



Burroughs
TD 700/800
EQUIPMENT

REFERENCE MANUAL

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Burroughs Corporation
Detroit, Michigan 48232

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SECTION 1
INTRODUCTION

GENERAL DESCRIPTION.

The Burroughs TD 700 or TD 800 Terminal Input and Display System is a free standing, self-contained display device which has the capability to accept and to display information locally and to exchange information with a central processor or another terminal in a half duplex mode over either half or full duplex communication circuits. The terminal is designed to operate with several keyboard configurations or without a keyboard in both international and domestic applications. The TD 700/800 Terminal acts as an interface between the operator and a remote system. The TD 700 system is comprised of three interdependent, semiautonomous subsystems: a SELF-SCAN® Panel Display (*1), the keyboard and keyboard interface, and control. The SELF-SCAN Panel is a unique adaption of the dot matrix technique in which an array of gas-filled cells may be selectively illuminated to display the various characters of a message. Burroughs SELF-SCAN Panel embodies a novel electronic scanning technique which results in a high-contrast, steady-state display.

The TD 800 system is comprised of two subsystems: a screen/control unit and the keyboard and keyboard interface. Control logic circuitry links the subsystems together to form the complete TD 700 Terminal System or TD 800 Terminal System.

ADVANTAGES OF THE TD 700.

Burroughs TD 700 employs an important advance in readout technology, the SELF-SCAN Panel Display. This new method of displaying both alpha and numeric data provides significant improvement in the reliability and effectiveness of a visual display device through the elimination of the cathode ray tube. The SELF-SCAN Panel requires lower voltage power supplies, no deflection circuitry, and no focusing. With the elimination of these analog circuits the downtime normally necessary for routine CRT adjustments and failures is also eliminated. The use of completely digital positioning circuitry makes the TD 700 a much simpler device to maintain. The SELF-SCAN Panel Display is economical because of the approximately ninety percent reduction in necessary electronic drive circuitry. The TD 700 is a more readable device than a cathode ray tube because of the increase in character size. There is no drift in character size or position. There is a high degree of contrast between the displayed characters and the background. The TD 700 is compact and modular. The keyboard, SELF-SCAN Panel Display, and the control unit may be installed as a single unit or as separate modules connected by six foot cables. System configurations are flexible because any available screen or keyboard may be cable-connected to an installed control unit. In short, the TD 700 Display Terminal

1 SELF-SCAN is a Burroughs registered trademark which identifies a new type of visual display.

offers compactness, modularity, reliability, simplicity, and an easily readable display at a significant savings when compared with the overall cost of a conventional cathode ray tube installation.

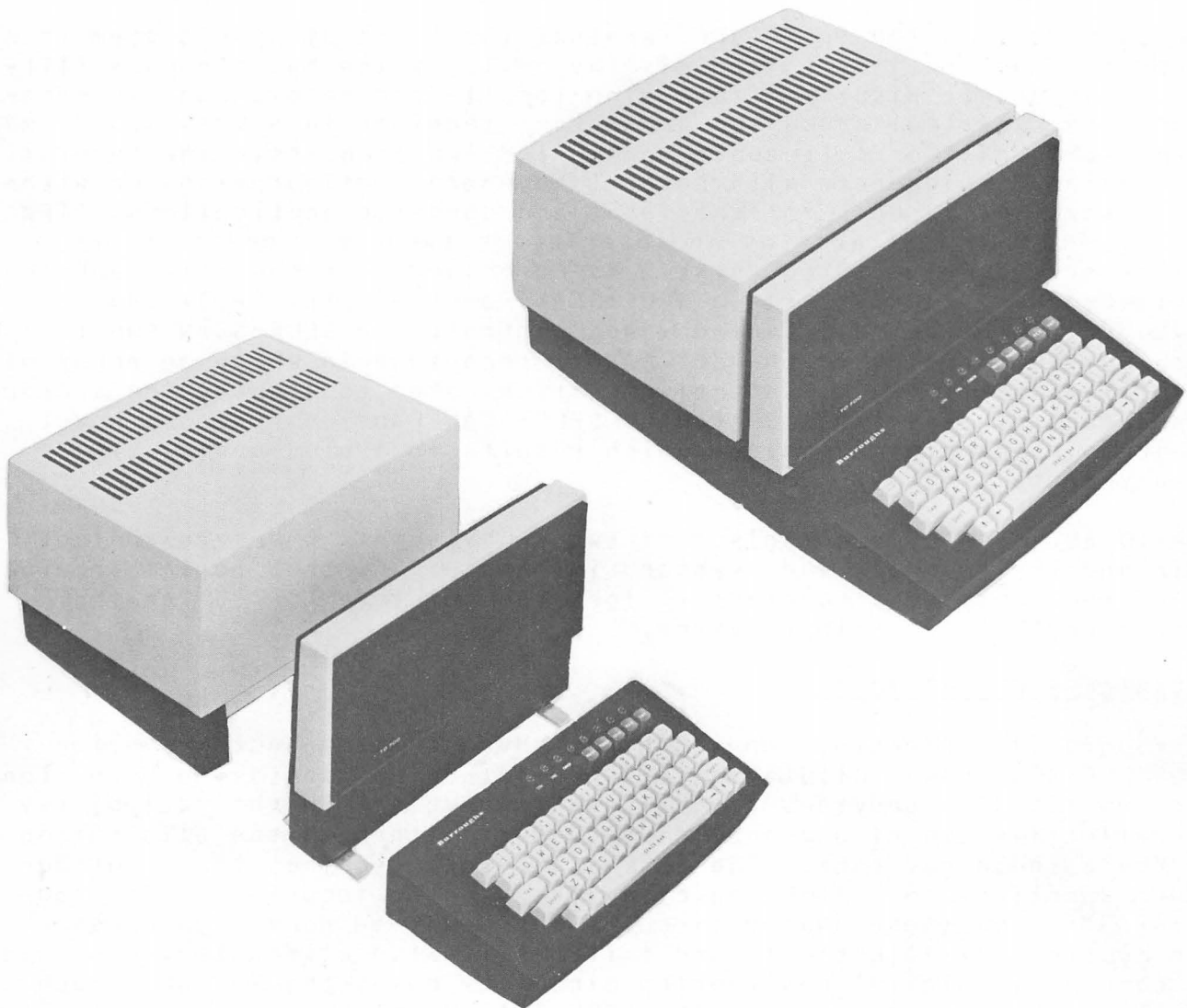


Figure 1-1. TD 700 INPUT AND DISPLAY SYSTEM

ADVANTAGES OF THE TD 800.

The large screen capacity of the TD 800 is the ideal complementary product to the TD 700. With the 960 or 1920 character display, virtually any application can be handled by the TD 800 Input and Display System. As requirements change, the displayed capacity of the 960 character screen/control unit can be doubled through field modification. The TD 800 is compact and modular, the keyboard and the screen/control unit may be installed as a single unit or as separate modules connected by a six foot cable. System configurations are flexible because any available keyboard may be cable-connected to an installed screen/control unit.

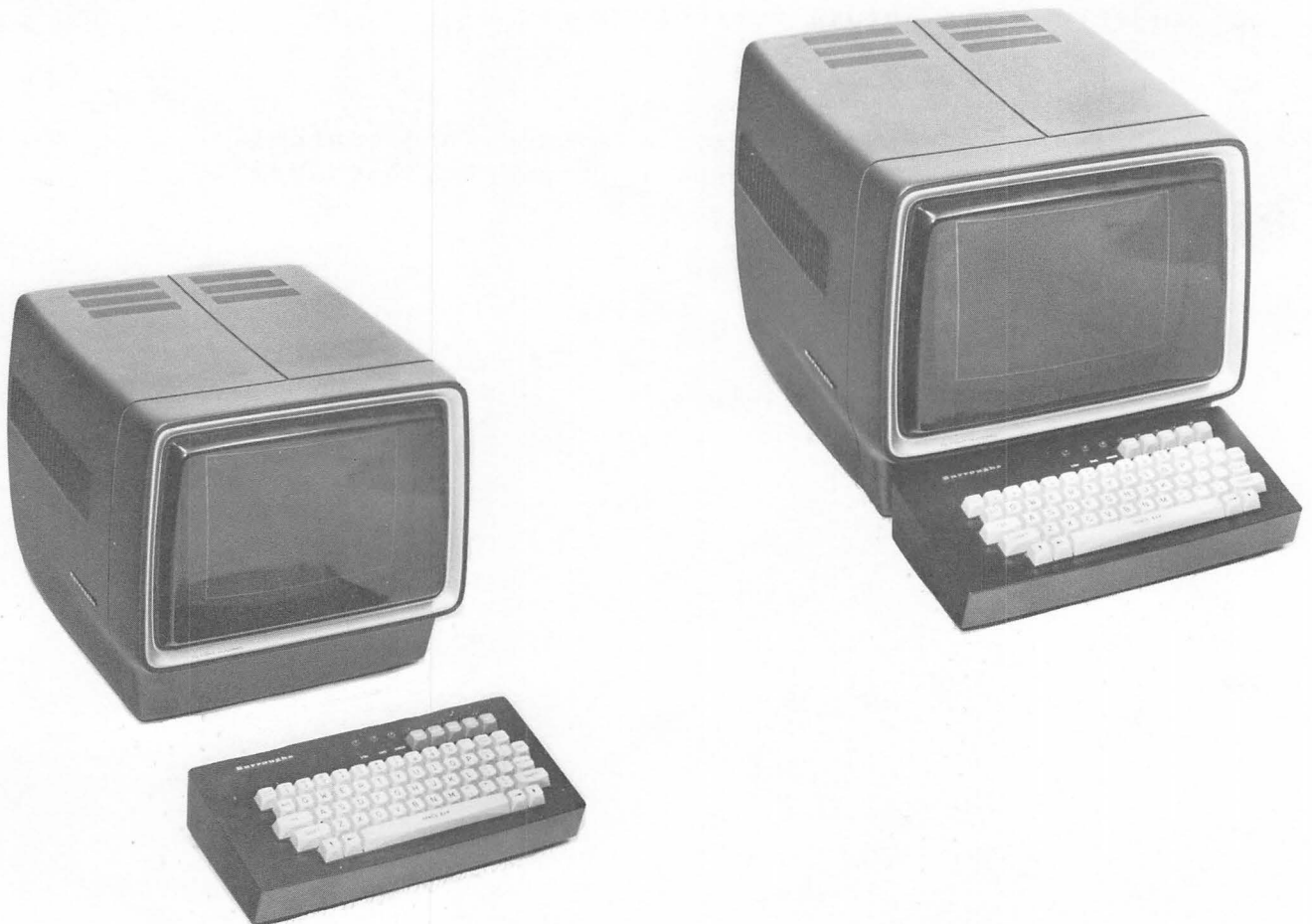


Figure 1-2. TD 800 INPUT AND DISPLAY SYSTEM

STANDARD FEATURES.

- a. On-line/off-line capability.
- b. TD 700 Display screen.
 - 1) Capacity of 256 characters (8 rows X 32 characters).
 - 2) Panel viewing area - 31.2 square inches (201.3 sq. cm).
- c. TD 800 Display screen viewing area - 71.3 square inches (460 sq. cm).
- d. Audible alarm on incoming message.
- e. Line terminal activity indicator.
- f. Brightness control.
- g. Audible alarm volume control.
- h. Modular units
 - 1) TD 700 - Panel display, keyboard, and control.
 - 2) TD 800 - Screen/control unit and keyboard unit.
- i. Edit Package
The Edit Package includes:
 - 1) Forms
 - 2) Tabulate
 - 3) Character Insert/Delete

SYSTEM ALTERNATIVES.

The following system features are provided and the customer should select one of the available alternatives for each feature.

a. Keyboard

- 1) Data Comm Alphanumeric (typewriter).
- 2) Source Data Input (keyboard).
- 3) Numeric (10 key adding machine).
- 4) No keyboard (receive only display).

b. Type of Data Transmission

- 1) Asynchronous.
- 2) Synchronous.

c. Remote Site Configurations.

d. Line Discipline.

- 1) Burroughs Standard Poll/select.
- 2) Point-to-Point.
- 3) IBM 2260 Communications Procedures.

e. Character Sets.

- 1) Domestic ASCII
- 2) International (various sets available).

f. TD 800 Screen Capacity.

- 1) 960 Characters (12 rows X 80 characters).
- 2) 1920 Characters (24 rows X 80 characters).

OPTIONAL FEATURES.

The following features may be used to supplement the basic terminal configuration.

- a. Transmission Rate Selection Dial.
- b. Multipoint Group Select and Broadcast Select Communications Procedures.
- d. Programmatic Mode Control
- e. Transmission Number
- f. TD 700 Extended Memory
- h. Keyboard Security Lock.

DESIGN LEVELS.

Commencing with the production of the TD 800, the terminal system design has incorporated a number of new features. The differences are noted by identifying the earlier TD 700 as Design Level 1 (D/L1) and the later model TD 700 and TD 800 as Design Level 2 (D/L2). The Design Level 2 begins with serial number 4001. The identification plate on the terminal will have the design level specified (D/L1 or D/L2).

The TD 700 D/L2 has been designed so that it may be modified to operate as a TD 700 D/L1. The TD 800 uses D/L2 keyboard subsystems and communications interface. The following Table defines the capabilities of the D/L1 and D/L2 terminals. The differences will be discussed under the Display Subsystems Section and the Communications Interface Section.

TABLE 1
DESIGN LEVEL SUMMARY

ITEM	D/L1	D/L2
1. Keyboard - Typewriter, Data Prep, Numeric, None	Yes	Yes
2. AC Power: 100V-127V, 200V-240V +5%, -10%, 50-60 Hz.	Yes	Yes
3. Communication Procedures -	Yes	Yes
a) Multipoint - Poll	Yes	Yes
Select	Yes	Yes
Fast Select	Yes	Yes
Broadcast Select	Yes	Yes
Group Select	Yes	Yes
Contention	Yes	Yes
Group Poll	No	Yes
b) Point-to-Point - Switched Line	Yes	Yes
Dedicated Line	Yes	Yes
c) Transmission NO. @ or A	Yes	No
0 or 1	No	Yes
4. Interfaces -		
a) RS232C/CCITT Asynchronous 75-1800 baud	Yes	Yes
b) RS232/CCITT Synchronous 2000-2400 baud	Yes	Yes
4800 baud	No	Yes
c) Two Wire Direct 1000 max 150-2400 baud	Yes	Yes
4800 and 9600 baud	No	Yes
5. Software Controllable Functions -		
a) DC1 - Programmatic Mode Control	Yes	Yes
b) BS - Backspace	No	Yes
c) LF - Cursor down	No	Yes
d) DC3 - Cursor up	No	Yes
e) HT - Tab	No	Yes
f) CR - Carriage Return Line Feed	Yes	Yes
g) FF - Home and Clear	No	Yes
h) DC4 - Home	No	Yes
i) US/RS - Forms Delimiter and	No	Yes
j) VT - Extended Memory Paging	No	Yes
k) DC2 - Forms Enable	Yes	Yes
6. Features -		
a) Fixed Tab	Yes	Yes
b) Character by Line Insert/Delete	Yes	Yes
c) 1. Forms using [and] Total Transmission	Yes	No
2. Forms using {and} Transmission to ETX	No	Yes
d) Concatenation	Yes	Yes
e) Baud Rate Select Switch	Yes	Yes
f) Extended memory	Yes	Yes
g) Printer Interface	No	Yes
h) Keyboard Security Lock	No	Yes

SECTION 2

TD 700/800 DISPLAY SUBSYSTEMS

GENERAL DESCRIPTION.

The TD 700 Display Subsystem is comprised of the following major functional blocks: an MOS (Metal Oxide Semiconductor) character generator, an MOS random access memory, dot pattern storage buffers and demultiplex circuitry, timing and mode control, cursor generation and control, anode and cathode drive electronics for the display panel, and the SELF-SCAN display panel. The TD 800 Display Subsystem consists of the following: an MOS character generator, and MOS random access memory, timing and mode control, cursor generation and control, solid state drive electronics for the CRT monitor, and the CRT monitor.

TD 700 DISPLAY PANEL.

The display panel is a SELF-SCAN display panel with a character capacity of 256 (8 rows x 32 characters). For display characteristics see Appendix C.

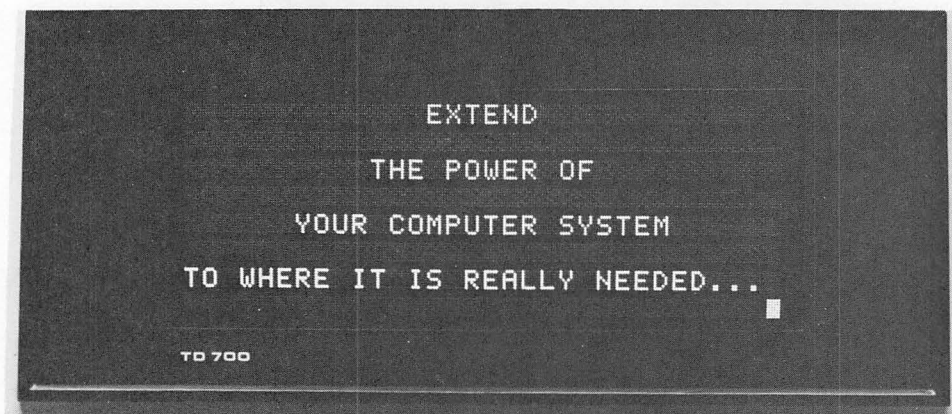
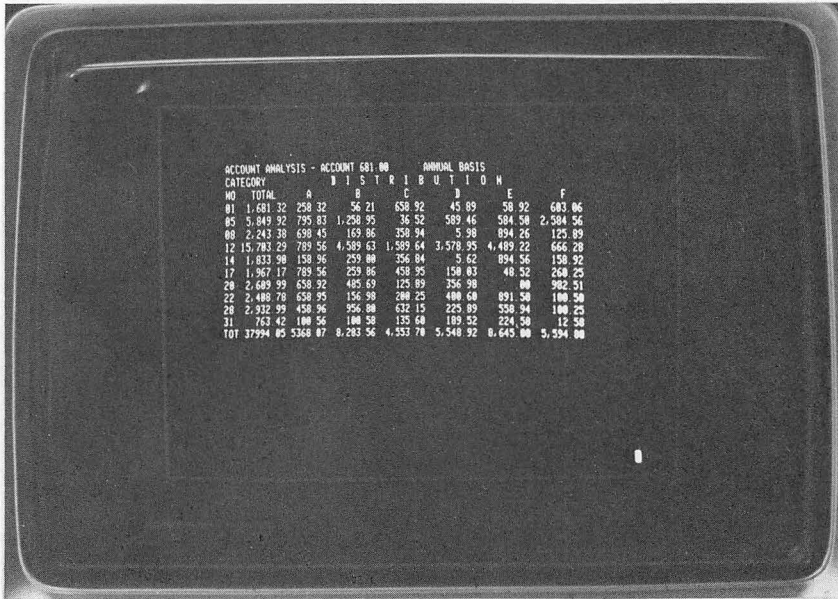


Figure 2-1. TD 700 SELF-SCAN
DISPLAY PANEL

ID_800_DISPLAY_MONITOR.

The display monitor is a 12" CRT display with character capacities of 960 (12 rows x 80 characters) and 1920 (24 rows x 80 characters). For display characteristics see Appendix C.



ACCOUNT ANALYSIS - ACCOUNT 681 00		ANNUAL BASIS					
CATEGORY		DISTRIBUTION					
MO	TOTAL	A	B	C	D	E	F
01	1,631.32	258.32	56.21	659.92	45.89	58.92	687.06
05	5,849.92	795.83	1,238.95	36.52	589.46	584.58	2,984.56
08	2,243.38	698.45	169.86	358.94	5.98	894.26	123.89
12	15,783.29	789.56	4,589.63	1,589.64	3,578.95	4,489.22	666.28
14	1,833.98	158.96	259.88	356.94	5.62	894.56	158.92
17	1,987.17	789.56	259.86	458.95	158.83	48.52	288.25
20	2,689.99	658.92	485.69	125.89	326.98	88	982.51
22	2,488.78	658.95	156.98	288.25	488.68	891.58	188.58
28	2,932.99	458.96	956.88	632.15	225.89	558.94	188.23
31	783.42	188.56	188.56	178.68	188.52	224.58	12.58
TOT	37,994.85	5,368.87	8,283.56	4,553.78	5,548.92	8,645.88	5,594.88

Figure 2-2. TD 800 DISPLAY MONITOR

CHARACTER GENERATORS.

64 CHARACTER GENERATOR.

The 64 character generator contained within the display subsystem produces a set of characters from a modified ASCII subset code consisting of six bits per character from columns two through five of a modified ASCII code chart (see Appendix B-1). The character generator handles the ASCII characters with both the seventh bit and the eighth (or parity) bit stripped away. The character decoding circuitry is capable of recognizing the lower case alphabetical ASCII codes which occur in columns six and seven of the Standard ASCII code chart and translating them to the equivalent upper case codes. Codes from columns zero and one may appear as alphabetic characters if transmitted as part of the text of a message. STX, ETX, EOT, ENQ, CR, DLE/X, DC1, DC2 are exceptions for Design Level 1 and column zero and rows one through eight of column one are exceptions for Design Level 2 which are used to enable specific functions within the terminal.

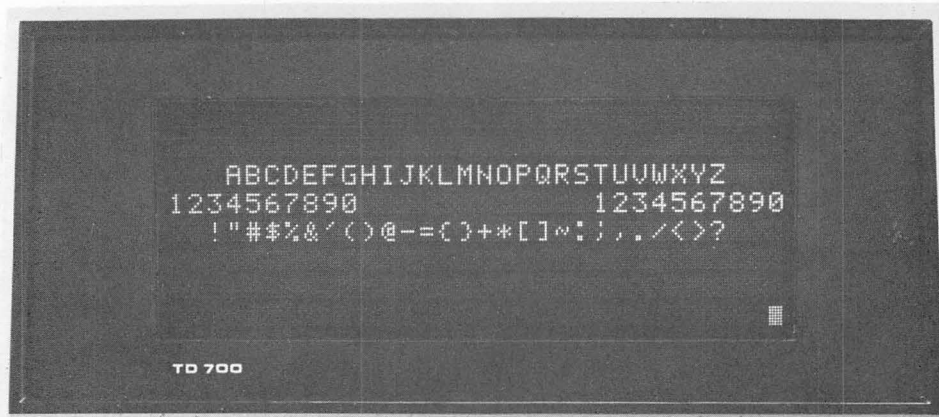


Figure 2-3. GRAPHIC CHARACTERS

MEMORY.

The memory of the TD 700/800 terminal is random access solid state MOS (Metal Oxide Semiconductor). The cursor positioning control circuitry determines the memory access point. Each TD 700/800 terminal memory basically has a capacity equal to the character capacity of the display panel. A TD 700 optional expanded memory extends the character storage capacity to 1024 characters.

CURSOR.

The display subsystem generates a visual cursor to display the relative position for data entry into, and recovery from, memory. The TD 700 Cursor consists of the full five by seven character dot matrix blinking alternately with the character contained in the location. The TD 800 Cursor is the negative image of the character in the character position. The cursor location is stored in a special cursor memory location rather than in the display memory. As each character is entered into or read from the display memory, the cursor advances to the next character position to the right, or to the beginning of the next line when the preceding line has been filled. From the last line right-most position the cursor returns to "home" in the upper left-most character position. The cursor is moved in the appropriate direction by the following keys: Line Feed, Reverse Line Feed, Forward Space, Backspace, Home. The TD 700/800 cursor is non-destructive allowing the operator to space "over" or "through" data without destroying it.

For example, to change the spelling of the word "DOTE to DATE", the operator would move the cursor forward through the "D" and into position over the "O". She would then type "A" which would replace the "O", and continue moving the cursor forward through the "T" and the "E" using the Forward Space key.

DATA ENTRY.

The display subsystem accepts data on parallel input lines. The code for data may be found in the modified ASCII code chart. (See Appendix B-1). All data is entered into memory sequentially beginning at the first position (column one, row one, the upper left-hand corner of the display screen). Data is entered left to right, proceeding from the rightmost character position of one row to the leftmost character position of the next row. When the cursor has passed through all character positions, it returns to "home" or the beginning position. If all positions are not filled the cursor remains in the position following the last character entered.

TABULATE.

The display subsystem has in conjunction with the keyboard a tabulation feature. The fixed tab stops are located every eighth position starting with the first position of each line of the display, such as the first, ninth, seventeenth, etc. Beyond the twenty-fifth character position on the TD 700 or the seventy-third character position on the TD 800 use of the TAB key causes the cursor to stop at the first position of the next line.

FORMS.

This feature provides the capabilities for handling protected and unprotected data in both the receive and transmit modes. The forms mode is used to send "Maps" or layouts from the central processor to assist the operator in inputting data in the proper format. In forms mode, data is divided into two categories: protected and unprotected. Protected data cannot be altered by the operator. Unprotected data may be edited, or new data may be entered in the unprotected area. Unprotected data fields, which may consist of from 1 to 255 characters on the TD 700 or to 959 or 1919 characters on the TD 800, are bracketed by delimiters. Each delimiter takes one position in memory. The cursor may be positioned in any of the character locations in an unprotected data field. The cursor, upon entering a protected data field from an unprotected data field, will advance to the first character location following the leading delimiter of the next unprotected data field.

USE OF FORMS IN DESIGN LEVEL 1.

In the TD 700 D/L1 the memory is always cleared and the cursor is homed when the terminal receives the STX character in the incoming message character stream. The central processor must send the protected and unprotected information with delimiters as one message to the terminal. The left (or open) bracket character (column 5, row 11) precedes an unprotected data field and the right (or close) bracket character (column 5, row 13) follows the unprotected data field. The central processor causes the terminal to be in the forms mode upon receipt of the message by transmission of a DC2 character (column 1, row 2) anywhere in the text of the message (between STX and ETX, usually immediately preceding ETX). The DC2 character does not take up a position in memory. After receiving the DC2, the terminal illuminates its forms indicator to alert the operator if the message contained no errors. The terminal then enters the Local Mode for operator data entry.

The line feed, reverse line feed, bracket, and return keys are inoperative in the forms mode. The bracket characters may not be used as text because they are recognized as delimiters. The TAB key advances the cursor to the first data character location of the next unprotected data field. The CLEAR key erases only data in unprotected fields.

When transmitting a message to the central processor while in forms mode, the terminal transmits only the unprotected data, the delimiters (brackets) are not transmitted. All unprotected data is transmitted from the terminal regardless of the location of the cursor. The central processor usually transmits a complete message including protected and unprotected data and the DC2 character to the terminal. The text of each message indicates with the presence or absence of the DC2 character the status (forms or normal) of that message. A typical forms message from the central processor to the terminal would have the following format:

--where p = protected data and u = unprotected data:

...STX NAME ^p [^uJAMES ^uDOE] ^p ADDRESS [123 ^u ANY ^u STREET] DC2..ETX.

The number of protected characters per field is a function of baud rate as shown in the following chart:

Baud_Rate	Characters
200	800
300	512
600	256
1200	128
1800	90
2000	80
2400	64

When the terminal is not in the forms mode, the forms indicator light is extinguished and the terminal does not recognize bracket characters as delimiters. When a message is transmitted to the terminal containing a DC2 character but not containing at least one left bracket, the terminal does not go to the forms mode. The terminal operator may control the forms status of the terminal by using the forms control push button. The forms control button may be used to either place the terminal in forms mode or remove it from forms mode, and provides the operator with an override capability. The coordination of forms with the central processor becomes the operator's responsibility when the forms control push button is used.

USE OF FORMS IN DESIGN LEVEL 2.

In the Design Level 2 TD 700 and TD 800 the forms option provides the capability for the handling of protected and unprotected data by the terminal in both message reception and transmission modes. The central processor causes the terminal to operate in the forms mode by the transmission of the DC2 character (column 1, row 2) in the text of the message. The DC2 character is not stored in memory. Upon receipt of the DC2 character the forms indicator is lit to alert the operator to the active forms status and the cursor is placed to the right of the first left delimiter from the home position. The left brace character (column 5, row 15) or the US character (column 1, row 15) precedes an

unprotected data field and the right brace character (column 5, row 14) or the RS character (column 1, row 14) follows the unprotected data field. A field engineering modification is available to change the delimiters to brackets (column 5, rows 11 and 13) for Design Level 1 compatibility. If the DC2 character is placed following STX and preceding the message, only the unprotected area of the forms message already stored in the memory of the terminal will be filled starting at the right of the first left delimiter from the home position. A second DC2 character in the same message will deactivate the forms mode. A delimiter is not valid in the first character position. The line feed and reverse line feed cursor control keys, left and right brace keys, and return key are inoperative in the forms mode. The delimiter characters may not be used as text by the central processor during forms mode because they are recognized as delimiters. The TAB key advances the cursor to the first data character location of the next unprotected data field. The CLEAR key erases only data in unprotected fields.

When transmitting a message to the central processor while in forms mode, the terminal transmits only the unprotected data, the delimiters (braces) are not transmitted. All unprotected data from the first position after the first left delimiter to the cursor position, is transmitted. A message transmitted by the central processor and not containing the DC2 character is treated as a standard message by the terminal. As a result, the terminal is taken out of the forms mode. A typical forms message from the central processor to the terminal would have the following format:

---where p = protected data and u = unprotected data:

...STX NAME ^D { ^U JAMES DOE } ^P ADDRESS { ^U 123 ANY STREET } ...DC2 ETX.

When the terminal is not in the forms mode, the forms indicator light is extinguished and the terminal does not recognize brace characters as delimiters. If the central processor transmits a message to the terminal containing a DC2 character when the terminal memory does not already contain at least one left bracket, the terminal does not remain in the forms mode, the forms indicator will not remain illuminated, and the cursor will halt at the first position on the display. The terminal may be returned to the receive mode while in forms mode by the actuation of the receive (RCV) key. The terminal operator may control the forms status of the terminal by using the forms control push button. The forms control button may be used to either place the terminal in forms mode or remove it from forms mode, and provides the operator with an override capability. The co-ordination of forms with the central processor becomes the operator's responsibility when the forms control push button is used.

CHARACTER_INSERT_AND_DELETE.

Character insert and delete are important edit features in allowing an operator to correct input mistakes such as misspelling. The character insert key, when depressed by itself, inserts a space at the position of the cursor. When it is depressed in conjunction with any alpha or numeric key, it will cause that character to be inserted at the cursor location. All succeeding characters on that line will be shifted right one space for each character inserted. Any surplus characters will be shifted off the right end of the line into which the character or space was inserted and lost. During forms mode all succeeding characters will be moved up to the first right delimiter. Any surplus characters in forms mode will be lost. Depression of the Character Delete key causes the character at the cursor location to be deleted and all succeeding characters within the line or unprotected data field to be shifted one space to the left, entering a space on the right.

INTERNATIONAL_CHARACTER_SETS.

The Display subsystem may optionally use character generators producing characters required by the international market.

TD_700_EXPANDED_MEMORY.

Expanded Memory in the TD 700 gives 1024 character memory capacity to a display with 256 character positions. The memory is organized into four pages of 256 characters. Each page may be displayed in turn at the option of the operator. All four pages may be transmitted to the Central Processor or sent by the Central Processor in a contiguous block of 1024 characters of data. The expanded memory pages are all enabled at the start of every terminal selection.

Two controls are available to the operator via the memory/advance key. In the unshifted mode, the key will advance the display from page to page. Each depression moves the display one page in a page 1-2-3-4 order, moving the cursor to the home position of each page. In the shifted mode, the key alternately enables or disables the expanded memory, leaving only page one accessible in the disabled state. Each depression in the shifted mode moves the cursor to page one home. When the terminal is not in the forms mode the expanded memory, when enabled, will automatically advance to the next page when a message to or from the terminal exceeds the limits of a page. However, the expanded memory will not advance past the starting address of the message. For the TD 700 D/L2, the ASCII code VT (column 0, row 11) transmitted after STX and before ETX causes the cursor to advance to the next page home.

Four lamps on the keyboard indicate which page is being displayed when the expanded memory is enabled. All lamps are extinguished when expanded memory is disabled indicating that only page one is available for display and access by the operator.

An audible indicator sounds for approximately 1/2 second when the cursor is advanced via the keyboard through the eighth position from the end of each page. A quadruple "beep" occurs when the cursor is advanced from page 4 to page 1 by any local operation including cursor controls, forms, clear, or tab.

Transmission of data from TD 700 is from page one home to the position of the cursor when the operator depressed the XMT key on the keyboard. All unprotected data from a TD 700 D/L1 in forms mode will be transmitted beginning with the first unprotected character after page one home position. Transmission of data from a TD 700 D/L2 in forms mode begins with the first unprotected character and continues with all unprotected data up to the position of the cursor. An ETX character is inserted at the cursor position of the terminal with the exception of D/L1 in forms mode in which the home position becomes the ETX position. The transmitted ETX character is followed immediately by BCC. The ETX position may be on any of the four pages. Reception of data into memory will cause an overflow error when the cursor is moved into the previously received or transmitted ETX position on TD 700 D/L1 by any cursor movement other than DC2, DC4 or FF.

All cursor controls are available in expanded memory if the terminal is not in forms. Forward space from the lower right of a page advances to upper left of the next page. Line feed in the bottom line of a page advances to the top line of the next page. Reverse line feed in the top line of a page backs to the bottom line of the previous page. Return in the bottom line of a page advances to the upper left of the next page. Home returns the cursor to page one home.

The FF character erases all four pages in parallel. When power is turned on, the four page expanded memory is enabled and all pages are erased leaving the cursor at page one home. The CLEAR key erases only the one page on the display if not in forms.

In the forms mode, enabling or disabling the expanded memory homes the cursor to page one home and same as page advance, causes a forms search leaving the cursor in the first position of the first unprotected data field after the home position of the new page. Tab moves the cursor to the first position of the next unprotected data field.

In the forms mode, the line feed, reverse line feed, and return are inhibited from the keyboard. Forward space, backspace, insert, delete, and home act normally but may change pages if appropriate. Character insert and delete may move data from page to page if an unprotected data field crosses the page boundary. CLEAR erases all unprotected data on all four pages and returns the cursor to the first unprotected data position after page one home, as does HOME. Any page without an unprotected data field cannot be displayed in the forms mode.

Transmission of data from the TD 700 D/L1 while in the forms mode begins with the first unprotected data character after page one home and continues with all the unprotected data of the four pages if

enabled, of just page one, if disabled, when the operator depressed the XMT key.

Transmission of data on TD 700 D/L2 while in the forms mode begins with the first unprotected data character after page one home and continues with all the unprotected data of the four pages if enabled or just page one if disabled, but only up to the position of the cursor when the operator depressed the XMT key.

Disabling expanded memory restricts memory access and display to page one by the operator. CLEAR erases page one only. Power on enables expanded memory and erases all four pages.

All keyboard and other controls act upon a disabled expanded memory as they would a terminal without the expanded memory option. All four page indicators on the keyboard are extinguished. Any form continued on other pages is not accessible. Any unprotected data field continued on page two would be illegal if expanded memory is disabled. For D/L1 terminals, access by the central processor is restricted to page one if expanded memory is disabled.

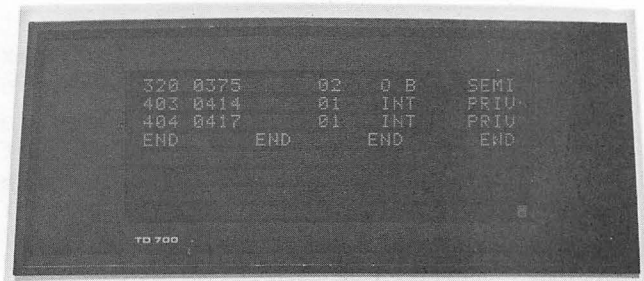
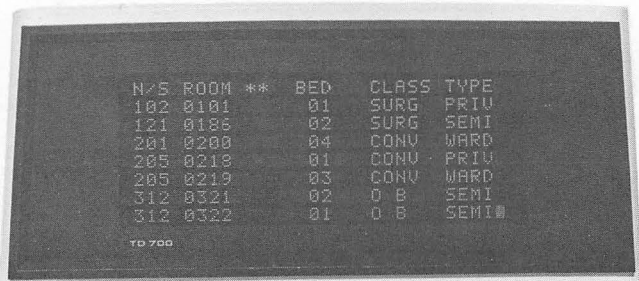


Figure 2-4. PAGING WITH EXPANDED MEMORY

PRINTER_INTERFACE.

The TD 700/800 printer option provides the terminal with selective hard copy capability. Printing of data stored in the TD 700/800 memory may be started by operator depression of the keyboard print key or by the central processor during selection which allows unattended printing of data.

To cause printing of a message in unattended mode the central processor may send a DLE/P character following STX and prior to ETX. Printing will start following transmission of the ACK character to the central processor signifying that a good message was received. If a DC1 character had been sent to hold the terminal in receive mode (programmatic mode control) following reception of a message then the terminal will be placed in local mode by the printer interface during printing and be returned to the receive mode at the completion of the print cycle.

Printing of data stored in the memory is from Home to the position of the cursor at the time of either the print key depression or receipt of BCC. If the TD 700 extended memory option is enabled this may be up to four pages or 1024 characters. If the terminal is in the forms mode the entire enabled memory will be printed including protected data. This takes the terminal out of forms mode to print then returns to forms, leaving the cursor at the first unprotected data position. A CR/LF will be sent to the printer at the start of each line.

SECTION 3
KEYBOARD SUBSYSTEM

GENERAL DESCRIPTION.

The TD 700/800 terminal contains a Keyboard Subsystem which provides for the manual entry of data to the display subsystem. The data entered through the keyboard is simultaneously stored in the refresh memory of the display subsystem and displayed upon the SELF-SCAN panel. The key characteristics, including spacing, pressure, and throw, are similar to an electric office typewriter. Three standard keyboards are available: one similar to a typewriter keyboard, one with an in-board numeric keyboard resembling as close as possible an EBCDIC key-punch keyboard, and one with a ten-key numeric keyboard with the function keys grouped to the right of the numeric keys. (See Appendix A.)



Figure 3-1. ALPHANUMERIC KEYBOARD

KEYBOARD CHARACTERISTICS.

All TD 700/800 keyboards have the following characteristics.

Key stroke of approximately .02" (5.1 mm).

Key pressure of approximately 3.0 oz. (84 g).

Two Key Rollover - The TD 700/800 keyboard provides 2 key rollover. Buffered output provides for striking the first key to produce the first output code and striking the second key to produce the second output code without releasing the first key. The first code is retained until the first key is released. Releasing the first key produces the second code on the output lines. This feature is provided to allow for the operator who inputs data so rapidly that she strikes a second key before releasing the first.

Shift key is an electronic, nonlocking control which generates the shifted output codes on the alphanumeric keyboards.

Shift lock is an alternate action shift lock which locks the shift key in the shift position on the data preparation keyboard.

Keyboard dimensions are: 14.3 inches (36.3 cm) X 3.2 inches (8.1 cm) X 6.9 inches (12.5 cm) with a weight of 6.0 pounds (2.721 kilograms).

CURSOR CONTROL KEYS.

Function keys do not represent a particular character on the modified ASCII code chart. They are designed to perform the following functions:

LINE FEED (↓).

Line Feed moves the cursor to the same relative position one line down. When the cursor is in the bottom line, Line Feed causes it to be moved to the same relative position in the top line. This function is disabled when the terminal is in the forms mode.

REVERSE LINE FEED (↑).

Reverse Line Feed causes the cursor to be moved to the same relative position one line up. When the cursor is in the top line, Reverse Line Feed causes it to be moved to the same relative position in the bottom line. This function is disabled when the terminal is in the forms mode.

BACKSPACE (←).

Backspace moves the cursor backward one position. When the cursor is to the left edge of a line, backspace causes it to be moved to the right edge of the next higher line. If the cursor is in Home position, backspace causes it to be moved to the last position of the last line. In the Forms mode, backspace is enabled only to the first character location in an unprotected data field.

FORWARD SPACE (→).

Forward Space moves the cursor one space to the right. If the cursor is at the right edge of a line, Forward Space causes the cursor to be moved to the first position on the next line. If the cursor is at the last position on the last line, Forward Space causes the cursor to be moved to the Home position. In the forms mode, Forward Space causes the cursor to move from the last position of one unprotected data field to the first position of the succeeding unprotected data field.

HOME.

Home causes the cursor to be moved to the leftmost position on the top line (home position). In TD 700 terminals with extended memory, Home causes the first page of memory to be displayed with the cursor positioned at the upper left position. The Home key operates in unshifted mode only.

CLEAR.

Clear erases all data on the screen and moves the cursor to the home position. In TD 700 terminals with extended memory, Clear causes the enabled page only to be cleared. In the forms mode, Clear erases all unprotected data only and moves the cursor to the first position of the first unprotected data field. Clear is accomplished by shifting and depressing the Clear/Home key.

REPEAT (RPT).

Repeat, when depressed with any alphanumeric key or Line Feed, Reverse Line Feed, Backspace, Forward Space, Carriage Return, Character Insert, or Character Delete, causes the repetition of that character or function in successive display panel and memory locations.

RETURN (RET).

Return moves the cursor from any position in one line to the first position of the next line. If the cursor is in the last line, Return moves it to home. The Return function is inoperative in the Forms mode.

TAB.

Tab causes the cursor to move forward to the next tab stop location. Tab positions are at every eighth character i.e. 1, 9, 17, 25, etc. In the Forms mode, use of the Tab key causes the cursor to move to the first position of the next unprotected field.

CHARACTER INSERT.

Character Insert, when depressed with the key of the character to be added, causes the added character to be inserted at the cursor location. The succeeding characters within the line are shifted one space to the right. Any surplus characters are shifted off the display

at the end of that line and lost. In the forms mode all succeeding characters will be moved up to the first right delimiter. Any surplus characters in forms mode will be lost.

CHARACTER DELETE.

Use of Character Delete results in the removal of the character displayed at the cursor location. The succeeding characters within the line are moved one space to the left for each character deleted. Spaces are fed into the line from the right edge of the line. In the forms mode spaces are fed from the next right delimiter.

KEYBOARD OPTIONS.

The keyboards are designed for greatest possible ease in operator entry. Three keyboards are available and each is designed for entering a specific type of data.

DATA COMM ALPHANUMERIC KEYBOARD.

Domestic.

This keyboard basically resembles a typewriter keyboard and is designed for greatest ease in entering alpha data. It is the most common keyboard for basic alphanumeric input and inquiry. Functional keys are placed at the outside edges of the alphanumeric keys. SHIFT and TAB are oversized to facilitate operator use. Cursor control keys are located at both ends of the space bar. Mode control keys are grouped together above and at the right side of the basic keyboard. (See Appendix A.)

International.

The Data Comm Alphanumeric keyboards may be provided with special characters to make them adaptable to the international market.

DATA PREPARATION KEYBOARD.

Domestic.

This keyboard resembles an EBCDIC keypunch keyboard in the placement of numerals and frequently used special characters. It is designed for ease in entering both alpha and numeric data and recommended for installations where operators are familiar with keypunches. The SHIFT key is double size to facilitate operator use. A SHIFT LOCK key is provided to enable the operator to enter strictly numeric data with one hand operation. The cursor control keys are located at both ends of the space bar. Mode control keys are grouped together above and at the right side of the basic keyboard. (See Appendix A.)

International.

The Data Preparation keyboard will also be supplied to international markets with the necessary and appropriate special characters.

NUMERIC KEYBOARD.

This keyboard is configured in the "Ten-key" adding machine layout

with the function keys grouped to the right of the data keyboard. It is designed for strictly numeric data input. (See Appendix A.)

NO KEYBOARD.

An optional model of the TD 700 or TD 800 is available without keyboard for use in a receive-only installation.

SECURITY LOCK (OPTIONAL).

A security lock is available as an option for the keyboard. The security lock will electrically inhibit unauthorized use of the keyboard by disabling the keyboard encoder outputs. The security lock consists of a tumbler lock with a removable key and is located on the right side of the keyboard assembly. The keyboard may only be locked in the Receive or Local modes.

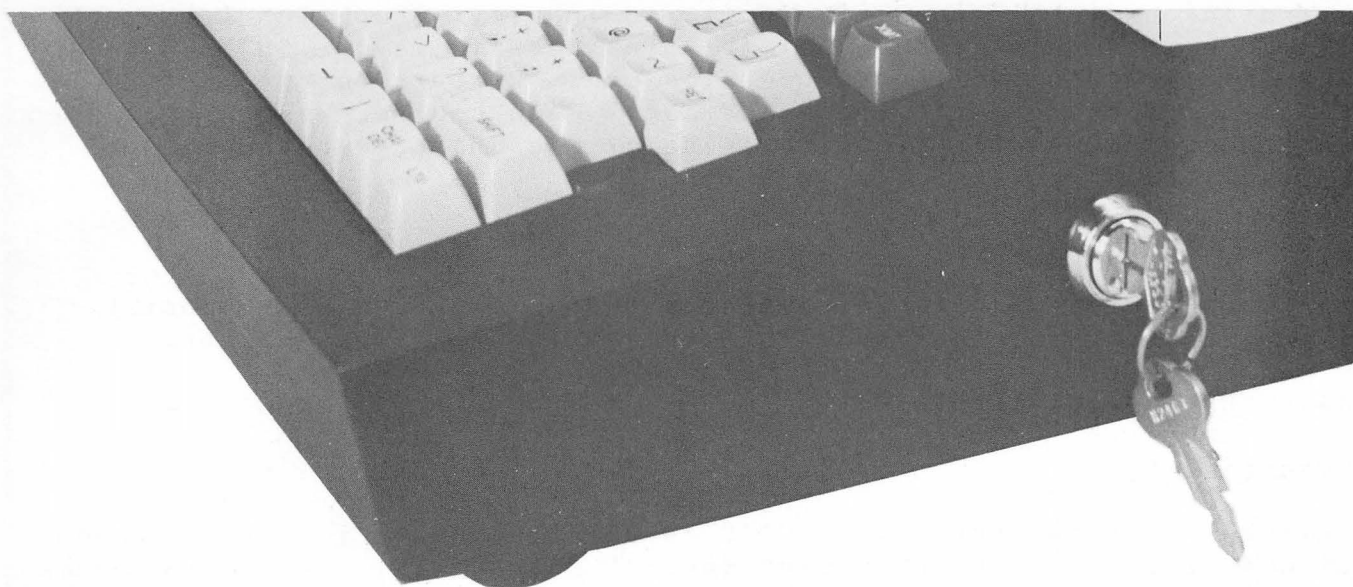


Figure 3-2. KEYBOARD SECURITY LOCK

INDICATOR AND FUNCTION CONTROLS.

The TD 700/800 terminal incorporates indicators and controls which relate the mode of operation and status of the terminal to the operator. These indicators (with the exception of the speed dial, power switch, and power on indicator) are located on the keyboard frame.

TRANSMIT (XMT).

The Transmit mode indicator is illuminated by the depression of the

Transmit key and indicates that the terminal is transmit ready. Transmission of data is from page one home to the position of the cursor. All unprotected data from a TD 700 D/L1 in forms mode will be transmitted beginning with the first unprotected character after home position. Transmission of data from a TD 700/800 D/L2 in forms mode begins with the first unprotected character and continues with all unprotected data up to the position of the cursor. Depression of the transmit key inserts an ETX at the cursor position of the terminal, (with the exception of D/L1 in forms mode in which the home position becomes the ETX position), initiates a transmit operation and disables all keyboard keys except LOCAL and LTAI. The transmitted ETX character is followed immediately by BCC. The indicator is extinguished when the terminal receives an "ACK" signaling a successful transmission or when the terminal is switched to Local mode.

RECEIVE (RCV).

The Receive mode indicator is illuminated by the depression of the Receive key or by the successful completion of a data transmission from the terminal. The indicator signifies that the terminal is prepared to receive data and is extinguished when the terminal is switched to Local or Transmit mode.

LOCAL.

The Local mode indicator is illuminated by the depression of the Local key or by the use of the keyboard when the terminal is in the Receive mode with no data being transmitted to the terminal. It is also illuminated following the successful completion of data transmission from the terminal when the programmatic mode control is set to Local. The indicator is extinguished when the terminal is switched to the Receive or Transmit mode.

FORMS.

The Forms indicator is illuminated whenever the terminal is in the Forms mode. Forms status results from either the terminal's receipts of the DC2 character from the central processor or by the activation of the FORMS key by the terminal operator (at least one leading delimiter must be in the display data). The Forms indicator is extinguished by the receipt of a central processor message with no DC2 character or with two DC2 characters, or by activation of the FORMS key by the terminal operator.

PRINT (OPTIONAL).

The illumination of the Print mode indicator and printing of data stored in the TD 700/800 memory may be started by operator depression of the Print key or by the receipt of a DLE/P character following STX and prior to ETX. Printing in the unattended mode will start following transmission of the ACK character to the central processor signifying that a good message was received. The light will be extinguished when printing is completed.

ERROR.

The Error indicator is illuminated when a character parity or block check error is detected by the terminal in data being received or when the received message exceeds the display capacity. Reception of data into memory will cause an overflow error when the cursor is moved into the ETX position on TD 700/800 D/L2 or page one home on TD 700 D/L1 by any cursor control other than DC2, DC4 or FF (which change the ETX position to page one home). The Error indicator is turned off by the successful retransmission of the message, the receipt of the new message, or the depression of the LOCAL key.

ENQUIRY (ENG).

The Enquiry indicator is illuminated when the terminal detects the central processor attempting to transmit a message to the terminal while the terminal is not in the Receive mode. The indicator is extinguished by the operator placing the terminal in the Receive or Local mode. The audible alarm sounds in conjunction with the ENQ indicator to alert the terminal operator.

LINE TERMINAL ACTIVITY INDICATOR (LTAI).

This feature is provided primarily for on site trouble shooting. The LTAI indicator is illuminated whenever the central processor is transmitting to any terminal on the line. The LTAI indicator is extinguished on any given terminal when that terminal is transmitting to the central processor. It may also be extinguished by depressing the LTAI control key. If the indicator goes off and on with normal terminal activity and no direct operator intervention with the LTAI key, the given terminal is being polled/selected. The length of time that the light remains on or off depends upon the individual system. On a system with few terminals per line, a low volume of messages, and many polls from the central processor, the light will go on and off much more frequently than on a system with many terminals per line, a high volume of messages, and few polls from the central processor per specific terminal.

If the light remains on, the status of the terminal may be determined by extinguishing the LTAI by depressing the LTAI control key. If the light comes back on and remains on, there is activity on the line, but the central processor is not addressing this terminal or this terminal is not responding. If the light remains off, there is no activity on the line, indicating that either the CPU or the line is not active.

AUDIBLE ALARM.

The Audible Alarm sounds momentarily whenever the central processor attempts to transmit to the terminal while the terminal is not in the Receive mode or group selects or broadcast selects the terminal. The Audible Alarm sounds once when the cursor is advanced to the eighth character position from the right end of the bottom line of the display or a quadruple sound upon advancing from page four to page one. The

Audible Alarm Volume control provides a continuous range of sound level.

BRIGHTNESS CONTROL.

a brightness control is provided to allow the operator to adjust the display screen brightness to his preference.

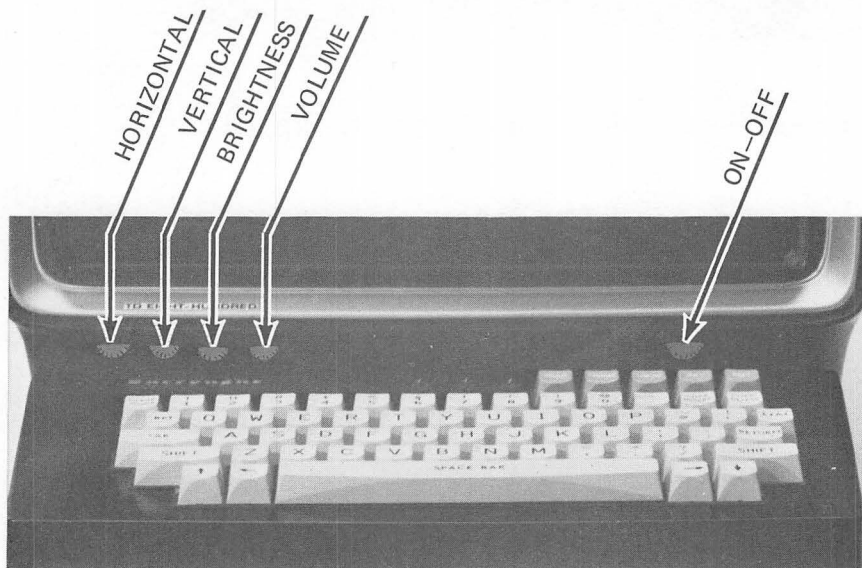
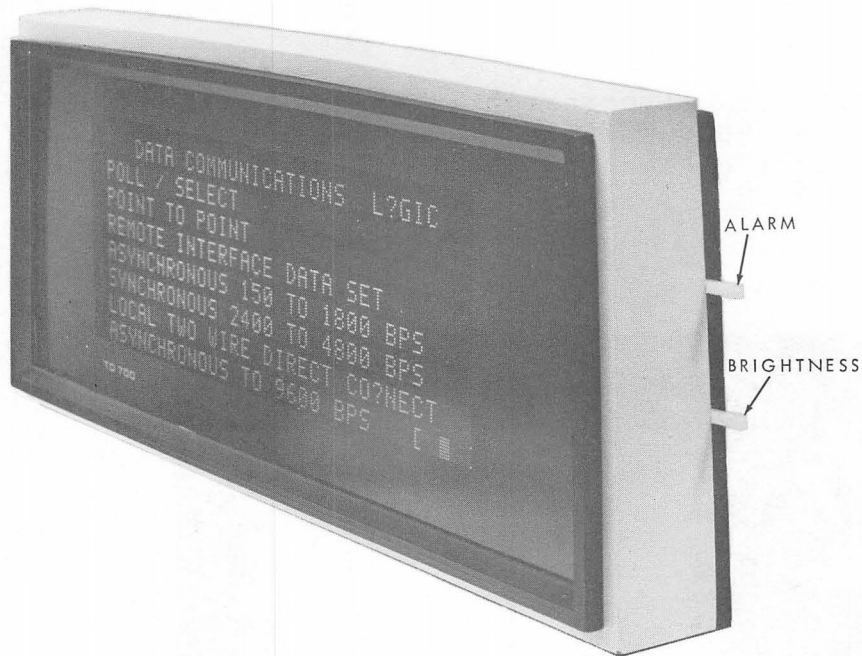


Figure 3-3. BRIGHTNESS CONTROL AND ALARM

TRANSMISSION RATE SELECTION DIAL (OPTIONAL).

The Rate Dial control selects the clock data rate for data communications. The Rate Dial is located near the data set connector at the rear of the machine, and is a seven position control for terminals operating in domestic asynchronous networks and in international asynchronous or synchronous networks.

POWER ON.

The Power On indicator is illuminated whenever the terminal's Power Switch is in the "ON" position. The indicator is extinguished whenever the Power Switch is in the "OFF" position.

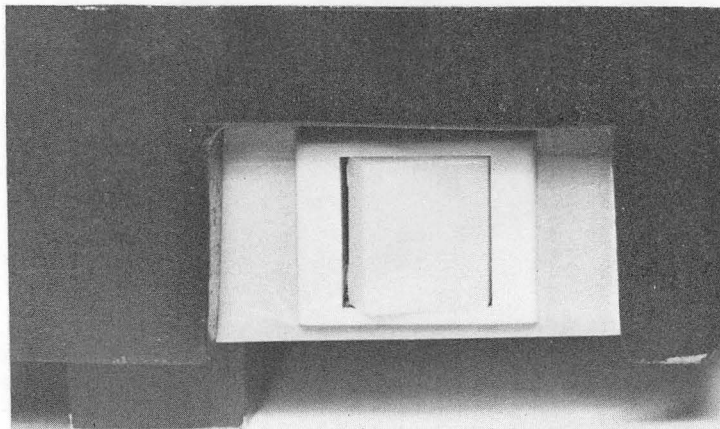


Figure 3-4. POWER ON SWITCH/INDICATOR

SECTION 4

COMMUNICATIONS INTERFACE

GENERAL DESCRIPTION.

The Communications Interface forms part of the third subsystem of the TD 700/800 Terminal, the control subsystem. The communications procedures detailed offer the user a choice of operating modes and network environments. Line disciplines relating to the TD 700/800 conform to Burroughs Standard Communications Procedures greatly simplifying the task of "mixing" different types of terminals within a single network, and on the same line. For example, in order to add a TD 700 or TD 800 to a network of TC's using the zero XMN option, only the polling list of the handler would need to be updated.

The TD 700/800 terminal is compatible with the Series TC terminals, the TU 500/900 terminals and the RT 2000/4000 Logic Unit.

NETWORK CONFIGURATIONS.

Remote terminals may be connected to a data center central processor or a central TC by a variety of communication links. The communication link may be through telephone company facilities using switched or leased lines, or the link may be an in-house facility, either direct connect or through data sets.

The network configurations possible with the TD 700/800 depend on the line control discipline to be implemented and in some instances on the physical distance of the terminals from the central processor. The following line control disciplines are available and are described in detail in later sections. Burroughs Standard Poll/Select, Point-to-Point, and IBM 2260 Communication Procedure.

In a multidrop leased-line network, data sets from several remote sites may be connected to a multidrop communication channel through a central office bridge. This central office bridge may, in turn, be connected to other central office bridges, all connecting into a single multidrop line.

The number of terminals and data sets connected in this manner is limited only by the requirement to provide an acceptable response time for transactions handled by all terminals on that particular network, including those terminals at other sites connected to the same line with a central office bridge(s). Thus, only the volume and size of transactions need be considered in determining the number of terminals that may be placed on one line.

In switched line, time-sharing, or batch network either the Burroughs Standard Poll/Select or Point to Point line control discipline may be utilized. The remote site should be operator attended.

TERMINAL INTERFACE.

The TD 700/800 terminal is operable with certain asynchronous and synchronous data communication interfaces conforming to EIA standard RS232C, CCITT Recommendation V24 of the International Market, and Two-Wire Direct Interface. The communication interface of the terminal is capable of half duplex asynchronous or synchronous operation over either half or full duplex communication circuits. Data rates for the TD 700 D/L1 vary from 75 bps to 2400 bps. Data rates for Design Level 2 vary from 75 bps to 9600 bps.

CHARACTER FORMAT.

A modified ASCII 7-bit code is the standard transmission code set for the TD 700/800 system. These codes consist of two general categories, control characters and graphic characters. There are 23 control characters and 91 graphics which include both upper and lower case alphabets, the numerals zero to nine, 27 other symbols, and the special characters for POLL, SELECT, FAST SELECT, and BROADCAST SELECT. (See Appendix B-1)

The standard 7-bit character configuration is shown; bit 7 is the high-order bit, and bit 1 is the low-order or least-significant bit:

b7	b6	b5	b4	b3	b2	b1
1	0	0	1	0	1	0

The example represents the character "J" column 4 row 10 or simply "4/10". The column number is determined by taking the decimal equivalent of the binary number formed by bits 7, 6, 5; and the row number by taking the decimal equivalent of the binary number formed by bits 4, 3, 2, 1. Columns are sometimes referred to as "sticks". Stick 3 ASCII codes are the numerals 0 through 9 and the special characters for "colon", "semicolon", "less than", "equal to", "greater than", and "question mark".

The lower case characters for terminals without lower case capabilities will be interpreted as upper case characters.

ASYNCHRONOUS DATA COMMUNICATION.

Asynchronous Data Communication utilizes even parity. Each character transmitted uses ten nominally equal time intervals representing, in order, a start bit, seven bits of data (least significant bit first) a parity bit, and a stop bit. The start bit has polarity 0 (space). The stop bit has polarity 1 (mark). The ninth bit transmitted is the character parity bit selected to make total number of 1 (marking) bits in the character even. The start, stop, and parity bits are automatically put on the line in the proper sequence by the hardware.

SYNCHRONOUS DATA COMMUNICATION.

Synchronous Data Communication utilizes odd parity. Each character transmitted uses eight nominally equal time intervals representing, in order, seven bits of information (least significant bit first), and a parity bit selected to make the total number of 1 (marking) bits in the character odd. The parity bit is added to the character data bits automatically by the hardware. The SYN character is used to provide a signal on the line to establish and maintain synchronism between the communicating stations. The SYN character may be transmitted at any time except between an ETX and the immediately following BCC. When a Synchronous transmission is initiated, at least four SYN characters must be transmitted prior to any other character to establish synchronization. This function is automatically accomplished by the hardware. The terminal purges the SYN character in recognition of a normal character sequence and does not include it in the BCC (Block Check Character) calculation.

DATA RATES AND DATA SETS.

Domestic.

- a. 75 bps Asynchronous - This interface is compatible with the Bell 103 and Bell 202 families of data sets or their equivalent.
- b. 150/300 bps Asynchronous - This interface is compatible with the Bell 103 Data Set family or equivalent.
- c. 600/1200 bps Asynchronous - This interface is compatible with the Burroughs TA 713 Data Set which requires duplex telephone circuits, or an equivalent data set, including Bell 202D. The interface also applies to switched lines and utilizes a Bell 202C or equivalent data set.
- d. 1800 bps Asynchronous - This interface is compatible with the Burroughs TA 783 Data Set which requires a duplex telephone circuit, or an equivalent data set.
- e. 2000/2400 bps Synchronous - This interface is compatible with the Burroughs TA 734-24 (2400 bps) or with the Bell 201A Data Set (2000 bps) or the Bell 201B data Set (2400 bps). The interface operates half duplex at 2000 bps on switched or leased (2- or 4-wire) telephone circuits, and at 2400 bps on leased lines. If it is desired, the TA 734-24 may be used on the telephone company switched line network by interfacing it into a Bell 1000A Data Access Arrangement Unit (Type CDT). The switched line arrangement is manual answer and dial type.
- f. 4800 bps Synchronous - This interface is compatible with the Burroughs TA 733-48 or with the Bell 203 data Set family and requires duplex (4 wire) telephone circuits.
- g. Two-wire Direct Interface Asynchronous - This interface

operates according to the data rates defined on page 4-16.

International.

The Terminal conforms to the interface circuit requirements defined by CCITT Recommendation V24 and operates with data sets or equivalents described in the succeeding paragraphs.

- a. V21 Data Set - The Terminal operates in a compatible interface with the V21 Data Set or equivalent including the GPO Datel 2. Operation is asynchronous, half duplex, at data rates of 150 or 200 bps.
- b. V23 Data Set - The Terminal operates in a compatible interface with the V23 Data Set, or equivalent, including the GPO Datel 1 and Burroughs TA 753. Operation is asynchronous, half duplex, at data rates of 600 or 1200 bps.
- c. V26 Data Set - The Terminal operates in a compatible interface with the V26 Data Set or equivalent, including the Burroughs TA 734-24 and TA 733-48, and the GPO Datel 7. Operation shall be synchronous, half duplex. Using the Facility 3 form of GPO Datel 7 data set, operation is at a data rate of 2400 bits/second on 4-wire line with alternative data rates of 600 or 1200/bits second on 2-wire line.

DATA SET EXPANDERS.

The Burroughs TD 700/800 terminal communications interface is capable of connecting to and operating with the Burroughs TA 800 series of Data Set Expanders. These are the TA 800-1 (4 terminals), TA 800-2 (8 terminals), TA 800-3 (12 terminals), and TA 800-4 (16 terminals).

LINE ADAPTERS.

Appropriate line adapters, speed adapters and other necessary hardware is used to interface the terminal to a computer.

COMMUNICATION CHARACTERS.

Communication characters for the TD 700/800 terminal consist of control characters, function characters, and other characters which serve as special indicators.

BASIC CONTROL CHARACTERS.

- a. ACK - Acknowledgement - The affirmative response to selections and messages directed to the Terminal is the transmission of a message containing an ACK character. Messages transmitted by the Terminal to the Data Center are acknowledged by the Data Center. The Terminal recognizes and takes action on the ACK character received from the Data Center.
- b. BCC - Block Check Character - The Block Check Character is sent with all data messages. It is used for error detection in the transmission of a data message to check the longitudinal parity of the characters. The BCC is not a unique character since its generation is based on a binary summation and, therefore, may become any character. BCC is generated by independently summing without carries each of the 7 individual levels (channels) of the codes transmitted. The BCC causes the sum of the number of "on" or "1" bits in each of these levels of the transmitted codes to be even. A character parity bit is generated for the BCC conforming to the individual character parity scheme dictated by the type of transmission. The summation to obtain BCC starts with the first character following SOH in the message being transmitted and extends through the ETX. BCC follows ETX and always appears as the last character in a data message. Generation of the BCC for transmitted messages is an automatic function of the TD 700/800 terminal, as is checking the BCC on all incoming messages.
- c. DLE-EOT (DEOT) - Mandatory Disconnect - Mandatory Disconnect is used with the switched line Point-to-Point procedure.
- d. ENG - Enquiry - This character is always used to end a poll or selection message and requires a reply. It may be sent by a remote in a multipoint network to wake up the Central Processor during contention. It may be sent by either station in a Point-to-Point network.
- e. EOT - End of Transmission - this character normally indicates the end of a communication sequence. However, in control procedure, it is used as the first character in a poll or selection message. The Data Center (which is designated as the control station), by transmitting this code sets all remotes in the control state (that is, listening for a poll or selection). If a terminal is polled and is not ready to transmit it automatically responds with EOT meaning "no traffic".

- f. ETX - End of Text - The ETX character serves to terminate the text portion of all messages containing text. The ETX character always precedes the BCC (block check character).
- g. NAK - Negative Acknowledge - The terminal transmits a message containing a NAK character when either of the following two conditions prevails: 1. A selection is recognized and the Terminal is not ready to receive. 2. A message containing text is received but an error occurred. The terminal recognizes and takes action on a NAK character received from the Data Center by resending the message which caused the NAK.
- h. SDH - Start of Heading - The SDH character appears as the first code in all messages containing text. Note: The heading defined as that portion of the message that begins with SDH and includes a sequence of characters which constitute the address of a terminal and the transmission number if used.
- i. STX - Start of Text - The STX character appears as the first code following the heading in all messages containing text. STX identifies all characters that follow, up to but not including ETX, as the text of the message.
- j. SYN - Synchronous Idle - The Synchronous Idle character is used as a timing or idle character with systems utilizing synchronous transmission.

SPECIAL COMMUNICATION CHARACTERS USED BY THE TD 700/800 TERMINAL.

- a. AD1, AD2 - A unique two character identification address is assigned to each terminal in a network. This permits a terminal to identify messages directed to it and permits the CPU to identify the terminal sending a message. The address of the terminal is assigned to the terminal at the time of installation but may be altered by a Field Engineer. AD1, AD2 are not unique ASCII codes in themselves, but represent any two characters from columns 2 through 7 of the modified ASCII code chart. This provides 96 unique address characters and 9,216 possible terminal addresses for a single network.
- b. BSL - Broadcast Select (Lower case letter "t") - BSL is used to identify a message as a Broadcast Select to all terminals within any given network. The message is sent from the CPU to all terminals on the line without inquiry as to the receive-ready status of any terminal. All terminals with power on are automatically placed in receive-ready status and receive the message simultaneously. The addressed terminal acknowledges receipt of the message.
- c. CON - Contention character (BEL "0/7") - CON is used in a message transmitted by the CPU to place all terminals on the line in the Contention Mode. (EOT, NUL, NUL, CON).

- d. DLE-P (Optional) - When the DLE-P characters are in the text of a message to the terminal, printing of data stored in memory will begin following the transmission of the ACK character to the central processor.
- e. FSL - Fast Select (lower Case Letter "s") - FSL distinguishes a message which is sent by the CPU without inquiry as to the receive-ready status of the terminal.
- f. GSL - Group Select - Any agreed upon character from columns 2 through 7 of the ASCII code chart assigned at the time of installation. It may be changed by a Field Engineer. GSL distinguishes a message directed to all terminals within a predetermined group. The message is sent by the CPU without inquiry as to the receive-ready status of the terminals in the group; and all terminals with power on are automatically placed in receive-ready state. The addressed member of the group acknowledges receipt of the message for the group.
- g. FDL - Poll (lower case letter "p") - This character is part of a Polling message, and it inquires of an addressed remote location whether it is ready to transmit to the Data Center. It is ignored by all but the addressed remote and causes that station to reply with an EOT if it is not ready to transmit, or with a message if it is ready to transmit.
- h. SEL - Selection (Lower case letter "q") - This character is part of a selection message, and it enquires of an addressed remote location whether it is ready to receive a message from the Data Center. It is ignored by all but the addressed station and causes that station to reply with a negative acknowledgement (NAK) if it is not ready to receive a data message from the Data Center, or with an ACK, if it is ready to receive a message.
- i. XMN - Transmission Number - TD 700 Design Level 1: "a" and "A" (col 4, rows 0 and 1). TD 700/800 D/L2: "a" and "A" or "0" and "1" (col 3, rows 0 and 1). The transmission number for D/L 2 terminals can be set for either set of characters by a Field Engineer.

FUNCTION CHARACTERS ASSOCIATED WITH THE TD 700/800 TERMINALS.

- DC1 - The DC1 character activates the Programmatic Mode Control option by keeping the terminal in the receive mode after reception of a message. It requires no memory space. If a DC2 character is also present in a message to a D/L1 terminal the DC2 function will override the DC1 function.
- b. DC2 - The DC2 character, if inserted by the CPU into a message following the STX character and preceding the ETX character, causes the terminal to be placed in the optional Forms mode. At least one left delimiter must be in the memory of the receiving terminal at the time of transmission of the DC2.

A second DC2 character in the message preceding the ETX character causes the Forms mode to be reset on D/L2.

- c. CR - Carriage Return - Carriage return if transmitted as a text character in a message, causes the terminal cursor to be moved to the first position of the next line.

The following are for Design Level 2 only:

- d. BS - Backspace - The BS character causes the cursor to move one character position to the left. When the cursor is at the first position of a line, the backspace character causes the cursor to move to the last character position of the preceding line. When the cursor is located at the home position, the backspace character causes the cursor to appear in the last character position of the bottom line. In the forms mode, the cursor cannot be backspaced beyond the first character of an unprotected data field. BS
- e. LF - Cursor Down - The LF character causes the terminal to execute a line feed function by moving the cursor one line down. When the cursor is in the bottom line, the cursor down character causes the cursor to appear in the top line. LF
- f. DC3 - Cursor Up - The DC3 character causes the terminal to execute a reverse line feed function by moving the cursor one line up. When the cursor is in the top line, the cursor up character causes the cursor to appear in the bottom line. DC3
- g. HT - tabulation - The HT character causes the terminal to execute a tab function by moving the cursor to the next tab stop. Stops are located at every eight character position on a line, such as 1, 9, 17, 25 etc. In the forms mode the tab character causes the cursor to move forward to the character position following the leading delimiter of the next unprotected character field.
- h. DC4 - Home - The DC4 character causes the terminal to execute a cursor home function by moving the cursor to the first character position of the first line (home position). In forms mode the cursor moves to the first unprotected character position. DC4
- i. FF - Home and Clear - The FF character causes the terminal to execute a combined home and clear function by moving the cursor to the home position and erasing all data (except protected data when in forms mode) from the screen. FF
- j. US/RS - Forms Delimiters - The US/RS characters (col. 1, rows 14 and 15) cause the forms delimiters (braces) to be displayed on the screen. The US/RS characters are interpreted by the terminal as braces (col. 5, rows 14 and 15). Design Level 2 terminals may be altered by Field Engineering to recognize only Design Level 1 forms delimiters (brackets;

col. 5, rows 11 and 13).

- k. VT - TD 700 Expanded Memory Advance Page - The VT character causes the next page of the TD 700 expanded memory (option) to be displayed on the screen and moves the cursor to the home position of that page.
- l. NUL - Time Fill -The NUL character is used as time fill when required in the forms mode following characters HT, VT, FF, DC2, and DC4. Also, any cursor movement requiring a forms delimiter search through protected data may require NUL's. In either case, the number of NUL's required is determined by the following formula:

$$\text{Minimum no. of NUL's} > \left(\frac{\text{Char. positions moved} \times \text{baud rate} \times 6 \times 10^{-6}}{8 \text{ (Synchronous) or } 10 \text{ (Asynchronous)}} \right) - 1$$

NOTE: Use an additional NUL character when a fractional solution is obtained. If NUL's are transmitted to a D/L1 terminal they will take a memory space.

ILLEGAL CHARACTERS.

An illegal character is defined as a character having incorrect parity or a legal character appearing incorrectly in a predefined sequence. The terminal tests each character received for parity and accepts control characters only in their proper predefined sequence according to the communication procedure being used.

Upon receiving a text character with bad parity or a bad block check character (longitudinal parity), the terminal illuminates the ERROR indicator and automatically transmits a NAK to the Central Processor. In addition, if the condition causing the ERROR is a data character parity error, the "question mark" character (ASCII 3/15) appears on the display screen in place of the "bad" character. A message with bad block check is displayed, but the ERROR indicator is illuminated and retransmission of the message is requested. Distorted control characters result in the terminal not receiving a complete sequence and consequently not responding to the Central Processor. The Central Processor then initiates error recovery procedures. Optional Control Characters (BSL, GSL, XMN, SYN) are received as illegal characters by terminals not possessing the appropriate option.

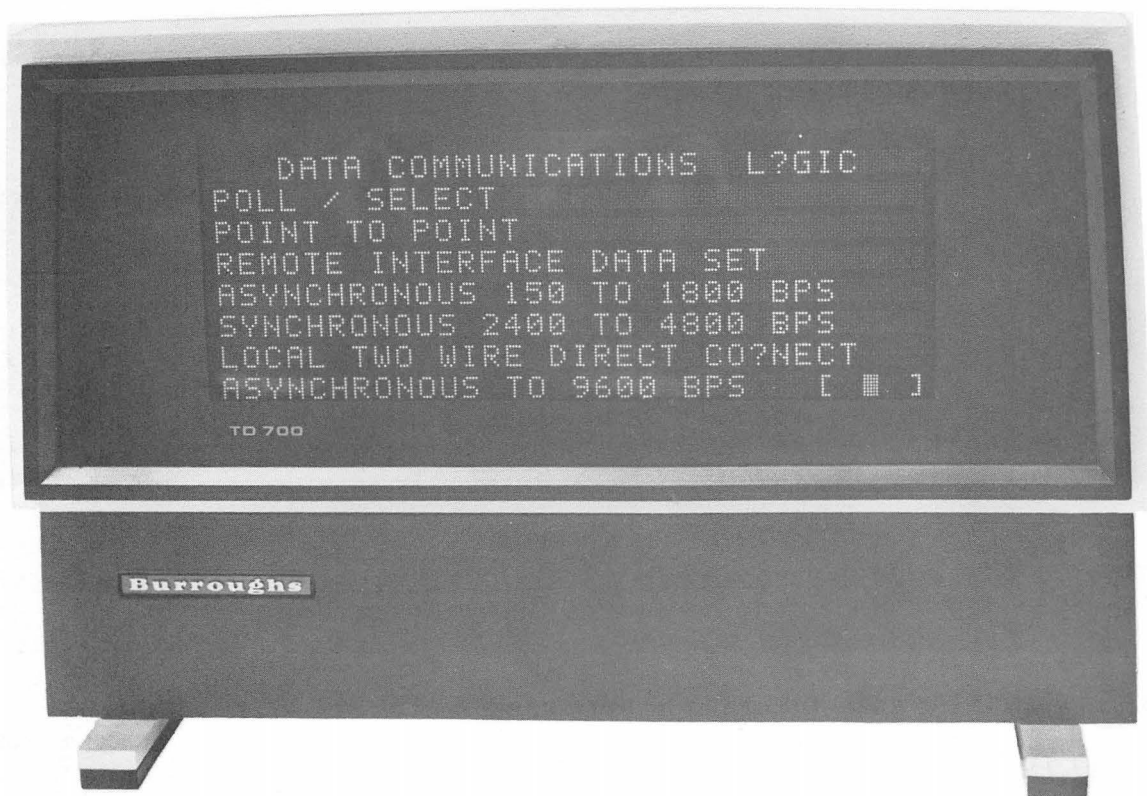


Figure 4-1. ILLEGAL CHARACTERS

MODES OF OPERATION.

The Burroughs TD 700/800 terminal operates in three modes: local, transmit, and receive. The operator controls the mode of the machine with the LCL, XMT, and RCV keys. Depressing the LCL key during either transmit or receive immediately transfers the terminal to the local mode under control of the operator. No further data is respectively transmitted or received.

LOCAL.

Both "power on" and the LCL key place the terminal in the local mode during which the terminal is off-line and data is entered manually through the keyboard. At any time other than during the actual receipt of data, depression of any alpha or numeric key will cause the terminal to enter the LCL mode. If an ENQ is received through selection or from the point-to-point calling station, as applicable, the terminal automatically transmits a NAK indicating that it is not receive-ready. If an ENQ is received through polling, the terminal automatically transmits an EOT indicating "no traffic". When receiving any ENQ in the LCL mode, the terminal activates its audible alarm and a visual indicator to alert the operator that the Central Processor or calling station is transmitting. The optional procedures, Broadcast and Group Select, cause the terminal to switch automatically to receive if the terminal was in the Local mode.

TRANSMIT.

Depression of the XMT key on the terminal keyboard by the operator causes the terminal to enter the transmit mode. Transmission from the terminal utilizes three basic procedures: Initialization, Message Transfer, and Termination, which are detailed in the following paragraphs.

Multipoint initialization consists of a poll sequence (EOT, AD1, AD2, PCL, ENQ) transmitted by the Central Processor which contains the terminal's address. The terminal responds with an EOT if it does not have a message to send. This is defined as a negative response to a poll. If the terminal is in the transmit mode and has a message for the Central Processor, it responds with its own identity (SOH, AD1, AD2) and enters the Message Transfer procedure. If the optional BSL or GSL was received while the terminal was in the transmit mode, the terminal would automatically switch to receive.

Point-to-point initialization is the establishment of a link between the calling (master) station and the called (slave) station. When using switched line communication, the master/slave relationship of the terminals is already established and the initialization procedure continues with the transmission of an ENQ as soon as the dialed connection has been made and the operator presses the XMT key. A NAK response indicates that the called terminal is not receive-ready, and the calling station may proceed with mandatory disconnect (DEOT) by using the Local key. When using dedicated line (contention) communica-

tion the station wishing to transmit bids for master status by transmitting an ENG as soon as the operator depresses the XMT key. A NAK response indicates that the other terminal is not receive-ready or that contention for master status has been unsuccessful. The station wishing to transmit will repeat its enquiry. In both cases of point-to-point communication, the receipt of an ACK from the called or receiving station confirms the connection, completes the Initialization procedure, and begins Message Transfer.

The Message Transfer procedure takes place immediately following successful completion of the Initialization procedure. The terminal transmits SOH, AD1, AD2, (AD1, AD2 = terminal's "I am" address), XMN, and STX followed by that data in memory starting at the first screen position and continuing up to the cursor location. An ETX is added to the message by the control logic. Transmission of the text from the terminal provides two parity checks: A character parity bit transmitted as the eighth bit of each character and a block check character generated as a longitudinal sum (without carry) of the corresponding bits of each character in the message following SOH through ETX. The transmission of the BCC causes the terminal to await response from the receiving station. If NAK is received, the entire message is retransmitted automatically.

When a Message Transfer has been successfully completed, the transmission sequence is terminated by the transmission of an EOT. Following EOT, the terminal operating mode automatically changes from Transmit to Receive after a time delay. The delay is set by Field Engineering from one baud time, for TDI or half duplex data sets, up to 100 milliseconds for two wire switched connections.

RECEIVE.

The terminal is placed in the receive mode at the completion of a message transfer procedure by reception of a DC1 character or by depression of the RCV key on the terminal keyboard. When in the receive mode, the terminal accepts data from the communication lines in accordance with the line discipline utilized. In standard select, the terminal detects the sequence EOT, AD1, AD2, SEL, ENG; responds with an ACK (if it is receive-ready); and awaits the SOH preceding the text of the message. In all communication procedures applicable to the TD 700/800, a transmission number may be included in the header following the address, but it is ignored by the terminal except in computing the Block Check Character.

In Design Level 1 terminals, receipt of the STX character causes the terminal to clear the display of the previous message and position the cursor to "home" where display of the incoming message begins.

In Design Level 2 terminals, the DC4 or FF characters cause the cursor to move to the home position, or to move to the home position and erase the previous data, respectively. Data received without a DC4 or FF character will be stored in the memory beginning at the position of the cursor. With the receipt of an SOH character, the

terminal, depending on Field Engineering installation adjustment, may automatically clear the display of the existing message and cause the cursor to be moved to the home position.

The terminal employs two types of parity checks on all incoming messages. Each character is checked for parity (even parity for asynchronous data, odd parity for synchronous data), and a longitudinal parity is computed and checked against the Block Check Character received at the end of the message. If both parity checks are correct, the terminal responds to the message with an ACK. If either parity check fails, the terminal lights the ERROR light and responds to the message with a NAK. The ERROR light is turned off when a valid message is received in response to the NAK. The terminal responds to a correctly received message with an ACK and switches to the local mode unless the Programmatic Mode Control DC1 is present and activated, in which case, the terminal remains in Receive mode. The keyboard is disabled during the actual receipt of data. The LCL key, however, will place the terminal in the Local mode at any time. Care should be taken to avoid depressing LCL when a transmission is in progress. If a transmission is interrupted, no ETX or BCC will be generated, and the message will not be completed, thus forcing a CPU time out.

COMMUNICATIONS PROCEDURE OPTIONS.

TRANSMISSION RATE SELECTION DIAL.

The TD 700/800 terminal has the ability to operate at a number of data rates which are selectable by means of a Rate Dial, located near the data set connector. The Rate Dial is a seven position switch which permits selection of asynchronous rates of: 75, 150, 200, 300, 600, 1200, or 1800 bits per second.

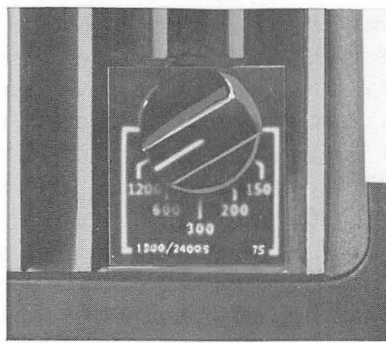


Figure 4-2. RATE DIAL

International asynchronous and synchronous system requirements are accommodated by the speed dial for selecting the following rates for the given data sets:

POSITION ON DIAL	DOMESTIC ASYNCHRONOUS RATE	RATE	INTERNATIONAL	
			DATA SET	MODE
1	75	-	-	-
2	150	150	V21	Async
3	200	200	V21	Async
4	300	-	-	-
5	600	600	V23	Async
		600	V26	Sync
6	1200	1200	V23	Async
		1200	V26	Sync
7	1800	2400	V26	Sync

PROGRAMMATIC MODE CONTROL.

DC1

DC1 - The DC1 character, if inserted by the CPU into a message following the STX character, causes the terminal to remain in the Receive mode at the successful completion of the transmission. Without the DC1 character in the message, the terminal switches to the Local mode after a successful transmission from the CPU. It is recommended that this character be omitted in all messages to conversational terminals. When the terminal is in the Local mode the operator is notified that the CPU is attempting communication by the audible alarm. If the terminal remains in the Receive mode, the operator's attention is not called to the terminal by the receipt of a new message and the previous message could be overwritten by a new message before the operator is able to respond.

TRANSMISSION NUMBER (XMN).

Transmission numbers are assigned by alternately numbering transmissions on an even/odd basis. For Design Level 1 the two transmission numbers are either the character codes for a and A (column 4, rows 0 and 1 respectively). The transmission numbers for Design Level 2 are either the character codes for 0 and 1 (column 3, rows 0 and 1 respectively) or may be field adjusted to the character codes for a and A. The optional transmission number, when used, immediately precedes STX in all messages transmitted. Transmission numbers received by the terminal are ignored, but are included in the Block Check Character calculation.

CONFIGURATIONS.

TWO-WIRE DIRECT INTERFACE (TDI) COMMUNICATIONS.

The Burroughs TD 700/800 terminal uses a standard Two-Wire Direct Interface with the conditions listed in this section. The TDI cable can not exceed 1000 feet but may be limited to a shorter distance depending on the specifications of the connected devices.

TDI With Concatenation.

The first TD 700/800 can be connected to the Central Processor using TDI, followed by additional terminals using the RS232 concatenated interface (see CONCATENATION). This connection would permit group polling in the TDI network.

Character Format.

Character format is ten (10) bit (asynchronous). The bit string is composed of 1 start bit, 7 data bits forming a single character transmitted least significant bit first, 1 character parity bit, and 1 stop bit.

Data Transmission Rate (Asynchronous).

Data Transmission rate for Asynchronous data may be any of the following rates which are governed by the TDI and which are set by the field engineer:

- a. 150 bits/second
- b. 300 bits/second
- c. 1200 bits/second
- d. 1800 bits/second
- e. 2400 bits/second
- f. 4800 bits/second (D/L2)
- g. 9600 bits/second (D/L2)

The characters of a message sequence are the same as those specified for multipoint communications procedures:

- PCL (see page 4-22)
- SEL (see page 4-25)
- FSL (see page 4-28)
- CON (see page 4-31)
- BSL (see page 4-34)
- GSL (see page 4-37)

CONCATENATION.

The TD 700/800 terminal has available a concatenation, or series chaining, method of connecting multiple terminals to a single data set in either Synchronous or Asynchronous mode or TDI terminals in Asynchronous mode. In this series connection, the TD 700/800 is compatible with the TC series terminals and the TU 900 terminals when operating asynchronously at 600, 1200, or 1800 bps. (Note: The TC and the TU 900 operate asynchronously only). Any distribution of types of terminals in any order is acceptable with the series TC. A concatenated

TU 900 must be the last terminals in a chain. The maximum cable length between the data set and the first terminal and between successive terminals is one hundred feet. The TD 700/800 terminal provides within its connector both an input and an output set of connections. The input connections accept the interface circuits from the data set or the preceding terminals. The interface signals are utilized by the terminal, as appropriate, and then reconstituted to specified levels by driver circuitry before being applied to the output connections for transmission to the succeeding terminal in the string. Disconnecting or powering down any TD 700/800 terminal in the chain disables all terminals downstream from the disabled terminal. The cable connectors are configured as mating connectors to enable continuity of the terminal chain when a terminal is removed, so long as the hundred foot maximum cable length between terminals is not exceeded. When concatenating with any TC, certain limitations must be adhered to. (See the L/TC Equipment Reference Manual, REMOTE CONFIGURATIONS).

In order to concatenate with a TC 500 which does not propagate the Clear to Send signal, the TD 700/800 contains within its concatenation circuitry a delay circuit which synthesizes the Clear to Send signal when actuated by the Request to Send signal. The delay is adjustable by a field engineer to 50 milliseconds as required by the Bell 202 family data sets, to 265 milliseconds as required by the Bell 103 family data sets, or to 15 milliseconds as required by Burroughs TA 713 and TA 783 data sets.

The limitations on cabling for concatenation are defined by TC 500 requirements. With a 50 card backplane version of the TC 500 in the string, the total accumulated cable length must not exceed 350 feet at a data rate of 1200 bits per second. With the 60 card backplane version of the TC 500 in the string and data rates of 1200 bits per second or 1800 bits per second, the total permissible delay is a maximum of 32.5 microseconds and 13.3 microseconds respectively. (see L/TC Equipment Reference Manual, NUMBER OF MACHINES PER DROP). For concatenating the TD 700/800, three specific cables are required in complying with the various combinations.

- a. TD 700/800 Adapter - a family of cables 15, 25, 50 or 100 feet, which consist of a Bell Style plug and jack on the respective ends conforming to the mating pair of the connector. It may be ordered as the TD 700/800 Data Set connector and is also used in concatenating multiple TD 700's.

NOTE 1: International installations might require an additional data set to TD 700/800 cable utilizing either an SEL style or a GPO style data set connector. The Bell style connector is used in concatenating multiple TD 700's.

NOTE 2: When Bell data sets are used the first TD 700/800 must be no farther than 50 feet from the data set.

- b. TD 700/800 Concatenation Adapter - A Cable assembly,

consisting of three Bell Style connectors and two cables in a "Y" configuration. The cables are one foot in length each with a connector on each limb. The left connector is capable of mating as a plug with the data set or upstream TD 700/800. The right connector is capable of mating as a jack with the downstream TD 700/800. The lower central connector mates with the Terminal as a jack. (It may be ordered as TD 054 Concatenation Y cable).

- c. TD 700/800 to TC 500 Adapter - A cable, 1 foot in length which consists of a Bell style RS232C jack and a TC 500 50-pin plug on the respective cable ends. Because of physical distances between machines, it will usually be necessary to complete the concatenation with a TD 700/800 Adapter Cable (see a. above). This cable should be ordered as a TAAC-1 kit (Transmission Adjunct Adapter Cable).

- 1 = TD 700/800 Adapter - Data Set Connector
- 2 = TD 700/800 Concatenation Adapter TD 054
- 3 = TD 700/800 - TC 500 Adapter TAAC-1

Cables not numbered herein may be found in the L/TC Equipment Reference Manual, Remote Configurations.

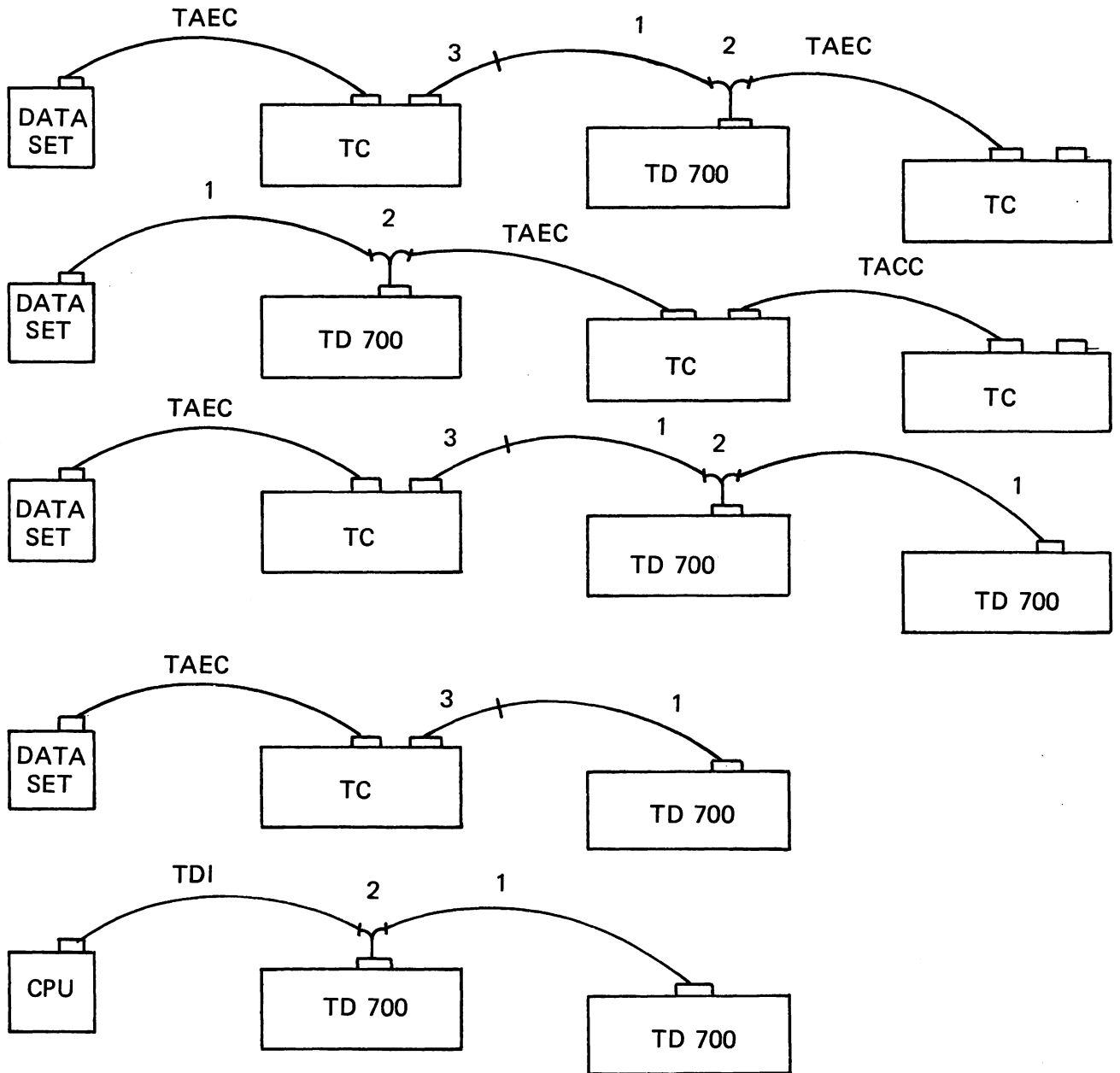


Figure 4-3. SAMPLE CONCATENATION CONFIGURATION

LINE CONTROL DISCIPLINES.

Line Control Disciplines to be discussed are:

- Burroughs Standard Poll/Select
- Fast Select
- Contention Mode
- Multipoint Broadcast Select (Optional)
- Multipoint Group select (Optional)
- Point-to-Point Switched
- Point-to-Point Dedicated (Contention)
- IBM 2260 Communication Procedures

POLL/SELECT.

The Data Communication Processor in a Poll/Select environment is designed for utilizing multidrop points on a network of private or switched lines. Central Office bridging is permitted and is expected to be a normal part of the operation of this system.

Polling, directed from the Data Center, is continuous. The frequency of polling is a function of the Data Center. The polling frequency may vary during the day, without affecting the terminal's basic operation other than to change the frequency of transmitting and receiving messages.

A message is entered through the keyboard. When the message is complete and the terminal is in a Transmit Ready condition, it waits for a Poll from the Data Center to activate the transmission of this message.

A message from the Data Center is received by the terminal if it is in the Receive mode, and is stored in memory and displayed.

Data messages transmitted to the Data Center will be acknowledged by a single character ACK if received properly or by a single character NAK if not properly received.

Receipt by the terminal of a single character ACK from the Data Center (resulting from receipt at the Data Center of a good data message) will cause the terminal to transmit a single character EOT. When the Data Center receives this it will transmit EOT as part of the next polling/selection routine.

Receipt by the terminal of a single character ACK from the Data Center will cause the terminal to enter the receive ready mode and count the transmit number.

Receipt by the remote of a single character NAK from the Data Center (resulting from failure of the Data Center to receive a good data message) will cause the remote to retransmit the message. The terminal will retransmit the message as many times as it receives a NAK from the Data Center. The data message will be retained in the

Transmit buffer by the remote.

Failure of the Data Center to receive a message or an EOT from a polled remote will result in the Data Center timing out, ending the sequence and transmitting EOT, either as a single character or as a part of a new poll or selection. If the polled remote had been Transmit ready, it will still have its assembled message and will be ready to transmit when next polled.

Message_Formats_and_Length.

Poll Messages.

The purpose of the Poll Message is to inquire of the terminal if it is ready to transmit a message. The terminal must receive a poll before it can begin transmission. The Poll Message starts with EOT, followed by the address of the terminal (AD1, AD2), followed by the Poll character (POL = p), and is terminated with ENQ.

Select Messages.

A Select Message inquires of the terminal if it is ready to receive a message from the Data Center. It begins with EOT, followed by the address of the terminal (AD1, AD2), followed by the Select Character (SEL = q), and is terminated with ENQ.

Data Messages.

Data Messages are messages containing data that are transmitted to the Data Center or are received from the Data Center. Data Messages begin with Start of Header (SOH), followed by the terminal address (AD1, AD2), the optional transmission number (XMN), Start of Text (STX), the text of the message, and are terminated with End of Text (ETX) and the Block Check Character (BCC).

Message Length.

Poll and Selection messages have a defined length of 5 characters.

Data Messages have a defined number of control and format characters of 6 characters plus the XMN, if used. The text of a message may not exceed the memory capacity of the terminal. The characters stored in memory are described in the ASCII code chart, columns two through seven (See Appendix B-1). The text portion consists of everything following STX up to ETX (does not include ETX and BCC).

Certain response messages will consist of single characters.

Message_Conventions.

Polling and Selecting is directed by the Data Center, and consists of the Data Center transmitting a Poll Message or a Select Message to the terminal.

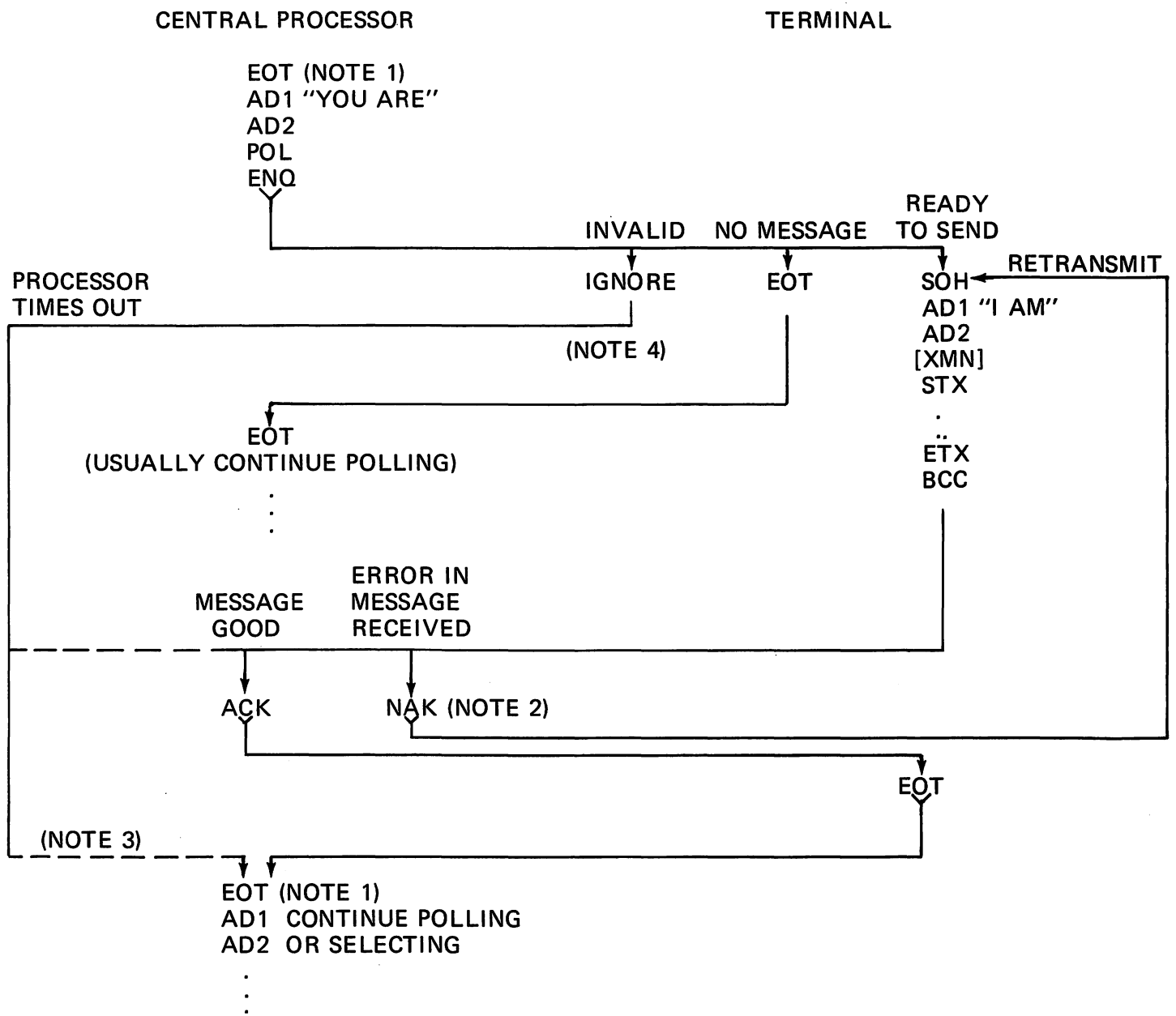
A terminal will ignore any poll or select that is not addressed to it or that contains a parity error.

A terminal that is anticipating a single character response will ignore any single character message received (ACK, NAK or EOT) that contains a parity error.

If the Data Center is anticipating a single character response and it fails to receive a good character, it will time out, terminate the sequence and reinitiate the transaction.

POLL (POL).

A Poll will be acknowledged by the terminal transmitting a data message if the terminal is output ready. A Poll to a terminal that is not output ready will result in the automatic transmission of EOT by the terminal.



[] INDICATES OPTION

Figure 4-4. POLLING

- NOTE 1: This EOT may be the termination of a previous transmission sequence. To minimize the effect of noise, the polling sequence may follow immediately.
- NOTE 2: If the Central Processor receives a message for which the character parity, block check, or terminal address test fails, NAK may be transmitted calling for a repeat of the transmission. This process can be repeated any specified number of times (may be zero) at which time, if the test fails, an error may be recorded by the Central Processor and EOT will be transmitted, terminating the sequence.
- NOTE 3: If the terminal does not receive an ACK, NAK, or EOT character, it may retain its message and remain quiet. The central processor then times out and transmits an EOT terminating the sequence. The terminal will retransmit the message when next polled.
- NOTE 4: If the terminal receives an invalid POL message, it will not respond. This lack of response will cause the Central Processor to time out and initiate recovery procedures. No response will ordinarily be the result of one of three conditions being present:
- a. The addressed terminal is not on line.
 - b. The EOT, POL, and/or ENQ characters are corrupted.
 - c. The address AD1, AD2 following the EOT is corrupted thereby preventing any terminal on line from recognizing the address.

SELECT (SEL).

A selection will be acknowledged by a terminal transmitting a single character ACK if it is receive ready.

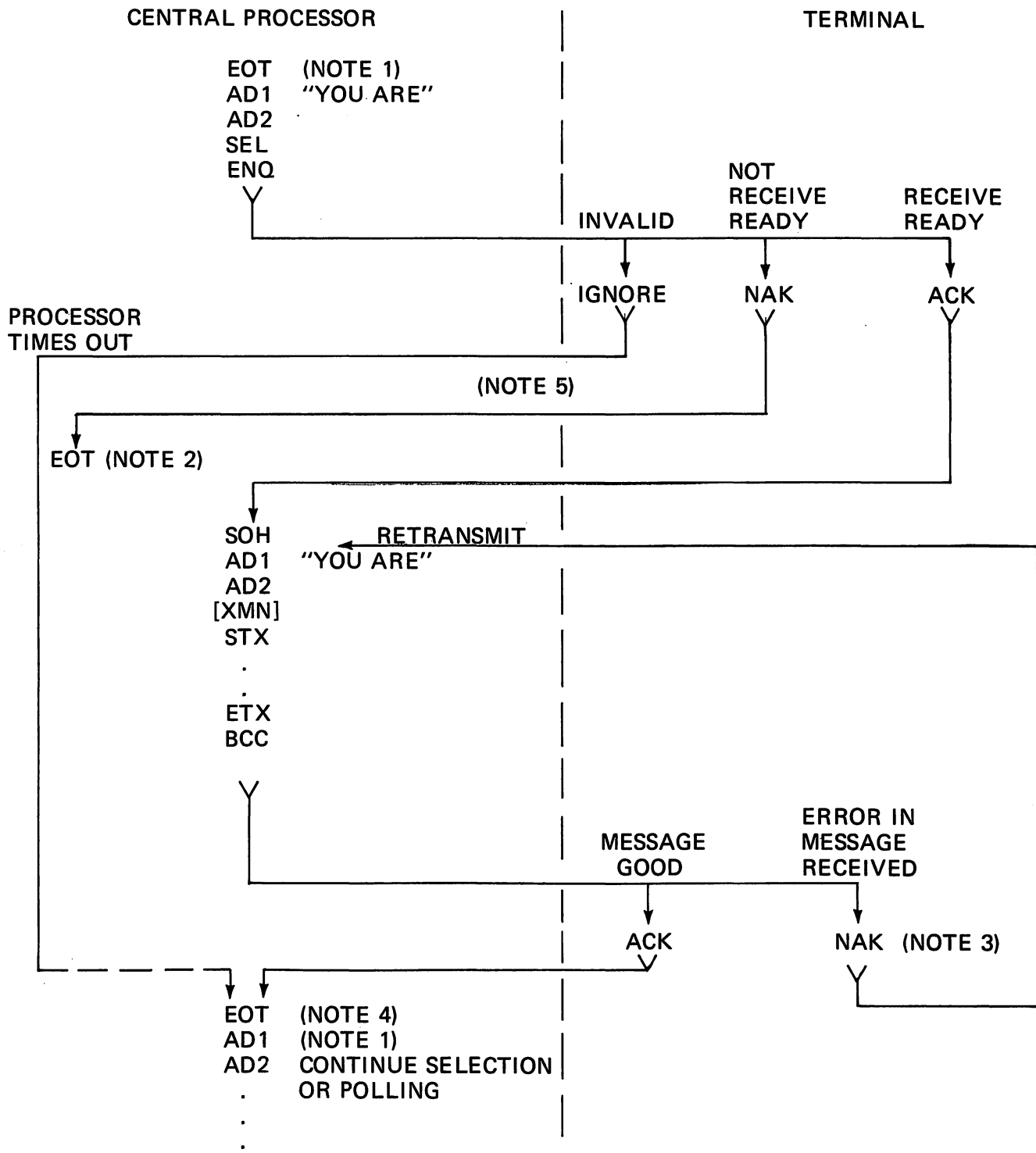
Selection of a terminal that is not receive ready will result in the transmission of a single character NAK by the remote. This will cause the Data Center to transmit an EOT character either as a single character or as it continues its polling and/or selecting routine. Data messages transmitted to the terminal will be acknowledged by a single character ACK if received properly or by a single character NAK if not properly received.

Receipt by the Data Center of a single character ACK from a terminal resulting from receipt at the terminal of a good data message will cause the Data Center to re-establish the control state by transmitting a single character EOT or an EOT that is the first character of a poll or selection. The other terminals in this same network will now become sensitive to the polling/selection routine which will now be reinitiated by the Data Center.

Receipt at the Data Center of a single character NAK from a terminal resulting from failure of a terminal to receive a good data message following selection will cause the Data Center to retransmit the message. Continued retransmission resulting in receipt of NAK's up to "n" times, by Data Center count, will result in transmission by the Data Center of EOT either as a single character or as part of a poll or selection.

Failure of the Data Center to receive an ACK or a NAK in a specified period of time from a terminal following selection results in the Data Center timing out and transmitting EOT either as a single character or as the first character of a reselection, or a new poll or selection.

Failure of the terminal to receive a message from the Data Center following selection will mean that the terminal will transmit neither ACK nor NAK. The absence of this reply will be detected at the Data Center and the terminal will be reselected.



[] INDICATES OPTION

Figure 4-5. SELECTION

- NOTE 1: This EOT may be the termination of a previous transmission sequence. To minimize the effect of noise, the selection sequence may follow immediately.
- NOTE 2: If the terminal is not ready to receive, as indicated by the transmission of the NAK, the Central Processor may retry the selection of that particular terminal at its proper place in the next selection cycle.
- NOTE 3: If the character parity or block check is not validated by the terminal, it will transmit a NAK. The Central Processor may retransmit the message a specified number of times (may be zero). If the terminal still does not acknowledge the message, the Central Processor may terminate the sequence with an EOT after recording the error. The Central Processor may, at the option of the programmer, retain the message for retransmission during the next selection sequence to the specified terminal.
- NOTE 4: If the Central Processor does not receive a response (ACK or NAK) to its message, it will time out and may retransmit the block a specified number of times (may be zero). If no response is received, the Central Processor will time out, terminate the sequence with an EOT, and record the error. The Central Processor may, at the option of the programmer, retain the message for retransmission during the next selection sequence to the specified terminal.
- NOTE 5: If the terminal receives an invalid control message, it will not respond. This lack of response will cause the Central Processor to time out and initiate recovery procedures. No response will ordinarily be the result of one of four conditions being present.
- a. The addressed terminal is not on line.
 - b. The EOT, SEL, and/or ENQ characters are corrupted.
 - c. The address AD1, AD2 following the EOT is corrupted thereby preventing any terminal on line from recognizing the address.
 - d. The ETX character is corrupted. If the ETX character was lost the addressed terminal continues looking for the ETX or an EOT. Therefore, one of the following two methods should be used by the Data Center when recovering from the time out.
 - 1) If the Data Center wishes to readdress the terminal which just caused the time out, it may. The initial EOT will return this terminal to the ready to receive message state if the ETX had been corrupted.

- 2) If the Data Center wishes to address another terminal on the same line as the terminal which timed out, it may proceed with the EOT, AD1, AD2, etc. sequence of the communications procedure, for only the terminal addressed in the previous sequence will be looking for the ETX. The EOT of this sequence will return a terminal waiting for an ETX to the "ready to receive control message" state.

FAST SELECT (FSL).

The Fast Select procedure is used when it is desired to transmit a message to a terminal whose status is known to be receive ready or when the Data Center does not wish to test the receive status of the terminal. The character 7/3 (s) of ASCII Modified Code for Information Interchange (X34.4, July 1967) is used to indicate the Fast Select procedure. This character is normally referred to as the Fast Select (FSL) character.

Line Discipline.

The addressed terminal will respond with ACK or NAK to a Fast Select. ACK indicates the terminal received the message correctly; NAK indicates an error occurred. If the reply is NAK, the Data Center may retransmit "n" times ("n" may equal zero). Figure 4-6 shows the character sequences used by the Fast Select communications procedure.

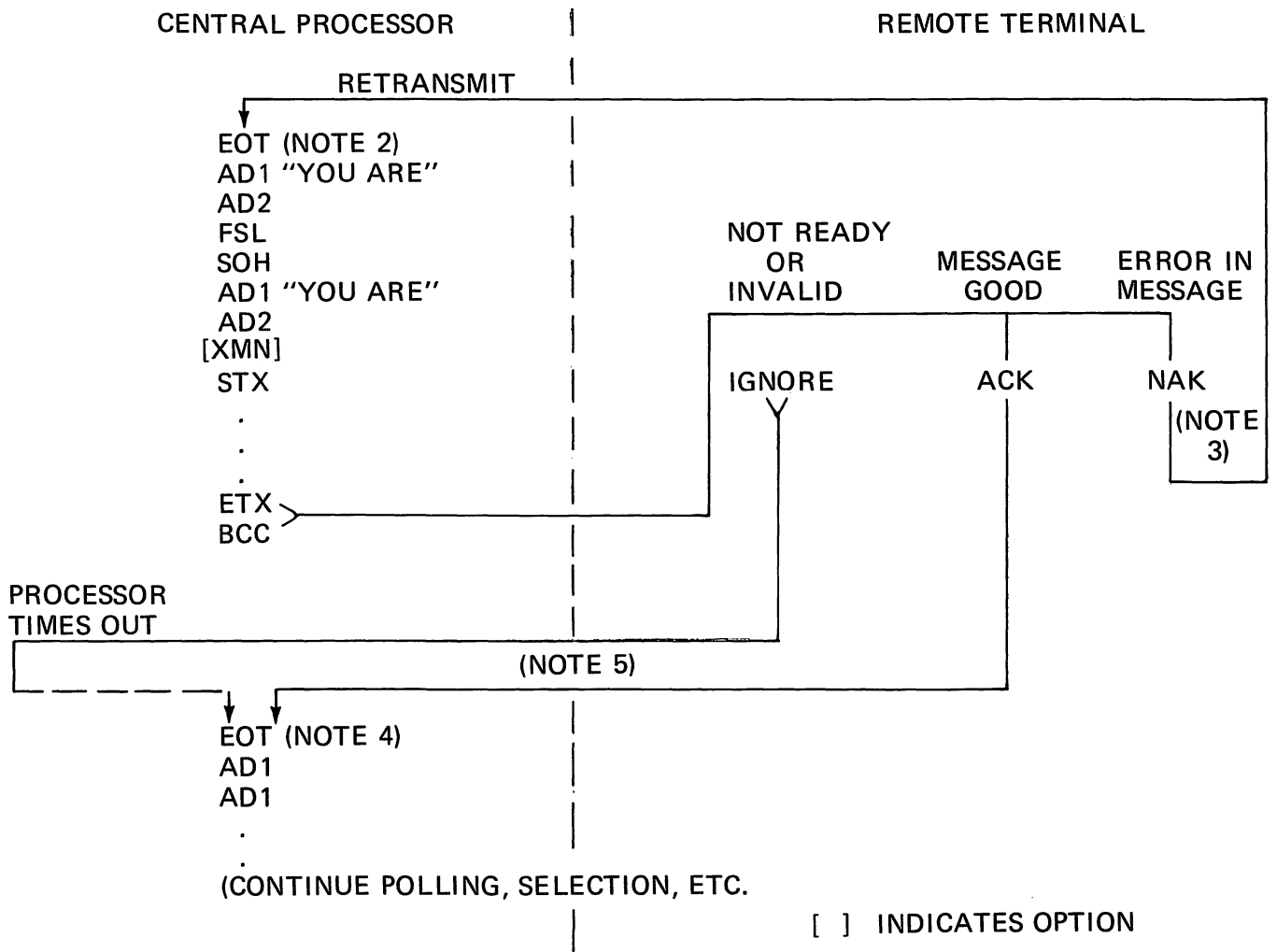


Figure 4-6. FAST SELECT

(Note 1)

- NOTE 1: Fast Select is used when the Central Processor wishes to transmit a message without testing the receive ready status of the terminal. With Fast Select procedures, the text message immediately follows the selection sequence to which there is no specific ACK/NAK response.
- NOTE 2: This EOT may be the termination of a previous transmission sequence. To minimize the effect of noise, the Fast Select sequence may follow immediately.
- NOTE 3: If character parity or block check are not validated by the terminal, it will transmit a NAK. The Central Processor will retransmit the entire message a specified number of times (may be zero). If the terminal does not acknowledge the message, the Central Processor will terminate the sequence with an EOT, and record the error, the Central Processor may, at the option of the programmer, retain the message for retransmission during the next selection sequence for the specified terminal.
- NOTE 4: If the Central Processor does not receive a response (ACK or NAK) to its message, it will time out and may retransmit the message a specified number of times (may be zero). If no response is received, the Central Processor will time out, terminate the sequence with an EOT, and record the error. The Central Processor may, at the option of the programmer, retain the message for retransmission during the next selection sequence for the specified terminal.
- NOTE 5: If the terminal fails to respond, the Data Center should time out. No response will ordinarily be the result of one of four conditions being present:
- a. The addressed terminal is not on line or not receive ready.
 - b. The EOT, FSL, SOH and/or STX characters are corrupted.
 - c. The address AD1, AD2, is corrupted thereby preventing any terminal on line from recognizing the address.
 - d. The ETX character is corrupted. If the ETX character was lost the addressed terminal continues looking for the ETX or an EOT. Therefore, one of the following two methods should be used by the Data Center when recovering from the time out.
 - 1) If the Data Center wishes to readdress the terminal which just caused the time out, it may. The EOT will return this terminal to the "ready to receive control message" state if the ETX had been corrupted.
 - 2) If the Data Center wishes to address another terminal on the same line as the terminal which timed out, it may proceed with the EOT, AD1, AD2, etc., sequence

of the communications procedure, for only the terminal addressed in the fast select will be looking for the ETX. The EDT of this sequence will return a terminal waiting for an ETX to the "ready to receive control message" state.

CONTENTION (CCN).

The Contention procedure enables the central processor to terminate polling of the multipoint network after placing the system in the contention mode. In this mode any terminal desiring to transmit a message to the central processor may initiate the polling activity by transmitting the character sequence AD1, AD2, PCL, ENQ with the depression of the transmit key. The central processor will respond by polling that terminal and continue with the normal polling procedure.

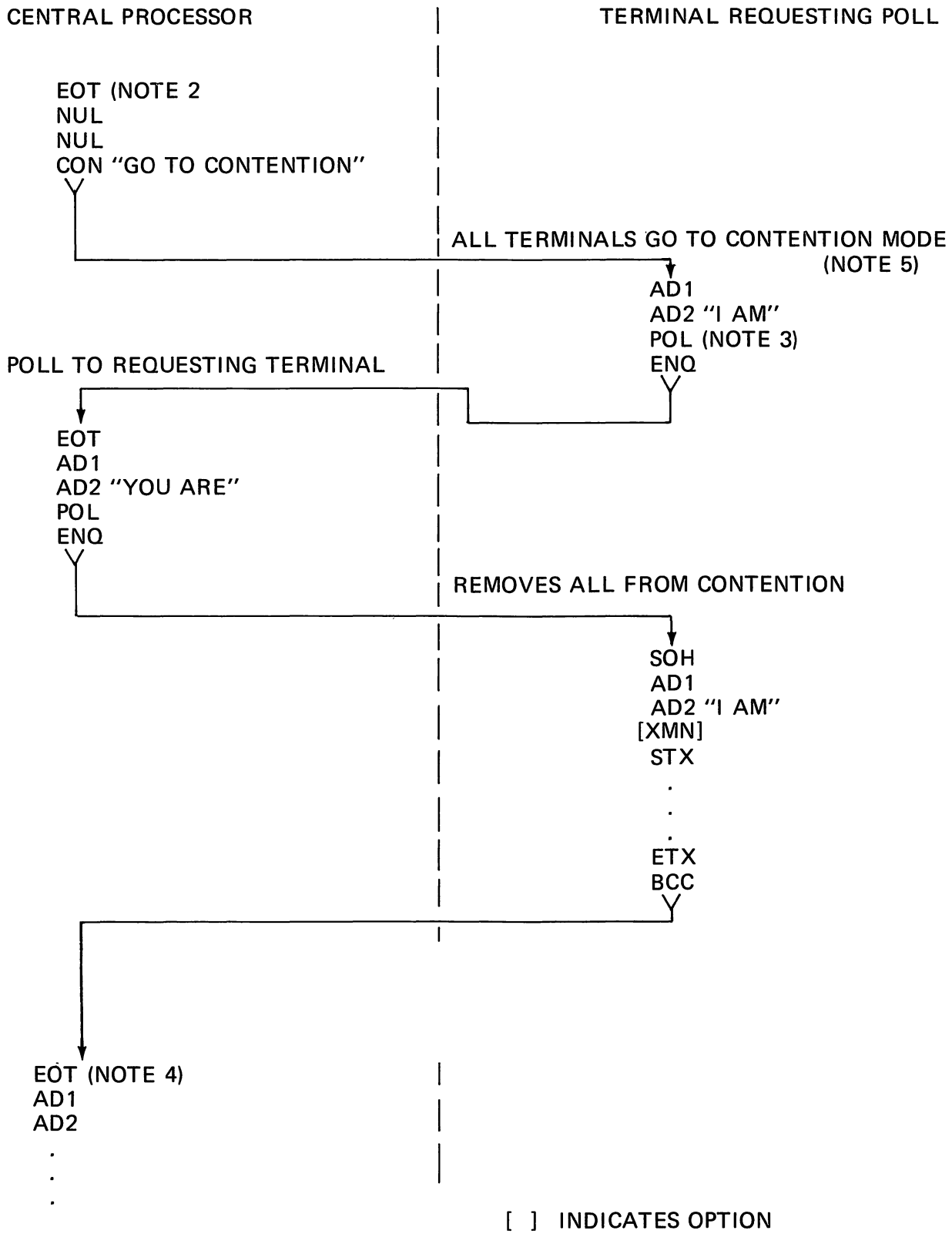


Figure 4-7. MULTIPOINT CONTENTION MODE

(Note 1)

- NOTE 1: The contention procedure enables the Central Processor to terminate the polling of a multipoint network after placing the terminals in the contention mode. This feature is often desirable during periods of low activity. Terminals are placed in contention when the Central Processor transmits the EOT, NUL, NUL, CON message. In this state the Central Processor ceases to poll the terminals until "awakened".
- NOTE 2: This EOT may have been the termination of a previous transmission sequence. To minimize the effect of noise, the "go to contention" sequence may follow immediately.
- NOTE 3: A terminal in the contention mode can awaken the Central Processor by transmitting its address, POL, ENG. This causes the Central Processor to poll the requesting terminal. If two terminals in contention attempt to transmit the "wake-up" message at the same time, the garbled message will cause the Central Processor to initiate a cycle through the poll list to determine which terminals are transmit ready.
- NOTE 4: The poll to the requesting terminal removes all terminals on the line from the contention mode. After servicing the requesting terminal, it is wise to poll all terminals in the sequence (in case another has become transmit ready while servicing the first) before returning all terminals to the contention mode.
- NOTE 5: The "go to contention" message may be garbled in which case the terminal will not know to "awaken" the Central Processor with a POL request and will simply sit in the transmit ready state indefinitely. For this reason, it is essential that the Central Processor periodically go through its poll list to ascertain the status of the terminals. The terminals may then be returned to the contention mode. Any terminal already transmit ready will automatically send AD1, AD2, POL, ENG.

BROADCAST SELECT (BSL).

This procedure is used when it is desired to transmit a message to all terminals on a line. A special Broadcast Select (BSL) character 7/4 (t) of the ASCII Modified Code for Information Interchange (X34.4, July 1967), is used in the selection sequence to indicate to all terminals that this is a broadcast message and all are to accept the message. This code is followed by the start of heading (SOH) of the message. No acknowledgement of the select portion of the message is made. Broadcast Select overrides the terminal Local and Transmit modes, causing the terminal to automatically switch to the receive mode and accept the BSL message sounding the audible alarm.

Line Discipline.

The address AD1, AD2, in the line procedure identifies the terminal which will acknowledge receipt of the message. The response of the addressed terminal is ACK or NAK. ACK indicates the addressed terminal received the message. NAK indicates an error occurred in transmission. If the reply is NAK, the Data Center may retransmit "n" times ("n" may equal zero). If the terminal fails to respond The Data Center should time out. Figure 4-3 shows the character sequences used by the Broadcast Select communications procedure.

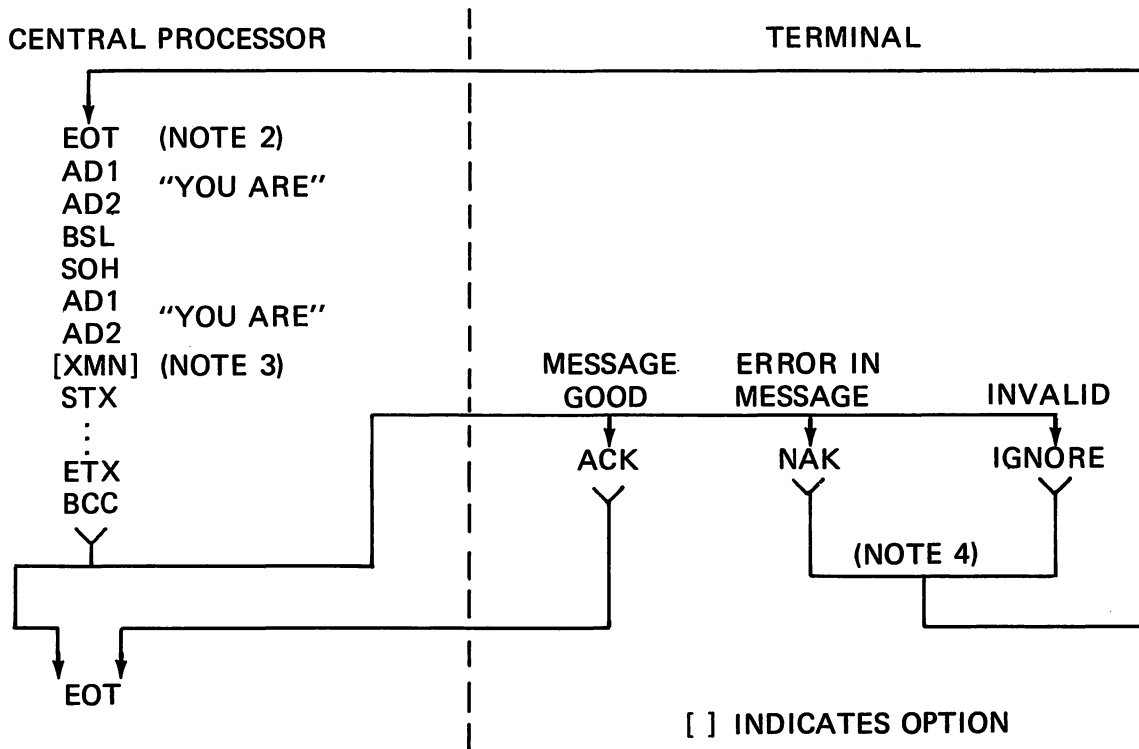


Figure 4-8. BROADCAST
(Note 1)

- NOTE 1: Broadcast Select is a fast select of all terminals in the multipoint network which contain the BSL option. AD1, AD2 is the terminal in the network selected to acknowledge receipt of the message.
- NOTE 2: This EOT may be the termination of a previous transmission sequence. To minimize the effect of noise, the broadcast sequence may follow immediately.
- NOTE 3: The XMN is ignored by the terminal except in computation of the BCC.
- NOTE 4: If the message contains a parity error, the terminal transmits a NAK which the central processor considers as a request for rebroadcast of the last transmission. If the Central Processor receives no response from the terminal, it times out (see procedure below) and may rebroadcast the message. Rebroadcasts are performed a specified number of times (may be zero) and, if no affirmative acknowledgement is received, the Central Processor records the error and terminates the broadcast mode with a EOT.

Time-Out-Recovery.

No response will ordinarily be the result of one of four conditions being present:

- a. The addressed terminal is not on line.
- b. The EOT, SOH, BSL and/or STX characters are corrupted.
- c. The address AD1, AD2, is corrupted, thereby preventing any terminal on line from recognizing the address.
- d. Corruption of the ETX character. When this happens all terminals unable to recognize an ETX will continue looking for an ETX or an EOT.

Since all machines on a line listen to a broadcast select message if the loss of the ETX character is responsible for the time out, all machines will be looking for an ETX or an EOT. The initial EOT of the next control message will return all terminals to the "ready to receive control message" state allowing recognition of a poll, select, fast select, etc., sent by the Data Center.

GROUP SELECT (GSL).

Group Select is a fast select of a group of terminals. The FSL character of the fast select procedure is replaced by the Group Address in this communications procedure. The Group Address, called the Group Select (GSL) character, may be any agreed upon character from ASCII modified chart columns 2 through 7. The address in the message is now the group address plus the individual address of one of the terminals in the group.

The Group Select character is assigned to the terminals at the time of installation in the same manner as the address is assigned.

Line Procedure.

Those terminals having the group address matching the one in the message will receive the message. Group Select overrides the terminal Local and Transmit modes, causing the terminal to automatically switch to the receive mode to accept the GSL message sounding the audible alarm. Only terminal AD1, AD2, of the group will respond with ACK or NAK as the case may be. ACK indicates the terminal whose address is AD1, AD2, GSL received the message correctly; NAK indicates the addressed terminal recognized an error in the procedure. If the reply is NAK, the Data Center may retransmit "n" times ("n" may equal zero). Figure 4-9 shows the character sequences used by the Group Select communications procedure.

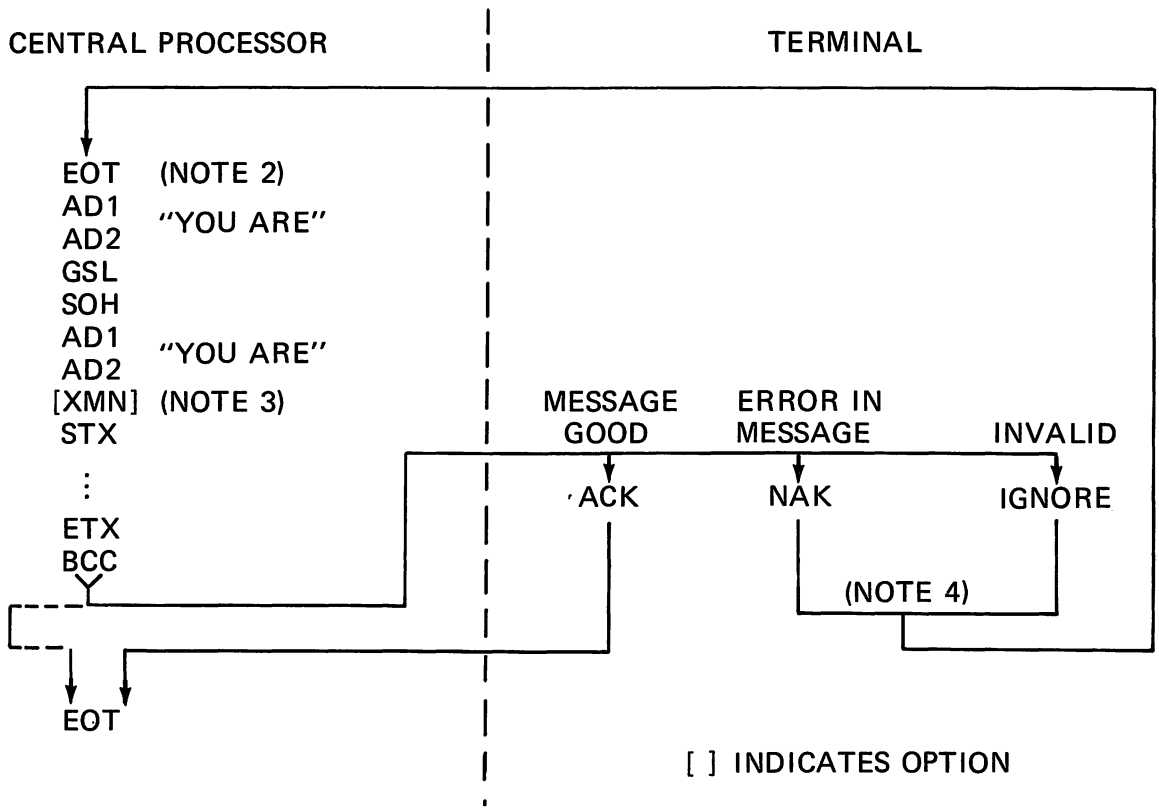


Figure 4-9. GROUP SELECT

(Note 1)

- NOTE 1: Group Select is a fast select of a particular group of terminals in a multipoint network. Each terminal may have a group address for which it will accept the GSL message. The terminal has the capability through internal adjustment to recognize any one of the 96 possible GSL character identifications from columns two through seven of the modified ASCII code chart. (See Appendix B.) The address characters AD1, AD2 are the address of the terminal selected to acknowledge the transmission for the group.
- NOTE 2: This EOT may have been the termination of a previous transmission sequence. To minimize the effect of noise the group selection may follow immediately.
- NOTE 3: The transmission number is ignored by the terminal except in computation of the Block Check Character.
- NOTE 4: If the message contains a parity error, the terminal transmits a NAK which signals the Central Processor to repeat the transmission. If the Central Processor receives no response from the terminal, it times out and may reselect the group. A reselect or repeat of a transmission takes place a specified number of times (may be zero) until an affirmative acknowledgement is received. If the group select limit is reached without receipt of an acknowledgement, the Central Processor times out, records the error, and terminates the procedure with an EOT.

Time-Out-Recovery.

If the terminal fails to respond, the Data Center should time out. No response will ordinarily be the result of one of four conditions being present:

- a. The Addressed (AD1, AD2, GSL) terminal is not on-line.
- b. The EOT, SOH, GSL, and/or STX characters are corrupted.
- c. The address AD1, AD2 is corrupted thereby preventing any terminal on-line from recognizing the two characters.
- d. The ETX character is corrupted. If the ETX character was lost the addressed terminal continues looking for the ETX or an EOT. Therefore, one of the following two methods should be used by the Data Center when recovering from a time out. These methods are based on the assumption that the time out occurred due to the loss of the ETX (condition 4).
 - 1) If the Data center wishes to address a terminal which belongs to the group of terminals which caused the time out, it may. The initial EOT of the control message will return all terminals in the group to the "ready to receive control message" state if condition 4

has occurred.

- 2) If the Data Center wishes to address another terminal on this same line but not belonging to the group which just caused the time out, it may proceed with the EOT, AD1, AD2, etc. The EOT of the sequence will return any terminals waiting for an ETX to the "ready to receive control message" state.

GROUP POLL (OPTIONAL).

The Group Poll procedure is an option of the standard multipoint procedure. The terminal has the capability of accepting an additional AD1, AD2 other than its terminal address AD1, AD2. The Group Poll address can be set by Field Engineering with characters selected from columns 2 thru 7 of the ASCII code chart (see Appendix B). If these group addresses are decoded during the standard poll procedure the terminal will respond by attempting to transmit an EOT character (indicating no traffic) or by transmitting a message if in the Transmit mode. Orderly transmission of data to the central processor by all terminals having the same group address is accomplished by the following:

- a. All terminals with the same group addresses must be on the same concatenation.
- b. A terminal with data to transmit will block propagation of the Request-to-Send and Clear-to-Send signals over the data set interface lines until released by a successful transmission to the central processor followed by the receipt of the ACK or EOT characters from the central processor.
- c. An EOT character will not be transmitted by any terminal detecting a Request-to-Send signal sent by any terminal more remote from the data set in the concatenation.
- d. No terminal will transmit anything until it receives, in response to its Request-to-Send signal, a Clear-to-Send signal from a terminal closer to the data set in the concatenation.

Data received by the central processor will be in order from the group closest to the central processor in the concatenation and ending with and EOT from the group member most distant from the central processor in the concatenation. Each message will contain the individual terminal's address characters (AD1, AD2). Upon receipt of an NAK character, retransmission will be via the standard poll procedure. Concatenated terminals with the same group address for group polling will be similar in their characteristics of the Request-to-Send/ Clear-to-Send response time.

The central processor may terminate a group poll sequence at any time by transmitting EOT in place of ACK. The Terminals remaining in the Group will not attempt to transmit and will retain their message until the next poll. The terminal waiting for the ACK character will retain its message for retransmission with the same transmission number during the next poll.

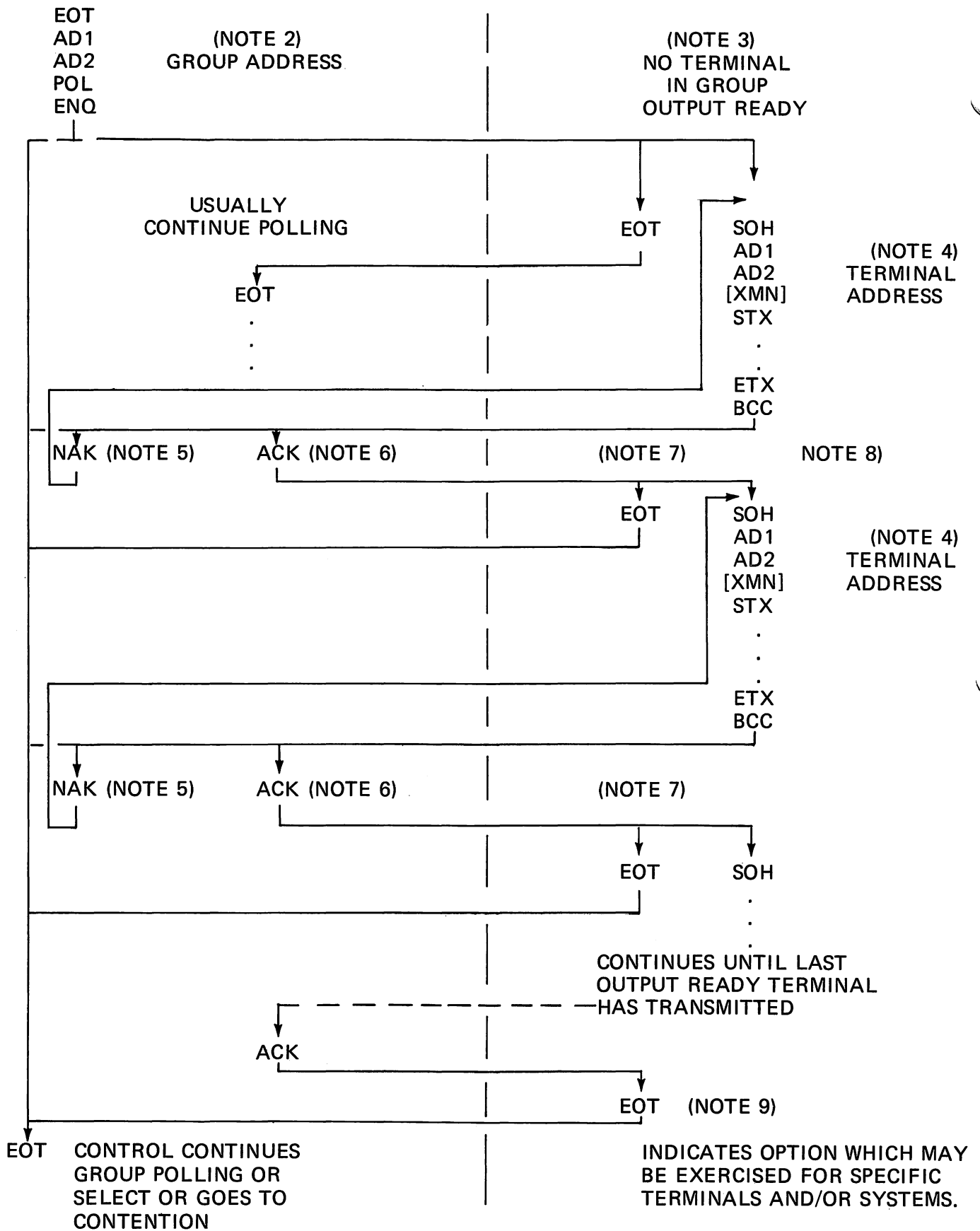


Figure 4-10. GROUP POLLING

(Note 1)

NOTE 1: This procedure is used to reduce the overhead in a network of terminals where several are located at one location on a common communication line. The receipt of one group poll will if no terminals are output ready, result in one response for the group. Thus, the control can pass to the next group. In periods of low activity, the control will be able to go through the polling list determining the output status of all terminals with but one poll to each location, not each terminal. Also, if multiple terminals are output ready at a location, they are allowed to transmit, in sequence, in response to one poll. Selecting, Broadcast, Fast Select, etc. are not affected by this group polling procedure. In a concatenation of terminals, if one of the terminals is removed because of downtime, etc., the loss of the missing terminals will have no effect on these procedures.

NOTE 2: In this procedure, the polling sequence follows the same format as a normal poll and uses the normal poll character. Group polling is controlled by addresses only. The group address is assigned to a group of concatenated terminals. Each member of the group shall respond to the group address as if the group address were its individual address.

NOTE 3: When the poll is received by the addressed group, each terminal connected to the data set via concatenation will prepare to answer the poll by raising the Request-to-Send signal line. The terminals which have a message ready for transmission will prepare their message; the terminals with no message will prepare to transmit EOT. In sequence, each terminal without the message traffic will sample the Request-to-Send signal line and, if a Request-to-Send signal from another terminal is detected, the terminal without message traffic will cancel its EOT response and will wait for the next EOT from the central processor.

NOTE 4: Each message sent in response to a group poll contains the address of the individual responding terminal. The responding terminal shall block the concatenated Request-to-Send and Clear-to-Send signals related to terminals more remote from the data set. These signals shall remain blocked from the more remote terminals until the responding terminal has completed its transmission and has received an ACK or EOT character from the central processor.

NOTE 5: If the central processor detects an error in the message received in response to a group poll, the NAK character will be transmitted, thereby, calling for a repeat of the transmission. This action can be repeated "n" times ("n" may be equal to zero), at which time, if the test fails, an error will be recorded at the central processor and an EOT character will be transmitted, terminating the transmission sequence. The terminal shall transmit the same message when next polled.

- NOTE 6: If the Terminal does not receive an ACK, NAK or EOT character it may retain its message and remain quiet. The central processor will timeout and transmit an EOT character, thereby, terminating the transmission sequence. The message will be retransmitted when next polled.
- NOTE 7: If no other terminals are output ready, EOT is sent. In some systems, the number of messages allowed to be sent from a group as a result of a single poll may be limited by system agreement. In this case, EOT may be sent by the CP in place of ACK even though other output-ready terminals may be in the group awaiting service. The terminal awaiting ACK will retain its message until the next group poll is received as will the remaining output-ready terminals.
- NOTE 8: As soon as an ACK character is received from the central processor, the next output-ready terminal will transmit.
- NOTE 9: When an ACK character is received from the central processor and no terminals are output ready, the last terminal in the concatenated group shall be responsible for transmission of the final EOT.

POINT-TO-POINT.

Point-to-Point is a line control discipline which allows two machines to communicate with each other on a strictly one-to-one basis. Because only two machines can be listening to a line at any given time, the addressing scheme is limited to identifying the sending unit only rather than the receiving unit as in multipoint disciplines. The TD 700/800 terminal is capable of two types of Point-to-Point Communication.

When using the switched line procedure, the stations contend for master status. The "calling" point assumes master status and the "called" point assumes slave status. At the conclusion of message transfer, the relative status may be reversed if the called terminal has a message to transmit. Master status may be passed back and forth until no further messages remain to be transmitted. The stations then "hang up" and the connection is broken. Any further transmission would require the transmitting station to "dial up" the station to which it wishes to transmit.

When using dedicated (or leased) lines, the two stations on the line contend for master status. When master status is established, the master station proceeds with message transfer. At the conclusion of any given message transfer, the stations return to the contention mode and either may obtain master status.

Switched_Line_Procedures.

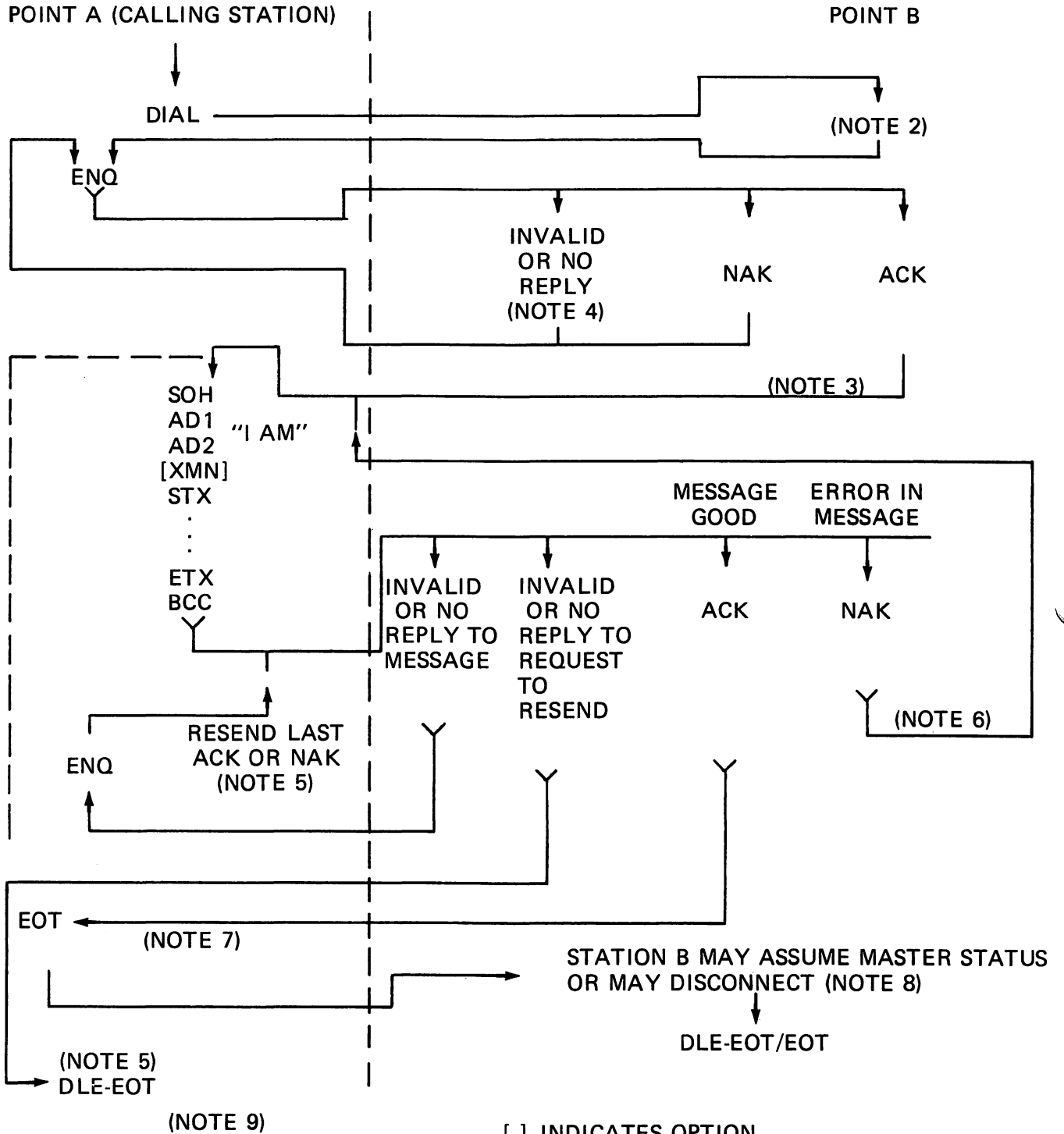


Figure 4-11. POINT-TO-POINT - SWITCHED.

(Note 1)

- NOTE 1: This procedure applies when a point-to-point link is established over switched lines.
- NOTE 2: The calling station is initially considered to be the master station and the called station is initially considered to be the slave station.
- NOTE 3: If the slave station is receive ready, it transmits an ACK. After detecting the affirmative reply, the master station transmits its message. If the slave station is not receive ready, it will transmit a NAK in response to the enquiry. The master station may then repeat its enquiry a specified number of times (may be zero). If no ACK is received, the master station proceeds to the mandatory disconnect.
- NOTE 4: If an invalid reply or no reply is received by the master station in response to its enquiry, the master station may repeat the enquiry a specified number of times (may be zero). If no ACK is received, the master station proceeds to the mandatory disconnect.
- NOTE 5: If the master station receives an invalid reply or no reply to a transmission, the operator may send a reply request character, ENQ by depressing the XMT key. This ENQ may be sent "n" times. This ENQ asks the slave to retransmit its last ACK or NAK. If the slave had received an invalid data message because of a bad control character and did not respond to the master, the slave will, at this point, transmit a NAK indicating that it did not receive a good data message. The master should then retransmit the data message. If the slave did respond to the original data message, it will repeat its response. If a valid acknowledgement is still not received, the master station proceeds to the mandatory disconnect to clear the connection.
- NOTE 6: If a slave receives a message for which character parity or block check tests fail, a NAK will be transmitted. The master will then repeat the transmission a specified number of times (may be zero) looking each time for an affirmative acknowledgement. If no acknowledgement is received before the limit of transmissions is reached, the master proceeds to the mandatory disconnect.
- NOTE 7: Once transmission from the master (calling) station to the slave (called) station is completed, the calling station may relinquish master status to the called station by sending an EDT. By exchanging EDT's, master status may continue to be interchanged and messages transmitted until at some point neither station has anything to transmit.
- NOTE 8: If the new master station (originally the called or slave station) has a message for the station which originally called it, the new master proceeds directly to the Message Transfer Sequence (beginning ENQ, top of figure 4-11). If the new

master has no message to transmit, it may either initiate the mandatory disconnect or transfer master status back to the other station by transmitting an EOT.

NOTE 9: Upon completion of a Message Transfer Sequence, the master station may omit the transfer of master status (EOT) and proceed directly to the mandatory disconnect.

Dedicated_Line_Procedure.

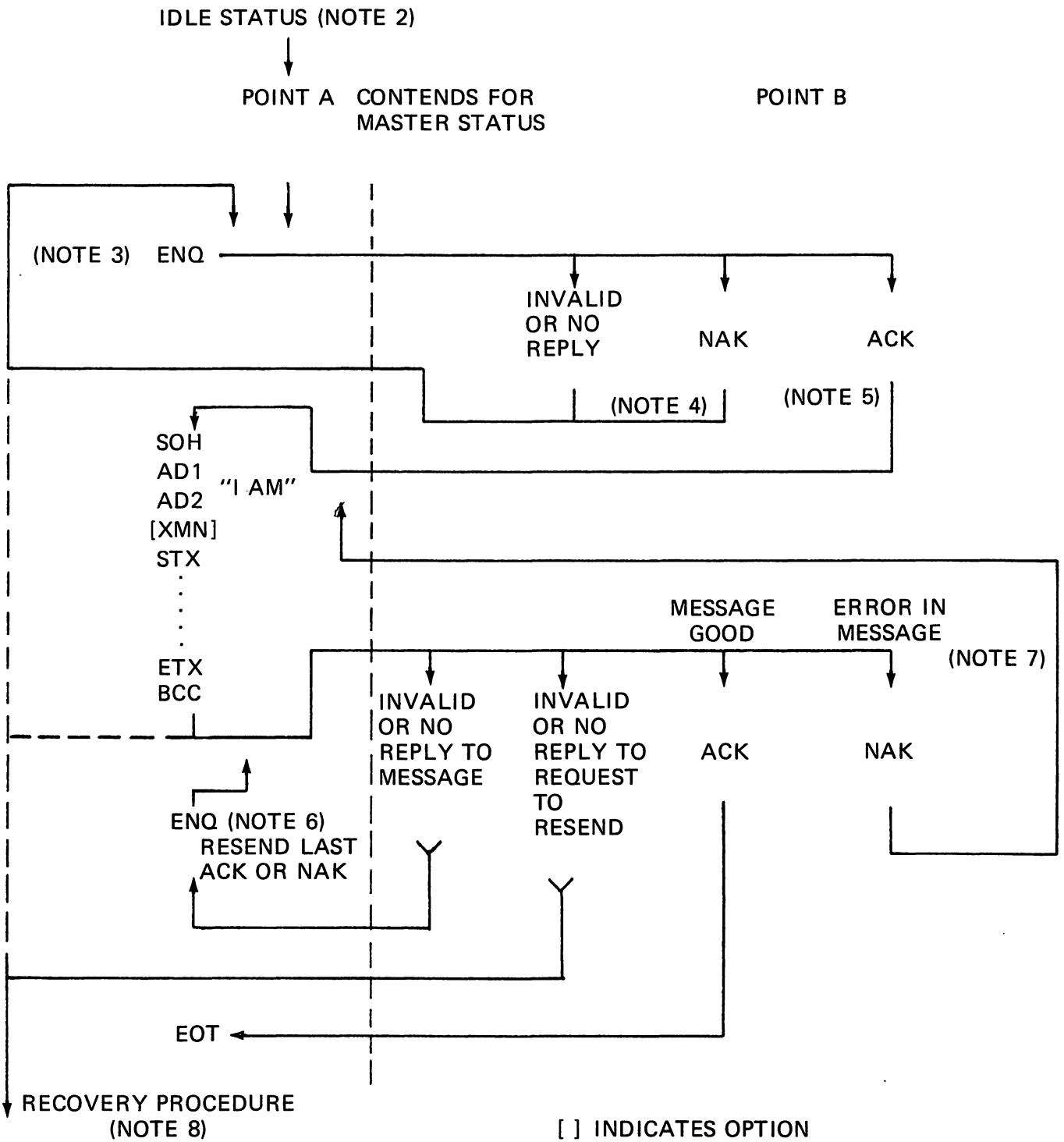


Figure 4-12. POINT-TO-POINT - DEDICATED.

(Note 1)

- NOTE 1: This procedure applies when there are two stations on a dedicated point-to-point link, with neither station designated as the master station. Both stations contend for master status by transmitting an ENQ and may seize it under the condition that the other station is not also contending for it at the same time. If master status is not obtained, the operator should simply reattempt the procedure by depressing the XMT key. The contention procedure determines the master/slave relationship of the two stations. A terminate function returns the system to the idle condition.
- NOTE 2: The idle condition on the communication link is the condition which follows the terminate function (EOT) of the previous transmission. In this condition, neither station has master status but either station may bid for it.
- NOTE 3: A station wishing to transmit, bids for master status by sending the enquiry character ENQ and beginning its time out function which is dependent upon the operator. The operator will reinitiate the bid after the time out interval if master/slave status has not been established. To resolve "simultaneous" bids by both stations which result in a garbled message ignored by both the operator should reattempt the procedure by depressing the XMT key.
- NOTE 4: In case of an invalid reply, no reply, or NAK to the initial ENQ character, the station bidding for master status reinitiates the bid by sending the ENQ character again (depressing the XMT key). The station operator may reinitiate any number of times, and if still unsuccessful exit to an error recovery procedure.
- NOTE 5: If Point B is ready to receive, it affirmatively acknowledges (ACK) the ENQ. Point A then assumes master status and proceeds with the message transmission.
- NOTE 6: If the master station receives an invalid reply or no reply to a message transmission, the operator may send an ENQ (which requests that the slave station retransmit its last ACK or NAK) by depressing the XMT key. This ENQ may be sent "n" times. If the slave had received an invalid data message and because of a corrupted control character did not reply to the master, it should now transmit a NAK causing the master to resend the data message. If the slave did respond to the original data message it will resend its last response. If, after sending the reply request once, a valid acknowledgement is not received, the master station will time out and exit to an error recovery procedure.
- NOTE 7: If the slave receives a message for which character parity or block check tests fail, NAK is transmitted calling for a repeat of the transmission. This process is repeated a specified number of times (may be zero), and if the tests

still fail, the master exits to the recovery procedure.

NOTE 8: Failure of Point A to achieve master status or failure of the master station to receive a valid response to a message results in transmission of an EOT to return the system to the idle state.

IBM 2260 COMMUNICATION PROCEDURES.

The TD 700/800 D/L2 has, as an option, the communication capability of the IBM 2260 polling and select procedures. These procedures operate at 1200 bps asynchronous or 2400 bps asynchronous. The data set used for this connection is the Burroughs Model TA 734-24, Western Electric Model 201 B, or equivalent.

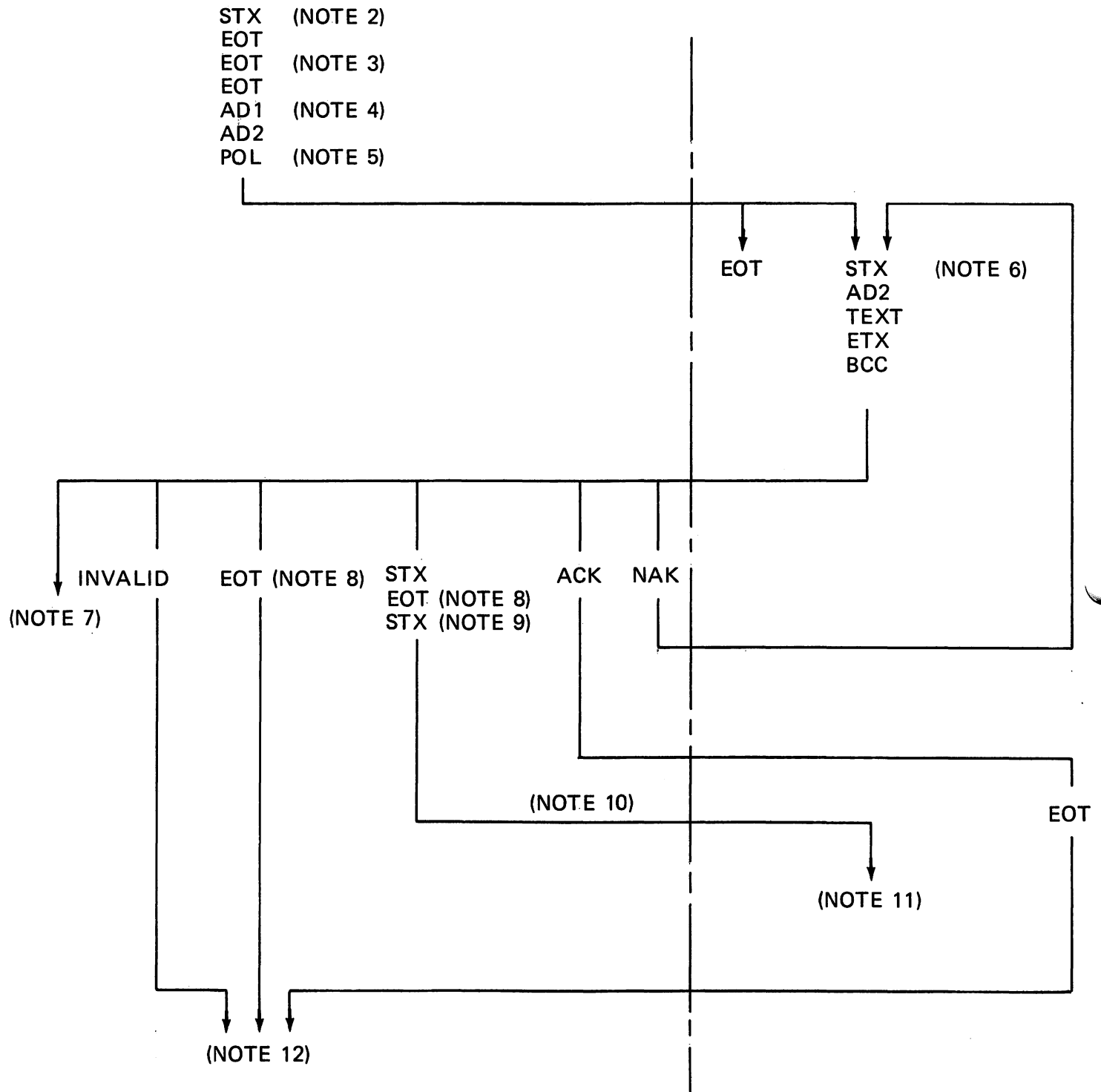


Figure 4-13. IBM 2260 POLLING PROCEDURE

(Note 1)

- NOTE 1: The interface to the System 360/370 is via an IBM 2701 Data Adapter Unit with a type III Terminal Adapter. The IBM 2260 Display Terminal operates only over leased lines.
- NOTE 2: This STX character may or may not be present in the polling sequence. The determining factor is the 360/370 environment in which the terminal is operating. Therefore, the capability of accepting a polling sequence consisting of multiple characters with the STX or without the STX is essential. See note 4 for valid poll or select sequence. The characters in a polling sequence may or may not be contiguous depending on the IBM system environment.
- NOTE 3: The number of EOT characters that precede the address may be either 3 (as shown) or greater. The terminal will be able to operate in either environment.
- NOTE 4: The polling sequence consists of a 4 character sequence starting either with EOT or SOH followed by AD2, AD2 and the ASCII control character for poll (space) column 2, row 0. It may be preceded by a variable number of characters which are ignored.
- NOTE 5: AD1, AD2 can be represented by any characters in the ASCII set column 2, row 0 through column 7, row 14.
- NOTE 6: The data message sent to the IBM 360/370 must begin with the STX character followed by the AD2 value of the terminal.
- NOTE 7: At this point, the terminal should also be receptive to a new poll or select sequence. The terminal will retain the message and retransmit on the next poll.
- NOTE 8: The number of EOT characters may be either 1 (as shown) or greater. The terminal will be able to operate in either environment.
- NOTE 9: This STX character must be present and may be the start of another poll or select sequence.
- NOTE 10: The most widely used reply in a Burroughs terminal network would be the ACK character. However, the STX-EOT and STX-EOT-EOT-EOT character sequences are allowed in an IBM 2260 environment, and would probably be the required reply in a mixed IBM 2260/Burrough Terminal System.
- NOTE 11: If an acknowledgement that ends with EOT is received, the terminal will remain quiet and wait for a new poll or select. In either case the terminal considers the transmission successful.
- NOTE 12: At this point, the central computer may poll the terminal, poll another terminal, select the terminal, or select another terminal.

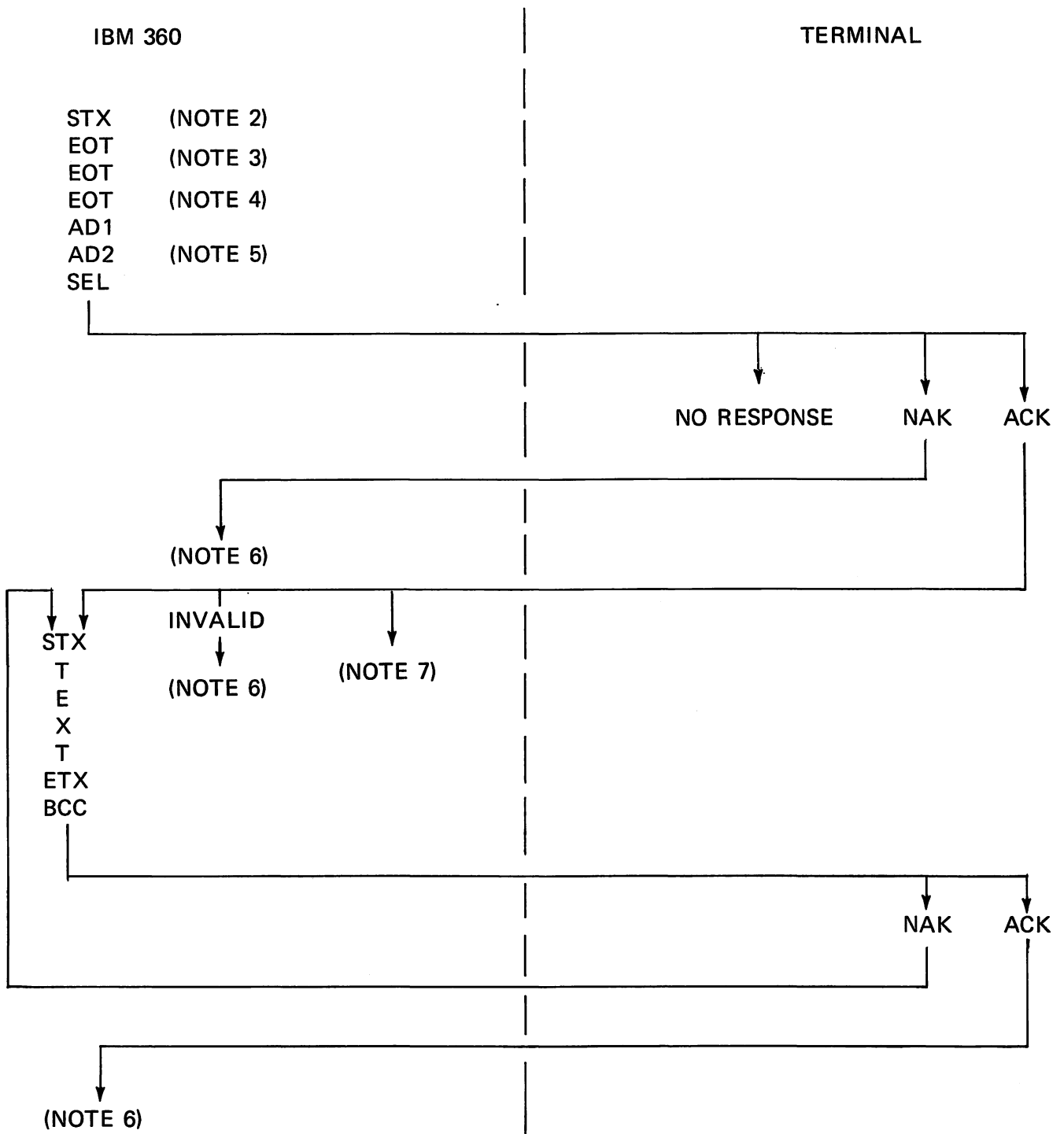


Figure 4-14. IBM 2260 SELECTING PROCEDURE

(Note 1)

- NOTE 1: The interface to the System 360/370 is via an IBM 2701 Data Adapter Unit with a type III Terminal Adapter. The IBM 2260 Display Terminal operates only over leased lines.
- NOTE 2: This STX character may or may not be present in the selecting sequence. The determining factor is the 360/370 environment in which the terminal is operating. Therefore, the capability of accepting a polling sequence consisting of multiple characters with the STX or without the STX is essential. The characters in a selecting sequence may or may not be contiguous depending on the IBM system environment.
- NOTE 3: The number of EOT characters that precede the address may be either 3 (as shown) or greater. The terminal will be able to operate in either environment.
- NOTE 4: The selecting sequence consists of a 4 character sequence starting either with EOT or SOH followed by AD1, AD2, and the ASCII control character for select (Q) column 4, row 0. It may be preceded by a variable number of characters which are ignored.
- NOTE 5: AD1, AD2 can be represented by any characters in the ASCII set column 2, row 0 through column 7, row 15. If ASCII character DEL is used in the AD2 position in a selection sequence, a broadcast function will result with one device being charged with reply responsibility. In Broadcast Select all terminals with the same AD1 address must be grouped on the same concatenation (see page 4-16). All terminals with power on will receive this message. A field installable modification will limit the reception to only the group defined by AD1.
- NOTE 6: At this point, the central computer may poll the terminal, select the terminal, or select another terminal.
- NOTE 7: At this point, the terminal should also be receptive to a new poll or select sequence.

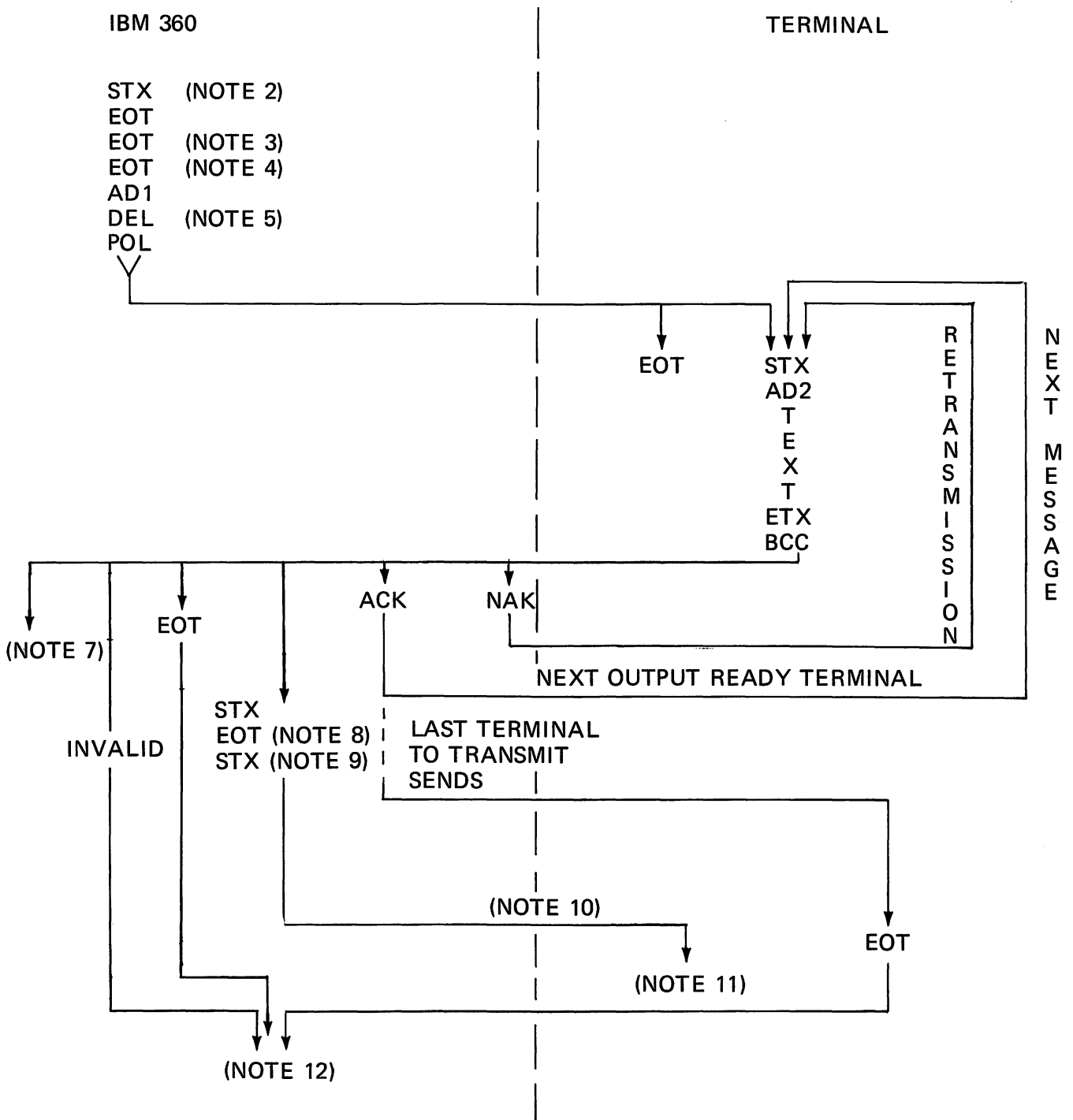


Figure 4-15. IBM 2260 GROUP POLLING

(Note 1)

- NOTE 1: The interface to the System 360/370 is via a 2701 with type III terminal adapter. The IBM 2260 Display Terminal operates only over leased lines.
- NOTE 2: The STX character may or may not be present in the group polling sequence. The determining factor is the 360/370 environment in which the terminal is operating. Therefore, the capability of accepting a group polling sequence consisting of multiple characters with the STX or without the STX is essential. See Note 4 for valid poll or select sequence. The characters in a polling sequence may or may not be contiguous depending on the IBM system environment.
- NOTE 3: The number of EOT characters that precede the address may be either 3, as shown, or greater. The terminal will be able to operate in either environment.
- NOTE 4: The group polling sequence consists of a 4 character sequence starting either with EOT or SOH followed by AD1, DEL. It may be preceded by a variable number of characters that are ignored.
- NOTE 5: AD1, can be represented by any character in the ASCII set Col. 2, Row 0, through Col. 7, Row 15. When ASCII character DEL is used in AD2 position a group polling function will result with one device being charged with reply responsibility. Any terminal which has as its AD1 character that used in the group poll sequence can reply. Using the standard group polling hardware an order of priority of response will be established and on receipt of ACK for the just sent message the next output ready terminal will transmit. Each terminal will insert in the message that it transmits its own individual AD2 identification. All terminals with the same AD1 address must be grouped on the same concatenation (see page 4-16).
- NOTE 6: The data message sent to the IBM 360/370 must begin with the STX character followed by the AD2 value of the individual terminals.
- NOTE 7: At this point, the terminal should also be receptive to a new poll or select sequence. The terminal, and all others waiting, will retain the message and XMT it on the next poll.
- NOTE 8: The number of EOT characters may be either 1 (as shown) or greater. The terminal will be able to operate in either environment.
- NOTE 9: This STX character must be present and may be the start of another poll or select sequence. This terminal will remain quiet and become receptive to a selection. All others waiting will retain their message and XMT it on the next poll.

NOTE 10: The most widely used reply in a Burroughs terminal network would be the ACK character. However, the STX-EOT and STX-EOT-EOT are valid replies in a 2260 environment and in a mixed 2260/Burroughs terminal system would probably be the required reply. To develop a true look-a-like interface, the capability of accepting any of the listed responses must be included.

NOTE 11: If an acknowledgement is received that ends with EOT, the terminal will remain quiet and wait for a new poll or select. In either case the terminal considers the transmission successful.

NOTE 12: At this point the central computer may poll the terminal, poll another terminal, select the terminal or select another terminal.

SECTION 5

ENVIRONMENTAL CHARACTERISTICS

GENERAL DESCRIPTION.

This section deals with the TD 700/800 power supply electrical characteristics, temperature/humidity range and barometric pressure range.

POWER SUPPLY.

The power supply is part of the Control subsystem and is mounted within the control unit of the TD 700/800 terminal. The power supply provides all necessary direct current, regulated voltages to the terminal. The DC power is generated from the AC input line voltage and is derived from a single transformer. The primary side of the transformer is capable of adjustment to accept a number of discrete values of AC line voltages typical of both the domestic and international markets. Output voltages are not adjustable by Field Engineers. The load is continuous with a 100% duty cycle. One ON/OFF switch controls all outputs of the power supply.

ELECTRICAL CHARACTERISTICS.

TA = +25 C unless otherwise specified.

TD 700 OUTPUTS:

Nominal Voltage	Regulation	Current Capacity (Amps)
+5.1	±2.5%	8.0
+12	±2.5%	0.175
+30	±5%	0.04
-12	±2.5%	1.0
-250	±2.5%	0.08

TD 800 OUTPUTS:

Nominal Voltage	Regulation	Current Capacity (Amps)
+5.1	±2.5%	8.0
+12	±5%	0.175
+16	±5%	0.6
+19	±2.5%	0.01
-12	±5%	1.0

INPUT VOLTAGE.

Single phase, 50 and 60 Hz \pm 1%, with taps for 100, 110, 115, 120, 127, 200, 208, 220, 230, 240 VAC, \pm 10% with three wire input including separate earth ground.

PROTECTION.

Each output has over voltage protection. There are appropriate fuses for each output voltage on the ID 700. Output sensing is provided for the loss of +5.1V, in order to protect the display panel.

TEMPERATURE AND HUMIDITY RANGE.

Operating Environment:

ID_700

32 to 140 deg. F
(0 to 60 deg. C)

10% to 90% relative humidity

ID_300

32 to 140 deg. F
(0 to 60 deg. C)

10% to 90% relative humidity

Nonoperating Environment:

-29 to 158 deg. F
(-34 to 70 deg. C)

10% to 90% relative humidity

32 to 158 deg. F
(0 to 70 deg. C)

10% to 90% relative humidity

BAROMETRIC PRESSURE RANGE.

Operating Environment: 20 to 32 inches of mercury (50 to 80 cm Hg)

Nonoperating Environment: 10 to 32 inches of mercury (25 to 80 cm Hg)

APPENDIX A -

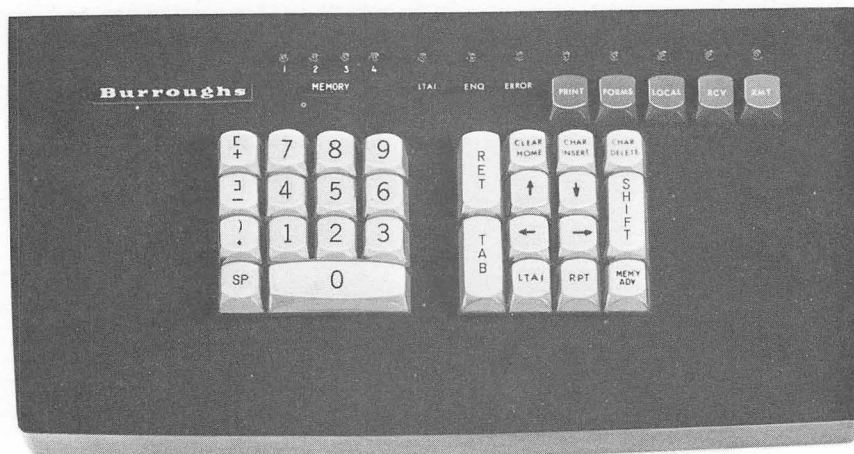
KEYBOARD.



ALPHANUMERIC KEYBOARD



SOURCE DATA KEYBOARD



TEN KEY KEYBOARD

APPENDIX B -

CODE CHART.

AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII)

MODIFIED

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

APPENDIX C -
DISPLAY CHARACTERISTICS.

The TD 700 display characteristics are as follows:

Dimensions	14.5 inches (36.8cm) X 9.4 inches (23.9cm) X 2.2 inches (5.6cm)
Weight	7.5 pounds (3.402 kilograms)
Character capacity	256
Panel viewing area	9.2" (23.4cm) X 3.4" (8.6cm)
Character size	0.20" (5.1mm) wide, 0.28" (7.1mm) high
Dot diameter	0.024" (.61mm)
Center to center dot spacing	0.040" (1.0mm)
Character spacing	2 blank columns of dots between successive characters
Register spacing	3 blank rows of dots between successive rows
Scanning rate	85 Hz (cycles/second) minimum
Flicker	none observable
Average brightness (unfiltered)	25 ft - lambert, typical
Contrast ratio	20:1 (approximate)
Color	Red-orange characters on dark background
Viewing angle	100 deg. F minimum
Geometric distortion	none
Linear distortion	none
Focusing	none required
Shifting	none

The TD 80C display characteristics are as follows:

Dimensions	14.8 inches (37.59cm) X 16.4 inches (41.66 cm) X 18.2 inches (46.23cm)
Weight	75 pounds (34 Kilograms)
Display medium	CRT monitor, television scan
Character capacity	960 1920
Text format (char/row)	80 80
Rows	12 24
CRT size	12" (30.5cm) diagonal, 74 sq inches (930.25 sq.cm)
Display screen size	9.5" (24cm) wide X 7.5" (19cm) high
Character size	0.09" (2.3cm) wide, 0.2" (5.1cm) high
Character format	5 X 7 dot matrix
Character spacing	2 blank columns of dots between successive characters
Register spacing for 960 characters	13 blank dot rows between successive rows
Register spacing for 1920 characters	3 blank dot rows between successive rows
Refresh rate	60 Hz or 50 Hz, (input line frequency)
Flicker	none observable
Display brightness	50 ft lambert, max.
Contrast ratio	20:1 (approximate)
Color	white - P4 phosphor, aluminized
Viewing angle	100 deg. F minimum

NOTES



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Business There's*



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