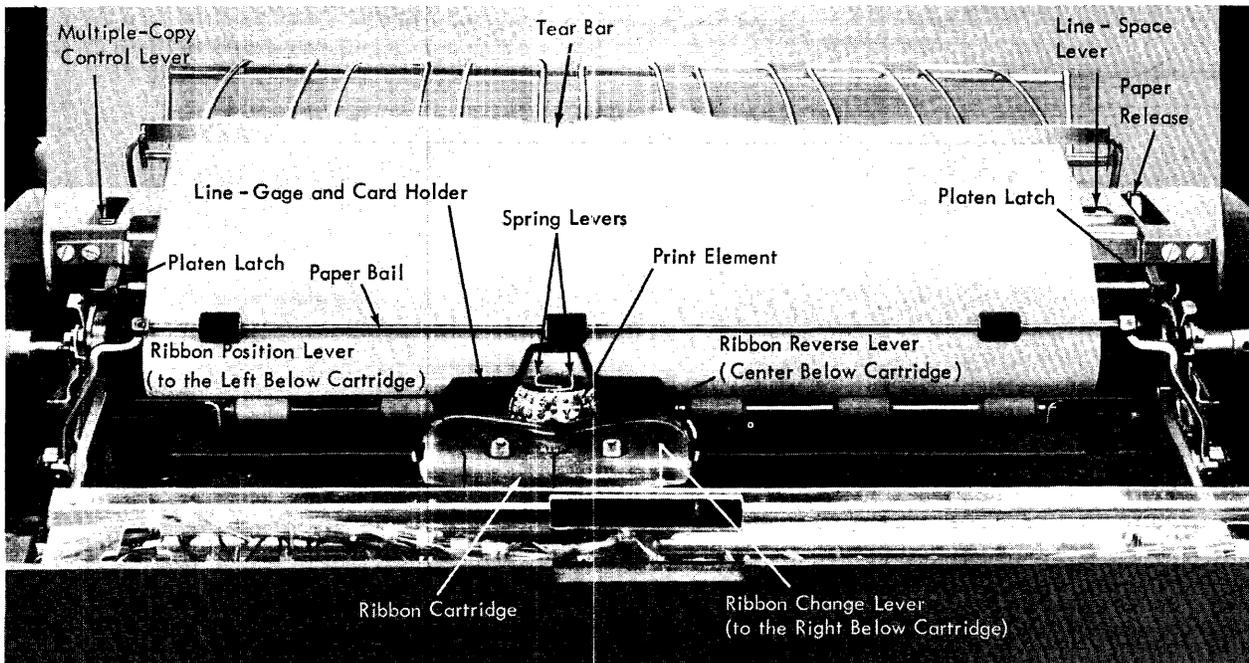


Figure 21. 1052 and 1053 Printer Controls

5. Press the blue margin-indicator toward the platen and slide to the new location.

The exact position of the margins is always shown at the front of the unit by means of two blue indicators and the visible margin guide. The white indicator shows the position of the print-element carrier.

*Note:* If the right margin is reached for any reason (printing, tabbing, or spacing) during a line-loop operation, an automatic carrier-return is initiated and printing on-the-fly occurs. To prevent this, a programmed carrier-return must occur before the right margin stop is reached. A monitor printer must be used at the sending terminal or fill characters must be placed in the message to provide sufficient time for the CR/LF function. During all home-loop operations, the readers and keyboard are interlocked to prevent this. For further information, refer to *Setting the Right Margin Stop*.

**Paper Release.** When this lever is moved toward the operator, it releases the roller tension from the platen, permitting removal or repositioning of the paper. This lever must remain in the release position when using a pin-feed platen.

**Paper Bail and Bail Lever.** Moving the bail away from the platen, by use of the bail lever, permits insertion of paper. When in position, the bail holds the paper against the platen.

**Line-space Lever.** This lever controls vertical line spacing of the platen for either single or double line spacing.

**Multiple-Copy Control Lever.** This lever provides for adjusting the print element to platen clearance for best printing results with single or multiple-copy forms. Set this lever to the second mark for a three-carbon form and to the third mark for five-carbon forms.

**Platen Variable.** Pressing the left platen knob inward permits the platen to be rotated freely. This should be used to adjust the typing line as well as to relocate a line when re-inserting a sheet for a correction or an addition.

*Note:* For a pin-feed platen, the right platen knob must be pressed inward to permit the platen to be rotated freely.

**Line Gage and Card Holder.** This guide aids paper insertion by providing a center guide-line and side calibrations for proper horizontal and vertical alignment. This guide is also designed to hold small cards in position for typing.

**Ribbon-Reverse Lever (see Figure 36).** This lever permits the operator to reverse the direction of the ribbon prior to the end of the ribbon. The ribbon *automatically* reverses when either end of the ribbon

is reached. This lever is black and located directly below the center of the ribbon cartridge and slightly in front of it.

**Ribbon-Position Lever (see Figure 36).** This four-position lever (left to right) permits the ribbon to be positioned so that either the bottom (red), middle (red-black), or top (black) section of the ribbon is used. The fourth position (extreme right) is used for stencil operations. Periodic repositioning of this lever extends the life of the ribbon and permits the used portions of the ribbon to be re-inked. This lever, which is black, is located directly below the left-center of the ribbon-cartridge and slightly in front of it.

With a two-color ribbon on the printer and the automatic-ribbon shift and line-feed-select special feature installed, manually position this lever to the third position from the left. This permits use of the black portion of the ribbon in downshift and use of the red ribbon for upshift.

**Ribbon-Change Lever (see Figure 36).** Moving this lever to the extreme right lifts the ribbon guide and permits easy removal of the ribbon and ribbon cartridge. This lever is black and located directly below the right center of the ribbon cartridge and slightly in front of it.

**Tab Key.** Pressing this key moves the print-element carrier to the next tab stop to the right.

**Set and Clear, Tab Control Key.** Pressing the SET portion of this key (after the carrier is properly positioned by using the space bar) positions a tab stop. Pressing the CLEAR portion of this key (when the carrier is positioned at a tab stop) clears this tab.

**Space Bar.** Pressing this key moves the print element carrier one space to the right.

**Carrier-Return Key.** Pressing this key returns the print-element carrier to the left margin and automatically line spaces to the next printing line.

## Interlocks

The presence of paper is necessary to satisfy interlock circuitry to place the printer in a state of readiness. Lack of paper is indicated by a contact approximately two inches from the print line. Printing will not be interrupted by this action, but will continue until the message block (EOB) is completed. When paper is out, and the printer is addressed again, a negative response will be transmitted.

### 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 will remain locked if an interlock condition (such as a card jam or empty hopper) occurs on the punch.
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 polling address.
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 out).
6. an EOT code is received or transmitted.
7. a 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.
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.
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.
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 general 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 provided the keyboard is selected by a common "zero" poll.
6. executing a carrier return (whether generated or an automatic basis), tab, and line-feed.

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, and line-feed.
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. EOT code is received.
3. after a two-second polling or addressing response timeout.
4. operation of reset button.
5. the 20-second receive time-out ends.

### Setup Procedures

When the 1052 and/or 1053 is used with the system, the procedure is:

1. Turn the 1051 main-line switch on. This causes an automatic systems reset. If the terminal is in a multi-point network that is in use, turning the power on can cause an error on the line. Therefore, it is de-

sirable to have a schedule for turning power on and off for all stations in such a network. However, at all other times, when power is on and prior to the start of another job, press the reset button to reset the system. Refer to *Controls and Indicator Lights*. Following a reset, Reader 1 is automatically selected if the system has component recognition installed for the assigned loop (home or line). Line-component recognition is standard for 1051 Models 1 and 2.

*Note:* When a reset occurs, everything is reset except the data-check light. This light is then reset by pressing the data-check button.

2. Verify that the keyboard and printers are set for the correct:
  - a. shift status (upshift or downshift),
  - b. line-spacing (single or double),
  - c. ribbon position (refer to *Ribbon Position Lever*),
  - d. margins and tab stops,
  - e. multiple-copy control,
  - f. print element,
  - g. printing position (print element at the left margin).
3. Check for proper positioning of all assignment and function switches located on the 1052/1053 switch panel. (Refer to *Controls and Indicator Lights* for detailed information on these switches.) The switch position information should appear on the completed operator-instruction sheet for the job.
4. Check 1052/1053 Printers for proper forms, sufficient quantity and proper positioning.

### Setting the Right Margin Stop

Whenever the right margin stop is reached, an automatic carrier-return and line feed function is initiated (however, no CR/LF code is generated). All other system-initiated CR/LF operations are controlled by a programmed CR/LF code. In most situations, if a reader is operating, it will interlock when a CR/LF is initiated. However, in some cases, it is possible to print on-the-fly during a CR/LF operation. The following is a summarization of the CR/LF operation under automatic and programmed situations:

*Home Loop.* The reader is always interlocked for an automatic or programmed CR/LF during home-loop operation.

### Line Loop

1. Programmed CR/LF code.
  - a. If a monitor printer is used at the sending terminal,

and a reader is transmitting, the reader stops during a printer CR/LF.

- b. Without a monitor printer (at the sending terminal), printing on-the-fly will occur at the remote receiving printer unless fill characters (idle codes) are inserted in the tape or card to allow time for the CR/LF to occur.
2. Automatic CR/LF. Printing on-the-fly will occur at the monitor and remote receiving printers if an automatic CR/LF is initiated. An automatic CR/LF is initiated if the right margin is reached without a programmed CR/LF code having been transmitted.

The right margin stop must be positioned so that the distance from the left margin stop corresponds to the maximum line length. When the right margin stop is set too short, an automatic carrier-return and line feed will occur when the print element reaches this stop. If the right margin stop is set too long, the message must contain a CR/LF code at the proper position, otherwise the message format will be altered.

*Note:* The automatic carrier return is provided in the event that the programmed or keyed carrier return (the normal method of returning the carrier) is inadvertently omitted. The automatic carrier return is not to be used as a planned operation.

### Chain Installation (Vertical Forms Control Special Feature)

#### Removal

1. Turn the power off.
2. Lift the top cover, unlatch and lift the forms feed control arm, shown in Figures 22 and 23. (It has two idlers and is located at right end of platen.)
3. Disconnect the connector plug (now exposed).
4. Release the platen latches and lift out the platen.
5. Loosen the sprocket idler by turning the thumbnut about half a turn.
6. Move the sprocket idler about a half inch toward the platen and retighten the thumbnut.
7. Remove the right-hand chain from the idlers and pass it over the platen knob.
8. Pull gently on the chain in a line tangent to the nylon drive sprocket and toward the idlers to free the chain from the switch roller.

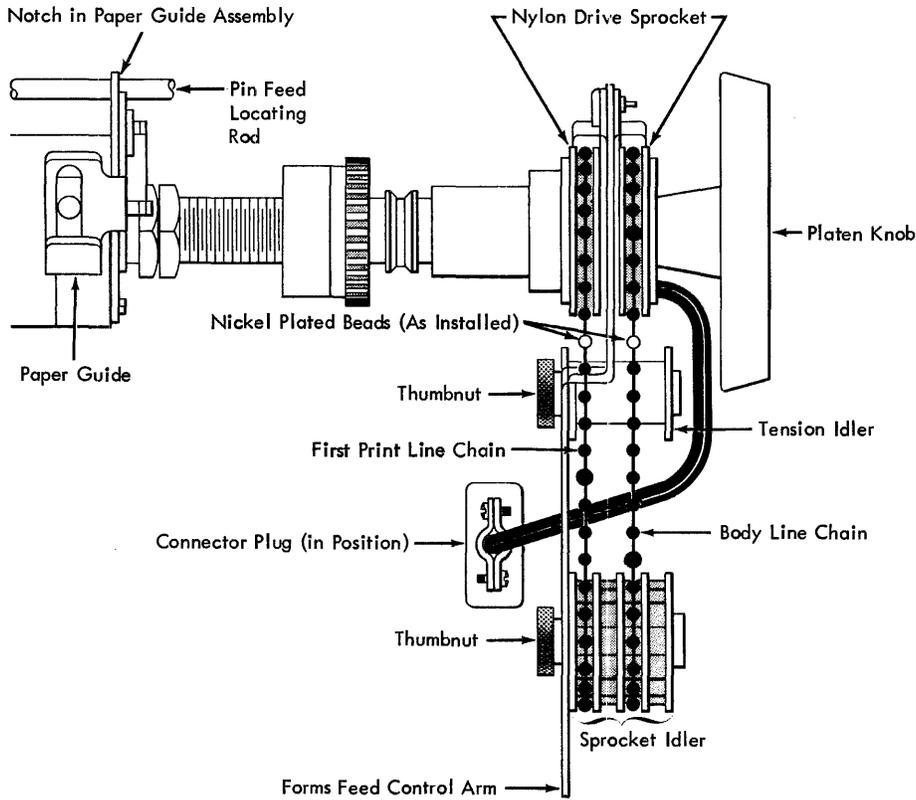


Figure 22. Top View of Forms-Feed Control Device

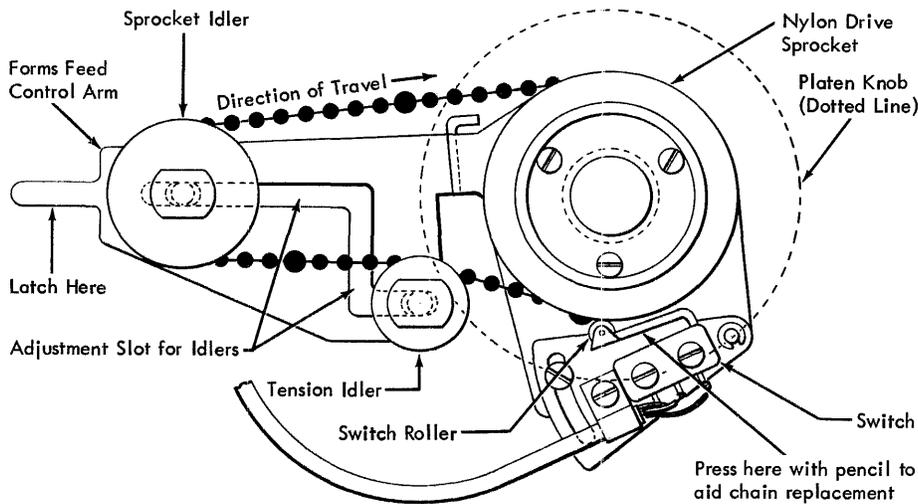


Figure 23. Side View of Forms-Feed Control Device

9. Remove the second chain from the idlers and pass it over the platen knob and the switches in back.
10. Pull gently on the chain in a line tangent to the nylon drive sprocket and toward the idlers to free the chain from the switch roller.

11. Pass the chain over the wire and plug.

*Note:* If the platen is replaced without chains installed and a prefix LF or prefix Space code is received, the printer starts line feeding and continues until the proper reset button is pressed.

## Replacement

Place the platen on the edge of a desk in the position similar to its position in the machine. The proper orientation of the chains may be deduced by comparing the chains to be used with a sample of the form. When in operation the chain moves away from you.

1. Place the first-print-line chain over the platen knob onto the left nylon drive sprocket. Check for the proper direction of travel. (This chain usually has fewer large beads than the body-line chain. To be certain, check against the form.)
2. Pass the plug and wire through the chain so that it is free.
3. The switch is behind and beneath the platen on the left side of the control arm plate between the nylon sprockets. It is operated by a spring roller that rides against the nylon sprocket. The chain must pass between the roller and the nylon sprocket. A convenient way to do this is:
  - a. Hold the chain in tension with your right hand.
  - b. Look over the platen behind the nylon sprocket.
  - c. Push the switch roller down with a pencil so the chain falls into place.
  - d. Be sure that the chain is properly positioned in the sprocket. Each bead should be individually positioned on a sprocket notch.
4. Put the chain on the idlers. If the chains are 12 inches or shorter, they should go over the tension idler and around the sprocket idler. The first-print-line chain goes in the left-hand section of the sprocket idler. The second chain goes in the right center section. If the chains are longer than 12 inches, they go over and around the sprocket idler (the whole chain) and then loop around the tension idler. In this case each chain uses two sections of the sprocket idler. These paths are shown on an instructional decal on the underside of the top cover.
5. Rotate the platen so the nickel-plated bead is visible on the nylon sprocket.
6. Place the other chain over the right-hand nylon drive sprocket so that the two nickel-plated beads are next to each other on the two nylon sprockets. Check for the proper direction of travel.
7. This switch is beneath the platen on the right side of the control arm plate between the nylon sprockets. The chain must pass between the roller and the sprocket. This is accomplished in a manner similar to step 3:
  - a. Hold the chain in tension with your right hand.
  - b. Look over the platen behind the nylon sprocket.
  - c. Push the switch roller down with a pencil so the chain falls into place.
  - d. Be sure that the chain is properly positioned on the sprocket. Each bead should be individually positioned in a sprocket notch.
8. Check the nickel-plated beads for alignment. Adjust the right-hand chain if necessary.
9. Put the chain over the idlers in the same path as the other chain.
10. Adjust the sprocket idler so there is a little slack in both chains. The tension idler can be used for fine adjustment.
11. Replace the platen (if pin feed, the notches in the paper guide shown in Figure 22 must engage the pin feed locating rod behind the platen). The platen latches click when the platen is in place.
12. Replace the connector plug.
13. Latch the control arm down.
14. Turn the power on.
15. Insert the forms and adjust them to the first print line.
16. Align the bead chains with the form by:
  - a. Locating the form on the first print line.
  - b. Holding the platen-release knob in.
  - c. Keying the prefix LF code.
  - d. Releasing the platen-release knob after line feeding has stopped.

The bead chains move to the proper position while the form holds still.

*Note:* If the terminal has a 1053 equipped with vertical forms control but no 1052, the bead chains must be aligned with the form manually. To accomplish this:

1. Position the first print line chain (left-hand) so a large bead is immediately in front of the switch roller (see Figure 23). The roller should rest upon the first small bead behind the large bead (single space line feed is assumed). If necessary, the control arm may be lifted to gain a better view of the switch roller. When replacing the control arm, care must be taken to turn the platen so that no relative motion takes place between the chain, the control arm, and the platen.
2. While holding the platen knob in so that no motion at all takes place at the chains, control arm and drive sprocket mechanism, turn the form to the first print line.
3. Continue with step 17.
17. If the first form is to be used, move the form back at least two lines (below the first print line), guiding the forms behind the platen to prevent slack. An alternative is to move the printing element to the left-hand margin, position the first line of the form on the print line, and omit the initial CR/LF and prefix LF codes.

## Keyboard Operation

The keyboard is designed to provide for operator keying speeds up to 14.8 characters per second. Beyond this speed, a momentary interlock occurs between key strokes to prevent exceeding the 14.8 cps. The shift status of the 1052 keyboard is changed by either reading or keying the opposite shift.

When transmitting to a remote printer, the ribbon-shift, line-feeding and print element status should be 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

The component-recognition codes (home and line) are two-character codes consisting of a prefix character followed by a specific numeric character. The prefix character conditions the 1051 control unit to recognize the numeric character that immediately follows it and thus provides the proper component control. For home-loop operation, keying of recognition codes must be done with the system in the program mode (system switch set to program).

These two-character recognition codes are originated by pressing the prefix key (8) while holding down the alternate-coding key. 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

Through the use of these component-recognition codes, the operator can exercise keyboard control of the units desired for each particular application.

*Note:* Use of the component recognition codes requires: Home Component Recognition special feature (for home-loop operation), and the Line Component Recognition standard feature (for line-loop operation).

In the 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 a remote unit.

## Home-Loop Operation

Component-recognition codes keyed or read in the home loop are effective only when the prog-dup switch is set to PROC. When a two-character recognition code is generated (keyed or read), the particular component control is executed if the assignment switch for that component 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.

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. However, with this switch set to DUP, no component control is executed.

### Line-Loop Operation

When transmitting 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 those units at the sending station only.

An addressing operation should contain the proper component select characters for the receiving units to be used. By including the component select characters with the station address, it ensures that the units will be available for control by component-recognition codes included in the text of the message.

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 the selected printer.

### Keying Bypass and Restore Codes

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 another bypass) keyed or read are *punched* but *not printed*.
4. A subsequent restore character must be keyed or read to return the terminal to the normal mode of operation (read, punch and print).

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.

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 a print status.

### Example of Line-Loop Keying

This example describes the use of component select characters, 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	Component-Select Character
	Yes	Positive response from component
Punch 1 On, A3	On and Ready	Component-Select Character
	Yes	Positive response from component
Punch 2 On, A4	On and Ready	Component-Select Character
	Yes	Positive response from component
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	Component-Recognition Code
A	Print, Punch 1, No Punch 2	Text

MESSAGE RECEIVED TEXT MODE	COMPONENT ACTION	DESCRIPTION
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	
Prefix 4 (Punch 2 On)	No Print, No Punch 1, No Punch 2	Component-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	Component Recognition Code
Prefix 8 (Punch 2 Off)	No Print, Punch 1, Punch 2	Component Recognition Code
F	No Print, Punch 1, Punch 2	Text
G	No Print, Punch 1, Punch 2	Text
H	No Print, Punch 1, Punch 2	Text
J	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 PROC) will operate the same as when received in a line-loop operation.

## 1052 Printer-Keyboard and 1053 Printer — Special Features

### Pin-Feed Platen

A pin-feed type platen, used for feeding forms with pre-punched feed holes, is available for the 1052 and 1053 in a choice of twelve widths. These widths, pin to pin, are: 5-¼", 6", 7-½", 8", 9", 9-¾", 9-¾", 10", 10-½", 11-¼", 11-½", 13-½". The form width must be specified for each pin-feed platen.

The 1052 is equipped for the feeding and stacking of continuous fan-fold forms as long as 15" between folds.

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

## 1054 Paper-Tape Reader

### Controls (Figure 24)

#### Tape Advance Wheel

This wheel permits the operator to feed the tape manually forward or in reverse without reading the tape.

#### Table Release

Pressing this button causes the tape guide to raise, permitting the insertion or removal of punched media (tape or edge-punched documents).

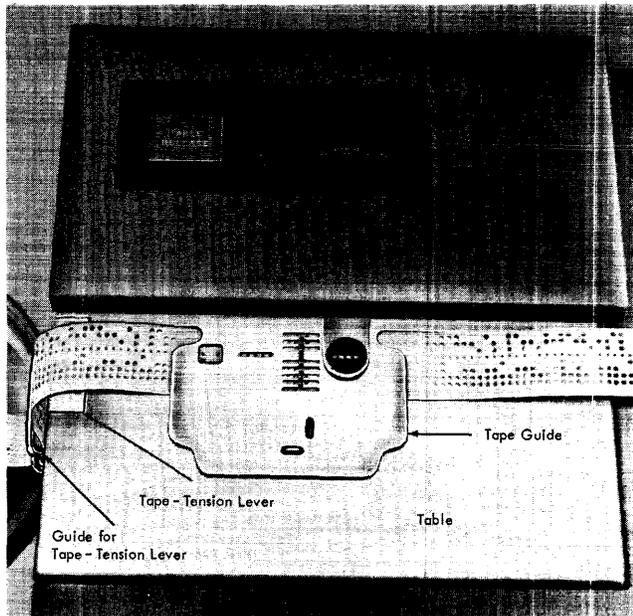


Figure 24. 1054 Controls

### T-D, Tape/Document (Only with Edge-Punch Read Special Feature)

This two-position lever must be set to T to permit the 1054 to read 1-inch tape, or D to permit the 1054 to read edge-punched cards and ledger stock.

### Interlocks

*Tape Presence Contact.* When tape runs out of the reader, this contact is activated to stop the reader. A minimum of 12 idle characters must follow the last punched character to insure 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 (see Figure 24).

When tape is inserted in the 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.

### Setup Procedures

When the 1054 is being used with the system, the setup procedure is:

1. Place tape in tape reader and check for proper alignment of tape. The proper tape insertion procedure is:
  - a. Position the T-D lever with T visible (for tape operation).
  - b. Press the table-release button to raise the table.
  - c. Insert the tape under the tape guide (and also under the guide adjacent to the tape-tension lever) with the tape leader over the sensing pins. These pins are indicated by the red line on the tape guide. The tape should be inserted with the tape leader to the right and the three-track section of the tape toward the back of the reader. (The tape contains three punching tracks on one side of the feed holes and five punching tracks on the other side.)
  - d. Reposition the table by pressing the table down and check that the feed holes are over the feed pins.
  - e. Operate the tape-advance wheel to manually position the first coded column over the sensing pins (as indicated by the red line on the tape guide).

*Note:* The procedure for the insertion of edge-punched documents is the same as for tape except that the T-D lever is positioned with the D visible (for documents).

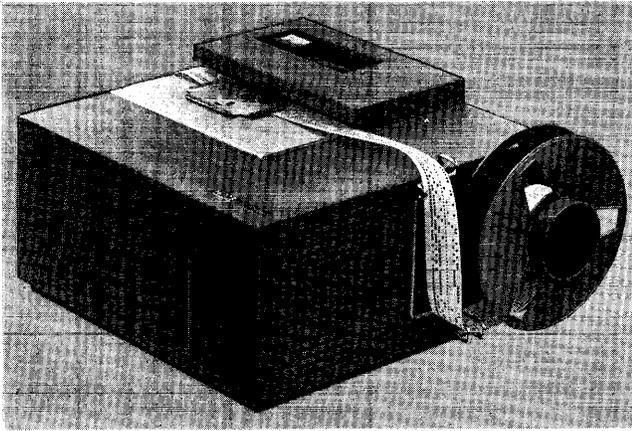


Figure 25. 1054-Tape Insertion

2. Thread the leader end of the tape through the guides (Figure 25) and insert in the take-up reel slot so that the counterclockwise rotation of the reel will properly wind the tape. This reel is a split-reel type with the front removable for easy insertion and removal of tape.

*Note:* To place a reel of punched tape into the center feed reel for reading by the tape reader, position the roll with the three-hole edge up. The inside (leading) end of the tape must be twisted 90° so that the three-hole edge is toward the back of the reader, and then inserted over the sensing pins. Be sure that the tape feed holes align with feed pins.

3. If the reader stops because of the tape-presence contact opening, operate the reader-stop switch to the proper line or home position for the operation before inserting another document or tape.

If this procedure is not followed, the reader will start automatically once the tape table is lowered with another document or tape in position. This could damage the feed holes. This situation is also prevented by sensing a reader stop code or de-selecting the reader just prior to the end of the document or tape.

## Reader Operation — 1054

### General Rules

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

*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).

2. A reader can be transmitting to the line while the second reader is simultaneously operating in a home-loop.
3. 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.
4. A reader, assigned to a home-loop operation, and reading, is *stopped by*:
  - a. 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 will not stop the reader.
 

*Note:* The setting of the stop code switch has no effect in home-loop.
  - b. Positioning the reader-stop switch to HOME.
  - c. Running out of tape.
  - d. A CR and LF, LF, or tab operation on a printer, or a release, DUP or skip on the card punch.
  - e. A taut tape condition.
5. A reader assigned to a line-loop operation, and reading, is *stopped by*:
  - a. Sensing a reader stop code with the stop-code switch set to SENSE. See *Stop Code Switch* in the 1052 Printer-Keyboards and 1053 Printer section.
  - b. Positioning the reader-stop switch to the line position,
  - c. Running out of tape, or
  - d. A taut tape condition.
6. When a reader reads a prefix code followed by the component-recognition code for the alternate reader it will:

### Home Loop:

- a. Stop the reader and transfer reading to the alternate reader if the prog-dup switch is set to PROG, with the home component recognition special feature installed.
- b. Allow the reader to continue reading but punch the prefix code and/or print 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:* Stop the reader and transfer reading to the alternate reader.

## Polling a Tape Reader

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 will remain locked at this time. 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 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 will transmit if it is assigned (component assignment switch set to *SEND*) and *READY*.
2. Reader-2 will transmit if it is assigned and ready when reader-1 is not.
3. The keyboard is unlocked if neither reader is assigned and ready.

## Reader-Stop Code

### Home 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. 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.

*Note:* Check the *Reader Stop — Prefix J special feature* under the 1051 Control Unit — Special Features.

### Line Loop

In this mode of 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*.

## Reader Skip (Home Loop Only)

This operation is effective only after the reader has been stopped by sensing a reader-stop code punched in the tape. After such a stop, pressing the reader-skip button on the keyboard starts the reader advancing, 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 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.

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 (see Figure 8). It also provides a power-driven take-up reel for the re-winding 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 with a minimum thickness of .004 inch and a maximum thickness of .010 inch, including folds.

Documents must be fed singly, except for specified fanfold documents, which can be fed in continuous form. Document size limits (for single documents) are 4.0 inches for minimum length (feeding edge) and 16.0 inches for maximum length. Document width can be a minimum of 2 inches and a maximum of 12 inches, but cannot exceed its length.

*Note:* This feature does not preclude interspersed use of paper tape.

## 1056 Card Reader

### Controls (Figure 26)

#### Eject

Pressing this button on the card reader causes any card in the card path to automatically eject to the stacker. With the Model 1 card reader, the preceding operation will also cause a card from the hopper to move to the read station. During ejection, no reading takes place from program tape or from card, and an EOB is not generated.

With the 1056 feed and hopper empty, pressing the eject button causes the program tape to home at reading speed until the 12-track punch is sensed, then it

continues at high speed (60 cps) to column one. If a card is in the card path, pressing the eject button causes the program tape to home at high speed and the card to eject to the stacker.

#### Feed (Model 1 Only)

Pressing this button feeds a card into reading position from the 1056 hopper. This button is not active during the time the 1056 is operating (reading, feeding, or ejecting). Also, it is not active when the stacker is full.

#### Auto EOB (On-Off)

This two-position switch permits automatic generation of an EOB code from the trailing edge of the card, when on. When off, this switch inhibits the generation of this automatic EOB. The inhibit function exercised by this switch, is effective for both home-loop and line-loop operations. When off, this switch permits any number of cards to be read without the generation of an automatic EOB. The EOB is placed in the last card to properly end the record.

#### Program Tape, On-Off (Special Feature)

This two-position switch is associated with the card-reader-program special feature, and when on, permits normal program tape operation. When off, the program tape is not effective. Refer to Figure 26 for the location of this switch on the 1056 Model 1. The 1056, Model 2, has this switch located inside the right-side cover.

#### Interlocks

The 1056 contains several interlocks to check for proper operation. The most significant of these are:

*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 its being read by the 1056. All cards are placed in the hopper of the 1056, face-down column-one edge first.

*Note:* A card containing an improper corner-cut is removed from the 1056 by pressing the eject button.

*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.

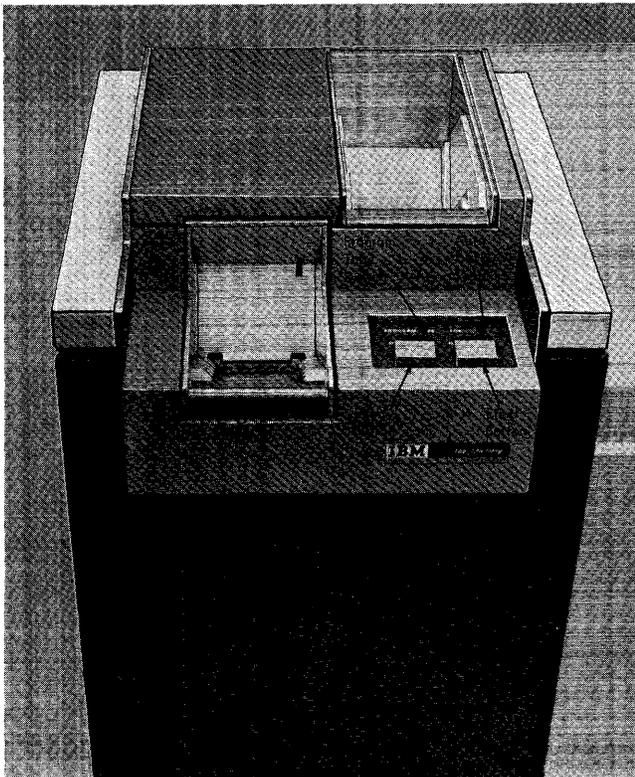


Figure 26. 1056 Model 1, Controls

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

### Setup Procedures

When the 1056 is being used with the system, the setup procedure is:

1. Press the eject button to stack any card which inadvertently remained in the card reader because of improper shutdown of the system. (The 1051 main-line switch must be on at this time.)
2. Install the card reader program tape (if used) in the reader with the column 1 under the brushes with the 1-track toward the machine. Check the on-off switch for the program tape to ensure that it is properly positioned.
3. Place the card(s) in the hopper of the card reader face down, column 1 edge first. After loading a pack of cards, place the card weight on top.  
Press the feed button to move a card into reading position, and thus place the 1056 in a ready status. (The cards stack face up in original order.)
4. Press the reset button on the 1052 to reset the system prior to initiating system operation.

### Installing a Program Tape

When the program tape is changed the power should be turned off. Open the right side of the 1056 for access to the tape reading mechanism. The reader brush assembly is locked in position by the knurled locking rod

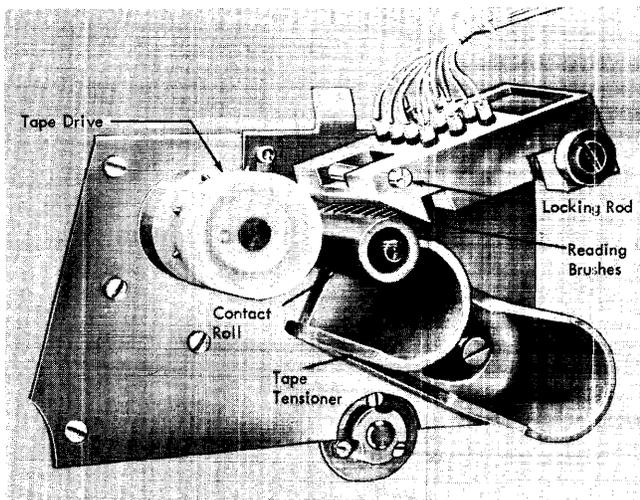


Figure 27. 1056 Program Tape Reader

(Figure 27). Raise the assembly by pulling the rod outwards and lock it in the raised position by releasing the rod. Push the tape tensioner left and remove the program tape. Slide the new tape over the drive and tensioner with tape track-1 towards the machine. For initial alignment, the reference edge (left curved surface on tape tensioner) should be at about column 3-½ to 4 on the program tape. Tighten the tape tensioner by sliding to the rightmost position. Now the reference edge should align with the tape at column 4-½ to 5. Lower the reader brush assembly, locking it in position with the knurled rod. Close the side panel and turn the 1051 main-line switch and the 1056 program tape switch on.

### Reader Operation — 1056

#### General Rules

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

*Note:* Avoid setting the assignment switches for two readers to HOME if the home-component-recognition special feature is not installed. Reader conflict occurs when the home-reader start button is pressed with both readers assigned to HOME (without this special feature installed).

2. A reader can be transmitting to the line while the second reader is simultaneously operating in a home-loop.
3. 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.
4. A reader, assigned to a home-loop operation, and reading, is *stopped by*:
  - a. Sensing a reader stop code when the prog-dup switch is set to PROC. 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.  
*Note:* The setting of the stop code switch has no effect in home-loop.
  - b. Positioning the reader-stop switch to HOME.
  - c. Running out of cards.
  - d. A temporary interlock due to a CR and LF, LF, or tab on a printer, or to a release, DUP or skip on the card punch.

5. A reader assigned to a line-loop operation, and reading, *is stopped by*:
  - a. Sensing a reader stop code with the stop-code switch set to SENSE. See *Stop Code Switch* in the 1052 Printer-Keyboards and 1053 Printer section.
  - b. Positioning the reader-stop switch to the line position,
  - c. Running out of cards.
6. When a reader reads a prefix code followed by the component-recognition code for the alternate reader it will:

*Home Loop:*

- a. Stop the reader and transfer reading to the alternate reader if the prog-dup switch is set to PROG, with the home component recognition special feature installed.
- b. Allow the reader to continue reading but punch the prefix code and/or print 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:* Stop the reader and transfer reading to the alternate reader.

7. Except during an eject operation, the card reader always emits an EOB character at column 81 (if the auto EOB switch is set to auto) 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:
  - a. Stops all reading from the card, as well as the program tape.
  - b. For home-loop operations the card is ejected and stacked, and the next card is fed into reading position.
  - c. For line-loop operations the card is ejected and stacked 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. 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, if necessary.
    - (4) Place the corrected card in the hopper and replace the cards removed in step 1.
    - (5) 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.

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 (when the EOB code is read), stacked, and the next card is fed into the reading position.

The operator must:

- (1) Remove all cards from the hopper.
- (2) Remove the last stacked card and correct, if necessary.
- (3) Place the corrected card in the hopper.
- (4) Replace the cards removed in step 1.
- (5) 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.

8. 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 9-track and located in the corresponding tape column to the card column with the EOB code. 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). Exercise care in eliminating this EOB, because this permits transmitting large groups of cards with only one LRC. When an error occurs, all cards in this group must be retransmitted. Because of this, it is desirable to place an EOB at the end of each card. If the line correction special feature is installed, the batching of cards into multiple card groups is impractical. This is because only the last card (EOB card) is recirculated when an error is indicated.

To send the EOT (C) character from the card reader, it must be sent via a trailer card. With unattended operation the (C) will turn off all component motors leaving the card in the card path. However, when the next polling occurs, the terminal responds positively, the 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

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 cards in 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 a 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 will remain locked at this time. 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 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 will transmit if it is assigned (component assignment switch set to `SEND`) and `READY`.
2. Reader-2 will transmit if it is assigned and ready when reader-1 is not.
3. The keyboard is unlocked if neither reader is assigned and ready.

#### **Card Ejection — Home Loop**

A card is ejected (at 60 cps) to the stacker 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 9-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) to the stacker 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 9-track of the card reader program tape is sensed.
4. an EOT code is read.
5. a positive answer to an EOB/LRC is received (if the line-correction feature is installed).

*Note:* 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**

##### *Home Loop*

If the Prog-Dup switch is set to `PROC`, and a reader stop code is sensed, the reader stops and the code is not punched. 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.

*Note:* Check the *Reader Stop — Prefix J Special Features* under the 1051 Control Unit — Special Features.

##### *Line Loop*

In this mode of 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`.

#### **Reader Skip (Home-Loop Only)**

This operation is effective only after the reader has been stopped by sensing a reader-stop code punched in the card. After such a stop, pressing the reader-skip button on the keyboard starts the reader advancing, passing over punched data until a CR/LF, tab 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 be started again by pressing the reader skip button; reading can be resumed by pressing the reader-start home button.

The 1056 recognizes the IBM card code equivalent of the basic PTT code/6. These codes include the upshift and downshift codes through which additional graphics can be provided. Any card code punched in a card is read, translated and transmitted by the 1056. The resultant translated code may be valid, it may be of incorrect parity, or it may be garbled.

### 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 in error. If the message is still incorrect after the third transmission, the reader stops and manual intervention is necessary. See *Home-Correction* and *Line-Correction* in the section on 1051 Special Features.

### 1056 Card Reader — Special Features

#### Card Reader Program

A punched paper-tape loop, physically the same as that for the 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.

Data punched in the tape can also be read, thereby doubling card capacity (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 the tape is not punched in that column, only one reading cycle occurs.

Controls and data are punched in the tape (Figure 28) as follows:

TAPE TRACK	FUNCTION
1	B-Bit
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

} Data and Function Code Punching (PTT Code/6)

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 to the stacker 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 insure stopping.

*Note:* This valid character is read and acted upon. If no action is desired, use an idle or delete code.

When skipping is stopped with an 11-track punch, the 1056 reverts to normal reading operations; the data in the corresponding card column is read. Skipping can also be stopped by an EOB or EOT code in the tape, a 9-track punch, or by pressing the eject button. In these instances, except for EOB, reading is not resumed, but, rather, the card is ejected to the stacker. When the EOB stops the skip, normal EOB functions apply. Refer to *Reader Operation-1056* in the Principles of Operation section.

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 28):

CARD LENGTH	LENGTH OF TAPE LOOP	DATA COLUMNS	LOCATION OF TRACK 12 PUNCH
80 col.	81 col.	1 through 80	56 through 80
51 col.	54 col.	1 through 51	29 through 51
22 col.	54 col.	1 through 22 28 through 49	2 through 22 29 through 49
22 col.	81 col.	1 through 22 28-49 56-76	2 through 22 29 through 49 56 through 76

With this feature, a switch is provided to enable the operator to make this feature operative when desired.

*Note:* Data that is punched in tape columns beyond the last card column is not read.

#### 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.

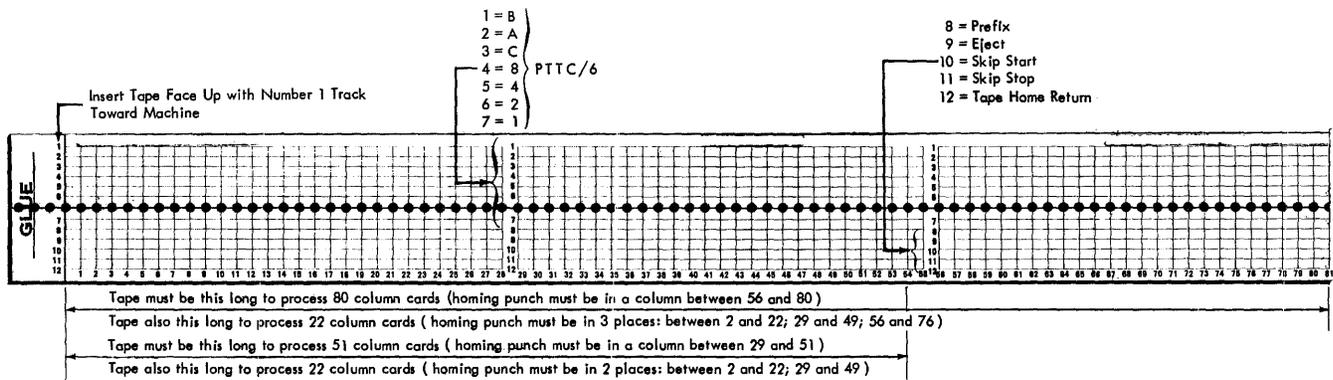


Figure 28. 1056 Program Tape

### Extended Character Reading (1056 Model 1 Only)

This special feature permits the 1056 to read and translate upshift as well as downshift characters punched in the IBM card-code. 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 PTT code/6 (see Figure 44).

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 PTT code/6 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 PTT code/6.

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 (unless the prefix code is punched in the tape and its associated numeric or alphabetic character is punched in the corresponding card column).

*Note:* The standard card code and the extended card code are compatible for line-loop operations due to the identical bit configuration of the characters (see Figure 44). However, for home-loop operations, the card readers and card punches must all be equipped with extended character capability or all be without this capability. A card reader with this extended character reading special feature can however, correctly process cards containing the standard card code.

### Short Card Pack Feed (1056 Model 1 Only)

With this feature, the 1056 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.

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.

## 1055 Paper-Tape Punch

### Controls (Figure 29)

#### Delete

Operating this button causes the tape punch to advance the tape by punching a delete code and a feed hole. Delete codes can be punched continuously by simultaneously pressing and holding down the delete and feed buttons on the associated punch. A punch-delete button is also located on the 052 if the home-correction special feature is installed.

#### Feed

Pressing this pushbutton causes the tape punch to advance the tape by punching idle characters and feed holes. Holes are continuously punched by holding the button in the operative position. A punch-feed button is also located on the 1052, if the home-correction special feature is installed.

#### Tape Advance

This wheel permits the operator to feed the tape manually forward or in reverse without punching the tape.

*Note:* If tape is moved forward, exercise care because no feed holes will be punched.

#### Document Pressure Lever

This lever is located to the left of the punch station. During tape punching this lever is manually positioned

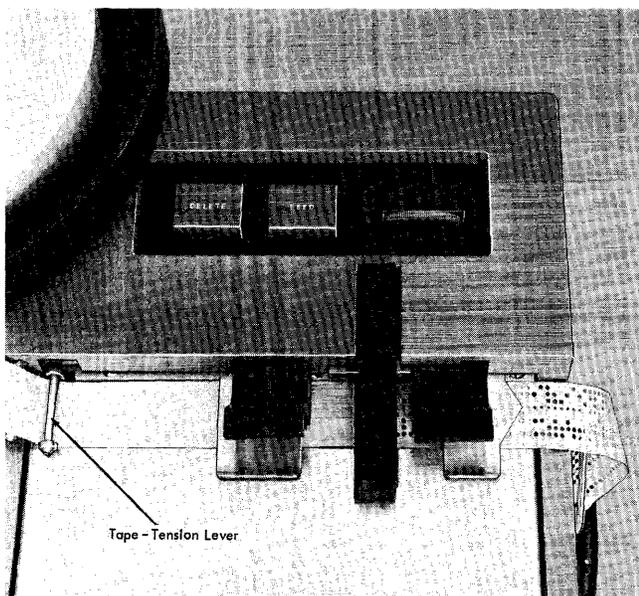


Figure 29. 1055 Controls

to its left most limit so that it is not effective. For document punching, this lever is moved to the right. It must remain in a raised position until after the document is inserted, then lowered to an active position.

#### Tape Pressure Lever

This lever is located to the right of the punch station. During both tape punching and document punching, this lever is in a down position (active). However, when tape is inserted, this lever must be raised until the tape is properly positioned, then lowered.

#### Interlocks

Protective features 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. 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.

#### Setup Procedures

When the 1055 is being used with the system, the setup procedure is:

##### FOR TAPE

1. Place a blank reel of tape in the tape supply pan and properly thread the tape through the guides.
2. Move the document pressure lever to the left so that it is ineffective for tape operations.
3. Pivot the tape pressure lever up.
4. Take the leading end of the tape from the supply pan and thread the tape with the outer surface of the tape up for punching.
5. The tape should pass under the tape-tension lever, the die, and the tear guide.
6. The tape is then threaded around the guides (Figure 30) on the side of the unit and inserted in the take-up reel slot to permit counterclockwise winding of the tape.  
*Note:* The tape reel is the split-reel type to permit easy insertion and removal of the tape.
7. Lower the tape-pressure lever.
8. Press the feed key to punch several inches of tape with feed holes and idle characters. This permits self-aligning of the tape for proper punching registration.

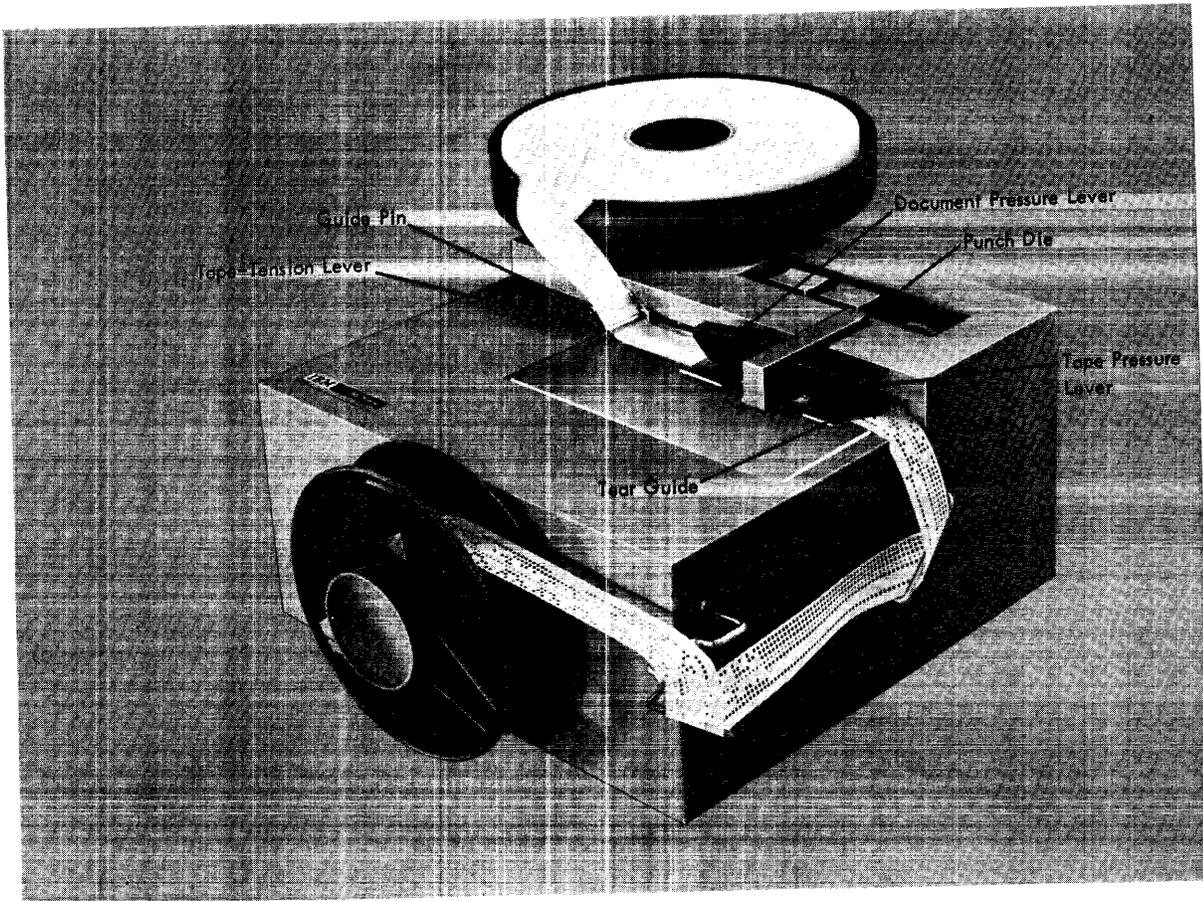


Figure 30. 1055-Tape Insertion

#### FOR EDGE-PUNCHED DOCUMENTS

1. Move the document pressure lever to the right and pivot up so that the document can be inserted.
2. Insert document from the left toward the right with the top edge of document against the registration rail, and the right edge of the document under the die and firmly against the stop which is located here.
3. Lower the document pressure lever onto the document. All feed holes in the document must be pre-punched, because no feed holes are punched by the tape punch during document punching.

### Punch Operation — 1055

#### Automatic Tape Delete

This operation requires either the home-correction special feature or the line-correction special feature. See *Home-Correction* and *Line-Correction* in the section on 1051 Special Features. 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 8-hole 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, punching delete characters until the track 8-hole punched by the CORRECT button is passed.
3. In a *communications-line 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. This is followed by a re-read operation at the transmitting tape reader.

## 1055 Paper-Tape Punch — Special Features

### Edge Punching

This special feature permits documents with pre-punched feed holes to be fed and punched (chad type) by the paper-tape punch. Documents can be paper, punched card, or ledger stock with a minimum thickness of .004 inch and a maximum thickness of .010 inch, including folds. Document size limits (for single documents) are 4 inches minimum length (feeding edge), and 16 inches maximum length. Document width can be a minimum of 2 inches and a maximum of 12 inches, but cannot exceed its length.

The length of continuously-fed fanfold documents must be evenly divisible by .100 inch for proper registration. The first feed hole must be .050 inch from the leading edge of the document. Documents greater than 8 inches long cannot be punched within .6 inch of the leading and/or trailing edges (leading edge of first and trailing edge of last with continuously-fed fanfold documents). See Figure 9. The direction of feed for all documents must be identified by printing, corner cut (on corner away from punching), or some other identification.

*Note:* 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.

## 1057/1058 Card Punch

### Controls (Figure 31)

#### Auto-Feed

When on, this two-position switch permits the punch to automatically feed another card when column 81 of the card passes the punching station. At the same time, the card in the left card bed is stacked, the one in the center is registered at the reading station, and the one at the right is registered at the punching station. This automatic feeding occurs when column 81 of the card passes the punching station by any one of the three possible operations: punching, skipping, or releasing. See *Stacker Auto-Feed*.

#### Auto Skip, Auto Dup

When this two-position switch is turned on, the program for automatic skipping and automatic duplicating is effective. When this switch is turned off, the 11 (start automatic skip) and 0 (start automatic duplication) codes in the program card are nullified.

Automatic skipping proceeds at the rate of 80 columns per second; automatic duplicating, at 20 or 18 columns per second, depending upon whether the punch is a 1057 or 1058.

#### Main Line

This two-position switch (see Figure 12) must be turned on for the punch to operate either with the 1050 System, or as an independent punch.

#### Print (1058)

When this two-position switch is turned on, the character is printed, above each column, as the respective character is punched. This provides for a full 80 columns of interpreting.

#### Keypunch; Autopunch

When this two-position switch is set to **KEYPUNCH**, all the normal keypunch functions are available. On **AUTOPUNCH**, the punch is under system control (assignment switches, component-recognition feature—line or home, component selection and attend—unattended operation under line control, etc.).

#### Motor Control

This three-position switch (On, Test, Off) provides:

*On:* The 1057/1058 is operative with the 1050 System.

*Test:* The 1057/1058 has no power in this position regardless of the position of the mainline switches on the 1051 and 1057/1058. This is a safety device for use when the 1057/1058 is being serviced.

*Off:* The 1057/1058 operates as a stand alone unit even if the 1051 mainline switch is turned off.

#### Stacker Auto-Feed; On-Off

This two-position switch (see Figure 12) on the stacker must be on to permit the auto-feed switch on the 1057/1058 keyboard to be effective. It is a momentary switch that turns off when the stacker becomes full, and returns to the ON position when the cards are removed.

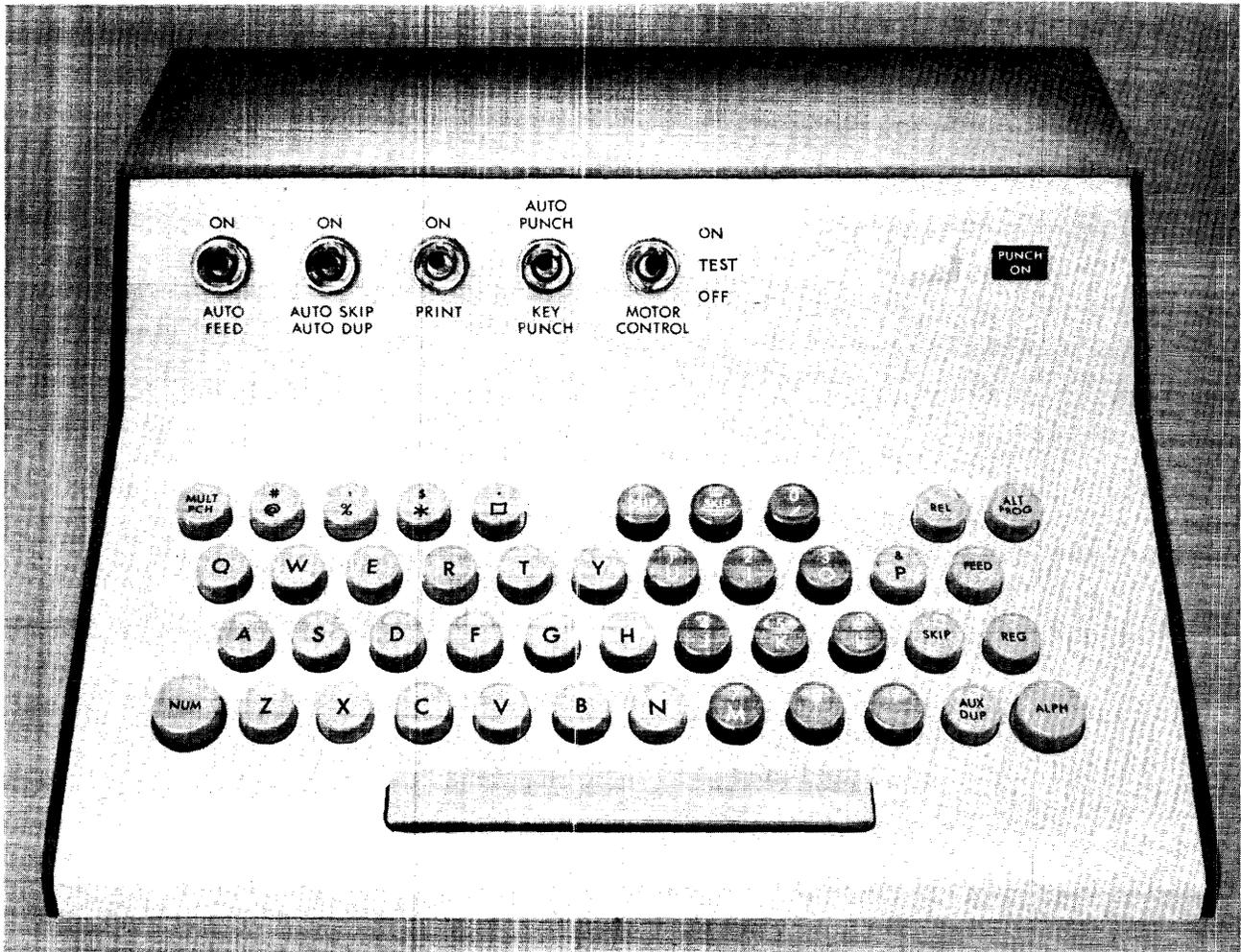


Figure 31. 1058 Keyboard and Controls

### Interlocks

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 also is used to detect card feed jam conditions.
3. The program card star wheels must be in the reading position.
4. A stacker switch indicates an unfilled stacker.
5. Main-line switch **ON**.

A buzzer will sound if any of these conditions is not satisfied (with the exception of item 5).

If any of these interlocks occur while the punch is operating in the home loop, the punch stops punching. The reader does not stop in this instance, nor does the keyboard lock.

### 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).

### Setup Procedures

When the 1057/1058 is being used with the system, the setup procedure is:

1. Place the blank cards in the hopper and lower the star wheels on the program drum.
2. Turn on the main-line switch for the punch (located on the right leg). Now turn on the main-line switch for the system (located on the side of the 1051). When the main-line switch for the system is turned on an automatic reset for the system occurs. This causes an automatic eject and feed cycle at the card punch.

*Note:* For any operations except UNATTENDED, the system attend-unattend must be set to ATTEND when line control is on.

3. For system operation, set the following switches:  
Auto Feed, ON.  
Print, ON (if unit is a 1058 and printing is desired).  
Keypunch-Auto, set to AUTO.

*Note:* When KEYPUNCH-AUTO is set to AUTO, a buzzer will sound if any ready status interlock is not satisfied.

Auto Skip, Auto Dup, ON (provided this control is desired).

Stacker Auto Feed, ON.

4. Press the feed key (on the punch keyboard) twice to register cards at both the read and punch stations.
5. The program card used in the 1057/1058 is punched:

NORMAL PROGRAM	FUNCTION	ALTERNATE PROGRAM
12	Field Definition	4
11	Start Automatic Skip	5
0	Start Automatic Duplication	6
1	Alphabetic Control	7
2	Print Preceding Zeros	Unavailable
3	Suppress Printing	9
blank	Start Manual Field	blank
8	Reader Interlock Time	8

### Punch Operation — 1057/1058

#### PTT Code/6 Translation

The 1057/1058 translates and punches any PTT Code/6 (Perforated Tape and Transmission Code/for 6-Bit environments) code received. This is under the control of the function panel and the operator panel special feature.

Exceptions: DELETE and IDLE codes are not punched, unless the operator panel special feature is installed; thus permitting the punching of idle codes.

The 1058 card punch can print:

- 26 alpha characters, A through Z
- 10 numerics, 0 through 9
- 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 are not printed:

EOB	Punch OFF
Bypass	Upper case
Restore	Backspace
Reader Stop	Lower case
Line Feed	EOT (Home-Loop Only)
Tab	Prefix
Punch ON	Minus Zero
Record Mark	Plus Zero
Carrier Return/ Line Feed	

Prefix F, G, and H codes are translated to perform the following in either home or line-loop operations:

1. Prefix F is duplicate. The field to be duplicated must be defined by the program card.

2. Prefix G is alternate program. Alternate program status is retained until the end of the card.
3. Prefix H is card release. The card is released to the stacker. Any field duplication as defined by the program card is executed.

### 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 only
2. Punch only
3. Function and punch
4. No action

*Note:* The function panel is functionally replaced by the operators panel special feature when installed.

When the 1051 control unit transmits the PTT code/6 to the 1057/1058, for one of the functions listed in the first column, the associated action occurs. The specific action initiated depends on the function panel or operator panel wiring, as indicated by the four columns on the right of the following chart.

PTT CODE/6 FOR	FUNCTION ONLY	PUNCH ONLY	FUNCTION & PUNCH	No ACTION
Tab	Skip*	X	X	X
EOB	(Line) Skip to Col 81 (Home) Release	NA	X	NA
EOT	Release	NA	X	NA
Reader Stop	NA	X	NA	X
Backspace	NA	X	NA	X
Upshift	NA	X	NA	X
Downshift	NA	X	NA	X
CR/LF	Skip*	X	X	X
LF	NA	X	NA	X
Bypass	NA	X	NA	X
Restore	NA	X	NA	X
Prefix F	Duplicate	X	X	X
Prefix G	Alternate Program	X	X	X
Prefix H	Card Release	X	X	X
Space	Space	NA	NA	X

\*Skip field defined by format of the program card.

NA — Not Applicable

*Note:* Without the operator panel installed, the EOB and EOT codes always perform their functions.

*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 stacker. Any programmed duplication takes place.

*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 stacker. A negative answer to an LRC causes the card to be released to the stacker without an 11-punch in Column 81 (indicating an incorrect card).

An EOT code received from the 1051 Control Unit is not punched and does not release the card to the stacker.

## 1057/1058 Card Punch — Special Features

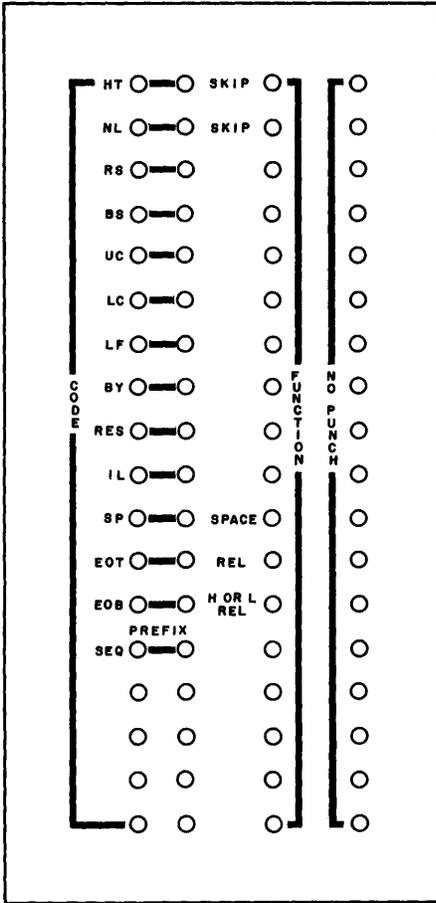
### Extended Character Punching (1057 Only)

This special feature permits the 1057 to translate upshift as well as downshift characters from the PTT code/6 to the IBM card-code, and then punch these characters. Any shift codes encountered during translation are automatically eliminated before punching. This feature accommodates all punched card characters in the PTT code/6 (see Figure 44).

*Note:* With this feature installed, the function panel of the 1057 should not be wired to punch shift codes. Refer to the *Principles of Operation — 1057/1058 Card Punch: Function Panel.*

### Operator Panel

This special feature overrides the function panel in the 1057/8 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 32), 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 descrip-



tion applies to each code *independently*, subject to the following restrictions:

<u>CODES</u>	<u>FUNCTION ONLY</u>	<u>PUNCH ONLY</u>	<u>FUNCTION &amp; PUNCH</u>	<u>NO ACTION</u>
Horizontal Tab	Skip*	X	X	X
EOB	Line-release to Col. 81	X	X	X
EOT	Home-release Release (home only)	X	X	X
Reader Stop	NA	X	NA	X
Backspace	NA	X	NA	X
Upshift	NA	X	NA	X
Downshift	NA	X	NA	X
New Line (CR/LF)	Skip*	X	X	X
Line Feed	NA	X	NA	X
Bypass	NA	X	NA	X
Restore	NA	X	NA	X
Space	Space	NA	NA	X
Sequence (prefix)	X**	X	X**	X

\*Skip field define by program card

\*\*Applies to sequence (prefix) codes which control card punch functions: duplicate, alternate program, and card release.

NA — Not Applicable

*Note:* 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 32. 1057/1058 Operator Panel

## 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 PTT code/6 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 CR/LF	Punch 1 On 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	

	CODE	DESCRIPTION
THIRD CARD	{ Prefix Zero	
FOURTH CARD	{ Prefix Zero	
	EOB CR/LF	End-of-Block Carrier-Return and Line Feed
	{ 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 CR/LF	Punch 1 on

#### 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 zeroes, 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	Printer 1 on Carrier Return and Line Feed.
	{ One	
	{ CR/LF	
FIRST CARD	{ Prefix	Punch 1 off (tape punch)  Reader 2 on, Reader 1 off (transfers reading to the card reader from the tape reader)
	{ Seven	
	{ Prefix Zero	
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:

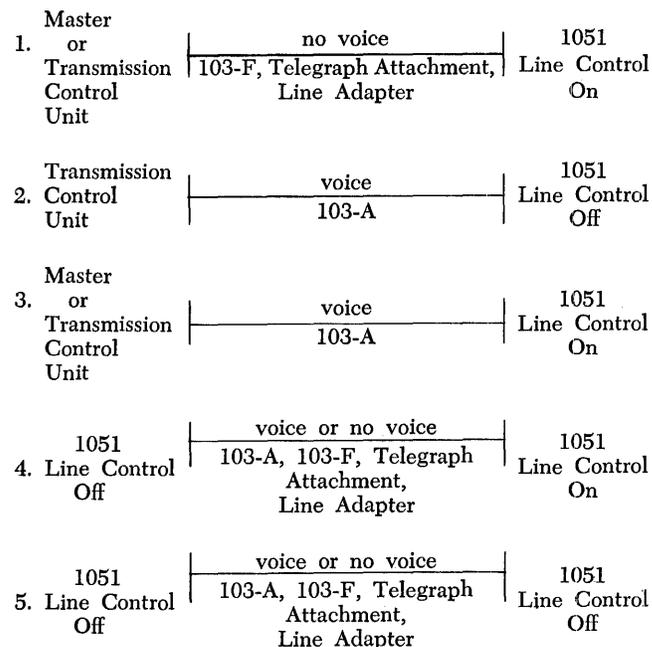
Column 25 contains an EOB code which causes the card to eject and a new card to feed and read (repeat steps b, c and d).

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.

### Point-to-Point Operation (Figure 33)

When only two terminals are connected to a communications line, the operation is termed *point-to-point*. All 1050 Systems connected 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 modes of operation for point-to-point communication are:



In Examples 1-3, either the master station or the transmission control unit always controls the line and thus, the message traffic. In Example 4, the terminal operating with line control off can not recognize polling or addressing responses. When addressing therefore, time must be allowed to receive a response before transmitting the text. When polling, the transmission of text from the polled terminal must be delayed until the polling terminal transmit time-out (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 (this resets the transmit time-out).

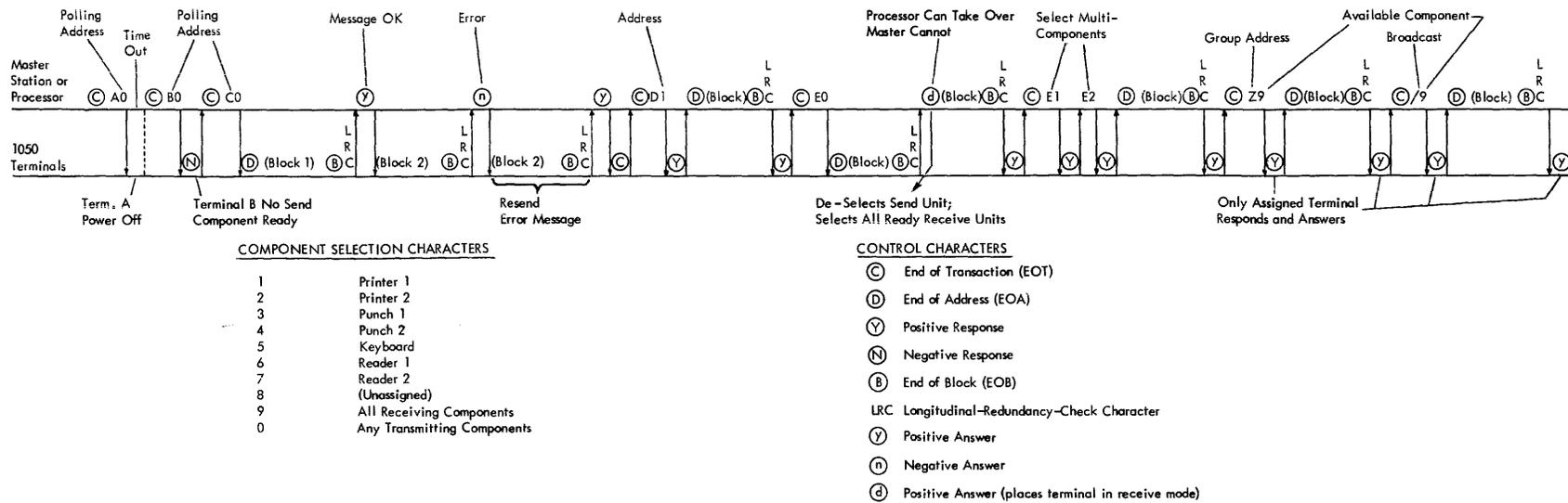
In Example 5, a contention system exists, especially with a no voice-line connection. In this case, the terminal which transmits the first character, controls the line. The receiving terminal cannot transmit until the end of its 9-18 second receive time-out. The only indication to the operator as to when this occurs is the lack of further text reception, or trying to send by keying or starting a reader.

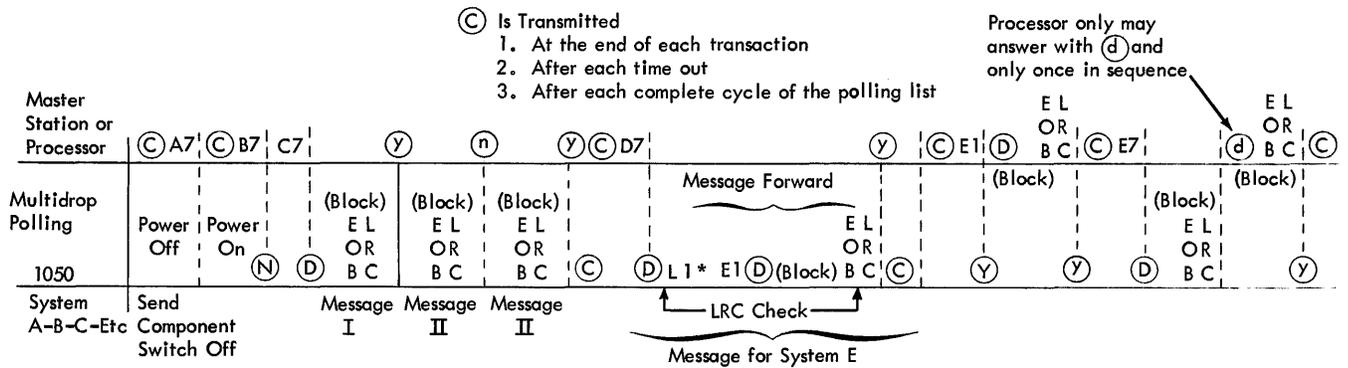
For both Examples 4 and 5, receive units should always be assigned to line and ready, to ensure that all transmissions are received. With line control off, there is no way to determine at the sending terminal if the receive units are ready to receive data.

Unattended operation is possible in any of the point-to-point examples described (1-5), as well as in multipoint operations. For maximum efficiency in such op-

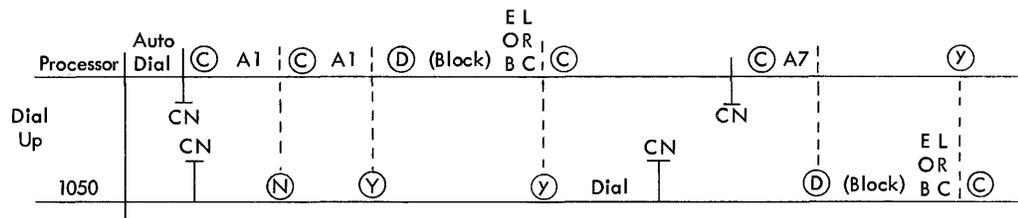
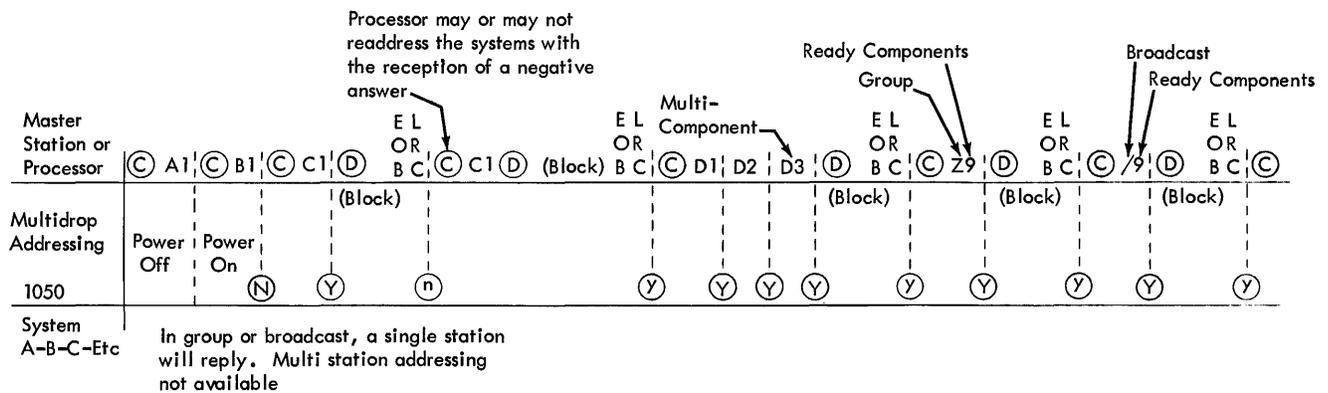


Figure 34. Line Control for Master Station or Processor





\* Symbol determines which multipoint line on TCU is addressed. Specific symbol depends on TCU program.



Dial Up:  
Multiplexor always maintains control.  
In system to system operation one system must act as a controlling central.

Figure 35. General Line-Control Operation

this endless tape loop, a (C) A6 is punched after the last polling code, or a series of (C)'s. Then the duplicate codes are overlapped, aligned, and joined with adhesive tape. 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 the tape reader assigned to the reader-1 position, 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 ((C) A6) is read, and the reader stops immediately after reading the component select character (6). The master station automatically switches to a receive mode and awaits 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 (D), 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 will print the transmitted text; and
2. Any recognized master station punch with its assignment switch set to REC and in a ready status will punch 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 will automatically restart at the end of a two-second time-out. If the reception of text is interrupted for more than 20 seconds (minimum), a time-out occurs and the master station data-check light is turned on. This action interrupts the automatic polling operation. To restart it, press the data-check button (turning out the data-check light) and the line-reader-start button.

When the master station receives a message in error, the data-check light is turned on and 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 Ⓑ code.

If the line-correction special feature is installed, the transmitting station will make three attempts to transmit the message correctly. To restart polling after the third incorrect attempt, press the data-check button at the master station to turn off the data-check light and press the line-reader-start button. The reader does not start until after the 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 prior to pressing the line-reader-start button.

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.

Normally the card in the card reader is ejected to the stacker after an EOT Ⓒ is sensed. However, when operating as a master station, the card reader will stop automatically after each polling address. This means

that when the master station is polling, an automatic ejection will not occur upon sensing an EOT Ⓒ. The EOB Ⓑ code may be punched in the column following the last polling character if further card sensing is not desired.

The terminals being polled are either in a control or a non-selected text mode at this time; therefore an LRC answer will not be received at the master station and the card reader will 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 will eject 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 9-track (EJECT) 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 to the stacker when an EOB Ⓑ code is sensed. In either case, the polling card must be manually removed from the stacker 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.

*Note:* 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.

#### 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, only responses print.

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).

Component recognition for the printers occurs automatically without the use of prefix-1 or prefix-2 codes only when the terminal is a master station and is operating in the control mode. Printers are deselected by polling responses. A remote terminal must transmit component-recognition codes to the master station for each receive component that is required for data reception. When a Ⓒ is transmitted by the master station, all receive components, previously recognized by the remote terminal, are deselected. Monitor printers, located at any terminal (master station or otherwise) do not have to be recognized to record transmitted data.

## Addressing

The methods used by the master station when addressing other 1050 stations are:

### Keyboard

As with polling, all addressing characters must be manually keyed. Group and broadcast addressing, as well as individual station addressing, is possible.

*Note:* If all the receiving units in a group of terminals are not printers or card punches, care must be exercised to insure that the answering terminal does not transmit the EOB answer until all receive units in the group are ready to receive.

A master station printer must have its assignment switch set to SEND-REC to provide line monitoring for recording all station addresses, responses and LRC (negative) answers. A response to addressing must occur within two seconds. If no response is received, 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 (D) code.

Any character other than a period (positive response), including a (C) 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 a 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 now be keyed again, or another station can be addressed.

*Note:* It is unnecessary for the master station to transmit an EOT (C) at the completion of a message because this is used at the start of each polling or addressing operation. However, to turn off the motors at a down-line station that has been receiving in the unattended mode, an EOT is required.

### Paper-Tape Reader

The station address and the associated text are punched in a tape which is then placed on the tape reader in the Reader 1 position. This eliminates the need for 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 (C A4) and prior to transmitting the text.

The master station reader is restarted by the reception of a positive response. The text is now transmitted, starting with an EOA (D). Each addressing operation requires a separate tape containing the station address and associated text for that operation. If a negative response is received or no response is received within two seconds, the addressing tape is removed from the reader and another tape is inserted, if desired.

If the line-correction special feature is installed, the master station attempts to transmit the message three times. After the third unsuccessful attempt, the master station tape reader stops, and the resend and data-check lights are 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.

*Note:* It is unnecessary for the master station to transmit an EOT (C) at the completion of a message because this is used at the start of each polling or addressing operation. However, to turn off the motors at a down-line station that has been receiving in the unattended mode, an EOT is required.

### Card Reader

Basically, an addressing operation using the card reader is identical to that performed by the tape reader; *both the address and message should be in the card*. The same conditions for reader selection exist here as for the tape reader.

When a system has the line-correction special feature installed, the card will be read three times. 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 will be automatically stacked 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 nega-

tive LRC answer is received, retransmit this complete unit.

*Note:* It is unnecessary for the master station to transmit an EOT (C) at the completion of a message because this is used at the start of each polling or addressing operation. However, to turn off the motors at a down-line station that has been receiving in the unattended mode, an EOT is required.

### 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, only responses print.

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 the printers without the use of Prefix-1 or Prefix-2 codes occurs automatically without the use of Prefix-1 or Prefix-2 codes only 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 that is required for data reception. When a (C) is transmitted by the master station, all receive components, previously recognized by the remote terminal, are deselected. Monitor printers, located at any terminal (master station or otherwise) do not have to be recognized, to record transmitted data.

### Single-Cycle Operation

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 prior to 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 oper-

ation. The character in error is in the second printed line of data and is the middle of the line. The present 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 PROC.
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, prior to the error character, is printed.
16. Key in the correct character (8) at this point.
17. Advance the tape in the tape reader, one character position, by operating the tape advance wheel. This will prevent the error character from being read.
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 after completing step 16. No additional keying occurs.

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.

### **Correction Procedures**

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 when 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 will automatically backspace 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 first have been 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.

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. In all cases where 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 switch.)
5. Operate the home—reader-start button.

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

#### **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 processed.

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-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.

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 polled. Without the line-correction special feature, the reader does not reverse-feed and operator intervention is required.

#### *Correction Procedure for On-Line 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 cancelled. The procedure for cancelling 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.

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) will print 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.

This section includes detailed information that does not readily fit into the principles of operation or special techniques sections. The items included are:

- Glossary of Terms
- Data Set Operating Procedure
- 1052/1053 Printer Maintenance
- Specifications for 1050 Recording Media
- 1050 Planning Chart and Operator Instruction Sheet
- 1050 Timing Considerations
- 1050 Character Set Information
- Summary of Two-Character Function Codes (Prefix and Alphabetic Character)

### **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.

**HALF DUPLEX:** 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. This code is effective when the system(s) involved contain the proper component-recognition features (line or home).

**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:* For use in point-to-point dial-up connections.

*Western Electric Data Set 103F:* For use in multi-point or point-to-point leased line connections.

*Western Union Data Sets:* For use in multipoint or point-to-point leased line connections.

*IBM Line Adapter:* For use in multipoint or point-to-point privately owned line connections. 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 will reset and time-out. This condition occurs once before controlling station reverts to polling or addressing operations.

### Western Union Data Sets

In a network using this type of data set, group addressing and broadcast addressing can be accomplished.

### 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 prior to starting transmission of 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 communications 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."

### General Maintenance for the Printer (Figures 21 and 36)

#### Print Element Replacement

The removal and replacement of a printing element requires only seconds. To accomplish this:

1. Check the printer to ensure that it is in lower-case shift. When in lower-case shift, the arrow on the print element points toward the platen. If in upper case shift, press the shift key.

2. Turn the mainline switch off.
3. Raise the top cover.
4. Press the spring levers (on top of print element, see Figure 36).
5. Lift the print element off the element post.
6. Press the spring levers (of the replacement print element) together firmly and place on the element post. The arrow on the print element must point toward the platen.
7. Release the spring levers. They will click when in proper position. The print element is now locked in position for printing.

#### Ribbon Replacement

The IBM SELECTRIC Ribbon Cartridge permits quick, clean ribbon changing in a matter of seconds. To remove and replace a ribbon:

1. Turn mainline switch on and tab or space the carrier to the center of the line.
2. Turn the mainline switch off, lift the top cover, and tilt the hinged switch panel toward the operator slightly.
3. Move the ribbon change lever to the extreme right to raise the ribbon guide.

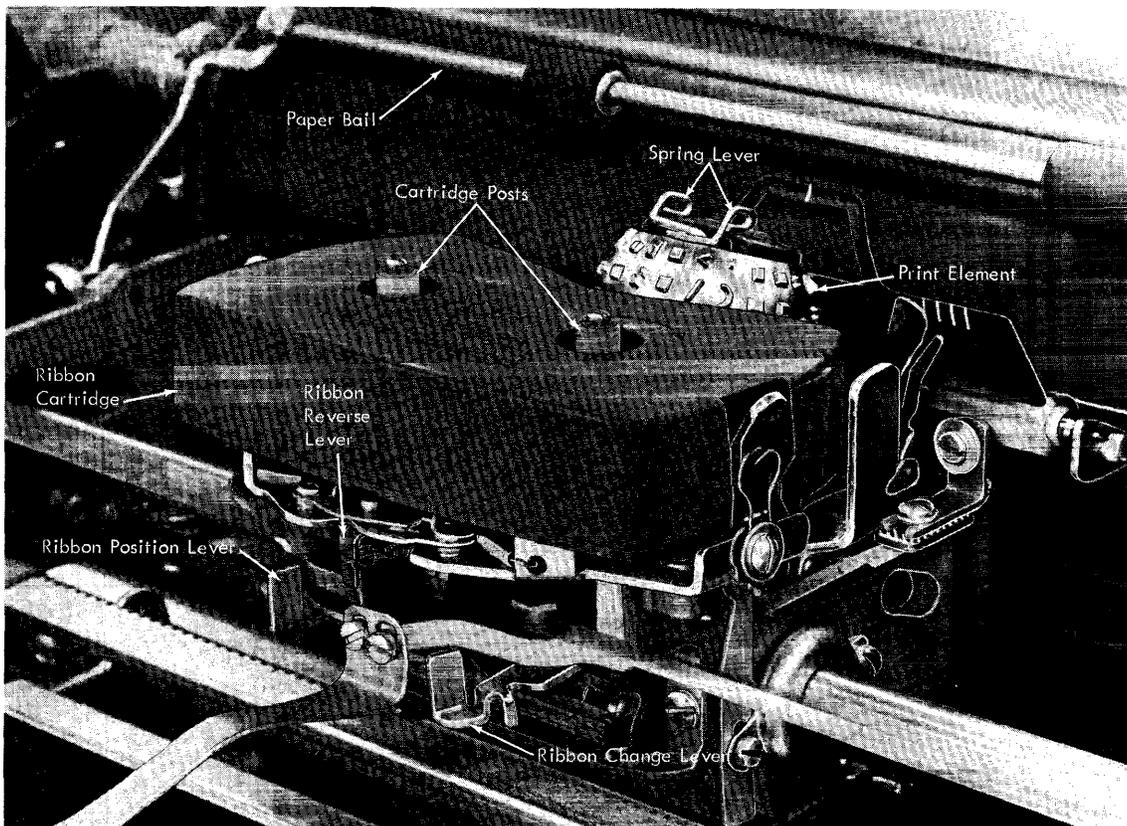


Figure 36. 1052 and 1053 Printing Mechanism

4. Lift the ribbon cartridge straight up and ease the ribbon out of the slots in the ribbon guide.
5. Rewind the excess ribbon by inserting a wooden pencil in either of the cartridge holes and turn in the direction of the arrow.
6. Position the new cartridge with the exposed ribbon facing the platen.
7. Slide the ribbon through the slots in the ribbon guide.
8. Position the cartridge on the cartridge posts and press into place.
9. To rewind excess ribbon, turn either cartridge post in the direction of the arrow.
10. Move the ribbon change lever to its extreme left position. This lowers the ribbon guide into proper typing position.

#### **Platen Removal**

To remove the platen for changing or cleaning,

1. Turn the main-line switch off.
2. Lift the top cover.
3. Move the paper release lever and the paper bail toward the operator.
4. Press the platen latches at both ends of the platen assembly (see Figure 21) and lift the platen out.

#### **Platen Replacement**

1. Position the ratchet teeth to the right.
2. Center the end plate in the groove in the right end of the platen shaft. Press the platen into position, and check for a click when it locks.

#### **Cleaning the Print-Element**

Two specially designed brushes are available from IBM for cleaning the IBM 1052 and 1053 Printers. They are: the dual-purpose brush, and the print element brush. To clean the print element:

1. With the mainline switch on, set the print-element carrier in lower case.
2. Turn the mainline switch off.
3. Remove the print element.
4. Clip the print element to the end of the dual-purpose brush.
5. Brush away from you and toward the top of the print element, using the element brush.

## **Specifications for 1050 Recording Media**

### **1052/1053 Document Printing Recommendations**

#### **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 form 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. paper.

#### **Roll Paper Specifications**

Maximum width: 15"  
 Maximum outside diameter: 5-½"  
 Minimum diameter of center hole: ¾"

#### **Specifications for Paper-Tape and Edge-Punch Documents**

The 1050 system is capable of using paper tape, Mylar\* laminated paper tape, Mylar coated aluminum tape, and edge-punched documents. These specifications apply to all of these document types.

Width:	Tape 1" (± .003") Document, 12" Maximum, 2" Minimum (Width cannot 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)

\* Trademark of E. I. duPont deNemours Company

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 inch for proper registration. The first feed hole must be .050 inch from the leading edge of the document. Documents greater than 8 inches long cannot be punched within .6 inch 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.

### **Tape Splicing**

The general rules to follow when splicing tape are:

1. All splicing should be done in non-data portions of the tape whenever possible.
2. Either a butt-joint or lap-joint type splice is acceptable. However, the thickness at the splice must not exceed .010". Any splicing material used for a butt-joint splice must be flexible and should be attached to the top of the tape.
3. Width of the splice must not exceed the width of the tape.
4. No staples or other types of fasteners can be used for splicing. Also, any excess glue on the surface of the tape must be completely removed.
5. When lapping punched tape columns, more than one punched column should be lapped.

### **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 37 and 38). 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.

*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 39) 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 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 40).

### 1051 Control Unit

1. a. System Speed: 14.8 cps or  $(9 \times 14.8)$  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):  
 $(5 \times 67.5) + 250 + 12 = 599.5$  ms.

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

$(5 \times 67.5$  ms) = five character times (EOT, station identification, component identification, response, and EOA).

250 ms  $\pm$  50 = delay before transmission of response and turn-around time.

12 ms = turn-around time for master to go from receive mode to transmit mode.

4. Addressing time (multiple components):  
 $[(5 \times 67.5) + 250 + 12] + [N - 1][(3 \times 67.5) + 70]$

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

250 ms  $\pm$  50 = delay before transmission of first response and turn-around time

12 ms = 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

$(3 \times 67.5$  ms) = three character times

70 ms = delay before transmission of additional responses.

5. Polling time for an individual terminal:  
 $(4 \times 67.5) + 250 = 520$  ms

*Note:* For unattended operation, see item 7.

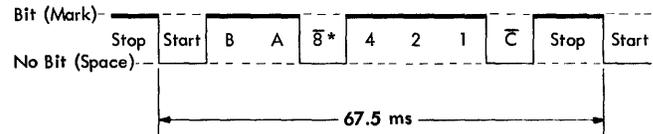
$(4 \times 67.5$  ms) = four character times

250 ms  $\pm$  50 = delay before transmission of response, and turn-around time.

6. LRC time:  $(3 \times 67.5) + 70 = 272.5$  ms

*Note:* This includes EOB, LRC, and the answer.

70 ms = delay before transmission of answer.



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

Figure 40. Bit Configuration of a "G" Character (Serialized)

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.

### 1052-1053 Printers

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

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

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:  $(2 \times 67.5) = 135$  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 tape for re-read: 67.5C

*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:  $(2 \times 67.5) + 67.5 (2D)$

*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
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 characters read from card and/or 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  $\leq$  (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. Feeding and registering: 330 ms
2. Punching:
  - a. 1057/1058 from the 1051—14.8 cps

- b. 1057 independent—20 cps (maximum)  
1058 independent—18 cps (maximum)

3. 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.

4. Skipping or Releasing: 80 cps

$85 + 12.5n$

85 ms = start time

12.5 ms = one character-time at 80 cps

n = number of columns skipped or released.

### 1050 Systems Time-Outs

Interruption of text transmission: 9-18 seconds.

Master station, addressing or polling response: 2 seconds.

Master station text interrupted: 19-37 seconds.

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.

## 1050 Character Set Information

### 1051 Control Unit

The 64 characters of the PTT code/6 (Figure 44), can be transferred to or received from both the home and the line data channels.

### 1052/1053 Printers

The printer acts upon the following characters of the PTT code/6:

1. The 44 printable characters in downshift:
  - 10 numeric graphics
  - 26 alphabetic graphics (upper or lower case, determined by print element)
  - 8 special character graphics.
2. The 44 printable characters in upshift:
  - 26 upper case alphabetic graphics
  - 18 special character graphics (two graphics . and , are also available in downshift).
3. The 7 characters for the functions of Space, LF, CR/LF, Tab, Upshift, Downshift, and Backspace are recognized in both the upshift and downshift mode.

### 1052 Keyboard

A total of 59 of the 64 PTT codes/6 can be keyboard generated. (The CANCEL code is an additional even parity code.) Codes for PN, PF, MZ, PZ, and 7 are excluded from the keyboard character sets (Figures 20, 41, 42 and 43) and are not used internally by the 1050. The IDLE and DELETE characters are keyed to the HOME data channel but never to the line data channel.

### 1054 Paper-Tape Reader

All 64 PTT codes/6 (Figure 44) are recognized and transmitted to the assigned data channel.

### 1055 Paper-Tape Punch

63 PTT codes/6 are recognized and recorded. The delete character is excluded. See *Delete Code* in this section. (The eighth track is punched with the CR/LF code, with either the home, or line correction special feature installed.) The EOT character is *not* punched when received from the line data channel with line control on.

### 1056 Card Reader

The IBM punched-card code is read and translated into the PTT code/6. The 17 function codes (space is included as a function) and 47 graphic characters are recognized and properly translated. Upshift graphics must be preceded by an upshift code. This permits the upshift graphics to be coded the same as their respective downshift graphics.

A blank column is read as a space and transmitted as a C-bit only.

### 1057 Card Punch

Card punching of function codes is determined by the wiring of the function panel. The maximum character set for punching is 61 characters (with the operator panel special feature installed, the idle code can also be punched). The IDLE and DELETE (see *Delete Code*) characters are excluded from the character set. The EOT character is *not* punched (nor does it initiate a card release) when received from the line data channel with line control on. The use of the upshift card code assignments requires the installation of the extended character punching special feature. A space code (C-bit only) is not punched but is indicated by a blank column.

### 1058 Card Punch

The character set is the same as that for the 1057. However, only the 44 printable characters (see 1052/1053 Printers in this section, item 1) can be properly interpreted.

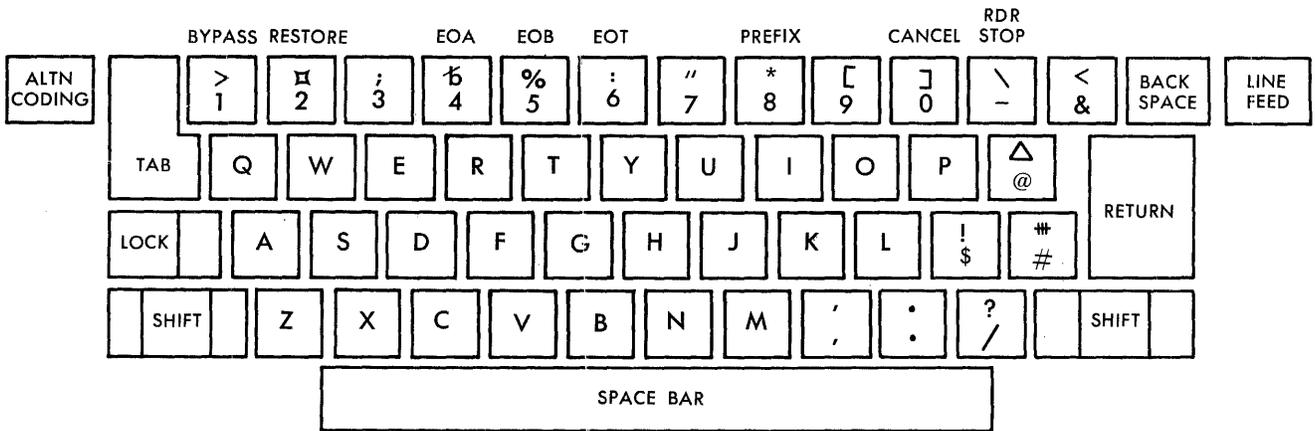


Figure 41. 1052 Keyboard (A-Character Arrangement)

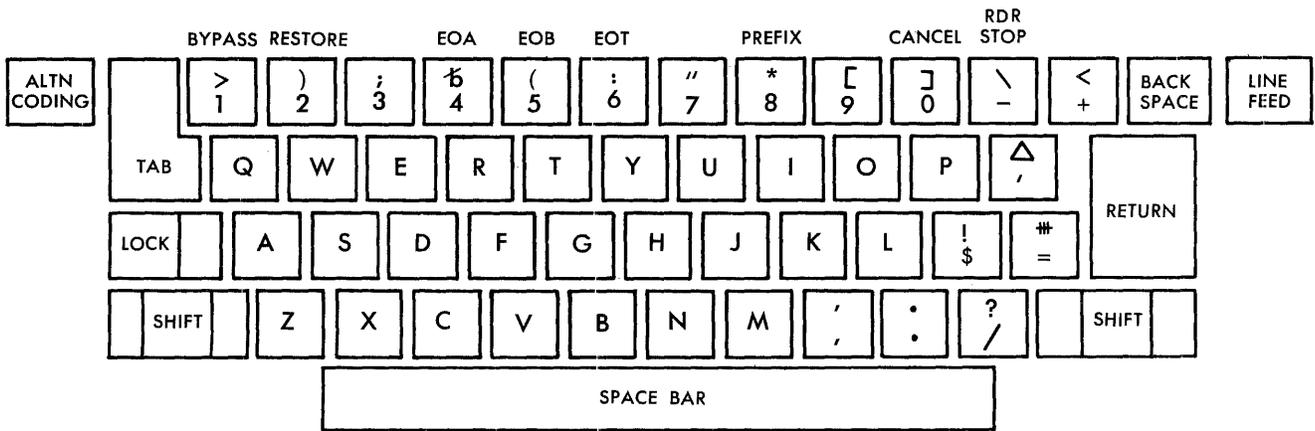


Figure 42. 1052 Keyboard (H-Character Arrangement)

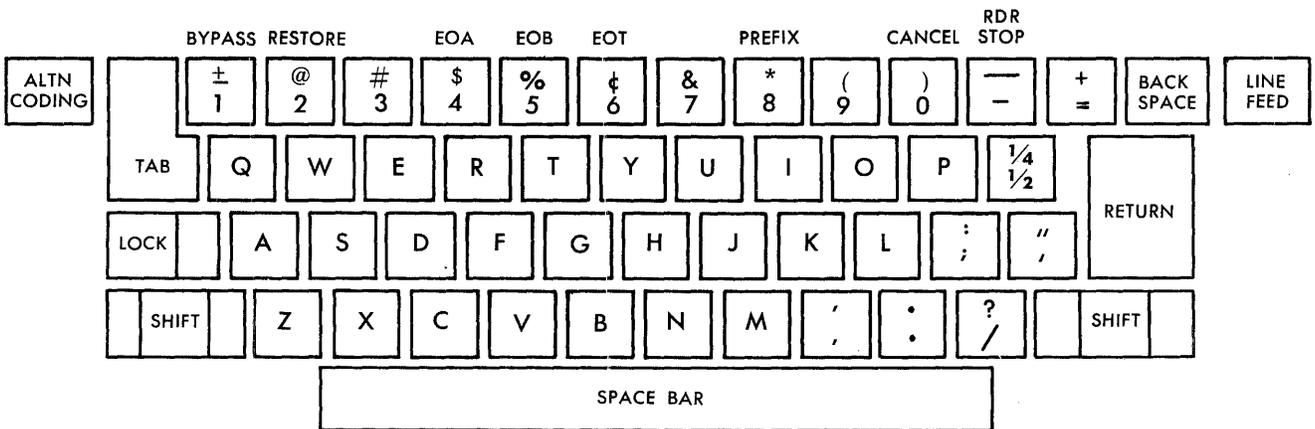


Figure 43. 1052 Keyboard (Typewriter Character Arrangement)

LOWER CASE				PTT CODE/6 Tape Track							UPPER CASE							
STANDARD CARD CODE	CHARACTER SET				8	7	6	5	4	3	2	1	CHARACTER SET				STANDARD CARD CODE	EXTENDED CARD CODE
	Std.	A	H	Typ.	Bit Value							Std.	A	H	Typ.			
12-8-3					B	A		8			2	1				12-8-3	12-8-1	
11-8-3		\$		/	B		C	8			2	1			:	11-8-3	11-8-2	
0-8-3		,			A		C	8			2	1				0-8-3	0-8-1	
8-3		#	=	'				8			2	1		±	#	8-3	0-8-7	
8-4		@	1/2	'		A								Δ	1/4	8-4	11-8-7	
12		&	+	=	B	A	C							<	+	12	12-8-6	
11					B									\	-	11	0-8-6	
0-1					A	C								?		0-1	12-8-2	
1		1												=	>	1	8-6	
2		2									2				)	@	2	12-8-4
3		3					C				2	1		#		3	11-8-6	
4		4							4					;	\$	4	8-2	
5		5					C		4					%	(	%	5	0-8-4
6		6					C		4	2				:	c		6	8-5
7		7							4	2	1			"	&		7	8-1
8		8						8						*		8	11-8-4	
9		9				C	8							[	(	9	12-8-5	
0		0				C	8							]	)	0	11-8-5	
12-1		a			B	A								A		12-1	12-0-1	
12-2		b			B	A					2			B		12-2	12-0-2	
12-3		c			B	A	C				2	1		C		12-3	12-0-3	
12-4		d			B	A			4					D		12-4	12-0-4	
12-5		e			B	A	C		4			1		E		12-5	12-0-5	
12-6		f			B	A	C		4	2				F		12-6	12-0-6	
12-7		g			B	A			4	2	1			G		12-7	12-0-7	
12-8		h			B	A		8						H		12-8	12-0-8	
12-9		i			B	A	C	8						I		12-9	12-0-9	
11-1		j			B		C							J		11-1	12-11-1	
11-2		k			B		C			2				K		11-2	12-11-2	
11-3		l			B					2	1			L		11-3	12-11-3	
11-4		m			B		C		4					M		11-4	12-11-4	
11-5		n			B				4			1		N		11-5	12-11-5	
11-6		o			B				4	2				O		11-6	12-11-6	
11-7		p			B		C		4	2	1			P		11-7	12-11-7	
11-8		q			B		C	8						Q		11-8	12-11-8	
11-9		r			B			8						R		11-9	12-11-9	
0-2		s				A	C				2			S		0-2	11-0-2	
0-3		t				A					2	1		T		0-3	11-0-3	
0-4		u				A	C		4					U		0-4	11-0-4	
0-5		v				A			4			1		V		0-5	11-0-5	
0-6		w				A			4	2				W		0-6	11-0-6	
0-7		x				A	C		4	2	1			X		0-7	11-0-7	
0-8		y				A	C	8						Y		0-8	11-0-8	
0-9		z				A		8						Z		0-9	11-0-9	
THE CODES BELOW ARE NOT PRINTABLE																		
BLANK	SPACE					C								SPACE	BLANK	BLANK		
0-8-2	#					A		8			2			#	0-8-2	12-8-7		
11-0	MZ				B			8			2			✓	11-0	0-8-5		
12-0	PZ				B	A	C	8			2			✓	12-0	8-7		
FUNCTION CODES									MEANING									
9-4	PN					C	8	4								Punch On		
0-9-4	BY					A		8	4							Bypass		
11-9-4	RES ✓				B			8	4							Restore		
12-9-4	PF				B	A	C	8	4							Punch Off		
9-5	RS							8	4			1				Reader Stop		
0-9-5	LF					A	C	8	4			1				Line Feed		
11-9-5	NL			X†	B		C	8	4			1				New Line (Carrier Return and Line Feed)		
12-9-5	HT ✓				B	A		8	4			1				Horizontal Tab		
9-6	UC ✓							8	4	2						Upper Case		
0-9-6	EOB ✓					A	C	8	4	2						End of Block		
11-9-6	BS ✓				B		C	8	4	2						Backspace		
12-9-6	LC ✓				B	A		8	4	2						Lower Case		
9-7	EOT						C	8	4	2	1					End of Transaction		
0-9-7	PRF ✓					A		8	4	2	1					Prefix		
11-9-7	IL ✓				B			8	4	2	1					Idle		
12-9-7	DEL ✓				B	A	C	8	4	2	1					Delete		

NOTE: The tape feedholes are located between the 4-bit and the 8-bit.

† This 8th track punch is punched into tape with the NL code when the 1050 system has either the Line Correction or Home Correction special features (or both) installed. This punch is not included in the parity check of the NL character.

Figure 44. PTT Code/6 (Perforated Tape and Transmission Code/for 6-Bit Environments)

## Code Summary

COMPONENTS	NUMBER OF CHARACTERS		REMARKS
	Downshift 44 + 7	Upshift 44 + 7	
1051 1052/1053 Printers	64		(print and function)
1052 Keyboard	59		
1054	64		
1055	63		62 characters from the line. With line control on EOT is not punched.
1056	64		
1057	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.
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 opera-

tion. This code is also transmitted during line-loop operations.

2. Punched when either the delete button 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 when receiving from a reader. This code is *never* punched by any 1057 or 1058.

### Summary of Two-Character Function 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

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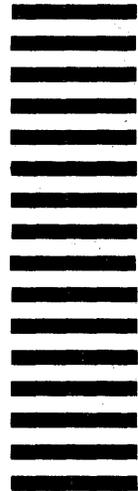
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