ASYNCHRONOUS "DATASPEED*" 4420 KD/KDP STATIONS

DESCRIPTION AND OPERATION

CONTENTS PAGE

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1. GENERAL

1.01 This practice covers the DATASPEED 4420 Station Arrangements and provides the information necessary to identify DATASPEED 4420 and associated equippment (supplemental information is referenced and necessary).

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 Before installation, determine the station configuration.

1.04 When ordering replaceable components, unless otherwise specified, prefix each part number with the letters TP (ie, TP408065).

2. SUPPLEMENTAL INFORMATION

Sections:

574-500-Series	43 Teleprinter Sets
574-501-Series	43 Teleprinter Printer
574-502-Series	43 Teleprinter Operator Console
574-503-Series	43 Teleprinter Enclosures
582-200-206	Installation (4420)
582-200-406	Wiring
582-200-506	Testing and Troubleshooting
582-200-706	Disassembly/Reassembly and Parts
582-200-755	Routine Maintenance
582-210-Series	80-Column and 132-Column DATASPEED 40 Printer
582-211-Series	DATASPEED 40 Operator Console
582-213-Series	DATASPEED 40 Display Monitor
999-300-124	How To Operate Manual (DATASPEED 4420)
999-300-126	How To Operate Manual (43 Teleprinter)
999-301-121	How To Operate Manual (DATASPEED 40 Printer)

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3. AC POWER AND ENVIRONMENTAL REQUIREMENTS

3.01 Currents and power shown are maximum values based on power company supplied voltages within the limits:

103 to 127 volts ac 60 Hz ±0.5 Hz.

3.02 Maximum IN RUSH current:

Monitor and Base	13 amps (See Note 1)
DATASPEED 40 Printer	10 amps (See Note 1)

Note 1: Worst case conditions, for up to 3 cycles.
Note 2: Refer to Section 574-500-Series for 43 Teleprinter requirements.

3.03 Heat generation:

Monitor and Base	386 BTU/HR
DATASPEED 40 80-Column Printer	428 BTU/HR
DATASPEED 40 132-Column Printer	547 BTU/HR
DATASPEED 43 Teleprinter	255 BTU/HR

3.04 Environmental restrictions: Environmental conditions should be maintained within the following limits to avoid damage and provide proper operation.

Operating:

Amb. temp. +4.5°C to +43°C (+40°F to +110°F)
Rel. humidity: 5% to 95% (non-condensing)
Altitude: Sea level to 10,000 ft.

Storage:

Amb. temp. -40°C to +65°C (-40°F to +150°F)
Rel. humidity: 5% to 90% (non-condensing)
Altitude: Sea level to 50,000 ft.

Note: As with any device that can be damaged by water, sudden temperature changes that can cause condensation should be avoided.

3.05 Weight (approximate) unpacked:

	Lbs.
Monitor	38
Base Assembly	9
Opcon (standard) w/base	7-1/2
Opcon (wide) w/base	8-1/4
80-Col. DATASPEED 40 Printer	41
132-Col. DATASPEED 40 Printer	56
43 Teleprinter Set (RO)	29
80-Col. DATASPEED 40 Printer Cabinet	43
132-Col. DATASPEED 40 Printer Cabinet	52-1/2

4. STATION IDENTIFICATION

4.01 The DATASPEED 4420 consists of three basic station arrangements:

KD (Keyboard Display)
KDP (Keyboard Display With DATASPEED 40 Printer)
KDP (Keyboard Display with 43 Teleprinter)

DATASPEED 4420 KD

4.02 The KD consists of a keyboard and monitor, with the station logic mounted under the monitor. The KD may be mounted on a pedestal top or on the customer's own office furniture.

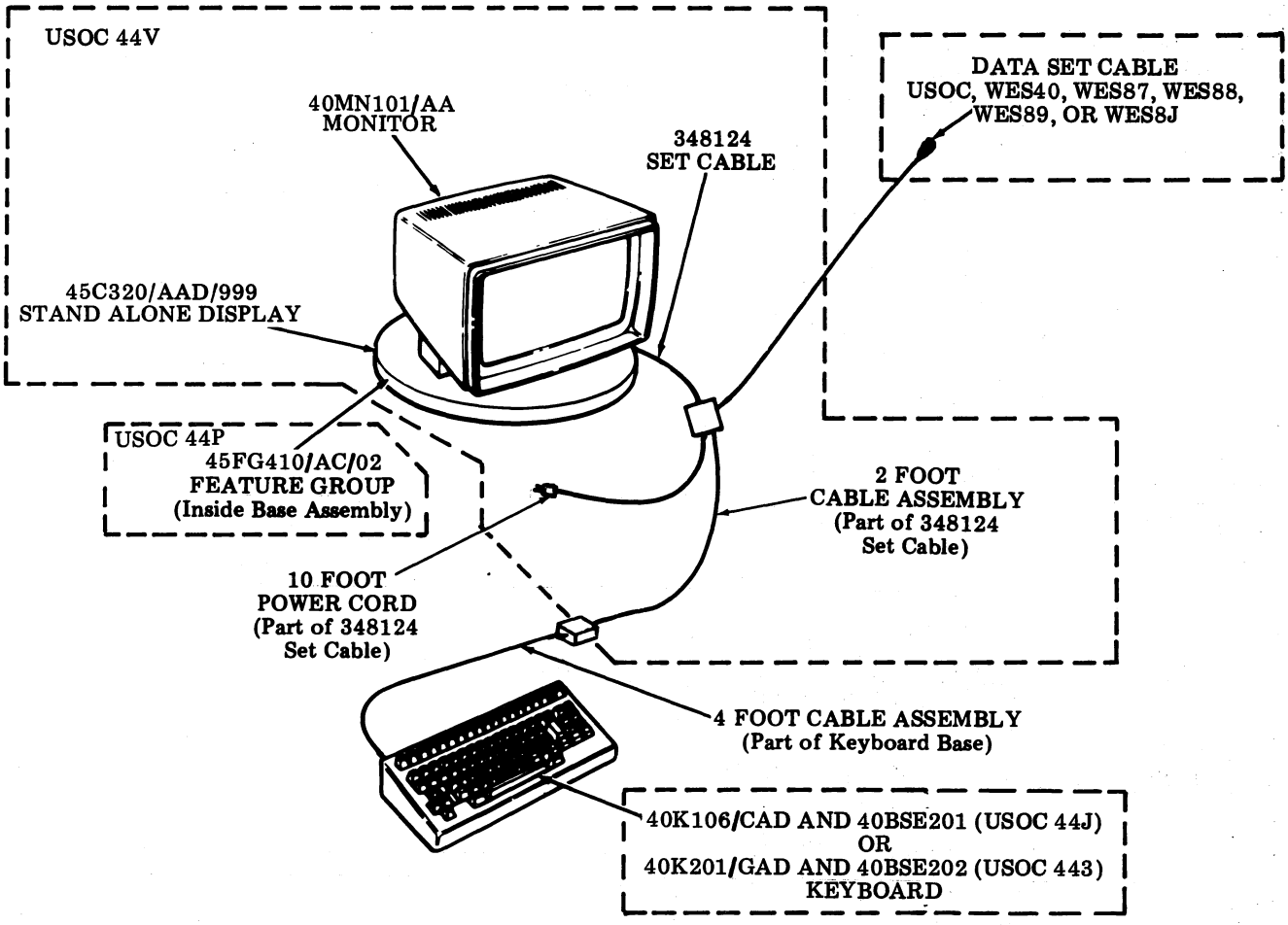
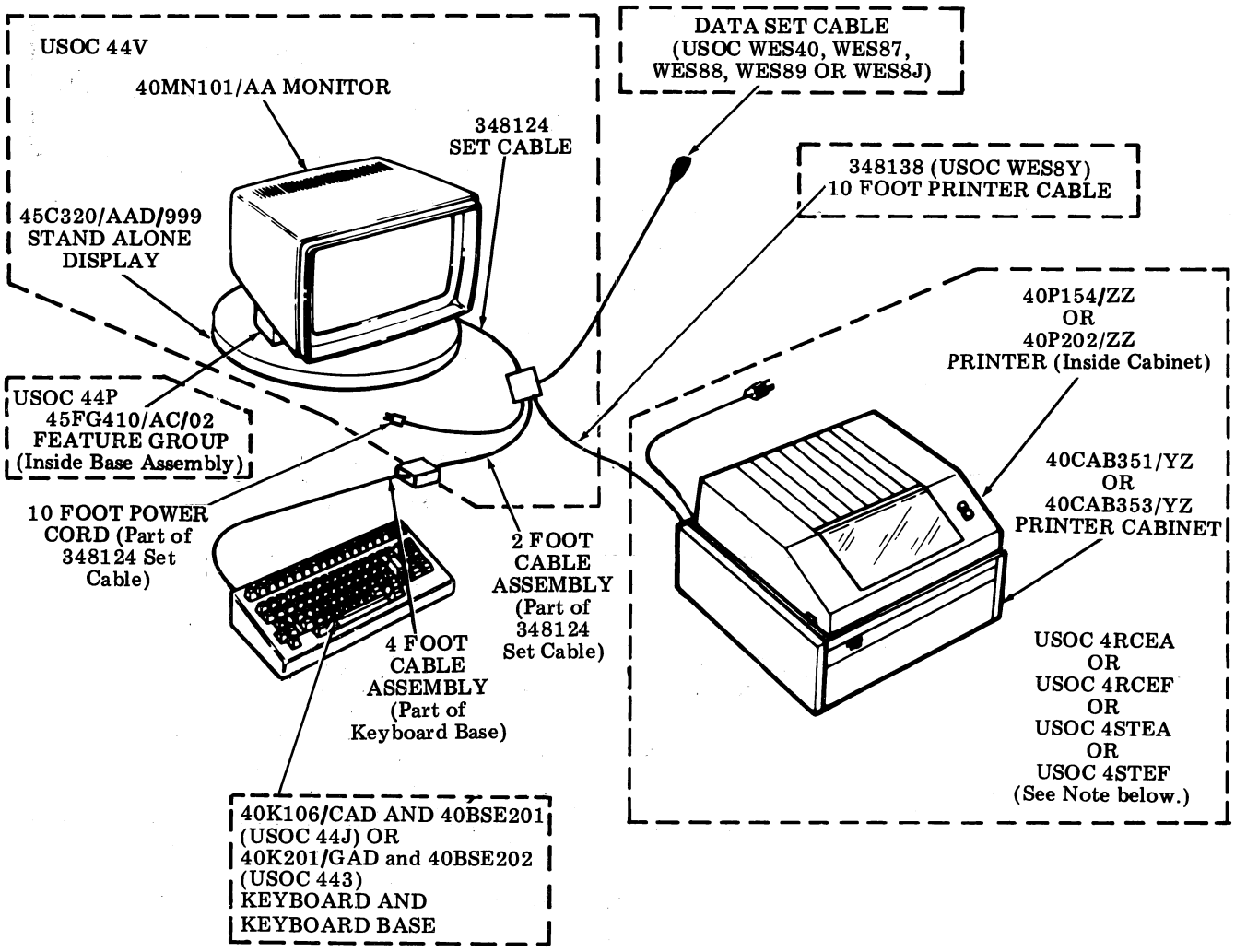


Fig. 1—DATASPEED 4420 KD

DATASPEED 4420 KDP WITH DATASPEED 40 PRINTER

4.03 The KDP consists of a KD station with a DATASPEED 40 tractor feed printer or a 43 Teleprinter (RO) adjacent to the KD. The DATASPEED 40 printer may be 80 or 132 column; the 43 Teleprinter may be friction (80 column) or pin feed (132 column).



Note:

USOC 4RCEA includes 40CAB351/YZ, 40P154/ZZ, 407026 (cabinet hardware modification kit) and 400645 (monocase ASCII type carrier).

USOC 4RCEF includes 40CAB351/YZ, 40P154/ZZ, 407026 (cabinet hardware modification kit) and 400629 (up-low ASCII type carrier).

USOC 4STEA includes 40CAB353/YZ, 40P202/ZZ, 405671 (cabinet hardware modification kit) and 400780 (monocase ASCII type carrier).

USOC 4STEF includes 40CAB353/YZ, 40P202/ZZ, 405671 (cabinet hardware modification kit) and 400777 (up-low ASCII type carrier).

Fig. 2—DATASPEED 4420 KDP With DATASPEED 40 Printer

DATASPEED 4420 KDP WITH 43 TELEPRINTER

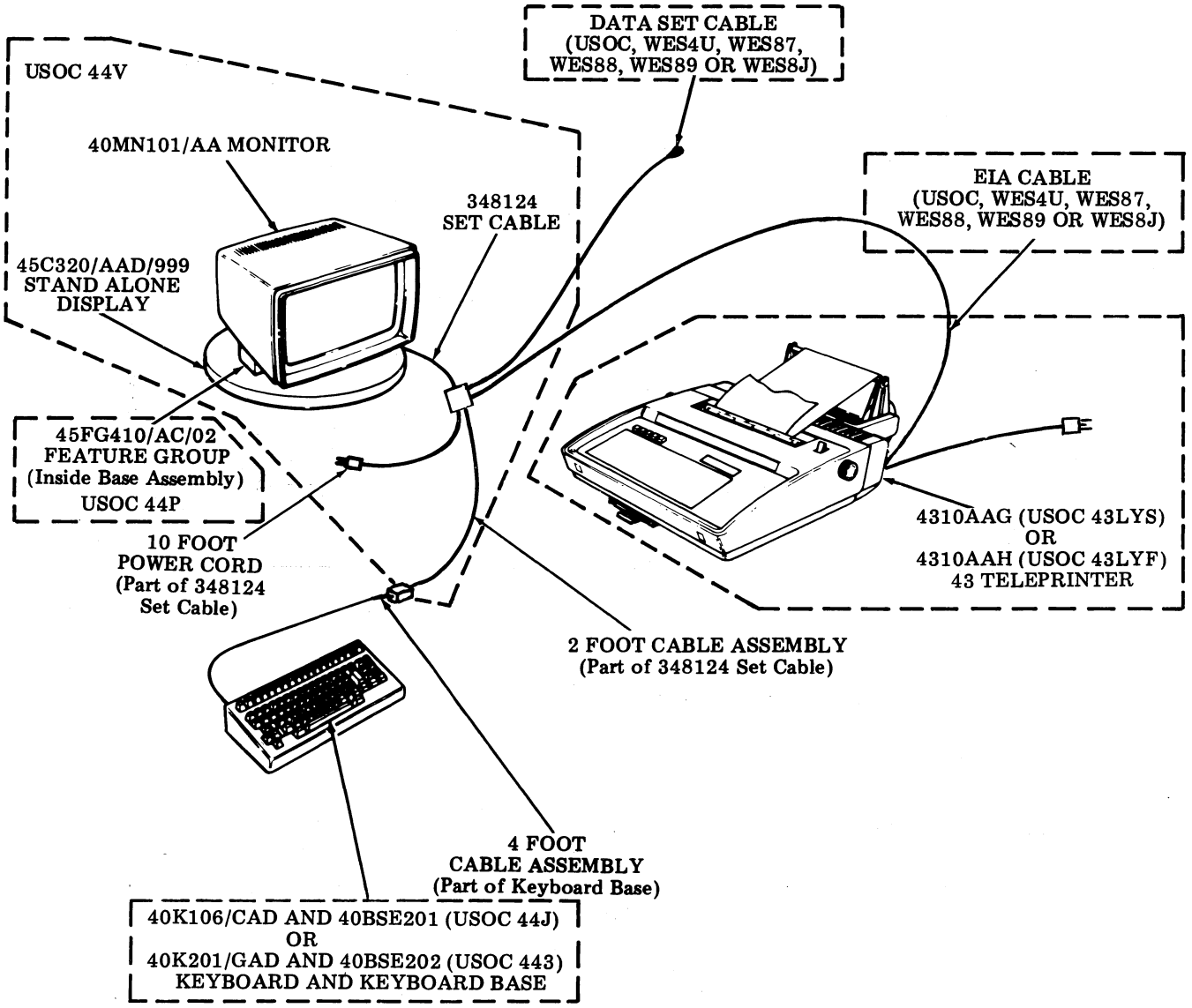
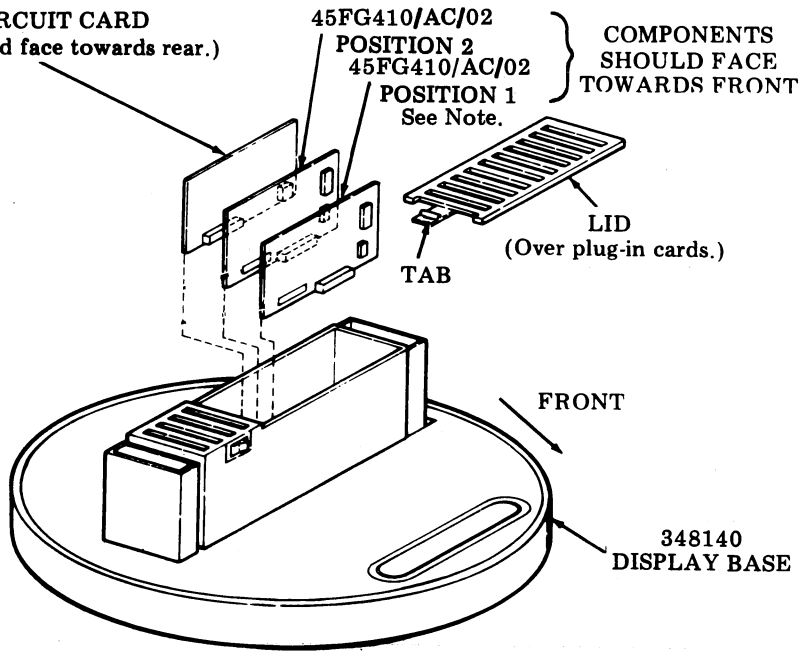


Fig. 3—DATASPEED 4420 KDP With 43 Teleprinter

CIRCUIT CARD ARRANGEMENT

4.04 The DATASPEED 4420 Stand Alone Controller (45C320/AAD/999) consists of the following circuit cards and display base:



Note: Feature Group 45FG410/AC/02 is not part of 45C320/AAD/999; they must be obtained separately.

Fig. 4

Refer to Section 582-213-701 for location of monitor circuit cards.

Data Sets

4.05 The following data sets are used in DATASPEED 4420 applications:

Data Set
103J
103JR
108F/G
113A
201C
201C/R
208A
209A
212A
212AR

5. ACCESSORIES

5.01 The following is a list of accessories that may be used with the DATASPEED 4420 Station:

Fig. 5—DATASPEED 40 Printer Form Out Belt — USOC WES62

Form Selector Setting				Color of Belt	Part Number
4	3	2	1		
Length of Form, Inches					
3-1/3	2-1/2	5	10	Amber	402571
3-2/3	2-3/4	5-1/2	11	Blue	402572
4	3	6	12	Yellow	402573
4-1/3	3-1/4	6-1/2	13	Brown	402574
4-2/3	3-1/2	7	14	Red	402575
5	3-3/4	7-1/2	15	Pink	402576
5-1/3	4	8	16	Lt. Green	402577
5-2/3	4-1/4	8-1/2	17	Green	402578
6	4-1/2	9	18	Lt Blue	402579
7-1/3	5-1/2	11	22	White	402580

Belts available individually. Blue belt is factory furnished. Form lengths ending in the fractions 1/4- or 3/4-inch are not compatible with line spacing of 3 or 6 lines per inch; those ending in 1/2-inch are not compatible with 3 lines per inch; and those ending in 1/3- or 2/3-inch are not compatible with 4 or 8 lines per inch.

Accumulating Rack — USOC 4TN00

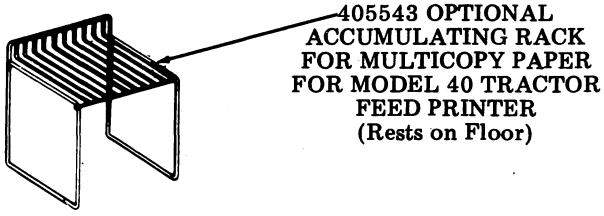


Fig. 6

EIA Cables — Data Set or 43 Teleprinter

Length	Part Number	USO Code
3 Ft.	430569	WES8J
7 Ft.	408065	WES4U
12 Ft.	408066	WES87
25 Ft.	408067	WES88
50 Ft.	408068	WES89

SSI Extender Cable — DATASPEED 40 Printer

Length	Part Number	USO Code
6 Ft.	405306	WES78
12 Ft.	405307	WES8C
25 Ft.	405308	WES79
50 Ft.	405309	WES8E

Note 1: Above cables connect between 348138 cable (USOC WES8Y) and DATASPEED 40 Printer.

Note 2: For distances between 50 feet and 2,000 feet use cables 405237 and 405239 (USOC WES77). Two twisted pairs of standard telephone wire (eg D station wire) and two 42A blocks must also be provided.

6. COMPONENT SPACE REQUIREMENTS

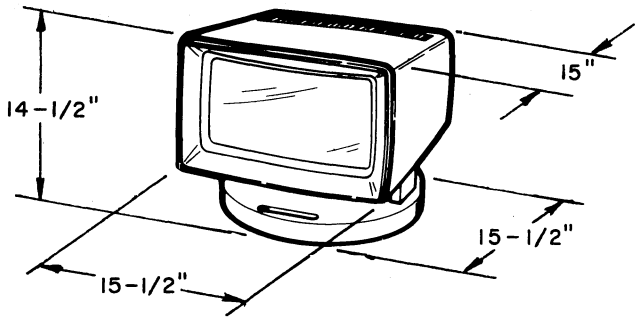


Fig. 7—Display Base and Monitor

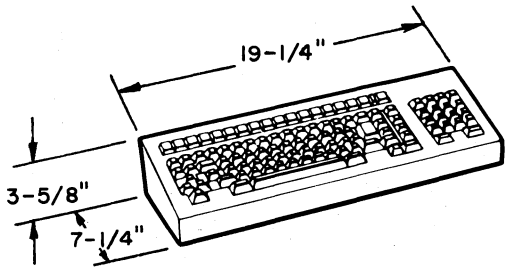


Fig. 8—40K201/GAD Keyboard with 40BSE202 Keyboard Base

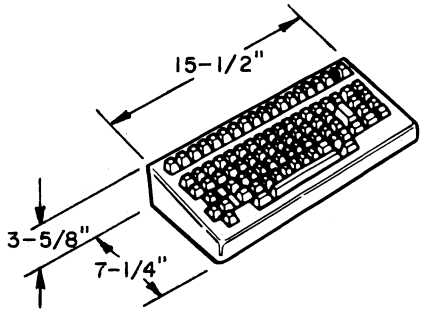


Fig. 9—40K106/CAD Keyboard with 40BSE201 Keyboard Base

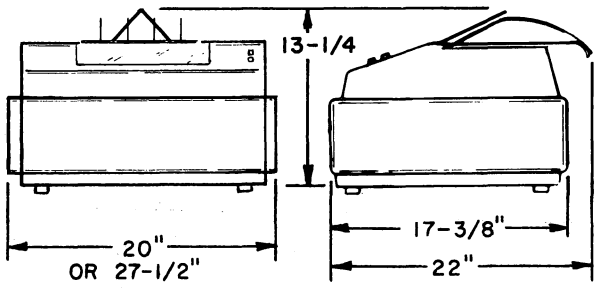


Fig. 10—Printer in Cabinet (80 or 132 Column Tractor Feed)

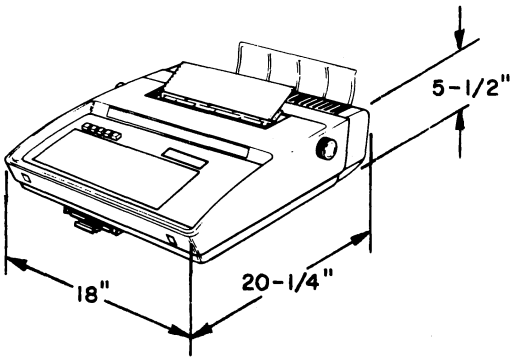


Fig. 11—43 Teleprinter (Pin Feed RO)

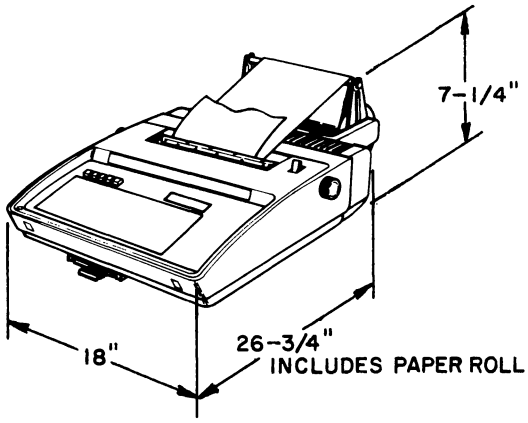


Fig. 12—43 Teleprinter (Friction Feed RO)

7. THEORY OF OPERATION

7.01 The DATASPEED 4420 Asynchronous Communication Station is a buffered display based station designed to provide a means for efficient keyboard entry of data into a data system. The station is a keyboard on-line or a keyboard to buffer with a buffer size of 5760 characters. An optional DATASPEED 40 line printer or a 30 cps 43 Teleprinter is available.

7.02 The station consists of a microprocessor driven controller that resides in a housing below the monitor (refer to Fig. 1, 2 or 3); a DATASPEED 40 monitor and a DATASPEED 40-type keyboard. A DATASPEED 40 or a 43 Teleprinter are available for KDP arrangements.

7.03 The station is arranged to operate full duplex asynchronously or isochronously on point-to-point private line or on the switched telephone network. Maximum on-line speed is 9600 baud; however, throughput may be significantly reduced (approximately 2400 baud for KD; 1200 baud for KD with DATASPEED 40 printer; 300 baud for KD with 43 teleprinter) when its buffer becomes full (factors which will cause throughput to be reduced are the use of such functions as CLEAR, LINE EDIT, FORM FEED, PRINT ON LINE, etc). When the station's buffer approaches capacity it will send a stop command to the sender and when sufficient space is again available it will send a start command. Failure of the sender to respond to these commands may result in a loss of data. Networks having high baud rates and long messages require special attention to prevent lost data and a significant loss of throughput.

7.04 The station, to be useful with a distant device, must employ a data set. The data set converts digital signals encountered in data transmission to modulated tones and transmits them over switched telephone networks or private line services. These tones are then demodulated and regenerated at the remote ends in its original digital form for reception. The data sets used with this terminal are full duplex, either for asynchronous or isochronous operation. The type of data sets specified are Bell System (or equivalent) 103J, 103JR, 108F, 108G, 113A, 201C, 201CR, 208A, 209A, 212A and 212AR.

A. Controller

7.05 The controller is microprocessor driven using 16384 bytes of random access memory (RAM), 16384 bytes of read only memory (ROM) for the basic software, 4096 bytes of ROM for the multiple printer software packages, 128 bytes of battery back-up random access memory for options (CMOS RAM), and 4096 bytes of read only memory (ROM) dedicated to device initialization and diagnostics. The keyboard is connected to the controller via a 4 foot maximum SSI cable (the keyboard receives operating power from the controller) while an optional SSI printer can be connected up to 2000 cable feet from the controller and an EIA printer may be up to 50 cable feet away. The display physically mounts above the controller which supplies video information to the monitor via cable connectors mounted in the monitor's base.

B. Monitor (Display)

7.06 The standard 40MN101 monitor is used to display information to an operator via a cathode ray tube. The monitor is mounted physically above the controller and electrically connects through the base of the monitor. The display memory in the controller stores the data information needed by the monitor. Periodically, the display hardware, using direct memory access (DMA), transfers information to CACHE storage for use with the monitor. The font character codes stored in the display are listed in Fig. 13. Control characters are displayed according to their graphic representation shown in Fig. 14.

b_7 b_6 b_5 / Bits b_4 b_3 b_2 b_1 / COLUMN / ROW	0_0 0	0_0 1	0_1 0	0_1 1	1_0 0	1_0 1	1_1 0	1_1 1
0 0 0 0 0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1 1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0 2	STX	DC2	"	2	B	R	b	r
0 0 1 1 3	ETX	DC3	#	3	C	S	c	s
0 1 0 0 4	EOT	DC4	$	4	D	T	d	t
0 1 0 1 5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0 6	ACK	SYN	&	6	F	V	f	v
0 1 1 1 7	BEL	ETB	'	7	G	W	g	w
1 0 0 0 8	BS	CAN	(	8	H	X	h	x
1 0 0 1 9	HT	EM	)	9	I	Y	i	y
1 0 1 0 10	LF	SUB	*	:	J	Z	j	z
1 0 1 1 11	VT	ESC	+	;	K	[	k	{
1 1 0 0 12	FF	FS	,	<	L	\	l	|
1 1 0 1 13	CR	GS	-	=	M	]	m	}
1 1 1 0 14	SO	RS	.	>	N	^	n	~
1 1 1 1 15	SI	US	/	?	O	_	o	DEL

Fig. 13—ASCII (ANSI X3.4—1968)

ASCII CONTROLS	DESCRIPTION	DISPLAY GRAPHIC	KEYBOARD DESIGNATION
NUL	Null	N_U	NUL
SOH	Start of Heading	S_H	SOH
STX	Start of Text	S_X	STX
ETX	End of Text	E_X	ETX
EOT	End of Transmission	E_T	EOT
ENQ	Enquiry	E_Q	ENQ
ACK	Acknowledge	A_K	ACK
BEL	Bell	B_L (Note 4)	BEL
BS	Backspace	Note 1	BS
HT	Horizontal Tab	▶	HT
LF	Line Feed	≡	NEW LINE
VT	Vertical Tab	V_T	VT
FF	Form Feed	F_F	FF
CR	Carriage Return	←	RETURN
SO	Shift Out	S_O	SO
SI	Shift In	S_I	SI
DLE	Data Link Escape	D_L	DLE
DC1	Device Control 1	D_1	DC1
DC2	Device Control 2	D_2	DC2
DC3	Device Control 3	D_3	DC3
DC4	Device Control 4	D_4	DC4
NAK	Negative Acknowledge	N_K	NAK
SYN	Synchronous Idle	S_Y	SYN
ETB	End of Transmission Block	E_B	ETB
CAN	Cancel	C_N	CAN
EM	End of Medium	E_M	EM
SUB	Substitute	S_B	SUB
ESC	Escape	E_C	ESC
FS	File Separator	F_S	FS
GS	Group Separator	G_S	GS
RS	Record Separator	R_S	RS
US	Unit Separator	U_S	US
(NON-CONTROLS)			
DEL			DELETE
SP		Note 2	

Note 1: The backspace function is performed and not displayed.
Note 2: Space appears as a blank on the display. The space bar on the keyboard does not contain a designation.
Note 3: There are no printer graphics for control characters.
Note 4: Only displayed when entered locally.

Fig. 14—Control Graphic Representations and Designations

C. Keyboard

7.07 Keyboards are similar in appearance and functions to the DATASPEED 40 keyboards. Some keytops designations have been changed; some have been added to provide additional functions (refer to Fig. 15). The keyboard contains the standard cursor control keys, editing keys and typewriter keys. A repeat key (REPT) has been added which will cause any key on the keyboard (except SHIFT, CONTROL, CAPS LOCK) to be repeatable. The control key locations are ASCII bit paired except for FS, GS, RS, and US. Keyboards containing a numeric cluster are also available for use with DATASPEED 4420 arrangements (refer to Fig. 16).

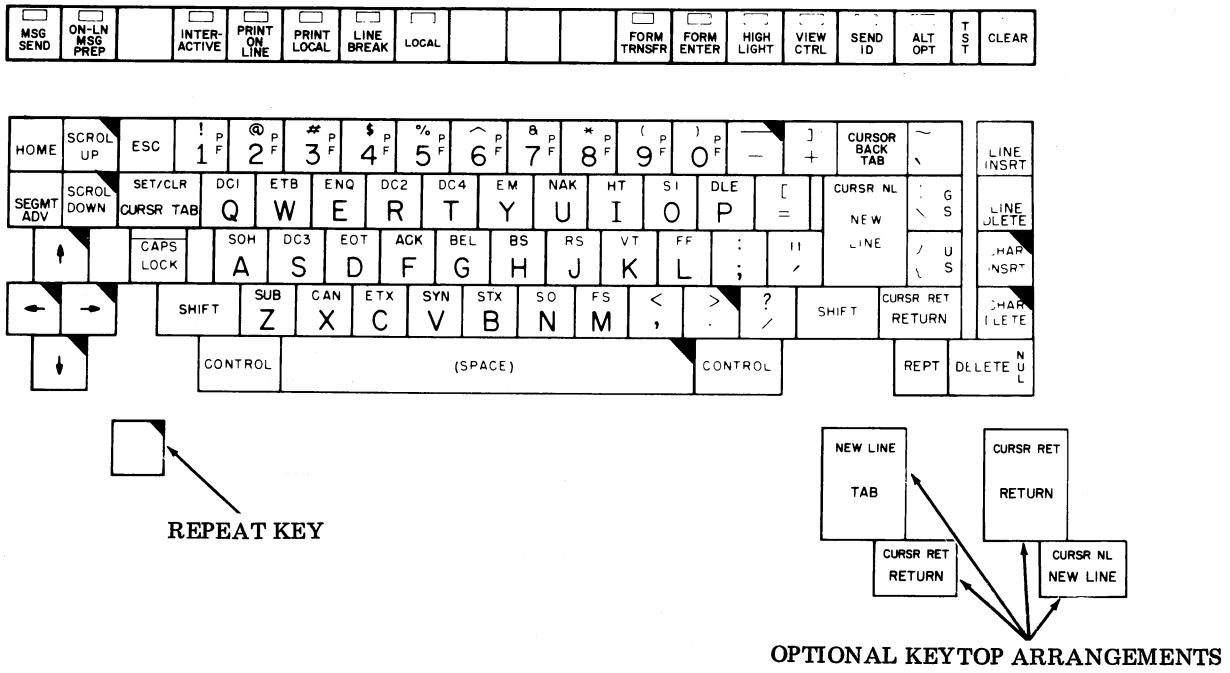


Fig. 15—40K106/CAD Keyboard Layout (Without Numeric Cluster)

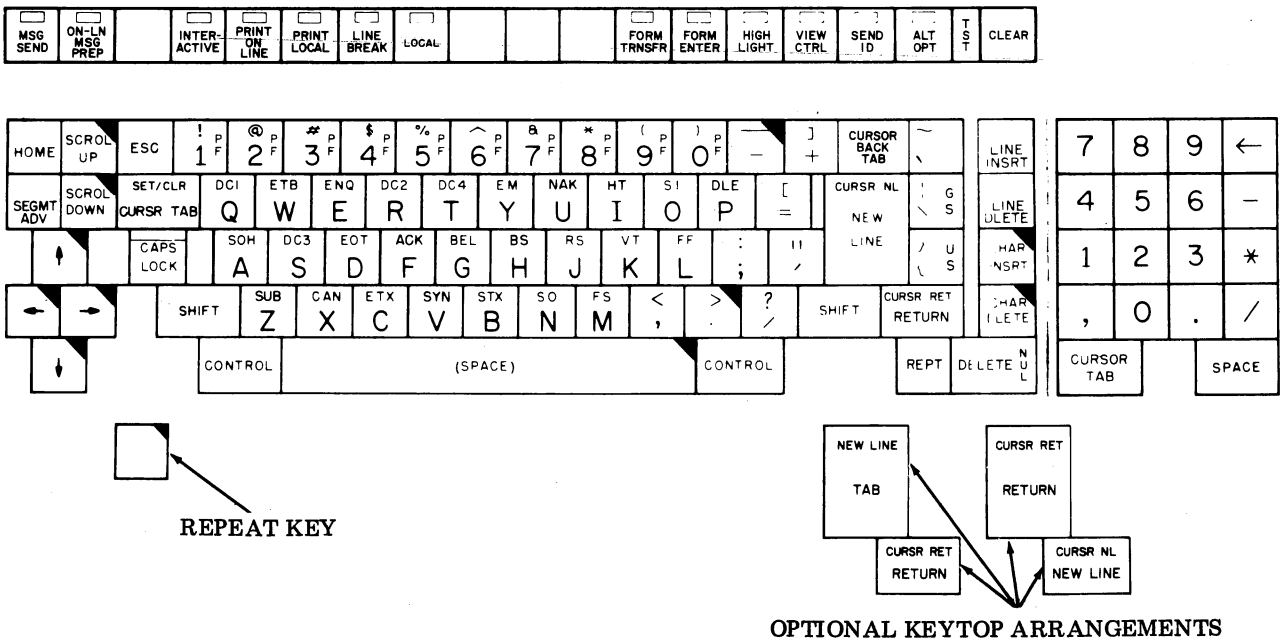


Fig. 16—40K201/GAD Keyboard Layout (With Numeric Cluster)

D. Printers

7.08 Two DATASPEED 40 printers are available for use with this station. The first printer is an 80 column tractor feed while the other printer is a 132 column tractor feed. The printers are connected electrically to the controller via a standard SSI cable. The printer can be physically located within 2000 cable feet from the controller. If a printer is not part of the station arrangement, the PRINT ON LINE and PRINT LOCAL keytops are not functional. Printing rate of the printer is a function of the station's operating speed and individual line lengths. The printer interface contains a 2000 character buffer to accommodate longer messages and/or higher operational speeds. If the printer cannot keep up with the received message, the station will send a stop command and the remote sender must stop transmission. If this is not observed, data may be lost. A New Line or Form Feed character should be sent before each message to assure proper positioning.

Character Printer

7.09 Two basic 43 teleprinter receive-only sets are available for use with this station to provide character-at-a-time printer operation. Data reception is provided at 30 characters per second (cps) (300 wpm). The printer is electrically connected via a standard EIA cable. The printer can be physically located up to 50 cable feet from the controller. A 2000 character buffer is provided to accommodate longer messages and/or higher operational speeds. The station will send a stop command when the buffer becomes full and the remote sender must stop sending if loss of data is to be avoided. A New Line character should be sent at the start of each message to assure that the printer is at the proper position.

E. Option Storage

7.10 The station is equipped with a Ni-Cad battery which will cause the option selections to remain in memory even though power may have been lost due to a power failure or the station power being turned off. The battery is continually charged while power is applied to the unit. If power is turned off for an extended period of time, the battery will supply power and station retains its memory for a minimun of three weeks. If the battery should become totally discharged, it will completely recover to a fully charged condition in ten hours (power applied to unit and power switch on).

F. Electrical Interface

7.11 The controller provides four ports to connect to external devices. Two are Teletype Corporation SSI interfaces (for keyboard and an optional DATASPEED 40 printer) and two are EIA RS-232-C (for connection to a data set and an optional character printer).

7.12 The controller interface to a data set is made at the junction box of the 348124 set cable. All output signals at this interface will be +5 Vdc to +12 Vdc to represent an "on" condition for control signals and a "space" condition for data signals. An "off" condition or a "mark" will be represented by a voltage level of -5 Vdc to -12 Vdc with respect to signal ground.

7.13 A simple auxiliary EIA RS-232-C interface is provided to interface to a 43 teleprinter. This interface delivers all characters to the printer at 30 characters per second (Pin 3) when Data Terminal Ready (Pin 20) is "on". The interface provides Data Carrier Detect (Pin 8) and Data Set Ready (Pin 6), if the printer is selected and Data Terminal Ready (Pin 20) is "on".

7.14 Lead Designations

Data Set Port

PIN NO.	
1	Frame Ground (AA)
2	Transmitted Data (BA)
3	Received Data (BB)
4	Request to Send (CA)
5	Clear to Send (CB)
6	Data Set Ready (CC)
7	Signal Ground (AB)
8	Received Line Signal Detector (CF)
12	Sec. Rec'd Line Sig. Detector (SCF) or Rate Indicator
15	Transmitter Signal Element Timing (DB)
17	Receiver Signal Element Timing (DD)
19 (Note)	Secondary Request to Send (SCA) or Rate Select
20	Data Terminal Ready (CD)
22	Ring Indicator (CE)
25	Analog Loop (CN)

Note: Terminals 19 and 23 are strapped together in the set cable.

EIA Printer Port

PIN NO.	
1	Frame Ground (AA)
2	Received Data (BB)
3	Transmitted Data (BA)
4 (Note 1)	Clear to Send (CB)
5	Request to Send (CA)
6	Data Terminal Ready (CD)
7	Signal Ground (AB)
8	Secondary Request to Send (SCA)
11 (Note 2)	Received Line Signal Detector (CF)
20	Data Set Ready (CC)
23	Rate Select
25	Analog Loop

Note 1: Terminals 14 and 4 are strapped together in the set cable.
Note 2: Terminals 11 and 19 are strapped together in the set cable.

7.15 The controller interface with the keyboard allows the station operator to either enter data locally into the display logic or to type data directly onto the output interface in the interactive mode.

Note: The interactive mode may be optionally enabled or disabled.

7.16 The interface between the keyboard and the controller is in the form of Teletype Corporation Standard Serial Interface (SSI). With this system, all information is transmitted on two pairs of signal leads. The receive pair is designated as INFORMATION TO CONTROLLER, ITC, and its complementary signal INFORMATION TO CONTROLLER, $\overline{\text{ITC}}$. Similarly, the send pair is information to device, ITD, and INFORMATION TO DEVICE, $\overline{\text{ITD}}$. All information is transmitted in the form of 18 bit words. Each word consists of a start bit, steering bit, 7 ASCII information bits, a flag bit and a parity bit. The remaining 7 bits that form the word are sent as MARKS.

7.17 The send pair, ITD and $\overline{\text{ITD}}$, is constantly transmitting either lamp or status (alarm) information from the CL to the keyboard. Again, the information is in the form of an 18 bit word composed of a start bit, steering bit, 6 bits for the lamp address and two bits for the lamp condition (lamp on or off). The remaining bits are transmitted as MARKS.

7.18 As stated above, the serial data information is present on a pair of leads, a true and a complement. Together these leads form a 1 volt P-P signal level between the signal pair. These signals are transformer isolated at each end of the cable. Transmission is at a rate of 56 kilobits/second, resulting in a bit time of 17.9 microseconds and a word time of 321 microseconds. To indicate a SPACE, or ON condition for control bits, the data leads change state during the midpoint of a bit time. The absence of a transition during this time would be interpreted as a MARK for data or an OFF condition for control bits.

7.19 The controller can interface to a DATASPEED 40 printer using an SSI interface. This interface is available by wiring the SSI printer cable 348138 to the terminal block in the junction box of the 348124 set cable. The SSI interface operates in a manner similar to that described for the keyboard interface (refer to paragraphs 7.15, 7.16, 7.17 and 7.18). Character transfer is on a demand response basis.

G. Answer-Back

7.20 The answer-back sequence will be sent on-line in response to: a received ENQ control character in either the interactive (interactive send enabled) or on-ln msg prep mode; depression of the SEND ID key in interactive, or optionally upon auto answer in all modes of operation except print local and options selection. The answer-back sequence is programmable in the options selection mode, up to 40 characters. Depression of the SEND ID key in either local or on-ln msg prep mode causes the answer-back sequence to be displayed starting at the present cursor position.

H. Programmable Functions

7.21 Programmable Functions (PF) are character sequences that may be programmed into the station. Up to ten PF sequences can be programmed, however, the maximum number of characters that can be entered is forty (including answer-back characters). PF sequences are sent on-line in the interactive mode (interactive send enabled) by depressing the number keys on the keyboard while the CONTROL key is depressed. The PF sequences can also be displayed in the local and on-ln msg prep modes. PF sequences are programmed in the option selection mode.

I. BUFFERS

7.22 The station contains three buffers, a 1024 character line buffer, a 2000 character display buffer and a 2000 character printer buffer. As characters are received from the line they are processed through the line buffer and the display buffer in the interactive mode and/or through the line buffer and the printer buffer in either the interactive or on-ln msg prep modes. The line buffer will upon a 25 percent full condition (256 characters) cause a stop command to be sent to the remote sender. When the buffer is empty the station will send a start command. The remote sender must stop sending within 700 characters to avoid any loss of data. The signal sent depends on the selection of Option 216.

J. Printer Functions

Printer Buffer

7.23 A 2000 character buffer is provided to temporarily store incoming data during printer operations. When the printer buffer reaches a full condition, data will fill the line buffer.

Printer Motor Control

7.24 The motor will turn on immediately upon a character entering into the buffer. The motor will remain on and shall not turn off until approximately one minute after the buffer becomes completely empty and all data is printed. (This applies only to DATASPEED 40 printers.)

Horizontal Tab (HT)

7.25 This feature allows the printer upon receipt of a horizontal tab character to advance to the next horizontal tab stop. Printer tab stops are specified in the options mode to be preset horizontal tab settings. Such printer tab settings can be overridden or supplemented on-line by receiving the sequence ESC1 (to set a tab) or ESC2 (to clear tabs from the present column to the right hand margin — 80 or 132). The column to be set or columns cleared is dependent on the column that receives the escape sequence. Tabs that were set on-line are cleared automatically upon disconnect (switched networks only) and preset tabs (if any) are restored. To set or clear printer tabs on-line, PRINT ON LINE indicator must be lit. If INTERACTIVE and PRINT ON LINE indicators are both lit, then tabs are set or cleared for both the display and the printer at the same time. Do not specify tabs beyond the right margin capability of the printer. If HT is received, and no tab stop exists between the print position and right margin (80 or 132 column), the next printing character will print on the first print position of the next line.

Vertical Tabulation (VT)

7.26 There is no provision to provide vertical tabulation in this station. Upon receipt of a VT character the DATASPEED 40 printer will advance to the first position of the next line.

Underlining Printed Data

7.27 Underlining printed data is allowed when the data is of the format — "character, backspace, and underline". The underline information is stored until the full line of data is printed and then the underline characters for the proper positions are passed to the printer. This operation will reduce the effective printing speed (throughput) of the printer and should be considered if the remote sender is not equipped to stop on the optional stop command. A line terminating character is required on the last line to assure proper operation of the printer. When the number of backspaces in the underline sequence is greater than the number of characters between the present printer position and the first character position, underline characters (equal to the difference) will be printed in the positions after the present printing position.

Printer/Paper Alarms

7.28 The printer when turned on in either PRINT ON LINE or PRINT LOCAL constantly monitors the operational status of the printer. If printer/paper troubles are encountered, a line break and/or a data set disconnect may optionally occur. The station will go to local mode if a disconnect occurs. Printer troubles are defined as follows:

(a) Improper SSI or EIA connection between controller and printer or no power on the printer.

(b) Motor does not turn on (or stay on) in response to a motor on command.

(c) Motor does not come up to proper speed within 3 seconds after a motor on command.

(d) Typecarrier jams or breaks.

(e) Printer status word has an incorrect format (or framing).

(f) Status words are not received in response to data or status requests from the controller.

(g) Paper out or low paper.

In all cases, the PRINT ON LINE indicator will flash to alert the operator of printer troubles. The printer trouble must be fixed before a new call connection can be made (switched networks).

K. Operational States

Full Duplex

7.29 Full duplex facilities are capable of simultaneous send and receive. The type of data set used with this station must be capable of full duplex transmission. Simultaneous transmission is permitted with this station only in the interactive mode. In this mode, the operator uses the keyboard to send, character at a time, while the display (and printer) receives from the line. Generally, the remote computer echos back the, keyboarded data. Monitor Keyboard Send Data option must not be enabled during echoplex. Data sent in the msg send mode cannot be echoed back for display. The msg send mode does not allow simultaneous transmission/reception, although the full duplex interface will be maintained.

Keyboard To Display

7.30 The keyboard, in either the local or on-ln msg prep modes, is used to enter data onto the display for message preparation. All cursor and edit controls are functional. Control characters can be viewed (or not viewed) on the display as they are being entered from the keyboard via the state of the VIEW CTRL key. These characters are stored in the display memory even if they are not viewed.

Keyboard On-Line

7.31 The keyboard, in the interactive mode, is used to send, character by character, information to a remote host computer. All ASCII characters on the keyboard can be sent. Cursor and editing keys can be optionally transmitted. No cursor or editing functions will be performed on the display unless they are echoed back from the remote host and if the On Line Edit option is enabled to perform the functions. If a line break occurs, no characters can be sent on-line and the alarm will sound when the local buffers have been filled.

Message Send From Display

7.32 The display memory is used to store one or more prepared messages for transmission. To transmit that message the MSG SEND key is depressed (or via a received ESCf or message end character). Sending begins as a call connection (if call not already connected) and in response to an "on" indication of the Clear To Send (CTS) lead. Sending starts from the present cursor position or optionally from the HOME position or from the start of line in which the cursor is positioned. The remote receiver can stop the transmission by sending a DC3 or optionally a continuous space (break) or cause Pin 12 of the EIA interface to go low (-12 Vdc). Sending will not resume until the station receives a DC1 or optionally the signal line switches to a continuous mark or Pin 12 goes high (+12 Vdc). Sent data may be optionally altered. Protected, highlight and horizontal tab data and sequences may be deleted, altered or generated. The line feeds stored in the display memory may be altered with the appropriate line ending sequence as it is being sent. Sending ends when the station transmits the selectable ending or disconnect character(s) or when another mode key is depressed (INTERACTIVE, LOCAL or ON-LN MSG PREP). The station will switch modes and position the cursor to the next character position following the last character sent provided it is not the 80th column.

7.33 Line-at-a-time transmission is optionally available. With this option, with the station in the interactive mode and depression of any keytop found in Fig. 13, the unit will change to the on-ln msg prep mode. The operator may type in a line to be sent and when the carriage return is displayed the unit will perform a cursor return and shift to the msg send mode. It is necessary to select CR as the message end character that will cause the station to change from the msg send mode to the interactive mode.

Receive To Display

7.34 All characters are received and processed through a 1024 character line buffer and and a 2000 character display buffer in the interactive mode. Control characters may or may not be stored, however, control action will always be performed and executed. Parity of the received character may be optionally checked and the Sb character substituted upon reception of bad parity. The On Line Edit Option is used to perform cursor and editing functions on-line via corresponding two character ESC sequences (an escape sequence is defined as being an ESC character followed by any character other than ESC, it is therefore possible to send to the station any number of ESC characters in a row followed by a non ESC character to make up an ESC sequence). If a series of ESC sequences is received only the last one will be acted upon. See Fig. 17 for applicable sequences. If the function is to be performed then the corresponding ESC sequence is not displayed. If the function is not to be performed then the corresponding ESC sequence is displayed. The On Line Edit Option also permits highlighted and protected data to be displayed. Cursor positioning is allowed in the interactive mode to position the cursor to an absolute location on the display. The two characters following a received ESCY are used to position the cursor. Refer to Fig. 18 for the position (character) definition. Cursor readout is also permitted in interactive mode following a received ESC_ (underline) sequence. The readout will relate also to the absolute character definition defined in Fig. 18 and will send an ESCYcharacter character sequence. Horizontal tabulation is performed on the display when a HT character is received. The HT character optionally may be displayed. Destructive scrolling will be performed in the interactive mode whenever there are no protected characters stored in display memory. Destructive scrolling forces the oldest data in display memory to scroll off and be lost while storing the newest data on the bottom line. If protected data does exist in display memory receive data will not cause destructive scrolling to occur and data will be lost at the last character position in the 72nd line (acts like on-ln msg prep, local modes). The interactive mode (receive to display) is terminated by reception of an end or disconnect character(s) received ESCf (go send), optionally CR (carriage return) or when another mode key is depressed (msg send, on-ln msg prep, local). The station will switch modes and position the cursor on the character following the last character received (except if it was the 80th column).

7.35 Protected data sent will not be copied by the optional printer even if the PRINT ON LINE and FORM TRNSFR indicators are lit if the station is optioned for "Send Unprotected as Displayed and Protected Without Delimeters". If a highlighted field is followed by a protected field the ESC sequence order will be ESCW, ESC4. Also if the last character sent is highlighted or protected the station will not send an ESC sequence to turn off the highlight or protect.

SEQUENCE	FUNCTION	MODES WHEN OPERATIONAL				
			INTERACTIVE		ON-LINE MSG PREP	MSG SEND
		ALWAYS	SND CURSR EDIT CTRL ENABLED	REC ON-LINE EDIT, PERFORM ESC SEQUENCE	ALWAYS	ALWAYS
ESC NL	Cursor Newline		X	X		
ESC 0	Single Tab Set			X		
ESC 1	Column Tab Set			X		
ESC 2	Column Tab Clear			X		
ESC 3	High Light On			X		
ESC 4	High Light Off			X		
ESC 7	Cursor Up		X	X		
ESC @	Cursor Tab		X	X		
ESC A	Cursor Up		X	X		
ESC B	Cursor Down		X	X		
ESC C	Cursor Right		X	X		
ESC D	Cursor Left		X	X		
ESC G	Cursor Return		X	X		
ESC H	Cursor Home		X	X		
ESC J	Cursor Clear		X	X		
ESC L	Line Insert		X	X		
ESC M	Line Delete		X	X		
ESC O	Cursor Backtab		X	X		
ESC P	Char Delete		X	X		
ESC Q	View Cont Invert			X		
ESC R	Device Reset			X		
ESC S	Scroll Up		X	X		
ESC T	Scroll Down		X	X		
ESC U	Segment Advance		X	X		
ESC W	Form Enter On			X		
ESC X	Form Enter Off			X		
ESC Y	Cursor Position	X				
ESC Z	Underline Off			X		
ESC \	Underline On			X		
ESC ^	Char Insert		X	X		
ESC _	Cursor Readout	X				
ESC b	GO INTERACTIVE				X	X
ESC f	GO MESSAGE SEND	X			X	
ESC h	Form Transfer On	X			X	X
ESC i	Form Transfer Off	X			X	X
ESC z	Clear to 80th Col.			X		
ESC }	Reverse Video On			X		
ESC ~	Reverse Video Off			X		

Fig.--17 Received Escape (ESC) Sequence Actions

Receive to Printer

7.36 As characters are received from the line in either the interactive or on-ln msg prep modes, they are processed through a 1024 character line buffer and a 2000 character printer buffer. All control characters are suppressed and will not be printed. ESC sequences to the printer are not suppressed at the KD (the character after ESC may be optionally suppressed at the DATASPEED 40 printer). Printing rate will be a function of the operational speed of the station, type font on the printer, format of the message and the content of the message. Horizontal tabulation and underline functions will decrease the total throughput. Paper and printer alarm conditions are monitored and cause optional line breaks and data set disconnects to occur.

Keyboard to Display and Printer (Interactive)

7.37 As the characters are sent from the keyboard to the line, in the interactive mode, they can be optionally displayed and optionally printed if Monitor Keyboard Send Data Option is enabled. Two character optional ESC sequences generated will not be displayed nor printed. All control characters will be stored in the display memory and viewed per VIEW CTRL key.

CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW	CHAR	COL/ ROW
SP	1	(	9	0	17	8	25	@	33	H	41	P	49	X	57	`	65	h	73
!	2	)	10	1	18	9	26	A	34	I	42	Q	50	Y	58	a	66	i	74
"	3	*	11	2	19	:	27	B	35	J	43	R	51	Z	59	b	67	j	75
#	4	+	12	3	20	;	28	C	36	K	44	S	52	[	60	c	68	k	76
$	5	,	13	4	21	<	29	D	37	L	45	T	53	\	61	d	69	l	77
%	6	—	14	5	22	=	30	E	38	M	46	U	54	]	62	e	70	m	78
&	7	.	15	6	23	>	31	F	39	N	47	V	55	^	63	f	71	n	79
'	8	/	16	7	24	?	32	G	40	O	48	W	56	—	64	g	72	o	80

Fig. 18—ASCII Characters for Cursor Positioning

L. Modes of Operation

Local (LOCAL)

7.38 In this mode of operation all keyboard keys are active and data can be entered from the keyboard to the display. A data connection is not established. Only the LOCAL indicator will be lit; the INTERACTIVE, MSG SEND, and ON-LN MSG PREP indicators will be off. If Auto Answer Printer Control Option is enabled (printer must of course be present), then an active ring indicator (incoming call) will force the printer on-line and the mode is switched to on-ln msg prep mode.

On-Line Message Preparation (ON-LN MSG PREP)

7.39 In this mode of operation, all keyboard keys are active and data can be entered from the keyboard to the display. The optional printer may be enabled to copy received data from the line. A data set connection will be established or maintained via ring indicator or the mode prior to on-ln msg prep. The ON-LN MSG PREP indicator is lit (LOCAL, MSG SEND, INTERACTIVE indicators are off).

Message Send (MSG SEND)

7.40 Depression of the MSG SEND key or reception of "message end" or ESCf sequence will cause data entered or received on the display to be queued for sending. This mode can be entered optionally by depressing a keytop corresponding to one of the characters of Fig.13. The cursor may go home if optioned to Send from Home. After the data connection is established (it may have been established prior to the depressing of the MSG SEND key), the message on the display is sent. The actual message sent on-line may differ from that displayed in accordance with the send variations and options. Sending terminates when it sends a message ending or disconnect character(s). A new mode will then be established. If no message end or disconnect character(s) are present on the display, the character and action of Option 209 will be implemented. The send operation can be stopped by sending or receiving line break or DC3 or the SCA lead (Pin 12) goes spacing and started by end of break or receiving a DC1 or the SCA lead going marking. The send operation can also be restarted by going to on-ln msg prep mode and then depressing the MSG SEND key.

Interactive (INTERACTIVE)

7.41 Depression of the INTERACTIVE key or reception of message end character, ESCb sequence in on-ln msg prep mode or turning on power will place the display in a receive mode (also the optional printer if on) while it permits the keyboard to be optionally interactive for character by character transmission. The INTERACTIVE indicator is lit (LOCAL, ON-LN MSG PREP and MSG SEND indicators are off). If an exact copy of the printed data being sent is required, the Monitor Keyboard Send Data Option must be selected; however, if the distant terminal echoes back sent data, then this option shall not be selected.

Print On-Line Operation (POL)

7.42 The PRINT ON LINE (POL) function allows data from the line to be printed on the associated printer. When selected, the PRINT ON LINE lamp will be lighted. The POL function can be selected by key control from the keyboard, optionally upon an incoming call (via ring indicator), or by recognition of a received DC2 character. The function is deselected by depressing the POL key or the recognition of a received DC4 character. The print on line function cannot be selected while a print local operation is being performed. With the unit in local mode and optioned to answer on ring indicator or with POL on, when ring indicator turns on, the unit will shift to the on-ln msg prep mode with print on line. The PRINT ON LINE key will not be operational in this mode.

7.43 The print on line function may be optionally locked "on" so that the operator cannot turn the PRINT ON LINE indicator off by depressing the PRINT ON LINE key. The print on line function if locked "on" can only be disabled by either a printer problem or the KD going into the options selection mode. If the PRINT ON LINE indicator is off it may be turned on by depressing the PRINT ON LINE key.

Print Local Operation (PRINT LOCAL)

7.44 Data on the display can be printed through the print local function. Data on the display is printed from the present cursor position or optionally from HOME or from the begining of the line that has the cursor to the last non space character on the page. Print local can be initiated in the local, on-ln msg prep and interactive modes. After the data on the display is transferred to the printer the station will return to the mode it was previously in. While printing the PRINT LOCAL indicator is lit while all other mode control key indicators are off (including PRINT ON LINE). The station is available for automatic answer during print local operation providing it is in an off-line state and is optioned for auto answer on ring indicator. If the station answers a call during the print local operation the print local function will be terminated. Options involving line ending sequences, protected data and highlight delimeters apply to the print local operation.

Option Selections

7.45 Depression of CONTROL key with HOME then CONTROL key with LINE INSRT causes the option selection table to be displayed on the monitor. While the operator may use this to view existing option selections, it is normally used to enter option selections to establish initial station options. This mode can only be established when in the local mode or the on-ln msg prep mode. An option may be changed by placing the cursor over the option and entering the desired new option from the keyboard. The new choice will appear on the display. To exit the option selection mode, the mode key that was used to enter the options selection mode must be depressed. If an invalid option selection is made the option selection mode will not exit and the invalid selection(s) will be shown in reverse video. Option choices may be in upper or lower case letters. Printer tab stops may be designated as either an upper or lower case"x". The station is not available for automatic answer while in the option selection mode. After the option selection mode has been exited the station returns to the mode it was previously in and the station will operate in accordance with the selected option choices.

M. Operator Controls

Repeat (REPT)

7.46 Depression of this key and another key will cause that key to repeat. The keys that cannot be repeated are CAPS LOCK, CONTROL and SHIFT.

View Controls (VIEW CTRL)

7.47 This key may be depressed (indicator is lit) in interactive, local and on-ln msg prep modes to allow the operator to see graphic symbols for all ASCII control characters stored in the display's memory. When VIEW CTRLS is not selected (indicator is off) any control characters in the display memory (including NEW LINE) will be displayed as spaces. Fig. 14 lists the control characters. Delete is not affected by VIEW CTRLS.

Alternate Option (ALT OPT)

7.48 The depression of the ALT OPT key located on the keyboard allows the operator to select which of two pre-selected groups of option choices will be active for subsequent message activity. The indicator will light when the alternate group of options is selected. The indicator is not lit when the primary group of options is selected. The ALT OPT key is used to activate either of the two groups. The switch operation is allowed in local, on-ln msg prep and interactive modes.

Send Identification (SEND ID)

7.49 This key is depressed to initiate transmission of the answer-back sequence in the interactive mode. The answer-back sequence is displayed on the screen if the Monitor Keyboard Send Data Option is activated. Depression of SEND ID in on-ln msg prep or local modes will cause the answer-back sequence to be stored and displayed starting at the present cursor location. The SEND ID indicator will be on while the answer-back sequence is being sent and shall be extinguished upon completion.

Line Break (LINE BREAK)

7.50 Depression of this key will cause a timed line break of approximately 300ms to be sent on-line in the interactive or on-ln msg prep modes. The LINE BREAK indicator will be lit during this interval. A received line break may cause a NUL character to appear on the display.

Form Transfer (FORM TRNSFR)

7.51 Depression of this key overrides the protected data, automatic generation of new line and sending of highlight options and lights the FORM TRNSFR indicator. All data displayed will be transferred when in the msg send mode. Escape sequences will be generated to delimit tabs, highlighted data and protected data. Depressing the FORM TRNSFR key again will cause the form trnsfr mode to be deselected and the indicator to be turned off. While in the interactive mode a received ESCG will optionally enable FORM TRNSFR and a received ESCi will disable FORM TRNSFR.

HIGHLIGHT

7.52 When this key is depressed while in the on-ln msg prep or local modes, all characters on the display will be flashed as they are entered, that is, the intensity will alternate between half and normal. The HIGHTLIGHT indicator will turn on when activated causing the form enter mode to deselect if on. Optionally in the interactive mode, a received ESC3 or ESC4, will turn highlight on and off respectively causing displayed data between the two sequences to be highlighted.

FORM ENTER

7.53 When this key is depressed in the local or on-ln msg prep modes all characters entered will be protected after the FORM ENTER key is turned off. Characters entered with this key off will not be protected. Protected characters are displayed at half intensity. Protected characters cannot be overwritten, moved or deleted unless the FORM ENTER key is lit. The position following a group of protected characters is the same as a tab stop. The FORM ENTER indicator will turn on when activated causing the hightlight mode to deselect if on. In the interactive mode, a received ESCW or ESCX will optionally cause FORM ENTER to turn on and off respectively causing displayed data between the two sequences to be protected. Underlines received while in the form enter mode, will be protected.

N. Display Attributes

Screen

7.54 Twenty-four lines of data with 80 characters each occupies a full screen.

Segment

7.55 The display memory contains three segments where each segment contains 24 lines (80 characters per line maximum). Lines 1 to 24 is called Segment one (1), 25 to 48 is called Segment two (2), and 49 to 72 is called Segment three (3).

Page

7.56 A page is the total data stored in the display memory. It consists of three segments containing 72 lines (up to 80 characters each). The maximum number of characters on a page is 5760.

Segment Marks

7.57 Single, double, or triple dots located left of the first character column on the screen indicates the beginning location of the display segment, respectively.

Tab Marks

7.58 A single dot located at the bottom left of any character position indicates the presence of a horizontal tab stop. Horizontal tabulation functions utilize these stops to advance to the next field.

Normal/Half Intensity

7.59 The intensity (brightness) of a character on the display can alternate between the normal display brightness (called NORMAL) and half the normal brightness (called HALF).

Cursor

7.60 The cursor is shown on the display as a lighted rectangle and is used to indicate the present location of display activity. If the cursor is placed over a character, the character image is shown inverted within the lighted rectangle.

Unprotected Character

7.61 An unprotected character is one used for normal data entry having no special attributes. It is displayed at normal intensity.

Protected Character

7.62 A protected character, displayed at half intensity, is one used to set up protected fields on the display. These characters cannot be overwritten unless the form enter mode is selected.

Highlight Character

7.63 A highlighted character on the display is one that usually alerts an operator of an urgent or alarming condition. The intensity of the highlighted character will alternate between normal and half.

Upper, Lower Case Font

7.64 The display utilizes a full complement of upper and lower case ASCII characters with a 7 by 9 dot matrix within a 9 by 14 field.

Underline

7.65 Each location on the display can be underline. Writing an underline does not clear what is already written at the present character (cursor) position. Cursor left may be used to step back over the character in order to underline it. Characters will be sent before backspacing and underline. Underline is not considered a character and is treated as space for purposes of character and line insert. Underlines received in the form enter mode will be protected. The underline mode may be turned on by the sequence ESC \ and turned off by the sequence ESCZ.

Reverse Video

7.66 Reverse video is the displaying of a black character on a white background (reverse of normal display). In the interactive mode the station will begin to display data in reverse video upon the reception of the sequence ESC } and return to normal display (white character on a black background) upon receiving the sequence ESC ~. Normal and half intensity definitions also apply to reverse video mode as well as protected and highlighted definitions. No more than 25 percent of the character positions (500) on the screen may be displayed in reverse video at any one time.

O. Display Functions

7.67 The following display functions will occur if the keyboard key is depressed in the local or on-ln msg prep modes or if in the interactive mode, an appropriate escape sequence is received from the line and the station is optioned to perform escape sequences.

Display Initialization

7.68 Upon power on or a device reset, the display memory will be initialized with "space" at each of the 5760 displayable character locations. The tab, underline, highlight and protect attributes in each location are also cleared. All display pointers are reset. The cursor is positioned to Home, Segment 1 is displayed. Highlight and form enter modes on the keyboard are not selected (indicators are off). The view ctrl mode is selected (indicator on) to allow the various control characters (see Fig. 14) to be displayed. The Segment mark is set to a single dot, positioned next to home (top position of screen).

Display Receive Buffer

7.69 A two thousand (2000) character buffer is provided to temporarily store incoming data during display functions.

Monitor Ready

7.70 The monitor is not considered "ready" to receive or store data if it is neither turned on nor functional. The station cannot, if monitor is not ready, enter either the interactive or message send modes. In the event the monitor is turned off or becomes nonfunctional while in interactive or message send modes, the station will go to local mode and DTR to the modem will be dropped.

Cursor Up (↑) (Repeatable)

7.71 Operation of this keyboard key moves the cursor up one line in the same column. When the display is receiving on-line, the action of receiving an ESC7 or ESCA sequence is the same as the key operation with one exception. When the cursor has reached the top of the screen and more ESC7 or ESCA sequences are received, then the displayed information will scroll down.

Cursor Down (↓) (Repeatable)

7.72 Operation of this keyboard key moves the cursor down one line in the same column. When the display is receiving on-line, the action of receiving an ESCB sequence is the same as the key operation except after the cursor has reached the bottom line on the display. At this point, if more ESCB sequences are received, then the displayed information will scroll up.

Cursor Right (→) (Repeatable)

7.73 Operation of this keyboard key moves the cursor one character position to the right in the same line until the 80th character position is reached. When the display is receiving on-line action of an ESCC sequence will be the same.

Cursor Left (←) (Repeatable)

7.74 Operation of this keyboard key moves the cursor one character position to the left on the same line until the 1st character position is reached. When the display is receiving on-line, the action of the backspace code or an ESCD sequence will be the same. Backspace code (Bs) is transmitted in the interactive mode.

Cursor Tab (CURSR TAB)

7.75 Depression of this keyboard key advances the cursor to whichever occurs first (this may cause scrolling):

FORM ENTER Lit

(a) Tab stop
(b) First column, next line
(c) Last column, last line, last segment.

FORM ENTER Not Lit

(a) Column after protected field
(b) Tab stop not in protected field
(c) First unprotected location on next line
(d) Last column, last line, last segment.

No horizontal tabulation character will be written at the cursor location nor will spaces be written in any character position along the way. The key operation does not differ from the action of receiving an ESC@ sequence on-line.

CURSOR BACK TAB

7.76 Depression of this keyboard key allows the operator to position the cursor to whichever comes first:

FORM ENTER Lit

(a) Previous tab stop
(b) Beginning of current line
(c) First line, first column, first segment.

FORM ENTER Not Lit

(a) Beginning of current unprotected field if not there.
(b) Beginning of previous unprotected field if in protected field or at the beginning of current unprotected field.
(c) Previous tab stop not within protected field.
(d) Beginning of current line if unprotected.
(e) First line, first column, first segment.

If protected data resides from the present cursor position to the beginning of the line, then a CURSOR BACK TAB will move the cursor up to the next line searching for one of the above conditions. If the cursor is on the first line of the screen then a CURSOR BACK TAB will cause a scrolling operation moving all data down one line. The operation will cease at the Home position. The command is the same if an ESCO sequence is received on-line.

Cursor New Line (CURSR NL)

7.77 Operation of this keyboard key in conjunction with the CONTROL key will advance the cursor to the first position on the next line. No NEW LINE character will be written at the cursor position or at the first character position. After the cursor has reached the bottom line of the screen, additional CURSOR NEW LINE commands will cause the displayed information to scroll up. This command will not clear the next line. The operation is the same if an ESCNL sequence is received on the line except CURSOR NEW LINE from the keyboard will stop when the 72nd line is reached on the bottom of the screen but continues if received from the line.

Cursor Return (CURSOR RET)

7.78 Operation of this keyboard key in conjunction with the CONTROL key returns the cursor to the first character position on the same line. No return character is written in the cursor position. This operation is the same if an ESCG sequence is received from the line.

Segment Advance (SEGMT ADV)

7.79 Operation of this keyboard key causes the next segment of the page to be dis-

played. 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 the last part of Segment 2 and the first part of Segment 3 is displayed, Segment 3 will be displayed. If the last part of Segment 3 and the first part of Segment 1 is displayed, Segment 1 will be displayed. When an ESCU sequence command is received on-line, the operation will be the same. The cursor position on the screen will not change during this operation.

Scroll Up (SCROL UP) (Repeatable)

7.80 Operation of this keyboard 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. When an ESCS sequence is received on-line, the operation will be the same. The cursor position on the screen will not change during this operation. The SCROL UP key will be operational in the interactive mode if Send Edit Controls Option is disabled.

Scroll Down (SCROL DOWN) (Repeatable)

7.81 Operation of this keyboard 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 on the screen. The cursor position on the screen will not change during this operation. When an ESCT sequence is received on-line, the operation will be the same. The SCROL DOWN key will be operational in interactive mode if Send Edit Controls Option is disabled.

HOME

7.82 Operation of this keyboard key causes the cursor to normalize to the first unprotected character position in the data. Depressing the key a second time will move the cursor to the first character position on the first segment. Only the first segment is now in view and the cursor is at home position. An ESCH sequence when received on-line will cause the cursor to go to the first character position of the first segment. This same operation occurs if the unit is optioned to go home on send and a send or print local occurs and the HOME key is then depressed.

CLEAR

7.83 To clear an entire page of unprotected data on the display, position the cursor to the home position and depress the CLEAR key. Data is always cleared from the cursor location to the end of page. With the FORM ENTER key depressed (indicator lit) both protected and unprotected data are cleared. This command will be the same when an ESCJ sequence is received on-line.

SET/CLR Horizontal Tab's

7.84 If no tab mark is under the cursor, depression of this keyboard key (with the CONTROL key depressed) will cause a tab mark to be written in the current cursor position and all character positions in the same column (as the cursor) to the last line of the third segment. If there is a tab mark currently set at the cursor location, it is cleared and all tab marks in the columns below and to the right of this column to the last line of the third segment are cleared. The clearing and setting of tab marks will not normally alter data. However, if horizontal tab characters are incorporated in the data on the display when tabs are cleared, there may be some data loss.

Line Insert (LINE INSRT)

7.85 This function will cause all lines from the cursor line to the end of the line field to move down one line if the last line of the line field is blank. A line field is defined by identical tab marks or indentical protected new line fields on consecutive lines (also, bounded by the first and last line in the page). The cursor line will be cleared (all spaces) and the cursor returned to the start of the line. If FORM ENTER is on (indicator lit) no protected data fields exist and only lines containing tab stops are considered in the line field. This operation is the same if an ESCL sequence is received on-line. The alarm will sound if the operation is attempted from the keyboard but it can not be performed.

Line Delete (LINE DLETE)

7.86 This function will cause the cursor line to be cleared and all following lines down to the end of the line field to move up one line. The cursor will be returned to the start of the line and the last line of the field will be cleared. See LINE INSERT for description of line

field. This function will be the same if an ESCM sequence is received on-line. If protected fields are present on the line, the unprotected fields will be cleared with no movement of any lines of data.

Character Insert (CHAR INSERT)

7.87 This function causes the character at the cursor position and all characters to the right of the cursor to move to the right. The movement is bounded by a tab stop and/or a protected character and/or the 80th character position. To move one position to the right, a blank (space) must have existed as the last character in that bounded field. If FORM ENTER is on (indicator lit) then only tab stops and the 80th character position define the boundary conditions. This functions the same if an ESC^ sequence is received on-line. The alarm will sound if the operation is attempted from the keyboard and it can not be performed.

Character Delete (CHAR DLETE)

7.88 This function causes the character at the cursor position and all characters to the right of the cursored character, bounded by a tab stop, and/or a protected character, and/or the 80th character position, to move one position to the left. The cursored character will be lost and a space will be generated at the end of that bounded field. If FORM ENTER is on (indicator lit), then only tab stops and the 80th character position define the boundary conditions. This function is the same if an ESCP sequence is received on-line. The alarm will sound if the operation is attempted from the keyboard but it can not be performed.

Destructive Scrolling

7.89 The display will destructively scroll, as a permanent feature, in the interactive mode provided there are no protected data stored in the display memory. With destructive scrolling the display can receive unlimited amounts of data, however, only the last 72 lines of data will be retained. The receipt of a new line in the last line of the display will cause all data to be moved up one line, the cursor positioned at the start of the last line, and the last line will contain no data. Tab stops that were on the last line before a destructive scroll operation will be duplicated on the new last line. If there is at least one protected character in the display then the destructive scrolling feature is disabled and received data will be lost after the cursor has reacned the last position on the 72 line; thus reacting the same as when the keyboard enters data on the display in either local or on-ln msg prep modes.

Line Feed

7.90 This function if generated from the keyboard will cause the new line character to be stored and the symbol displayed, if VIEW CNTRL is enabled, and will position the cursor at the beginning of the next line. With the cursor on the last line of the screen and the NEW LINE key depressed, the display will "scroll up" one line. 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 received on-line, this command will cause destructive scrolling to occur (provided there are no protected data characters on the page).

7.91 If a character (including space) is written into the last position of a line and the 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.

7.92 When the new line character is placed in a line, no characters can be written to its right. Also, any unprotected characters which may have been present to the right, prior to depressing the NEW LINE key, will be changed to spaces. Tab marks to the right of a new line character are ignored for all tabbing operations. In the interactive mode, a new line will cause the next line to be cleared.

SPACE

7.93 This function places a blank character at the cursor position if that position is unprotected. Depression of this keyboard key will replace any non-protected character at the cursor position with a space character and therefore, should not be used for positioning the cursor. If FORM ENTER is on (indicator lit) then the writing of a protected space will overwrite any character presently there. Operation is the same if received on-line.

TAB (Horizontal Tab)

7.94 This function operates the same as CURSOR TAB (explained above) except a HT character (→) is written at the cursor location. In addition, any unprotected characters between the HT character and where the cursor stops, will be replaced with spaces. Horizontal tab will not appear on screen, if VIEW CTRL indicator is off. This function operates the same when received on-line. A horizontal tab functions like new line if no tab stops or protected data exist between the tab and the 80th column.

RETURN

7.95 This function when operated from the keyboard or received on-line, will cause a carriage return (CR) to be written at the present cursor position. Cursor advances one character position to the right.

Backspace

7.96 This function when operated from the keyboard will cause a backspace (Bs) character to be transmitted in the interactive mode and will cause a cursor left function in all other modes. When received on-line, the function will cause the cursor to move left one character position. Succeeding Bs characters will move the cursor left, one at a time, until the first character position and then stop.

Cursor Positioning

7.97 The cursor will be positioned on the display by an ESCY, character, character, sequence received in the interactive mode. The two characters following the ESCY can optionally position the cursor according to row, column or column, row. Refer to Fig. 18 which identifies the characters used in the absolute positioning of the cursor.

Auto Cursor Tab

7.98 This function occurs automatically during display operations whenever the cursor is positioned over the last character before a protected field, FORM ENTER indicator is off, and a displayable character has just been received from the keyboard or from the line. The character will be inserted at the cursor position after which the cursor will be automatically advanced to the next unprotected character position. The cursor will stop, always, on the 80th character position of the 72nd line since destructive scrolling is not operational when protected characters are stored in the display memory.

P. Optional Keyboard Display Features

Speed Selection -- Option 201

7.99 This option defines the operational speed of the station. The speed selection is dependent upon the type of data set used and must be identical to the operational speed of the remote station. This option is also utilized to select automatically between 10 and 11 unit code where 10 unit code is defined for all speeds except 110 baud which is 11 unit code. Both groups of options can be low speed (300 baud or less) or high speed (above 300 baud), or one can be high speed and the other low speed.

Asynchronous/Isochronous -- Option 202

7.100 This option is used to allow the station to be compatible with asynchronous 108D-, 108E-, 113A-, or 212-type Data Sets and synchronous 201-, 208A-, 209A-, or 212A-type Data Sets. The internal clock of the controller is used for asynchronous operation while isochronous operation uses the clocks provided by a synchronous data set. Isochronous operation being defined as bit synchronous, character asynchronous.

Disconnect Timer — Option 203

7.101 When this option is enabled, the received line signal detector lead (CF) from the EIA interface is monitored in each of the receiving modes. In the event the received line signal detector senses a lack of received carrier for approximately 45 seconds, the station will drop Data Terminal Ready in the EIA interface and a disconnect will be attempted; when this option is disabled loss of received carrier will not result in dropping of data terminal ready. A receive mode can be either interactive or on-ln msg prep with a printer. This option should be disabled when a private line data set is used. If this option is disabled then Option 237 must also be disabled.

Auto Answer Printer Control -- Option 204

7.102 If this option is enabled, the printer will be turned on (POL indicator will light -- if not already lit) in response to an active ring indication from the data set (on an incoming

call). The printer will not answer when the station is in the options selection mode. This option is not functional when Option 300 selects no printer. If the printer is not turned off by either a received DC4 (Option 236) or depression of the POL key, the printer will remain on after call connection.

Received Parity — Option 205

7.103 This option determines if a received vertical parity error as defined by Option 207 is either displayed (optionally printed) as received or substituted with the Sb character symbol.

Send Cursor, Edit Control — Option 206

7.104 This option when enabled is functional only in the interactive mode whereby the cursor or edit controls, if depressed, will generate on-line their respective ESC sequence. The ESC sequence will not be acted upon, or displayed if Monitor Keyboard Send Data Option is activated. See Fig. 17 for applicable sequences. Cursor left always sends backspace.

Parity Check and Generation — Option 207

7.105 This option basically defines the parity of the data sent and received on-line. The parity bit is the 8th bit of the data and can be chosen to be even, odd, always mark or always space. The Received Parity — Option 205 utilizes this option to determine the type of parity checked.

Message Send Mode to On-Line Message Preparation Mode — End Character — Option 208

7.106 This option is used to cause a change of modes from send to on-ln msg prep via one of several selectable end characters. The end character will be sent on-line as the last character sent from the display while the cursor advances to the next character position. When the station is switched into the on-ln msg prep mode, the data set will not disconnect. Do not choose the same end character as the one chosen in Option 209 below.

Message Send Mode to Interactive Mode — End Character — Option 209

7.107 This option may be used to cause a change in modes from send to interactive via one of several selectable end characters. The end character will be sent on-line as the last character sent from the display while the cursor advances to the next character position. Do not choose the same end character as the one chosen in Option 208 above. If no message ending character(s) is present on the display, the character selected in this option will be used for mode switching and will be automatically sent at the end of the message.

Interactive Mode to Message Send Mode — End Character — Option 210

7.108 This option may be used to cause a change in modes from interactive to send via one of several selectable end characters. The end character as received on-line will force the station to change to the msg send mode. Prior to changing modes, the remote station may wish to reposition the cursor to allow a transmission of the data just received on the display (for checking purposes). Do not choose the same end character as the one chosen in Option 211 below.

Interactive Mode to On-Line Message Preparation Mode — End Character — Option 211

7.109 This option may be used to cause a change in modes from interactive to on-ln msg prep via one of several selectable end characters. The end character as received on-line will force the station to change to the on-ln msg prep mode for message preparation and possible reception to the optional printer. The data set will not disconnect as the station switches to the on-ln msg prep mode. Do not choose the same end character as the one chosen in Option 210 above.

Disconnect Character(s) Sequence — Option 212

7.110 This option is used to provide a means for the station to disconnect from the data set via a selectable character or character sequence (EOT, DLE EOT or none). The option is functional in all on-line modes of operation and will cause the station to change modes to the local mode whenever the character (sequence) is either sent or received. If an EOT control character is used for disconnect then it cannot be used for any of the end characters above (Option 208-211).

Line Ending Sequence — Option 213

7.111 This option is used in the send mode to substitute for the new line (stored in the display) as it is being sent on-line with the desig-

nated line ending sequence. A single line feed or carriage return, line feed, or carriage return, carriage return, line feed are selectable.

Monitor Keyboard Send Data — Option 214

7.112 This option is active in the interactive mode to provide a means to copy the data on the display (and printer if POL is on) as it is being sent from the keyboard. Escape sequences generated on-line (via Option 206) by the depression of a cursor or edit function key will not be executed, displayed or printed as it is being sent on-line. In addition, this option, if enabled, will produce a copy of the answerback message on the display (and printer if POL is on) as it is being sent in the interactive mode.

Note: There are three ways of getting a copy of what is transmitted from the keyboard; via the Monitor Keyboard Send Data Option, via data loopback from the data set (EIA interface) or via echoing by the remote station. Only one of these methods should be used at any one time in order to avoid garbled messages or double characters.

Batch Stop/Start Send Control — Option 215

7.113 This option is used to control the transmission of data from the display. Transmission starts when the SEND key is depressed and will continue until optionally a DC3 is received or transmitted, a line break is received or the SCF lead (Pin 12 of the EIA interface) goes spacing. Transmission will stop until optionally a DC1 is received, the line break is removed or the SCF lead goes marking. DC3 must not be used as a message ending character if DC3 is used to stop transmission.

Stop/Start Receive Control — Option 216

7.114 This option is used to control the reception of data from a remote source to the display and/or printer. If the station buffers become full, the station in accordance with this option will send a DC3 or line break or will cause the SCA lead (Pin 19 of the EIA interface) to go spacing. When the line buffer becomes empty a DC1 will be sent, the line break removed or the SCA lead will go marking. The LINE BREAK indicator will light when the line buffer is full (more than 256 characters). If the SCF lead is used for receiver control then Option 237 must be disabled.

Large Keytop Arrangement — Option 217

7.115 This option allows the New Line (NL), Carriage Return (CR) or the Horizontal Tab (HT) keytop to be the large keytop on the keyboard (refer to Fig. 15 and 16). The physical keytops must coincide with the option selected.

Cursor Position Definition — Option 222

7.116 This option used in the interactive mode defines the cursor positioning specified by the two characters following an ESCY character sequence (refer to 7.34). One choice permits the two characters to designate row, column and the other choice column, row. The display will always perform the positioning function and will not display the characters.

7.117 A cursor readout sequence (ESC__), if received in interactive mode will cause an ESCY, character, character sequence to be sent. Refer to Fig. 18 for ASCII characters used for positioning and readout.

Stored Received Control Characters — Option 223

7.118 This option allows all control characters (except ESCAPE (ESC), CR, NULL, DC1, DC3, DC2, DC4, as discussed below) to be either stored or not stored as they are received on-line. Although the control characters may not be displayed a function using this control character will be executed. Storage and execution of escape sequences follows Option 229. Displaying of all control characters is subject to the VIEW CTRL key.

Store Receive CR Character — Option 224

7.119 This option is used to allow a CR character to be either stored or not stored as it is received on-line in interactive mode. In either case, the CR may execute functions defined elsewhere.

Store Received Null Character — Option 225

7.120 Same as above (Option 224) using the NULL character.

Store Received Delete Character — Option 226

7.121 Same as above (Option 224) using the DELETE character.

Store Receive DC1 and DC3 Characters -- Option 227

7.122 Same as above (Option 224) using both the DC1 and DC3 characters.

Store Receive DC2 and DC4 Characters -- Option 228

7.123 Same as above (Option 224) using both the DC2 and DC4 characters.

On-Line Edit -- Option 229

7.124 This option causes the station to store and/or execute editing ESC sequences (eg. ESCB for cursor down) as they are received on-line in the interactive mode. The sequences can be stored and not executed, or they can be executed and not stored, or they will neither be stored nor executed. Two character escape sequences as defined in Fig. 17, are applicable.

Protected Data Send Variations -- Option 230

7.125 This option applies to the msg send and print local modes and is inoperative in the interactive mode. All control characters are sent according to Option 232.

(a) If Send Without Delimiters is chosen, then all escape sequences normally generated by protected data are removed from the text. All other data are sent as displayed except highlight which will be sent according to Option 233.

(b) If Send Unprotected as Displayed, Protect as Space is chosen then all protected characters will be transmitted to the line as space characters. All unprotected characters will be sent as displayed with any unprotected HT (Horizontal Tab) characters being converted to space. If the HT character is the last character on the line, it is sent as HT.

(c) If Send Unprotected as Displayed, Protect as Delete is chosen then all protected characters will be transmitted to the line as delete characters. All unprotected characters will be sent as displayed with unprotected HT being converted to space.

(d) If Send only Unprotected is chosen then only unprotected data are sent on-line discarding all protected data and their escape sequences from the text during transmission. If the HT character is the last character on the line, it is sent as HT.

(e) Send only Unprotected and Insert Tab for Each Protected Field (sometimes referred to as HT and SKIP) is chosen to provide a method of rapidly moving through displayed text containing both protected and unprotected data. When a protected field is reached, the station will generate a HT character and skip to the first unprotected character following that field. A protected data field is defined by the first character of the field being any non control character. The insertion of the HT character can be inhibited by placing a control character as the first character of the field therefore defining the field as a control field. Protected control characters are sent or suppressed as per Option 232.

Note: A field is continued on the next line if the last character of the previous line is a protected new line.

Automatic Generation Of New Line Sequence At 80th Column -- Option 231

7.126 The option can be disabled (no new line at 80th column) to allow formats with 132-column printers.

Send/Do Not Send Protected Control Characters -- Option 232

7.127 This option provides a means in msg send and print local modes to perform as follows.

7.128 If optioned "Do not Send Protected Control Characters" (FORM TRNSFR off) then protected control characters will not be sent. If optioned "Send Protected Control Characters" then all protected control characters will be sent as unprotected.

Message Send Highlight Delimiters -- Option 233

7.129 This option provides a means in msg send mode to either send or not send highlight delimiters (ESC3 or ESC4) on-line. These mark the beginning and end of highlighted fields, respectively.

Send Answer-Back -- Option 234

7.130 This option is used to cause the answerback to send its character sequence when

the station automatically answers a call via an active ring indicator. Upon data connection and a clear to send indication from the data set, the answer-back will be sent. This can occur in any of the modes except options selection.

Start of Message Send Definition — Option 235

7.131 This option applies only to msg send and print local modes and is inoperative in the interactive mode. When the msg send or print local functions are to be performed, this option will be tested to determine if the cursor must be repositioned to the home position or to the beginning of the present line (on the depression of the Carriage Return (CR) key) before the function proceeds otherwise the cursor will be left at its current position (Option 209.h. must be selected). If the Send From Home Option is selected and a print local function is performed, the cursor will be homed upon the completion of print local.

DC2/DC4 Printer Control — Option 236

7.132 Whenever this option is enabled, the printer will turn on in response to a received DC2 character and will turn off with a received DC4 character from the line in any of the receiving modes (interactive or on-ln msg prep). When this option is enabled and the PRINT ON LINE lamp is off and a problem exists with the printer, a received DC4 will cause the PRINT ON LINE lamp to flash. This option is not functional when Option 300 selects no printer.

212L1A Data Set Auto Select — Option 237

7.133 When a 212L1A Data Set is used to provide automatic selection of speeds and options, this option must be enabled. This permits the automatic control of option selection via the interface between the station and data set. This allows the station to control the data set speed for call origination and the data set to select the proper station group/speed options when auto answering. Call origination is established by an operator by normally initiating a data connection to a remote station. The station must be in msg send, interactive, or in the on-ln msg prep mode prior to call connection. A call origination cannot be established if the station is in the local mode. Upon auto answering, a call connection can be established in local mode provided a printer is present and functional and Option 204 is enabled. In this mode the active ring indicator lead forces the station to the on-ln msg prep mode with POL on. If the station is in interactive mode then POL will come on and received text is copied on both the display and printer. If this option is enabled, the primary options must be chosen for low speed (300 baud or less) and the alternate option for high speed. The primay option group is always selected for low speed and the alternate option group is selected for high speed. The low speed selected will be either 110 or 300 baud depending upon the primary selection of Option 201. The high speed will automatically be 1200 baud no matter what the alternate selection is under Option 201.

Interactive Send — Option 238

7.134 With this option enabled keyboarded data, in the interactive mode, will be sent out on-line whereas with this option disabled no data will be sent on-line.

7.135 Options 217 through 220 and 239 through 240 are available for future applications. Options 241 through 299 are not available.

Type of Printer Interface — Option 300

7.136 This option defines the type of printer, if any, used with the station. Available optional printers are 80- or 132-column DATASPEED 40 printers, 80- or 132-column 43 Teleprinters or none.

Response to Paper/Printer Alarms — Option 301

7.137 This option is used to provide a means to take positive action when the printer is soon to be or is no longer capable of receiving any more data. Conditions such as low paper, paper out, loss of SSI interface, DTR off and motor not coming up to speed are among the paper and printer alarms. If Send Break, Do Not Disconnect Call is chosen then a continuous spacing line (this follows Option 216) is sent until the operator takes corrective action. If Send Break, Disconnect Call is chosen a timed line break is sent on-line prior to the data set disconnecting and station switching to local mode. If Disconnect Only is chosen, then the station will disconnect from the line and go to the local mode. If Finish Call is chosen, then no action takes place until the next attempt to complete a call connection. In all the above cases, no call connection can be made until corrective action is taken on the printer. Do not choose a disconnect if a private line data set is to be used.

Print On Line Lock On — Option 302

7.138 With this option enabled once the PRINT ON LINE indicator has been turned on it will not be possible to turn the indicator off by depressing the PRINT ON LINE key. The indicator can only be turned off by entering and then exiting the options selection mode or by powering the station down and then up again. The PRINT ON LINE indicator will flash if the printer develops a problem and continues to flash until the problem is corrected. With this option disabled the PRINT ON LINE indicator can be turned on and off by way of the PRINT ON LINE key.

7.139 Options 303 and 304 are for future applications.

7.140 Option 201 through 216 require the selection of two choices; a primary choice and an alternate choice (selections may be the same). Primary selections are active when the ALT OPT indicator is not lit; alternate selections are active while the ALT OPT indicator is lit. The remainder of the options (Options 221 through 238 and 300 through 302) are active in both modes; ALT OPT indicator off or on.