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TC-70
CRT DISPLAY TERMINAL
SPECIFICATIONS



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1.1 General Description

The TC-70 Display Terminal consists of a video display and keyboard packaged with their control electronics. The communication controls are entirely self-contained providing for direct connections to a communication line interface. By use of the standard typewriter keyboard and auxiliary control keys, the operator may request information from the computer, secure a response to the inquiry, or send an administrative message.

1.2 Display Description

The display section of the terminal employs a 12" video screen. Characters are displayed utilizing a 5 x 7 dot matrix technique. A special symbol (cursor) indicates the position currently addressed for data entry. The cursor reverses the background area around the character to provide the operator with a positive identification of the data entry point.

The video screen may be organized as a split screen (horizontally split) or as a full screen display. The split screen mode is the normal mode, to which the terminal automatically returns after every transmitted message. The top portion of the video screen is utilized for operator entry into specific field locations. The lower section of the split screen section (receive area) is reserved for responses and messages transmitted by the computer.

DISPLAY CHARACTERISTICS

Characters	512
Characters Per Row	32
Number of Rows	16
Video Type	12 Inch Rectangular
Character Style	5 x 7 Dot Matrix
Character Height26 Inches
Row Spacing11 Inches
Character Set	64 Alphanumerics
Display Mode	Modified Raster Scan
Refresh Rate	60 Complete Refresh Cycles Per Second

1.3 Keyboard Description

The keyboard is physically and functionally divided into three sections to facilitate message composition as shown in Figure 1.

1.3.1 Alphanumeric Keyboard

This keyboard has a standard typewriter layout and offers the superior human factors of a standard IBM Selectric Key mechanism. Its function is to provide for operator entry of message data.

1.3.2 Function Keyboard

This 15-key cluster provides a means for the operator to access any one of the predefined fields in a message. (Field identification and field size must be specified by the customer when ordering.) The purpose of the Function Keyboard is to provide a message composing control over the data entered. This keyboard controls the data entry cursor, and depression of a function key automatically positions the cursor in the first position of the corresponding field. Each

function key operates independently as a preset tab key. The keys are labeled to correspond to their respective fields. The function keys may be depressed in any order.

1.3.3 Control Keys

Several control keys are provided which establish the state of the terminal. These keys enable the operator to select the format for the display and change the cursor position. Independent keys initialize the terminal and effect message transmission. A full description of the control keys is provided below and in Figure 1.

1.3.3.1 Display Format

Full Screen: This momentary switch, when depressed, deactivates the split screen controls making the complete display screen available for message composition or receiving. Depressing Full Screen places the cursor at the beginning of the lower light on the console. In Full Screen mode, message transmission terminates at the current cursor location.

In Full Screen mode without Header, incoming messages are inhibited (N response to address) while the operator is composing a message. A Message Waiting indicator alerts the operator to this condition. The terminal will return to Split Screen status upon transmission of the message, unless Header is in effect.

Split Screen: This momentary switch may be depressed to place the terminal in Split Screen mode.

Header: This switch mechanically latches in either of two positions. Upon depression (in Full Screen mode only), the switch causes the screen to be electronically split into two portions divided at the position of the cursor. All information preceding the cursor is protected against modification by the computer. Any subsequent received messages will begin at the selected split screen location. Raising the Header key returns the terminal to the standard screen mode. The Header condition is indicated by a light on the console.

Field Limits: This switch mechanically latches in either of two positions. When depressed, the pre-defined fields (as described in paragraph 1.3.2) are defined on the display screen by plus (+) delimiters.

1.3.3.2 Display Cursor Controls

Back Space (<—): This key moves the cursor one place to the left.

Forward Space (—>): This key moves the cursor one place to the right.

Line Return (): This key moves the cursor one line up.

Line Advance (): This key moves the cursor one line down.

The cursor controls described above have two modes of operation, repetitive and single cycle. Pressing and releasing any of these keys results in a single space in the selected direction. Pressing and holding any of these keys causes repeated spaces until the key is released.

Alternate Field: This momentary key initiates a shift mode which redirects the addresses of three of the function keys. This mode is reset by a second depression of the Alternate Field Key or upon transmission of the message. The operator is reminded of this mode of operation by a light on the console.

Home: This momentary pushbutton returns the cursor to the beginning of the storage (upper left screen position).

Print: This momentary pushbutton initiates the printing of the display buffer from the beginning of the buffer to the end of the received message. This key is disabled in the absence of a printer attachment.

1.3.3.3 Terminal Controls

The controls discussed below are demonstrated in Figure 1.

Reset: This pushbutton resets any error conditions (indicated by the error light on the console) or initializes the control electronics if there are no error conditions.

Clear: This pushbutton erases the display buffer except for the field delimiters in the case that Field Limit is depressed.

Send: This Pushbutton initiates the sending of the message composed by the operator. The actual transmission will not occur until the terminal is polled by the computer.

Inquiry: This pushbutton performs similar to Send. The only exception is the length of the message as defined in paragraph 2.1.1.

1.3.3.4 Indicators

The indicators described below are shown in Figure 2.

Message Waiting: This light indicates that the terminal has refused to accept a message from the computer (N response to address) and may occur in Full Screen mode without Header during message composition.

Alternate Field: This light indicates that three of the function keys have been redirected to their alternate screen positions.

Header: This light signifies the Header mode described above.

Full Screen: This light signifies the Full Screen mode described above.

Training: This light alerts the operator to the disposition of the transmitted message as described in paragraph 3.6.

Error: This light alerts the operator to the following error conditions:

- (1) Parity errors from the communication line or keyboard.
- (2) Operator entry of data into a field delimiter position.

Both of these conditions will cause the keyboard to lock until the error is reset.

Standby: This light is on when the terminal is monitoring the communication line and neither transmitting nor receiving.

Receive: This light is on when the terminal is receiving data from the communications line.

Transmit: This light is on when the terminal is currently transmitting data on the communications line.

Enter: This light indicates that information may be entered from the keyboard.

1.4 Communications Facilities

The communicator section of the terminal operates with a six-level BCD code identical to that employed by the IBM 2740 terminal (IBM PTTTC/EBCD). As listed in Appendix D, the terminal offers several line control features, all of which are fully compatible with IBM 2740 and/or IBM 2741 line code and line control.

The terminal operates start/stop at speeds up to 1200 baud. The interface is RS232 compatible for use with external modems. Internal modems are available for operation up to 1200 bits per second (See Appendix D).

2. Functional Description

The various display format controls described have been designed to provide considerable flexibility for the system and software designer. This section suggests a few of the possible modes of operation for a conversational system.

2.1 Message Formats

Three of the most useful message formats are discussed below. The choice of message format is entirely under operator control.

2.1.1 Inquiry Format

Depression of the Inquiry function key after message composition initializes control electronics which will cause transmission of only those message fields which are required to initiate a meaningful inquiry from the computer database. The inquiry message length must be defined by the customer when ordering, and all inquiry data must be organized on the video screen as the first contiguous fields defined.

2.1.2 Defined Data Entry Format

For the purpose of this specification, this format refers to the normal message consisting of the several fields which identify the previously defined "normal" data entry format. By definition, this message ends at the split screen boundary. To assure proper message length, the terminal must be in Split Screen mode prior to depressing Send.

2.1.3 Administrative Message

This message type represents an extension of the Defined Data Entry format which requires that the Full Screen key be depressed prior to completing the message composition. A variable length message may be added to the "normal" data prior to depressing Send.

2.2 Operating Procedure

Several operating mode changes are automated.

The terminal returns to Split Screen mode at the completion of each message transmission unless the terminal is in Header mode. The Enter mode (enabling message composition or change) will prevail in all non-error conditions except message transmission.

After an Inquiry message composition is complete, the Inquiry key is depressed to initiate transmission. While awaiting message transmission to start and/or after transmission is complete, additional data may be entered into fields that have not been defined as part of the inquiry message. Further messages may be sent in response to computer replies by depressing the Inquiry key or the Send key.

3. Unique Features

Several unique features have been provided to optimize the Data Entry task. These features, some to which reference has been made, are explained below:

3.1 Field Delimiters

Field delimiters define the ends of each of the data message fields. They are provided to guide the operator during message composition. Should the operator attempt to enter data in a delimiter position the keyboard will lock and the error light will indicate that the selected field has been exceeded. Depressing the Reset key will restore the terminal to its operational status.

3.2 Overlap

To facilitate rapid conversational response, the TC-70 Display Terminal has been provided with an overlap feature. The operator may enter or update data in the message composition section of the display screen under any of the following conditions:

- (a) Prior to initiating a Send operation (normal Enter mode).
- (b) While awaiting transmission of a message.
- (c) While waiting to receive a computer response.
- (d) During the receiving of a computer response.

3.3 Packed Transmission

To conserve communication time, all unfilled positions in the composed message are not sent over the communication line. Field delimiters are transmitted to enable the computer software to determine data fields received (see paragraph 4.1).

3.4 Receive Clear

The terminal, upon receiving the first character of a message, clears the lower area of the screen prior to storing and displaying the new image.

3.5 Changeable Field Limits

The specific locations of any message field delimiters can be changed in the field by service personnel.

3.6 Training Mode

A toggle switch is provided to dictate a mode of operation which inserts a special character (Training) at the beginning of each transmitted message as a flag to the computer.

4. Communication Line Format

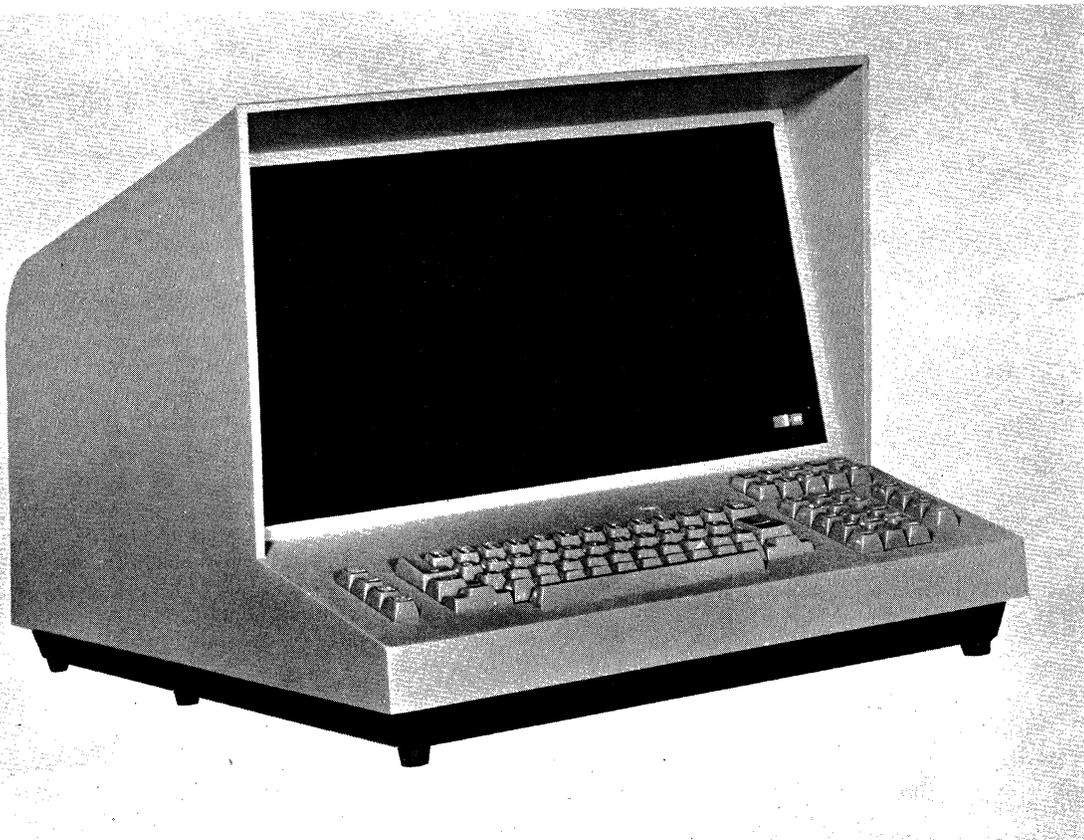
4.1 Data Format

The composed message is transmitted in the same order as it appears on the screen. Each message field is terminated by a plus (+) sign. All data and line control characters are presented in the IBM PPTC/EBCD code. The order of serial bit transmission is START, B, A, 8, 4, 2, 1, parity, and STOP. As described in paragraph 3.4, unused character positions in the message are not transmitted.

4.2 Line Control

The line control codes are necessary to establish a coordination discipline between the terminal and the computer complex (or master station). Line control codes are used to establish priority of transmission or receiving (to prevent two or more terminals attempting to transmit over the same line simultaneously).

This terminal can be provided with any of the line control features offered by the IBM 2741 and IBM 2740. These special features (listed in Appendix D) are identical to their IBM 2740, 2741 counterparts.



APPENDIX A: CODE CHART

	BA 00			BA 01			BA 10			BA 11		
8421	U	L	LC	U	L	LC	U	L	LC	U	L	LC
0000	SP	SP		¢	@		-	-	(N)	+	&	
0001	=	1		?	/		J			A		
0010	<	2		S			K			B		
0011	;	3		T			I			C		
0100	:	4		U			M			D		
0101	%	5		V			N			E		
0110	'	0		W			O			F		
0111	>	7		X			P			G		
1000	*	8		Y			Q			H		
1001	(9		Z			R			I		
1010)	0										
1011	"	#	(D)	I	,	(S)	1	\$		↵	.	(Y)
1100												
1101				INDEX			CAR RET			TAB		
1110	UC SHIFT					(B)	BKSP			LC SHIFT		
1111			(C)	TRAINING			IDLE			DELIMITER		

U: UPPER CASE
L: LOWER CASE
LC: LINE CONTROL

APPENDIX B: CHART FONT

ALPHABETICS

A B C D E F G H I J
K L M N O P Q R S T
U V W X Y Z

NUMERICS

0 1 2 3 4 5 6 7 8 9

SPECIALS

* # ! @ " \$ %
& ' () * + , - . / : ;
= ?

APPENDIX C: OPTIONS

The features listed below are standard options to be specified by the customer. All of the options are field changeable by trained personnel.

Display Screen Locations

All locations listed may be selected from the 256 character positions in the upper half of the display screen.

- (1) Split Screen location
- (2) Inquiry message length.
- (3) Cursor locations for the Function Keys
 - (a) 12 single key limits.
 - (b) 3 keys with alternate limits activated by the Alternate Field control.
- (4) Cursor location desired upon depression of Full Screen switch. This location will be set at the Split Screen location unless otherwise specified.

- (5) Field delimiters which appear as plus signs (+) on the screen. A total of 15 delimiter positions are available.

Terminal Identification

Terminals with the station control special feature (see Appendix D) are provided with two addresses and with two master/slave choices.

A single character terminal address and a single character group address are available for station control. These characters must be chosen from alphabetic (AZ), numeric (0-9), (@), (\$), (.), or (&).

Each terminal must be designated as a group master or group slave.

Each terminal must be designated as an all-call master or all-call slave should broadcast operation be desired.

APPENDIX D: SPECIAL FEATURES

Several special features are available as additions to the basic TC-70. These features are listed below for reference.

Internal Modem

Two types of internal modems are available for the TC-70 for data rates up to 1200 bits per second. These modems are compatible with either the Bell 103 data set up to 300 bits per second or the Bell 202 data set up to 1200 bits per second.

Buffer and Display Capacity

Two special configurations are available:

- (1) 1024 character buffer with 512 character display including a vertical roll control to access the total buffer.
- (2) 1000 character buffer and display organized as 20 rows of 50 characters each.

Printer Attachment

In addition to the standard printer control interface, a

printer adapter and IBM Selectric* type output printer is available as an attachment to the TC-70.

Line Control Features

To optimize communication line use and offer full compatibility with IBM software support, several line control features are available. Detailed application information is available upon request or by reference to IBM SRL publication A24-3403-3. The features available are:

- (1) Station Control without prefix.
- (2) Station control with prefix.
- (3) 2741 compatibility.
- (4) Checking without Auto EOB.
- (5) Checking with Auto EOB.
- (6) Dial-up without transmit control.
- (7) Dial-up with transmit control.

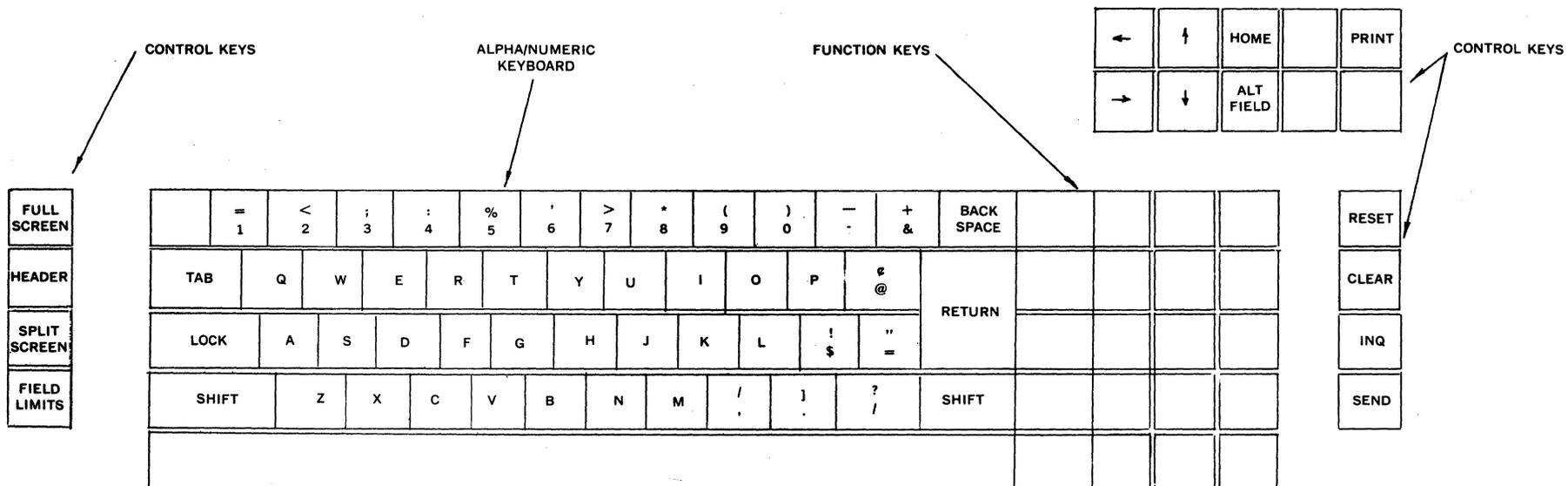


FIGURE 1

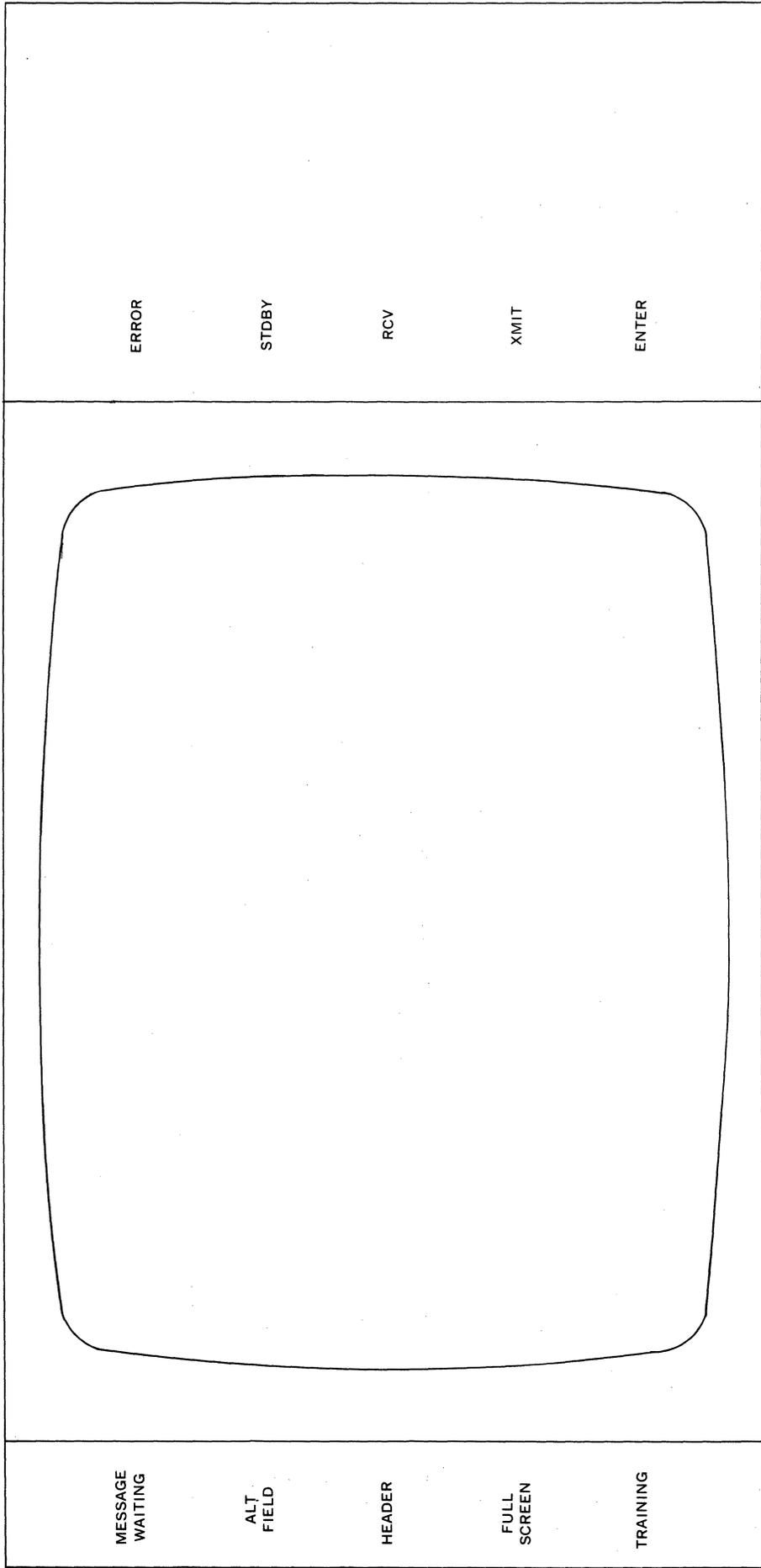


FIGURE 2