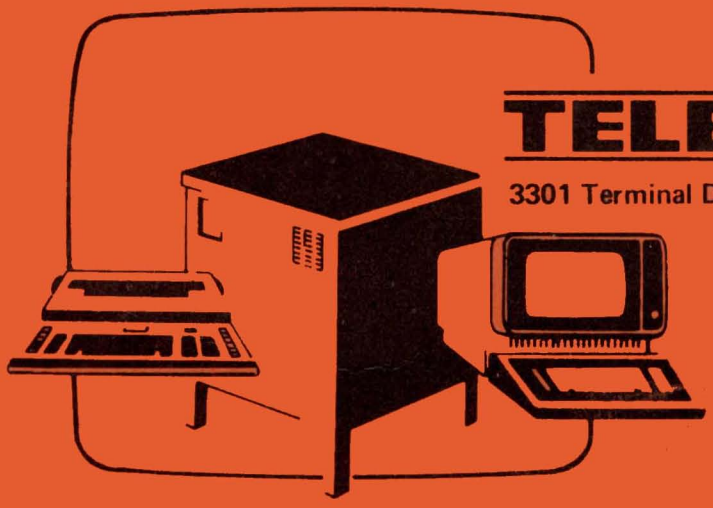
# OPERATOR'S MANUAL

## TC 277C/D KEYBOARD DISPLAY TERMINAL



TELEX® TERMINAL COMMUNICATIONS

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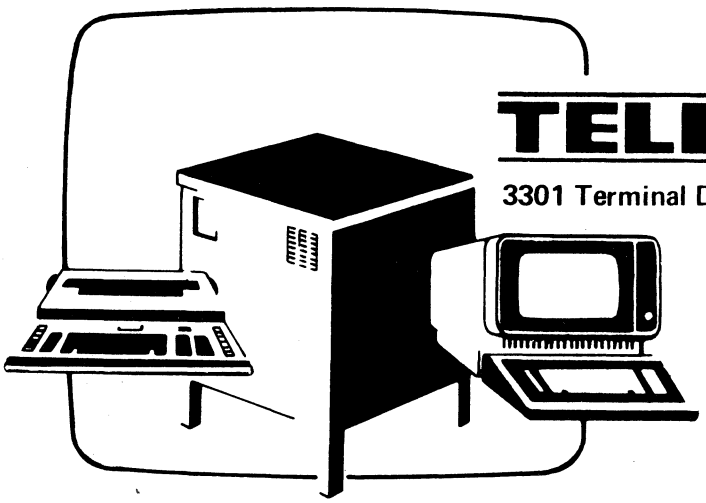

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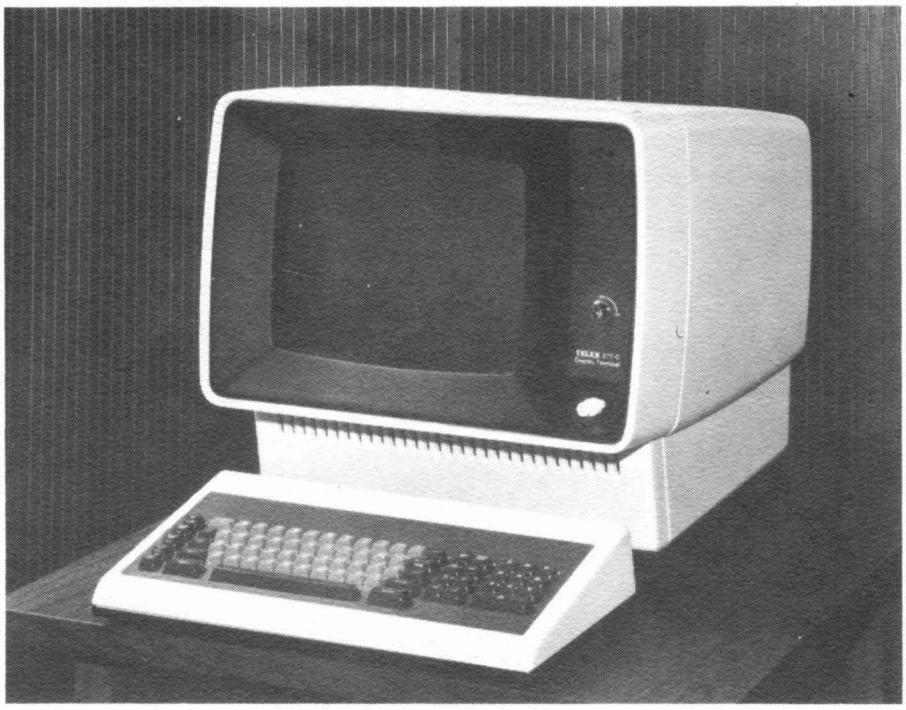

**TC 277C Display Terminal**

**TC 277D Display Terminal**

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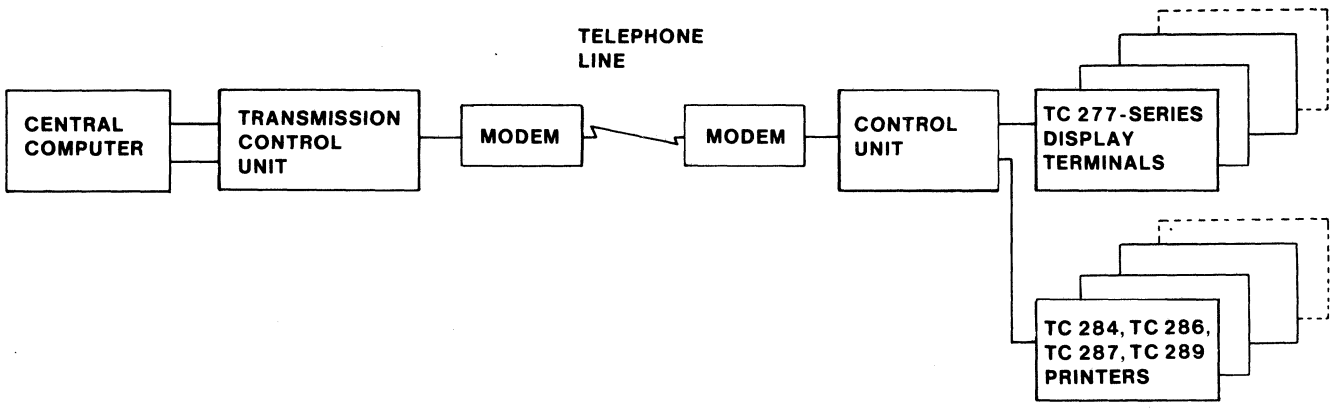
# INTRODUCTION

The TC 277C/D Keyboard Display Terminal is classified as a programmed terminal; that is, certain operations of the terminal are controlled by programs stored in memory and executed by an internal microprocessor. The TC 277C/D is both an input and an output data terminal. The Operator uses function switches to signal the Central Computer application program, thus causing the program to display either formatted or unformatted data on the screen of the cathode-ray tube (CRT). This data is displayed in the form of alphameric characters and symbols and is simultaneously entered and stored in an internal, temporary storage area (buffer). The Operator uses a keyboard and function switches to input, edit, and delete data in the display. The Operator then enters the displayed data into the Central Computer for storage or additional processing. If an optional printer is attached to the Control Unit, the application program can initiate hard-copy printout of the displayed data. A typical installation with its associated equipment is shown below.

This Operator's Manual is intended to help the Operator understand the functions and operating procedures of the terminal. Subsequent sections of the Manual will describe the various components of the terminal; how to install the TC 277C/D; how to receive data from the Central Computer; how to input, edit, and delete displayed data; how to use the program function keys to manipulate displays or the entire system; how to perform minor maintenance; and how to obtain service in case of equipment malfunction. For additional information or assistance, contact the TTC Marketing Representative.




**Typical Installation of a TC 277C/D Keyboard/Display Terminal.**

## DESCRIPTION

The TC 277C/D Keyboard Display Terminal consists of an attached keyboard and a 15-inch video screen. The keyboard is similar to an ordinary typewriter keyboard. It is used to compose messages using the displayed format and to make necessary changes; cause messages to be printed; and transmit all data entered. The keyboard functions are discussed later in the OPERATING PROCEDURES section of this manual.

The screen displays alphameric and special characters with dual-intensity to assist you in message preparation. Types and locations of data displayed on the screen are shown in the OPERATING PROCEDURES section. A combined on-off/brightness-contrast control knob and the optional Audible Alarm Feature are the only operator controls on the display assembly. See CONTROLS AND INDICATORS for definition of control functions.

A printer is used in association with the TC 277C/D Keyboard Display Terminal when a hard-copy printout is required.

## CUSTOMER INSTALLATION

The TC 277C/D Keyboard Display Terminal has been designed with the user in mind. The design supports customer installation and set-up, which saves valuable time and the inconvenience of waiting for Field Engineer installation. No special equipment or tools are required to set up the terminal for operation. When your terminal arrives, simply remove the packing material and follow the instructions listed below:

- Place the unit within 6 feet of the 115 VAC power outlet.
- Place the keyboard in front of the display.
- Ensure the following environmental parameters are adhered to:
    - Temperature Range: +50°F to +95°F (10°C to 35°C).
    - Humidity: 8% to 80% relative humidity (no condensation).
- Ensure that the Power ON/OFF Switch located at the front right side of the unit is in the OFF position (pushed in).
- Plug the AC power cord into the 115 VAC power outlet.
- Pull out the Power ON/OFF Switch; allow approximately 30 seconds warm-up time.
- Watch for the cursor to appear on the screen. On the status line near the bottom of the screen, observe *r01 c01*. If these conditions are not present, or if any other characters are observed, refer to DIAGNOSTIC TESTS.
- Depress ENTER and verify that the *INPUT INH* message indicator is displayed on the status line.
- Depress RESET and verify that the *INPUT INH* message indicator is extinguished.
- Depress several alphabetic character keys. The appropriate characters for the keys depressed should be observed on the display screen.
- Push in the Power ON/OFF Switch.
- Connect the coax cable from the controller to the coax receptacle at the rear of the unit.
- If the Selector Pen is supplied with the unit, refer to SELECTOR PEN FEATURE.
- If the optional Operator Identification Card Reader (OICR) is supplied with the unit, connect the OICR cable to the receptacle at the lower-left corner of the unit (as observed from the rear) and refer to OPERATOR IDENTIFICATION CARD READER (OICR) FEATURE.

The installation of your TC 277C/D Keyboard Display Terminal is now complete and the terminal is ready for normal operation.

# OPERATING CHARACTERISTICS

## OPERATING MODES

The TC 277C/D has been designed to operate in several modes. Only a brief description of each mode is given below. Detailed descriptions of the modes are presented in KEYBOARDS and OPERATING PROCEDURES of this section.

### DATA INPUT MODE

In this mode the Operator inputs data onto the display screen from the keyboard. The terminal is in Data Input Mode whenever power is on the terminal and the *INPUT INH* (inhibited) or *INS* (insert) *MODE* indicators are not ON.

### INSERT MODE

This is an editing mode which allows the Operator to insert new characters within data already displayed on the display screen. This mode is entered from Data Input Mode by depressing the INS MODE Key and is exited by depressing the RESET Key.

### SECURITY LOCKED MODE (Optional)

This feature provides key-switch-operated control over communications with the Central Computer application program. With the key-switch turned to the ON position, the terminal will be inaccessible to the application program and the keyboard will be inhibited, thus preventing data input to the display screen from the keyboard, card reader, and selector pen operations.

### DIAGNOSTIC MODE

The Diagnostic Mode is designed for use by the Operator or the Field Engineer in diagnosing equipment operation and malfunction. (While in this mode, the terminal cannot communicate with the system.) Diagnostic Mode is entered and exited by depressing the DIAG Key while simultaneously holding down the ALT FUNC Key. A second depression of this key sequence will reset the terminal to its normal mode of operation.

### SELECTED MODE

In this mode the terminal is in the process of executing a command sent by the Central Computer application program. *INPUT INH* will be displayed on the status line.

## CONTROLS AND INDICATORS

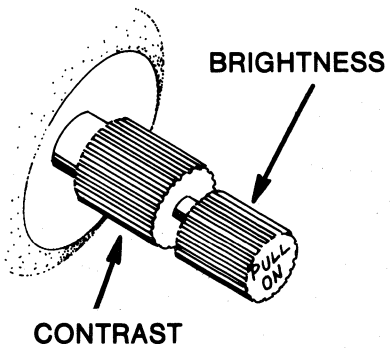
The fundamental uses of the controls and indicators will become apparent once you, the Operator, actually become involved with the display screen and keyboard functions. This section describes the functions of the Operator controls and the displayed message indicators.

### OPERATOR CONTROLS

The Operator uses these controls to apply power to the terminal, adjust the image on the display screen for optimum viewing comfort, and adjust the Audible Alarm.

- **Power Switch**

  The Power Switch is a tri-function switch and control used to apply power, control the display contrast, and adjust the image intensity.



The Operator pulls out the switch to apply power to the terminal (and pushes it back in to turn it off). After a short warm-up period, a special symbol (the cursor) will appear on the screen. The cursor is discussed under DISPLAY SCREEN.

- **Brightness Control**

  The brightness of the characters appearing on the display screen can be adjusted by turning the knob of the Power Switch counterclockwise to make the image dimmer, clockwise to make it brighter.

- **Contrast Control**

  The contrast of the viewing image is adjusted by turning the knob at the rear of the Power Switch. The Operator will find this control useful in distinguishing between two levels of intensity--normal and high.

- **Audible Alarm Volume Control (Additional Feature)**

  The Audible Alarm is adjusted by turning the knob located underneath the front righthand corner of the terminal housing. (See DISPLAY SCREEN.)

## INDICATORS

The display screen is an indicator which enables the Operator to observe the data-entry process and which displays the message indicators described below.

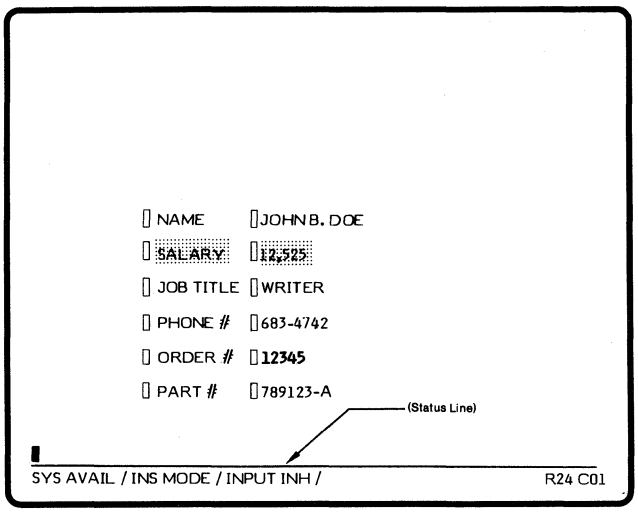
### Message Indicators

The message indicators are displayed on the status line near the bottom of the display screen. (See illustration, Status Line Messages.) The status line facilitates operator access of status information and other operator-related information about the current mode of operation. The messages displayed are as follows:

- *SYS AVAIL* (system available). Indicates that the Central Computer is available to accept an Operator-initiated transmission.

- *INS MODE* (insert mode). Indicates that the terminal is in Insert Mode, an editing mode in which characters can be inserted into data already displayed on the screen.

- *INPUT INH* (input inhibited). Indicates that input from the keyboard, Operator Identification Card Reader (OICR), and Selector Pen is inhibited (prevented). The operating characteristics of the terminal are so designed that certain functions of the keyboard are prevented when attempted at inappropriate times.




Denotes an attribute character (not visible)
Data Nondisplay data.

**Status Line Messages.**

## DISPLAY SCREEN

The display screen enables the Operator to observe the data entry process. The screen displays a graphic representation of the data stored in the buffer as received from the application program as well as the data entered by the Operator. The character position to be occupied by the next character entered is indicated by the cursor.

## CURSOR

This special symbol is automatically generated when the Power Switch is pulled ON and occupies the first position in the buffer (upper leftmost position on the display screen). The cursor (resembling a reverse image) is used to indicate where the next character entered from the keyboard will be displayed. The cursor displays around an empty character position (called a "Null"), which an entered character will fill, or around a displayed character, which an entered character will replace. The cursor's position in the display is shown by the R (row) and C (column) address displayed in the status line (e.g.; *R24 C01:* Row 24 Column 1).

The Operator can reposition the cursor to any character position on the display screen by using the cursor-positioning keys, and the application program can reposition the cursor to any character position. In neither case will the cursor enter characters into the character positions it occupies as it moves across the screen.

Unless otherwise repositioned by the application program, the cursor will move to the next sequential character position after a character has been entered on the display screen. Although the cursor can be positioned in certain "protected" character positions (explained in DISPLAY FIELDS, below), characters cannot be entered into these positions from the keyboard. The cursor is not affected by field attributes nor by the optional Key Lock Feature; it is displayed even when positioned in a nondisplay field and when the Key Lock Feature (if installed) is ON.

## WRAP

The cursor will "wrap" the display screen; that is, if the cursor is repositioned beyond the limits of the display screen in any direction, it will reappear on the opposite side of the screen.

## AUDIBLE ALARM

This additional feature is an aid to the Operator. The Alarm sounds whenever the Operator enters a character in the next-to-last character position on the display screen. This alerts the Operator to the fact that the cursor is about to wrap; that is, go off the display screen and reappear at the top leftmost character position. Subsequently entered characters will replace any data already displayed. The Alarm may also be sounded by the application program; the conditions necessary for this are defined in the User's Guide. The Alarm also sounds when an unsuccessful OICR card-read operation is attempted.

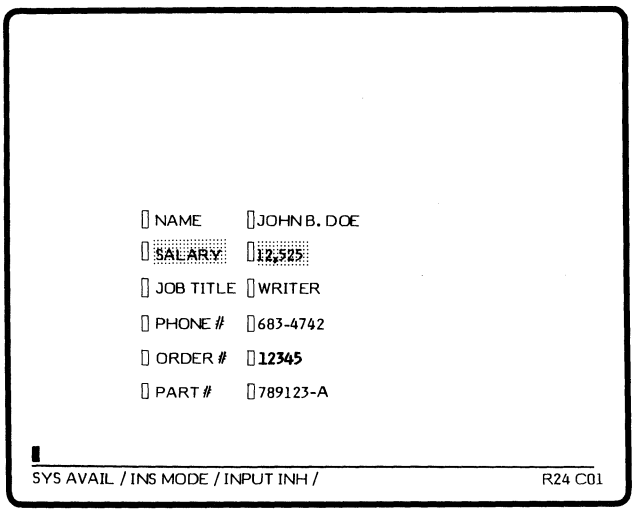
## DISPLAY FIELDS

An application program can enter data onto the display screen in two basic methods--unformatted and formatted. When the display is unformatted, the Operator enters data onto the screen in a free-form manner. When the display is formatted, all or part of the displayed data is arranged in a predesigned form by the application program. Much of the data that is entered into a Central Computer is organized into "fields"--for instance, dates, names, order numbers, or part numbers. Application programs standardize the arrangement of these fields in order to make data entry faster and easier. An example of this standardized arrangement (or format) is shown in the Example of an Operator-completed Format. In this case, the fields are *NAME, SALARY, JOB TITLE, PHONE #, ORDER #*, and *PART #*. Note that the first character position in each field is occupied by a symbol (▯). Each symbol represents a nondisplayed control character, which is called an attribute character because it defines the characteristics or attributes of the data that follow it. Each attribute character plus all the data following it, up to the next attribute character, is called a "field." Each attribute character occupies a character position in the buffer, although it cannot be seen or printed. During a display or printout, its character position appears as a space. In this format, input fields are provided into which the Operator will input data.

The Example of an Operator-completed Format illustrates how an Operator might complete input fields. The total number of character positions provided in an input field has been selected to provide for the longest possible insertion. If an attempt is made to exceed this total number, the *INPUT INH* indicator will come on and the keyboard will be inhibited; or, if a "numeric protected" attribute follows the input field, the cursor will skip (tab) to the next input field.

### ATTRIBUTE CHARACTERS

Attribute characters, in addition to defining the start of a field, also define other characteristics for all character positions contained in that field.




**Example of an Operator-completed Format.**

- PROTECTED OR UNPROTECTED. The displayed fields shown in the left column of the format example would normally be protected, thus preventing their modification by the Operator. Unprotected fields are defined as input fields to be filled in by the Operator, as shown in the example above.

- ALPHAMERIC OR NUMERIC. An alphameric field is one in which alphabetic, numeric, or symbol characters can be entered (for example, the input field for *PART #*). A numeric field (applicable with the optional Numeric Lock Feature, only) is one in which only numeric data can be entered (i.e., the digits 0 through 9, period, and minus sign, plus the DUP Key if the SHIFT and LOCK Keys are also depressed on typewriter-style keyboards). The input field for *PHONE #* is a numeric field.

- CHARACTER DISPLAY. The input fields for *NAME, JOB TITLE, PHONE #, ORDER #*, and *PART #* are displayed; the input field for *SALARY* is nondisplayed; and the bold display in the input field for *ORDER #* represents an intensified display field. Since the data entered into a nondisplayed input field is not visible, the Operator should note that it will be impossible to visually verify this entered data before transmitting it to the Central Computer.

- TAB STOP POSITIONS. These positions are the first character positions in an input field in which data can be entered.

### AUTOMATIC SKIP

In certain instances the cursor will automatically skip the next field or fields after a character has been entered into the last character position in an unprotected data field. If the attribute character of the next field defines it as numeric and protected, the cursor will automatically skip that field and will, instead, occupy the first character position in a numeric, unprotected field or an alphameric, unprotected field.

## ADDITIONAL FEATURES

### OPERATOR IDENTIFICATION CARD READER (OICR) FEATURE

#### Description

When the display terminal is equipped with the optional OICR Feature (which is attached through a cable), the Operator can send a coded message to the host system by passing a special magnetic-striped card through the slot. The Operator may be required to use the OICR when beginning operation of the display terminal.


A specially designed (coded) credit card may also be used to update an account or request information about accounts. The code, which identifies the person using the OICR or which represents an account number, is contained on a magnetic stripe attached to the back of the card. The card data is held in the terminal buffer as a nondisplayed, nonprintable field and the entire field is protected. If the terminal is unformatted, the entire screen will be a protected field.

### Operation

To operate the OICR, follow the procedure detailed below:

- Set the ON-OFF Switch to ON.
- If the *INPUT INH* (inhibited) indicator is displayed, depress RESET.
- Pass the magnetic card through the OICR. The cursor will advance across the screen at a rate of one space per character accepted. A successful read will produce one keyboard click for each character selected, an AID code will be set, and the keyboard will be inhibited to prevent a mix of reader/keyboard data.

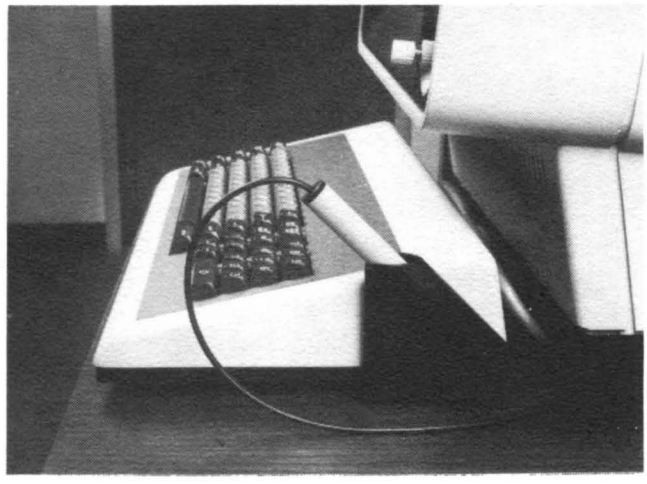
### Improper Card Reads

Card data will not be read into the buffer and the Audible Alarm (optional) will sound if any of the following conditions exist when the card is read:

- A read error was detected. (Pass the card through the OICR again.)
- The *INPUT INH* indicator is on prior to reading the card. Turning on this indicator as part of the OICR operation is not an operational error and does not prevent data from being loaded into the buffer.
- The cursor is located in a protected field before the card is read.
- The cursor is located in an attribute location before the card is read.

## SELECTOR PEN FEATURE

The optional Selector Pen Feature (often called a Light Pen) is a light-detecting device that enables the Operator to select certain data fields to be read by the User's program for further processing. By pressing the tip of the pen against the screen over a selectable field (thus activating a switch in the pen), the Operator selects the field; that is, signals the application program that more information about the displayed data is needed or that selected information is being input. The selector pen is stored in its holder, which is securely attached to the terminal, thus insuring that the stored pen is always in the same place and is pointed in the same direction.



**Selector Pen.**

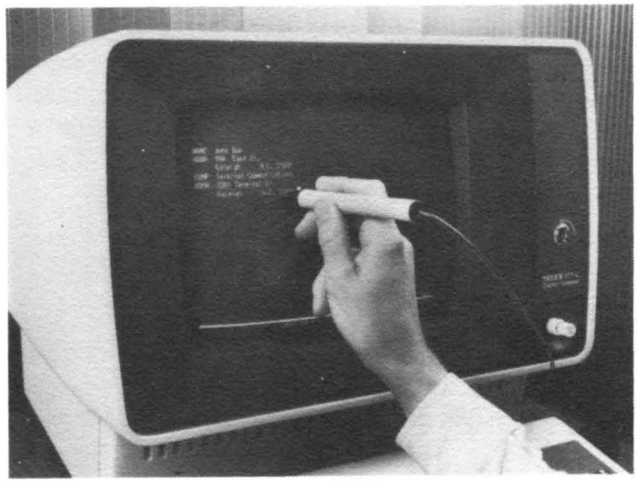
A format containing the light-pen-selectable fields will be displayed, under control of the application program. The format may look similar to the one shown here. A selectable field is one that can be detected by the selector pen. To see at a glance whch fields are selectable, depress the tip of the selector pen against the palm or table top. An easily seen line will appear through all selectable fields. This line will always be of high intensity, independent of the intensity of the characters displayed. Note that some of the selectable fields are preceded by a question mark, in this case called a designator character. There are only two visible designator characters--the question mark (?) to designate an unselected field, and a "greater than" symbol (>) to designate a field which has been selected.

```
NAME:  John Doe
ADDR:  900 East St.
       Raleigh      NC    27609

COMP:  Terminal Communications
ADDR:  3301 Terminal Dr.
       Raleigh      NC    27604

HOST HOTEL:  304

DATE OF ARRIV:  ?Jan    ?Feb    ?Mar    ?Apr    ?May    ?Jun
                ?Jul    >Aug    ?Sep    ?Oct    ?Nov    ?Dec

                ?1  >2  ?3
                ?0  ?1  ?2  ?3  ?4  >5  ?6  ?7  ?8  ?9

NO. OF ROOMS:   ?1   2   ?3   ?4   ?5   ?6   ?7   ?8

TYPE OF ROOM:   ?1 Bed          >2 Beds          ?Special
                ?1 Person       >2 People

NO. OF NIGHTS:  ?1  >2  ?3  ?4  ?5  ?6  ?7  ?8

Next Room       Availability        Sell        Guaranteed Sell        Cancel
```

**Example of Selectable Fields Format.**

To select a field, position the selector pen directly over any character in the field and depress the tip against the screen. Since a light detector in the tip of the pen will be energized by light emitted by a character on the screen, it is important that the pen be held approximately perpendicular to the screen and directly over a character in the field to be selected; otherwise the wrong field may be selected. As a sign that the field has been selected, the question mark in front of the field will change to the "greater than" sign. The Operator should verify that the designator character of the desired field has changed. Should the wrong field be selected, it can be deselected by performing the selection process a second time: the "greater than" sign will change back to a question mark. The Operator can select as many selectable fields as required.

Typically, the selection process is completed by selecting a selectable field that is not preceded by a visible designator sign. These fields can be determined by depressing the selector pen against the palm, which will cause an intense line to appear through all selectable fields. Completion of the selection process will signal the application program that action is needed and will inhibit any further selections or keyboard entries until the application program allows them. Typical procedures have been given for the use of the selector pen. Consult the User's Guide to determine the exact procedures to follow for your particular application program.



**Using the Selector Pen.**

# KEYBOARDS

The TC 277C/D Display Terminal may be equipped with one of five types of keyboards, each of which was designed to operate in a specific data-processing environment. The keyboard enables the Operator to change, edit, or create character displays except within fields defined by attribute characters as protected from keyboard operations. Alphameric character keys, control keys, and special function keys are provided to facilitate data entry and image modification. The five types of keyboards include the Typewriter, Typewriter with Check Processing Feature, Data Entry, Data Entry with Keypunch Layout, and Operator Console.

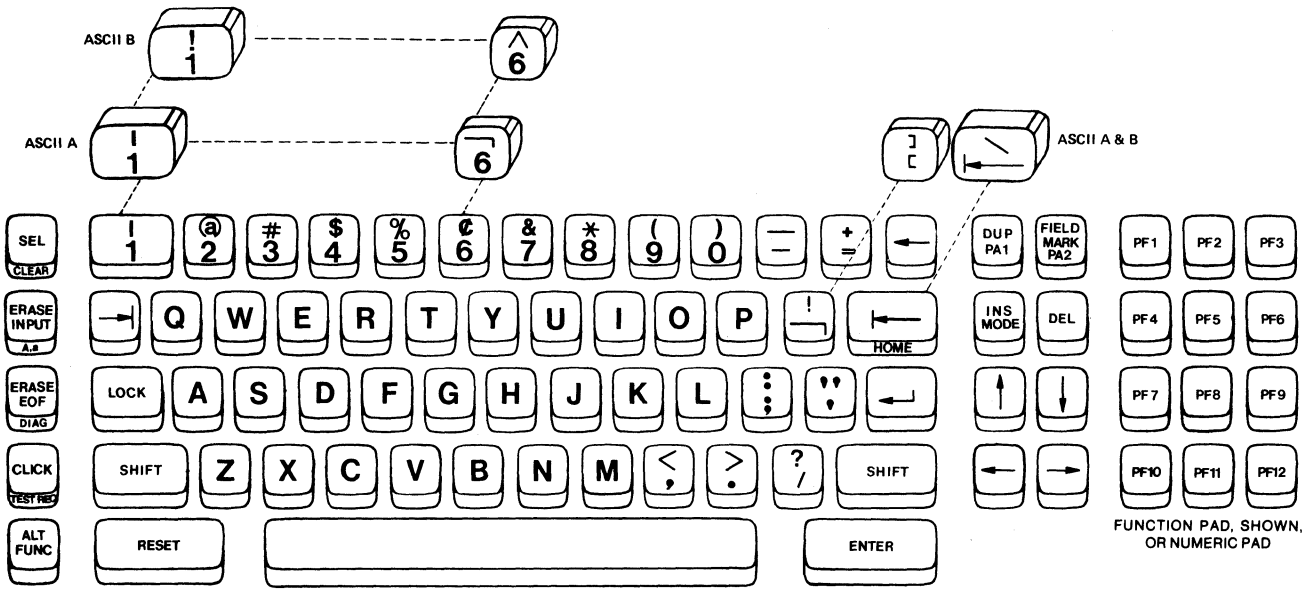
For each of the keyboards listed above, the keyboard layout is shown and the keys described by function. The section DATA INPUT KEYS explains the functions of the keys used in the normal, Data Input Mode. The section CURSOR POSITIONING KEYS explains how the cursor is positioned on the display screen. The section EDITING KEYS shows the Operator how data displayed on the screen can be modified (or edited). The section PROGRAM ATTENTION KEYS explains how to request actions by the application program.

The alphameric, special symbol, and cursor control keys are autorepeat; that is, they are designed to repeat their functions if held depressed.

## TYPEWRITER KEYBOARD

The Typewriter Keyboard closely resembles the standard office typewriter keyboard: most of its keys are in the same location and perform the same functions. The following discussion of the keyboard is organized according to the functions of the keys. Key functions of both the Typewriter Keyboard and Check Processing Keyboard are described beginning on the next page.

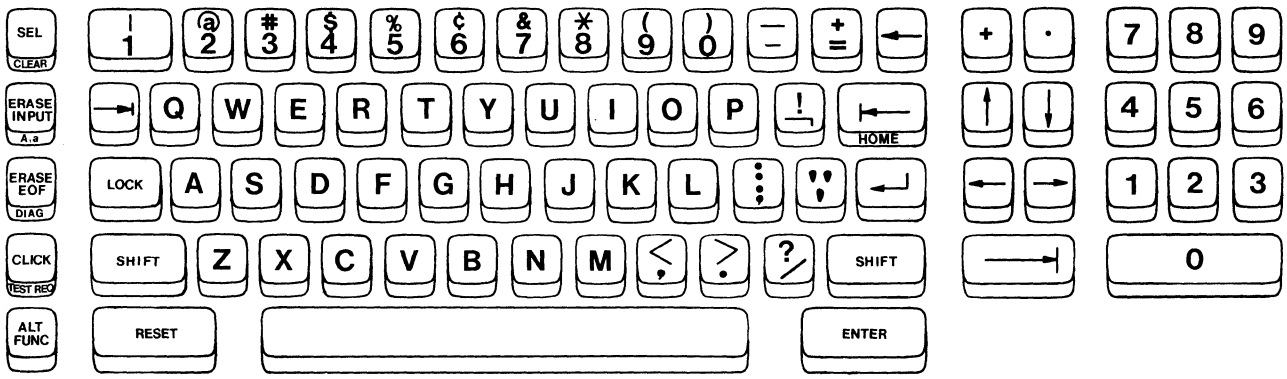
The Typewriter Keyboard contains either 26 or 27 symbols and punctuation marks. The total number, as well as the actual symbols and punctuation marks, will depend upon the model of the keyboard. Symbols and punctuation marks listed below may be found on the Typewriter Keyboard:




| *Key* | *Sign or Punctuation Mark* | *Key* | *Sign or Punctuation Mark* |
|---|---|---|---|
| \| | logical OR | + | plus |
| ! | exclamation mark | = | equals |
| @ | at | [ | opening bracket |
| // | number | ] | closing bracket |
| $ | dollar | \ | back slash |
| % | percent | : | colon |
| ¢ | cent | ; | semicolon |
| ¬ | logical NOT | " | quotation mark |
| ^ | circumflex | ' | apostrophe |
| & | ampersand | < | less than |
| * | asterisk | , | comma |
| ( | left parenthesis | > | greater than |
| ) | right parenthesis | . | period |
| _ | underscore | ? | question mark |
| - | minus or hyphen | / | slash |

## CHECK PROCESSING KEYBOARD

The Check Processing Keyboard provides a modified typewriter keyboard layout which lends itself to banking applications such as check verification. This layout allows the Operator to work from the righthand portion of the keyboard (numeric pad) by placing a plus sign (+), decimal point (.), and a forward tab to the immediate left of the numeric pad. This keyboard is equipped with the EBCDIC character set.




### DATA INPUT KEYS

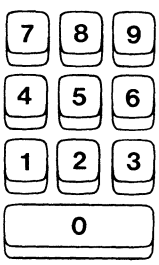
The Operator uses these keys to enter data onto the display screen in the normal Data Input Mode.

#### Alphabetic Characters

The keyboard contains the 26 alphabetic characters. Both uppercase and lowercase alphabetic characters can be entered into the buffer and transmitted to the Central Computer and displayed.

#### Numeric Characters

The typewriter keyboard contains the 10 numeric characters; in addition, your keyboard may have this optional 10-key numeric pad configured in adding-machine style, thus providing an optional method of entering numeric data.




#### SHIFT and LOCK

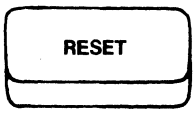
The SHIFT and LOCK Keys function exactly as on a standard office typewriter keyboard: whenever the SHIFT Key is held depressed, the character or symbol on the upper portion of a dual-character key will be displayed when that key is depressed. If the SHIFT Key is not depressed, the character or symbol on the lower portion of the key is displayed. The keyboard can be locked in the shift position by depressing the LOCK Key; the keyboard can be unlocked from the shift position by depressing the SHIFT Key again. Both uppercase and lowercase alphabetic characters can be entered into the buffer and transmitted to the Central Computer and displayed.

### Numeric Lock Feature

When equipped with this optional feature, the terminal will automatically shift to Numeric Mode if the display screen is formatted and the cursor enters a numeric field. In Numeric Mode only these keys can enter data: the digits 0 through 9, period, minus sign, and DUP (duplicate) (when the SHIFT or LOCK Key is also depressed). Depressing any other key in Numeric Mode will inhibit the keyboard and turn on the *INPUT INH* (inhibited) indicator. The Input Inhibited condition can be reset by depressing the RESET Key. No provision is made to override this feature and allow entry of alphabetic characters into a protected numeric field.

### Space Bar

The Space Bar functions the same as on a standard office typewriter keyboard except that the Space character occupies a character position on the display screen in the buffer and in the transmitted data. For this reason the Space Bar should not be used to position the cursor. (See CURSOR-POSITIONING KEYS, below.) The Space Bar is an autorepeat key.




This key is used to reset Input Inhibited or Insert Mode conditions except that the key is inoperative while the terminal is transmitting or receiving data.

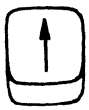

An Operator frequently processes a series of documents in which the same data (such as the date) is entered into a particular field on every document. The DUP Key is provided to speed up this sort of entry. Typically, the Operator enters the data on the first document; on successive documents the DUP Key can be depressed when the cursor is positioned in the first character position in the appropriate input field. An asterisk will be displayed in the character position, a tab to the next unprotected character position will be performed, and the application program informed that a duplicate operation has been requested. However, the Operator must confirm that the application program uses this key for this function.

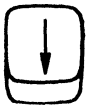

The Operator uses the FIELD MARK Key to mark the end of a field when the display screen is unformatted. A semicolon (;) will be displayed, and the application program will be informed that this character represents the end of a field.

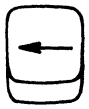

The ALT FUNC (alternate function) Key functions as a shift key for the keys directly above it and the HOME Key.

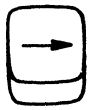
### CURSOR-POSITIONING KEYS

These keys are used to reposition the cursor to various positions and in various directions on the display screen. The proper key or keys to use at any given time will depend upon the current position and the desired new position of the cursor, as well as the reason for the change.


(UP)


(DOWN)

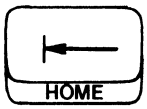

(BACKSPACE)


(RIGHT)


(LEFT)

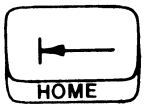
All of these cursor-positioning keys move the cursor one character position at a time. Since all are autorepeat, they repeat their functions until they are released, enabling the Operator to reposition the cursor to a desired line, or character position in a line, quickly and easily. Although all of the

keys will cause the cursor to wrap, the vertical positioning keys (UP and DOWN) behave differently from the horizontal positioning keys (LEFT, RIGHT, and BACKSPACE). Vertical wrap occurs without any horizontal movement; i.e., the cursor stays in the same character-position column. Horizontal wrap always involves vertical movement: if the cursor is repositioned off screen with the LEFT or BACKSPACE Keys, the cursor will reappear on the righthand side of the screen, one line higher than before. If the cursor is repositioned off screen with the RIGHT Key, the cursor will reappear on the lefthand side, one line lower than before. The LEFT and BACKSPACE Keys function similarly, the only difference being their location on the keyboard.

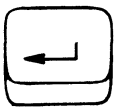



Depressing the HOME Key while the ALT FUNC Key is depressed causes the cursor to be positioned in the first unprotected character position on the display. The cursor will be positioned to the first display position on the screen if there are no fields or if all data is protected.

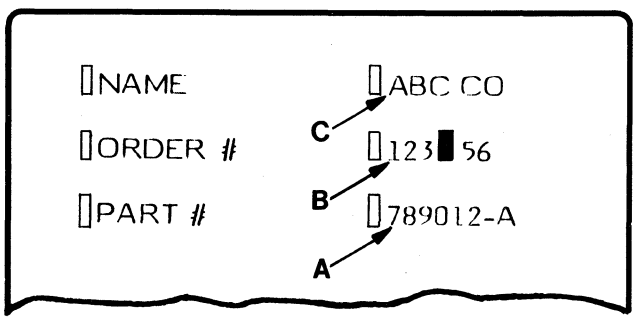

(TAB)



(BACKTAB)


(NEW LINE)

These cursor-positioning keys are used to move the cursor to a new line or to the first character position in an unprotected input field, making the operation faster and easier than by moving the cursor one character position at a time.

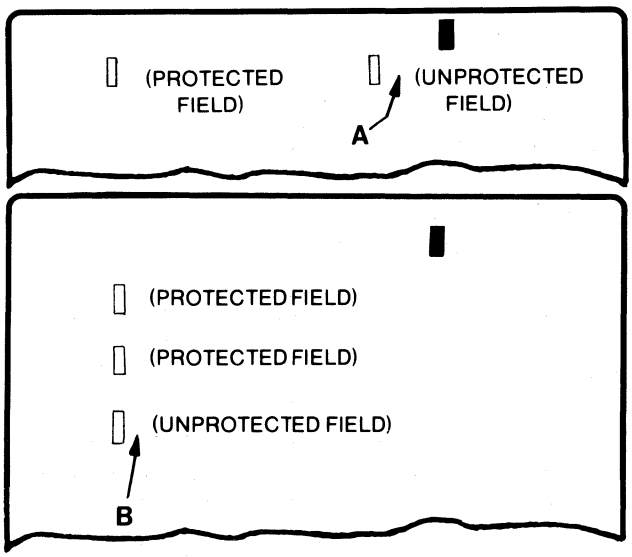



**Using the TAB and BACKTAB Keys to Reposition the Cursor.**

Both the TAB and BACKTAB Keys move the cursor to the first character position in an unprotected input field, the TAB Key moving it forward. If the cursor is in the indicated character position (over the number 4), and given that *NAME, ORDER #*, and *PART #* are protected fields, depressing the TAB Key will move the cursor to the first character position in the next unprotected input field; i.e., to the character position indicated by the arrow labeled "A." Depressing the BACKTAB Key will move the cursor backward to the first character position in the present unprotected field; i.e., to the character position indicated by the arrow labeled "B." Had the cursor already occupied the first character position in an unprotected input field (i.e., the character position indicated by the arrow labeled "B") depressing the BACKTAB Key would have moved the cursor backward to the first character position in the next previous unprotected input field; i.e., to the character position indicated by the arrow labeled "C."

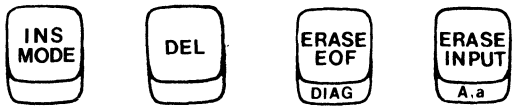
Depressing the NEW LINE Key always moves the cursor to the next unprotected character position which is in a line lower on the screen than the one in which the cursor is currently displayed. On an unformatted display screen, this would be the first character position in the next line.

On a formatted display screen, this would be the first character position in the first unprotected field either in the next line, as shown by the arrow labeled "A," or after several lines, as shown by the arrow labeled "B." If all character positions on the display screen are protected, the cursor will return to the first position in the buffer (the upper leftmost position on the display screen). The NEW LINE Key is autorepeat.

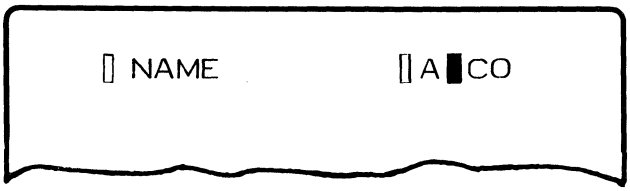


## EDITING KEYS

These keys are used to edit data which has already been entered on the display screen. The Operator will find them useful in correcting mistakes and in altering data.

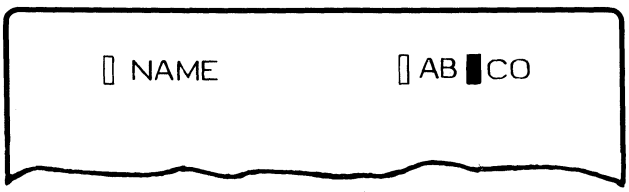



Depressing the INS (insert) MODE Key places the terminal in the Insert Mode (*INS MODE* will be displayed); the mode is exited by depressing the RESET Key. In this mode, characters can be inserted within data already entered on the display screen. Suppose that the name entered in the input field for *NAME* has been incorrectly entered as *A CO*, instead of the correct *ABC CO*.

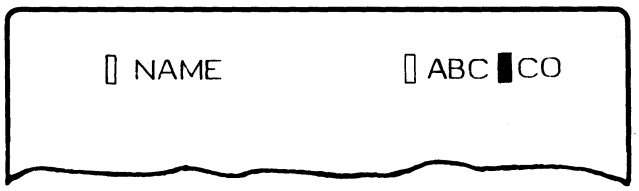



The Operator can insert the omitted letters in Insert Mode by first positioning the cursor in the character position in which the character *B* should be inserted, then depressing the B Key.

The display screen will then appear as shown below. Notice that the *Space*, *C*, and *O* characters have all moved one space to the right. (Had a Null instead of a Space character been present under the cursor when the B Key was depressed, the character *B* would have been entered without any lateral shift of the already present letters.)

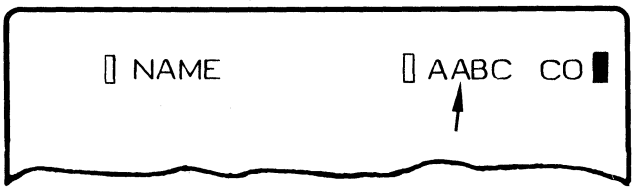



Now the Operator should insert the character *C* into the line. The screen will appear as shown.

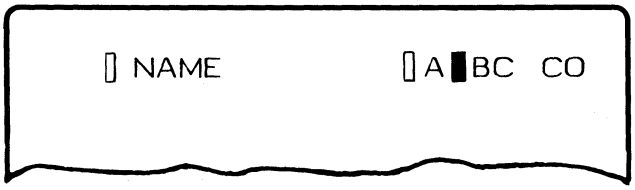


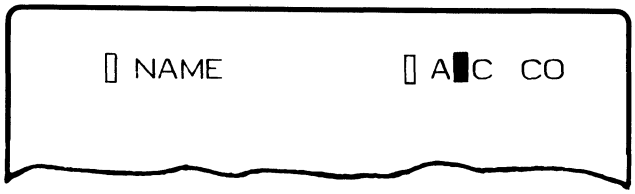

If more than one row of characters is contained within the field, a character occupying the last character position in the row is shifted into the first character position of the row next below. The editing operation having been completed, the Operator can depress the RESET Key to reenter the Data Input Mode. In Insert Mode, as in Data Input Mode, the total number of characters entered into a field cannot exceed the number provided by the application program. Any attempt to enter an excessive number of characters will display the *INPUT INH* indicator and inhibit the keyboard.

The function of the DEL (delete) Key is opposite to that of the INS MODE Key: the DEL Key is used to delete extraneous characters in an unprotected field. Unlike the INS MODE Key, there is no Delete Mode. To use the key, the cursor is positioned over an extraneous character and DEL is depressed. The extraneous character is deleted and any remaining characters to the right move one character position to the left. A Null will now occupy the character position formerly occupied by the rightmost character. The function of the DEL Key extends only to the end of the row in which the cursor is positioned. The function of the key is graphically illustrated below where the extraneous character (the extra *A*) is pointed out.




The cursor is positioned over the extraneous character, and the DEL Key is depressed, leaving the edited result.






The ERASE EOF (to end of field) Key is used when it becomes necessary to erase most or all of the data which has been entered into an input field. Position the cursor in the first character position to be erased, depress the ERASE EOF Key, and all characters previously entered will be erased to the end of the field. The cursor will not move, enabling the Operator to begin reentering data at once. If the display is unformatted, it will be erased to the end of the screen.

The ERASE INPUT Key is used to erase all of the entered data on the display screen. Depressing this key will erase all input fields (or the entire display on an unformatted screen), reduce all character positions to Nulls, and move the cursor to the first unprotected buffer position.

## PROGRAM ATTENTION KEYS

The Operator uses keys referred to as program attention keys to signal the application program that some kind of action is requested. Since these actions on the part of the application program must occur before work can continue at the terminal, the depression of these keys will inhibit the keyboard, display the *INPUT INH* indicator and clear the *SYS AVAIL* (system available) indicator.


Depressing the CLEAR Key in conjunction with the ALT FUNC Key--

- Erases the display screen and reduces all character positions to Nulls.
- Repositions the cursor to the first buffer position (upper leftmost position on the display screen).
- Inhibits the keyboard, displays the *INPUT INH* indicator, and clears the *SYS AVAIL* indicator.
- Signals the application program that the CLEAR Key has been depressed.

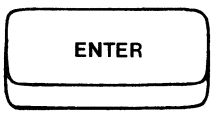
Although most application programs will reply to the signal by turning off the *INPUT INH* indicator (thus allowing the Operator to resume operations), some do not. The Operator must consult the User's Guide for the program to determine the correct procedure to follow.


Depressing the SEL (select) Key activates the SEL function, which duplicates light-pen operation. A field is selected by positioning the cursor in a light pen-detectable field and then depressing the SEL Key.


Depressing the TEST REQ (Requested) Key in conjunction with the ALT FUNC Key--

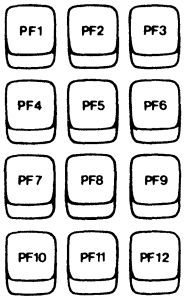
- Inhibits the keyboard, displays the *INPUT INH* indicator, and clears the *SYS AVAIL* indicator.
- Signals the application program that the TEST REQ Key has been depressed.

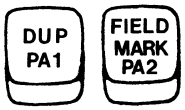
Normally, this key is used to signal the application program whenever the Operator suspects that the terminal is failing. The application program will transmit a test message that is used to diagnose trouble. However, the Operator must consult the User's Guide for the program to determine the correct procedure to follow.




Depressing the ENTER Key will signal the application program that the data on the display screen is ready to be entered into the Central Computer. The keyboard will be inhibited and the *INPUT INH* indicator will remain on until the operation is completed by the application program.

The keyboard of your terminal may contain this optional 12-key pad. The function of each PF (program function) Key is determined by the particular application program in use. Therefore, the Operator must consult the User's Guide for the program to determine the key functions.




These are Program Access keys used by the Operator to signal the application program that some kind of action is requested. Since the kind of action requested depends on the particular application program in use, the Operator must consult the User's Guide for the program to determine their functions.

## SPECIAL FUNCTION KEYS

The Operator uses these keys to select mono-case or dual-case character sets, to enable or inhibit the keyboard clicker, and to switch from a normal mode of operation to Diagnostic Mode.

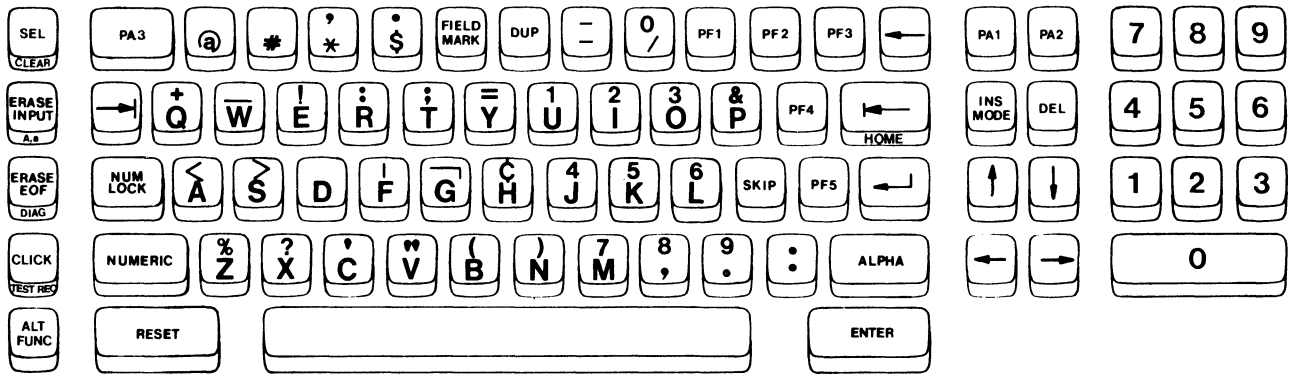

Depressing the A/a Key in conjunction with the ALT FUNC Key selects mono-case or dual-case character sets for display data.


Depressing the DIAG (diagnostic) Key in conjunction with the ALT FUNC Key switches the terminal from a normal mode to Diagnostic Mode. Depressing the DIAG Key while holding down the ALT FUNC Key again resets the terminal to normal operation.


Depressing the CLICK Key enables or inhibits operation of the keyboard clicker. To inhibit the clicker, the Operator depresses the CLICK Key a second time.

## DATA ENTRY KEYBOARD

The Data Entry Keyboard combines two familiar keyboards--the standard office typewriter keyboard and the keypunch keyboard. The alphabetic keys are arranged as on the standard office typewriter, and the keypunch numerals are arranged as on the keypunch. This arrangement makes 10 keys both alphabetic and numeric--alphabetic in the normal or Nonshift Mode and numeric in the Shift Mode. The discussion of the keyboard is organized according to the functions of the keys. The key functions of both the Data Entry Keyboard and the Data Entry Keyboard with Keypunch Layout are described beginning on the next page.




The Data Entry Keyboard contains 26 symbols and punctuation marks, as shown below:

| *Key* | *Sign or Punctuation Mark* |
|---|---|
| | at |
| # | number |
| , (Note) | comma |
| * | asterisk |
| . (Note) | period |
| $ | dollar |
| - (Note) | minus (or hyphen) |
| / | slash |
| + | plus |
| ! | exclamation mark |
| : | colon |
| ; | semicolon |
| = | equals |
| & | ampersand |
| < | less than |
| > | greater than |
| ¦ | logical OR |
| ¬ | logical NOT |

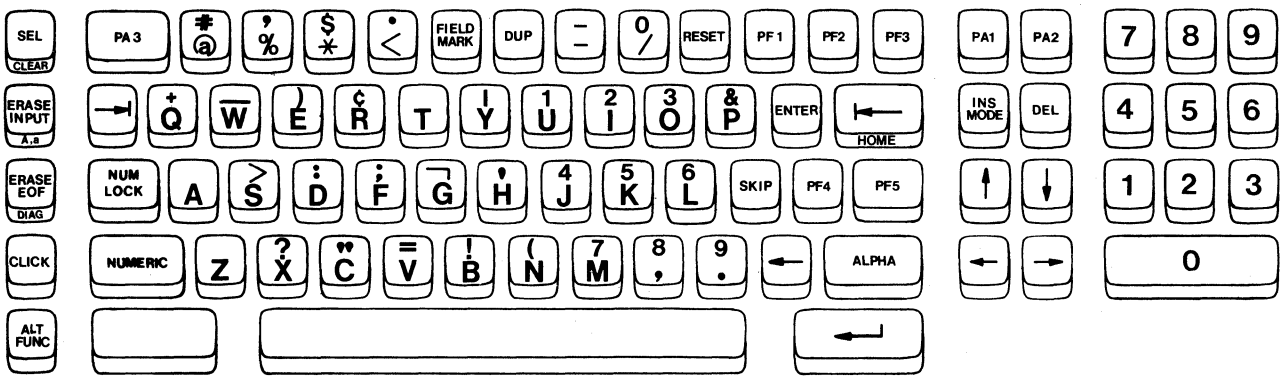
| *Key* | *Sign or Punctuation Mark* |
|---|---|
| ¢ | cent |
| % | percent |
| ? | question mark |
| ' | apostrophe |
| " | quotation mark |
| ( | left parenthesis |
| ) | right parenthesis |

**NOTE**

For convenience, three characters are duplicated in both Nonshift and Shift Modes: comma, period, and minus sign.

## DATA ENTRY KEYBOARD WITH KEY-PUNCH LAYOUT

This keyboard has the same keys and features as those found on the Data Entry Keyboard. However, the key layout is different, closely resembling the layout of a card punch. The keyboard, a 77-key version with many autorepeat keys, is equipped with the EBCDIC character set.




### DATA INPUT KEYS

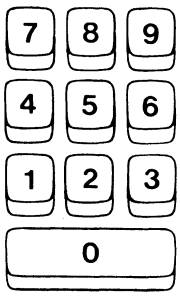
The Operator uses these keys to enter data onto the display screen in the normal Data Input Mode.

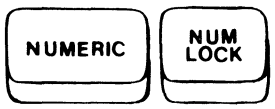
#### Alphabetic Characters

The keyboard contains the 26 uppercase alphabetic characters. Only uppercase characters are displayed on the screen and entered into the Central Computer.

#### Numeric Characters

Each Data Entry Keyboard contains the 10 numeric characters, arranged in keypunch style; in addition, the Data Entry Keyboard has a 10-key numeric pad configured in adding-machine style, making the method of entering numeric data optional.




Since these keys are functionally related, they will be discussed together. The function keys familiarly labeled SHIFT and LOCK are labeled NUMERIC and NUM (numeric) LOCK on the Data Entry Keyboard. They function as on a standard office typewriter keyboard: whenever the NUMERIC Key is held depressed, the character, symbol, or number on the upper portion of a dual-character key is displayed when that key is depressed. If the NUMERIC Key is not depressed, the character or symbol on the lower portion of the key is displayed. The keyboard can be locked in the shift position by depressing the NUM LOCK Key; the keyboard can be unlocked from the shift position by depressing the NUMERIC Key again.

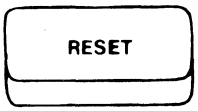
#### Numeric Lock Feature

When equipped with this optional feature the terminal will automatically shift to Numeric Mode if the display screen is formatted and the cursor

enters a numeric field. In Numeric Mode, only these keys are operable: the digits 0 through 9, period, minus sign, and DUP (duplicate). Depressing any other displayable character keys inhibits the keyboard and displays the *INPUT INH* (inhibited) indicator. The Input Inhibited condition can be reset by depressing the RESET Key. The Numeric Lock Feature can be overridden if it is desired to enter other displayable characters into a numeric field. If the character is located on the upper portion of a dual-character key, either the NUMERIC or the NUM LOCK Key is first depressed, then the character key to be entered. If the character is located on the lower portion of a dual-character key, the ALPHA Key is first depressed, then the character key to be entered.

**Space Bar**

The Space Bar functions the same as on a standard office typewriter keyboard except that the Space character occupies a character position on the display screen, in the buffer, and in the transmitted data. For this reason the Space Bar should not be used to position the cursor; use the cursor-positioning keys for this purpose. (See below.) The Space Bar is a dual-level autorepeat key.




This key is used to reset Input Inhibited or Insert Mode conditions, except that the key is inoperative while the terminal is transmitting or receiving data.

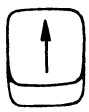

An Operator frequently processes a series of documents in which the same data (such as the date) is entered into a particular field on every document. The DUP (duplicate) Key is provided to speed up this sort of entry. Typically, the Operator enters the data on the first document; on successive documents the DUP Key can be depressed when the cursor is positioned in the first character position in the appropriate input field. An asterisk will be displayed in the character position, a tab to the next unprotected character position will be performed, and the application program informed that a duplicate operation has been requested. However, the Operator must confirm that the application program uses this key for this function.

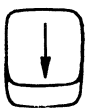

The Operator uses this key to mark the end of a field when the display screen is unformatted. A semicolon is displayed and the application program is informed that this character represents the end of a field.

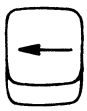

The ALT FUNC (alternate function) Key serves as a shift key for the keys directly above it and for the HOME Key. The ALT FUNC Key enables the function on the front of these keys.

## CURSOR-POSITIONING KEYS

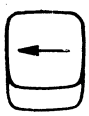
These keys are used to reposition the cursor to various positions and in various directions on the display screen. The proper key or keys to use at any given time will depend upon the current position and the desired new position of the cursor, as well as the reason for the change.


(UP)


(DOWN)

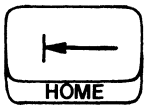

(BACKSPACE)


(RIGHT)

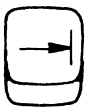

(LEFT)

All of these cursor-positioning keys move the cursor one character position at a time. Since all are autorepeat, they repeat their functions until they are released, enabling the Operator to reposition the cursor to a desired line, or character position

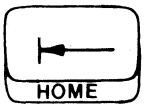
in a line, quickly and easily. Although all of the keys will cause the cursor to wrap, the vertical positioning keys (UP and DOWN) behave differently from the horizontal positioning keys (LEFT, RIGHT, and BACKSPACE). Vertical wrap occurs without any horizontal movement; i.e., the cursor stays in the same character-position column. Horizontal wrap always involves vertical movement: if the cursor is repositioned off screen with the LEFT or BACKSPACE Keys, the cursor reappears on the righthand side of the screen, one line higher than before. If the cursor is repositioned off screen with the RIGHT Key, the cursor reappears on the lefthand side, one line lower than before. The LEFT and BACKSPACE Keys function similarly, the only difference being their location on the keyboard.



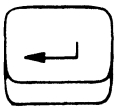

Depressing the HOME Key while the ALT FUNC Key is depressed causes the cursor to be positioned in the first unprotected character position on the display. The cursor will be positioned to the first display position on the screen if there are no fields or if all data is protected.



(TAB)

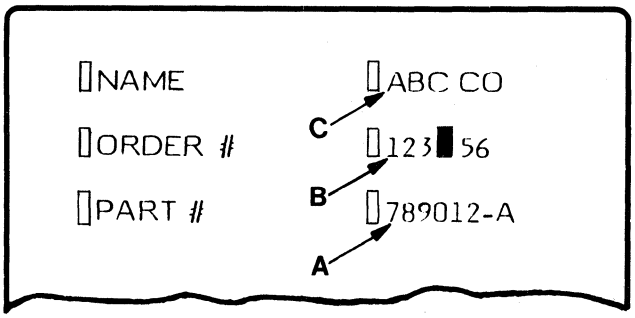



(BACKTAB)



(NEW LINE)

These cursor-positioning keys are used to move the cursor to a new line or to the first character position in an unprotected input field, making the operation faster and easier than by moving the cursor one character position at a time. The figure below illustrates the use of the TAB and BACKTAB Keys. Both the TAB and the BACKTAB Keys move the cursor to the first character position in an unprotected input field, the TAB Key moving the cursor forward and the BACKTAB Key moving it backward. If the cursor is in the indicated character position (over the number *4*) and *NAME*, *ORDER #*, and *PART #* are protected fields, depressing the TAB Key will move the cursor to the first character position indicated by the arrow labeled "A." Depressing the BACKTAB Key will move the cursor backward to the first character position in the present unprotected field; i.e., to the character position indicated by the arrow labeled "B." Had the cursor already occupied the first character position in an unprotected input field (i.e., at the character position indicated by the arrow labeled "B"), depressing the BACKTAB Key would have moved the cursor backward to the first character position in the next previous unprotected input field; i.e., to the character position indicated by the arrow labeled "C."

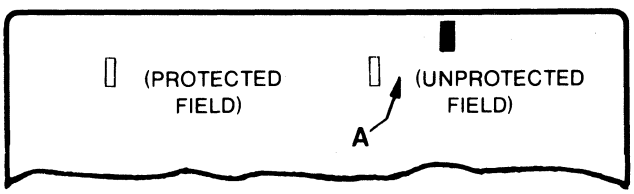


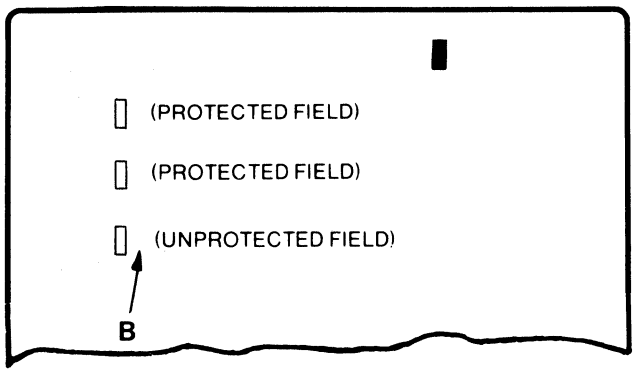

**Using the TAB and BACKTAB Keys to Reposition the Cursor.**

The SKIP and TAB Keys function similarly, the only differences being their locations on the keyboard.

Depressing the NEW LINE Key always moves the cursor to the next unprotected character position which is in a line lower on the screen than the one in which the cursor is currently displayed. On an unformatted display screen, this would be the first character position in the next line.

On a formatted display screen, this would be the first character position in the first unprotected field either in the next line, as shown by the arrow labeled "A," or after several lines, as shown by the arrow labeled "B."

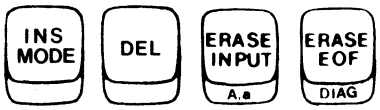




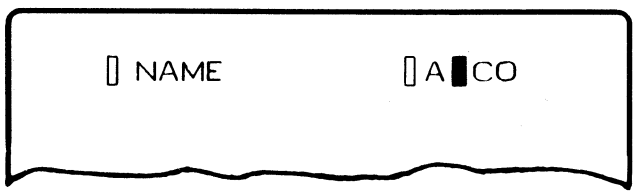

If all of the remaining character positions on the display screen are protected, the cursor will return to the first position in the buffer (the upper leftmost position on the display screen). The NEW LINE Key is autorepeat.

## EDITING KEYS

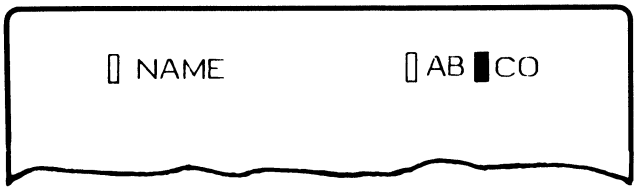
These keys are used to edit data that has already been entered on the display screen. The Operator will find these keys useful in correcting mistakes and in altering data.



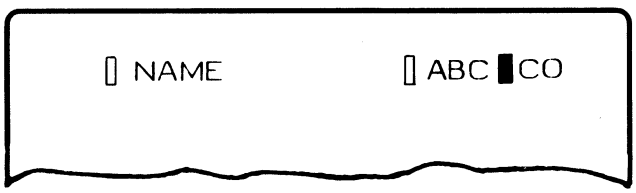

Depressing the INS (insert) MODE Key places the terminal in the Insert Mode. (The *INS MODE* indicator will be displayed.) The mode is exited by depressing the RESET Key. In this mode, characters can be inserted within data already entered on the display screen. Suppose that the name entered in the input field for *NAME* had been incorrectly entered as *A CO* instead of the correct *ABC CO*. The Operator can insert the omitted letters in Insert Mode by first positioning the cursor in the character position in which the character *B* should be inserted, then depressing the B Key.



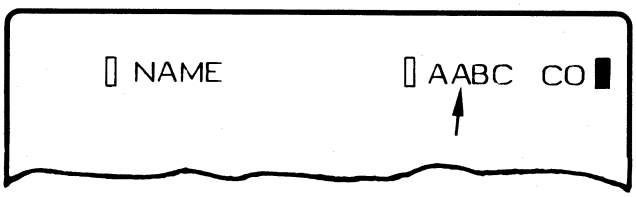

Notice that the *Space*, *C*, and *O* characters have all moved one space to the right. (Had a Null instead of a space character been present under the cursor when the B Key was depressed, the character *B* would have been entered without any lateral shift of the already present letters.



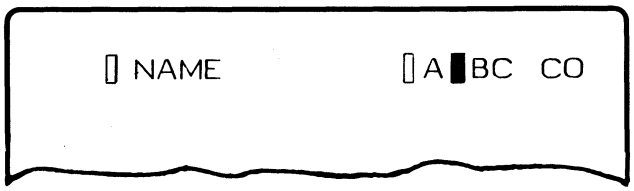

Now the Operator should insert the character *C* into the line. If more than one row of characters is contained within the field, a character occupying the last character position in the row is shifted into the first character position of the row next below. The editing operation having been completed, the Operator can depress the RESET Key to reenter the Data Input Mode. In Insert Mode, as in Data Input Mode, the total number of characters entered into a field cannot exceed the number provided by the application program. Any attempt to enter an excessive number of characters will display *INPUT INH* and inhibit the keyboard.



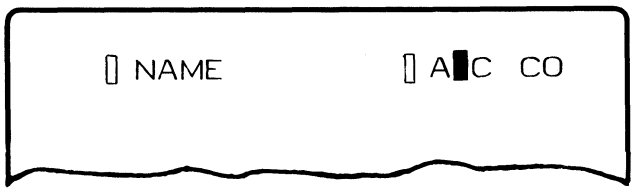

The function of the DEL (delete) Key is opposite to that of the INS MODE Key; the DEL Key is used to delete extraneous characters in an unprotected field. Unlike the INS MODE Key, there is no Delete Mode. To use the key, the cursor is positioned over an extraneous character and DEL is depressed. The extraneous character is deleted and any remaining characters to the right move one character position to the left. A Null will now occupy the character position formerly occupied by the rightmost character. The function of the DEL Key extends only to the end of the row in which the cursor is positioned. The function of the key is graphically illustrated below where the extraneous character (the extra *A*) is pointed out.



The cursor is positioned over the extraneous character.




The DEL Key is depressed, leaving the edited result.




The ERASE EOF (to end of file) Key is used when it becomes necessary to erase most or all of the data which has been entered into an input field. Position the cursor in the first character position to be erased and depress the ERASE EOF Key: all characters previously entered will be erased to the end of the field. The cursor will not move, enabling the Operator to begin reentering data at once.

The ERASE INPUT Key is used to erase all of the entered data on the display screen. Depressing this key will erase all input fields (or the entire display on an unformatted screen), reduce all character positions to Nulls, and move the cursor to the first unprotected buffer position.

## PROGRAM ATTENTION KEYS

The Operator uses these keys to signal the application program that some kind of action is requested. Since these actions on the part of the application program must occur before work can continue at the terminal, the depression of these keys will inhibit the keyboard, display the *INPUT INH* indicator and clear the *SYS AVAIL* (system available) indicator.


Depressing the CLEAR Key in conjunction with the ALT FUNC Key--

- Erases all entered data on the display screen and reduces all character positions to Nulls.
- Repositions the cursor to the first buffer position (upper leftmost position on the display screen).
- Inhibits the keyboard, displays the *INPUT INH* indicator, and clears the *SYS AVAIL* indicator.
- Signals the application program that the CLEAR Key has been depressed.

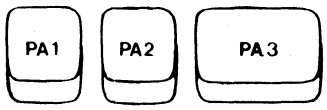
Although most application programs will reply to the signal by turning off the *INPUT INH* indicator (thus allowing the Operator to resume operations), some do not. The Operator must consult the User's Guide for the program to determine the correct procedure to follow.


Depressing the SEL (select) Key activates the SEL function, which duplicates light-pen operation. A field is selected by positioning the cursor in a light-pen-detectable field and then depressing the SEL Key


Depressing the TEST REQ (requested) Key in conjunction with the ALT FUNC Key--

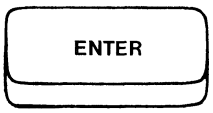
- Inhibits the keyboard, displays the *INPUT INH* indicator, and clears the *SYS AVAIL* indicator.
- Signals the application program that the TEST REQ Key has been depressed.

Normally, this key is used to signal the application program whenever the Operator suspects that the terminal is failing. The application program will transmit a test message that is used to diagnose trouble. However, the Operator must consult the User's Guide for the program to determine the correct procedure to follow.

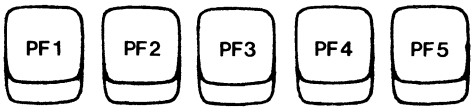



These are program access keys used by the Operator to signal the application program that some

kind of action is requested. Since the kind of action requested depends on the particular program in use, the Operator must consult the User's Guide for the program to determine their functions.




Depressing the ENTER Key signals the application program that the data on the display screen is ready to be entered into the Central Computer. The keyboard will be inhibited and the *INPUT INH* indicator will remain on until the operation is completed by the application program.




The function of each PF (program function) Key is determined by the particular application program in use. Therefore, the Operator must consult the User's Guide for the program to determine their functions.

## SPECIAL FUNCTION KEYS

The Operator uses these keys in conjunction with the ALT FUNC (alternate function) Key to select mono-case or dual-case character sets, enable or inhibit the keyboard clicker and to switch from a normal mode of operation to Diagnostic Mode.

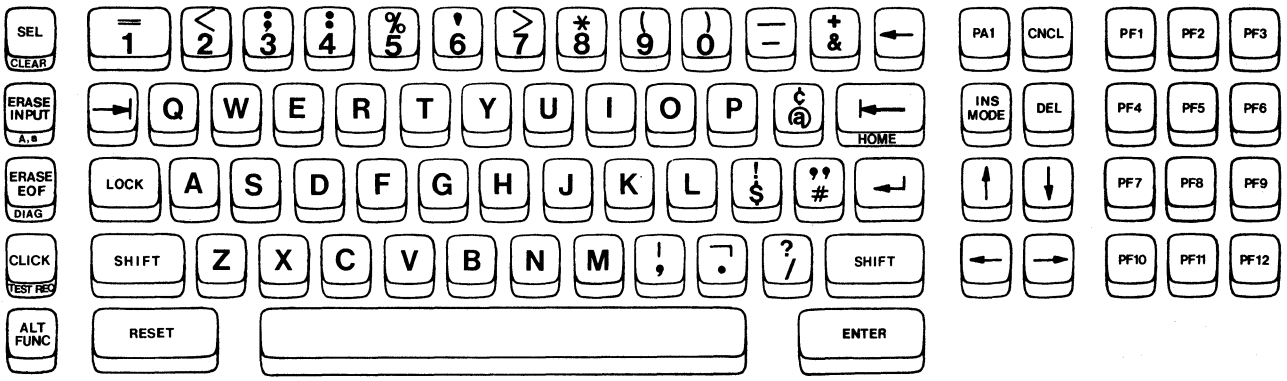

Depressing the A/a Key in conjunction with the ALT FUNC Key selects mono-case or dual-case character sets for display data.


Depressing the DIAG Key in conjunction with the ALT FUNC Key switches the terminal from a normal mode to Diagnostic Mode. Depressing the DIAG Key while holding down the ALT FUNC Key again resets the terminal to normal operation.


Depressing the CLICK Key enables or inhibits operation of the keyboard clicker. To inhibit the clicker, the Operator depresses the CLICK Key a second time.

## OPERATOR CONSOLE KEYBOARD

The Operator Console Keyboard is similar to the operator consoles used with IBM System/360 and System/370 computers. Most of the keys are in the same location and perform the same functions. The discussion of the keyboard is organized according to the functions of the keys.




The Operator Console Keyboard contains 25 symbols and punctuation marks as listed below:

| *Key* | *Sign or Punctuation Mark* |
|---|---|
| = | equals |
| < | less than |
| ; | semicolon |
| : | colon |
| % | percent |
| ' | apostrophe |
| > | greater than |
| * | asterisk |
| ( | left parenthesis |
| ) | right parenthesis |
| — | underscore |
| - | minus or hyphen |
| + | plus |
| & | ampersand |
| @ | at |
| ! | exclamation mark |
| $ | dollar |
| " | quotation mark |
| # | number |
| \| | logical OR |
| , | comma |
| ¬ | logical NOT |
| . | period |
| ? | question mark |
| / | slash |

## DATA INPUT KEYS

The Operator uses these keys to enter data onto the display screen in the normal Data Input Mode.

### Alphabetic Characters

The keyboard contains 26 characters. Both uppercase and lowercase alphabetic characters can be entered into the buffer, transmitted to the Central Computer, and displayed on the screen.

### Numeric Characters

The keyboard contains the 10 numeric characters, arranged in the configuration of the standard office typewriter keyboard.

### SHIFT and LOCK

The SHIFT and LOCK Keys function exactly as on a standard office typewriter keyboard: whenever the SHIFT Key is held depressed, the character or symbol on the upper portion of a dual-character key is displayed when that key is depressed. If the SHIFT Key is not depressed, the character or symbol on the lower portion of the key is displayed. The keyboard can be locked in the shift position by depressing the LOCK Key; the keyboard can be unlocked from the shift position by depressing the SHIFT Key again.

### Numeric Lock Feature

When equipped with this optional feature, the terminal automatically shifts to Numeric Mode if the display screen is formatted and the cursor enters a numeric field. In Numeric Mode only these keys can enter data: the digits 0 through 9, period, minus sign, and DUP (when the SHIFT or LOCK Key is also depressed). Depressing any other key in Numeric Mode will inhibit the keyboard and display the *INPUT INH* (inhibited) indicator. The Input Inhibited condition can be reset by depressing the RESET Key. No provision is made to override this feature and allow entry of alphabetic characters into a protected numeric field.

### Space Bar

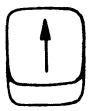
The Space Bar functions the same as on a standard office typewriter keyboard except that the Space character occupies a character position on the display screen in the buffer and in the transmitted data. For this reason the Space Bar should not be used to position the cursor; use the cursor-positioning keys. The Space Bar is autorepeat.

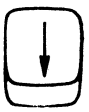

This key is used to reset Input Inhibited or Insert Mode conditions except that the key is inoperative while the terminal is transmitting or receiving data.

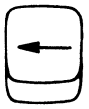

The ALT FUNC (alternate function) Key functions as a shift key for the keys directly above it and the HOME Key. The ALT FUNC Key enables the function on the front of these keys.

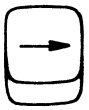
## CURSOR-POSITIONING KEYS

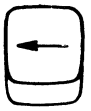
These keys are used to reposition the cursor to various positions and in various directions on the display screen. The proper key or keys to use at any given time will depend upon the current position and the desired new position of the cursor, as well as the reason for the change.

 (UP)

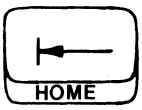
 (DOWN)

 (BACKSPACE)

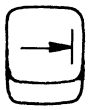
 (RIGHT)

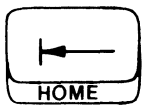
 (LEFT)

All of these cursor-positioning keys move the cursor one character position at a time. Since all are autorepeat, they repeat their functions until they are released, enabling the Operator to reposition the cursor to a desired line, or character position in a line, quickly and easily. Although all of the keys will cause the cursor to wrap, the vertical positioning keys (UP and DOWN) behave differently from the horizontal positioning keys (LEFT, RIGHT and BACKSPACE). Vertical wrap occurs without any horizontal movement; i.e., the cursor stays in the same character-position column. Horizontal wrap always involves vertical movement: if the cursor is repositioned off-screen with the LEFT or BACKSPACE Keys, the cursor reappears on the righthand side of the screen, one line higher than before. If the cursor is repositioned off screen with the RIGHT Key, the cursor reappears on the lefthand side, one line lower than before. The LEFT and BACKSPACE Keys function similarly, the only difference being their location on the keyboard.

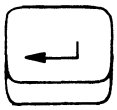



Depressing the HOME Key while the ALT FUNC (alternate function) Key is depressed causes the cursor to be positioned in the first unprotected character position on the display. The cursor will be positioned to the first display position on the screen if there are no fields or if all data is protected.

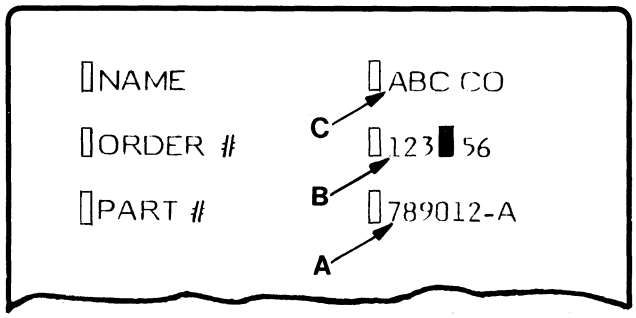

(TAB)



(BACKTAB)

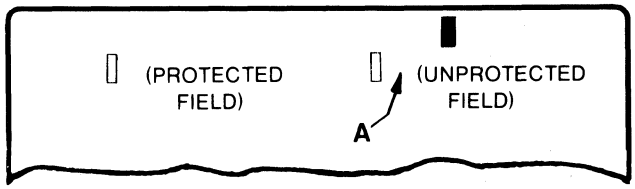

(NEW LINE)

These cursor-positioning keys are used to move the cursor to a new line or to the first character position in an unprotected input field, making the operation faster and easier than by moving the cursor one character position at a time. The use of the TAB and BACKTAB Keys is shown below. Both the TAB and BACKTAB Keys move the cursor to the first character position in an unprotected input field, the TAB Key moving the cursor forward and the BACKTAB Key moving it backward. If the cursor is in the indicated character position (over the number *4* ), and *NAME*, *ORDER #*, and *PART #* are protected fields, depressing the TAB Key will move the cursor to the first character position in the next unprotected input field; i.e., to the character position indicated by the arrow labeled "A." Depressing the BACKTAB Key will move the cursor backward to the first character position in the present unprotected input field; i.e., to the character position indicated by the arrow labeled "B." Had the cursor already occupied the first character position in an unprotected input field (i.e., at the character position indicated by the arrow labeled "B"), depressing the BACKTAB Key would have moved the cursor backward to the first character position in the next previous unprotected input field; i.e., to the character position indicated by the arrow labeled "C."

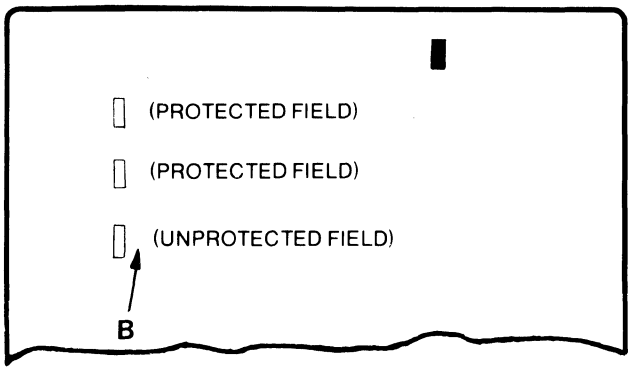



**Using the TAB and BACKTAB Keys to Reposition the Cursor.**

Depressing the NEW LINE Key always moves the cursor to the next unprotected character position in a line lower on the screen than the one which the cursor is currently occupying. On an unformatted display screen, this would be the first character position in the next line. On a formatted display screen, this would be the first character position in the first unprotected field either in the next line, as shown by the arrow labeled "A," or



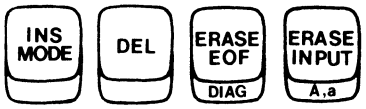

after several lines, as shown by the arrow labeled "B."



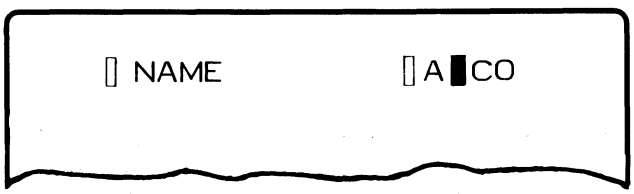

If all character positions on the display screen are protected, the cursor will return to the first position in the buffer (the upper leftmost position on the display screen). The NEW LINE Key is autorepeat.

## EDITING KEYS

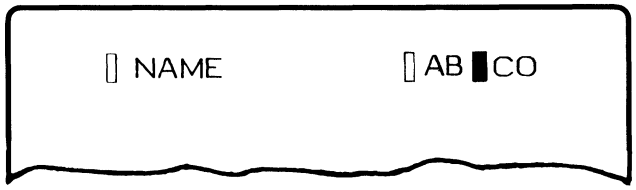
These keys are used to edit data which has already been entered on the display screen. The Operator will find these keys useful in correcting mistakes and in altering data.



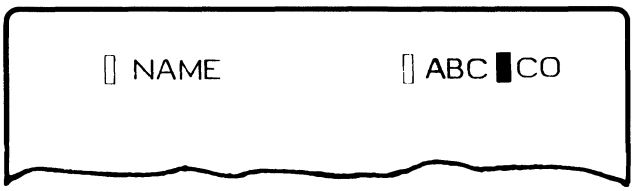

Depressing the INS MODE Key places the terminal in the Insert Mode. (The *INS MODE* indicator will come on.) The mode is exited by depressing the RESET Key. In this mode, characters can be inserted within data already entered on the display screen. Suppose that the name entered in the input field for *NAME* had been incorrectly entered as *A CO*, instead of the correct *ABC CO*. The Operator can insert the omitted letters in Insert Mode by first positioning the cursor in the character position in which the character *B* should be inserted,




then depressing the B Key. The display screen will then appear as shown below. Notice that the *Space*, *C*, and *O* characters have all moved one space to the right. (Had a Null instead of a Space character been present under the cursor when the B Key was depressed, the character *B* would have been entered without any lateral shift of the already present letter.)

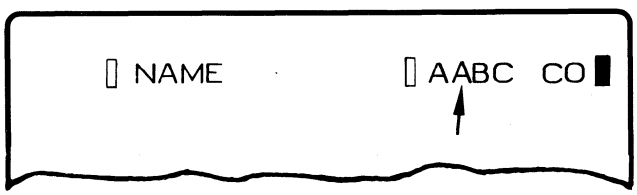



Now the Operator should insert the character *C* into the line, the result appearing as shown below.

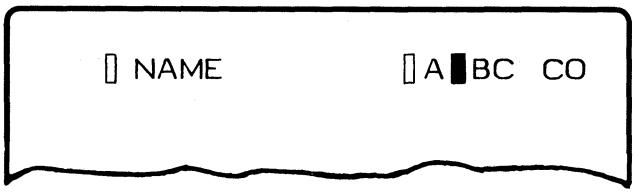



If more than one row of characters is contained within the field, a character occupying the last character position in the row is shifted into the first character positon of the row next below. The editing operation having been completed, the Operator can depress the RESET Key to reenter the Data Input Mode. In Insert Mode, as in Data Input Mode, the total number of characters entered into a field cannot exceed the number provided by the application program. An attempt to enter an excessive number of characters will turn on the *INPUT INH* indicator and inhibit the keyboard.

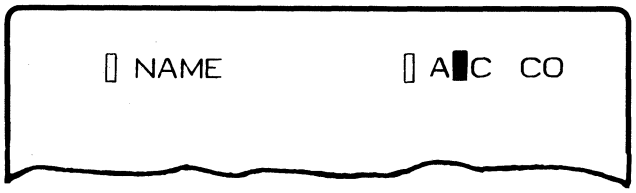
The function of the DEL (delete) Key is opposite to that of the INS MODE Key: the DEL Key is used to delete extraneous characters in an unprotected field. Unlike the INS MODE Key, there is no Delete Mode. To use the key, the cursor is positioned over an extraneous character and DEL is depressed. The extraneous character is deleted, and any remaining characters to the right will move one character position to the left. A Null will now occupy the character position formerly occupied by the rightmost character. The function of the DEL Key extends only to the end of the row in which the cursor is positioned. The function of the key is graphically illustrated below, where the extraneous character (the extra *A*) is pointed out.



The cursor is positioned over the extraneous character.




The DEL Key is depressed, leaving the edited result.




The ERASE EOF (to end of field) Key is used when it becomes necessary to erase most or all of the data that has been entered into an input field. Position the cursor in the first character position that is to be erased, depress the ERASE EOF Key, and all characters previously entered will be erased to the end of the field. The cursor will not move, thus enabling the Operator to begin re-entering data immediately. If the display is unformatted, it will be erased to the end of the screen.

The ERASE INPUT Key is used to erase all of the entered data on the display screen. Depressing this key will erase all input fields (or the entire display on an unformatted screen), reduce all character positions to Nulls, and move the cursor to the first unprotected buffer position.

## PROGRAM ATTENTION KEYS

The Operator uses these keys to signal the application program that some kind of action is requested. Since these actions on the part of the application program must occur before work can continue at the terminal, the depression of these keys will inhibit the keyboard, display the *INPUT INH* indicator and clear the *SYS AVAIL* (system available) indicator.


Depressing the CLEAR Key in conjunction with the ALT FUNC Key--

- Erases the display screen and reduces all character positions to Nulls.
- Repositions the cursor to the first buffer position (upper leftmost position on the display screen).
- Inhibits the keyboard, displays the *INPUT INH* indicator, and clears the *SYS AVAIL* indicator.
- Signals the application program that the CLEAR Key has been depressed.

Although most application programs will reply to the signal by turning off the *INPUT INH* indicator (thus allowing the Operator to resume operations), some do not. The Operator must consult the User's Guide for the program to determine the correct procedure to follow.


Depressing the SEL Key activates the SEL function, which duplicates light-pen operation. A field is selected by positioning the cursor in a light-pen-detectable field and then depressing the SEL Key.

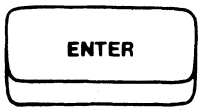

Depressing the TEST REQ (requested) Key in conjunction with the ALT FUNC Key--

- Inhibits the keyboard, displays the *INPUT INH* indicator, and turns off the *SYS AVAIL* indicator.
- Signals the application program that the TEST REQ Key has been depressed.

Normally, this key is used to signal the application program whenever the Operator suspects that the terminal is failing. The application program will transmit a test message that is used to diagnose trouble. However, the Operator must consult the User's Guide for the program to determine the correct procedure to follow.

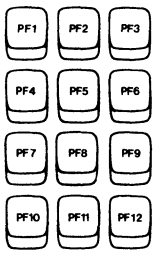

Depressing the CNCL Key signals the application program that the key has been depressed. Although the application program typically clears the input field in which the cursor is positioned and repositions the cursor to the first character position in the input field, the Operator must consult the User's Guide for the program to determine the correct procedure to follow.


This is a program access key used by the Operator to signal the application program that some sort of action is requested. Since the kind of action requested depends on the particular program in use, the Operator must consult the User's Guide for the program to determine its function.




Depressing the ENTER Key signals the application program that the data on the display screen is ready to be entered into the Central Computer. The keyboard will be inhibited, and the *INPUT INH* indicator will remain on until the operation is completed by the application program.

The function of each PF (program function) Key is determined by the particular application program in use. Therefore, the Operator must consult the User's Guide for the program to determine their functions.




**SPECIAL FUNCTION KEYS**

The Operator uses these keys to select mono-case or dual-case character sets, to enable or inhibit the keyboard clicker, and to switch from a normal mode of operation to Diagnostic Mode.


Depressing the A/a Key in conjunction with the ALT FUNC Key selects mono-case or dual-case character sets for display data.


Depressing the DIAG (diagnostic) Key in conjunction with the ALT FUNC Key switches the terminal from a normal mode to Diagnostic Mode. Depressing the DIAG Key while holding down the ALT FUNC Key again resets the terminal to normal operation.


Depressing the CLICK Key enables or inhibits operation of the keyboard clicker. To inhibit the clicker, the Operator depresses the CLICK Key a second time.

# OPERATING PROCEDURES

The previous sections of the manual should give the Operator the basic knowledge necessary to operate the display screen controls and the keyboard. The Operator will find it necessary to integrate these instructions with the User's Guide for the application program used by the local office. Since application programs and User's Guides vary, only generalized instructions can be given here. This section describes the normal data input procedures.

SIGNING ON. In some locations the Operator must use certain procedures to "sign on;" that is, signal the application program that the display terminal will be entering data.

STARTING TO WORK. The Operator will signal the application program when ready to process data (perhaps by depressing one of the program access keys, which will cause a formatted display or a message to appear on the display screen). The Operator will enter data from a source document into the input fields, then signal the application program (by depressing the ENTER Key) that data on the display screen is ready to be entered into the Central Computer. After the data has been sucessfully transmitted to the Central Computer, the application program will erase the input fields, and the display screen will again be available for data entry from another source document.

The following instructions describe the step-by-step operation of the terminal for normal data input procedures. The Operator should perform the operations, in sequence, as described.

- Pull Power ON-OFF Switch to the ON position. If the optional Security Lock is in the ON position, the *INPUT INH* (inhibited) message indicator will be displayed on the screen after a short warm-up period.

  Remarks: After the warm-up period, the cursor should appear in the first character position in the buffer (upper leftmost position on the display screen).

- Turn optional Security Lock to the OFF position. The *INPUT INH* message indicator will be extinguished.

- Adjust display brightness as required.

  Remarks: This control is part of the Power ON-OFF Switch. Turn the knob counterclockwise to make the image dimmer, clockwise to make it brighter.

- Adjust display contrast as required.

  Remarks: This control is part of the Power ON-OFF Switch. Adjust the contrast of the viewed image by turning the knob at the rear of the switch.

- Sign on, if required.

  Remarks: Follow the sign-on procedure given in the User's Guide for the application program.

- Signal the application program when ready to go to work.

  Remarks: Follow the procedure given in the User's Guide--usually, one of the program attention (PA) keys is employed. If the program utilizes a format, the format will subsequently appear on the display screen.

- Enter data from a source document. There is no indicator light to indicate Data Input Mode.

- Edit data when characters are not inserted or excess characters are not deleted, as required.

  Remarks: For simple replacement of characters (such as correcting a misspelled word), position the cursor over the character to be replaced and depress the key for the correct character. The correct character will replace the incorrect one.

- Edit data by deleting excess characters, as required.

  Remarks: To correct misspelled words by deleting excess characters, position the cursor over an extraneous character and depress the DEL (delete) Key. The extraneous character will be deleted, and any remaining characters to the right will move one character position to the left. The function of the DEL Key extends only to the end of the row (or field) in which the cursor is positioned.

- Edit data by inserting new characters as required. Before insertion of new characters, depress INS (insert) MODE Key. *INS MODE* will be displayed on the screen.

  Remarks: Position the cursor over the character position in which the omitted character is to be inserted. Depress the key for the character to be inserted. The character will be inserted, and all characters formerly under and to the right of the cursor will move one character position to the right. When editing has been completed, depress the RESET Key to place the terminal back in Data Input Mode.

- Edit data by erasing when required.

  Remarks: Erasing may be accomplished in three ways:

  - When only a single field or part of a field needs to be erased, place the cursor over the first character position to be erased and depress the ERASE EOF (to end of field) Key. All characters to the end of the field will be erased, but the cursor will not move; data may be reentered immediately by the Operator.

  - Depress the ERASE INPUT Key when all data entered from the display screen is to be erased. All data previously entered by the Operator will be erased, and the cursor will move to the first unprotected buffer position (upperleft character position).

  - Depress the CLEAR Key while holding down the ALT FUNC (alternate function) Key when the entire display is to be erased. The display screen will be erased, and the cursor will move to the first buffer position.

- The keyboard is disabled when the following conditions exist:

  Remarks: When the keyboard is disabled, most keys on the keyboard (including all of the alphameric characters and the symbols) are inactive.

  - The terminal is executing a command sent by the application program. The *INPUT INH* message indicator will be displayed.

    Operator action required: None. The indicator will be turned off by the application program after completion of the operation.

  - An operation initiated by a Program Attention (PA) Key is in progress. The *INPUT INH* message indicator will be displayed. The *SYS AVAIL* (system available) message indicator will be extinguished.

    Operator action required: None. The *INPUT INH* message indicator will be extinguished by the application program after completion of the operation.

  - The optional Numeric Lock Feature is installed on a terminal equipped with a Data Entry Keyboard and the Operator depresses a key other than the numerics plus the period, minus sign, and DUP Key without also depressing either the ALPHA or NUMERIC Keys when the cursor is in a numeric field. The *INPUT INH* message indicator will be displayed on the screen.

    Operator action required: Depress the RESET Key. The optional Numeric Lock Feature can be overridden by depressing the NUMERIC Key to enter uppercase shift characters, or the ALPHA Key, to enter lowercase downshift characters.

  - The optional Numeric Lock Feature is installed on a terminal equipped with a Typewriter, Check Processing, or Operator Console Keyboard and the Op-

erator depresses a key other than the numerics plus the period, minus sign, and DUP Key when entering data in a numeric field. The *INPUT INH* message indicator will be displayed on the screen.

Operator action required: Depress the RESET Key. No provision has been made to override the optional Numeric Lock Feature on Typewriter, Check Processing, and Operator Console Keyboards.

- The Operator depresses any alphameric key, the DUP Key, the FIELD MARK Key, the ERASE EOF Key, or the DEL Key while the cursor is in a protected field or over an attribute character. The *INPUT INH* message indicator will be displayed on the screen.

  Operator action required: Depress the RESET Key.

- The optional Security Lock is in the ON position. The *INPUT INH* message indicator will be displayed on the screen.

  Operator action required: Turn the Security Lock to the OFF position.

- The Operator has depressed the data entry keys faster than the terminal can perform the operations (a rare occurrence). The *INPUT INH* message indicator will be displayed on the screen.

  Operator action required: Depress the RESET Key.

- The Operator has depressed the SEL Key and the cursor is not located in a valid Light Pen Field. The keyboard will be inhibited and the *INPUT INH* indicator will be displayed.

  Operator action required: Depress the RESET Key.

- The Audible Alarm sounds when the following conditions exist:

  - The cursor enters the next-to-last character position on the display screen.

    Remarks: This is a signal to the Operator that the cursor is about to wrap. Subsequently entered data will replace any data already displayed.

  - The application program has been programmed to initiate an alarm.

    Remarks: The reason for the alarm will be explained in the User's Guide.

- Depressing the ENTER Key will signal the application program that the data displayed on the display screen is ready to be entered into the Central Computer. The *INPUT INH* message indicator will be displayed. The *SYS AVAIL* message indicator will be extinguished but will be displayed again after the data on the display screen has been transmitted to the Central Computer.

  Remarks: When the *SYS AVAIL* message indicator is displayed, the Central Computer is available to accept an Operator-initiated transmission.

# MAINTENANCE

## GENERAL

By exercising normal care and a common sense approach to maintenance, the Operator can do a better job and help minimize downtime and service calls.

### CLEANING

The terminal cover may be cleaned as required with a damp cloth and wiped dry. The display screen may require cleaning periodically. Clean the display only with glass cleaner.

### OPERATING ENVIRONMENT

The display terminal is designed to operate in a temperature range of +50°F to +95°F. Since the electronic circuits are convection-cooled, the areas around the bottom of the terminal case and the top panel should be left clear. Both the power cable and the data communication cable should be protected from damage due to impact and pedestrian traffic.

# TROUBLE WITH THE TERMINAL

## GENERAL

Since the terminal contains many mechanical and electronic components, it is possible that malfunctions can occur. Some of these can be remedied (or even prevented) by the Operator, while others require the services of a TTC Field Engineer. Some potential problem areas as well as some helpful suggestions are described in the text below.

### NO POWER

If the cursor does not appear after a short warm-up period when the Power Switch is pulled on, the Operator can--

- Check the power-cord plug to see if it is firmly plugged into its receptacle.
- Verify that power is available at the receptacle.
- Push the Power Switch to the OFF position, wait five seconds, and then pull it back to the ON position.

If these efforts fail to restore service, see SERVICE CALLS.

### REQUEST FOR TEST

Every display terminal is equipped with a TEST REQ (request) Key, although not all application programs are equipped with the software that enables the test procedures. The Request for Test (RFT) Procedure is designed to send a test pattern to a display terminal as a service aid whenever the Operator suspects that the terminal is not operating correctly. The Operator must consult the User's Guide for the application program to determine the correct procedure to follow.

## DIAGNOSTIC TESTS

Diagnostic tests are provided on two levels--power-on and Operator-initiated. Power-on tests verify all functions which can be tested without Operator intervention and are performed each time the terminal Power Switch is pulled ON. The Operator-initiated diagnostic tests are provided to allow the Operator to differentiate between system failures and operational or procedural problems. These tests are designed to provide Operator confidence in terminal operation.

### POWER-ON DIAGNOSTIC TESTS

The power-on tests are the Cyclic Redundancy Check (CRC), Video RAM (VRAM), and Control RAM (CRAM). The results of these tests are displayed at the bottom of the screen in the diagnostic message field of the status line. The Operator should observe the status line after power-on for any fail-test result messages for these tests and notify the supervisor of any failures.

The fail test messages are *CRC X, VRAM X,* and *CRAM X.*

### OPERATOR-INITIATED DIAGNOSTIC TESTS

The Operator may be expected to initiate the diagnostic tests when a malfunction has been observed or suspected or when requested by an off-site Field Engineer. The test results may isolate malfunctions which are Operator-detectable, or the Operator can communicate the results to the Field Engineer for off-site diagnosis. The diagnostics are designed to reduce downtime and increase Operator use of the TC 277C/D.

The Operator-initiated diagnostic tests are described below and step-by-step instructions are provided for each test. The Operator should select the appropriate test(s) and perform the procedures which follow, as required, to isolate

observed or suspected malfunctions. Before initiating a test the Operator should--

- Set the Power ON-OFF Switch to ON.
- Depress the DIAG (diagnostic) Key while holding down the ALT FUNC (alternate function) Key. This puts the terminal in the Diagnostic Mode.
- Observe that the letter *D* is displayed and the cursor positioned to the right and adjacent to it. The letter *D* will start to blink after the selected test has been initialized, indicating that the test is in progress.

After the test(s) is performed, the Operator depresses the DIAG Key while holding down the ALT FUNC Key to return to normal operation.

**Display Attributes Test**

This test permits the Operator to view attribute characters (normally not visible) which are stored in the video buffer. Follow the steps below:

- Type the numeric character Test Code "03."
- Depress the ENTER Key.
- Observe that *DISP ATTR* (display attributes) is displayed in the Diagnostic Message Field. ( If an error is made in selecting a test, the entry can be corrected by depressing the RESET Key and typing in the correct code. If an undefined test is selected and the ENTER Key is depressed, *INVALID* will be displayed in the Diagnostic Message Field.)
- Depress the ENTER Key several times and observe that the mode will toggle from Attribute Display to Nondisplay and vice versa. Cursorlike displays will highlight attributes, but the true cursor is positioned on the status line.
- Depress the RESET Key. This terminates the test and re-initializes the terminal for test selection.

**NOTE**

If the Attribute Display Mode is not reset prior to test termination, attributes will continue to be highlighted. (The position of the true cursor can be determined by depressing any cursor-positioning key.) This mode of operation is intended to aid while operating in on-line mode by highlighting attribute positions.

**Pattern (PAT) Test**

The Pattern Test provides the Operator with the capability to format the video buffer by inserting and deleting attributes and composing fields. When this test is selected (Test Code "04" entered), current attributes will be disabled: attribute characters will not be protected and the Operator will be able to type in protected fields; data in nondisplay fields will be visible; intensified data will be unintensified; etc. All current nondisplay data will be erased when this test is selected to prevent display of secure information. Each attribute character is mapped into a data character and displayed in a reverse video block for easy identification. The true cursor is repositioned to the first display position on the video screen and *PAT* is displayed in the Diagnostic Message Field. Perform the following steps:

- Type in the numeric character Test Code "04."
- Depress the ENTER Key.
- Position the true cursor to the desired location using the cursor control keys.
- Specify attributes using the alphameric keys and enter the data.
- Depress the ENTER Key to change the character that precedes the cursor from a data character to an attribute character.
- Depress the RESET Key to terminate the PAT Test and reinitialize the Selection Field for test selection. Attribute characters will be enabled, protected, and not visible; data in nondisplay fields will not be visible; intensified data will be re-intensified, etc.
- Exit Diagnostic Mode to test normal keyboard functions.

**Alarm/Indicator Test**

The Alarm/Indicator Test allows the Operator to verify that the Audible Alarm and *SYS AVAIL, INS MODE,* and *INPUT INH* message indicators can be activated. Perform the following steps:

- Type in the numeric character Test Code "05."
- Depress the ENTER Key.
- Observe that *ALARM/INDC* (indicators) is displayed in the Diagnostic Message Field to indicate that the test is in progress.
- Depress the ENTER Key again and observe that *SYS AVAIL, INS MODE,* and *INPUT INH* are displayed on the status line and the Audible Alarm (if installed) is turned on. (Messages are displayed and Alarm sounds for approximately one second.)
- Depress the RESET Key to terminate the test.

**Operator Identification Card Reader (OICR)/Light Pen (Selector Pen) Test**

The OICR/LP Test is used to verify proper operation of the OICR and Light Pen (Selector Pen) when the terminal is equipped with these optional devices. When this test is initialized, *OICR/LP* is displayed in the Diagnostic Message Field. A light pen selection field will be displayed and designated by the mnemonic *LP SEL*; the remainder of the screen will be blank.

OICR TEST. This test compares data read from the OICR test card against matching data stored in ROM. Data is not stored in the video buffer for this test and the cursor is not moved. Perform the following steps:

- Type in the numeric character Test Code "06."
- Depress the ENTER Key.
- Observe that *OICR/LP* is displayed in the Diagnostic Message Field to indicate that the test is in progress.
- Pass the test card through the card reader. The test results are displayed in the Diagnostic Message Field and are interpreted as follows:

| Message | Meaning |
|---|---|
| *OICR* | Insertion of the test card was not detected (if card was passed through the card reader). |
| *NO SOR* | Card insertion was detected but a start-of-record (SOR) character was not detected. |
| *DATA OK* | All characters decoded correctly. |
| *DATA X* | Card was read but data characters after the SOR were not decoded correctly. |

- Depress the RESET Key to terminate the test, clear the video buffer to null characters, and re-initialize the Selection Field for test selection.

LIGHT PEN (SELECTOR PEN) TEST. Operation of the Light Pen Test must be visually verified by the Operator. The Light Pen Field is provided for this purpose. Perform the following procedures. Successful completion of these procedures indicates that the Light Pen and associated interface circuitry are functioning properly.

- Press the tip of the Light Pen against a flat surface. Verify that a solid line is displayed through all visible characters on the row designated by *LP SEL.* The solid line should not be displayed on any other row.
- Position the Light Pen over any visible character in the row designated by *LP SEL* . Press the tip of the pen against the screen and verify that the solid line is momentarily displayed (on the same line up to the pen position) and then is extinguished. Be sure the designator character changes from a (?) to a (>).
- Position the Light Pen over any *C* in the row below the Light Pen Field. Press the

pen against the CRT and verify that a selection is not made; i.e., the designator character does not change and the solid line is not extinguished until the pen is released.

- Again position the Light Pen over a visible character in the *LP SEL* row, press the tip against the screen, and verify that the (>) reverts to a (?).

- Depress the RESET Key to terminate the test, clear the video buffer to null characters, and re-initialize the Selection Field for test selection.

**Key/Switch Test**

The Key/Switch Test is used to monitor keyboard data input to the system and switchable inputs used to configure the terminal for features and keyboard types.

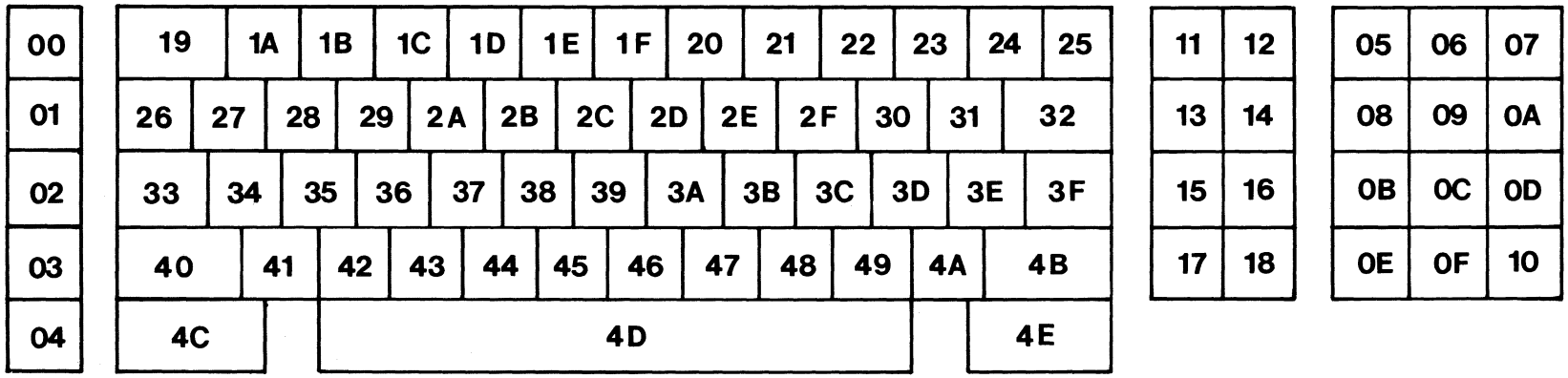
- Type in the numeric character Test Code "08."

- Depress the ENTER Key.

- Depress each key and verify that when a key is depressed an asterisk and the appropriate hexadecimal two-digit code (**XX*) are displayed in the Diagnostic Message Field. (See the following illustration.) When a key is released, a space replaces the asterisk.

- Depress the RESET Key and note that **4C* is displayed. Releasing the key will terminate the test and re-initialize the Selection Field for test selection.

The switches used to configure the terminal features (keyboard type, function pad, etc.) are constantly monitored as part of the Key/Switch Test with the data displayed in the Diagnostic Message Field. If a change in a switch setting is detected, the test will be automatically terminated and an error message displayed adjacent to the switchable input data. If an error is detected, the switchable input data will specify the setting of the switches when the error was detected.




**Hexadecimal Key/Switch Codes.**

### Screen Alignment Test

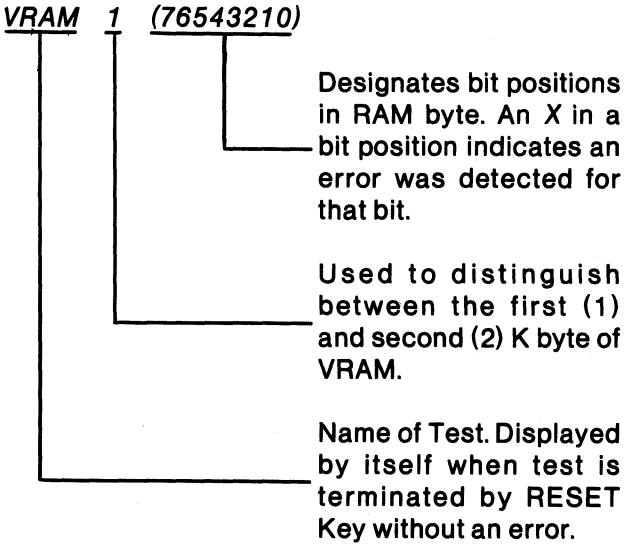
The Screen Alignment Test fills the video buffer with the *E* character to facilitate alignment and focusing of the CRT.

- Type in the numeric character Test Code "07."
- Depress the ENTER Key.
- Adjust the display screen contrast by turning the contrast control on the Power ON-OFF Switch.
- Depress the RESET Key to terminate the test, clear the video buffer to null characters and re-initialize the Selection Field for test selection.

### Video RAM (VRAM) Test

A checkerboard RAM test is performed on the video buffer which causes a full display screen of test data to be displayed. Perform the following procedure:

- Type in the numeric character Test Code "01."
- Depress the ENTER Key.
- Observe that the test results are displayed in the Diagnostic Message Field when an error is detected. The results of the test are interpreted as follows:




- Depress the RESET Key. The test will be terminated and *VRAM* will be displayed in the Diagnostic Message Field. The buffer will be cleared to all null characters, and the test results displayed in the Diagnostic Message Field. The Selection Field will be re-initialized for selection of another test.

### Control RAM (CRAM) Test

This tests the locations in the control RAM and is similar to the VRAM test except that no pattern is displayed on the display screen.

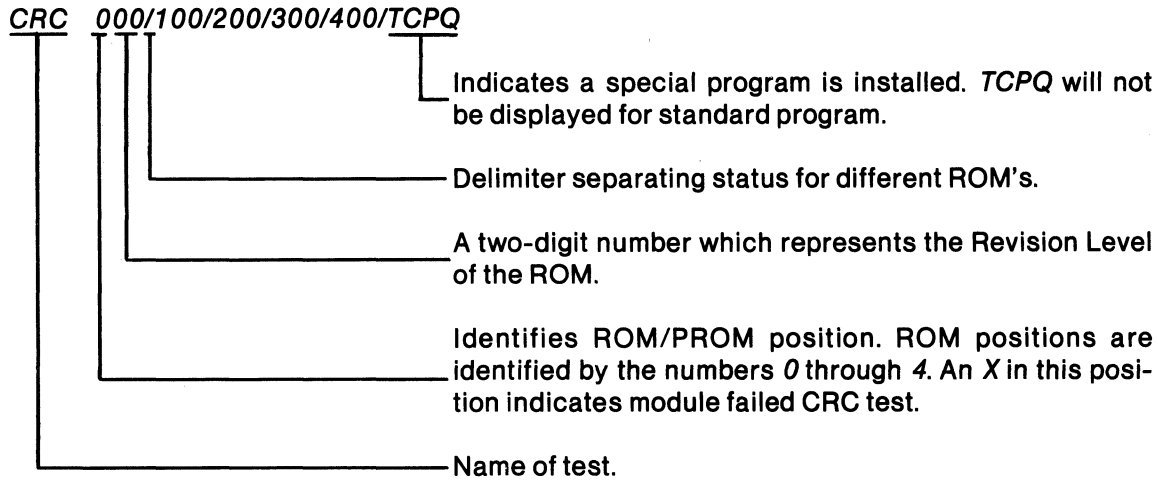
- Type in the numeric character Test Code "02."
- Depress the ENTER Key.
- Observe that *CRAM* is displayed in the Diagnostic Message Field. If an error is detected as part of the test, *CRAM X* is displayed. If no errors are detected, the test will run repeatedly.
- Depress the RESET Key. This terminates the test and re-initializes the Selection Field for test selection.

### Cyclic Redundancy Check (CRC) Test

The CRC Test performs a check on all firmware locations by computing a CRC value for each ROM/PROM and comparing the computed value with the correct value. Perform the following steps:

- Type in the numeric character Test Code "00."
- Depress the ENTER Key.

The results of the test are displayed in the Diagnostic Message Field and are interpreted as follows:




- Depress the RESET Key to terminate the test. The test will run repeatedly until terminated. Depressing the RESET Key freezes the results in the Diagnostic Message Field and re-initializes the Selection Field for test selection.

## SERVICE CALLS

The office in which your terminal is located will have established operating procedures to deal with equipment malfunction. In most cases, you will have been instructed whom to notify in case of specific malfunction--either your own Central Computer Office or a TTC Field Engineering Dispatcher. (Choose the appropriate toll-free telephone number for your location.)

- Northern U.S., 1-800-331-7410
- Southern U.S., 1-800-331-7435
- Oklahoma, 1-800-722-2740

When placing service calls, be sure to give the dispatcher the following information:

- Customer name and location.
- Telephone number and name of person to contact.
- Model number and serial number (if available).
- Problem you are experiencing.