# USER'S MANUAL
for
# DELTA 5000 FAMILY
of
# VIDEO DISPLAY TERMINALS

Delta Data Systems

**Delta 5000**

Woodhaven Industrial Park, Cornwells Heights, Pa. 19020 • Phone (215) 639-9400

*price* **$5.00**

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MODEL G




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# CHAPTER 1

# INTRODUCTION

## GENERAL

Delta 5100 and 5200 (Figure 1-1) make up a complete family of stand alone Video Display Terminals. Basically, each Delta 5000 is a keyboard and a visual display. The keyboard is used by the operator for composing messages for transmittal to an external source. The visual display is used by the operator during message composition and also for displaying messages generated by an external source. The Delta 5000's can economically be used for data retrieval, data preparation, inquiry-response systems, batch terminals, and other applications where a man-machine interface is important to the user.

## PHYSICAL DESCRIPTION

Each Delta 5000 consists of a single unit housing a keyboard, a display monitor and a controller. The assembly is 16 inches high, 18 inches wide and 27 inches deep and weighs approximately 100 pounds. With the single unit construction, the user need not find additional locations for more than one component of the terminal where limited desk space is a requirement. Optionally available is a Delta 5000 with a separate housed keyboard. Should it be a requirement to have the display remote from the keyboard, DELTA DATA SYSTEMS can fulfill this requirement.

## FUNCTIONAL DESCRIPTION

The Delta 5000 has a display capacity of 80 character positions on a line and 27 lines. Each character is made from a 7 x 9 dot matrix and a video scanning technique is used to display information. This 7 x 9 dot matrix allows for an extremely readable character set in either upper or lower case. Each Delta 5000 employs several standard features which implement an effective interface between operator and an external source, such as a computer, communications line, or another peripheral device.

These features are as follows:

* A familiar teletype/typewriter style keyboard.
* The ability to blink selected information on the screen.
* The ability to format information on the screen.
* The ability to page information on the screen. (PAGING is a unique innovation developed by DELTA DATA SYSTEMS CORPORATION which permits the local storage and access for the possible display of more lines of data than can be displayed on the screen at one time).

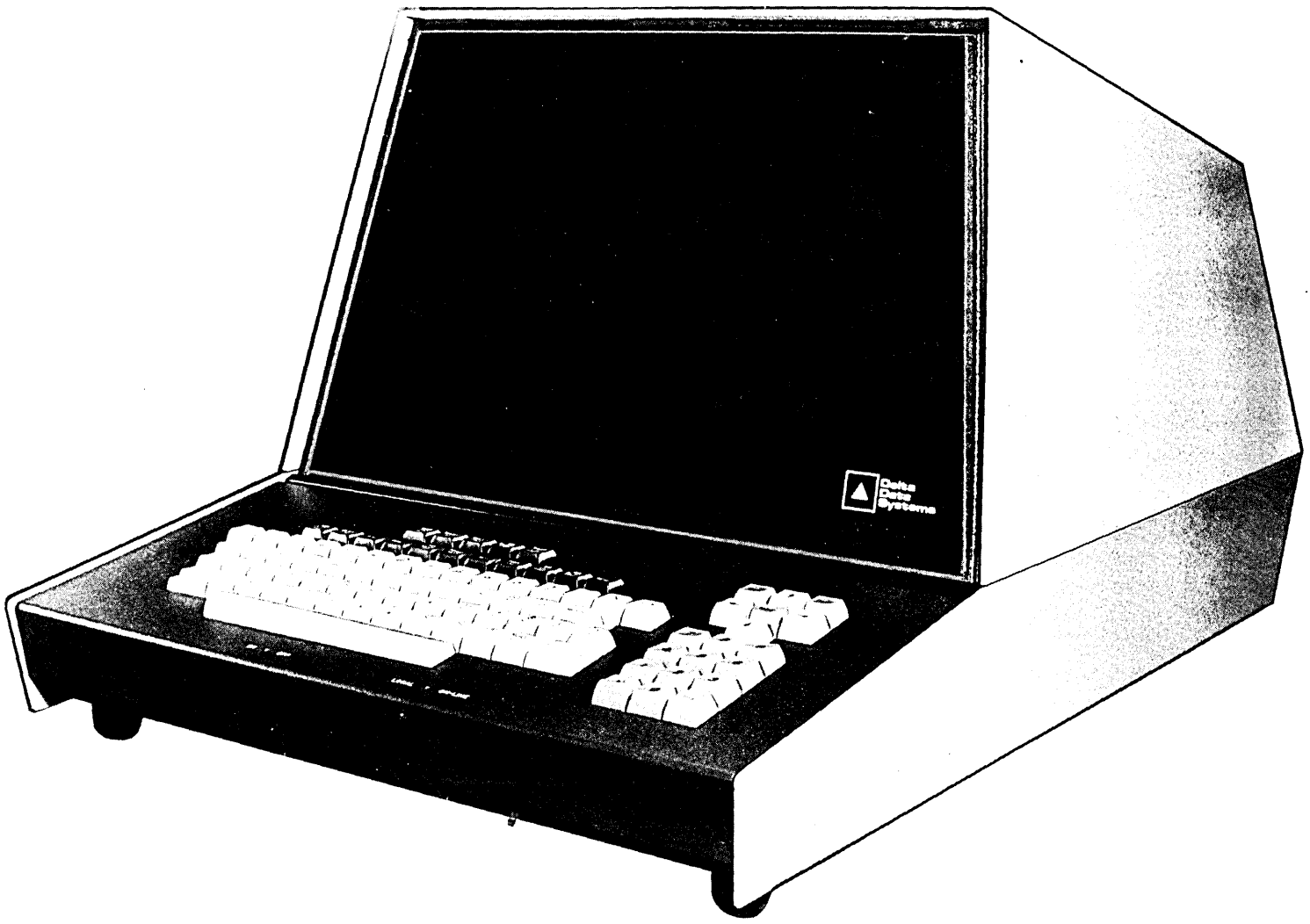



Figure 1-1. Delta 5000, 5100, 5200, 5300

* The ability to address any portion of displayed data.

* The ability to tabulate or jump the cursor to the start of a variable data field in the Format mode.

* Rapid cursor (position marker) movement in any direction.

* Separate numeric portion of the keyboard for rapid keyboard entry of numeric data.

DELTA 5000 FAMILY

The Delta 5000 family consists of Delta 5100, Delta 5200 and Delta 5300 which have the above described features. The unique features of each terminal in the Delta family are as follows:

Delta 5100. Delta 5100 is software and plug-to-plug compatible with a teletypewriter. Delta 5100 is characterized by asynchronous serial communications in which data is transferred one character at a time i.e., every character is transmitted as it is typed by the operator and every incoming displayable character is displayed as it is received. Operation may be in echo or half duplex mode. The input and output signals are in accordance with EIA and CCITT V 24 requirements and are USASCII coded. In addition to the serial communications interface which is character oriented, a parallel party line interface is optionally available which is message oriented. This party line interface may be connected to other remote peripherals. Also, optionally available for Delta 5100 is the block mode transfer capability which is in addition to the character-by-character transfer.

Delta 5200. Delta 5200, in addition to providing character-by-character transfers as Delta 5100, is capable of block (message or memory) data transfers. With block data transfers, Delta 5200 is capable of manipulating data prior to transmission. This allows complete editing of information on the screen prior to transmission. Delta 5200 also has optionally available the party line interface. An additional separately housed controller (MultiTerm 2) makes Delta 5200 completely compatible with the IBM 2260/2848 Display Complex for cluster environment. An IBM 2701 Data Adapter Unit equipped with the IBM Terminal Adapter Type III is required to interface the IBM System/360 with MultiTerm. In addition, MultiTerm 2 requires a modem to interface with the IBM System/360.

Delta 5300. Delta 5300 is a Delta 5200 with a separate controller that is IBM 2265/2848 compatible. It is used in a Stand Alone environment.

## DELTA 5000 SPECIFICATIONS

| | |
|---|---|
| Characters Per Line | 80 |
| Lines Per Display | 27 |
| Character Repertoire | 64 character standard, 96 character upper/lower case optional. Line drawing set not with upper/lower case. (Optional) |
| Character Generation | 7 x 9 dot matrix. |
| Character Code | USASCII |
| CRT Type | T.V. Monitor |
| CRT Size | 14 inch diagonal |
| CRT Phosphor | P31 (Green) |
| Refresh Rate | 60 times per second (50 times per second for 50 Hz units). |
| Memory Size | 1023, 2047 or 3071 characters. |
| Erase Capability | Clear message, memory, line, character. |
| Format Capability | Any character on the screen may be fixed or variable data. Only the variable data is cleared or transmitted. |
| Blink Capability | Any character or groups of characters on the screen may be made to BLINK at a rate of 2 times per second. |
| Transmit Capability | Full or half duplex. |
| Margin | |
| Delta 5100 | Bell sounds at 64th character position. |
| Delta 5200 | Adjustable bell anywhere on the line. |
| Tab Set (Delta 5200 Only) | Set TAB to any 5 positions (6 if margin not used) on a line. |
| Tab Clear | Clears all Tabs and Resets Margin to position 64. |

| | |
|---|---|
| Input/Output Communications | ATT 103, 201, 202 or equivalent data set, acoustic coupler. Up to 600 baud standard, up to 4800 baud optional with 3071 memory or less and up to 9600 baud optional, asynchronous with 2047 memory or less. |
| Party Line | 7 data lines, plus control lines. At up to 50,000 characters/second in the optional DMA Mode. |
| Serial | Bit serial at rates up to 9600 bits per second. RS232C and CCITT V 24 compatible. (600 baud standard, higher baud rates are optional). |
| Paging | Ability to move displays into memory above and below the present displayed information. |
| Cursor Type | Blinking underline. |
| Cursor Control Keys | Up, Down, Left, Right, Tab, Home. |
| Operating Temperature | 0 to 50 degrees Centigrade. |
| Input Power | 115 ± 10% V.A.C., 60 Hz ± 1 Hz or<br>230 ± 10% V.A.C., 50 Hz ± 1 Hz |
| Power Requirements | 350 Watts |
| Overall Dimensions | |
| One-piece housing | 27 inches deep<br>18 inches wide<br>16 inches high |
| Separate Keyboard | 9 inches deep<br>18 inches wide<br>5 inches high |
| Separate Display | 20 inches deep<br>18 inches wide<br>16 inches high |
| Weight | 100 pounds (approximately) |

## OPTIONS AND PERIPHERAL EQUIPMENTS

Several options and/or peripheral equipments are available for the Delta 5000. These include:

1. PARTY LINE INTERFACE. The party line interface allows other peripheral devices and special interfaces to be easily attached externally to the Delta 5000. The System's user will find it extremely valuable in applications where he has to interface to the Delta 5000 in a mode other than a communications mode. The party line offers the Delta 5000 display terminal great flexibility.

2. LINE DRAWING. All the Delta 5000's can have the ability to do line drawings. This enables the Delta 5000 to draw solid, vertical and horizontal lines, intersections, corners and special symbols. These line drawing concepts are extremely valuable in creating forms for ease of operator identification. The form is something personnel are used to working with and the Delta 5000's ability to put this on the screen adds to the flexibility and capability of the Delta 5000. Another unique application of the line drawing option is in the process control field where on-line diagrams are required for flow charting of processes.

3. 96 CHARACTER SET. This option adds a lower case capability to the Delta 5000 units. The use of the 7 x 9 dot matrix makes the lower case very readable. This has great applications in text editing where it is important to see on the screen what is to be placed onto the paper.

4. HIGH SPEED TRANSMISSION. The Delta 5000 has the optional capability of serial communications at rates of:

Up to 2400 baud or

Up to 9600 baud - with 2K memory or less.

The above are all asynchronous data rates using internal or external clocks and they are the maximum speeds within an option, lower speeds remain available within a given option range.

5. PERIPHERALS. The following peripherals are capable of operation with the Delta 5000.

Cassette Recorders

Printers

Acoustic Couplers

Modems

6. DIRECT MEMORY ACCESS. The direct memory access (DMA) is optionally available when the party line interface option is used. With this option, peripheral devices or a computer connected to the party line may directly read from or transmit to the Delta 5000 the entire contents of memory at a rate up to 500,000 7-bit characters per second, asynchronous.

7. DUAL RS232 - This allows an RS232, RO Printer to be connected to the Delta 5000. On hitting the "Print" button information will go from the Delta 5000 memory to the printer, but not out to the communications line. This option is available on Delta 5100 if the block transfer option is included.

# CHAPTER 2

# PRINCIPLES OF OPERATION

## BLOCK DIAGRAM DESCRIPTION

The function of the Delta 5000 as shown in Figure 2-1 is to serve as the interface between the operator and a central processor (via communication lines) and if the party line option is utilized with other peripheral devices. To perform this function effectively, the Delta 5000 must accept data from and transfer data to the operator, the central processor, and if used, the peripheral device(s). As shown in Figure 2-1, a common party line bus allows any one of these devices or a combination of (e.g., the keyboard and the computer) may be used to initiate or control data transfers. Thus, all I/O transfers to and from the Delta 5000 are processed over the party line I/O bus. The accepted party line data is checked for additions, deletions, and format changes by an I/O control. While the inputting, outputting, storage, editing is done in a binary code compatible with standard communications line interfacing, the data is presented to the operator in English alphanumerics. The operator is able to enter and edit data in familiar terms. To perform these operations, the Delta 5000 utilizes both digital and analog internal circuitry.

The input/output (I/O), editing, and storage (memory) operations are implemented with digital circuits. The digital language employs the American Standard Code for Information Interchange (ASCII) code which uses a 7-bit data word. Chapter 6 shows the complete Delta 5000 ASCII code tables. The CRT translation and video section translates the ASCII code to analog voltages and currents which drive the CRT. The analog signals cause the English alphanumeric equivalents of the ASCII code characters, which are stored in memory, to be displayed on the CRT screen. Based on the screen display, the operator can enter data, initiate editing operations, and control the keyboard, which provides a 7-bit ASCII output code or code sequence for every key. Operational features, which can be performed by each Delta 5000 are described below:

BLINK (See Chapter 4 for details of operation)

The selective blink features permit the keyboard or an external source to call attention to important information displayed on the screen. Such information blinks on and off at a rate of approximately two times per second. The operator's eye is captured by the blinking and he can take appropriate action to acknowledge receipt of such information. The "Blink Start" character will cause all information following the Blink Start to blink, until a "Space" is detected or a "Stop Blink" character is detected or Carriage Return. In the Format mode, blinking will also end where the end of a variable field is detected. This means that if a given word or a given set of numbers is required to blink, only one character is required to both start and stop the blinking.

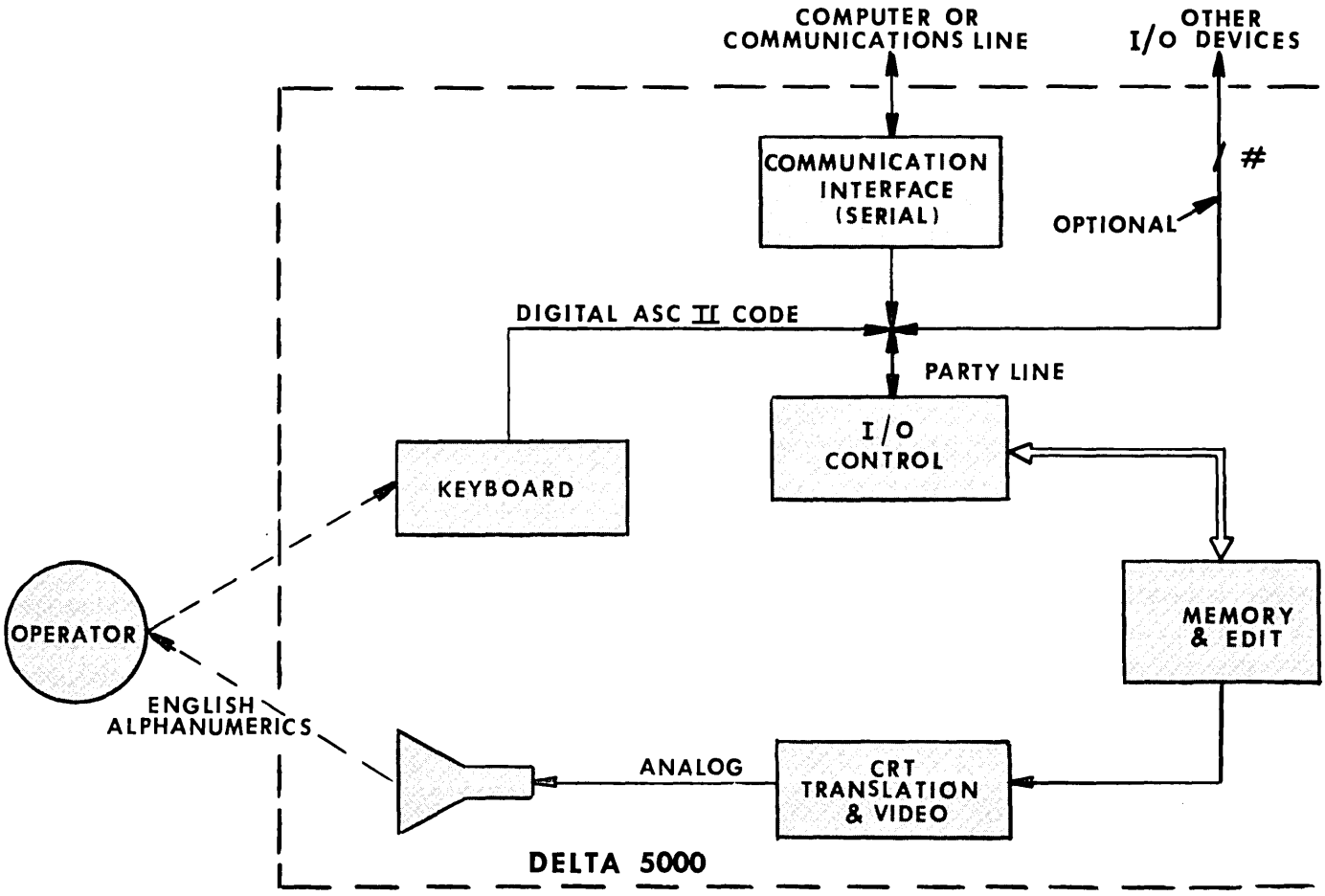



FIGURE 2-1 DELTA 5000 DATA FLOW

This reduces software and the amount of information required to be transmitted over the communications line. Any position in memory may be set into the Blink mode. Blink Start and Stop characters are stored in memory but not displayed.

The blinking characteristic is extremely important in applications such as process control, computer aided education, airline departure and arrival systems, law enforcement and stock applications. The blink characteristic is an unquestionably valuable tool in bringing the attention of the operator or user to specific information on the screen.

FORMAT (See Chapter 4 for details of operation)

The Format mode is designed to simplify the man-machine interface. The Format mode allows information to be put in a pre-established format on the screen, with fixed data fields and variable data fields. The "Tab" is used to position the cursor to the next variable data field. When looking at a formatted screen, the variable data fields may be identified by dotted underline. No information can be written over a fixed data field when in the Format mode. Clearing of the screen in the Format mode will only clear the variable information, leaving the format on the screen.

The format capability has great importance in inventory control, invoicing and general data entry systems. It is important because the operator gets a clear picture of what is required in the way of information and yet he does not have to worry about clearing this information or transmitting this information to the computer. The operator has easy access to the data fields.

The Format mode also has great capabilities in automatic test systems and in Process Control where fixed header information is entered onto the screen and then the variable unknowns are put onto the screen as they are accessed. This allows for ease of input, as "TAB" from computer will move cursor to next position for entering data. This minimizes the need to do "cursor addressing" and incrementing.

PAGING (See Chapter 4 for details of operation)

The Delta 5000 has a unique capability called PAGING. PAGING allows the terminal to store more information than can be presented on the display at any one time. Through PAGE UP or PAGE DOWN operation, the display can access all the information that is in the terminal in one line increments, allowing the display to look like a window looking over the entire memory. The PAGING concept will allow the operator to store as much information as the memory capacity at the Delta 5000 and then transmit a total memory or a message at a time to the computer. All space to the right of a

Carriage Return does not require refresh memory storage. For example, if the user has 3071 characters of memory and puts an average of 20 characters on a line, he is able to have a total of 153 lines of data stored at the terminal. He can look at any of these lines, 27 lines at a time, make corrections and then transmit the total information.

PAGING is a new concept not previously available in displays. It allows the operator to store as many lines of data at the terminal as required to use up the memory. The PAGING concept allows the user to receive more than one display screen of information at a time from a remote source and does not require a storage device, such as cassette recorder to hold an extra number of lines of data. PAGING also allows the user to verify more than just one screen of information prior to transmission, so that when transmission does take place, more information may be passed back and forth at one time, without the use of a Cassette Recorder.

The PAGING feature is valuable when working with lists of Bills of Material or other lists where the page of data is not always equal to the display size.

EDITING (See Chapter 4 for detailed operation)

The Delta 5200 has the ability to do complete editing operation. It can insert or delete on a line or character basis. By placing the cursor at various points on a line parts of lines, can be inserted or deleted.

# CHAPTER 3

## CONTROLS AND INDICATORS

### OPERATOR CONTROLS AND INDICATORS

The controls for initial set-up of the Delta 5000 and indicator lamps which indicate the mode of operations are shown in Table 3-1. Figures 3-1 and 3-2 show the location of these controls and indicators.

TABLE 3-1. Controls and Indicators

| CONTROL OR INDICATOR | FUNCTION |
|---|---|
| ON/OFF power Toggle Switch | When in the ON position, provides primary power to Delta 5000 equipment. The logo on the display illuminates to indicate power is applied. |
| LOCAL/ON LINE Toggle Switch | When in the LOCAL (off-line) position, disables the communications interface from transmitting or receiving data, and illuminates the LOCAL indicator lamp on the front of the unit. In the ON LINE position, enables this operation and illuminates the ON LINE indicator lamp on the front of the unit if the modem is also ON LINE. (Carrier is present). |
| BELL (ON/OFF) | When in the ON position, enables the bell operation. In the OFF position, inhibits the bell operation. The bell will sound as the switch is set to the OFF position. |
| DUPLEX (HALF/ECHO) switch | Used in TTY Mode only. When in the HALF DUPLEX position, data is both entered on the screen and sent to the communications interface. In the ECHO DUPLEX position, data is only sent to communications interface and must be echoed back to be displayed. |
| PARITY (ODD/EVEN/NONE) 3-position Switch Optional) | Selects odd, even or no parity in the communications interface equipped with the parity option. |

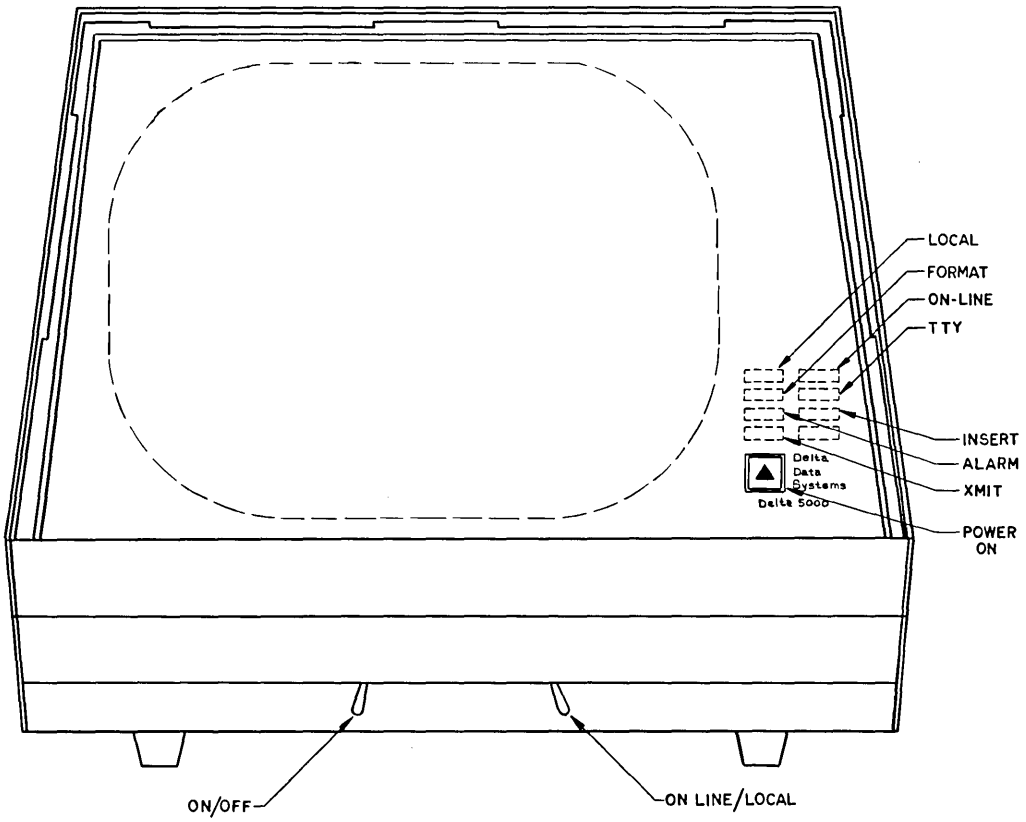



FIGURE 3-1. CONTROLS AND INDICATORS, FRONT VIEW

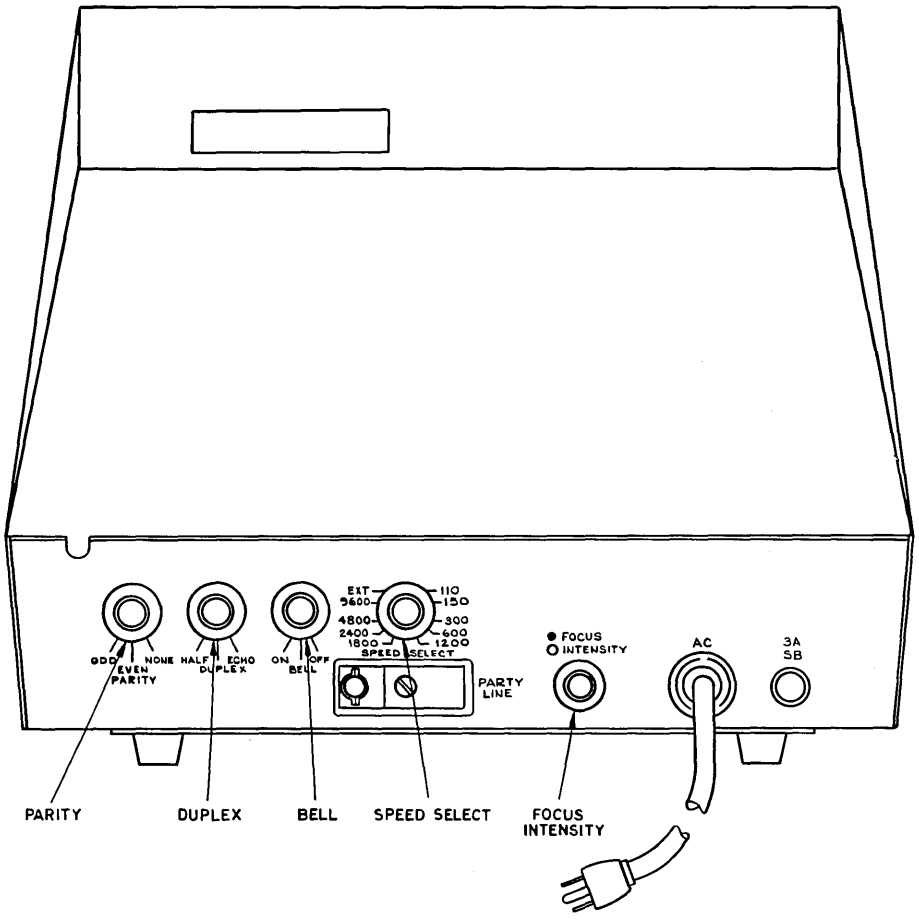



FIGURE 3-2. CONTROLS, REAR VIEW

| CONTROL OR INDICATOR | FUNCTION |
|---|---|
| SPEED SELECT (110/150/300/600/1200/1800/ 2400/4800/9600/EXT CLK) 10-position Switch | Selects the baud rate desired for serial communications. (In standard unit only baud rates up to 600 baud are active). |
| INTENSITY Variable Control | Adjust brightness of display to satisfy the operator. |
| FOCUS Variable Control | Adjust focus of display. |
| Power On Indicator Lamp | Illuminates logo when POWER ON/OFF switch is in ON position. |
| LOCAL Indicator Lamp | Illuminates when the LOCAL/ON LINE Switch is in LOCAL position indicating that the communications interface is disabled from transmitting or receiving. |
| ON LINE Indicator Lamp | Illuminates when the LOCAL/ON LINE Switch is in ON/LINE position and the communications interface is enabled to operate with the communications line. |
| TTY Indicator Lamp | Illuminates when the CTRL (control) key is held depressed and then the TTY MODE key is depressed. Indicates unit is in TTY mode of operation. |
| FORMAT Indicator Lamp | Illuminates when FORMAT key is depressed indicating unit is in Format mode. Reset by depressing and holding CTRL key and then the FORMAT key. |
| ALARM Indicator Lamp | Illuminates when the memory is full and the first line of data in memory has been deleted or a Bell control character is received over the party line. Also, the bell (audible alarm) sounds to indicate the above alarm conditions provided the BELL ON/OFF switch is in the ON position. Cancelled by depressing RESET switch. |

| | |
|---|---|
| INSERT Indicator Lamp | Illuminates when the START INSERT key is depressed indicating characters may be inserted at cursor while the character at the cursor position and to the right of the cursor are moved one space to the right. Cancelled by depressing and holding CRTL key and then depressing the INSERT key. |
| XMIT Indicator Lamp | Illuminates when a block mode transmission is enabled. Will also light during a Print operation. |

## KEYBOARD

### GENERAL

Images to be displayed on all Delta 5000 screens can be initiated at the Delta 5000 keyboard, (Figures 3-3 and 3-4). Through use of the keyboard the operator can compose the text to be displayed and can communicate with remote processors, peripherals, or other Delta 5000's or with local peripherals, or other Delta 5000's.

To the display, the keyboard is a peripheral, and communicates via a parallel "party line" data input/output bus. As a result, the keyboard can also be used to initiate block transfer control of data simulating the local or remote data source. Figure 3-3 shows the keyboard for the Delta 5100 and Figure 3-4 shows the keyboard for the Delta 5200. Since the keyboard operation for Delta 5200 is inclusive of Delta 5100 keyboard operation, the following description of keyboard operation for Delta 5200 is all inclusive.

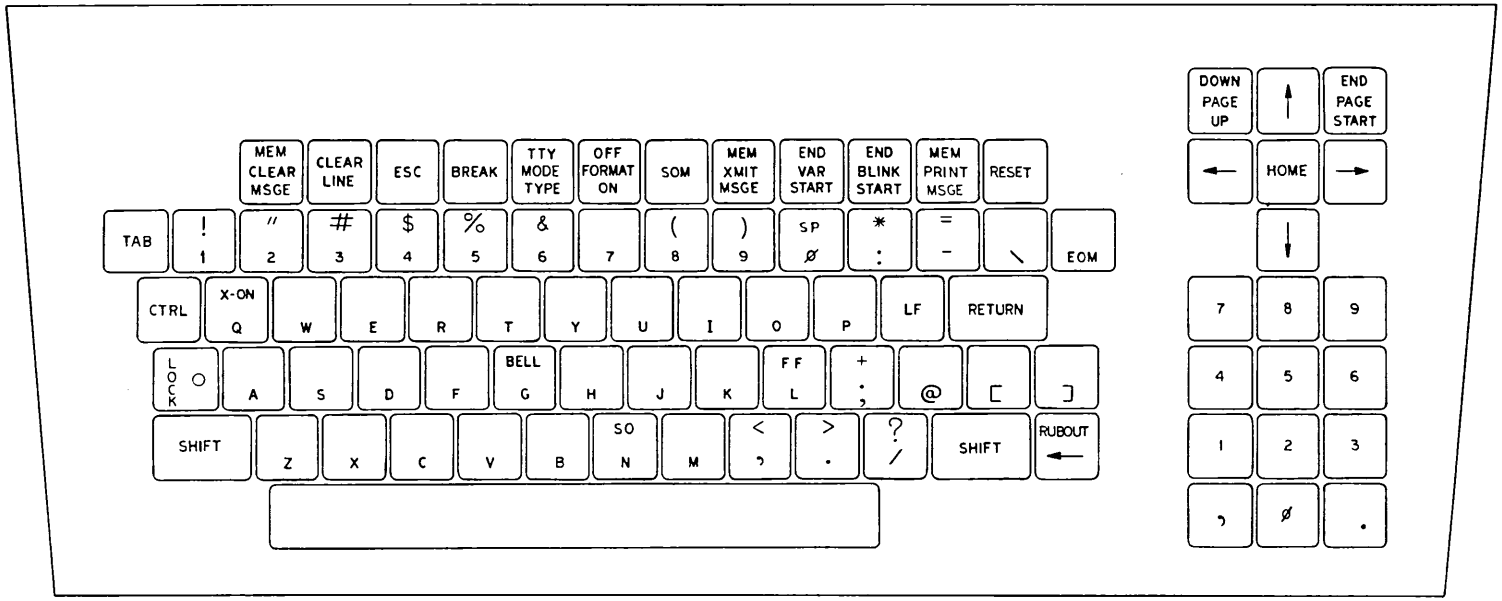
### CHARACTER KEYS

The characters that can be displayed consist of 26 standard upper case alphabetic characters, 10 numeric characters and 27 punctuation (or special) characters. Operation of any of the character keys causes the selected character to be displayed on the screen in the character position occupied by the cursor except in Format mode, where entry of data into a protected field is prohibited.

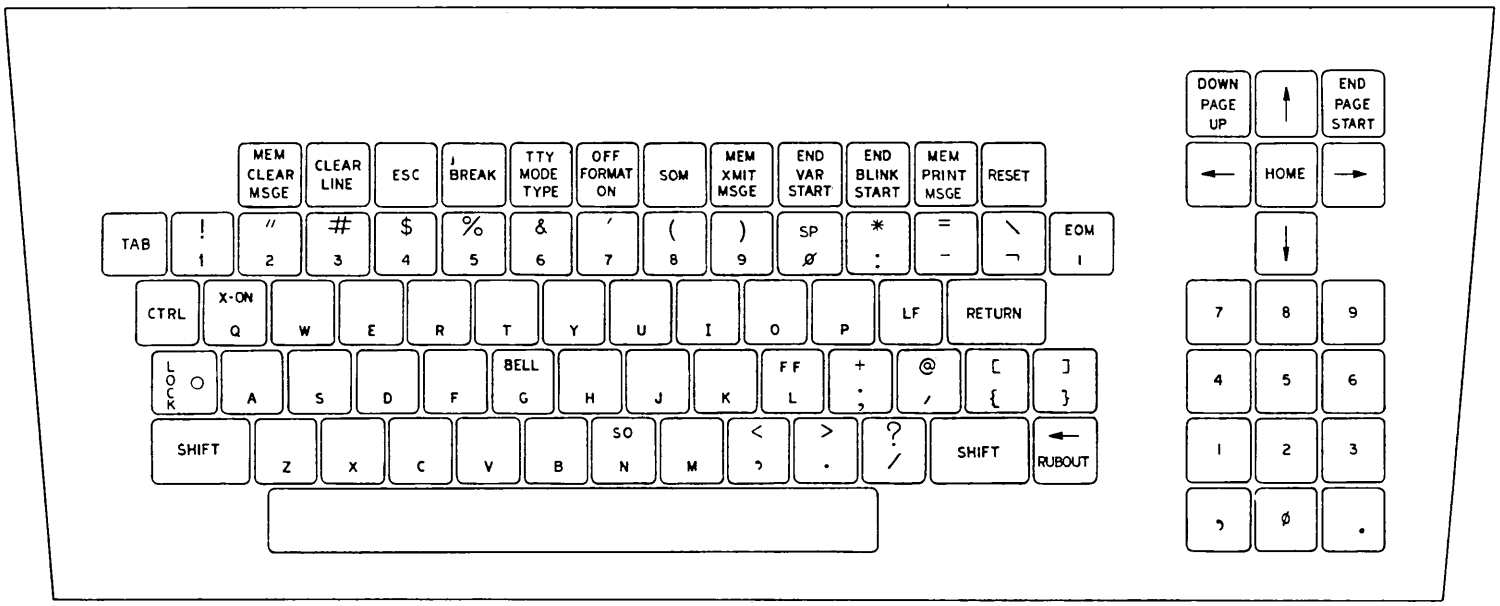
Rapid repetitive entry of data onto the screen can be performed with all character keys when they are depressed and held for two seconds. Entry will repeat at a rate of about 15 per second and continue as long as the key is held (unless interrupted by an I/O operation).

### KEYBOARD ORGANIZATION

The keyboard is physically organized in four sections. Each section is color coded to identify its function. The major portion of the keyboard consists of the alphanumeric data entry organized similarly to a typewriter or teletype. Above it are the keys required for editing and mode control. These keys contain heavy return springs to prevent the operator who accidentally mislocates fingers from causing an error. To the right of the data entry keyboard is a numeric entry pad, which permits rapid entry of numeric only data. The codes generated by keying the number pad are identical to those

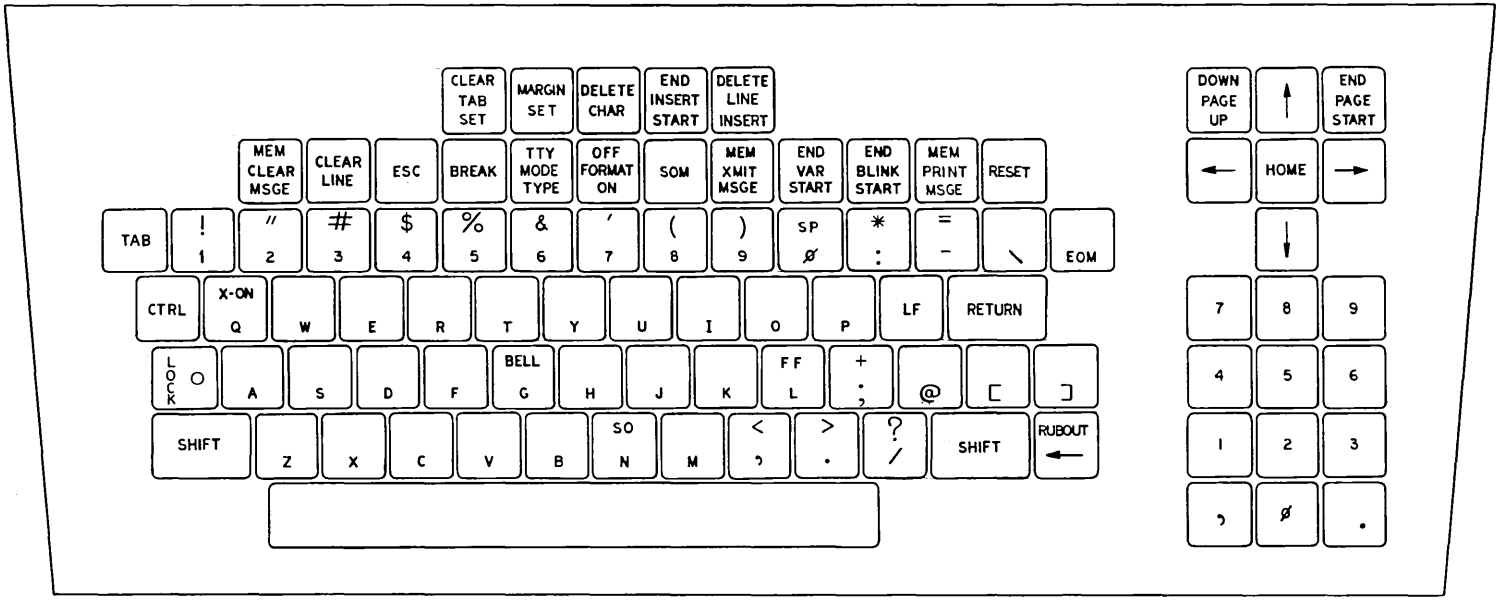



UPPER CASE ONLY

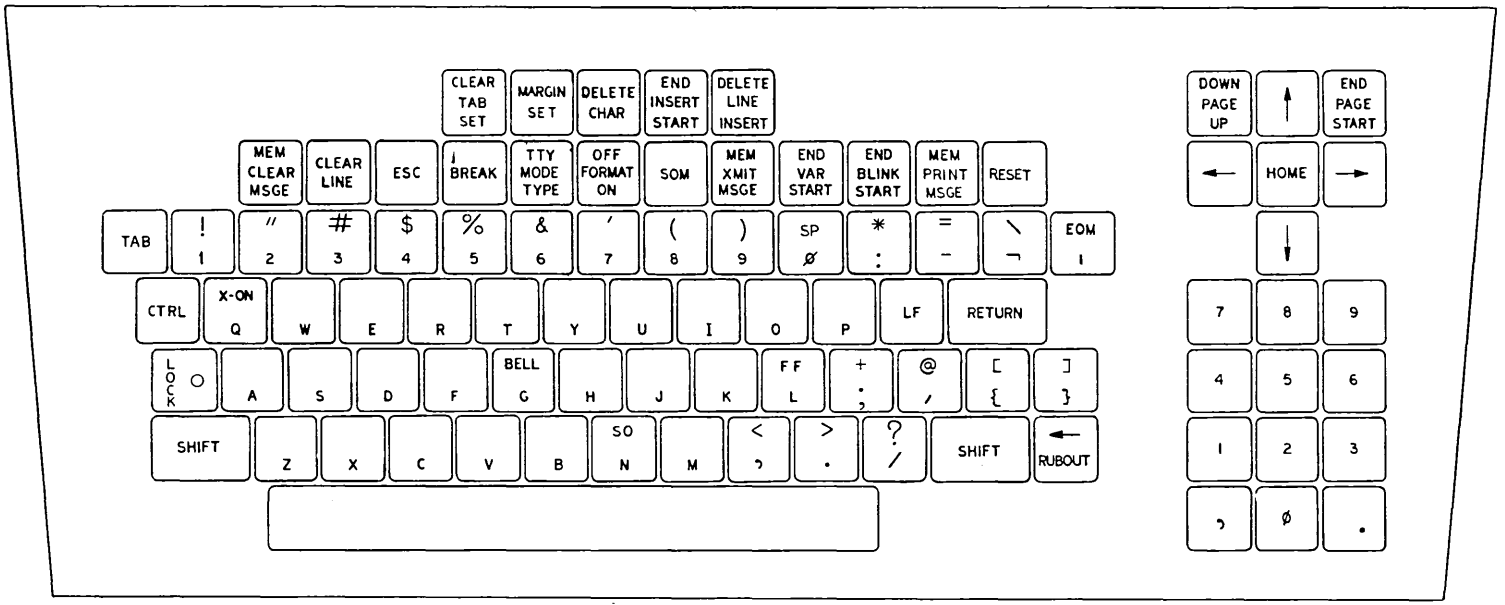



UPPER AND LOWER CASE

FIGURE 3-3 DELTA 5100 KEYBOARD




UPPER CASE ONLY




UPPER AND LOWER CASE

FIGURE 3-4 DELTA 5200 KEYBOARD

of the typewriter numeric keys. Above the number pad are the cursor and paging control keys.

CONTROL KEYS

Many of the control keys serve dual purposes. The action taken when the operator keys a control is signified on the bottom of the key. To execute the action indicated on the top of the key, the operator must first depress and hold the CTRL (control) key then depress the proper control keys. Table 3-2 lists all keys with a CTRL column for keys which require initial CTRL key action. The CTRL key is also used to permit generation for transmission in TTY mode of SOH, STX, ETX, EOT, ACK, BELL, FF (Form Feed), SO and NAK by simultaneously keying characters A, B, C, D, F, G, L, N , and U, respectively.

SHIFT

The standard use of the SHIFT key is required to generate the punctuation marks !, ", #, $, ', (, ), *, =, +, < , > , and ?. Like the CTRL key, the SHIFT key must first be depressed and held. Optionally for those applications with both upper and lower case, the SHIFT is used to cause the generation of upper case characters. Note: upper case characters are normally generated without shifting if this option is not installed. Optionally for those applications with line drawing, the SHIFT key is used to generate line drawing symbols. An illuminated SHIFT LOCK key is also provided.

REPEAT

Any function on the keyboard can be repeated by depressing the desired key and holding it down. After a 2 second delay the function or character will start to repeat at a rate of approximately 15 times per second.

TABLE 3-2 Keyboard Keys

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| Single Character | Causes symbol to be displayed. | N/A | Causes control code equivalent to be sent to I/O bus. Causes bit 7 of character code to be a "0". | 5100, 5200 |
| Double Character | Causes symbol on lower half of key to be displayed. | Causes symbol on upper half of key to be displayed. | Causes bit 7 of character code to be a "0". | 5100, 5200 |
| Shift | Causes control action defined in SHIFT column of this table. Does not generate any I/O code. | N/A | N/A | 5100, 5200 |
| Shift Lock | Enables all entries after keying to cause shifting action. Released by keying shift. This key is illuminated when the keyboard is in Shift Lock. | N/A | N/A | 5100, 5200 |
| CTRL | Causes control action defined in CTRL column of this table. Does not generate I/O code. | N/A | N/A | 5100, 5200 |
| TAB | a) Moves cursor to next preset column in non-format mode. | N/A | N/A | 5100, 5200 |
| | b) Moves cursor to start of next variable data field in Format mode. | N/A | N/A | 5100, 5200 |

TABLE 3-2. Keyboard Keys (Continued)

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| RETURN | Causes entry of CR and moves the cursor to start of next line. Entry is inhibited in type mode when overtyping existing characters. in TTY mode the Return key causes remainder of data on line to be cleared and cursor placed at beginning of the line. | N/A | N/A | 5100, 5200 |
| LF | Causes cursor to move down one line. Causes screen to "roll up" when cursor is on bottom line of display. | N/A | N/A | 5100, 5200 |
| RUBOUT | Causes DEL code to be sent to I/O bus. | Causes entry of ( ← ) symbol. | N/A | 5100, 5200 |
| RESET | Causes generation of a signal which is used to initialize Delta 5000, the communications interface and the I/O interface to preset condition. | N/A | N/A | 5100, 5200 |
| CLEAR LINE | Causes all data right of the cursor on a line to be deleted, except CR. | N/A | N/A | 5100, 5200 |
| ESC | Causes generation of ESC code. No character is entered into Delta 5000 memory. | N/A | N/A | 5100, 5200 |
| BREAK | Causes the communications interface to hold a "Spacing" condition for 0.7 seconds. | N/A | N/A | 5100, 5200 |

TABLE 3-2. Keyboard Keys (Continued)

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| TTY, TYPE MODE | Sets normal mode of character entry. | N/A | Sets control in communications interface to permit character at a time transmission of data. As each character is typed it is sent via the communication interface to the remote data source. | 5100, 5200 |
| FORMAT OFF, ON | Sets the Format mode of operation which causes protection of fixed data fields. Enables uses of automatic TAB. | N/A | Returns system to non-formatted operation. | 5100, 5200 |
| SOM | Causes entry of SOM symbol (■). If a SOM is already present in memory, it will be replaced with an EOM. | N/A | N/A | 5100, 5200 |
| XMIT MEMORY, MESSAGE | Type Mode: Sends XMIT code to I/O data bus. Conditions I/O to initiate message transmit when XMIT MESSAGE or XMIT MEMORY code is received. TTY Mode: Initiates a transmit message. | N/A | Type Mode: No action TTY Mode: If the terminal is in TTY mode, a memory transmission will be initiated. | 5100, 5200 |
| PRINT MEMORY, MESSAGE | Causes the terminal to initiate a message transmission to the printer output. | N/A | Causes the terminal to initiate a memory transmission to the printer output. | 5100, 5200 |
| VARIABLE START, END | Causes entry of a variable start character in memory which signifies the start of a variable field. | N/A | Causes entry of a variable end character in memory which signifies the end of a variable data field. | 5100, 5200 |

TABLE 3-2. Keyboard Keys (Continued)

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| BLINK START, END | Causes entry of a blink start character in memory which signifies the start of a blinking field. | N/A | Causes the entry of a blink end character which signifies the end of a blinking field. | 5100, 5200 |
| CLEAR MEMORY, MESSAGE | Causes all information from cursor to EOM or ETX symbol to be cleared. In Format mode, only variable data is cleared. | N/A | Causes the entire memory to be cleared moving the ETX symbol to the first position on the top line. In Format mode, only variable data in memory is cleared. | 5100, 5200 |
| TAB SET CLEAR | Stores the position of the cursor on a line on one of up to six temporary storage locations. If cursor is moved to first position of any line, the entry of Tabs is inhibited until all tabs are cleared. | N/A | Clears all previously set Tab positions and the variable margin position. | 5200 |
| MARGIN SET | Stores the position of the cursor on a line such that as the cursor is incremented past this position a bell (audible alarm) will sound. | N/A | N/A | 5200 |
| DELETE CHARACTER | Causes the character above the cursor to be deleted from the line. Moves all characters right and below the cursor up to a CR symbol to move one place left. In Format mode, only variable data can be deleted. The size of the variable field will remain unchanged. The character furthest to the right in the field will be replaced with a space. | N/A | N/A | 5200 |

TABLE 3-2. Keyboard Keys (Continued)

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| INSERT START, END | Causes all subsequent characters entered into memory to be inserted into the line up to the first CR symbol. In Format mode, only variable field data can be inserted. The insert is delimited by the end of the variable field which retains its length. The last character in the variable field is lost. | N/A | Resets entry operation from Insert mode such that characters replace previously entered characters at the cursor position. | 5200 |
| LINE INSERT, DELETE | Causes a CR to be entered at the present cursor location moving all characters beyond cursor and all lines below the line of the cursor to be located one line below their previous position. Invalid in Format mode. | N/A | Causes all information to the right of the cursor up to the 80th character or CR symbol to be deleted moving all lines below the cursor up one line. In Format mode, all variable data right of the cursor is replaced with spaces to the end of the variable field. | 5200 |
| PAGE UP, DOWN | Causes the display data in memory to move up one line removing the top line from the display (but not memory) and display the next line in memory. | N/A | Causes the display data in memory to move down one line removing the bottom line from the display (but not memory) and displaying a previous line at the top. | 5100, 5200 |
| PAGE START, END | Causes the display of the first 27 lines of memory data. The cursor is placed at the home position. | N/A | Causes the display to place the last line in memory (line with ETX symbol) on the bottom line of the display. For less than 27 lines of data in memory causes page start and position cursor at ETX. | 5100, 5200 |

TABLE 3-2. Keyboard Keys (Continued)

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| HOME | Cause cursor to move to first position on first line. | N/A | N/A | 5100, 5200 |
| → | Causes cursor to increment one location. After last position on line is reached, the cursor moves to the start of the next line. Operation is inhibited if cursor is at last position on the screen. | N/A | N/A | 5100, 5200 |
| ← | Causes cursor to decrement one location. As first position on a line is reached, the cursor moves to the last position on the next line up. Operation is inhibited if cursor is at home position on screen. | N/A | N/A | 5100, 5200 |
| ↑ | Causes cursor to move up one line on screen. If cursor is on top line increment is inhibited. | N/A | N/A | 5100, 5200 |
| ↓ | Causes cursor to move down one line on screen. If cursor is on bottom line, increment is inhibited. | N/A | N/A | 5100, 5200 |
| G, BELL | Enters "G" | Enters "G" | Causes bell to ring and alarm indicator to light. | 5100, 5200 |
| N, SO | Enters "N" | Enters "N" | Causes next code entered to be interpreted as shown in Figure 6-3. | 5100, 5200 |

TABLE 3-2. Keyboard Keys (Continued)

| KEY | NORMAL | SHIFT | CTRL | USED ON DELTA |
|---|---|---|---|---|
| L,FF | Enters "L" | Enters "L" | Causes the character after the first SOM or EOM displayed to be placed at the "Home" position with all lines moved and displayed accordingly. | 5100, 5200 |

# CHAPTER 4

# OPERATION

## POWER ON AND ESTABLISHING A READY-TO-OPERATE CONDITION

To place the Delta 5000 in the power-on condition and then establish a ready-to-operate condition, proceed as follows:

### POWER ON

The Delta 5000 is placed in the power-on condition by the following steps:

1. Insure that the power cable is properly connected between the Delta 5000 and an appropriate AC power source.

2. Insure that the interface cable(s) is properly connected between the Delta 5000 and the external source(s).

3. Place ON/OFF power switch (Figure 3-1) to the ON position and observe POWER ON (logo) indicator lamp illuminates. An ETX symbol and the cursor will be displayed at the up-left (Home) corner of the display.

### ESTABLISHING A READY-TO-OPERATE CONDITION

To prepare the Delta 5000 for the desired mode of operation, proceed as follows:

1. At the rear of the Delta 5000, place BELL, DUPLEX, PARITY (optional) and SPEED SELECT switches to the desired positions.

2. At the keyboard, randomly fill display with characters.

3. Return to the rear of the Delta 5000 and set FOCUS and INTENSITY controls for a clearly defined presentation.

4. At the lower-right recess portion of the keyboard, place LOCAL/ ON LINE switch to the ON LINE Position if it is desired to operate with the communication interface to the LOCAL (Off-line) position if it is desired not to operate with the communications interface but with another peripheral device or the keyboard connected to the party line. The ON LINE or LOCAL indicator lamp illuminates to indicate the selected mode. The Delta 5000 is now ready for normal operation.

## OPERATION

### SPECIAL SYMBOLS

As an aid to the understanding of the various Delta 5000's mode of operation, special symbols, which are or may be displayed on the screen, are described prior to the discussion of the modes of operation.

CURSOR. The cursor is an automatically inserted visual display position marker. It denotes the display position on the Delta 5000 display that the next character entered will occupy. The cursor is a non-destructive underline (_), that blinks at a rate of 2 per second. Since the cursor is non-destructive, it may be moved about freely on the screen without interfering with other characters. The cursor may be moved by the operator keying ←, ↑, →, ↓, or HOME, and is automatically moved when entering or editing.

While the Delta 5000 buffer memory can be organized to contain more than is visible on an 80 x 27 display screen, the cursor's position is limited to the display area. An operator or remote data source incrementing the cursor will cause the cursor to move through all positions on the screen. When the end of a line is reached, the cursor is automatically moved to the first position of the next line. If the cursor is moved backwards, it will move up as the start of a line is reached. While incrementing, the cursor will not move if the forward limit (line 27, position 80) or backward limit (HOME) is reached. Likewise, the cursor will not move to the bottom line from the top line while trying to increment up. Thus, the cursor is limited to the display area.

CARRIAGE RETURN SYMBOL. In order to fully utilize all available memory, a line of data can be delimited by either reaching 80 characters or containing a carriage return. To enable the operator to identify the line limit, the Delta 5000 is optionally equipped with a displayable symbol for the Carriage Return (▮). Entry of data when the cursor is under the CR symbol causes the entered character to be inserted into the line. Entry of data when the cursor is beyond the CR on a line causes the character to be entered at the cursor, and moves the CR symbol beyond the entered character. All the positions from the previous position of the CR symbol up to the entered character are filled with space codes. Entry of a Carriage Return when the cursor is under a CR symbol causes the cursor to move to the start of the next line and prohibits the insertion of an additional CR symbol on the screen. The non-displayed CR option operates identically except that no symbol appears on the screen.

END OF TEXT (ETX) SYMBOL. Because of Delta 5000's ability to retain in its buffer memory more information than can be displayed, an ETX (▮▮) symbol is used to define to the operator the location in memory where the last character was entered. When the memory has been cleared the only displayable symbol on the screen will be the ETX. This indicates that there are no characters between the start of memory and the ETX symbol. Entry of data when the cursor

is under the ETX, causes the character to be inserted in front of the ETX and increment the cursor to remain under the ETX. Entry of data when the cursor is beyond an ETX on the screen, causes CR symbol to be placed on each line from the line the ETX was on down to the line the cursor is on, and to fill that line with space codes up to the location the data is entered. The ETX is then moved from its original position to the position of the cursor.

START OF MESSAGE (SOM) SYMBOL. When it is desired to communicate with other devices in a block (Type) mode the block can be organized in two ways; on a total memory basis or on a message basis. The SOM symbol is a delimiter for message organization and defines to the operator the location of the start of the message. The symbol is represented by a filled character (■). Only one SOM is permitted in memory (See Table 3-2). The SOM symbol is automatically moved to replace the EOM symbol when the transmission of a message is successfully completed.

END OF MESSAGE (EOM) SYMBOL. This symbol is used in a manner similar to the SOM, and defines to the operator the end of the message. The EOM symbol ( ♦ ) is also used to delimit segments of the memory for display. For example, when a Form Feed is executed, the display window moves down into memory to locate the next EOM, on the line just off the top of the screen. There is no limit to the number of EOM's permitted in the memory.

FORMAT UNDERLINE. When it is desired to segment the display into fixed and variable data blocks, the operator or the remote data source delimits the blocks by entering Variable Start and Variable End control codes. All character positions between these codes are considered variable data and are shown on the screen with a dotted underline. In normal mode it can be used as an underline feature.

CHECK SYMBOL. For those terminals which require generation and checking of parity, a CHECK SYMBOL (\) is used to denote to the operator that a character was received which did not satisfy the requirements of the parity used. Parity checking and generating is a Delta 5000 option.

TTY MODE (Delta 5100 and 5200)

The TTY mode of operation is activated by depressing and holding the CTRL key and then depressing the TTY MODE key which in turn lights the TTY indicator lamp. In this mode of operation, as data is entered from the keyboard, it is immediately transmitted over the communications line. With the DUPLEX switch, located at the rear of the Delta 5000 in the ECHO position, the transmitted character is echoed back from the communications line and then displayed on the screen. With the DUPLEX switch in the HALF position, the character is immediately displayed on the screen and transmitted over the communications line. Character entry is accomplished by depressing the appropriate alphanumeric and/or symbol keys. The character entered is displayed at the location of the cursor and the cursor moves one position to the right.

Keys which generate double control codes; see Figure 6-4 and Table 6-2; are not transmitted over the communications line but are acted upon immediately by the Delta 5000. To generate these codes to the communications line it is necessary to generate the two characters separately, e.g., clear memory is Control N, R.

The TTY Mode of operation is provided to permit the Delta 5000 to simulate and replace a teletype in its operation. The following keys have been added to permit this replacement:

| | |
|---|---|
| ESC | An ESC key is located on the keyboard which when keyed causes the communications interface to send the teletype ESC code. |
| RUBOUT | A RUBOUT key is located on the keyboard which when keyed causes the communications interface to send the Teletype RUBOUT code. When this code is received on the party line, it is ignored. This permits the Delta 5000 to respond accurately to programs written for Teletype terminals in which this code is used to permit proper time for mechanical return of Teletype carriage before entering characters. It is also used to waste time or to ignore corrections to programs originally entered using paper tape. |
| BREAK | This key causes the communications interface with the modem to go to a spacing condition for approximately .7 seconds. It differs from a Teletype which requires the user to hold the BREAK key for a period of time. This difference eliminates the possibility of the operator cutting off the line by holding the key too long. Optionally, the break period can be modified. |
| INHIBIT CONTROL | Depressing and holding the SHIFT key and the CTRL key causing all following control codes generated by the keyboard to be transmitted to the remote source and are not acted upon in the Delta 5000. This feature is useful for those applications which require control codes for sign-on procedures or to delimit user software. |

TYPE MODE

The Type mode of operation is normally used by the Delta 5200 when a block of characters is to be received or transmitted. (Block transfer is optional for Delta 5100). The block transfer operation is characterized by bidirectional handshaking and transfers of blocks of data which are delimited by the STX and the ETX characters. To activate the Type mode from the keyboard, depress the TYPE MODE key. Message composition by the keyboard, for subsequent entry to the computer, is accomplished by depressing the appropriate

alphanumeric and/or symbol keys. During message composition, if all 80 positions on a line are not required a carriage return is inserted following the entered character by depressing the RETURN key.

Note: It is important to use the carriage return for delimiting lines and thereby conserve memory storage which would be wasted if spaces were inserted to reach the 80th position.

If a terminal is a Delta 5100 without the block mode options, it can be placed in the Type mode for local operation, such as setting a format. Once the fixed data is set, the operator places the Delta 5100 in the TTY/Format mode and proceeds to type in the variable data which is simultaneously transferred to the communications interface.

A number of editing features are available in Type mode for Delta 5200 and are as follows:

OMISSION OF DATA. To correct the omission of data, proceed as follows:

1. Position the cursor to the position data is to be entered.

2. Depress the START INSERT key and type-in the omitted data. The INSERT indicator lamp lights to indicate the Insert Mode.

Note: The character previously at the position of the cursor and all characters to the right and the cursor are moved one space to the right. If the line contains a CR not in the 80th position no other lines are affected. A character in the 80th position will be inserted into the first position of the next line and if it was a CR will result in the following line opening up and all lower lines pushed down one line. If a CR is entered in this mode, the cursor will be placed in the first position on the next line. If the memory is full, the first line in memory will be removed and the ALARM indicator lamp and the bell activated.

3. To return to the non-insert mode, depress and hold the CTRL key and then depress the END INSERT Key. The INSERT indicator lamp extinguishes.

4. Return the cursor to the original character position prior to typing further data.

DATA DELETION. To delete a character(s) and close up the data at the point of deletion, proceed as follows:

1. Position the cursor under the character to be deleted.

2. Depress the DELETE CHAR key the required number of times to delete the erroneous character(s).

Note: All characters to the right of the cursor are moved one position to the left with each keying. If there is a character or space in the 80th position of the line, then a character will be deleted from the first position of the next line and the delete character will appear in the 80th position of the line above.

3. Return the cursor to the original character position prior to typing further data.

SPELLING ERROR. If a spelling error is made during message composition proceed as follows:

1. Position the cursor to the character in error.

2. Type in the correct character.

3. Return cursor to the original character position prior to typing further data.

INSERT LINE. To transfer data from a line to the next line, proceed as follows:

1. Position the cursor under the first character of the data to be moved to the next line.

2. Depress the INSERT LINE key and observe a CR is inserted at the cursor and all data from the right of the cursor is inserted at the beginning of the next line. If no carriage return is on the acted upon line, all data on the next line is shifted over to allow for the inserted data. If a carriage return is on the line, the line moves the next line down one line and in effect produces an inserted line.

Note: If memory is full, the first line in memory is lost in this operation.

DELETE LINE. To delete all data from the cursor to the end of a line, proceed as follows:

1. Position the cursor under the first character of the data to be deleted.

2. Depress and hold the CTRL key and then depress the DELETE LINE key and observe all data to the right of the cursor is deleted and data from the next line replaces the deleted data. No data below a CR is affected except all lines are moved up one line. If no CR is present for several lines, all data above the CR will move left and up in a "snake up" fashion.

TABULAR PRESENTATION. The operator may set up to five variable tabular positons on a line, thereby having the same features as a typewriter and permitting columned presentation of data. To set tabular positions, access the positions, and then clear the positions, proceed as follows:

1. To clear all original tabs, depress and hold the CTRL key and then depress the TAB CLEAR key.

2. Position the cursor to the second desired tab position on the first line of the display.

3. Depress the TAB SET key which stores the cursor position in memory.

4. Position the cursor to the second desired tab position on the first line of the display and again depress the TAB SET key.

5. Repeat step 4 above if tabs 3, 4, and 5 are required. The tab positions are now set and remain the same for all lines of the display.

Note: All tabs must be set at the same time and on the same line of the display. Any line of the display can be used to set tabs. Up to 6 tabs may be set if MARGIN SET is not used.

6. To cause the cursor to jump to a tab position in entering data, simply depress the TAB key.

7. To clear all tab positions, depress and hold the CTRL key and then depress the CLEAR TAB key. This will also reset the margin to position 64. A tab from the last tab position on the bottom line of the display will cause a "roll-up" so that the cursor will be on the first tab position of the next line in memory.

Note: Positioning the cursor to the first position on a line during tab set prohibits any further tab setting until a tab clear is performed.

Note: If tabs and margin are to be set, they should be done in the same sequence. Setting a margin after a tab operation can cause a tab position to be lost.

MARGIN SET. The operator may set a margin at any position on a line and this margin will apply to all display lines. As the cursor passes the margin set position, a bell (audible alarm) sounds alerting the operator that the end of a line is near or approaching the position where certain data should be placed. Margin set is an aid in text preparation and editing. To set the margin, proceed as follows:

1. Position the cursor to the desired position for margin set.

2. Depress the MARGIN set key.

Note: If the operator selects not to set the margin, the margin will remain fixed at position 64. This is done when Tab Clear is performed and when power is first turned on.

3. To reset the margin depress and hold the CTRL key and then depress the CLEAR TAB key. Repeat steps 1 and 2 above.

Note: Resetting the margin requires resetting the tabs, if used.

COMMON OPERATION

The above procedures covered unique operations for the TTY mode and the Type mode. The following procedures cover operations which may be performed on all Delta 5000's in either the TTY or the Type mode.

PAGING. PAGING permits an operator or a computer to control an 80 x 27 character display window in a buffer memory. To permit the operator to move the window (display), four keys are provided. As an aid in the comprehension of the PAGING operation, refer to Figure 4-1, Memory Map and Figure 4-2, Example of Display Window. The operation of the four controls are as follows:

1. PAGE UP. Depressing the PAGE UP key moves the SOD (start of display) character to the end of the next display line. The effect is to remove this first (top) line from the display, move all other displayed lines up one line and move the first non-displayed line of the memory up onto the last line of the display.

Note: Page up is performed in one pass through memory. The cursor remains unchanged.

2. PAGE DOWN. Depressing and holding the CTRL key and momentarily depressing the PAGE DOWN key moves the SOD to the beginning of the first undisplayed line off the screen. The effect is to remove the bottom line from the display, move all other lines down one, and move the first non-displayed line above the screen onto the first line of display.

Note: Page down is performed in a maximum three passes through memory. The cursor remains unchanged.

3. PAGE START. Depressing the PAGE START key moves the SOD to the memory location following the STX. The effect is to display the first 27 lines of data in memory on the CRT. The cursor is moved to the Home position.

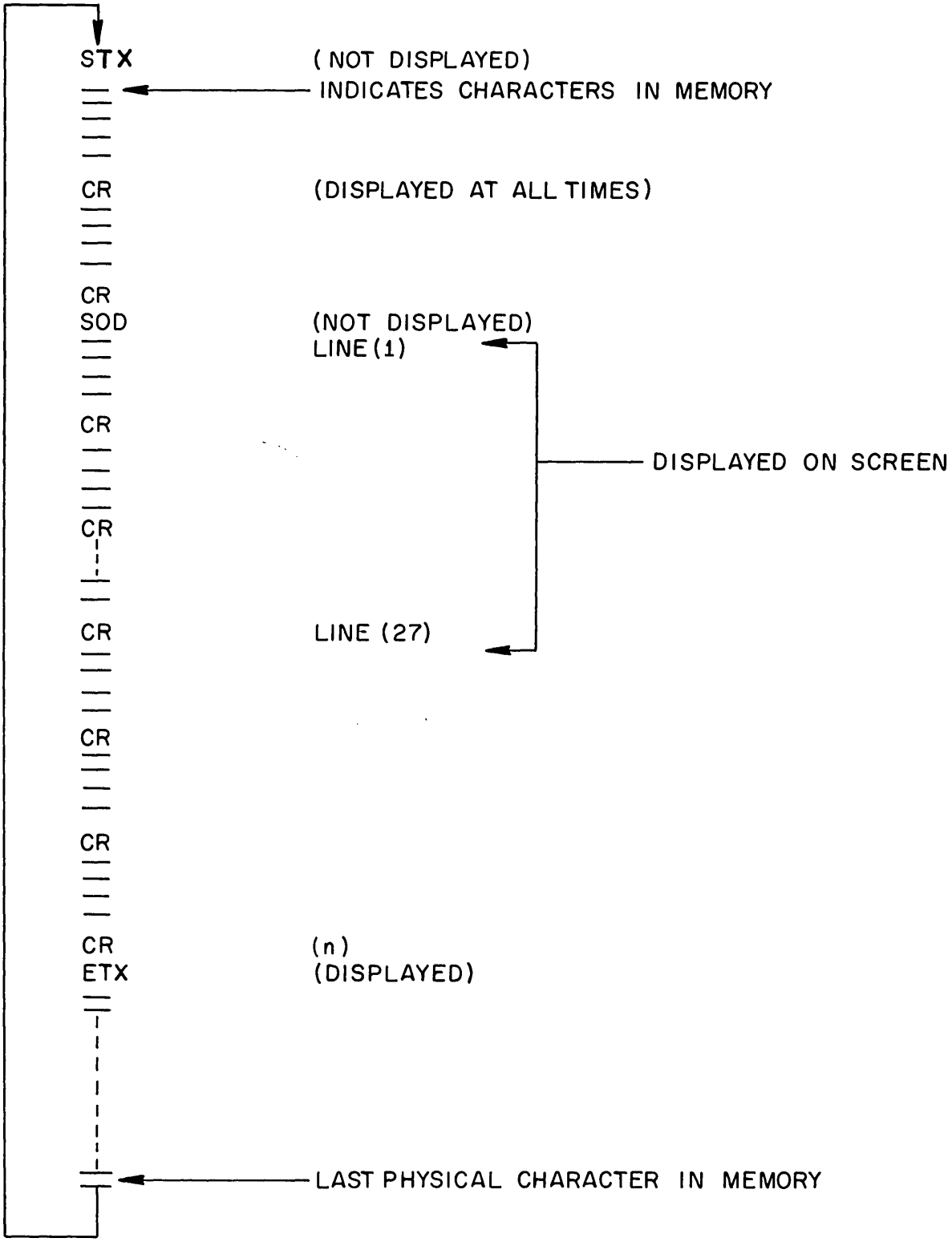



Figure 4-1. Memory Map

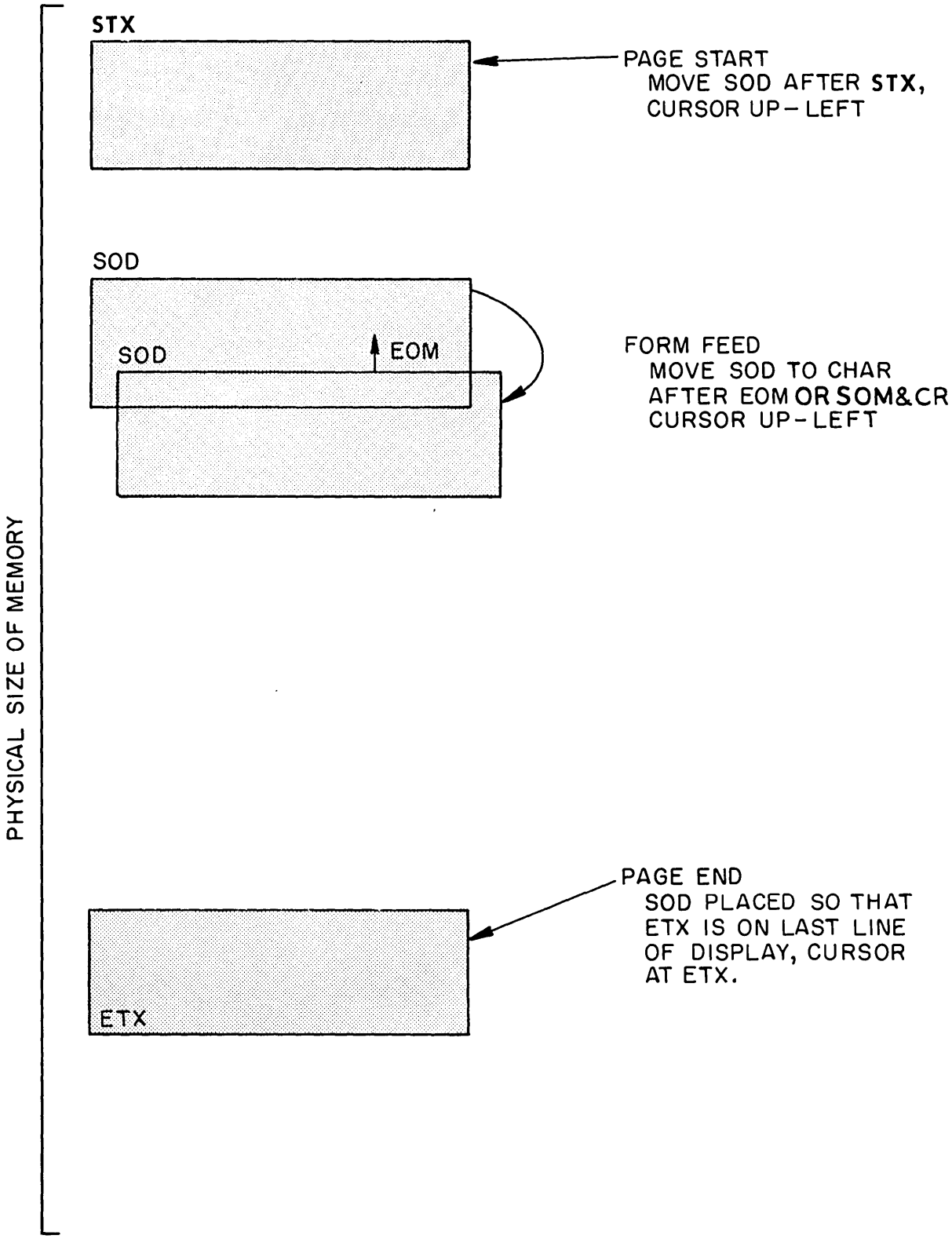



Figure 4-2 Example of Display Window

4. PAGE END. Depressing and holding the CTRL key and depressing the PAGE END key moves the SOD to a point 27 lines ahead of the ETX. The effect is to display the last 27 lines of data in the memory and to place the ETX on the last line of display. The cursor is placed under the ETX. If there is less than 27 lines of data in memory, all the data will be displayed and the cursor positioned under the ETX.

Note: Page End is performed in two passes through memory.

FORM FEED. Depressing and holding the CTRL key and momentarily depressing the FF/L key moves the SOD to the character following the next SOM or EOM symbol unless that character is a CR in which case it is inserted after the CR. If there is no other EOM's between the cursor and ETX, the SOD is inserted after the STX (page start). The effect is to move the first line of the next message to the first line of the display. Each EOM should be followed by a CR so that each message starts on a new line. If this is not done when a FF is issued, the remaining data on the last acted on line will move left to replace original message.

Note: Form Feed is performed in two passes through memory. The cursor is positioned at the Home position.

ROLL UP. When data is being entered at the 80th position of the 27th line of display, or a CR in TYPE Mode is entered in any character position of the 27th line, a Roll Up is performed. A Roll Up is accomplished by moving the SOD one line down in the memory causing the top line of display to be removed from the screen and call other displayed lines to move up one line. Thus, a Roll Up operation is performed automatically and requires no special operator action. A Roll Up is also performed when a line feed is generated and the cursor is on the 27th line.

MEMORY FULL. When there are 16 or less character positions remaining before the memory is filled, audible alarm (bell) will sound each time a character is entered. Anytime memory is full, the STX will be moved from its present position to the end of the first line, all characters between will be cleared to all zeros. This causes the first line of data to be cleared from the memory to make room for additional data.

FORMAT SET UP

The format feature is provided to permit the user to establish fixed forms which will be repetitively used by the operator. Several different forms can be retained in the Delta 5000 buffer memory by utilizing the Form Feed control. Format operation is characterized by entry of two types of data fields: fixed and variable. Fixed fields are maintained in protected status prohibiting the operator from modifying their contents. Variable fields are where the operator will modify, add or edit data before transmission. To set formats on the screen, proceed as follows:

1. Depress and hold the CTRL key and then the FORMAT key to establish the mode of entry which permits setting of the fixed fields.

2. Enter the fixed data field. When the start of a variable field is reached, depress the START VAR key.

3. Enter data or space codes for the duration of the variable field. Dotted underlines are inserted for each position of the variable field.

4. To end the variable field, depress and hold "Control" and VAR key. The operator may now enter fixed data once again. A carriage return (CR) will also act as an End Variable field delimiter.

5. Continue to enter fixed data and variable field delimiters as described above. Figure 4-3 shows an example of format mode data.

6. When the format has been entered, depress the FORMAT key and thereby locking the fixed data onto the screen.

Note: There is no practical limit to the number of variable and/or blinking fields on a line, however, certain useless combinations are deleted from memory. Examples are END VAR with no preceding START VAR or a START VAR followed immediately by an END VAR.

Illegal START VAR and START BLINK codes will not be eliminated from memory as long as the cursor in on the same line. This allows the operator to modify the length of the fields or to add new fields without having to re-format the entire display.

Delta 5000 can accept up to 220 non-displayable characters on each line in memory. Each variable field requires one or two non-displayable characters, namely START VAR and END VAR or CR. Each blink field requires one or two non-displayable characters, depending if a space, END VAR or END BLINK is used to delimit the blink field. The worst case combination of non-displayable characters is alternating variable and fixed fields, each one character wide. This results in only 160 non-displayable characters on a line; therefore the user need not worry about this limitation. Consider the possibility of the non-displayable characters exceeding the allowable memory storage, in which case the first line in memory is deleted.

Name:.....

Address:.....

City:.....State:..... Zip:.....

A. FORMAT WITHOUT VARIABLE DATA

Name:.....

Address:.....

City:.....State:..... Zip:.....

Figure 4-3. Example of Format Mode Data

Note: The carriage return (CR) is useful as an end variable field delimiter when preparing formats which are to be printed, since the CR is transmitted and will cause the printer to start a new line. Care must be taken in using the CR as an end variable field delimiter in applications where the variable data is stored or recorded (such as on the cassette) to be played back on a similar format at a later time. The CR, when played back will position the cursor outside the desired variable field.

Note: When a displayable character is entered into the last position of a variable field, the cursor will automatically increment to the start of the next displayed variable field. If the character was entered into the last position of the last variable field on the screen, the cursor will go to the home position.

Note: If an attempt is made to enter a character into a fixed field, the cursor will automatically increment to the start of the next displayed variable field. If there is no variable field between the cursor and the end of the display, the cursor will go to the home position. In either case the character is not entered.

FORMAT OPERATION. In the format mode, the operator can get to the start of the next variable field by keying the TAB key. This moves the cursor from where it is to the start of the next variable data field and the variable data may be entered. If variable data is being entered and the cursor moves into a fixed data field, the cursor automatically jumps to the start of the next variable field. No information can be written over a fixed data field when in the Format mode. When transmission takes place, only the variable data is transmitted and when clear is performed, only variable data is cleared. When entering variable data for the Delta 5200, editing may take place as long as information is not

inserted past the end of the variable field. The following lists the editing key and their function on variable data in the Format mode:

| | |
|---|---|
| INSERT LINE | No action occurs. |
| INSERT START | If the cursor is located under a variable field position, characters entered after receipt of this control are inserted into the particular variable field. The last character in the variable data field is lost. |
| DELETE CHAR | If the cursor is located under a variable field position, the character is deleted from the field and a space is placed in the last position of the field. |
| CLEAR LINE/ DELETE LINE | If the cursor is located under a variable field position, replaces all variable data right of the cursor with space codes up to the next fixed data field. |

BLINKING. Delta 5000's are equipped with the ability to blink fields of data at a rate of 2 per second. To set blinking fields proceed as follows:

1. Set cursor to the desired position for the start of the blinking data.

2. Depress the BLINK START key. Blinking fields are delimited by a Blink end, space, carriage return, the 80th position on a line, or end variable field, whichever comes first.

3. To end the blinking field with a non-displayed BLINK END character, depress and hold the CTRL key and then depress END BLINK key.

Note: See note under formatting as applied to the limitations of non-displayable characters.

CLEAR. The Delta 5000 operator or a remote source may clear the entire memory or portions of the memory (messages).

1. CLEAR MEMORY. Depressing and holding the CTRL key and then depressing the MEMCLEAR key, deletes all data leaving only the STX, SOD, and ETX in memory. The ETX character and the cursor are positioned at up-left. In the Format mode, all displayable characters in the variable field are replaced with space codes, blink start and stop non-displayable characters are removed in the variable field, and the fixed data is not affected.

2. CLEAR MESSAGE. Depressing the CLEAR MSGE key causes all data between the cursor position and an EOM character (or ETX if no EOM) except a CR to be replaced with space codes. The result is to have a blank screen with the EOM and CR symbols, but no effect on other messages. Like clear memory, only variable data is affected in the Format mode.

POWER OFF

The Delta 5000 is placed in the power-off condition by placing the ON/OFF power switch to the OFF position. The POWER ON (logo) indicator lamp estinguishes.

# CHAPTER 5

# SYSTEM OPERATION

## GENERAL

With the keyboard and the communication interface identically connected to the I/O controller via party line, all keyboard operations, as described in Chapter 4, may also be initiated from the computer through the communication interface. In addition, all communications control characters described in Chapter 6 may be generated by the computer (or another external source if utilized). This chapter describes the two types of transfer operations, characters and block, and the commands associated with the block transfer operation.

## TRANSFERS

### CHARACTER-BY-CHARACTER (Delta 5100 and 5200)

The computer can initialize the Delta 5000 for character-by-character mode of transfer by sending a SO control code (0001110) followed by a TTY mode control code (1011100). In this mode of operation the Delta 5000 can operate echo or half duplex.

ECHO DUPLEX. In this mode of operation (DUPLEX switch set to ECHO position) as the operator keys a message, the message is transmitted to the remote source. To display the information, the remote source must echo the received data. Because of the interrupt structure of the party line and the speed at which requests to enter data is honored (one microsecond) different information can simultaneously be sent and received by the Delta 5000 in echo duplex mode.

HALF DUPLEX. In this mode of operation (DUPLEX switch set to HALF position) as the operator keys a message, the message is transmitted to the remote source and also displayed on the screen. If the remote source should return the information, two characters would be displayed on the screen, one erroneously.

> Note: Keyboard functions listed in Figure 6-4 and Table 6-2 are not transmitted over the communications line but are acted upon immediately by the Delta 5000 regardless of where the duplex switch is set.

### BLOCK (Delta 5200, optional for Delta 5100)

TYPE MODE: (Figure 5-1)

The computer can initialize the Delta 5000 for block mode transfer by sending a SO control code (0001110) followed by an XMIT control code (1001011). This mode of operation causes a block of characters to be received or transmitted from the Delta 5000 which

are delimited by STX and ETX control characters when the XMIT MEMORY code (1011110) or XMIT MESSAGE code (1011111) is received.

TTY MODE (Figure 5-2)

A block mode transfer can be initiated from a remote source by sending an SO control code followed by a TTY XMIT MEM (1001010) or a TTY XMIT MESSAGE (1001011) code. Depressing the XMIT key causes a transmit message without the need of any further action on the part of the remote computer. Similarly, depressing and holding the CTRL key and then depressing the "Q" key causes a transmit message. This last code for starting a transmit message (Control Q) is optional and must be specified. Depressing and holding the CTRL key and then the XMIT key causes a transmit memory.

A carriage return (CR) code transmitted by the Delta 5000 in TTY mode, as part of a transmit memory or message will be followed by a line feed (LF) code so as to be compatible with teletypewriter applications. The STX, ETX and SOD are not transmitted in TTY mode.

COMMANDS (Delta 5200, optional Delta 5100)

TRANSMIT COMMANDS

There are two transmit commands, namely Transmit Memory and Transmit Message. To perform either of these transmit commands either the operator or the remote computer must first enable a transmit. The operator enables the transmit by depressing the XMIT key which sends a two character code (SO and XMIT) to the Delta 5000 controller via the party line. The computer can command the transmit by sending the two character code, either transmit command preceded by an SO character code immediately following the sequence. However, if a transmit command is sent without the proper two character enabling code preceding it or the XMIT key is not depressed, the Delta 5000 will respond with an EOT character. This is shown in the sequence/response diagram Figure 5-1, part A and C. This permits the computer to perform one of the following tasks:

1. On a timed or random basis, interrogate the Delta 5000 for an operator's transmit request.

2. To initialize and control a complete transmission unconditionally i.e., SO, XMIT, SO, and command.

Transmit Memory

Type Mode (Figure 5-1)

Figure 5-1, part D shows a sequence/response diagram for controlling this command. All data in memory from the first character up to the location of the ETX is transmitted. In format

FIGURE 5-1

TRANSMITS IN TYPE MODE

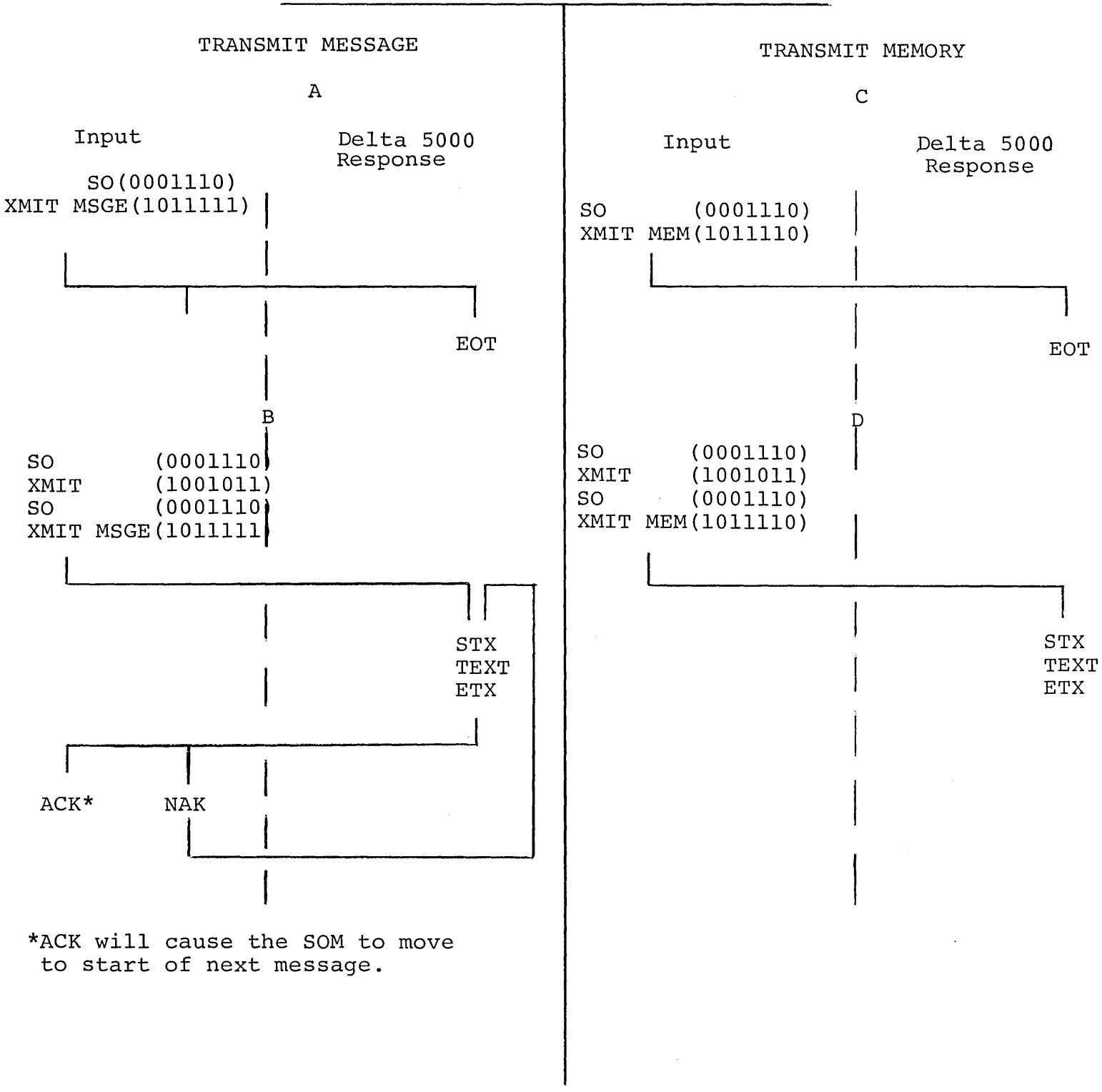
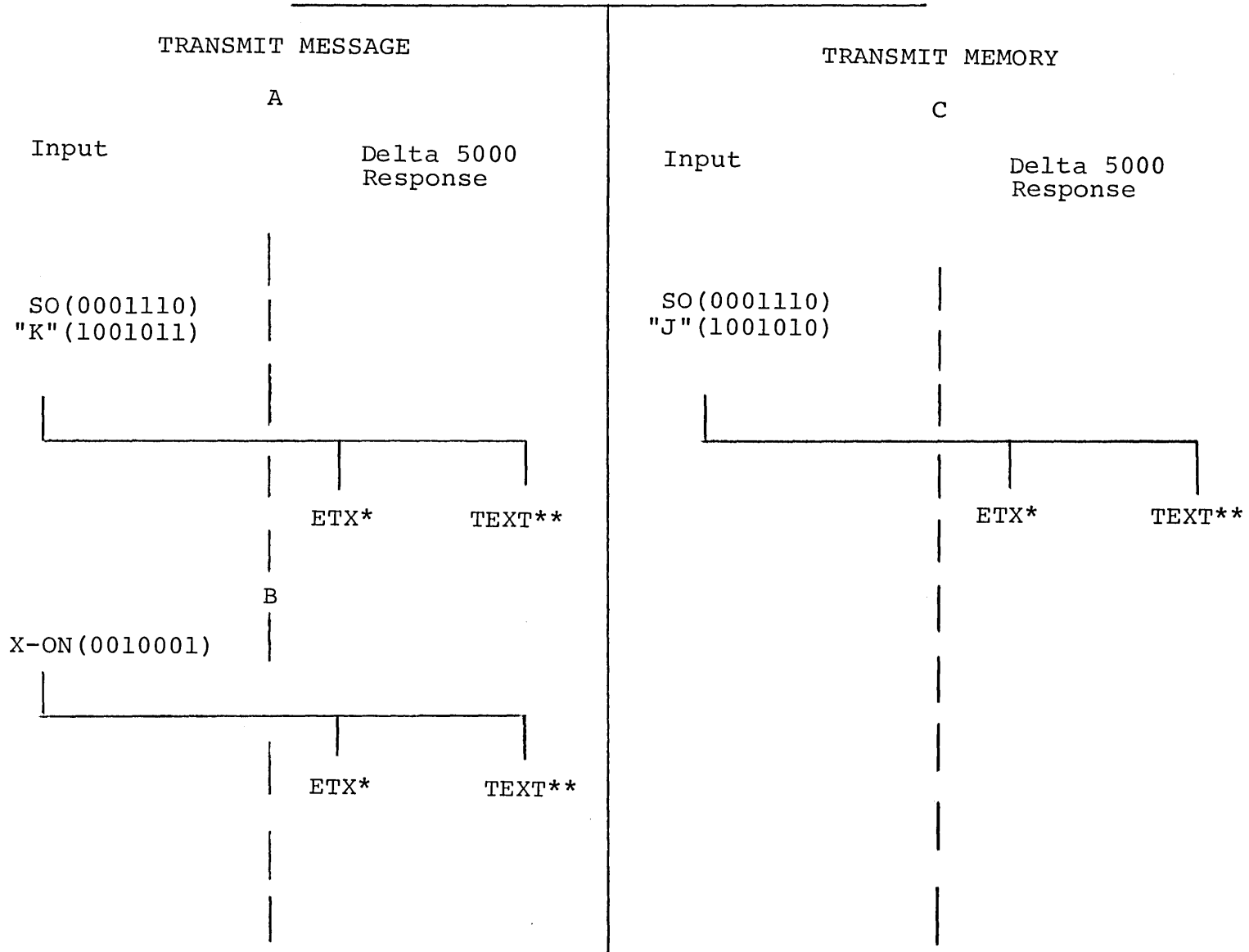


FIGURE 5-2

TRANSMITS IN TTY MODE




*ETX is response if there is no SOM in memory or if the Delta 5000 is in FORMAT mode and there are no variable fields in the message.

**The SOD is not sent in TTY mode. The SOM will be moved to start of next message immediately after transmission is complete.

*ETX is response if Delta 5000 is in FORMAT mode and there are no variable fields in memory or if there is a clear memory.

**The SOD is not sent in TTY mode.

mode, only variable data and the End Variable Field delimiters are transmitted. A CR is transmitted if it is used as a variable field delimiter. Upon receipt of a Transmit Memory command, assuming a XMIT request has been issued, the Delta 5000 I/O will send to the communications interface an STX character followed by all data (variable data in Format mode) in memory followed by an ETX character. The character SOD will also be included in the message to represent the location in memory where the display starts. The SOD is transmitted in Format mode only if it is in a variable field. As the Delta 5000 I/O sends the ETX character, the XMIT command is reset requiring that the operator or computer execute another transmit request for the next Transmit command.

TTY Mode

Figure 5-2, part C shows a sequence/response diagram for this command. It is identical to transmit memory in Type mode except that the STX, SOD and ETX are not included. An ETX is transmitted if there is no data in memory or if the transmit is initiated in format mode and there are no variable fields in memory.

Transmit Message

Type Mode (Figure 5-1)

Figure 5-1, part B shows a sequence/response diagram for controlling this command. All data in memory from the SOM character to the next EOM character, (or if none, the ETX character) is transmitted. Upon receipt of a Transmit Message command, assuming a transmit request has been issued, the Delta 5000 I/O will send to the communications interface an STX followed by the message (as defined above) and an ETX character. The SOD character will be transmitted if it falls between the SOM and EOM. In format mode only the variable data and the End Variable Field delimiters between the SOM and the next EOM (or ETX) is transmitted. The SOM and EOM need not be in variable fields. Upon successful receipt of message, the computer must respond with an ACK. This causes the SOM in the Delta 5000 buffer memory to be replaced with an EOM and the EOM of the message transmitted to be replaced with an SOM. This permits automatic conversational dialog between user and Delta 5000. If the computer detects a parity error (parity is optional) it can respond with a NAK and cause the message to be retransmitted.

TTY Mode

There are two ways of initiating a transmit message in TTY Mode. Figure 5-2, part A shows a sequence response diagram for an SO followed by XMIT (USASCII "K") while part B is for the optional X-ON command usually associated with teletypewriter reader operation. All data in memory from the SOM character to the next EOM (or ETX) is transmitted. The SOM and EOM need not be in variable fields. An ETX is transmitted if there is no SOM in memory or if the Delta 5000 is in Format Mode and there are no variable fields between the SOM and EOM. Upon completion of

the transmit the SOM and EOM interchange as described above if performed automatically, that is, no ACK or NAK is necessary. Message retransmission is therefore not available in TTY mode.

Receive Block

Figure 5-3 shows a sequence response diagram for controlling the receipt of a block of data (Delta 5100 and 5200 with optional ACK/NAK response) through the communications interface. All blocks of data are delimited by STX as the first character and ETX as the last character. Delimiters are not required for Delta 5000's not equipped with the optional ACK/NAK response or if the parity switch is set to NONE.

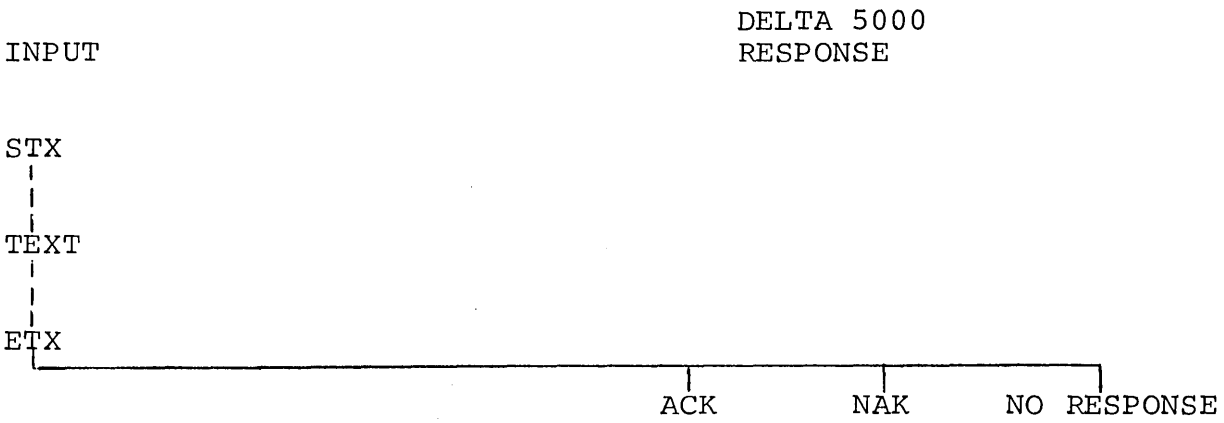



Figure 5-3. Receive Sequence/Response Diagram

Upon receipt of the ETX character, the Delta 5000 sends back an ACK signal acknowledging receipt of the message. If a parity error has occured in receiving the message, the Delta 5000 will respond with a NAK. The Delta 5000 will not respond if there was a parity error in the STX or ETX. All control characters may be received in text which permits function control of Delta 5000 features. This includes setting the absolute cursor position to establish field of display. The keyboard will be locked out from the STX until the ETX or an EOT is received.

ABSOLUTE CURSOR POSITIONING

A remote computer or any device on the party line may set or cause the transmittal of the absolute (x and y) position of the cursor on the display screen.

SET CURSOR. The following sequence of characters received on the party line from the communications interface, keyboard, other peripheral devices or any combination of these controllers causes the cursor to be positioned absolutely on the Delta 5000 display screen.

| CHARACTER | CODE | FUNCTION | KEY |
|---|---|---|---|
| 1 | SO | Shift Out | CTRL-N |
| 2 | CPE | Cursor Position Entry | N |
| 3 | CAX | Cursor Position on a line | As Required |
| 4 | CAY | Cursor Line | As Required |

The values of CAX and CAY are the 1's complement of the binary value of the position. See Table 5-1. An incorrect CAX or CAY code can position the cursor off the display screen. Home will restore the cursor.

Transmit Cursor

The following sequence of characters received on the party line from keyboard, communications interface, other peripherals, or any combination of these controllers will cause the Delta 5000 to send to the communications interface or other peripheral, two characters representative of the position of the cursor on the display screen. The values of CAX and CAY are the 1's complement of the binary value of the position. See Table 5-1.

| CHARACTER | CODE | FUNCTION | KEY | SOURCE |
|---|---|---|---|---|
| 1 | SO | Shift Out | CTRL-N | Remote |
| 2 | CPX | Cursor Position XMIT | O | Remote |
| 3 | CAX | Cursor Position on Line | NA | Delta 5000 |
| 4 | CAY | Cursor line | NA | Delta 5000 |

TABLE 5-1. Position codes for cursor set and transmit code.

| CURSOR POSITION | BIT 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| 26 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | (Max. Line No) |
| 79 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | (Max. Position on Line). |

PRINT COMMANDS (Optional Delta 5200 and Delta 5100 with block transmit)

There are two print commands, namely print message and print memory. The Delta 5000 printer output will drive any printer with an RS232C or CCITT V 24 interface. When a print command is received the Delta 5000 initiates a block mode transmit and sends out data through the communications interface. The normal RS232C communications interface output is held in an idle state and data is routed to the printer output. The structure of the printer data is start/stop asynchronous serial data, 10 or 11 bits per character dependent on communications interface strapping.

Note: The number of bits per character for printer data is identical to that for RS232C (CCITT V 24) output data.

The baud rate for the printer data is independent of the RS232C output and is strappable for any of the baud rates available with the Delta 5000 (110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600). The printer speed is normally strapped for 110 baud. To change printer speed, remove the cover and locate the push-on jumper at the right rear of the chassis, adjacent to the card cage. Connect the jumper between the pin marked "Printer" and the pin marked with the desired baud rate.

The print command provides a pause of between 100 and 200 milliseconds after each CR is sent to allow extra time for the printer to perform a carriage return. The RS232C control lines such as Request to Send and Clear to Send are not used for print commands, however, the Delta 5000 ON-LINE/LOCAL switch must be in the ON-LINE position. Refer to Chapter 7 for details of printer interface.

Print Memory

All data in memory from the first character up to the location of the ETX is transmitted via the printer output. In Type mode the data is preceded by an STX character and followed by an ETX. The SOD is included in data. In TTY Mode, the STX, ETX and SOD are not included however, a LF (Line Feed) is included after each CR (Carriage Return). In Format mode, only variable data and the End Variable Field delimiters are transmitted. A Carriage Return is useful as an End Variable Field delimiter for text to be printed since it is transmitted during a print in Format Mode.

Print Message

All data in the memory from the SOM character to the next EOM character (or ETX) is transmitted via the printer output. In Type Mode the data is preceded by an STX character and followed by an ETX. The SOD character is included if it falls within the message. In TTY mode, the STX, ETX and SOD are not included;

however, a LF (Line Feed) is included after each CR (Carriage Return). In Format mode, only variable data and End Variable Field delimiters between the SOM and EOM (or ETX) are transmitted. The SOM and EOM need not be in variable fields. See comments on the use of CR as End Variable Field delimiters in paragraph above. Upon completion of the Print Message operation the SOM in the Delta 5000 buffer memory is replaced with an EOM and the next EOM is replaced with a SOM. If there is no EOM in the Delta 5000 buffer memory, the SOM will remain in the same location.

# CHAPTER 6

## DELTA 5000 CODE SET

The United States of America Standard Code for Information Interchange is the basic code set used for all communications between processors, and peripherals, and Delta 5000 remote display systems. This code approved by the United States of America Standards Institute, is a seven bit code.

Figure 6-1 shows the normal 128 characters of the 7-bit ASCII code. Figure 6-2 shows the character codes for lower case option. Figure 6-3 shows the codes for the control function, which are performed if the preceding character entered was an SO. A lower case code entered into a unit equipped for upper case only will cause the equivalent upper case character to be displayed as shown in Figure 6-1. Subsequent transmission of data from memory will send out the lower case codes that were entered.

### SINGLE CONTROL CHARACTER FUNCTION

Table 6-1 lists all the single control characters (i.e., control characters which require no SO characters to precede them) and associated functions. Figure 6-2 shows the codes for these single characters. The code chart position refers to the column and row positions in Figures 6-1 through 6-3.

Table 6-1. Single Control Character Functions

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| NULL | 0-0 | This character is ignored by the I/O and used to waste time. |
| STX (Start of Text) | 0-2 | Signifies to the communications Interface that all subsequent data is text. It is transmitted by the Delta 5000 as the first character of a block in TYPE mode. |
| ETX (End of Text) | 0-3 | Signifies to the Communications Interface that the block of data transmitted or received is complete. It is transmitted by the Delta 5000 as the last character of a block in TYPE MODE. |
| EOT (End of Transmission) | 0-4 | It is transmitted by the Delta 5000 (in TYPE Mode) in response to a transmit message or memory command if the XMIT key or its code has not preceded the command. An EOT received by the communications interface causes the Delta 5000 and the Party Line Reset. |

| b7 → | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| b6 → | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| b5 → | | | | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| b4 | b3 | b2 | b1 | COL → / ROW | -0 | -1 | -2 | -3 | -4 | -5 | -6 | -7 |
| 0 | 0 | 0 | 0 | -0 | NULL | DLE | SPACE | ø | @ | P | @ | P |
| 0 | 0 | 0 | 1 | -1 | SOH | X-ON (XMIT) (MESG) | ! | 1 | A | Q | A | Q |
| 0 | 0 | 1 | 0 | -2 | STX | SOD | " | 2 | B | R | B | R |
| 0 | 0 | 1 | 1 | -3 | ETX | | # | 3 | C | S | C | S |
| 0 | 1 | 0 | 0 | -4 | EOT | | $ | 4 | D | T | D | T |
| 0 | 1 | 0 | 1 | -5 | | NAK | % | 5 | E | U | E | U |
| 0 | 1 | 1 | 0 | -6 | ACK | SYNC | & | 6 | F | V | F | V |
| 0 | 1 | 1 | 1 | -7 | BELL | SOM | ' | 7 | G | W | G | W |
| 1 | 0 | 0 | 0 | -8 | CURSOR ← | | ( | 8 | H | X | H | X |
| 1 | 0 | 0 | 1 | -9 | TAB | CURSOR → | ) | 9 | I | Y | I | Y |
| 1 | 0 | 1 | 0 | -10 | LF | CURSOR ↑ | * | : | J | Z | J | Z |
| 1 | 0 | 1 | 1 | -11 | CURSOR ↓ | ESCAPE | + | ; | K | [ | K | [ |
| 1 | 1 | 0 | 0 | -12 | FF | VARIABLE END | , | < | L | \ | L | \ |
| 1 | 1 | 0 | 1 | -13 | CR RETURN | VARIABLE START | - | = | M | ] | M | ] |
| 1 | 1 | 1 | 0 | -14 | SO | BLINK END | . | > | N | ↑ (EOM) | N | ↑ |
| 1 | 1 | 1 | 1 | -15 | | BLINK START | / | ? | O | ← | O | RUBOUT |

NOTE 1

Notes: 1. When received, these codes are stored in memory and displayed as shown. After they are stored in memory subsequent block mode transmission will send out these codes.

**FIGURE 6-1 DELTA 5000 UPPER CASE USASCII CODES**

| b7 → | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| b6 → | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| b5 → | | | | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| b4 | b3 | b2 | b1 | COL → / ROW | -0 | -1 | -2 | -3 | -4 | -5 | -6 | -7 |
| 0 | 0 | 0 | 0 | -0 | NULL | DLE | SPACE | ø | @ | P | ` | p |
| 0 | 0 | 0 | 1 | -1 | SOH | X-ON (XMIT) (MESG) | ! | 1 | A | Q | a | q |
| 0 | 0 | 1 | 0 | -2 | STX | SOD | " | 2 | B | R | b | r |
| 0 | 0 | 1 | 1 | -3 | ETX | | # | 3 | C | S | c | s |
| 0 | 1 | 0 | 0 | -4 | EOT | | $ | 4 | D | T | d | t |
| 0 | 1 | 0 | 1 | -5 | | NAK | % | 5 | E | U | e | u |
| 0 | 1 | 1 | 0 | -6 | ACK | SYNC | & | 6 | F | V | f | v |
| 0 | 1 | 1 | 1 | -7 | BELL | SOM | ' | 7 | G | W | g | w |
| 1 | 0 | 0 | 0 | -8 | CURSOR ← | | ( | 8 | H | X | h | x |
| 1 | 0 | 0 | 1 | -9 | TAB | CURSOR → | ) | 9 | I | Y | i | y |
| 1 | 0 | 1 | 0 | -10 | LF | CURSOR ↑ | * | : | J | Z | j | z |
| 1 | 0 | 1 | 1 | -11 | CURSOR ↓ | ESCAPE | + | ; | K | [ | k | { |
| 1 | 1 | 0 | 0 | -12 | FF | VARIABLE END | , | < | L | \ | l | ¬ |
| 1 | 1 | 0 | 1 | -13 | CR RETURN | VARIABLE START | - | = | M | ] | m | } |
| 1 | 1 | 1 | 0 | -14 | SO | BLINK END | . | > | N | ↑ (EOM) | n | ~ |
| 1 | 1 | 1 | 1 | -15 | | BLINK START | / | ? | O | ← | o | RUBOUT |

**FIGURE 6-2 DELTA 5000 UPPER LOWER CASE USASCII CODES**

| b7 → | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| b6 → | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| b5 → | | | | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| b4 | b3 | b2 | b1 | COL → / ROW | -0 | -1 | -2 | -3 | -4 | -5 | -6 | -7 |
| 0 | 0 | 0 | 0 | -0 | | | | | FORMAT OFF | | | |
| 0 | 0 | 0 | 1 | -1 | | | | | FORMAT ON | HOME | | |
| 0 | 0 | 1 | 0 | -2 | | | | | PAGE DOWN | CLEAR MEM | | |
| 0 | 0 | 1 | 1 | -3 | | | | | PAGE UP | CLEAR MSG | | |
| 0 | 1 | 0 | 0 | -4 | | | | | PAGE END | | | |
| 0 | 1 | 0 | 1 | -5 | | | | | PAGE START | CLEAR LINE | | |
| 0 | 1 | 1 | 0 | -6 | | | | | MARGIN SET | DELETE CHAR | | |
| 0 | 1 | 1 | 1 | -7 | | | | | INHKBD | ENKBD | | |
| 1 | 0 | 0 | 0 | -8 | | | | | TAB CLEAR | INSERT END | | |
| 1 | 0 | 0 | 1 | -9 | | | | | TAB SET | INSERT START | | |
| 1 | 0 | 1 | 0 | -10 | | | | | XMIT MEM (TTY) | PRINT MEM | | |
| 1 | 0 | 1 | 1 | -11 | | | | | XMIT MESG (TTY) | PRINT MESG | | |
| 1 | 1 | 0 | 0 | -12 | | | | | LINE DELETE | TTY MODE | | |
| 1 | 1 | 0 | 1 | -13 | | | | | LINE INSERT | TYPE MODE | | |
| 1 | 1 | 1 | 0 | -14 | | | | | CURSOR POS ENTER | XMIT MEM | | |
| 1 | 1 | 1 | 1 | -15 | | | | | CURSOR POS XMIT | XMIT MSG | | |

**FIGURE 6-3 DELTA 5000 USASCII CONTROL CODES**

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| ACK (Acknowledge) | 0-6 | When received by the Delta 5000 it acknowledges error free receipt of a transmit message data block from the Delta 5000 to the remote processor. It is generated by the communications interface (with optional ACK/NAK response) to acknowledge receipt of error free data. |
| BELL | 0-7 | Causes the Delta 5000 Bell to be rung and ALARM indicator to light. |
| Cursor ← | 0-8 | Causes cursor to move one position left. Moves cursor from first position of a line to last position of line above. Movement stops at "Home" position. |
| TAB (Tabular) | 0-9 | Causes the cursor to move to the next of up to six preset columnar positions **(Delta 5000 only). In the Format mode,** causes the cursor to advance to the start of the next variable field for all Delta 5000's. |
| LF (Line Feed) | 0-10 | Causes the cursor to move down one line. |
| Cursor ↓ | 0-11 | Causes the cursor to move down one line. Will not advance cursor beyond line 27 (bottom line). |
| FF (Form Feed) | 0-12 | Causes the display window to move up such that the next SOM or EOM in memory is on the line just above the top line of the screen with the character following the SOM or EOM in the first position of the display (except CR). |
| Carriage Return | 0-13 | In Type Mode causes the entry of a CR code and moves the cursor to the start of the next line. If the cursor is under data the entry is inhibited in memory and only the cursor is moved. In TTY mode causes any data between cursor and end of line to be cleared and positions cursor to beginning of line. Successive CR's cause only one effective CR action. |

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| SO | 0-14 | Sets a control which causes the next entered character to be interpreted as described in Table 6-2. |
| X-ON | 1-1 | In TTY Mode causes a transmit message i.e., transmit from SOM to next EOM or ETX. |
| SOD (Start of Display) | 1-2 | Defines the location in a message where the display starts. Transmitted in TYPE and Block mode only. |
| NAK | 1-5 | When received by the Delta 5000 signifies the message just received by the remote processor contains a parity error and causes the Delta 5000 to retransmit the message. If the parity ACK/NAK response option is installed in the Delta 5000 communications interface, Delta 5000 will generate a NAK to the remote processor signifying that the block received contained a parity error. |
| SOM (Start of Message) | 1-7 | Entered on the display. Used to signify start of message for message mode transmission. It is transmitted only in a transmit memory. When transmit message command is completed, the SOM moves to replace the EOM with receipt of an ACK in TYPE mode, immediately upon completion of the transmission in TTY mode. |
| Cursor → | 1-9 | Causes cursor to move one position to the right. Moves cursor from last position on line to first position of line below. Movement stops at 80th position of 27th line. |
| Cursor ↑ | 1-10 | Causes cursor to move up one line. Movement stops on first line of display. |
| ESCAPE | 1-11 | Used only in TTY mode as a delimiter in some applications. No action occurs in the Delta 5000 |
| VARIABLE START | 1-13 | Placed in memory to delimit to start of the variable field. |

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| VARIABLE END | 1-12 | Placed in memory to delimit the end of the variable field. |
| BLINK START | 1-15 | Placed in memory to delimit start of a blinking field. |
| BLINK END | 1-14 | Placed in memory to delimit end of a blinking field. |
| RUBOUT | 7-15 | Used in TTY mode as a delimiter or time waster in some applications. Entry into Delta 5000 produces no action. |
| EOM (End of Message) | 5-14 | Entered on display as a ( ↑ ) symbol. Used to delimit messages and for Form Feed (see Keyboard Operation). |

DOUBLE CONTROL CHARACTER FUNCTIONS

Table 6-2 lists all the double control characters (i.e., control characters which must be preceded by an SO character) and associated functions.

TABLE 6-2. Double Control Character Functions

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| FORMAT OFF | SO/4-0 | Takes unit out of Format. |
| FORMAT ON | SO/4-1 | Sets unit into Format mode, thereby protecting fixed data fields. Reset by Format Off control characters. |
| PAGE DOWN | SO/4-2 | Causes the display data to move down one line. |
| PAGE UP | SO/4-3 | Causes the display data to move up one line. |
| PAGE END | SO/4-4 | Causes the display window in memory to move such that the line containing the ETX is on the bottom line of the display. |
| PAGE START | SO/4-5 | Causes the display window in memory to be moved such that the top line represents the first line of memory. |

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| MARGIN SET | SO/4-6 | Causes the present position of the cursor to act as a margin. Any further entry of data at that position will ring a bell. Fixed at position 64 on Delta 5100. Margin set for position 64 at power turn on on Delta 5200. |
| INHKBD | SO/4-7 | Locks out keyboard by inhibiting output of Keyboard from being entered on to party line. Reset by RESET key, ENKBD control character or EOT received by communications interface. |
| TAB CLEAR (Delta 5200) | SO/4-8 | Resets all Tab positions and resets margin to position 64. |
| TAB SET (Delta 5200) | SO/4-9 | Causes the position of the cursor on a line to be stored in one of six temporary locations. |
| TTY, TRANSMIT MEMORY | SO/4-10 | Used only in TTY mode. Causes all data in the Delta 5000 memory to be transmitted in a block mode. See Chapter 5 for details. |
| XMIT | SO/4-11 | Used to set I/O control to permit response to requests for transmission. In TTY mode, a message transmission will be initiated. |
| DELETE LINE (Delta 5200) | SO/4-12 | Causes all characters on a line from cursor to and including 80th position or CR to be deleted moving all lines below cursor up one line. Cursor remains in the same position. |
| INSERT LINE (Delta 5200) | SO/4-13 | Causes insertion of a CR symbol at the cursor location moving all data to the right of the cursor and all lines below it down one line. Cursor does not move. |
| CURSOR POSITION ENTER | SO/4-14 | Causes the next two characters entered into the Delta 5000 to represent and set the cursor to the absolute position defined in the sequence. The first character represents the position on a line and the second character the line. |

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| CURSOR POSITION XMIT | SO/4-15 | The Delta 5000 upon receipt of this code will cause the transmission of two characters, the first is the position of the cursor on a line, the second is the line. |
| HOME | SO/5-1 | Causes the cursor to move to the first position on the top line of display. |
| CLEAR MEMORY | SO/5-2 | Causes the Delta 5000 to clear all data from memory leaving the screen blank except for the ETX character. In Format Mode only variable data is cleared by replacing variable field characters with space codes. |
| CLEAR MESSAGE | SO/5-3 | Causes all data from the cursor to the EOM symbol to be replaced by space codes. In Format Mode, only variable data is cleared. |
| CLEAR LINE | SO/5-5 | Causes all characters to the right of the cursor on a line to be deleted. A CR is generated at the cursor position. |
| DELETE CHARACTER (Delta 5200) | SO/5-6 | The character at cursor is deleted causing all characters to the right up to a CR to be moved left one location. |
| ENKBD (Enable Keyboard) | SO/5-7 | Enables keyboard operation |
| INSERT END (Delta 5200) | SO/5-8 | Resets entry mode from Insert to Normal operation. |
| INSERT START (Delta 5200) | SO/5-9 | Causes all subsequent character entries to be inserted into memory at the cursor location moving all characters to the right and below cursor up to the first CR symbol to be moved right one place. Cursor moves one space to right after entry of character in this mode. |
| PRINT MEMORY<br>PRINT MESSAGE | SO/5-10<br>SO/5-11 | Used to initiate a transmission via the printer output. |

| CHARACTER | CODE CHART POSITION | FUNCTION |
|---|---|---|
| TTY MODE | SO/5-12 | Causes all characters keyed on the keyboard to be sent to the communications interface as well as displayed. Refer to Section 4 for details of TTY mode operation. |
| TYPE MODE | SO/5-13 | Causes all characters keyed on the keyboard to be displayed. Refer to Section 4 for details of TYPE Mode operation. |
| XMIT MEMORY | SO/5-14 | Used only in TYPE Mode. The Delta 5000 upon receipt of this code will cause the entire contents of the buffer memory to be transmitted to the remote processor. In Format Mode, the variable end delimiter and variable data only are transmitted. Refer to Section 5 for details. |
| XMIT MESSAGE | SO/5-15 | Used only in TYPE Mode. The Delta 5000 upon receipt of this code will cause all information from an SOM symbol to the next EOM symbol to be transmitted. Upon successful acknowledgement (receipt of ACK) the SOM is moved to replace the EOM. |

# CHAPTER 7

## COMMUNICATIONS INTERFACE

### GENERAL

This section describes the standard communications interface supplied with each Delta 5100 and 5200. It is characterized by:

1. EIA RS232C and CCITT V 24 compatibility.
2. Unpolled or contention operation.
3. 10 or 11 bit start-stop asynchronous serial transmission.
4. Switch selectable baud rates of 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600 or external.
5. A separate output for RS232C (CCITT V 24) compatible printers.

Normal communications is bit serial start-stop asynchronous. Each word is 10 or 11 bits long, the first bit (start bit) is always a "0" followed by 8-data bits followed by one or two stop bits which are always "1". See Figure 7-1. The eighth bit is always made a "1" unless the vertical parity option is installed in which case it is replaced by a bit which makes the number of "1's" in the eight-bit word an even number or odd according to the parity switch setting.

### INTERFACE CONNECTION

The interface leads utilized when connecting to a common-carrier data set that conforms to EIA RS232 or CCITT V 24 are described as follows:

| Pin Number | Line Description | Circuit RS232C | Circuit CCITT V 24 |
|---|---|---|---|
| 1 | Frame Ground | AA | 101 |
| 2 | Transmitted Data | BA | 103 |
| 3 | Receive Data | BB | 104 |
| 4 | Request to Send | CA | 105 |
| 5 | Clear to Send | CB | 106 |
| 6 | Data Set Ready | CC | 107 |
| 7 | Signal Ground | AB | 102 |
| 8 | Data Carrier Detect | CF | 109 |
| 15 | Transmission Signal Element Timing | DB | 114 |
| 17 | Receiver Signal Element Timing | DD | 115 |
| 20 | Data Terminal Ready | CD | 108 |

### LINE DESCRIPTIONS

Frame Ground (Circuit AA, 101). This conductor, where used, is electrically bonded to the machine frame.

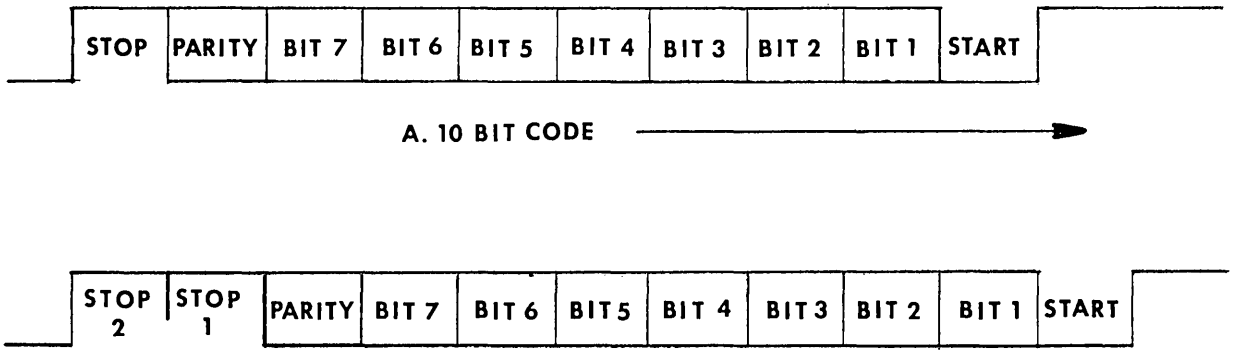



FIGURE 7-1 BIT SERIAL FORMAT

Transmitted Data (BA, 103). This circuit transfers data from the Delta 5000 to the data set for transmission to the remote processor. The Delta 5000 holds circuit BA in the Mark condition during any time interval between characters or words or when no signals are to be transmitted.

Receive Data (BB, 104). This circuit transfers data from the data set to the Delta 5000. Signals on this circuit are generated by the data set in response to data signals received from the remote source. The data set holds this line in the Mark condition when the line is idle or carrier is not detected.

Request to Send (CA, 105). This signal is generated by the Delta 5000 and indicated that the terminal is prepared to transmit data.

Clear to Send (CB, 106). This signal is generated by the modem in response to request to Send (CA, 105) and indicates to the Delta 5000 whether the modem is ready for a data transmission.

Signal Ground (AB, 102). This conductor establishes the common ground reference for all interface lines except circuit AA, 101.

Data Carrier Detect (CE, 109). This signal is generated by the modem. The on condition of this circuit is presented when the data modem is receiving a carrier signal. An off condition indicates that no carrier is being received. An on condition is used in Delta 5000 to illuminate the "On Line" lamp when selected.

Data Terminal Ready (CD, 108). The signals on this circuit are used to control switching of the signal converter to the communications channel. The on condition is maintained whenever the Delta 5000 has power applied.

Transmission Signal Element Timing (DB, 114). Signals on this circuit are generated by the modem and used to provide the Delta 5000 with signal timing information for transmitted data in the external clock mode.

Receiver Signal Element Timing (DD, 115). Signals on this circuit are generated by the modem and used to provide the Delta 5000 with signal timing information for received data in the external clock mode.

## ELECTRICAL CHARACTERISTICS

The Delta 5000 data set interfaces comply with the electrical requirements of the RS232C and CCITT V 24 as described below:

All voltages are measured at the connector with respect to signal ground (Circuit AB or 102). The output line delivers between 5v and 25v into a resistance of at least 3000 ohms. The input circuit signals depend on the following conditions:

| Polarity | Data | Logic | Control |
|---|---|---|---|
| + | Space | 0 | On |
| - | Mark | 1 | Off |

The terminating impedance at the receiving end of the interchange circuit must have a value of not less than 3000 ohms or not more than 7000 ohms. The capacitance measured at the interface connector should not exceed 2500 pf. The open-circuit voltage of the input circuits should not exceed 2v of either polarity.

For the data and timing circuits, the rise and fall time through the +3v to -3v range should not exceed 3 percent of the nominal bit time.

Included with each Delta 5000 is a cable which permits connection of modems that conform to RS232 or CCITT V 24. The connector is a Cinch or Cannon DB-19604-432.

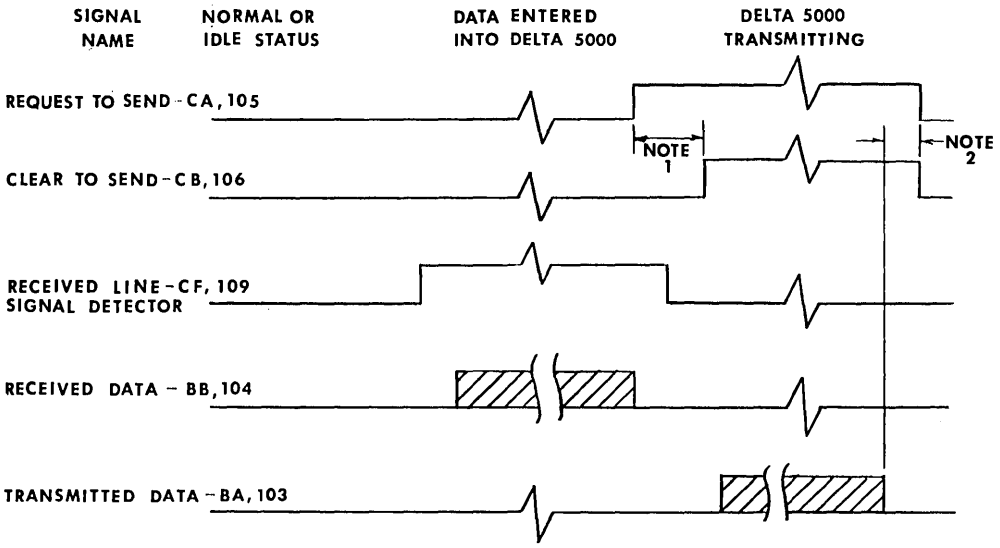
INTERFACE CONNECTION FOR PRINTER OUTPUT (Optional)

A cable is included with each Delta 5000 equipped with the optional printer output. The connector is a Cinch or Cannon DB-19604-433 which will mate with the standard RS232C connector. The signal pin assignments are:

| PIN NUMBER | SIGNAL | |
|---|---|---|
| 3 | Printer Data | |
| 7 | Signal Ground | |
| 6 | Data Set Ready | Jumpered Together |
| 8 | Data Carrier Detect | |
| 20 | Data Terminal Ready | |

Pin 6, 8, and 20 are jumpered together to provide signals normally provided by a data set which the printer may require for normal operation.

Note: The printer output option is available on Delta 5100 only if the block mode option is included.




Notes:
1. Circuit CA,105 is set immediately after receipt of the last character in a transmit command sequence. The delay time from circuit CA,105 to CB,106 is the data set turn-around time. Applications which do not use a data set can tie CA to CB which will result in no turn-around delay.
2. Circuit CA,105 is held on for approximately 4 milliseconds after the last bit is transmitted to allow it to clear the data set before shutting off Carrier.
3. Turn around time to receive data after a block transmission is approximately 8 milliseconds.

FIGURE 7-2. COMMUNICATIONS TIMING DIAGRAM

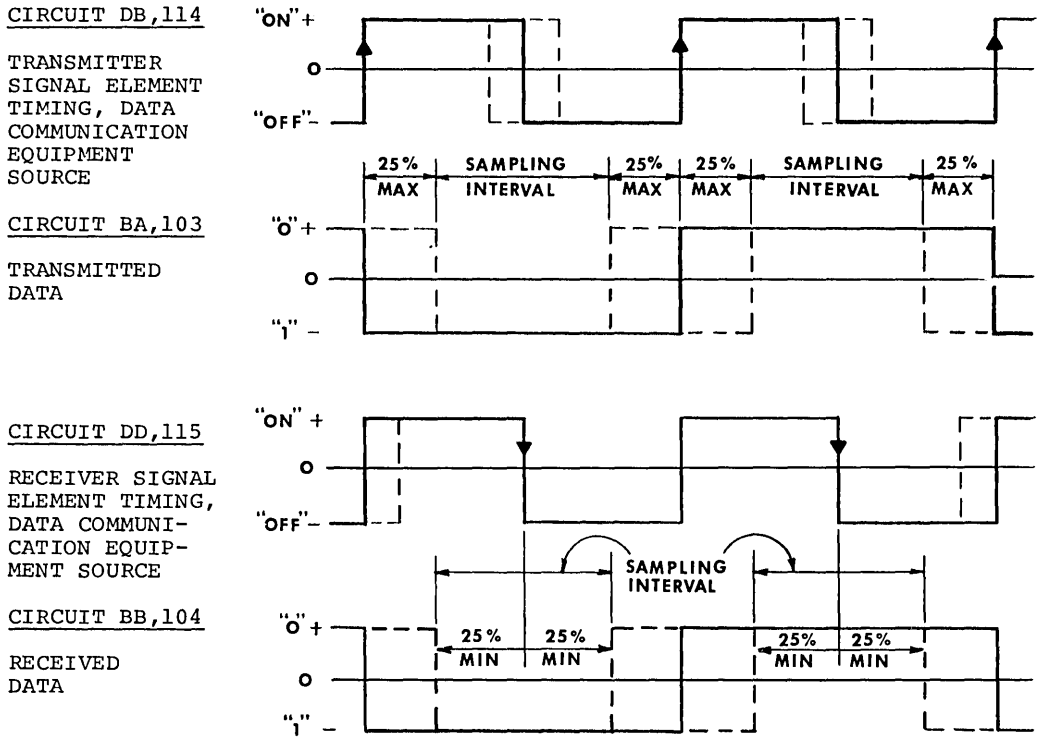



FIGURE 7-3. TIMING RELATIONSHIP BETWEEN DATA AND EXTERNAL CLOCKS

# CHAPTER 8

# PARTY LINE I/O

## GENERAL

All control of INPUT and OUTPUT to or from the Delta 5000 is via a Party Line data bus. In the standard unit, both the keyboard and the communications interface are connected via this bus. Optional remote peripherals can be attached to the bus. The party line is identical on the Delta 5100 and 5200. The unit is supplied without any provision for taking the party line signals outside the Delta 5000 package. A connector to permit external use can be ordered as an option.

## OPERATION

The Party Line consists of a bidirectional data bus containing 7 parallel lines and a unidirectional control signal bus which provides signals necessary to control I/O operations.

## PARTY LINE SIGNALS

### DATA BUS

Seven bidirectional lines, DATA1(L) to DATA7(L), transmit data between peripheral devices and the internal Delta 5000 controller. DATA7(L) is the most significant bit and DATA1(L) is the least significant bit.

### CONTROL BUS

Lines that transmit or receive control signals between peripheral devices and the internal Delta 5000 controller. These lines are described as follows:

DATAVL(L) (Data Available). This signal is generated by the peripheral and indicates that the peripheral has put data on the data bus. The Data Available signal must be at least 500 n-secs and the data must remain on the data bus for a long as DATAVL(L) is true. It is required that no peripheral can generate a DATAVL(L) signal if the Delta 5000 is busy.

TBUSY(L) (Terminal Busy). This signal is generated by the Delta 5000 and indicates to the peripherals that the Delta 5000 is busy. This signal goes true whenever a DATAVL(L) or a DAREQ(L) is generated and will stay true until the controller has completed the data transfer operation.

DAREQ(L) (Data Request). This signal is generated by the peripheral and causes the Delta 5000 to place a character on the Data Bus. This signal must remain true until the Delta 5000 generates a DARDY(L) signal. Under no circumstances should a DAREQ(L) signal be generated when the Delta 5000 is busy.

DARDY(L) (Data Ready). This signal is generated by the Delta 5000 in response to the DAREQ(L) signal and indicates to the peripheral that data is on the Data Bus. This signal and Data Bus remain true until the DAREQ(L) is terminated.

ICL(L) (Interrupt Clock). This signal is generated by the Delta 5000 and is used to clock the request flip-flops of the various peripherals. The frequency rate of the clock is 1MHZ. This signal will not be present when IACK(L) is true.

IREQ(L) (Interrupt Request). This signal is generated by a peripheral and when true indicates a request for service has been made. This signal should terminate when an IACK(L) is received.

PLACK(L) (Party Line Acknowledge). This signal is generated by the Delta 5000 when a request by a peripheral may proceed. It signifies that no device of higher priority has requested service.

ICP(L) (Interrupt Complete). This signal is generated by a peripheral to signify when its operations are complete. All request flip flops will be reset with this signal. This signal should be a pulse of 1 to 2 microseconds duration and the IACK will be terminated on the leading edge of this pulse.

RESET(L). This signal is transmitted when the operator depresses the RESET key on the keyboard. It may also be received from a peripheral. This signal will initialize the internal Delta 5000 Controller. This signal will be true as long as RESET is depressed.

INHENT(L) (Inhibit Entry). This signal when received by the I/O causes the I/O to ignore data transfers taking place on the party line.

XMITE(L) (Transmit Command). This signal is generated by the internal Delta 5000 Controller whenever a transmit command has been received. This signal will terminate when the transmission has been completed.

DMA(L) (Direct Memory Access). This signal is generated by a peripheral to indicate a high speed data transfer will occur. This signal will cause the Delta 5000 to disable the display and allow the memory to be read or written into at a high-speed data rate. The peripheral will terminate this signal when the data transfer is over.

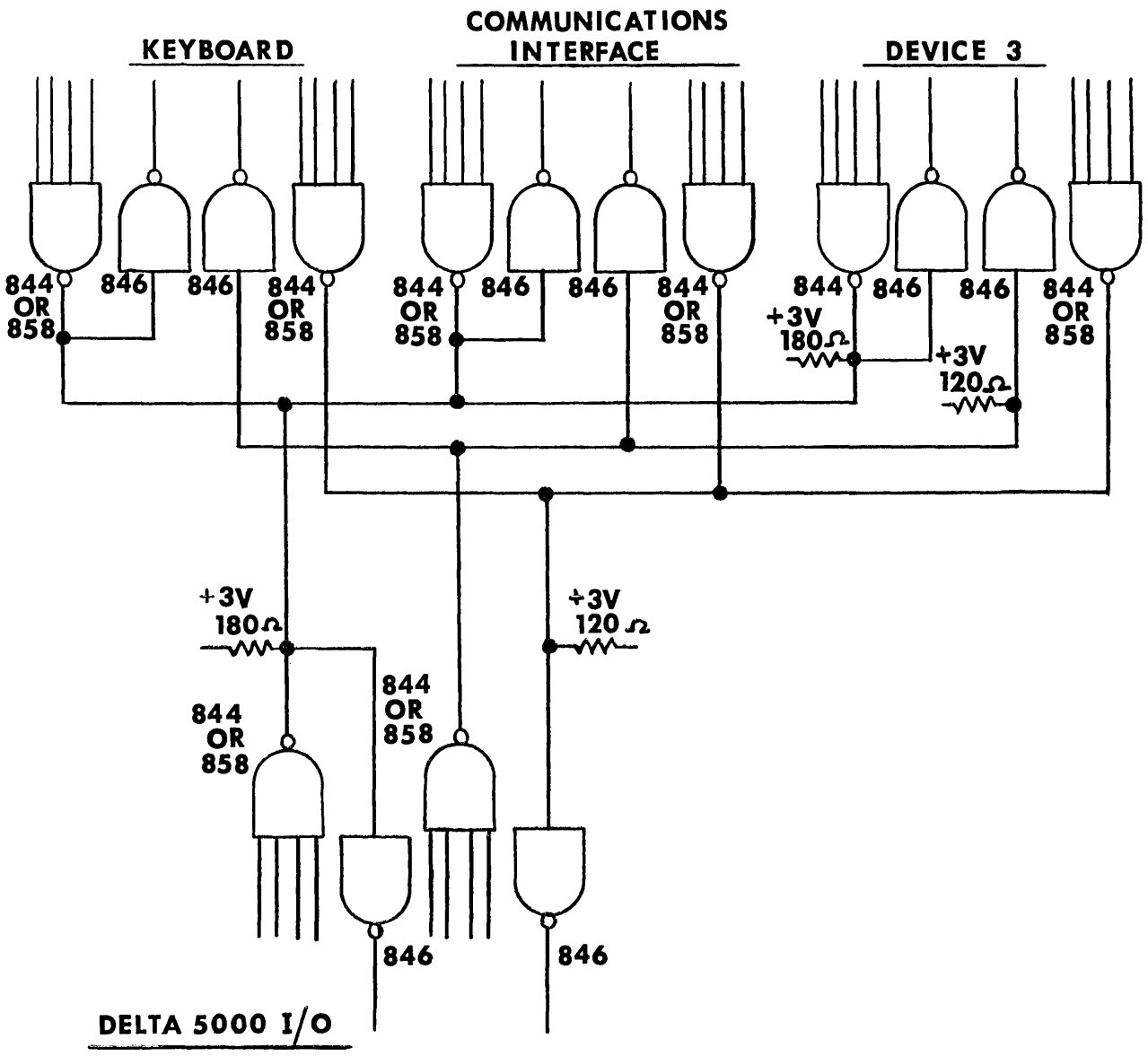



FIGURE 8-1 PARTY LINE LOADING INTERCONNECTING DIAGRAM

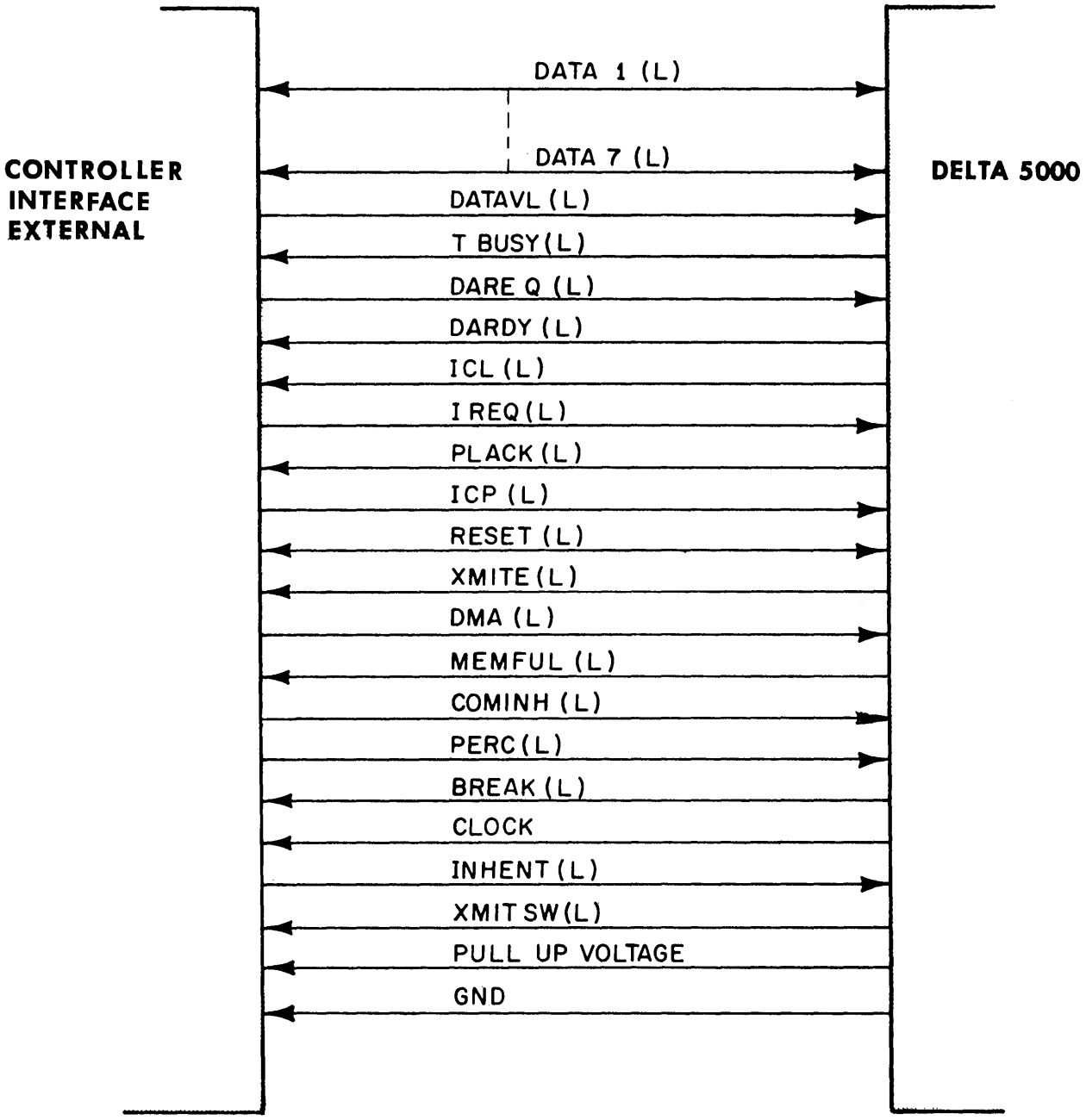
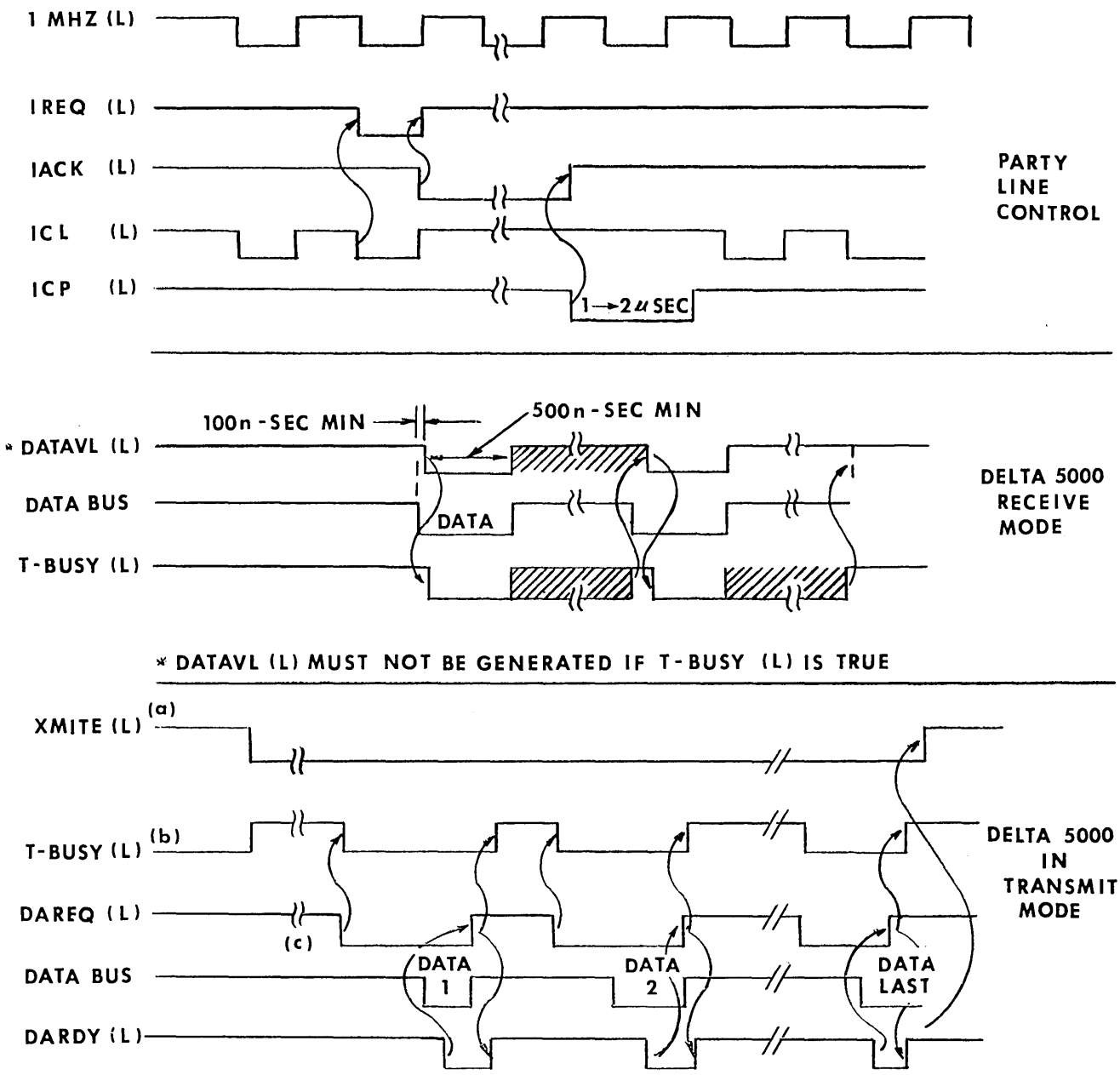



**FIGURE 8-2 PARTY LINE - INTERCONNECTION**




(a) XMITE goes true upon receipt of a valid transmit command.
(b) DAREQ (L) cannot be generated if TBUSY (L) is true.
(c) During this time the peripheral controller must obtain control of the Party Line before generating DAREQ(L).

**FIGURE 8-3 PARTY LINE-TIMING**

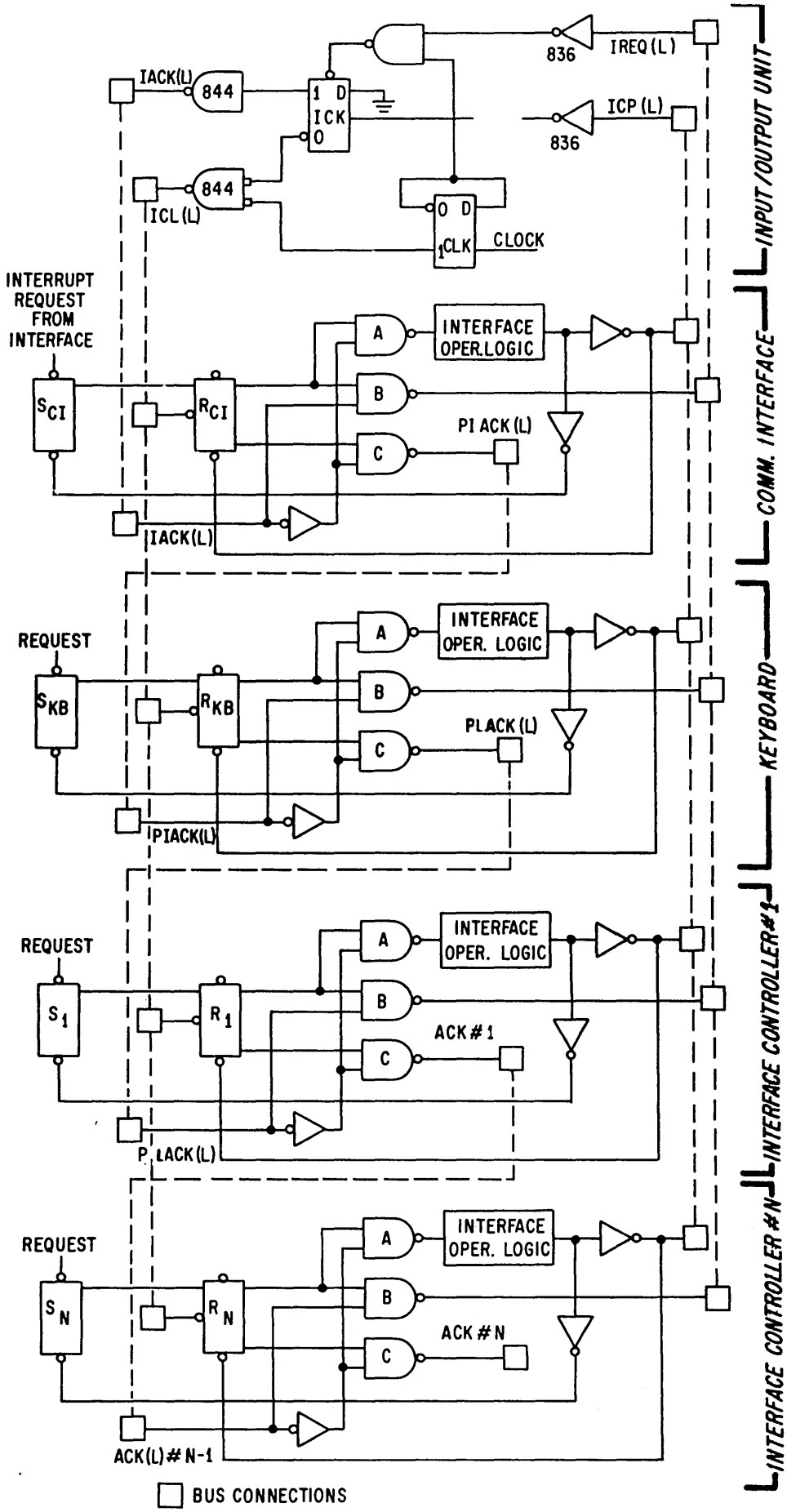



FIGURE 8-4 SEQUENTIAL PRIORITY INTERRUPT SCHEMATIC

MEMFUL(L) (Memory Full). This line is generated by the internal Delta 5000 Controller. It will signify that all memory locations are used and any additional data entries will cause data to be lost. This signal will be terminated upon receipt of a Clear Memory, Clear Message, Clear Line, Delete Line or Delete Character command.

COMINH(L) (Communication Interface Inhibit). This line is generated by the Delta 5000 and inhibits the communications interface from the party line. Peripherals may also generate this signal to inhibit the communications interface.

CLOCK. A 1 MHZ clock signal generated by the Delta 5000.

XMIT SW(L) (Transmit Switch). This signal is transmitted to a peripheral when an operator depresses the XMIT key on the keyboard and the Delta 5000 is in the TYPE mode. The signal is true for 1 to 2 microseconds.

PERC(L) (Peripheral Control). This signal is generated by a peripheral interface whenever it has control of the party line. It prevents the Communications Interface from generating DATA REQUESTS when the Delta 5000 is in the transmit mode.

BREAK(L). This signal is an interrupt function. It is generated by the keyboard and is true for approximately 700 milliseconds.

PARTY LINE CIRCUITRY

The Party Line is attached to the I/O control PC Card in the Delta 5000. All signal levels of the party line are DTL compatible and low (L) when true. Each line whose source is on the I/O card is driven with a DTL 844 or 858 driver. This driver requires a pull up resistor. The last device in a string which uses the signal should terminate it with a 120 ohms resistor connected to a +3 volts (supplied on the party line connector). See Figure 8-1. If the line is bidirectional, it should be terminated at both the Delta 5000 and the last location in the string with a 180 ohms resistor to the +3V supply. The +3V supply must have a low frequency and high frequency bypass capacitor on the external controller interface.

All signals received by the I/O interface are loaded by one standard DTL 846 or 836 gate. These lines if unidirectional are terminated at the Delta 5000 input by a 120 ohms resistor connected to +3 volts. Each data or control signal should be distributed to other peripherals via a twisted pair of wires with the grounds returned to a point as close to the source as possible. Party line cables should not exceed 10 feet. Figure 8-2 defines the direction of control signals. Figure 8-3 shows timing considerations.

All signals are low true:

Logical "1" = 0.0 volts + 0.5
- 0.0

"0" = 2.5 to 5.5 volts

Interrupt System

Party Line operation employs a unit sequential interrupt system under control of the Delta 5000 I/O section. A definite priority has been established, and each interface controller must provide a signal to all subsequent controllers to indicate that it is not using the Delta 5000. In the design of the Delta 5000, the Communications Interface Controller has the highest priority followed by the Keyboard Controller. A signal generated by the keyboard, PLACK(L) (Party Line Acknowledge), will be the priority signal received by any additional interface controller.

It is required that each interface controller is prohibited from generating party line signals until it has received priority. Figure 8-4 shows a schematic of the interrupt structure.

Operation of the Interrupt System

The interrupt system shown in Figure 8-4 operates as follows: When a request is determined by an interface controller, its request storage flip flop is set. FF (SCI, SKB, S1....SN). On the next trailing edge of interrupt clock (ICL(L)), the request FF, (RC1, RKB, R1....RN) is set for each device where the request storage FF is set. Since IACK(L) and each propagated IACK is high at this time, the Interrupt Request IREQ(L) is made true. The interrupt Flip Flop (I) in the I/O is set on the next phase of the clock causing IACK(L) to go true and ICL(L) to be removed from the bus. When IACK(L) goes true to the CI, this indicates that priority is available. The common input of gates A & C are enabled. If RC1 is set, only gate A will have an output and the CI will have obtained control of the party line. If RC1 is not set, Gate C will have an output which passes priority on to the keyboard. This signal will be passed on to each succeeding controller until the highest priority request Flip Flop is found. When any controller has obtained the party line, it is free to generate the appropriate party line signals. When a controller is finished with its operation, it must generate an ICP(L) (Interrupt Complete Signal). This should be a pulse of (1-2)$\mu$-sec. This signal will reset all Request Flip Flops and the Interrupt Flip Flop (I) in the I/O is reset. This removes the IACK(L) signal and allows ICL(L) to return to the bus and to set any request FF where there is a corresponding request storage FF set. Thus, multiple requests will be serviced in their order of priority.

# DIRECT MEMORY ACCESS

The Delta 5000 can make provision for a high speed direct memory access via the party line as an option. All basic timing for transmission and receipt of data via the party line will be consistant with the present slow speed party line timing with the exception of the direct memory access signal (DMA(L)).

## Theory of Operation

The Direct Memory Access (DMA) mode of operation is the high speed, parallel transfer of data between the Delta 5000 and an external device. The two modes of operation, receive and transmit, will be discussed separately.

First, there are certain rules that must be taken into consideration. Rules that apply to both modes of operation are:

(1) The Delta 5000 must not be in FORMAT mode during any transfer.

(2) Signal line PERC must be pulled low and signal line COMINH must be pulled low, unless communications interface operation is desired.

(3) No new operation can be initiated until the one in process is completed.

(4) There are time limits between transfers, 2$\mu$ second minimum and 200$\mu$ second maximum.

(5) An IREQ (Request for the Party Line) must be made, and acknowledged (PLACK) by the Delta 5000 at the beginning of any transfer operation.

(6) DMA line cannot be pulled low, if TBUSY is true.

(7) No editing can be done during DMA operation.

Additional rules that apply for Receive mode are:

(1) There is no command for receive mode.

(2) No "Control" characters can be entered in the data stream except Carriage Return (CR), Start of Message (SOM), Start and Stop Blink, and Start and Stop Variable Field codes.

Additional rules that apply for Transmit mode are:

(1) When doing a Transmit Message, a SOM must be in memory.

(2) The signal lines, DMA, PERC, and COMINH must not go false until signal XMITE goes false.

DMA Receive Mode

In order to perform the DMA Receive operation, the external device must gain Party Line (P/L) control. This is accomplished by setting IREQ (L) (Interrupt Request) true. If the terminal is not busy, PLACK (L) (Party Line Control Acknowledged) will go true and remain true until ICP (L), (Interrupt Complete) is generated at the termination of the operation.

At the time PLACK (L) is received, PERC (L) and COMINH (L) must go true. Also, at this time DMA (L) and DATAVL (L) can go true. Immediately, TBUSY (L) goes true, while the cursor location is sought. TBUSY (L) will be true for a time of 1$\mu$second minimum to 120 millisecond maximum and then display is stopped.

When TBUSY (L) goes false, the time-out one-shot is triggered. The external device now has up to 200$\mu$ seconds to generate a DATAVL (L) signal. This signal tells the Delta 5000 that data is available on the Party Line (P/L).

When DATAVL (L) goes true, TBUSY (L) will be true 0.1$\mu$ seconds later. Data must be true for 0.1$\mu$-seconds before the leading edge of DATAVL (L) and remain true for a period of 600 to 1400 $\mu$seconds. DATAVL (L) must be true for at least 0.5$\mu$ seconds When the data has been entered, TBUSY (L) will go false, telling the external device to enter another character. This operation is continued until the transfer is completed.

If the 200$\mu$ second time-out is exceeded the Delta 5000 will go into a "Spin" operation. A marker code is placed in the memory and the memory "spun" once around and stopped back on the marker. A "Spin" is a safety operation which prevents the loss of data in memory. If a character is entered after a "spin" is started, TBUSY(L) goes true and remains true until the "spin" is completed and the character is entered into memory.

The data that is entered will overwrite all data contained in memory until the transfer is terminated.

When it is desired not to overwrite a location and retain the data in this location a NUL (all Ø's) code should be entered. This is the "skip" operation Although NUL is the primary skip code any code in column 0, rows 0 through 7 of the code chart (Figure 6-1, 6-2) will cause a skip.

Also, if a variable field is being updated (i.e., the Start of Variable Field is "Skipped") and this variable Field contains a Start Blink code which is to be overwritten, this code should be overwritten with an End Blink code. The reason for this operation is to prevent overrunning the Variable Field. This could occur because the Start Blink is not displayed, thus does not use a position of the Variable Field. It is therefore possible for the Variable Field to be lengthened. By over-writting the Start Blink with a Stop Blink code, the logic will eliminate the Stop Blink code automatically when transfer is completed.

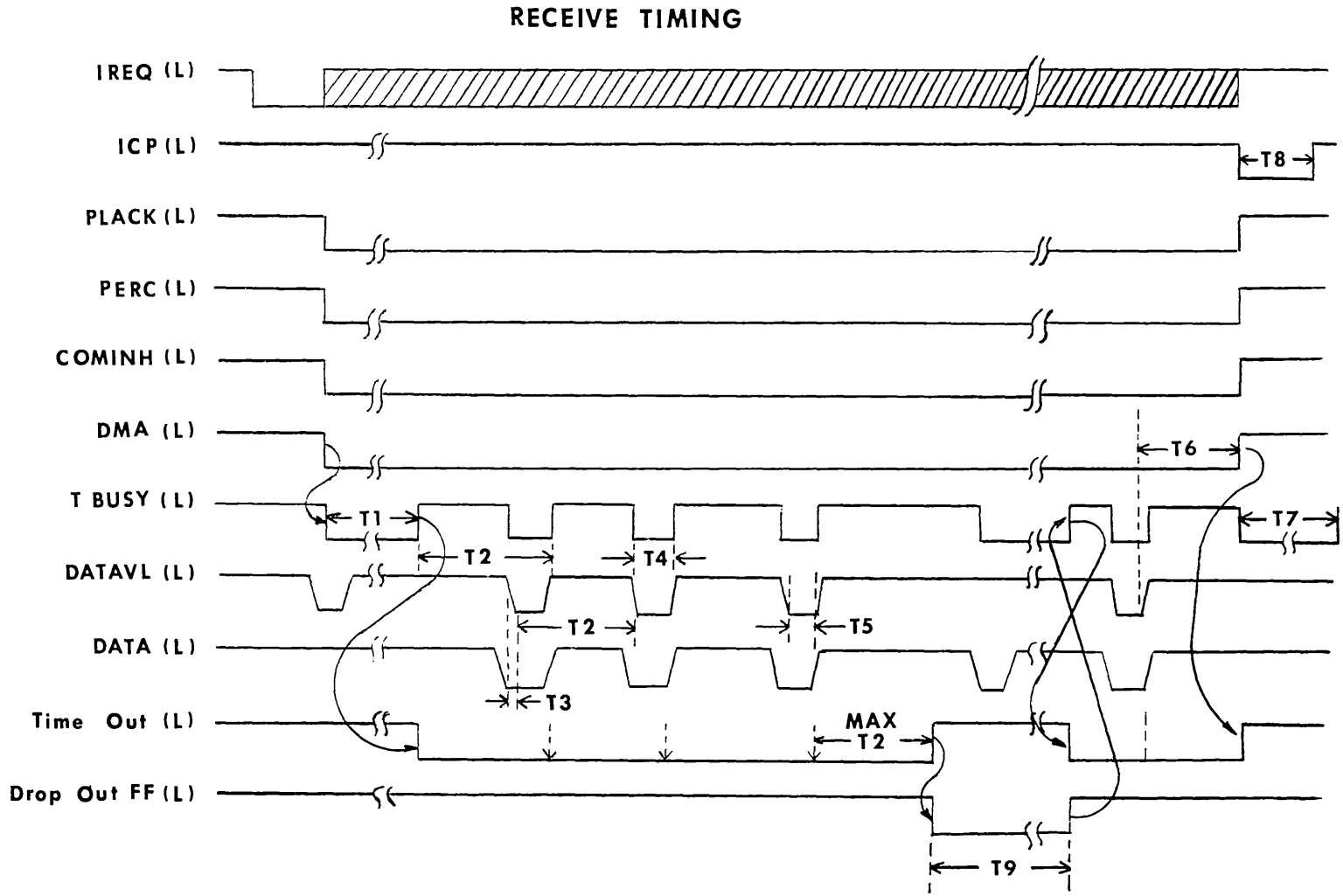



FIGURE 8-5 DMA RECEIVE TIMING DIAGRAM

| | MIN. | MAX. |
|---|---|---|
| T1 | 1$\mu$ sec. | 120 msec. |
| T2 | 2$\mu$ sec. | 200$\mu$ sec. |
| T3 | 0.1$\mu$ sec. | - |
| T4 | 0.6$\mu$ sec. | 1.4$\mu$ sec. |
| T5 | 0.5$\mu$ sec. | 0.9$\mu$ sec. |
| T6 | None | 200$\mu$ s |
| T7 | 0.5$\mu$ sec. | 475$\mu$ s - 1K MEM<br>950$\mu$ s - 2K MEM<br>1425$\mu$ s - 3K MEM |

| | MIN. | MAX. |
|---|---|---|
| T8 | 1$\mu$ s | 2$\mu$ s |
| T9 | - | Same as T7 |

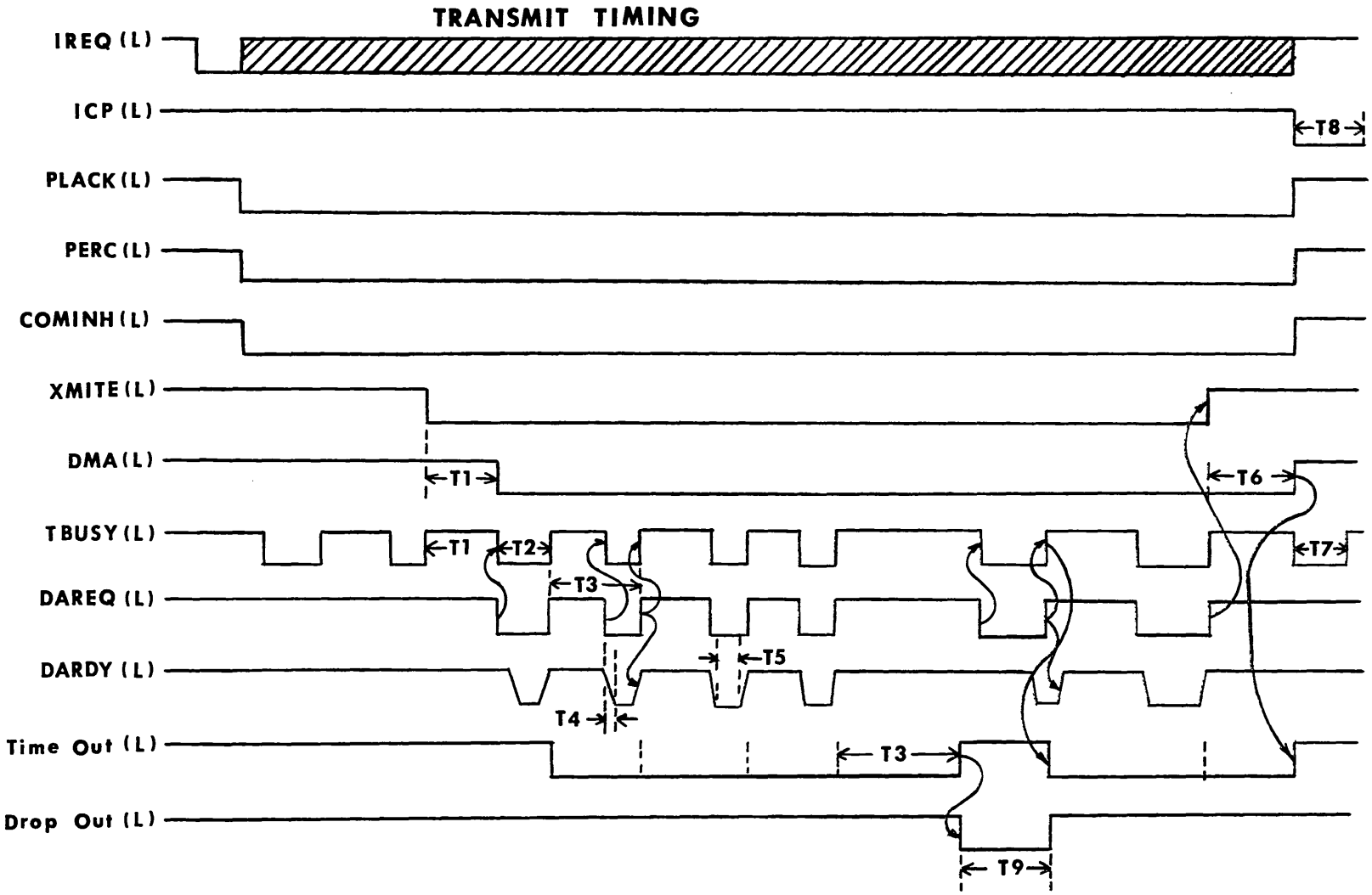



FIGURE 8-6 DMA TRANSMIT TIMING DIAGRAM

| | MIN. | MAX. |
|---|---|---|
| T1 | 0.5$\mu$ sec. | Before DAREQ |
| T2 | 0.5$\mu$sec. | 475$\mu$s - 1K MEM<br>950$\mu$s - 2K MEM<br>1425$\mu$s - 3K MEM |
| T3 | 2$\mu$ sec. | 200$\mu$s |
| T4 | 0.55$\mu$sec. | 1.1$\mu$s |
| T5 | 0.1$\mu$sec. | - |
| T6 | None | 200$\mu$s |
| T7 | 0.5$\mu$ sec. | Same as T2 |
| T8 | 1$\mu$ sec. | 2$\mu$s |
| T9 | — | Same as T2 |

If during data transfer, the STX, SOD and/or ETX are overwritten, they will be replaced by the Delta 5000 at the end of operation. This is accomplished by logic on the DMA board which is called the "Putback" operation.

When the transfer is completed, signal lines DMA(L), PERC(L), and COMINH(L) must be put to the false condition and signal ICP(L) must be generated. At this time, the Delta 5000 logic will perform the "putback" operation (if needed), delete all unnecessary characters, enable the display, and return control to the operator.

DMA TRANSMIT MODE

To perform the TRANSMIT operation, the external device must gain Party Line (P/L) control, using the sequence identical to that described in the RECEIVE operation. (Note: When PLACK(L) goes true PERC(L) and COMINH(L) must be pulled low).

When P/L control is acknowledged by PLACK(L), if the operation were initiated by the operator, the external device will send the transmit command character sequence. The command character sequence will be either TRANSMIT MEMORY (SO, XMIT MEMORY) or TRANSMIT MESSAGE (SO, XMIT MESSAGE). If the operation is initiated by the external device, the command character sequence will contain four characters. This sequence will be TRANSMIT (SO, XMIT) and either of two transmit commands.

The operator initiates the operation by depressing the "XMIT" key. When this key is depressed, two operations occur:

(1) The SO, XMIT codes are transmitted from the keyboard to the Delta 5000 logic via the party line.

(2) XMITSW(L) is generated on the P/L. (Note: Signal XMITSW(L) is also generated when the external device sends SO, XMIT to initiate the TRANSMIT operation).

When the Delta 5000 decodes the last character of the two or four character command sequence, TBUSY(L) is true. Before TBUSY(L) goes false, XMIT(L) will go true. Now, DMA(L) and DAREQ(L) can be pulled low (true).

When DAREQ(L) goes true, TBUSY(L) will immediately go true, while the first character to be transmitted is sought. TBUSY(L) can remain true for a period 0.5 $\mu$ seconds to 1.4 milliseconds in duration.

DARDY(L) and TBUSY(L) will remain true until DAREQ(L) goes false. Now, within the 200$\mu$ second time out period another DAREQ(L) (Data Request) must be generated by the external device. The Delta 5000 will respond with DARDY(L) (Data Ready) at this time. This operation will continue until the last character (ETX) is transmitted.

When DAREQ(L) goes false as the ETX is transmitted, XMITE(L) will go false. DMA(L) can now go false during a period beginning when XMITE(L) goes false, till 200$\mu$ seconds after. Also, at this time ICP(L) must be generated and PERC(L) and COMINH(L) should go to the false state.

If at any time during the transfer a DAREQ(L) is not generated within the 200$\mu$ second time out, a "spin" operation is initiated. The "Spin" is explained in the RECEIVE operation.

At no time should DMA(L), PERC(L), and COMINH(L) go false before XMITE(L) goes false. This would cause undetermined conditions to arise in the Delta 5000 logic. These conditions could only be cleared by issuing a RESET(L) to the Delta 5000.

PARTY LINE CONNECTOR

| NAME | CONNECTOR PIN | NAME | CONNECTOR PIN |
|---|---|---|---|
| DATA 1 (L) | A | PLACK (L) | f |
| DATA 1 Return | L | PLACK Return | j |
| DATA 2 (L) | B | ICP (L) | k |
| DATA 2 Return | M | ICP Return | p |
| DATA 3 (L) | C | RESET (L) | l |
| DATA 3 Return | N | RESET Return | r |
| DATA 4 (L) | D | XMIT (L) | m |
| DATA 4 Return | P | XMIT Return | s |
| DATA 5 (L) | E | DMA (L) | K |
| DATA 5 Return | R | DMA Return | V |
| DATA 6 (L) | F | MEMFUL (L) | n |
| DATA 6 Return | S | MEMFUL Return | t |
| DATA 7 (L) | H | COMINH (L) | DD |
| DATA 7 Return | T | COMINH Return | u |
| DATAVL (L) | W | PERC (L) | EE |
| DATAVL Return | a | PERC Return | v |
| T BUSY (L) | Y | BREAK (L) | FF |
| T BUSY Return | c | BREAK Return | w |
| DAREQ (L) | x | CLOCK (L) | HH |
| DAREQ Return | b | CLOCK Return | x |
| DARDY (L) | J | INHENT (L) | JJ |
| DARDY Return | U | INHENT Return | y |
| ICL (L) | Z | XMITSW (L) | KK |
| ICL Return | d | XMITSW Return | z |
| IREQ (L) | e | PULL UP VOLTAGE (+3V) | MM |
| IREQ Return | h | GND | NN |

# CHAPTER 9

## TIMING CONSIDERATIONS

Table 9-1 is a list of the timing requirements for each Delta 5000 operation. Programming personnel should make note of these time limitations for subsequent entry of data. When entering data and commands thru the communications interface RUBOUT codes should be used as fillers to allow for execution time. All times are in microseconds unless otherwise indicated.

TABLE 9-1. TIMING CONSIDERATIONS

| | TIME LIMITATIONS (MAXIMUM) $\mu$ sec. | | |
|---|---|---|---|
| OPERATION | 1K Memory | 2K Memory | 3K Memory |
| Entry of a Data Character | 510 | 990 | 1460 |
| Absolute Cursor Position Entry | 480 | 960 | 1440 |
| Page Up | 480 | 960 | 1440 |
| Page Down | 1440 | 2880 | 4320 |
| Page Start | 960 | 1900 | 2850 |
| Page End | 1440 | 2880 | 4320 |
| Form Feed | 960 | 1900 | 2850 |
| Variable Field Start/End | 510 | 990 | 1460 |
| Blink Start/End | 510 | 990 | 1460 |
| Clear Memory | 4450 | 4450 | 4450 |
| Clear Message | 960 | 1900 | 2850 |
| Cursor Movement (one space, any direction) | 480 | 960 | 1440 |
| Home Cursor | 480 | 960 | 1440 |
| Entry of Data In Insert Mode | 510 | 990 | 1460 |
| Insert Line | 480 | 960 | 1440 |
| Delete Line (1 character) | 960 | 1900 | 2850 |
| Each Additional Character Deleted. | 480 | 960 | 1440 |

TABLE 9-1 Continued

| OPERATION | TIME LIMITATION (MAXIMUM) 1K Memory | 2K Memory | 3K Memory |
|---|---|---|---|
| Entry of data to the right of CR 1 position | 960 | 1900 | 2850 |
| Each additional position right | 480 | 960 | 1440 |
| CR Entry | 510 | 990 | 1460 |
| Clear Line | 480 | 960 | 1440 |
| Tab | 3.8 milliseconds maximum (80 positions) | | |
| Tab Clear | 21 | 21 | 21 |

# CHAPTER 10

# INSTALLATION

## Size and Weight

Figure 10-1 is an outline drawing of the Delta 5000 detailing pertinent dimensions. Figure 10-2 is an outline drawing of the Delta 5000 with a separate keyboard. Either configuration weighs approximately 100 pounds (45 kg).

## Power Requirements

### Domestic

The Delta 5000 requires a 117 V.A.C., 60+1 Hz, single phase, primary power source. The tolerance on the primary voltage is + 10%. A standard three-wire cable (2 conductors plus ground) is provided with the Delta 5000. The primary source must be capable of a current carrying capacity of 3 amperes.

The Delta 5000 can be optionally connected for operating with 94 or 140 V.A.C. primary sources. The voltage tolerance is + 10% for each of these connections.

### World Trade

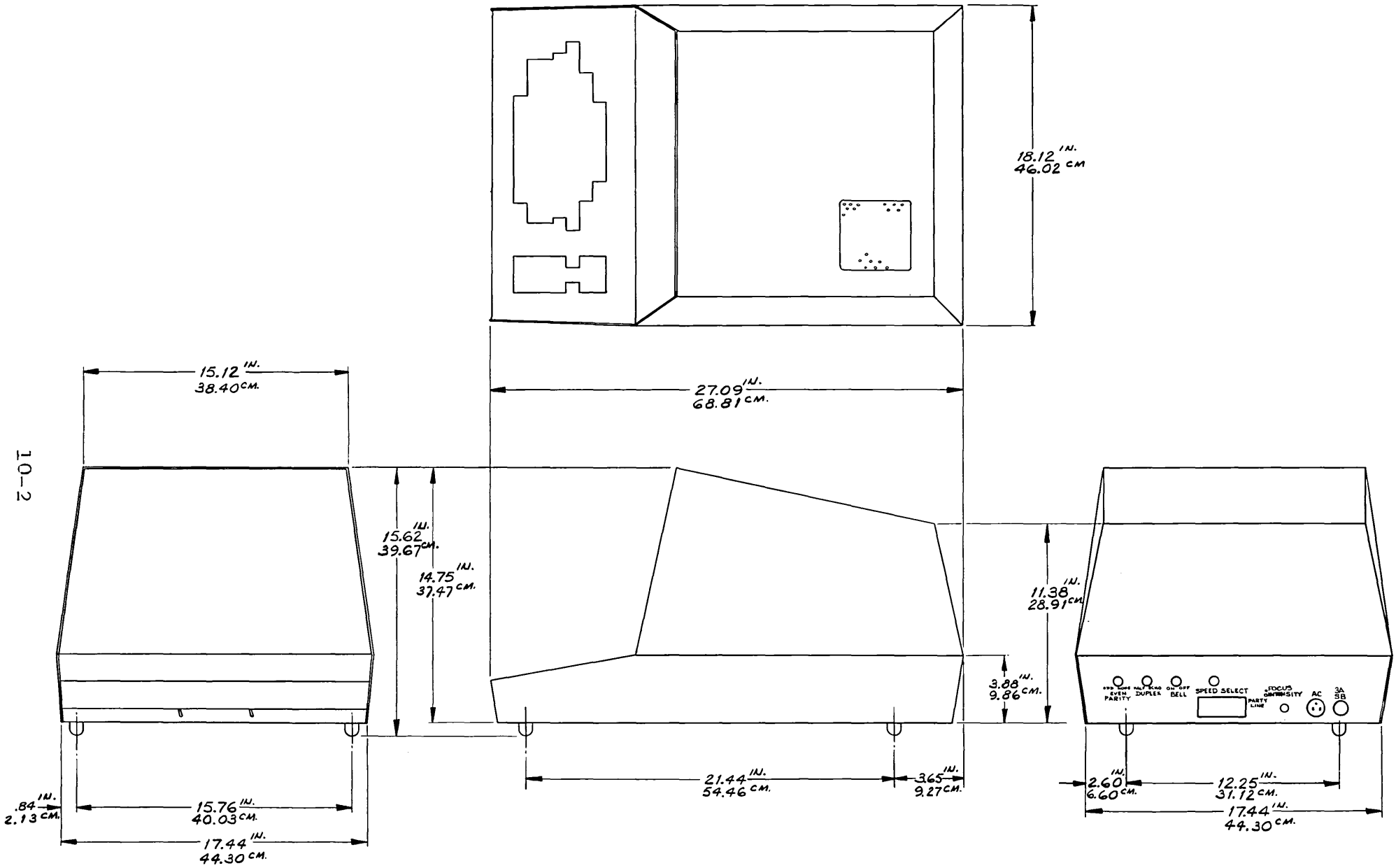
The Delta 5000 requires one of the following power sources: 198, 220, 242 V.A.C, 50 + 1Hz, single phase. The voltage tolerance is + 10% for each of these connections. If not specified the unit is connected for 200 V.A.C., 50 Hz.

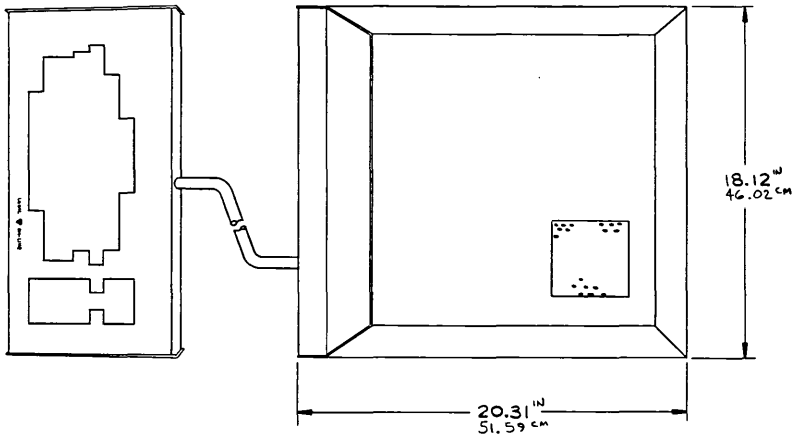
## Cabling

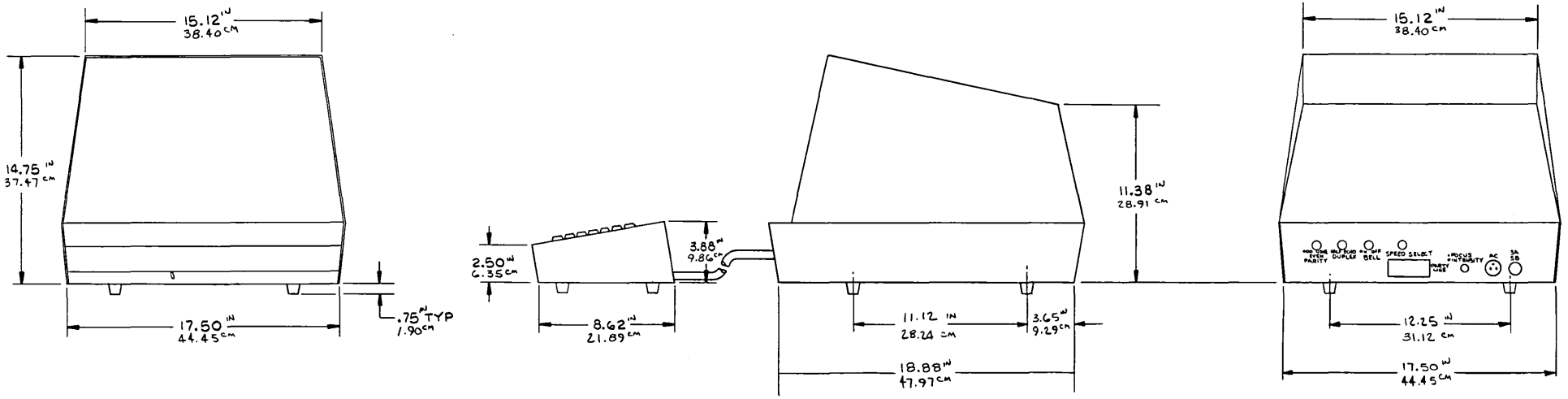
A single cable connects the Delta 5000 to the modem. The cable's standard length is ten feet (3 metres), however, optional cable lengths are available up to 50 feet (15.2 metres).

A single cable connects the Delta 5000 with optional serial printer output to the printer. The standard printer cable length is ten feet (3 metres), however, optional cable lengths are available up to 50 feet (15.2 metres).

The separate keyboard is connected to the monitor/controller by a single six foot (1.8 metres) cable. Optional cable lengths are 4, 8 and 10 feet (1.2, 2.4, and 3 metres).


18.12 IN.
46.02 CM
15.12 IN.
38.40 CM.
27.09 IN.
68.81 CM.
15.62 IN.
39.67 CM.
14.75 IN.
37.47 CM.
11.38 IN.
28.91 CM.
3.88 IN.
9.86 CM.
SPEED SELECT
FOCUS
INTENSITY
AC
3A
5B
.84 IN.
2.13 CM.
15.76 IN.
40.03 CM.
17.44 IN.
44.30 CM.
21.44 IN.
54.46 CM.
.365 IN.
9.27 CM.
2.60 IN.
6.60 CM.
12.25 IN.
31.12 CM.
17.44 IN.
44.30 CM.


18.12 IN
46.02 CM
20.31 IN
51.59 CM


15.12 IN
38.40 CM
14.75 IN
37.47 CM
17.50 IN
44.45 CM
.75 IN TYP
1.90 CM
2.50 IN
6.35 CM
3.88 IN
9.86 CM
8.62 IN
21.89 CM
11.38 IN
28.91 CM
11.12 IN
28.24 CM
3.65 IN
9.29 CM
18.88 IN
47.97 CM
15.12 IN
38.40 CM
12.25 IN
31.12 CM
17.50 IN
44.45 CM

# CHAPTER 11

## HINTS FOR THE DELTA 5000 USER

This chapter contains answers to the most commonly asked questions about Delta 5000 do's and don'ts and application hints. The items are not listed in any particular order - only as they occur. A heading is provided to provide a guide to their general area of use. Some of the items are repeated from other chapters of the manual.

1. Editing - Functions described in Chapter 4 such as Insert/ Delete Line, Insert/Delete Character, Tab and Margin can be used in TTY mode as well as Type Mode. Operation in TTY mode is identical to Type Mode.

2. Tab - All tabs must be set at the same time and on the same line of the display. Any line of the display can be used to set tabs. Up to 6 tabs may be set if MARGIN SET is not used.

3. Tab - Positioning the cursor to the first position on a line during tab set prohibits any further tab setting until a tab clear is performed.

4. Margin - If Tab set and Margin Set are to be used, they should be done in the same sequence. Setting a margin after a tab operation can cause a tab position to be lost.

5. Margin - Resetting the margin requires resetting the tabs, if used.

6. Format - The Carriage Return (CR) is useful as an end variable field delimiter when preparing formats which are to be printed, since the CR is transmitted and will cause the printer to start a new line. If the format on the Delta 5000 has lines which do not have any variable fields in them and it is desired that the printer feed these corresponding lines, end these lines with a start variable field code and then the carriage return. When the form is printed the carriage returns will be sent to the printer and cause the printer to skip over lines on the form. See items 7, 8 and 9.

7. Format - Units equipped with non-displayed carriage returns will not display the variable field combination of start variable field followed by a Carriage Return. That is, no underline will appear on the screen even though a variable field exists at that location.

8. Format - When entering data or doing a tab in format mode the cursor will stop at locations where there is a start variable field followed by a CR even though no variable field underline is displayed there. An attempt to enter data at this location will cause the cursor to advance to the start of the next variable field (or Home) and the data will be lost.

9. Format - Care must be taken in using the CR as an end variable field delimiter in applications where the variable data is stored or recorded (such as on the cassette) to be played back on a similar format at a later time. The CR, when played back will position the cursor outside the desired variable field.

10. Transmit - The "Transmit Message" code in TTY mode is the same code as the "Transmit" request code in TYPE mode.

11. Receive Block - Delta 5000 will act on all data received and does not require the STX, ETX delimiters to condition received data. The STX, ETX delimiters are used to define the data block to be checked for parity and to condition the ACK/NAK response.

12. Codes - Although all codes of Figures 6-1 and 6-2 and those shown in Figure 6-3 can be entered into the Delta 5000, not all of them are stored in the memory. Many of the codes are used to control the Delta 5000, - position cursor, cause a transmit, change modes, etc., but do not change the contents of the memory. All codes in columns 2 through 6 of the Figures 6-1 and 6-2 are stored in memory. All codes in column 7 except Rubout (7-15) are stored in memory. The only codes in columns 0 and 1 which can be entered into memory are CR (0-13), SOM (1-7), Variable End (1-12), Variable Start (1-13), Blink End (1-14), and Blink Start (1-15). The Delta 5000 internal logic inserts and controls STX (0-2), ETX (0-3), and SOD (1-2) for defining the start and end of memory data and the start of the displayed part of memory.

13. Codes - If, for any reason, an illegal code should appear in the memory, the Delta 5000 logic will delete the character. This could result from a logic failure, error in the memory or through a DMA operation.

# TROUBLE REPORT

## POWER FAILURE

- ☐ Terminal won't turn on.
- ☐ Terminal was operating; went dead.
  - ☐ Notice smoke or unusual odor at the time.

## INDICATORS

Mark the indicators which were on when failure occurred.

- ○ Local
- ○ Format
- ○ Alarm
- ○ XMIT
- ○ On-Line
- ○ TTY
- ○ Insert

## DISPLAY

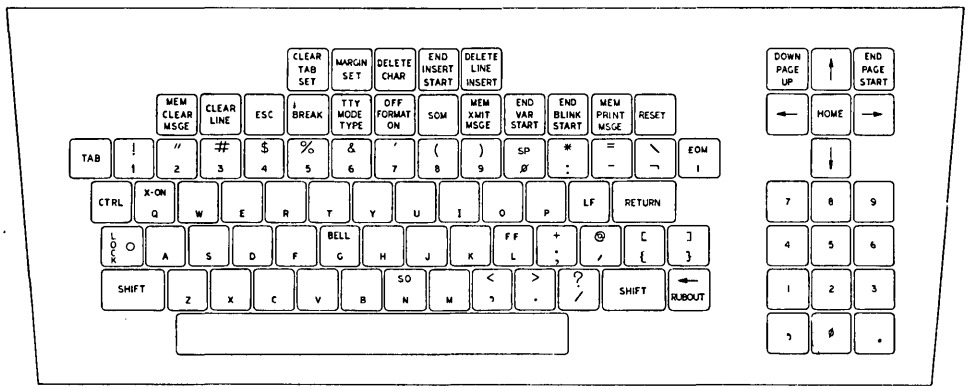
- ☐ Screen Dark
- ☐ Data Missing on screen
  - ☐ Cursor Missing
  - ☐ ETX Missing
  - ☐ Data Characters Missing
- ☐ Screen Shrunk
- ☐ Screen Enlarged
- ☐ Intensity Control has no effect
- ☐ Other _____

_____

## KEYBOARD FAILURE

- ☐ All keys fail.
- ☐ Some keys fail.

Mark all failing keys.




Describe the circumstances leading to the failure.

Terminal Serial Number _____

In order to keep you informed on additions and corrections to this manual, please fill out this card and mail it. Also if you have any comments regarding this manual, please make note below. Thank you for your cooperation. No postage necessary if mailed in the U.S.A.

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ADDRESS OF COMPANY:

TO WHOSE ATTENTION:

COMMENTS:

UNIT SERIAL #

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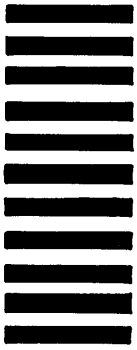

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