

PRELIMINARY

**Bell System Data Communications
TECHNICAL REFERENCE**

**DATASPEED[®] 40 STATIONS
FOR
DATAPHONE[®] SERVICE**

DECEMBER 1973

ENGINEERING MANAGER - DATA SYSTEMS



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DATASPEED. 40



1. INTRODUCTION

The DATASPEED 40 Station Arrangements provide advanced terminal equipment for entering, displaying, editing, printing, sending, and receiving data in communication systems. The initial product line includes a Display Device, Operator Console, Printer, and Controller. The significant characteristics are: easy data preparation and editing, modular design, quiet operation, modern versatile styling, and subscriber assisted trouble analysis.

This technical reference describes the initial DATASPEED 40 Station Arrangements intended for use on the Switched Telecommunications Network using existing facilities and data sets. Additional features and station arrangements will be available in the future; both for expanded switched network applications and for use on private line. Details of these proposed arrangements will be provided in subsequent technical references. Data set information for DATASPEED 40 Station Arrangement may be found by referring to its associated technical reference.

2. GENERAL

The DATASPEED 40 Station Arrangements described in this technical reference are arranged for operation on the switched network normally using Data Sets 202C, 202D (with appropriate Data Auxiliary Set or Telephone Set as required), or future Bell System equivalents. Data Set 202R may be used if Terminal and System constraints permit. The stations will operate at 1050 or 1200 baud (105 or 120 character per second), asynchronously with a ten-bit character (1 start bit, 7 ASCII bits, 1 even parity bit and 1 stop bit).

2.1 Interface

The interface for DATASPEED 40 Station Arrangements herein described will conform with EIA RS-232C. See Figure 10.

2.2 Coded Character Set

The American National Standard Code for Information Interchange (ANSI X3.4-1968; ASCII - see Figure 7) is the coded character set of the DATASPEED 40 Station Arrangements. Table 1 illustrates the code generating and response characteristics of the Station Arrangements described herein.

TABLE II-1

DATASPEED 40 ASCII GENERATING AND RESPONSE CHARACTERISTICS
(Refer to Figure 7)

<u>Device</u>	<u>Controls In Columns 0 & 1</u>	<u>Characters In Columns 2-5</u>	<u>Characters In Columns 6 & 7</u>
DISPLAY	Displays all controls except BS (Backspace). When the BS character is received the function will be performed but no character will be displayed. In addition, performs the LF (New Line) and optionally HT (Horizontal Tabulation) functions when LF & HT respectively are received.	Displays all characters; SP (Space) is indicated by a blank character at the cursor position.	Displays all.
PRINTER	Performs only the LF (New Line) and CR (Carriage Return) functions. VT (Vertical Tab) and FF (Form Feed) are converted to New Line.	Prints all characters.	When characters in columns 6 & 7 are received, the corresponding characters in columns 4 & 5 are printed (foldover). Option available to print all graphics except Delete.
OPERATOR CONSOLE	Generates all. Cursor Left (←) performs the BS (Backspace) function, but the BS character is not displayed or stored in memory.	Generates all.	Generates only Delete plus the five symbols, viz. grave accent (`), opening and closing braces ({ }), vertical line ( | ), and tilde overline (~). Option available to generate all characters.

2.3 Transmission Characteristics

The DATASPEED 40 Station Arrangements will operate at 1200 baud (120 characters per second) with an option available to operate at 1050 baud (105 characters per second). Transmission will be asynchronous with ten bits per character. The ten bits, in order of transmission, are as follows:

- b_1 - Start bit
- b_2 thru b_8 - Seven bits of ASCII
- b_9 - Even vertical parity bit
- b_{10} - Stop bit

2.4 Line Control and Message Transfer Procedures

The DATASPEED 40 Station Arrangements will provide two modes of operation on the switched network. One mode conforms to ANSI X3.28 Subcategory 2.1 "Two Way Alternate Switched Point-to-Point" establishment and terminating procedure with provisions for operating with the message transfer procedure Subcategory A1 "Message Oriented Without Replies and Without Longitudinal Checking". An optional mode enables communication with time sharing systems in a conversational mode.

3. STATION ARRANGEMENTS

General:

Three basic DATASPEED 40 Station Arrangements are available: a KSR - Keyboard and Display (KD), a KSR - Keyboard, Display W/Printer (KDP), and a Receive Only (RO) Printer. These three Station Arrangements are illustrated in Figures 1 through 4.

3.1 KSR - Keyboard and Display (KD)

The DATASPEED 40 KD consists of a Display Device, Operator Console and Controller. The basic features and hardware options are described in the table below.

TABLE III-1

DATASPEED 40 KSR-KEYBOARD AND DISPLAY

<u>Feature</u>	<u>Basic</u>	<u>Option</u>
<u>Display Logic Storage Character Set</u>	24 lines of 80 characters.	Expandable to 48 lines of 80 characters or 72 lines of 80 characters.
<u>Operator Console</u>	Generates all ASCII controls and graphics except lower case of alphabet. Backspace is generated by the cursor left key and not stored in the display memory.	Option available to generate all ASCII graphics.
<u>Display Device</u>	Displays all ASCII characters except BS (backspace) (See Figure 8 for control graphic representations). Performs LF (New Line) and BS functions.	HT (Horizontal Tabulation) function.
<u>Basic Editing Features</u>	The Operator Console and Display Device combine to provide Character overwrite, Cursor Home, Cursor Right, Cursor Left, Cursor Up, Cursor Down, Cursor Return, Clear from Cursor, Line Insert, Line Delete, Character Insert and Character Delete.	See Additional Editing Features Group listed below.
<u>Additional Editing Features Group</u>		Available as option.
Protected Format and Form Outline		
Horizontal Tabulation		
Highlight		
Substitute Character		The Additional Editing Features Group provides an option to display an SB (SUB) symbol for any character which is received with invalid (odd) character parity; the ASCII character SUB is stored in the Display Logic.

TABLE III-1 (Continued)

<u>Feature</u>	<u>Basic</u>	<u>Option</u>
<u>Message Preparation Alarms</u>		The Additional Editing Features Group provides an audible alarm which alerts the operator to typing actions that violate terminal constraints. Also, receipt of BEL (Bell) sounds this audible alarm and a B _L symbol is displayed. (1)
<u>Conversational Mode</u>		Available as option.

3.2 KSR - Keyboard Display W/Printer (KDP)

The DATASPEED 40 KSR - Keyboard, Display W/Printer consists of a Display Device, Operator Console, Printer and Controller. The basic features and hardware options are described in the table below.

(1) Successive Bell characters must be spaced 100 ms. apart to produce individual tones. If this condition is not met, a continuous tone will be produced.

TABLE III-2

DATASPEED 40 KSR-KEYBOARD, DISPLAY AND PRINTER

<u>Feature</u>	<u>Basic</u>	<u>Option</u>
<u>Display Logic Storage</u>	24 lines of 80 characters.	Expandable to 48 lines of 80 characters or 72 lines of 80 characters.
<u>Graphic Character Set (1)</u>		
<u>Operator Console</u>	Generates all ASCII graphics except lower case of alphabet.	Option available to generate all ASCII graphics.
<u>Display Device</u>	Displays all ASCII characters except BS (Backspace) (See Figure 8) for control graphic representations). Performs LF (New Line) and BS functions.	HT (Horizontal Tabulation) function.
<u>Printer</u>	Prints ASCII graphics in columns 2 through 5.	Option available to print all ASCII graphics. Option available to print a substitute symbol upon receipt of a character with invalid parity.
<u>Control Character Set (2)</u>		
<u>Operator Console</u>	Generates all ASCII controls.	HT (Horizontal Tabulation) function.
<u>Display Device</u>	Displays all controls except BS (Backspace). See Figure 8 for control graphic representations. Performs LF (New Line) and BS functions.	
<u>Printer</u>	Performs only the LF (New Line) and CR (Carriage Return) functions. VT (Vertical Tabulation) and FF (Form Feed) are converted to New Line. All other control characters, including HT (Horizontal Tabulation) and BS (Backspace) and SUB are discarded by the Printer Logic.	

(1) Col. 2-7 of ASCII shown in Figure 7.

(2) Col. 0&1 of ASCII shown in Figure 7.

TABLE III-2 (Continued)

<u>Feature</u>	<u>Basic</u>	<u>Option</u>
<u>Basic Editing Feature</u>	The Operator Console and Display Device combine to provide Character Overwrite, Cursor Home, Cursor Right, Cursor Left, Cursor Up, Cursor Down, Cursor Return, Clear from Cursor, Line Insert, Line Delete, Character Insert, and Character Delete.	See Additional Editing Feature Group listed below.
<u>Additional Editing Features Group</u>		Available as option on Display Device and Operator Console.
Protected Format and Form Outline Horizontal Tabulation Highlight Substitute Character		The Additional Editing Features Group provides a Display Device Field Option to display an S _B symbol for any character which is received with invalid (odd) character parity. The ASCII character SUB is stored in the Display Logic.
<u>Message Preparation Alarms</u>		The Additional Editing Features Group provides an audible alarm which alerts the operator to typing actions that violate terminal constraints. Also, receipt of BEL (Bell) sounds this audible alarm and a B _L symbol is displayed.
<u>Conversational Mode</u>		Available as option.

3.3 Receive Only Printer (RO)

The DATASPEED 40 RO Printer Station Arrangement consists of a Printer, Controller and an Operator Console. The basic features and hardware options are shown in Table III-3.

A 1000 character storage buffer is available as an optional feature of the Receive Only Printer to handle random short lines and thus reduce or eliminate the necessity of providing line fill. If the buffer is filled to approximately 90% of its capacity, the Supervisory Transmitted Data lead is turned off, until the buffer is empty. (The Data Set installed in the Station must be equipped with supervisory channel capability. The feature is to be used to stop further transmission of data until the buffer is empty, hence able to receive more data.)

TABLE III-3

DATASPEED 40 RO PRINTER

<u>Feature</u>	<u>Basic</u>	<u>Option</u>
<u>Graphic Set (1)</u>	Prints ASCII graphics in columns 2 through 5.	Option available to print all ASCII graphics.
<u>Control Set (2)</u>	Performs only the LF (New Line) and CR (Carriage Return) functions. VT (Vertical Tabulation) and FF (Form Feed) are converted to New Line. All other control characters are discarded by the Printer.	
<u>Substitute Character</u> (See Data Error Indicator Feature)		Option available to print a substitute character on the receipt of invalid character parity. The printed character will be two characters superimposed on a field of horizontal bars; these two characters are also the type carrier identifiers.
<u>Data Error Indicator</u>		Option available to indicate the detection of an invalid character parity. This feature should be used in combination with the Substitute Character Feature for maximum effectiveness.
<u>Discrete Calling</u>	A Trans Start key will initiate transmission of a unique station identifier to a sender equipped with a Discrete Calling Recognizer.	
<u>Test Generator</u>	When the Data Set is on hook, or in the Talk mode, depressing the Trans Start key will generate a 64 character message (columns 2-5 of ASCII) plus LF that will be printed out by the Printer.	

(1) Column 2-5 of ASCII shown in Figure 7.

(2) Column 0-1 of ASCII shown in Figure 7.

TABLE 3 (CONTINUED)

<u>Feature</u>	<u>Basic</u>	<u>Option</u>
<u>Printer Character Storage</u>		1000 Character input buffer available to permit printer to receive multiple short lines without need for time fill during transmission.

4. DESCRIPTION OF KSR (KS AND KDP) STATION COMPONENTS

4.1 Display Device

The Display Device consists of a Display Monitor and Display Logic. The Display Monitor houses the tube and its associated drive circuitry, while the Display Logic provides the data storage and editing electronics.

4.1.1 Display Monitor

The Monitor displays the data prepared on the keyboard or received from the transmission line on a cathode ray tube. The cathode ray tube has a low glare faceplate to reduce ambient light reflections and provides implosion protection. The Monitor will display twenty-four, eighty character lines. A graphic symbol is displayed for all of the ASCII combinations with the exception of Space, which is indicated by a blank character position, and Backspace which will cause the function to be performed but will not result in the BS character being displayed. The cursor, a solid white rectangle displayed on the face of the tube, indicates the position where a function will next be performed. When the cursor overlays a character already on the screen, that character is changed to a negative image.

DISPLAY MONITOR OPERATOR CONTROLS

- | | |
|--------------------|---|
| TUBE TILT | - The tube can be tilted to permit the operator to adjust the face of the tube to be perpendicular to the line of vision or to tilt the tube to compensate for lighting conditions within the room. |
| BRIGHTNESS CONTROL | - The brightness of the characters displayed on the screen is operator adjustable. |
| MONITOR POWER | - The power to the Monitor may be turned off by the operator. The Keyboard will be inoperable. The Operational and Special Function Control indicators will remain lighted when the Monitor power is off. Data stored in the Display Logic will not be altered. |

4.1.2 Display Logic

The Display Logic contains the display storage and editing electronics. The basic Display Logic contains storage for one segment, 24 lines containing 80 characters each. The Display Logic can be expanded to two or three segment storage capability as a option. The segment being displayed is identified by one, two or three displayed dots in a vertical cluster to the left of the display.

4.2 KSR-Operator Console

The Operator Console provides facilities for entering and editing data and manually controlling the Station. It consists of a keyboard, two editing clusters, operational controls and indicators and special function controls. See Figure 5.

4.2.1 Keyboard

The keyboard layout is similar in appearance to a standard office typewriter. The keyboard is capable of generating the 128 code combinations of the American National Standard Code for Information Interchange (ASCII); the Backspace (BS) character is generated by the Cursor left (←) key. All ASCII control characters except Tab, New Line and Return require simultaneous use of the Control key and the appropriate graphic key to produce the control character.

The keyboard is capable of being operated at a rate of over 2000 words per minute and permits N-key rollover, i.e., any number of keys may be depressed and the subsequent depression of an additional key will result in an output from that key.

The Dash, Period and Space keys will repeat when the key is depressed beyond the normal stopping point; the repeat character rate is 28 characters per second.

The basic keyboard for the DATASPEED 40 Station Arrangements will be arranged to generate all of the ASCII characters except the lower case of the alphabet. An option is available to convert to a full ASCII format.

4.2.2 Operator Controls

Station Control Switches

SEND - Operating this key places the unit in a send mode which turns on RTS to the data set. The unit will not begin sending until CTS is turned on by the data set. When in the SEND mode, the red lamp in the keyswitch will light. The unit will come out of the SEND mode after a valid turnaround character is sent or it is manually removed by depressing the LOCAL key.

RECEIVE - The red indicator in this keyswitch will light whenever the unit is conditioned as a receiver.

LOCAL

- The Station will normally be in the LOCAL mode if the power is on and no other mode has been established. This is the mode that allows preparation and editing of data "off-line." The data set is not conditioned either as a sender or receiver when the set is in LOCAL.

S/R

- This key is used to provide the terminal with optional conversational capabilities not requiring the usual message ending characters and control keys. When the terminal is in the S/R mode as indicated by the lighting of the lamp, the operator may prepare a line of information. When the line is completed and corrected to the operator's satisfaction, the Carriage Return character is entered which causes the cursor to return to the beginning of the line in which it is in and begin transmitting (SEND mode - lamp lights) up to and including a valid turnaround character. When in the S/R mode the CR is recognized as a turnaround character. The set will then condition itself and the data set as a receiver and wait for a response.

INTRPT

- This key is used to interrupt the remote sending station. When operated the key switch will light and remain lit until operated a second time. During this interval both the sending and receiving stations will remain in an idle mode. Transmission may continue from this point by re-operating the INTRPT key a second time (applicable only when a data set with supervisory channel control.

4.2.3 Cursor Controls

Cursor
RETRN

- Operation of these keys will not alter the information displayed on the Monitor or in the Display Logic Storage.
- Operation of this key returns the cursor to the first character position in the same line.

(↑) Cursor UP

- Operation of this key moves the cursor up one line in the same column until the cursor reaches the top line on the screen. This key is repeatable. When the Display is receiving on-line the action is the same except after the cursor has reached the top line on the screen if more than 24 lines of storage are provided, additional Cursor Up commands will cause the displayed information to scroll down until the first line of the page is displayed. Scrolling will stop at this point.

(↓) CURSOR DOWN

- Operation of this key moves the cursor down one line in the same column until the cursor reaches the bottom of the screen. This key is repeatable. When the Display is receiving Cursor Down commands on-line the action is the same except after the cursor has reached the bottom line of the screen; if more than 24 lines of storage are provided, additional Cursor Down commands will cause the displayed information to scroll up until the last line of the page is displayed. Scrolling will stop at this point.

(→) CURSOR RIGHT

- Operation of this key moves the cursor one character position to the right in the same line until the end of the line is reached. This key is repeatable.

(←) CURSOR LEFT

- Operation of this key moves the cursor one character position to the left in the same line until the beginning of the line is reached. This key is repeatable.

CURSOR TAB
(Optional)

- This key is provided with the Horizontal Tabulation option. Operation of this key will advance the cursor to the next Tab Mark, if present, or to the first character position of the next line. No Horizontal Tabulation character will be written at the cursor position nor will Space characters be written in any character positions.

HOME

- Operation of this key places the cursor in the first character position of the first line of the page. This is called the HOME position. If the Display has an expanded (3840 or 5760 characters) storage, operation of this key will cause segment 1 to be displayed and the cursor will be placed in the first character position of the first line.

4.2.4 Message Editing Controls

- Operation of these keys will alter the information on the display or in the display storage.

CLEAR

- Operation of this key will clear all unprotected data starting from the cursor position to the end of the Display Logic storage and place a Space character in these positions. If the entire storage is to be cleared, the Home Key is depressed prior to the Clear Key. A Display completely cleared of data will have only the cursor, Tab Marks and segment marks displayed on the screen.

LINE INSERT

- Operation of this key causes the line in which the cursor is located and all lines below it to move down one line on the screen and in the Display Logic storage. The cursor will be placed in the first character position of the line and all character positions will be filled with Space characters. For this function to occur, the last line of the storage must contain all Spaces; i.e., cannot contain any data.

LINE DELETE

- Operation of this key causes the line in which the cursor is located to be deleted from the screen and the Display Logic storage. All lines below the deleted line will move up one line position filling the gap created by deleting the line. The cursor will be positioned in the first character position of the line. This operation results in one additional line of Space characters following the last line of data.

CHARACTER INSERT

- Operation of this key causes the character located at the cursor and all characters to the right of the cursor, to the end of the character field, to shift one position to the right. A Space character will appear at the cursor position. If a character is displayed in the last character position of the character field the function will not be performed. This key is repeatable.

CHARACTER DELETE

- Operation of this key causes the character located at the cursor to be deleted. All characters to the right of the cursor, to the end of the character field, will move one position to the left and a Space character will appear in the right most position. This key is repeatable.

4.2.5 Segment Controls (Optional)

SCROLL UP

- This key is provided when the Display Logic has an expanded storage. Operation of the key causes the displayed lines to move up one line at a time. The top line will be removed from view and the next line of the page will move onto the screen as the bottom line. This key is repeatable. Scrolling up will be inhibited when the last line of the page is at bottom of the screen.

SCROLL DOWN

- This key is provided when the Display Logic has an expanded storage. Operation of the key causes the displayed lines to move down one line at a time. The bottom line will be removed from view and the previous line of the page will move onto the screen as the top line. This key is repeatable. Scrolling down will be inhibited when the first line of the page is at the top of the screen.

SEGMENT ADVANCE

- This key is provided when the Display has an expanded storage. Operation of the key causes the next segment of the page to be displayed. For example, if segment 1 is displayed, the screen will advance to segment 2. If the last part of segment 1 and the first part of segment 2 is displayed, segment 2 will be displayed. If segment 3 of a 72 line Display Device is fully displayed on the screen, performing this function will cause segment 1 to be displayed.

- The cursor position on the screen does not change during the operation of the SCROLL UP, SCROLL DOWN or SEGMENT ADVANCE keys.

4.2.6 Format Controls (Optional)

TAB SET (Column)

- This key is provided with the Horizontal Tabulation option. Operation of this key will cause a Tab Mark to be placed in the character position located by the cursor and all character positions below the cursor, in that column, to the end of the page. The Tab Mark is displayed as a single dot in the lower left-hand corner of the character position. No data on the page is altered.

TAB CLEAR

- This key is provided with the Horizontal Tabulation option. The key clears all Tab Marks from the cursor position to the end of the line and all Tab Marks in the column below the cursor and to the right of this column. No other data is altered.

HIGHLIGHT

- This key is provided with the Highlight option. The Highlighting feature provides the ability to blink character positions to allow data to stand out from surrounding information. Highlighted characters will blink at approximately one cycle-per-second, going from full intensity to one-half intensity. To enter highlighted data in Local mode, the Highlight key is depressed - the indicator will light. All data entered with the Highlight indicator on will be highlighted. Highlighted information will remain highlighted throughout all editing operations except when overwritten in the non-highlight mode. Re-operating the key will extinguish the indicator and subsequent character entries will be displayed in the normal unhighlighted condition. When highlighted information is transmitted each group of one or more highlighted characters optionally may be preceded by the Highlight On sequence and followed by the Highlight Off sequence.

Horizontal Tabulation

Horizontal tabulation is an optional feature which will permit the setting of tab stops at any position of any line. The tab settings of any one line are independent of the tab settings of all other lines. Tab sets may be set locally or on-line. A tab mark, a small dot in the lower left hand corner of a character position, indicates where a Horizontal Tab has been set. If this option is not provided with the Display and a Horizontal Tabulation character is received, a Horizontal Tabulation character (►) will be written on the screen at the cursor position and the cursor will advance one position.

FORM ENTER-FORM SEND

- Protected format and form outline is an optional feature that provides entry of data that will be displayed but which can not be operated on by the keyboard or edit controls. This feature also permits forms to be outlined by placing a protected New Line character one character position beyond the last character desired in each line. A Form Enter key is provided with the protected format-form outline option (see Section 5.1.2). When this key is operated, prior to depressing the Send key, all characters stored in the Display Logic may be transmitted together with those Escape sequences which delimit protected, highlighted, and Tab Set information.

4.2.7 Printer Controls

The following printer controls are available only when the printer is part of a Keyboard, Display, and Printer Station Arrangement.

PRINT ON LINE

- Operating this key allows the printer to copy all data that is sent or received by the display on-line. This mode can be turned on or off manually at will by the operator. The lamp indicates whether this mode is on or off.

PRINT LOCAL

- Operating this key will cause the contents of the display logic storage to be printed on the printer beginning with the character in the cursor location up to a valid message ending character.

4.3 RO Operator Console

An operator console is provided on the RO Printer to house up to four keys; these keys are designated and function as follows (see Figure 6).

Interrupt (Red Indicator)

An interrupt (INTRPT) key is provided to permit the received transmission to be interrupted. When operated, the key will light and the Supervisory Transmitted Data lead will turn off. A second operation of the INTRPT key turns on the Supervisory Transmitted Data lead and turns off the indicator. The sending and receiving station will remain idle during this interval. (Applicable only when a Data Set with a Supervisory Channel is provided).

Trans Start (Green Indicator)

An option provides a transmitter start (TRANS START) key associated with a Discrete Calling Generator (DCG). Depressing the key will cause a low speed 14 bit sequence (programmable) to be transmitted to a remote sending station. The key will remain on during this transmission.

The Discrete Calling Generator feature will permit a receiver to provide a unique identification to the Sender and will allow the DATASPEED 40 Printer to communicate with any Senders (such as DATASPEED TYPE II) having a Discrete Calling Recognizer. This key is also used to test the Printer when off-line. Refer to Section 6.

In-Service (Green Indicator)

The indicator of the IN SERVICE key is normally on. If it is off, the paper supply should be checked for a low or out of paper condition. When the paper supply condition is corrected operation of the key should cause the indicator to light. The status of the power supply is also monitored by this indicator.

Data Error (Red Indicator)

A DATA ERROR indicator may be provided on the RO Printer Station Arrangement to alert the subscriber that an invalid character parity has been detected. This feature can be disabled. However, if this feature is enabled and the substitute character option of the Printer is executed, the subscriber may scan the printer copy to locate the errored character(s). Operation of this key will extinguish the indicator.

4.4 Printer

The Printer is an electro-mechanical line-at-a-time friction feed impact printer which provides hard copy of the data stored in the Display Logic or of data received directly from the communication line. Printing is accomplished by impacting the paper and ink ribbon into a moving type pallet. The type carrier is readily changeable by the Bell System Maintenance Personnel.

Character and Line Spacing

Characters are spaced at ten characters per inch horizontally and lines are spaced at six lines per inch vertically.

Line Length

The maximum line length for the initial DATASPEED 40 Printers is 80 characters. An option will allow the right hand margin to be moved a maximum of 7 character positions to the left.

Graphic Character Set

The basic Printer Character set is arranged to print the 63 graphics in columns 2 through 5 of ASCII. An optional character set is available to print the 94 graphics in columns 2 through 7; the Space character is a non-printing graphic and Delete is a control (non-printing, non-spacing). When the Printer is arranged to print the 63 graphics, an option is executed in the Printer Logic to cause columns 4 and 5 of ASCII to be printed whenever graphics from columns 6 and 7 are received (foldover). A Printer using a 63 character set can thus intelligently print information received from a data source using a 94 character set.

Type Carrier

The type carrier for the Printer has 192 type pallet slots. These slots are filled with one or more character sets. Every character set on the type carrier begins with a slot reserved for the font set identifier consisting of two alpha characters on the face of the pallet. These characters are also used as an optional substitute character when incorrect parity is received.

The type carrier will therefore be equipped with either three character sets of the 63 graphic set plus a leading position or two character sets of the 94 graphic set of ASCII plus leading and trailing positions (192 slots).

Printing Rate

Characters are printed in the order in which the proper type pallet on the type carrier aligns with the proper column position. When a group of characters is in storage, simultaneous printing of several of these characters in different column positions is a possibility.

Although the type carrier and printing mechanism always operate at the same rate, the printing rate (in lines per second) is related to the size of the character set being used. Refer to Section 5.1.4 for Printer Format Considerations.

Data Stacking

Data stacking is a basic Printer feature which allows the Printer to accept and print data when New Line characters are received faster than they can be executed. If this condition occurs, the New Line (LF) characters are ignored and the graphic characters are printed serially, line after line, until the minimum line length or time fill is received. The length of the line, during data stacking, is depending upon the size of the Printer character set and the rate of reception from the communication line. Refer to Section 5.1.4 for Printer Format Considerations.

Control Characters-Recognition and Response

The ASCII control characters LF, VT, FF, CR and ETX are recognized by the Printer which responds as follows (other control characters received by the Printer are discarded):

- LF - The LINE FEED character causes a New Line command (Carriage Return and Line Feed) to be executed.
- VT - The VERTICAL TAB character performs the same function as the LINE FEED character.
- FF - The FORM FEED character performs the same function as the LINE FEED character.
- CR - The PRINTER has the capability to perform a carriage return without line feed to facilitate the underline or over-print of data. For maximum printing rate considerations, the line terminated with CR and the data following it, that is to be overprinted, are considered to be two separate lines of information.
- ETX - A Printer option enables a paper feedout of approximately 16 line feeds upon detection of the END OF TEXT character.

4.4.1 Printer Controls and Indicators

Low Paper Condition

- If a low paper (about ten feet left on roll) condition occurs while copy is being printed, the Low Paper indicator on the Printer housing, will light, but printing will continue to the end of the transmission. The Data Terminal Ready lead will then be kept in an off condition preventing receipt of further messages until the paper supply is replenished. The Print Local key will also be defeated until the condition is corrected.

Local Paper Advance

- A local paper advance key is provided on the Printer. Paper is fed out at a slightly slower rate than normal line feeding as long as the key is depressed.

Single/Double Line Feed

- A subscriber operable switch conditions the Printer to respond with one or two line feeds on a New Line command. The Automatic Paper Feed-Out of 16 single line feeds is not affected.

Paper and Ribbon

- The initial DATASPEED 40 Printers will accommodate single copy friction feed paper, 8-1/2 inches wide, 5 inch diameter teletypewriter paper roll. The ribbon is of nylon, 1/2" x 40 yards on a business machine style 1443 spool.

4.5 KSR Controller

The Controller contains the logic for controlling the various terminal devices and provides a Data Set interface.

The basic unit has an EIA interface (per RS-232C - See Figure 10) capable of asynchronous operation at 1050 or 1200 baud with single unit start and stop bits, seven bits of ASCII and a single even parity bit.

A number of SEND options are available. Refer to Section 5 for a detailed description.

4.6 Receive Only Controller

The Controller of the RO Printer Station Arrangement contains the logic for controlling the Printer plus an optional 1000 character storage buffer. The RO Controller provides an EIA interface (per RS232C - See Figure 10) capable of asynchronous operation at 1050 or 1200 baud with single unit start and stop bits, seven bits of ASCII and a single even parity bit. A number of options are available to accommodate a variety of applications; these options are detailed in Section 5.3.1.

5. TERMINAL OPERATION

The following is a typical DATASPEED 40 application. In particular the following will be considered.

Message Preparation

- Display Format Considerations
- Operation with Protected Format and Form Outline
- Printer Format Considerations
 - Data Stacking
- Message Ending Characters
- Message Preparation Alarms

Message Transfer

- Batch Send
- Batch Receive
- S/R (Conversation) Message Transfer
 - Single Lines
 - Multiple Lines

Message Reception

- Receive Only Printer Terminal

5.1 Message Preparation

Messages are typically prepared on the Keyboard Display when the station is in the local mode (i.e., conversational mode not executed). The overall format to be followed depends upon the overall system constraints and therefore all cases will not be considered. Some typical operations are described below. All operational keys are capitalized.

- a) Place terminal in LOCAL mode
- b) Place Cursor in HOME position
- c) CLEAR all data displayed on Monitor
- d) Enter and Edit Data
- e) Is transmission to be

- 1) Local Copy Only (Go to 5.1.1)
- 2) Send Mode, Batch Send, (Go to 5.2.1)
- 3) S/R Mode, Conversational (Go to 5.2.3)

5.1.1 Display Format Considerations

When transmitting to the DATASPEED 40 display there may be no more than 80 characters in a line, not including a LF at the end of the line. If more than 80 characters are sent, each one beyond the 80th will overwrite the character in the 80th character position on the display. The LF may be sent after the 80th character and will not overwrite the 80th character position thereby allowing for a full 80 character line.

The terminal has an option to either act on and not display two character sequences (e.g., Escape and one other character) or to not act on and display them. If they are acted on and not displayed they do not take up a character position in the display; therefore, they should not be counted as characters in determining the length of the line. If, however, the Escape sequences are displayed and not acted upon they do occupy character positions and must be included when determining the 80 character line length.

The Display Logic Storage has a minimum capacity of 24 lines. Capacity of 24 or 72 lines are optionally available.

The control functions (when available) that can be selected are listed in Figure 9. The appropriate amount of time must be allowed for these functions to be executed.

5.1.2 Operation with Protected Format and Form Outline

Protected format and form outline is an optional feature that provides entry of data that will be displayed but which will not be operated on by normal operation of the keyboard or edit controls. This feature also permits forms to be outlined by placing a protected New Line character one character position beyond the last character desired in each line.

To enter, change, or clear protected data in the Local mode, the Form Enter key must be depressed - the indicator will light. Data that is keyboarded with the Form Enter indicator lit is displayed at half intensity and is potentially protected. To protect the data, the Form Enter key must be depressed again extinguishing the indicator and restoring the terminal to the normal data entry mode. Once protected, any attempt to enter data into the protected area will result in an audible tone - the cursor will advance one character position and the protected data will remain unaltered.

If information is to be transmitted to a Display equipped with this option it should be recognized that the Display may have protected characters in storage. To prevent distortion of the text it is recommended that the Device Reset command, plus an appropriate time fill (See Figure 9) precede transmission of the text. This command will cause the Display Device to execute the Home,

Form Enter On, Clear, Tab Clear and Form Enter Off functions which will clear out all protected and unprotected characters. Alternatively the Home, Form Enter On, Clear and Form Enter Off commands, with appropriate time fill (See Figure 9) and various sending options (see below) can be transmitted if known protected tab settings are to be retained.

Protected Format Send Options

<u>Protected Characters</u> are sent as:	<u>Unprotected Characters</u> are sent as is with:
1. displayed	no changes
2. displayed	HT converted to space
3. spaces	no changes
4. spaces	HT converted to space
5. deletes	no changes
6. not sent	no changes
7. not sent	HT at end of field
8. not sent	HT converted to space

These options will affect all data transmitted unless the FORM SEND Key is used (See Section 4.2.6).

5.1.3 New Line Considerations

This key will cause the New Line symbol (\equiv) to be displayed and will position the cursor at the first character position of the next lines. If the Display has expanded storage (forty-eight or seventy-two lines) and the New Line key is depressed with the cursor on the last line of the screen, the New Line symbol will be displayed and the display will "Scroll UP" a line, i.e., the top line will no longer be visible, the remaining lines will move up one line on the screen and the cursor will be in the first character position of the new line which is moved up onto the screen. This action will continue until the last line in the page is displayed.

If a character including the Space character, is written into the last position of a line and the very next action is an attempt to write a New Line character, the character will not be overwritten but the New Line function will be performed. If, however, the cursor is moved and then returned to this position, writing of the New Line character will overwrite the character in the last position. If it is desired to overwrite the character in the 80th position with New Line, simply depress CHAR DELETE and then New Line. Characters other than New Line or Backspace will always overwrite a last character position.

When the New Line character is placed in a line, no character can be written to its right. Also, any characters which may have been present to its right. Also, any characters which may have been present to the right, prior to depressing the New Line key, will be changed to Spaces. Multiple New Line characters can be placed in the last line of the page as a means for advancing paper in a Printer. In addition, other characters can be placed after the New Lines in the last line of the page (When the Additional Editing Features Group is provided an alarm will sound for each character so entered. These characters will be transmitted unless preceded by a page ending character).

All lines which do not contain a New Line character will have a New Line character sent automatically following the 80th character of the line; however, transmission time will be increased since Space characters will be sent to fill out the line. It is therefore recommended that a New Line character be placed immediately to the right of the last character on the line for efficient transmission.

5.1.4 Printer Format Considerations:

There are two printers available with the DATASPEED 40. The basic printer includes a two line buffer to store the data being printed. The printing is done one line at a time and the greatest amount of time necessary to print a line depends on the length of the character set. Lines of data which take less time to transmit than the time required to print the line will cause data stacking, described below, to occur. To allow for the minimum time required to print each line, the transmission time required to send of each line of data must be equal to or greater than the minimum time to print the line. This can be accomplished two ways. The first is to transmit the line and wait for a time period equal to the difference between the minimum time required and the time taken by transmitting the line, e.g., time required = 191ms, line consists of 10 characters (9 char. & NL), transmission rate is 120 cps or 8.33 ms per character --- $191 - (10 \times 8.33) = 107.7$ ms of "wait time". This 107.7 ms could also be taken up by transmitting nonprinting or "fill" characters to occupy that time, e.g., $107.7 \text{ ms} / 8.33 \text{ ms/Char} = 12.9$ characters. If the line has more characters (both printing and nonprinting) than the necessary time required, no fill characters are necessary.

<u>Char.</u> <u>Set</u>	<u>Maximum</u> <u>Time</u>	<u>Minimum Characters Per Line</u>	
		<u>105 cps</u>	<u>120 cps</u>
64	191 ms	20	23
96	272 ms	29	33

The buffered printer contains a 1000 character storage buffer in addition to the two line buffer. This additional capacity allows data to be sent without either "fill" characters or "wait" time. The data flows into the buffer at a constant rate and the printer receives data from the buffer as needed. This means that as short lines that would normally require fill characters are received, the buffer begins to fill up since it provides the necessary wait time to the printer.

When longer lines are received the opposite occurs since a longer time interval than necessary has been provided. The buffer will then empty out. Instead of having to format each line it is only necessary to average a minimum number of characters per line over many consecutive lines to maintain a constant rate.

Char. Set	105 cps		120 cps	
	Char/Line	Lines	Char/Line	Lines
64	20	45	23	39
96	29	30	33	27

When the buffer becomes approximately 90% full it will alarm causing STD to turn off, the Data Set will then turn the Supervisory Channel off (when activated). The sending device should stop sending data and wait for the terminal to turn STD on again which will indicate that the buffer is empty.

Data Stacking

Data stacking is a basic Printer feature which allows the Printer to accept and print data when New Line characters are received on-line faster than they can be executed. The length of the line, during data stacking, is dependent upon the size of the Printer character set and the rate of reception from the communication line. For example, if the Printer is equipped with the graphics in columns 2 through 5 of ASCII and is receiving data from a 1200 baud, asynchronous line (10 units per character), characters will be arriving at the Printer at the rate of 120 per second. Since 191 ms is the maximum time required to print one line under the above conditions, receipt of a minimum of 23 characters or equivalent time fill will ensure that data is not stacked. If lines are shorter than this minimum length, the Printer will extend the printed line to approximately 23 characters (depending upon the particular character received) before printing the next line, as shown below.

LISTING OF TERMS

ALARM
CHARACTER FIELD
LINE FIELD
PAGE
PROTECTED CHARACTER
SCREEN
TAB MARK

Extended Form of Data

LISTING OF TERMS
ALARM
CHARACTER FIELD
LINE FIELD
PAGE
PROTECTED CHARACTER
SCREEN
TAB MARK

Actual Printed Copy
(Assuming Worst Case
Conditions)

In a KDP Station Arrangement data stacking will not occur in the Print Local Mode. Data Stacking can occur in either a KDP Station Arrangement or RO Printer Station Arrangement without the 1000 character buffer during on-line reception.

5.1.5 Message Ending Characters

EOT - End of Transmission
FF - Form Feed
ETX - End of Text
GS - Group Separator
CR - Carriage Return (S/R only)
DC4 - Device Control 4 (S/R only)

The EOT character will always be interpreted as a message ending character when either sent or received on-line or sent locally to the printer. When an EOT is detected while sending, the DATASPEED 40 will send the EOT then revert to the receive mode. When an EOT is detected while receiving the DATASPEED 40 will revert to the local mode. When printing locally the DATASPEED 40 will stop immediately after sending the EOT.

The FF character may be used as a valid message ending character on some sets by use of an option. If selected, it will cause the set to revert from the SEND mode to the LOCAL mode (determined by an option) when sent, and from receive to local when received.

The ETX and GS characters will be recognized as valid message ending characters on all sets. On some sets one or both of these characters may be used or not used as determined by options. When selected, each will cause the set to revert from the send mode to the local mode (determined by an option) when sent, and from receive to local when received.

The CR and DC4 characters are used as valid message ending characters only in the S/R mode. When sent each will cause the DATASPEED 40 to revert to the receive portion of the S/R mode. They will not be acted upon when received. The responses to these characters is shown below.

Responses to Message Ending Characters (2) (3)

	<u>Send Mode</u>	<u>Receive Mode</u>
GS	LOCAL (Send)	LOCAL (Receive)
ETX	LOCAL (Send)	LOCAL (Receive)
EOT	REC (Receive)	LOCAL (Send)
DLE EOT ⁽⁴⁾	LOCAL (Disconnect)	LOCAL (Disconnect)

Options Available on Sets with or Expandable to Include the Optional Editing Features (1)

	<u>Send Mode</u>	<u>Receive Mode</u>
GS	LOCAL (Send)	LOCAL (Receive)
ETX	LOCAL (Send)	LOCAL (Receive)
FF	LOCAL (Send)	LOCAL (Receive)
EOT	REC (Receive)	LOCAL (Send)
DLE EOT ⁽⁴⁾	LOCAL (Disconnect)	LOCAL (Disconnect)

- (1) GS, ETX, and/or FF may be optionally ignored.
- (2) RO Printer terminal does not respond to GS, EOT, or FF.
- (3) () denotes Data Set Mode.
- (4) 202R must be manually disconnected.

5.1.6 Message Preparation Alarms

An audible alarm is optionally provided to assist the operator when data is being entered from the Operator Console; the volume of this alarm is operator adjustable.

The following conditions will cause the alarm to sound:

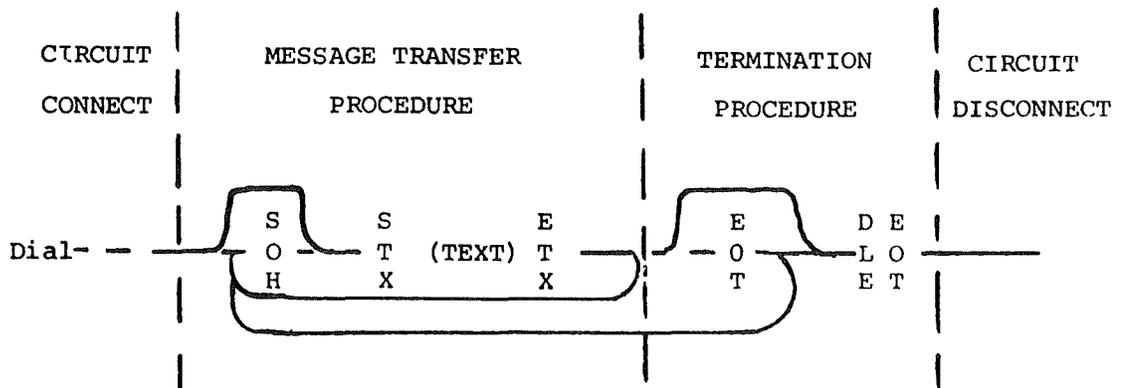
1. Writing a character in the 8th character position prior to the end of a line.*
2. Writing a character in the last character position of a line.*
3. Attempting to write a character over a protected character.
4. Attempting to write a character on a line following a New Line Character.
5. Writing a character on last line of page following new line.
6. Attempting to insert a character between a Horizontal Tab character and next Tab Stop.

* The end of a line (EOL) is the 80th character position or the character position just prior to a protected New Line.

5.2 Message Transfer

The ANSI X3.28 Subcategories 2.1/A1 prescribe the line control and message transfer procedures illustrated. The DATASPEED 40 Station Arrangements will conform to these procedures with the following qualifications:

1. Header Material, including the Start of Header (SOH) character, if required, must be entered by the operator. This header material, including SOH, has no affect on the terminal.
2. The Start of Text (STX) and End of Text (ETX) characters are entered by the operator. STX has no affect on the terminal, and ETX acts as a message ending character on some terminals.
3. The End of Transmission (EOT) character or the disconnect sequence DLE EOT is entered and transmitted by the operator following the transmission of a page terminated with a ETX.



ANSI X3.28 Subcategories 2.1/A1

Two-Way Alternate Switched Point-to-Point

Message Oriented Without Replies and Without Longitudinal Checking

5.2.1 Message Transfer

Batch Send

(S/R Mode is OFF)

- a) Terminal is in Local mode
- b) Data is entered and edited.
- c) A valid message ending character is entered at the end of the message.
- d) The operator places the cursor at the beginning of the message to be transmitted.
- e) The operator depresses the SEND key.
- f) The terminal begins transmitting and transmits up to and including the first valid message ending character it encounters.
- g) The terminal will react one of two ways (Refer to Section 5.1.5).
 1. Condition itself as a receiver.
 2. Revert to LOCAL.

5.2.2 Batch Receive

(S/R Mode is OFF)

- a) Terminal is placed in the receive mode (manually or by a message ending character).
- b) Reverse channel is turned ON (option).
- c) The station receives data until it detects a valid message ending character or loss of carrier for 45 seconds.
- d) The terminal reverts to the LOCAL mode.

5.2.3 S/R (Conversational) Message Transfer

The S/R mode is provided to allow for the preparation and editing of one line of information and the transmission of that line without the necessity of entering standard message ending characters or positioning the cursor. The normal operating procedure is to enter and edit one line of data on the display, when the line is satisfactory a CR character is entered following the last character in that line. The cursor will then return to the beginning of that line and transmit the entire line, one character at a time up to and including the CR. The remote device then responds with a LF character and other data if it wishes. When the remote terminal has finished, the operator may enter another line of data.

S/R Single Lines

(Supervisory Channel Control is applicable only when the terminal and Data Set are strapped to use it)

- a) The terminal is manually placed in the S/R mode.
- b) The terminal is conditioned as a receiver.
- c) The remote device sends data then turns its carrier off. (The RECEIVE lamp will remain ON after carrier is dropped).
- d) The operator enters and edits one line of data on the display.

- e) When the data entered is satisfactory the operator enters a CR character following the last character in the line.
- f) The cursor is automatically returned to the beginning of that line.
- g) The terminal automatically goes into the SEND mode (SEND lamp lights)
- h) The data is sent one character at a time beginning with the first character on the line up to and including the CR character.
- i) After the CR character is detected by the terminal, the entire sequence is now repeated beginning with step (b) of either single or multiple line operation.

5.2.4 S/R Multiple Lines

In the event that more than one line of data is to be transmitted at one time the following procedure is applicable.

- a) The terminal is manually placed in the S/R mode.
- b) The terminal is conditioned as a receiver.
- c) The remote device sends data then turns carrier off when finished.
- d) The operator enters the DC2 character into the display.
- e) The terminal has two possible actions which are determined by an option selection at the time of installation.
 - 1. Do nothing.
 - 2. Send the DC2 character immediately.
- f) Multiple lines of data may be entered in the display. The CR character may be entered in the same manner as other characters and will not cause transmission of the line it is in.
- g) The DC4 character is entered at the end of the data to be transmitted.
- h) The cursor is manually placed at the position containing the DC2 character. (If auto DC2 is used the cursor must then be positioned at the first character of the message).
- i) The SEND key is manually depressed by the operator.
- j) The data is sent one character at a time beginning with the DC2 character up to and including the DC4 character.
- k) After the DC4 character is detected by the terminal the entire sequence is repeated beginning with step (b) of either single or multiple line operation.

5.3 Message Reception

Receive Only Printer Terminal (RO)

The RO is always in a receive mode. Once the connection is established messages may be sent continuously, subject to the appropriate format considerations. Messages may be separated by the ETX character which may (option) cause the printer to feed out 16 lines. The RO may (option) also feed out 16 lines after the call is disconnected. When the unit is optionally arranged to have the 1000 character buffer it will turn STD off when the buffer is 90% full and on again when it is empty.

5.3.1 Receive Only Printer Terminal Options

1. A substitute character is printed in place of each character with a vertical parity error. Odd, even, or no parity check may be selected as an installer option.
2. The Data Error Indicator is lit when an invalid character parity is detected. Even or odd parity check may be selected as an installer option.
3. Selection of the foldover option (installer) causes all ASCII lower case alphas and graphics in columns 6 and 7 to print as the upper case alphas and graphics of columns 4 and 5. If this option is not selected, any lower case alphas and graphics in ASCII columns 5 and 7 (except delete) will be printed as errors ($\frac{5}{2}A_1$) in monospace printers.
4. An automatic new line (return and line feed) is generated automatically. The length of the line may be programmed as an installer option. A line length of between 73 and 80 columns may be selected.
5. The automatic paper feed-out which is provided for convenience in tearing off received copy may be selected by the installer. There are three possible selections:
 - a. No paper feed-out when the call is terminated.
 - b. 16 lines fed out when the call is terminated.
 - c. 16 lines fed out when the call is terminated or when an ASCII End of Text (ETX) character is received.

6. INSTALLATION AND MAINTENANCE

GENERAL

The DATASPEED 40 Maintenance Plan provides the ability to readily isolate a trouble to a faulty device, i.e., Printer, Display Monitor, Display Logic, Operator Console or Controller, and replace the necessary sub-assembly or circuit card(s). The ability to isolate the defective device or sub-assembly prior to dispatching maintenance personnel is essential to this plan.

The Operator's Manual will contain the detailed test procedures for the subscriber. One section will contain those checks which the subscriber should make before calling repair service and another section will contain the instructions for a joint test with a remote test man. These instructions will pinpoint the test indicators and keys which the subscriber will be asked to check or operate.

OPERATOR CONSOLE

Local Loop-Back Test

The subscriber is able to perform a series of simple tests at the Operator Console. The local loop-back test mode is established by simultaneous depression of the Return and Apostrophe keys beyond their normal stop position. The Test indicator to the left of CLEAR key will light to indicate that the Operator Console is now in the local loop-back test mode. The subscriber may now go through a series of specific key depressions and note the response from the Test indicator. These responses are reported to the Repair Service Bureau or test man to assist in diagnosing trouble conditions. The local loop-back test mode is terminated by depressing the "P" key beyond their normal stop position and Return Key.

Power

The subscriber may test to determine if power is available to the Operator Console by depressing the "P" key and Return Key beyond its normal stop position. The Test indicator to the left of the CLEAR key will light if power is available. Releasing the "P" key extinguishes the indicator.

DISPLAY DEVICE

The subscriber will be able to conduct a series of checks on the Display Monitor and Display Logic of the Display Device to assist in localizing troubles. These tests will consist of checking for the presence of the cursor, checking the raster and checking the condition of circuit board indicator lamps (viewed through the louvers at the top rear of the Monitor) and entering information from the keyboard. Using the operator's description of what is displayed, the test man can determine if a trouble is in the Display Monitor, Display Logic or some other section of the Terminal.

PRINTER

A test switch, accessible to the subscriber, is provided on the Printer. This switch, when activated, will disconnect the Printer from the Controller and, using a minimum of the Printer electronics, will exercise the mechanical portion of the unit. The error symbol should be printed in every column position, followed by a line feed, if the Printer is functioning properly.

By questioning the subscriber the test man can determine whether the mechanical or electronic areas of the Printer require servicing.

RO PRINTER STATION ARRANGEMENT

The Printer in the DATASPEED 40 RO Station Arrangement may be tested off-line by the subscriber. Depression of the TRANS START key (with the Data Set on hook or in the Talk mode) will cause a test message to be generated. The message consists of the 64 characters of columns 2 through 5 of ASCII plus LF. The message will be generated until the key is again depressed. Proper print out of the message will indicate that the Printer mechanism plus all electronics following the Data Set interface are performing correctly. Any irregularities in the print out can be described by the subscriber to assist the test man in diagnosing any Printer troubles. The normal Printer test switch, described above, is also available.

7. TECHNICAL FACTS

7.1 Electrical Requirements and Heat Generation

Supply Voltage 115 V \pm 10% @ 60 Hz. \pm 0.45 Hz.

Starting Current (1)

KD Terminal	20 amp. (2)
KDP Terminal	25 amp. (2)
RO Terminal	20 amp. (2)

(1) A single circuit, fused at 10 amps, has been found capable of withstanding the simultaneous starting load of a KD and an RO terminal, without Data Sets.

(2) Worse case. For up to 3 cycles.

Operating Power and Heat Generation

KD Terminal	2.7 amp.	260 watts	885 BTU
KDP Terminal- Printer Idle	2.9 amp.	275 watts	940 BTU
" " - Printer Operating	4.5 amp.	360 watts	1230 BTU
RO Terminal- Idle	1.6 amp.	145 watts	495 BTU
" - Printing	3.2 amp.	260 watts	885 BTU

7.2 Environmental Characteristics

Temperature

Storage	-40°F to +150°F
Operating	+40°F to +110°F

Relative Humidity

Storage and Operating	2% to 95% (non-condensing)
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Altitude

Shipping	Sea Level to 50,000 feet
Operating	Sea Level to 10,000 feet

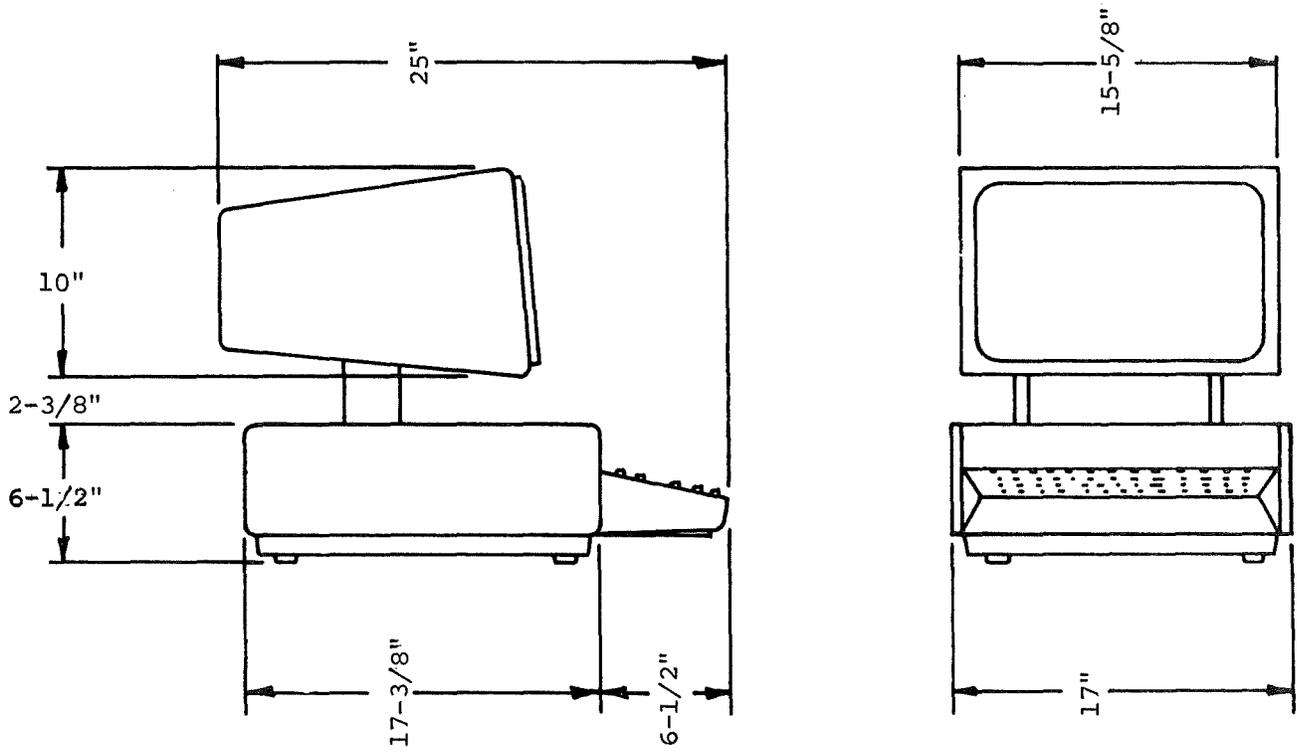
Weight

Display Monitor w/Housing	40 lbs.
Terminal Logic	50 lbs.
Printer and Printer Logic	40 lbs.
Housing for Terminal Logic or Printer	15 lbs.
Operator Console W/Cover	5 lbs.
Pedestal	56 lbs.
RO Printer Terminal	139 lbs.

7.3 Outline Dimensions

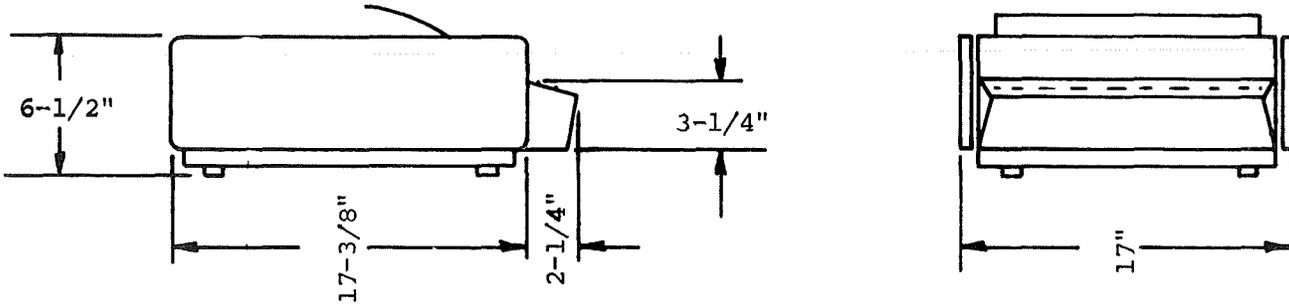
KEYBOARD AND DISPLAY

(ALSO KEYBOARD AND DISPLAY WITH PRINTER UNDER DISPLAY)

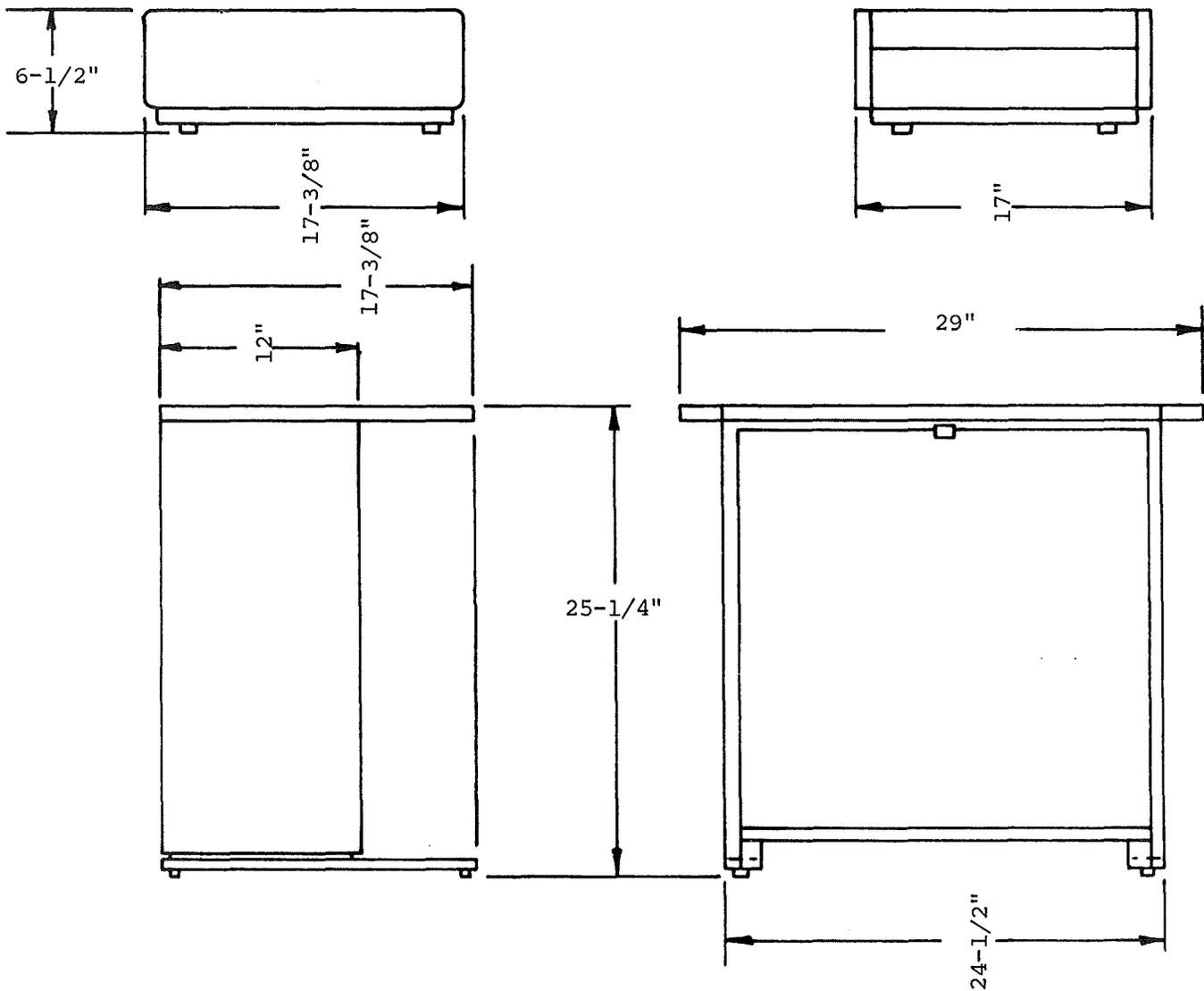


Outline Dimensions
(Cont.)

RECEIVE ONLY PRINTER (80 COLUMN)
AND PRINTER OF KEYBOARD DISPLAY W/PRINTER

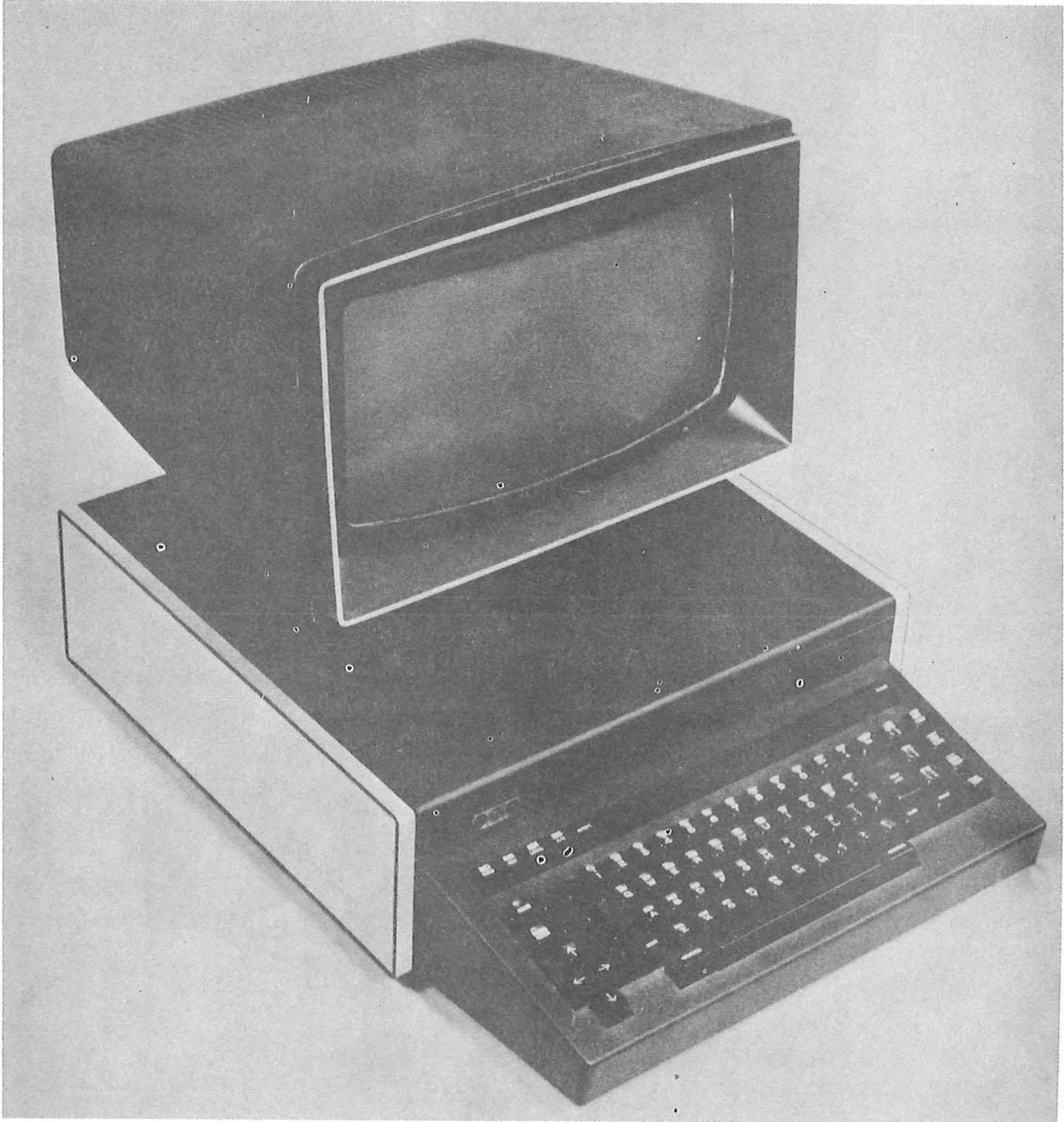


LOGIC (TABLE TOP)



PEDESTAL

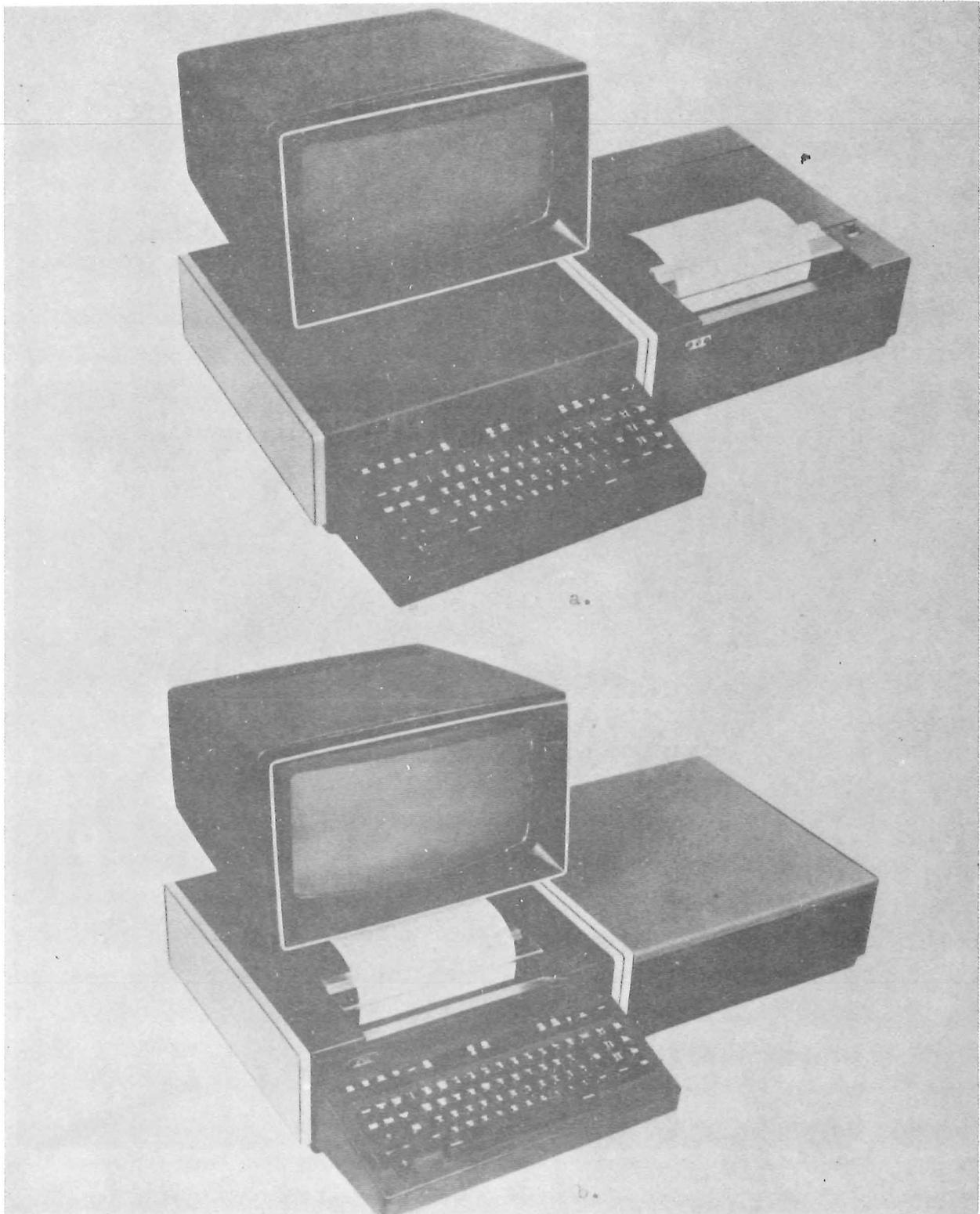
24-1/2" on RO Printer Pedestal



KSR - KEYBOARD AND DISPLAY

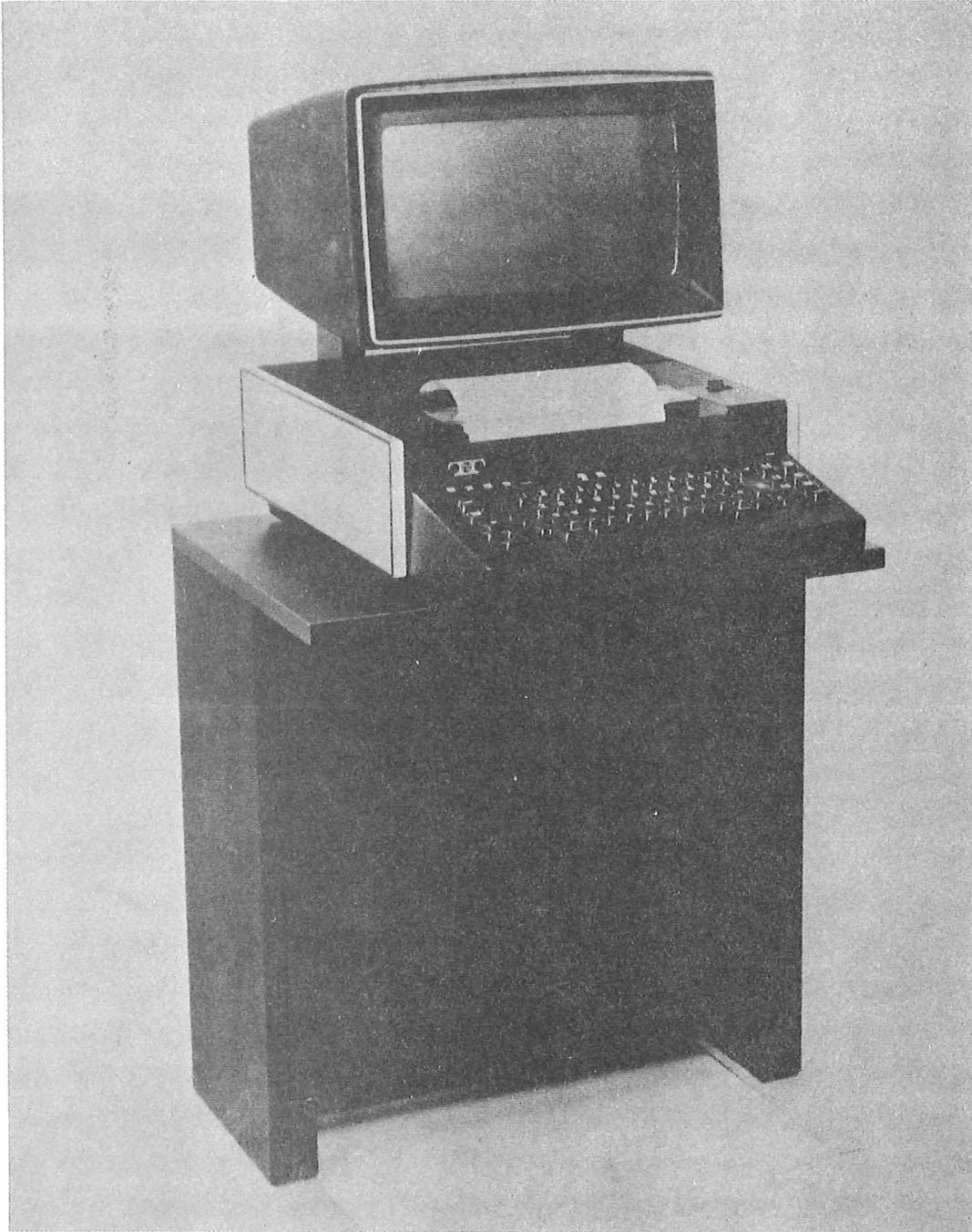
TABLE TOP ARRANGEMENT

FIGURE 1



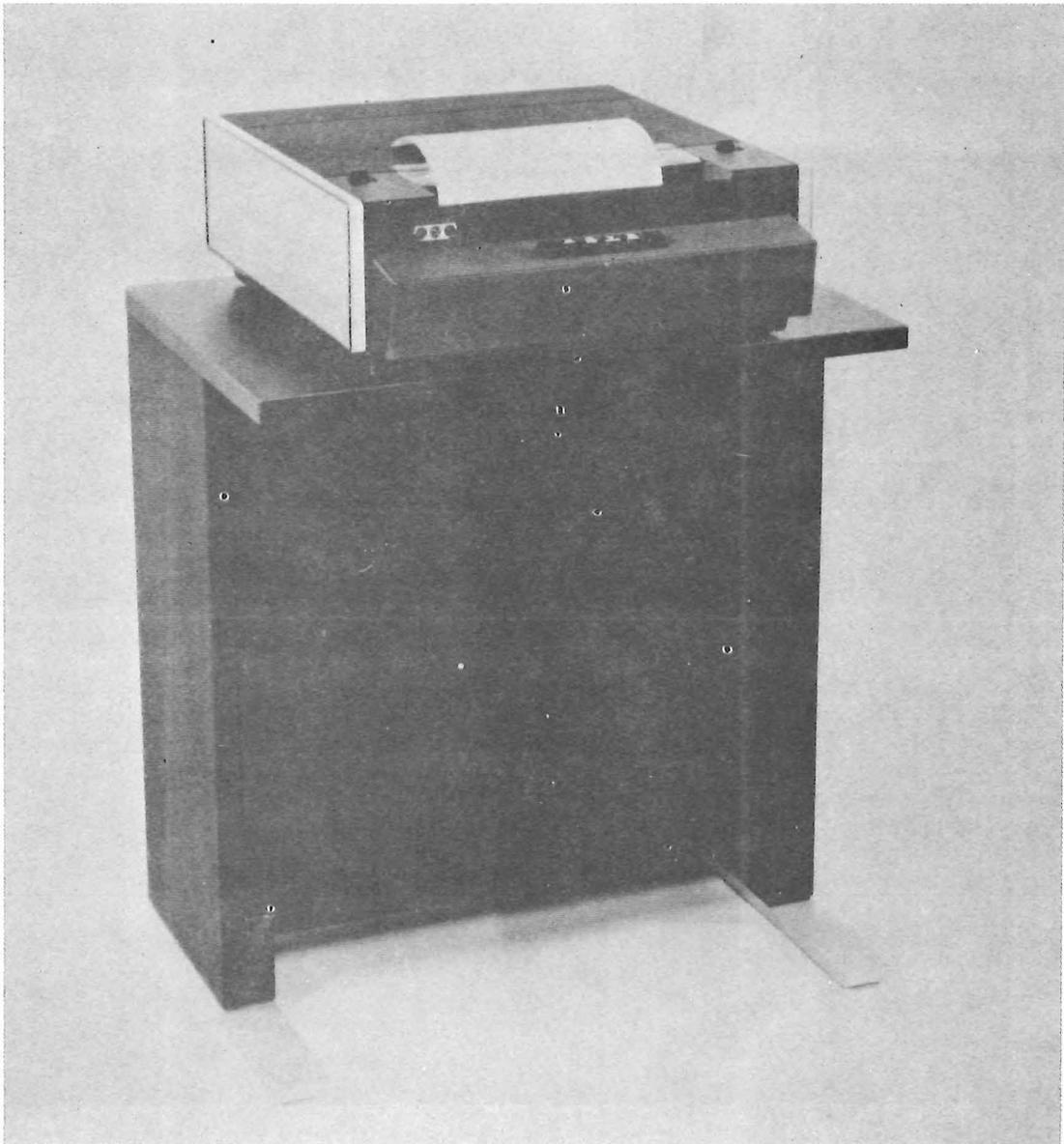
KSR - KEYBOARD, DISPLAY, AND PRINTER
TABLE TOP ARRANGEMENTS

FIGURE 2



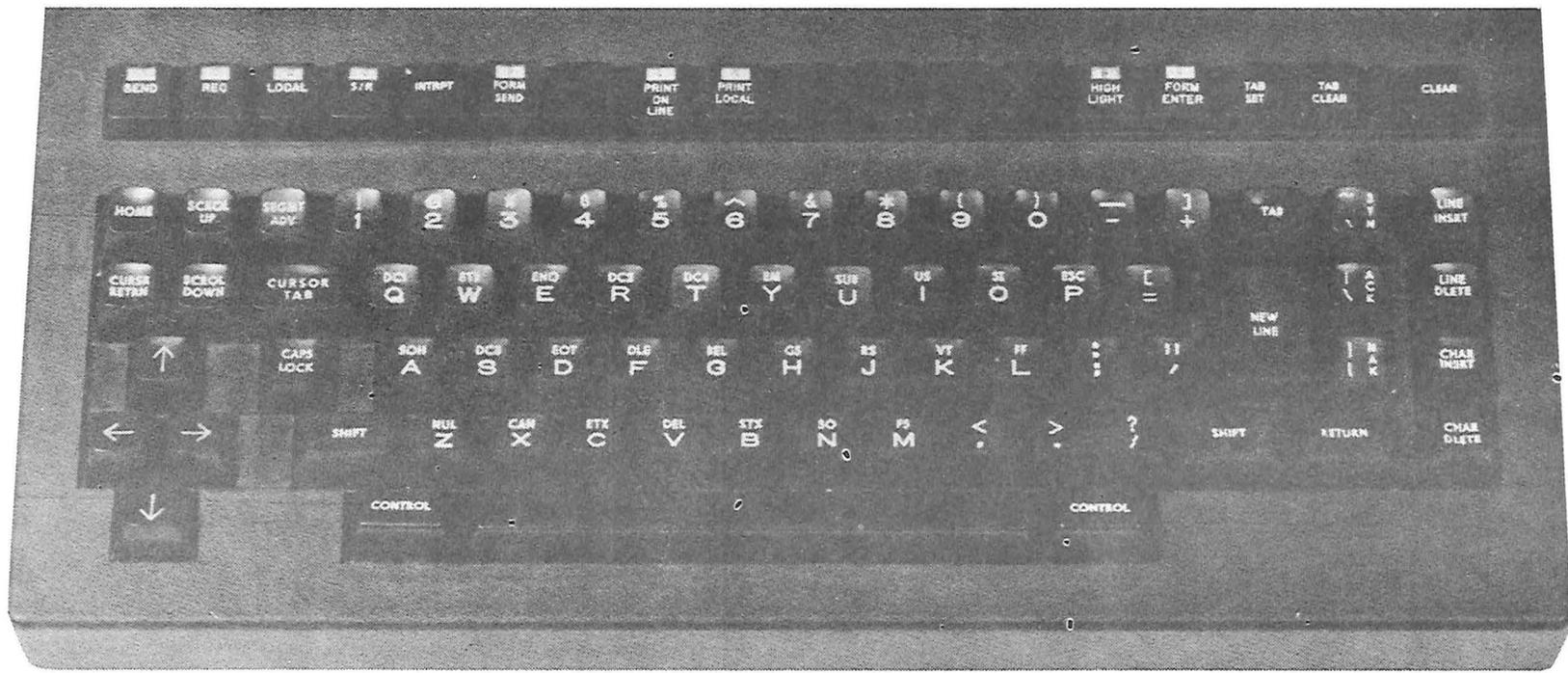
KSR - KEYBOARD, DISPLAY, AND
PRINTER UNDER DISPLAY
e/w PEDESTAL ARRANGEMENT

FIGURE 3



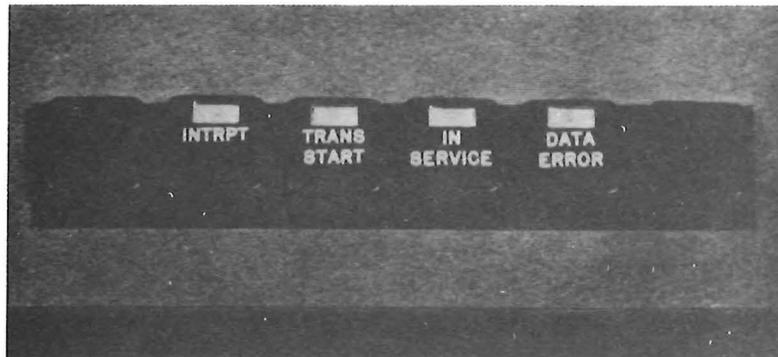
RECEIVE ONLY PRINTER

FIGURE 4



FULL COMPLEMENT
OPERATOR CONSOLE

FIGURE 5



OPERATOR CONSOLE
RECEIVE ONLY PRINTER
STATION ARRANGEMENT

FIGURE 6

ASCII CODE

BITS				7	0				1				
				6	0		1		0		1		
4	3	2	1	5	0	1	0	1	0	1	0	1	
				Col	0	1	2	3	4	5	6	7	
				Row	0	1	2	3	4	5	6	7	
0	0	0	0	0	NUL	DLE	SP	0	@	P	~	p	
		0	1	1	SOH	DC1	!	1	A	Q	a	q	
		1	0	2	STX	DC2	"	2	B	R	b	r	
	1	0	1	1	3	ETX	DC3	#	3	C	S	c	s
			0	0	4	EOT	DC4	\$	4	D	T	d	t
		1	0	1	5	ENQ	NAK	%	5	E	U	e	u
			1	0	6	ACK	SYN	&	6	F	V	f	v
1	0	1	1	7	BEL	ETB	'	7	G	W	g	w	
		0	0	8	BS	CAN	(	8	H	X	h	x
		0	1	9	HT	EM	)	9	I	Y	i	y
		1	0	10	LF	SUB	*	:	J	Z	j	z	
	1	0	1	1	11	VT	ESC	+	;	K	[k	{
			0	0	12	FF	FS	,	<	L	\	l	|
		1	1	1	13	CR	GS	-	=	M]	m	}
			0	0	14	SO	RS	.	>	N	^	n	~
1	1	1	15	SI	US	/	?	O	_	o	DEL		

- | | | |
|---------------------------|---------------------------|-------------------------------|
| NUL =Null | VT =Vertical Tabulation | SYN =Synchronous Idle |
| SOH =Start of Heading | FF =Form Feed | ETB =End of Transmission Bloc |
| STX =Start of Text | CR =Carriage Return | CAN =Cancel |
| ETX =End of Text | SO =Shift Out | EM =End of Medium |
| EOT =End of Transmission | SI =Shift In | SUB =Substitute |
| ENQ =Enquiry | DLE =Data Link Escape | ESC =Escape |
| ACK =Acknowledge | DC1 =Device Control 1 | FS =File Separator |
| BEL =Bell | DC2 =Device Control 2 | GS =Group Separator |
| BS =Backspace (1) | DC3 =Device Control 3 | RS =Record Separator |
| HT =Horizontal Tabulation | DC4 =Device Control 4 | US =Unit Separator |
| LF =Line Feed | NAK =Negative Acknowledge | SP =Space |
| | | DEL =Delete |

(1) Performs cursor-left function on Display Device

ANSI X3.4-1968 (ASCII)
Figure 7

CONTROL GRAPHIC REPRESENTATIONS AND DESIGNATIONS

<u>ASCII Controls</u>	<u>Display Device</u>	<u>Keyboard Designation</u>	<u>ASCII Controls</u>	<u>Display Device</u>	<u>Keyboard Designation</u>
NUL	NU	NUL	DLE	DL	DLE
SOH	SH	SOH	DC1	D1	DC1
STX	SX	STX	DC2	D2	DC2
ETX	EX	ETX	DC3	D3	DC3
EOT	ET	EOT	DC4	D4	DC4
ENQ	EQ	ENQ	NAK	NK	NAK
ACK	AK	ACK	SYN	SY	SYN
BEL	BL	BEL	ETB	EB	ETB
BS	(NOTE 1)		CAN	CN	CAN
HT	▶	TAB	EM	EM	EM
LF	≡	NEW LINE	SUB	SB	SUB
VT	VT	VT	ESC	EC	ESC
FF	FF	FF	FS	FS	FS
CR	←	RETURN	GS	GS	GS
SO	SO	SO	RS	RS	RS
SI	SI	SI	US	US	US
SP	(NOTE 2)		DEL	⌘	DEL

- notes: 1. Backspace (BS) is not displayed on the screen of the Display Device; when received on-line the cursor is moved one position to the left. The keyboard associated with the Display Device does not have a key designation "Backspace"; the cursor left key (←) performs the Backspace function.
2. Space (SP) appears as a blank on the Display Device screen. The Space Bar of the keyboard does not contain a designation.

FIGURE 8

ON-LINE CONTROL FUNCTIONS FOR DISPLAY DEVICE

(See Note 1)

<u>Function</u>	<u>Control Code</u>	<u>Execution Time (Note 2)</u>		
		<u>24 Line Display</u>	<u>48 Line Display</u>	<u>72 Line Display</u>
Tab Set (Single)	ESC 0 (Zero)	100 us	100 us	100 us
Tab Set (Column)	ESC 1	.6 ms	1.2 ms	1.8 ms
Tab Clear	ESC 2	50 ms	100 ms	150 ms
Horizontal Tabulation	HT	Note 3	Note 3	Note 3
Highlight On	ESC 3	4.8 us	4.8 us	4.8 us
Highlight Off	ESC 4	4.8 us	4.8 us	4.8 us
Cursor Up	ESC 7	140 us	140 us	140 us
Cursor Down	ESC B	125 us	125 us	125 us
Cursor Right	ESC C	140 us	140 us	140 us
Cursor Left (See Note 5)	BACKSPACE	100 us	100 us	100 us
Cursor Tab	ESC @	Note 3	Note 3	Note 3
Cursor Return	ESC G	150 us	150 us	150 us
Home	ESC H	170 us	170 us	170 us
Clear (See Note 4)	ESC J	70 ms	140 ms	210 ms
Form Enter On	ESC W	4.8 us	4.8 us	4.8 us
Form Enter Off	ESC X	4.8 us	4.8 us	4.8 us
Device Reset (See Note 6)	ESC R	10.0 ms	10.0 ms	10.0 ms

FIGURE 9

- NOTES:
1. The functions can be performed by Terminals that have been equipped with the optional Editing Features.
 2. Execution time is the time required for the terminal to perform the described function or to have progressed to a point where reception of another character will no longer interfere with completion of the function. An appropriate number of fill characters, or delay in transmission, must be provided whenever the execution time exceeds the on-line character interval.
 3. Execution time is 540 us for the first character position tabulation plus 195 us for each additional character position tabulation.
 4. The Clear function is a special case. The execution time refers to the period during which additional control functions are prohibited. After 12 ms LF characters may be sent and repeated if they are at least 12 ms apart during the execution time. Other graphic characters may be sent immediately.
 5. Provided in all Display Controllers.
 6. On receipt of the Escape R sequence, the Display Logic will execute the Home, Form Enter On, Clear, Tab Clear and Form Enter Off functions. All protected and unprotected characters and tab sets will be cleared by this function. The execution time of this function applies to operation when the next characters received are graphics. At least 33 ms per segment must elapse before additional escape sequences are received.

DATASPEED 40 202C/D DATA SET INTERFACE

<u>Pin No.</u>	<u>Lead Designations</u>
1	Protective Ground (AA)
2	Transmitted Data (BA)
3	Receive Data (BB)
4	Request to Send (CA)
5	Clear to Send (CB)
6	Data Set Ready (CC)
7	Signal Ground (AB)
8	Data Carrier Detector (CF)
9	
10	
11	Supervisory Transmitted Data (SA)
12	Supervisory Received Data (SB)
13	
14	
15	
16	
17	
18	
19	
20	Data Terminal Ready (CD)
21	
22	Ring Indicator (CE)
23	
24	
25	

Cinch or Cannon Plug - DB-19604-432

Data and Control Circuits in accordance with EIA RS-232C

<u>Voltage</u>	<u>Control</u>	<u>Line Signal</u>	<u>Binary State</u>
-5V to -25V	Off	Mark	1
+5V to +25V	On	Space	0

For additional details see appropriate Technical Reference (Bell System publication 41202) on 202C and D Data Sets

FIGURE 10

8. GLOSSARY

Alarm A tone of short duration which alerts the operator to a special situation.

The alarm will sound when a character is entered in the 8th character position prior to the end of the line. The alarm will sound again when the cursor reaches the last position of the line and a character is entered in this position. The end of a line is the 80th character position or the character position just before a protected New Line. If the cursor is placed over a protected character and an attempt is made to enter a character in that position from the keyboard, the alarm will sound. The alarm will also sound if an attempt is made to write a character to the right of any New Line Character. In addition the alarm will sound if an attempt is made to insert a character between a Horizontal Tab character and the next tab stop on the same line. Option available to sound alarm in response to a received ASCII Bell (BL) character.

Character Field A group of consecutive unprotected characters within a line bounded on the left by either the beginning of the line, a tab mark, or a protected character and bounded on the right by either the end of the line, a tab mark or a protected character. The end of a line is the 80th character position or the character position just before a protected New Line.

Cursor An indicator, on the Display, of the location where an Operator Console action will take place, i.e., the position where a character will be written or an editing function will take place. The cursor is displayed on the screen as a solid white rectangle. When a character is already in memory at the cursor location the image will be displayed within the cursor in a negative (black on white) form.

Highlight An optional feature that causes selected characters to "stand out" from surrounding information by blinking between half and full intensity once per second. Either local or on-line signals can initiate the highlight action.

Line Field A group of consecutive lines all having the same maximum line length and containing no protected characters other than protected New Line.

This field is bounded at the top by either the top of the screen (or page with the expanded storage), a line of a different maximum length, or a line containing one or more protected characters other than New Line. It is bounded at the bottom by either the bottom of the screen (or page), a line of a different maximum length or a line containing one or more protected characters other than New Line.

Page	The total data stored in the Display Logic. It consists of one, two or three segments each of 24 lines of 80 characters. The maximum data storage capacity is 72 lines of 80 characters per line (5760 characters.)
Protected Character	A character or character position which cannot be changed or moved unless the Operator Console is in the Form Enter mode. These characters are displayed at one-half the intensity of the unprotected characters.
Screen	The area where data is displayed on the tube face. The maximum display on the screen is 24 lines of 80 characters per line.
Scrolling	The shifting up or down the page, one line at a time, when more than one segment of memory is provided, of the selection of which 24 line portion of the page will be displayed on the screen.
Segment	A segment is a defined group of 24 lines of 80 characters (lines 1-24,25-48 or 49-72). This is the maximum that can be displayed on the Display Monitor at one time and is also the basic module of display memory capacity. A Display Device may be equipped with one, two or three segments of memory.
Tab Mark	A small dot displayed in the lower left-hand corner of a character position. It indicates where a Horizontal Tab has been set.
Tab Set (Single)	Causes a Tab Mark to be placed in the character position located by the cursor only. Can only be set on-line.
Tab Stop	Any of the following: <ol style="list-style-type: none">1. A tab mark located at an unprotected character position; a tab mark located at a protected character position is not treated as a tab stop.2. The first unprotected character position following a protected character.3. The first position on a line if it is unprotected.4. The last character position on the last line of the page.