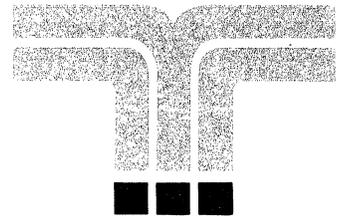


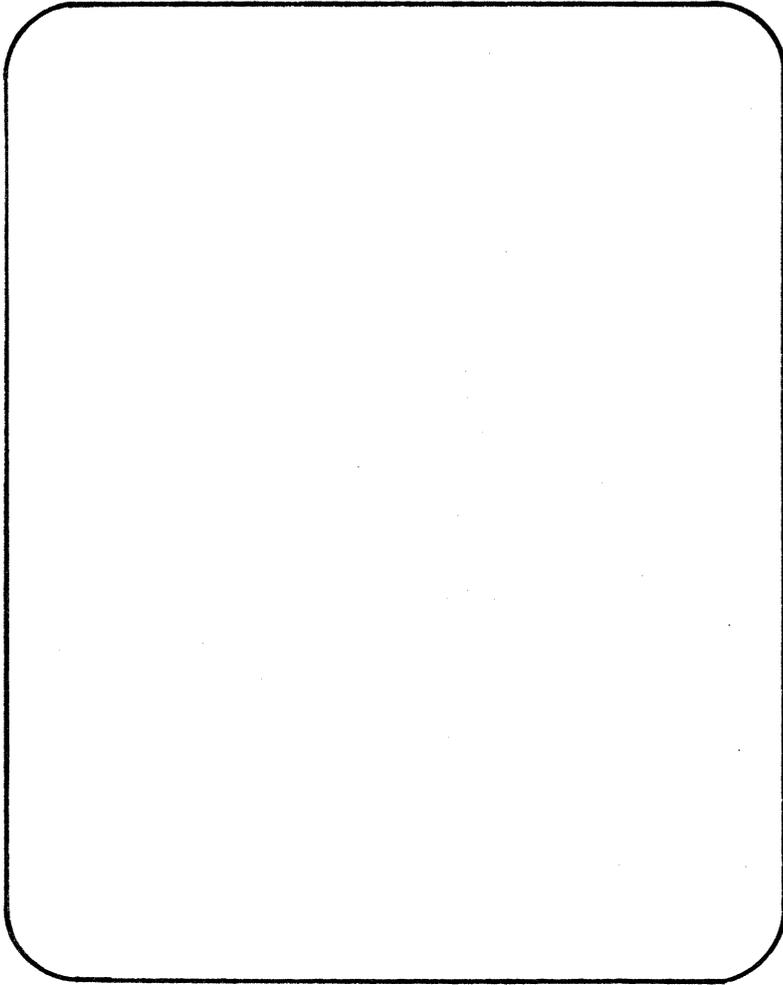
89412 13 1972

Terminal Communications



TC-62 CRT DISPLAY TERMINAL SPECIFICATIONS

MESSAGE
WAITING



ERROR

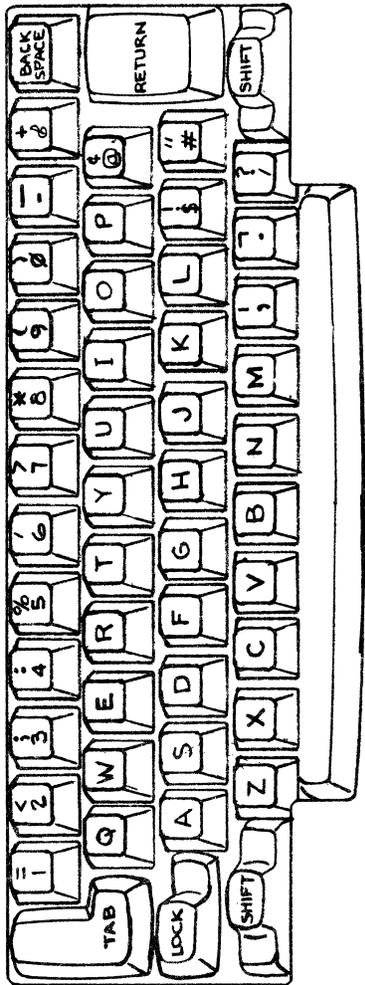
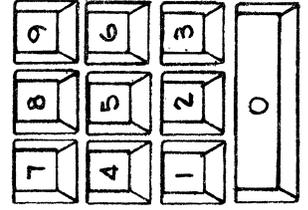
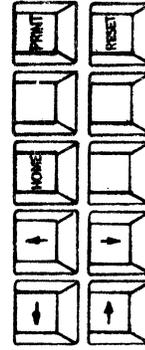
STANDBY

RECEIVE

TRANSMIT

ENTER

TRAINING



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1. GENERAL DESCRIPTION

The TC 62 Display Terminal consists of a video display and keyboard packaged with their control electronics in a compact table top unit. The TC 62 provides for data display and exchange with a computer over communication facilities. The communications controls are entirely self-contained, providing for connection to a communication line interface either direct or through an external data set.

A companion printer TC 35 is optionally available as an attachment to the TC 62 for hard copy output.

Software Compatibility

The TC 62 is compatible with IBM programming packages (BTAM, QTAM, etc.), which support the IBM 2740 (with station control feature).

Display Characteristics

The display section of the terminal employs a 12" (diagonal) video screen. Characters are generated with the 5 x 7 dot matrix technique. A special symbol (cursor) indicates the position currently addressed for data entry. The cursor is nondestructive and displays by reversing the background area around the character providing the operator with a positive identification of the data entry point.

The character set consists of the 26 upper case alphabets, the ten numerals, and the specials offered by the IBM 2740 EBCD code (See Appendix A).

Display mode for the TC 62 is modified raster scan at a refresh rate of 60 HZ.

The display format may be 16 rows of 32 characters, 12 rows of 40 characters, or 10 rows of 50 characters. Other formats are available as listed under OPTIONAL FEATURES. Character height ranges from .2 inches to .26 inches depending on format.

Alphanumeric Keyboard

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

Numeric Keyboard

This 10-key cluster supplements the alphanumeric keyboard by offering an alternate means for entering numerics. The keyboard format is similar to adding machine keyboards.

Control Keys

Several control keys are provided to control the state of the terminal.

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: Provides for operator erasing of the buffer.

SEND: Initiates the sending of the message composed by the operator. The actual transmission will not occur until the terminal is polled by the computer.

ENTER: Unlocks keyboard for data entry into buffer.

HOME: Returns cursor to the beginning of the buffer (upper left screen position).

PRINT: Initiates the printing of the buffer from the beginning to the printer stop code, or to the end if no printer stop code has been entered.

DISPLAY CURSOR CONTROLS: Four keys are provided for moving the cursor in one of the four directions as indicated on each key. These keys 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.

Set-Up Controls

Four controls are located behind a door on the right side of the machine:

CONTRAST: Video contrast knob.

BRIGHTNESS: Video brightness knob.

TRAINING: A toggle switch permits selection of a mode of operation which inserts a special character (Training) at the beginning of each transmitted message as a flag to the computer.

MASTER: A toggle switch which designates the terminal as group master for group addressing.

Indicators

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

- (1) Parity errors from the communication line or keyboard.
- (2) Attempted operator entry of data into a field delimiter position.
- (3) Buffer overflow.
- (4) Upon receiving a (C) response to the EOB,LRC sequence (feature code 6227 only).

STANDBY: This light is on when the terminal is monitoring the communication line and neither transmitting nor receiving data. This light will remain off until the first (C) is received from the computer.

RECEIVE: On during the receiving of message data or sending a checking reply.

TRANSMIT: On during the sending of message data or receiving a checking response.

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

MESSAGE WAITING: This light indicates that the terminal has not been prepared for receiving a message directed to it. This light will remain on until a message is accepted by the terminal or until the terminal is reset.

TRAINING: This light alerts the operator that the terminal is in training mode.

Alarm

The alarm will sound for any of the following conditions:

- (1) A negative response by the terminal to an address.
- (2) With checking feature but without feature code 6227 upon receiving a (N) response to EOB,LRC.
- (3) With checking feature combined with feature code 6242 upon receiving a (C) response to EOB, LRC.

Additional Features

Several features have been provided to optimize the data transfer operation.

PACKED TRANSMISSION.

To conserve communication time, unfilled positions in the composed message are not sent over the communication line.

TRAINING MODE.

This mode of operation causes a special character (A, 8, 4, 2, 1) to be transmitted at the beginning of each message to the computer.

LINE ADDRESSING.

Line addressing provides a means for computer selection of a particular display line for data entry. Each time the terminal is addressed by the computer the cursor (address register) returns to the home position. Line addressing requires two characters in sequence. The line address prefix (B, A, 8, 2) prepares the terminal to skip the number of display lines indicated by the line skip count character. The line skip count character immediately follows the line address prefix and represents the binary value (bit: B = 16, A = 8, 4 = 4, 2 = 2, 1 = 1) of the number of lines to be skipped. Character organization is BA8421 where bit 8 has no binary weight for line addressing. For example, the character 010010 (B = 0, A = 1, 4 = 0, 2 = 1, 1 = 0) will cause ten lines to be skipped and the character 100001 will cause seventeen lines to be skipped. Line addressing exhibits the following characteristics:

- (1) The two character addressing sequence may occur at any position in the message text.
- (2) There is no limit as to the number of line addressing operations within a message.
- (3) The line skip count character must have bit 8 equal to zero.
- (4) The line skip count may be used to return to previous lines by wrapping around (e.g., a line count of 10 issued when the current location is 6 would result in a new location of line 5 for the 12 line display format).

(5) The line address operation returns the cursor to the first position of the desired line.

TAB MARKS.

A special character (A, 8, 4) has been provided which displays on the screen as a plus (+) sign. These field delimiters may be sent by the computer but cannot be entered from the keyboard. A TAB MARKS switch is available to suppress display of the plus symbol (up position). The operating features are as follows:

- (1) Tab marks are protected against operator destruction during data entry. Any attempt to enter a data character at a tab mark position results in keyboard lock and error light (recover by depressing RESET).
- (2) With the TAB MARKS switch off (up position), the tab marks are still in effect though not displayed.
- (3) Tab marks will be cleared by either operator or computer clearing (regardless of TAB MARKS switch position).
- (4) Control functions tab, backspace, and carriage return, unlike data characters, will not cause the keyboard to lock when activated with the cursor positioned over a tab mark. These control characters will not be stored in a tab mark position; however, they will function normally.

FIELD TAB.

This function permits the operator (or computer) to advance from field to field by depressing the tab key (or sending the tab character). Each depression of the tab key will advance the cursor location to the first position of the following field. The details are:

- (1) In this operation, the tab mark acts as a tab stop.
- (2) The tab character is stored in the buffer except in tab mark positions which are protected.
- (3) The tab character appears as a blank on the display screen.
- (4) Depression of the tab with the cursor directly over a tab mark will cause the cursor to advance one position with no tab being stored.

2. SELECTIVE FEATURES

Several features are available for the TC 62 at no extra charge. A choice of one configuration out of each feature group below is required to completely specify the TC 62.

Cover Color

Four colors are available to complement the charcoal keyboard and display screen:

	<u>Feature Code</u>
Red	6204
White	6203
Blue	6202
Grey	6201

Display Format

Three display formats are available:

<u>Characters per row</u>	<u>Number of rows</u>	<u>Feature Code</u>
32	16	6232
40	12	6240
50	10	6251

Communication Interface

Two integral modems are offered as well as a standard EIA RS 232 interface. In addition, a shared modem interface is available for a clustered terminal system.

INTEGRAL MODEM TYPE 202 INTERFACE, feature code 6210.

This feature is prerequisite to the integral modem compatible with the WE 202D for 2-wire or 4-wire service. Up to 1200 bits per second rate is available for unconditioned lines and up to 1800 bits per second on C2 conditioned lines (does not include optional 202 type modem, feature code 6220).

A cable equipped with a standard telephone plug is supplied with this feature.

INTEGRAL MODEM TYPE 103 INTERFACE, feature code 6209.

This feature is prerequisite to the integral modem compatible with the WE 103 which provides 2-wire full duplex service for up to 300 bits per second (does not include optional 103 type modem, feature code 6219).

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A cable equipped with a standard telephone plug is supplied with this feature.

EXTERNAL DATA SET INTERFACE, feature code 6206.

This feature provides a cable and plug for attaching an external data set to the TC 62. The functional and electrical characteristics of the interface conform to EIA standard RS 232 (See Appendix E).

SHARED MODEM INTERFACE, feature code 6208.

This feature permits the TC 62 to be equipped with a special adapter which provides for the sharing of a differential digital interface among several terminals connected to a single modem. This feature is prerequisite to the shared modem adapter, feature code 6218 (not included). Refer to the TC 905 for details concerning the shared modem operation.

Communication Line Control

The TC 62 may be configured to be compatible with either the IBM 2740 Model 1 or IBM 2740 Model 2.

Refer to Appendix D for a summary of line control formats.

IBM 2740 MODEL 1 STATION CONTROL COMPATIBILITY, feature code 6241 and IBM 2740 MODEL 2 STATION CONTROL COMPATIBILITY, feature code 6242.

The station control feature permits the attachment of several TC 62 terminals to the same communication line. Each terminal is provided with a terminal address and group address to permit computer selection of a group or individual terminals. Address characters are chosen from alphabetic (A-Z), numeric (0-9), (&), (.), (\$), or (-).

Message flow to and from the terminal is under computer control by means of Polling and Addressing.

The Polling Sequence is:

- (1) Message composition and editing is performed by the operator and completed by depressing the SEND key.
- (2) A polling sequence is issued by the computer consisting of the following three characters:
©, Terminal Address, Space.

(3) If the operator has depressed the SEND key prior to receiving the Poll, the TC 62 will transmit the buffer contents; however, if SEND has not yet been depressed, the terminal responds with (N) to the Poll.

The Addressing Sequence is:

(1) An addressing sequence is issued by the computer in order to prepare the TC 62 for receiving a message. The four character sequence is: (C), (S), Address, space. The Address Character may correspond to Terminal, Group, or All-call (Slash /).

(2) The TC 62 upon recognizing the proper address will, if able, go into receive mode. Terminals without receive status (ENTER mode or awaiting a poll), will set the Message Waiting light and sound the alarm.

(3) A response will be sent to the computer indicating acceptance or rejection of the addressing operation; however, in the case of a Group or All-call address, only the designated master terminal will respond to the computer. The response for feature code 6241 is (N) for lack of terminal receive status and (Y) for acceptance. The response (N) or (Y) for feature code 6242 is preceded by a sense character which provides details regarding the TC 62 status (see Appendix D).

(4) The message format consists of message data preceded by (D) and followed by (C). This format applies to messages to or from the terminal.

Record Checking, feature code 6227.

This line control feature provides a means for detecting multiple errors in transmitted or received messages. In addition to the standard parity check on each character, this feature effects a parity check on each bit longitudinally along the message. This longitudinal redundancy check character (LRC) is the last character of each message block and is preceded by a special End-of-Block (EOB) character signifying that the LRC is to follow.

Upon recognizing the EOB,LRC sequence, the receiving device compares the received LRC with the internally generated LRC. If the LRC is correct and no parity errors have been detected, the receiving device will generally respond with a (Y) which, when recognized by the transmitting device will generally result in an End-of-message (C) character being sent to the receiver.

Other receiving and transmitting options are described in Appendix D.

Message Format Controls

Clear Command, feature code 6224

This feature permits recognition and operation of the Clear Command character.

Buffer clearing is under computer control. A special character (B, 8, 2) initiates a buffer clear operation. The clear command will erase from the current cursor position to the end of the screen. The following points provide functional details:

- (1) The clear command may appear at any position in the message text.
- (2) The cursor does not move.
- (3) Any tab marks in the affected area will be cleared.

Without Clear Command, feature code 6225

This feature provides for automatic clearing of the buffer. The terminal, upon receiving the first character of a receive message, clears the screen prior to storing and displaying the new message.

Space For Fill, feature code 6256

This feature causes the terminal to use the space character instead of the fill character to pack the buffer on clearing operations. Since spaces are not deleted upon transmission, packed transmission is disabled by this feature.

Stop Code, feature 6225

This feature enables circuits which will store a stop code (A, 8, 2, 1, S--logical OR symbol) at the cursor location upon depressing Send or Print. The stop code will determine the end of the message upon printing or transmission; however, it is not included in the message.

Start/Stop Code, feature code 6254

This feature includes the operation and adds a switch which stores a start code (B, A, 8, 2, 1, S--logical NOT symbol) at the cursor location, the start code determines the beginning of the message upon transmission. The start code is not transmitted.

Automatic Field Tab, feature code 6257

This feature causes the Field Tab operation to be disabled if and only if there are no Tab Marks stored in the buffer.

Without Tab Storage, feature code 6222

This feature prevents tab characters from being stored in the buffer.

Transmission Line Baud Rate

The TC 62 communication adapter operates in start/stop mode with a line oscillator accuracy of 0.2% about nominal. Since the terminal can support data rates up to 10,000 bits per second, the line baud rate is primarily limited by modem and transmission facilities. The line rate may be specified as follows:

<u>Rate in bits per second</u>	<u>Feature Code</u>
134.5	6234
300	6235
600	6236
1200	6237
Customer Specified	6238

Transmission Facility

This feature is applicable only to machines using type 202 modems either external or internal. Feature code 6212 provides for 2-wire service whereas feature code 6214 provides for 4-wire service.

Terminal Identification

This feature is field changeable by trained personnel; however, specific choices may be established prior to shipment if desired.

TERMINAL AND GROUP ADDRESS, feature code 6245.

A single character terminal address and a single character group address may be chosen from alphabetic (A-Z), numeric (0-9), (@), (\$), (.), (&), and (-).

ALL-CALL MASTER, feature code 6246.

This feature designates the specific TC 62 which will respond to a broadcast (all-call address) operation.

FIELD INSTALLED IDENTIFICATION, feature code 6247.

This feature precludes the above choices and provides for Terminal Address "A" and Group Address "1," which may be changed at installation time.

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3. OPTIONAL FEATURES

The features listed below expand the TC 62 capabilities:

Large Buffer Format

Three display formats are available for a large capacity buffer:

<u>Characters per row</u>	<u>Number of rows</u>	<u>Feature Code</u>
50	20	6250
64	16	6264
80	12	6280

Integral Modem Type 212, feature code 6220

This modem is compatible with the WE 202D providing up to 1200 bits per second for unconditioned lines and up to 1800 bits per second on C2 conditioned lines.

Two configurations are available for the telephone line interface.

- TWO-WIRE SERVICE, feature code 6212
- FOUR-WIRE SERVICE, feature code 6214

Integral Modem Type 103, feature code 6219

This modem is compatible with the WE 103 which provides 2-wire full duplex service for up to 300 bits per second.

Shared Modem Adapter, feature code 6218

This feature permits the sharing of a single modem among several TC 62 terminals. Refer to the TC 905 for details concerning the shared modem operation.

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4. FUNCTIONAL DESCRIPTION

Terminal operation requires that the ENTER key be depressed in order to operate the keyboard for message composition. While in the Enter condition, the buffer is dedicated to operator keyboard data entry which prohibits incoming messages from accessing the buffer. Any recognition of incoming traffic will sound the alarm and turn on the Message Waiting light.

Operation of the CLEAR key prior to data entry will erase the buffer contents (the buffer is actually loaded with a special "fill" character which will be deleted at message transmission), and restore the cursor to the first buffer position. Data entry and editing may be performed throughout the screen area using the non-destructive cursor controls.

Upon depressing the SEND key, the keyboard will lock and message transmission to the computer is initiated. Actual message transmission will not occur until the terminal is polled by the computer.

After message transmission is complete, the terminal will be able to accept an incoming message for storage in the buffer. Receive status will remain valid until operator depression of ENTER.

Any portion of the display screen, beginning with the first position, may be printed on an attached TC 35 printer. The end of the print field is determined by the position of the printer stop code. A stop code (logical-or symbol) may be placed in the buffer at any position to signify the end-of-message for the printer. If no stop code is inserted, the entire buffer contents will be printed.

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			L			C		
0100	:	4		U			M			D		
0101	%	5		V			N			F		
0110	'	6		W			O			F		
0111	>	7		X			P			G		
1000	*	8		Y			Q			H		
1001	(9		Z			R			I		
1010)	0					CLEAR			LINE ADDRESS PREFIX		
1011	"	#	(D)		,	(S)	!	\$		└	.	(Y)
1100				DELIMITER								
1101				INDEX			CAR RET			TAB		
1110	UC SHIFT					(B)	BKSP			LC SHIFT		
1111			(C)	FILL TRAINING			IDLE					

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

APPENDIX B: CHARACTER FONT

ABCDEFGHIJ
KLMNOPQRST
UVWXYZ

1234567890

%#!@"\$
*'+_/,<>=?
|~{()}-:;@.

□CURSOR

APPENDIX C: FEATURES

<u>Description</u>	<u>Feature Code</u>	<u>Prerequisite</u>
<u>Cover Color</u>		
Red	6204	
White	6203	
Blue	6202	
Gray	6201	
<u>Display Format</u>		
<u>Capacity</u>	<u>Characters Per Row</u>	<u>Rows</u>
512	32	16
480	40	12
500	50	10
1000	50	20
1024	64	16
960	80	12
		6232
		6240
		6251
		6250*
		6264*
		6280*
<u>Communication Interface</u>		
Integral Modem Interface--202	6210	
Integral Modem Interface--103	6209	
EIA RS 232 Interface	6206	
Shared Modem Interface	6208	
<u>Integral Modems</u>		
Integral Modem--202	6220*	6210
Integral Modem--103	6219*	6209
Shared Modem Adapter	6218*	6208
<u>Communication Line Control</u>		
IBM 2740 Model 1 Compatibility	6241	
IBM 2740 Model 2 Compatibility	6242	
<u>Record Checking</u>	6227	
<u>Message Format Controls</u>		
Clear Command	6224	
Without Clear Command	6225	
Space For Fill	6256	
Stop Code	6255	
Start/Stop Code	6254	
Automatic Field Tab	6257	
Without Tab Storage	6222	

Appendix C Continued

<u>Description</u>	<u>Feature Code</u>	<u>Prerequisite</u>
<u>Transmission Line Baud Rate</u>		
134.5	6234	
300	6235	
600	6236	
1200	6237	
Customer Specified	6238	
<u>Transmission Facility</u>		
Type 202 Modem 2-wire	6212	6220*
Type 202 Modem 4-wire	6214	6220*
<u>Terminal Identification</u>		
Address Specified on Order	6245	
All-Call Master	6246	
Field Installed Identification	6247	

*Denotes Optional Feature

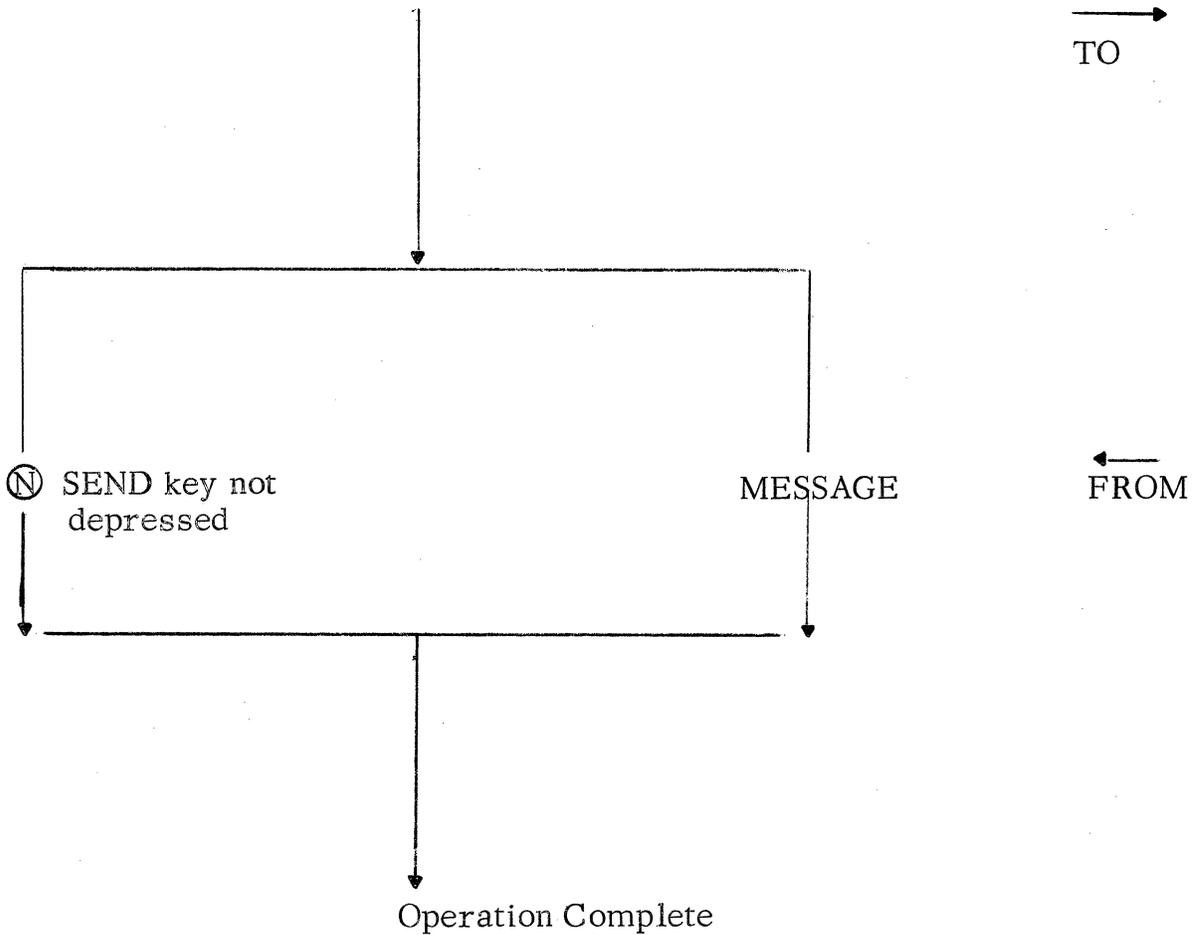
APPENDIX D: LINE CONTROL FORMAT

The polling, addressing, and message formats are shown below in the sequence that occurs from computer to terminal and from terminal to computer.

POLLING:

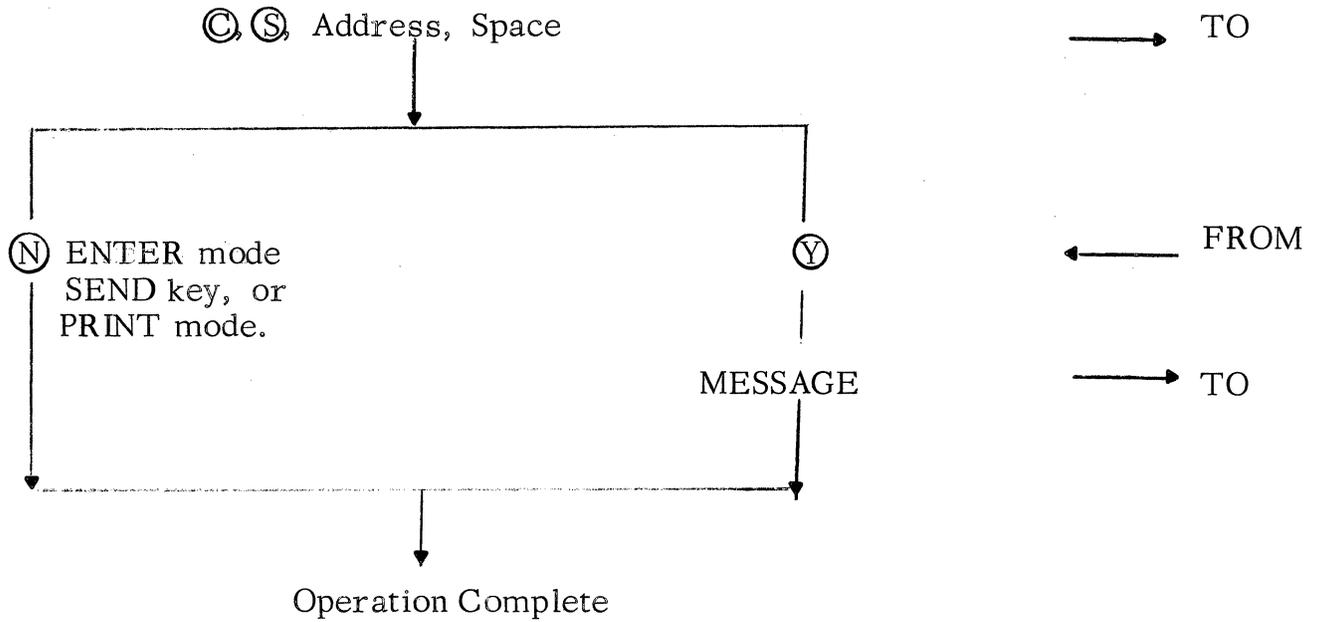
TO/FROM TERMINAL

Ⓒ, Address, Space

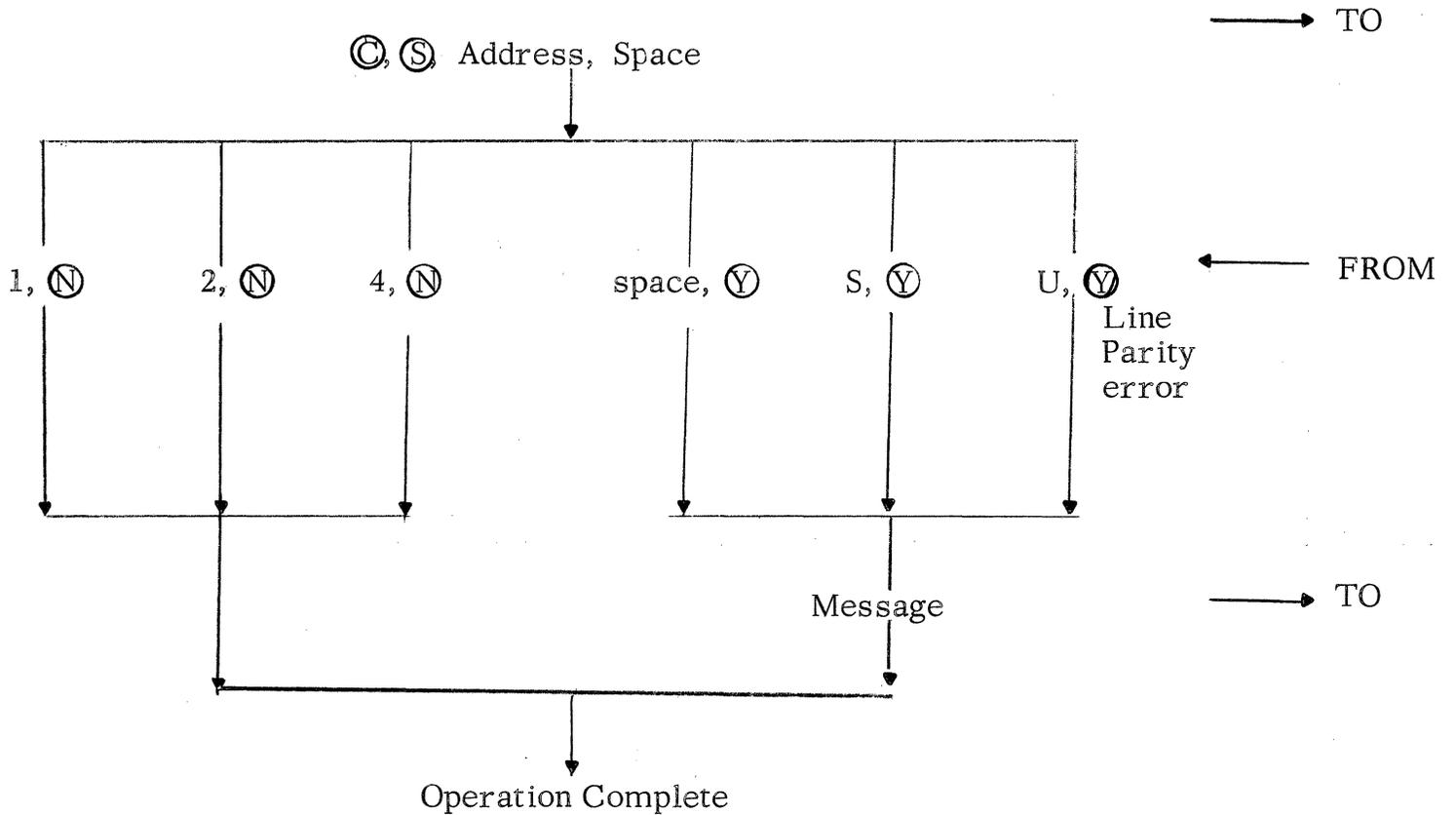


The polling Address character must be the terminal address.

ADDRESSING, feature code 6241:



ADDRESSING, feature code 6242:



MESSAGE FORMAT, without feature code 6227:

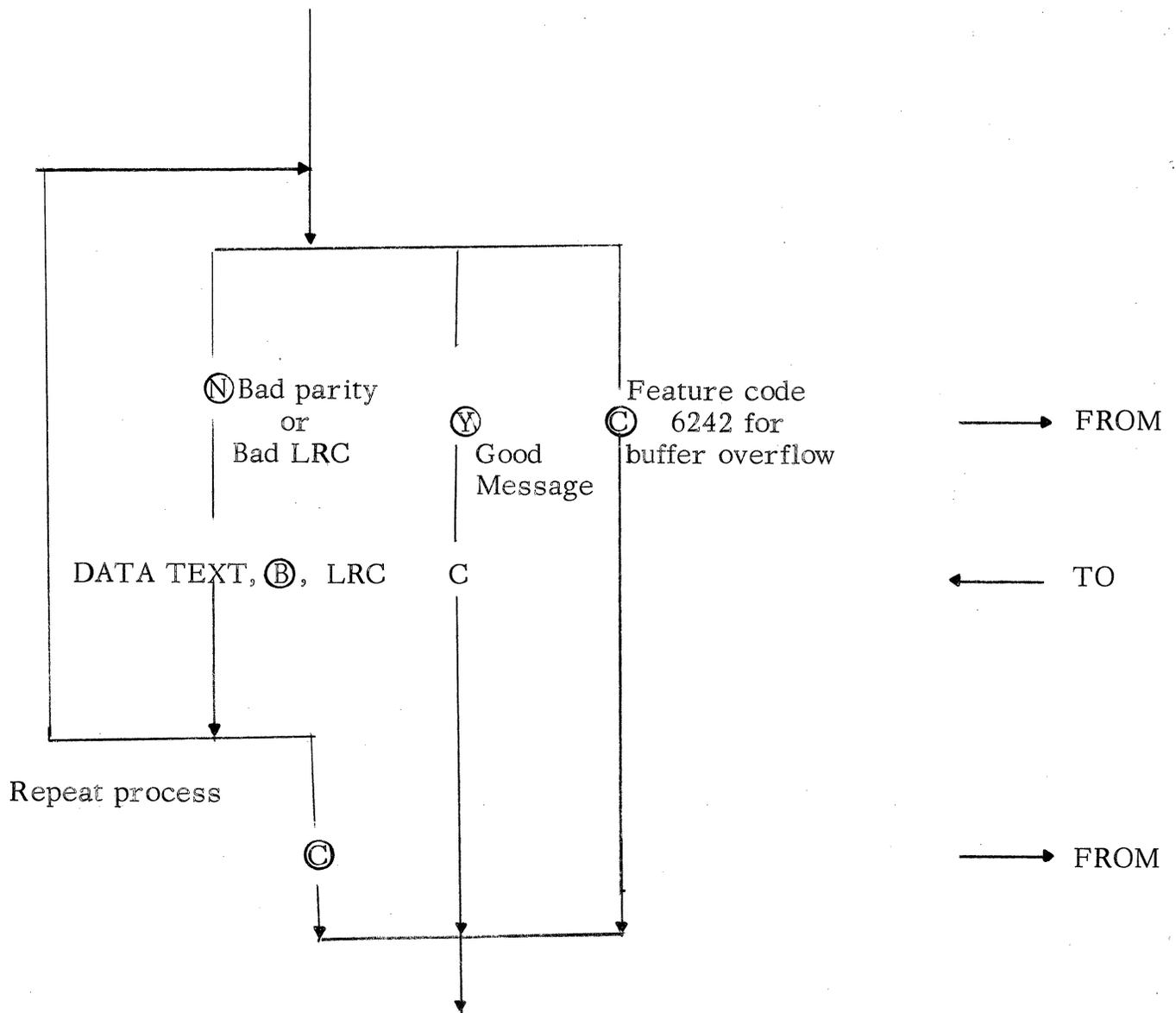
Ⓓ, Training, DATA TEXT, Ⓒ

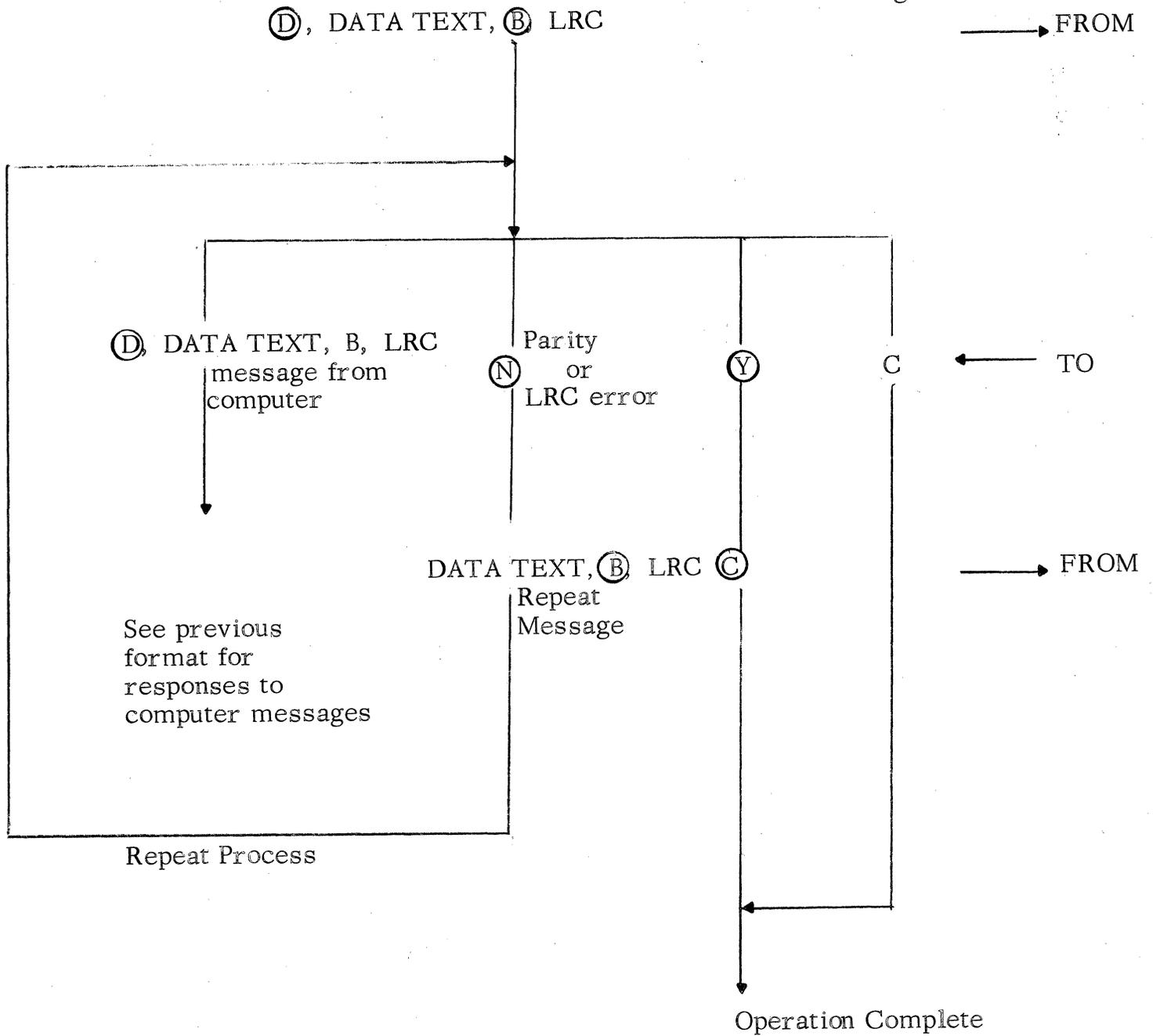
↙ Present only if training switch is on.

MESSAGE FORMAT, feature code 6227:

Ⓓ, DATA TEXT, Ⓑ, LRC

← TO





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APPENDIX E: LINE INTERFACE

RS 232 Interface

The cable supplied with the RS 232 interface feature is equipped with Cannon Connector DB-19604-432 or equivalent. Each output provides a nominal +10 volt signal operating into 3000 ohms when at the "on" or "space" level. The output will be approximately -10 volts for an "off" or "mark" signal. This output impedance is 300 ohms.

The input signal required is +3 to +25 volts for an "on" or "space" and -3 to -25 volts for an "off" or "mark" level. The minimum input impedance is 3000 ohms.

The connector pin assignments are:

7	Signal Ground
2	Transmitted Data
3	Received Data
4	Request to Send
5	Clear to Send
6	Data Set Ready
8	Data Carrier Detector
20	Data Terminal Ready

Telephone Line Interface

The cable provided for direct telephone line connection is terminated by a Western Electric 283B plug or equivalent.

APPENDIX F: PHYSICAL PLANNING DATA

Input Electrical Requirement

115 Volts, 1.5 amp.

Heat Dissipation

440 BTU/hour

Weight

~~72 pounds~~
72 pounds

Size

