File No. S370-36
Order No. GC28-2017-5

Systems

IBM Time Sharing System Terminal User's Guide

This manual gives instructions for using the IBM 3277 Display Station, the IBM 2741 Communications Terminal, and the teletypewriter terminal with the IBM Time Sharing System (TSS). It is intended for programmers, system managers, and system administrators who use terminals with TSS.

PREFACE

This manual is intended for programmers, system managers, and system administrators who use terminals in the IBM Time Sharing System (TSS). There are three parts to this manual. The first part provides operating instructions for the IBM 3277 Display Station. The second part describes how to operate the IBM 2741 Communications Terminal. The third part describes how to use the teletypewriter terminal. All instructions are limited to those needed to operate the terminals in the time sharing system. For additional information about the IBM terminal devices, refer to the following publications:

IBM 3270 Information Display System, GA27-2749

IBM 2740/2741 Operator's Guide, GA27-3001

IBM 2741 Communications Terminal, GA24-3415

The user of this manual must be familiar with the command system of TSS. This information for general users is available in:

IBM Time Sharing System: Command System User's Guide, GC28-2001

System managers and administrators should refer to:

IBM Time Sharing System: Manager's and Administrator's Guide, GC28-2004

Operators should consult:

IBM Time Sharing System: Operator's Guide, GC28-2033

For a general description of TSS, consult:

IBM Time Sharing System: Concepts and Facilities, GC28-2003

Sixth Edition (June 1978)

This is a major revision of, and makes obsolete, GC28-2017-4. This edition replaces the 1050 with the 3277.

This edition is current with Release 3.0 of IBM Time Sharing System/370 (TSS/370), and remains in effect for all subsequent versions or modifications of TSS unless otherwise noted. Significant changes or additions to this publication will be provided in new editions or Technical Newsletters.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

A form is provided at the back of this publication for reader's comments. If this form has been removed, comments may be addressed to IBM Corporation, Time Sharing System, Dept. 80M, 1133 Westchester Avenue, White Plains, New York 10604.

CONTENTS

FIGURES

TABLES

This manual gives instructions for initiating, operating, and terminating use of the 3277 Display Station, the IBM 2741 Communications Terminal, and the teletypewriter terminal in the IBM Time Sharing System. TSS also supports use of the 3767 Communication Terminal in "2741-mode".

For details about the hardware components and their other uses, consult the documents listed in the preface to this manual.

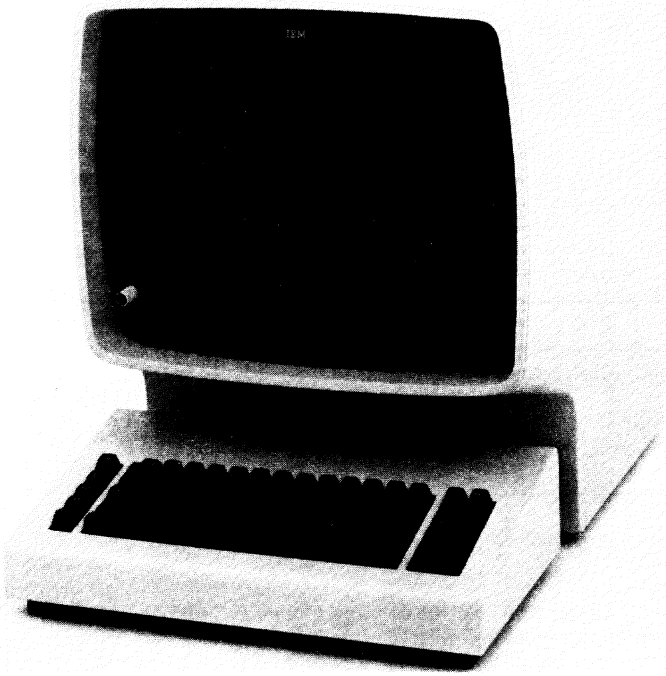


Figure 1. The IBM 3277 Display Station

IBM 3277 DISPLAY STATION

All IBM display terminals, when used with TSS, may be thought of as having three main components: (1) a CRT (cathode-ray tube) on which 80-character lines can be displayed, (2) a keyboard, and (3) an area of the computer's virtual storage called the conversation buffer. Characters typed are displayed immediately but not sent to the computer until a control key (named ENTER on the 3277) is pressed signalling a program to read data from the display. Throughout this guide, the term DSR (device support routine) is used to refer to the programming which causes transfer of data between the display and TSS. The DSR is usually transparent to the user but can accept commands and perform special functions, as explained later.

HARDWARE DESCRIPTION

When the 3277 is first turned on, it contains null, or empty, characters in all 1920 positions. Null characters are not blanks but appear as blanks in the display, and are not transmitted to the computer during input operations, whereas blank characters are transmitted. All data (input or output) displayed is formatted into fields; the hardware allows a field to begin at any character position and be of any length. The software (DSR) redefines fields so that they are compatible with the format of the total screen display. The first position of a field is occupied by an attribute character which is displayed as a blank and which cannot be altered using the keyboard. A sample input field, before and after the field is typed, is shown immediately below:

```
@_.............................(before)

@this is a sample field_.......(after)
```

The attribute character, although displayed by the 3277 as a blank is represented above by a "@". The cursor is represented by an underscore character "_", and the null positions are represented by dots "....". In this example the letter "d" in "field" was the last character typed. The cursor has been automatically moved to the next character position, which contains a null. (Note in the example above, that each typed character, including the blanks, replaces a null character in the line.)

All input sent from the 3277 terminal to a task within the computer is made up of fields, not individual characters. The attribute character for each field contains a "modified data tag" (a bit within the attribute character) which is turned on whenever any part of the field is modified. (Retyping a character in an output field or typing over a null character in the input field is considered to be a modification.) When input is sent to the task, the 3277 hardware sends all fields which have the modified data tag bit on.

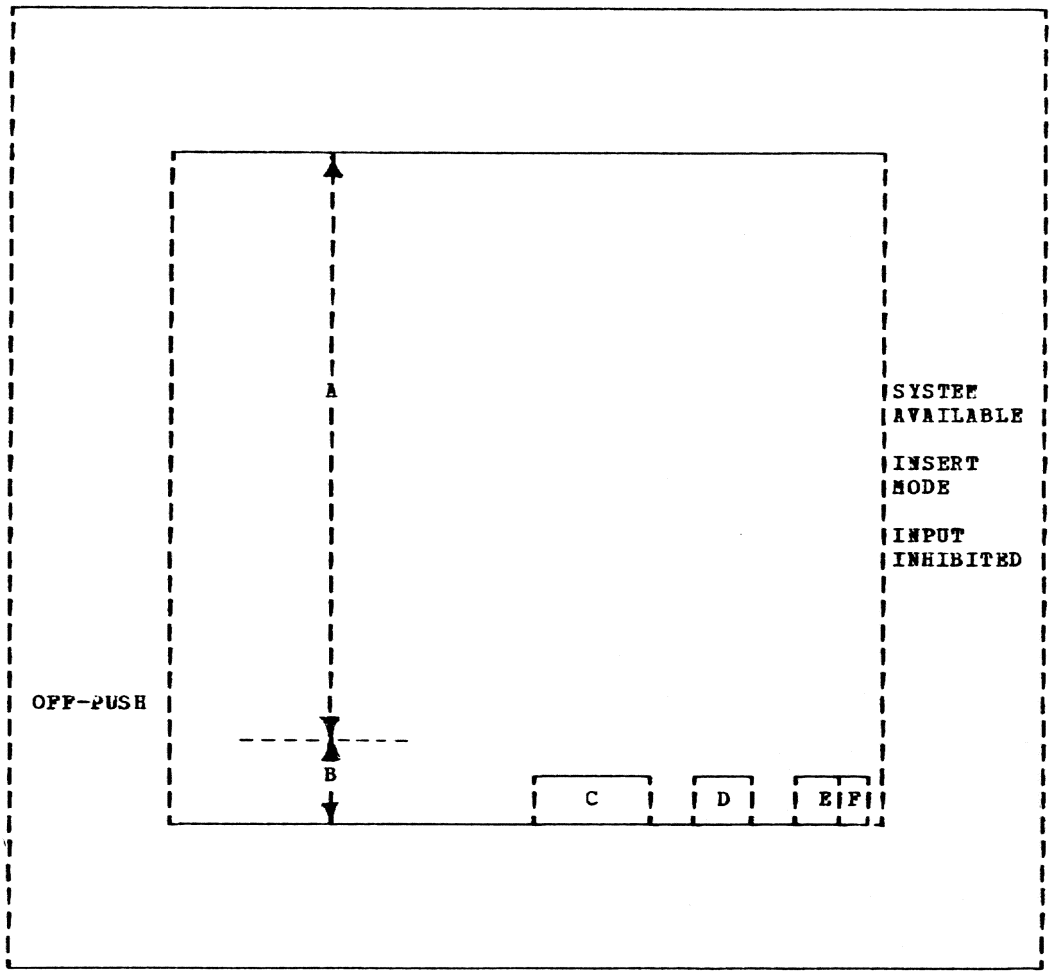


Figure 2. 3277 Screen Format

DISPLAY FORMAT

The display is logically divided into nine areas, as shown in Figure 2; some of the areas are defined by the hardware and others are defined by the software (DSR). The input and output areas are variable in length and in location. The general area descriptions that follow are based on TSS defaults which may be modified by the user.

Area "A" is the output area. This area is from 0 to 21 lines in length; each line contains 80 character positions, numbered 0 through 79. Position 0 of each line contains the attribute character and always displays as a blank; this allows 79 positions to be used for displaying output data. Each line is a separate field. (Any field in the output area can become an input field by moving the cursor to the field and retyping any character, or making any other changes, within the field.)

Area "B" is the input area, which is a multiple-line field containing up to 200, or up to 239 bytes, depending upon user selection. This area is located under the output area and is normally cleared to nulls before the prompting for input appears on the screen. The beginning of the input area is generally indicated by the cursor.

Note: The input and output areas A and B may be combined such that the input area is always one line below the output area on the display. Initially, the input area is at the top of the display and there is no output area. After the initial input line is entered, the input area becomes the output area, and the new input area begins one line below the output area (other input and output variations are discussed later under "screen commands").

Area "C" is the DSR message area, in which prompting messages are displayed. For example when a system routine is requesting input, the message "SYSTEM INPUT" is displayed at the beginning of the input area; the message "** WORKING **" means that the task is executing and is not expecting input.

Area "D" contains the current page (frame) number. The output buffer is logically divided into pages of 21 lines each, and the current page number corresponds to the page containing the top line displayed. This page number may be used with DSR commands to request that any previous page be redisplayed. The page number may be followed by the character 'H' denoting that this page (or frame) is being "held" (discussed later).

Area "E" displays the column number of the left side of the display. As the frame is moved to the right or left to view long lines, this area indicates the location of the frame over the lines.

Area "F" displays a "+" if at least one of the output lines displayed in area "A" (or one of the function key definitions to be displayed in the status frame, discussed later) will not fit in the display; otherwise, it is blank. Even if the frame is being moved to the right or left, this plus sign is displayed only if more output data exists to the right.

The SYSTEM AVAILABLE, INSERT MODE, and INPUT INHIBITED areas are hardware generated indicators. The SYSTEM AVAILABLE area, when illuminated, shows that the 3277 is turned on and has had successful communication with the system and that the system is available to the task. The INSERT MODE area is illuminated whenever the keyboard is functioning in insert mode (See Editing Keys). The INPUT INHIBITED area is illuminated whenever the keyboard is disabled. Any combination of these three indicators may be illuminated at any time.

After an input operation, the keyboard is not mechanically locked; it is disabled and the INPUT INHIBITED area is illuminated. When a program requests input, the keyboard is enabled, the INPUT INHIBITED area becomes dark to indicate that the input should be typed, and the DSR displays a prompt in the message area.

KEYBOARD

The 3277 keyboard is shown in figure 3. With one exception, all keys function only when the keyboard is enabled (INPUT INHIBITED area is dark). The exception is the RESET key, which may be pressed at any time to enable the keyboard.

Editing keys

The editing keys can be used to modify data before it is sent to the task; these keys are listed below:

- The SHIFT and shift LOCK keys function as on a normal typewriter . Pressing the SHIFT key puts the keyboard in upper shift. Pressing shift LOCK causes the keyboard to remain in upper shift until either SHIFT or shift LOCK is pressed. On some terminals, all letters are displayed as upper-case, even if some of them were entered in lower-case. Processing of lower-case data on such a terminal must be done with care.

- The space bar, when pressed, generates a blank character at the current cursor position and advances the cursor to the next display position. The space bar must be used to convert null display positions into blanks for use as input data. (Remember that a null character and a blank character both appear on the display as blanks in the input area, but not in the output area; for example, if the input area consists of two or more words each separated by two or more nulls, instead of blanks, the corresponding output will be a single word.) This key is typamatic(R) which means that if it is pressed more than momentarily its function is repeated until the key is released. This feature is useful for blanking out long input areas.

- The arrow keys are used to position the cursor. Normally, the DSR puts the cursor at the beginning of the input area, but the cursor may be repositioned as needed. This is particularly useful when a line already displayed is to be reentered. The cursor is moved to the desired line, changes are made, and the ENTER key is pressed. Most of the arrow keys are typamatic(R). In the following example the character "c" is replaced by a "z".

```
@abcdef..     "abcdef" has been typed
@abcdef..     cursor moved with arrow key
@abzdef..     "z" is typed, replaces "c"
```

Some display locations are protected. The message areas and column "0" of each output line are such protected locations. If an attempt is made to alter (type) in any of these locations, the keyboard becomes disabled, and the INPUT INHIBITED light comes on. To continue, the user must press RESET to unlock the keyboard, and use an "arrow" key to move the cursor out of the protected location before continuing.

• The ERASE EOF key is used to erase all characters (i.e., convert them to nulls) starting at the cursor position and continuing through the last position of the current field. Except for the input area "B", which may be longer than 1 line, this key affects only 1 line at a time.

• The ERASE INPUT key erases the current screen or frame (i.e., clears all unprotected character positions to nulls) and repositions the cursor to the top left corner of the screen (i.e., to the first unprotected character position of the frame).

• The DEL key is used to DELete the character occupying the position directly above the cursor. All characters to the right of the cursor on the same display line are moved one position to the left; the cursor remains at the same physical location, and a null character is placed into the right-most position of that line. This is a convenient way to remove extraneous characters from a line before sending it as input. In the case of a multiple-line input field the characters on the next line or lines are not moved; (if that is desired the characters must be moved line by line). In the following example, the character string "def" is replaced by an "x".

@abcdefg....	original data
@abcdefg...	cursor moved to the "d"
@abcefg....	DEL is pressed; erases "d"
@abcfg.....	DEL is pressed; erases "e"
@abcxg.....	"x" is typed, replaces "f"

•The INS MODE key places the 3277 into insert mode, and the INSERT MODE area is illuminated. In this mode, characters can be inserted in the middle of fields. When a character is typed, the cursor and all characters above and to the right of it are moved 1 position to the right, and the inserted character is placed into the vacated position; that is, the new character occupies the position previously occupied by the cursor. Because the cursor is moved also, multiple characters can be inserted in a natural order. In the case of a multiple-line input field, the entire field is moved to the right. In order for the insert to be possible, there must be at least 1 null character at the right end of the field for each character which is to be inserted; therefore it may be necessary to use the DEL key or the ERASE EOF key to convert characters or blanks to nulls before attempting the insert operation. If no nulls exist at the end of the field, the keyboard is disabled and the INPUT INHIBITED area is illuminated; this requires the use of the RESET key to free up the keyboard. Note that the keyboard remains in insert mode until the RESET key is pressed. In the following example, the character "c" is replaced by the string "12x".

@abcdefg....	original data
@abcdefg...	cursor to "c"; INS MODE is pressed
@ab1cdefg..	"1" is typed, and inserted
@ab12cdefg.	"2" is typed, and inserted
@ab12xdefg.	RESET pressed; "x" typed, replacing "c"

(Note in the example above that as a new character is added/inserted in a line, it reduces the number of null characters -- represented by "dots" in the line.)

Action keys

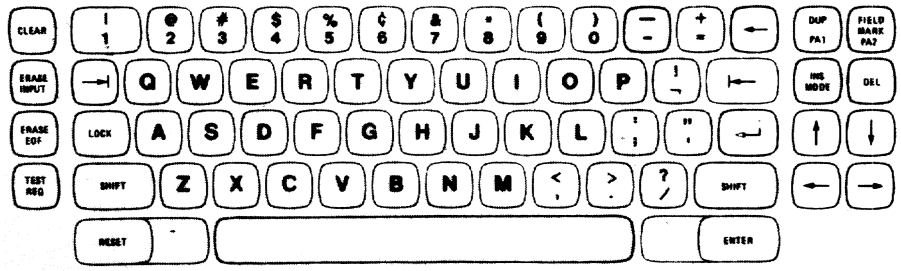
The following control keys are action keys, because they cause the DSR to gain control and to perform the requested action.

• The ENTER key is pressed to indicate that typing (input) has been completed. Nothing is sent to the task until this key is pressed; characters are stored in the 3277 display buffer and therefore may be modified and corrected with the editing control keys before being sent.

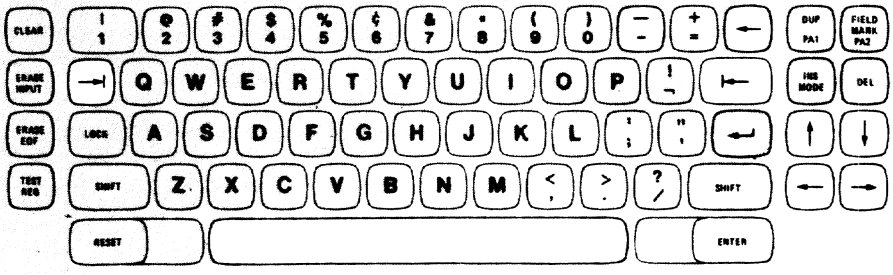
• The PA1 key is used to generate an attention interrupt. It may be necessary to enable the keyboard with the RESET key before this key can be used. Other action keys cause attention interrupts if they are pressed when input/output is not in progress. (The shift of the PA1 key ("DUP") is not an action key and is not supported by TSS.)

• The PA2 (CNCL) key may be used to refresh the entire display image. When pressed, it deletes and nullifies everything that was typed since the last pressing of the RESET key; any lines in the output area that were changed are restored. PA2 causes an attention interrupt. (The shift of the PA2 key (FM) is not supported by TSS.)

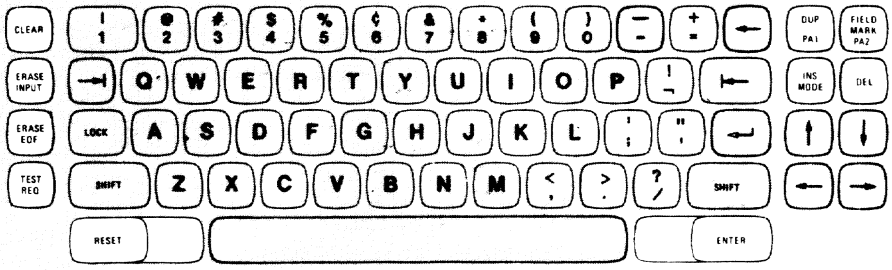
• The CLEAR key causes the DSR to set the output buffer to a new page, so that the next output line appears at the top of the display. This action also clears the display to null characters. CLEAR causes an attention interrupt.



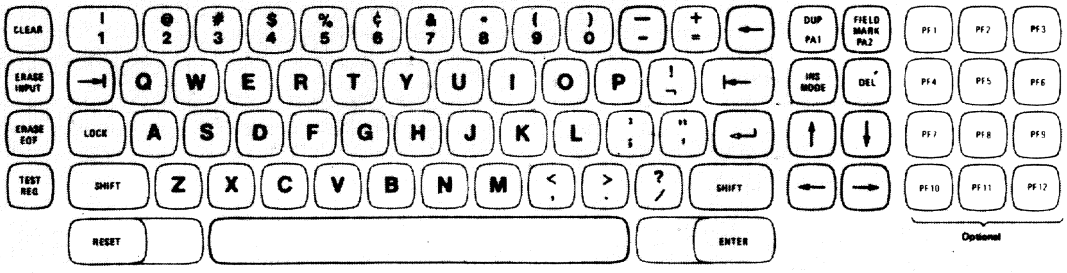
Cursor Positioning Keys



Typamatic Keys



System Function Keys



Program Function (PF) Keys

Note: Some installations may have specially ordered keyboards which differ slightly from that shown above.

Figure 3. 3277 Keyboard

- The TEST REQ key is used to send input to the DSR. Any input line which is sent with TEST REQ instead of with ENTER is interpreted as one or more DSR commands (screen commands) and is not sent to the program currently requesting input. The screen commands are described later. TEST REQ causes an attention interrupt.

- The PF (program function) keys are used to send input lines that have been previously defined for a userid. The text in these lines may be defined as normal input (to the task) or as screen commands (to the DSR), and is tranferred accordingly. The definitions may contain numbered symbolic parameters. Symbolic parameters in the definitions are replaced by text (separated by delimiters). The PF keys cause an attention interrupt.

Data input keys

The data input keys of the 3277 are similar to those of a typewriter except that on some keyboards most of the non-alphameric characters are located in different positions. All 3277 keyboards can generate both upper-case and lower-case alphabetic characters but on some, lower-case characters are displayed as upper-case. Appendix A shows the 3277 characters and the hexadecimal codes which are stored in the computer.

OPERATIONAL CHARACTERISTICS

The 3277 supports synchronous and asynchronous input modes.

Synchronous Input Mode

In synchronous input mode (normal TSS DEFAULT OF INMODE=W is active) the terminal keyboard remains in an 'input inhibited' or 'disabled' condition until the user's task prompts for more input. When the task prompts for the input, the keyboard is 'enabled' and the user enters a line of data. While the user is entering a line, the user's task is stopped and does not execute until the user finishes his line of input. When the user has signalled end of input by pressing the ENTER key, his task resumes execution. In other words, the user and his task are 'synchronized'.

On the 3277, the keyboard is locked and the INPUT INHIBITED light is on while the task is executing and not prompting for more input. When the task prompts for input, the keyboard is unlocked, the INPUT INHIBITED light is turned off and a prompt for input appears in the message area of the display. The user may now enter his input and push the ENTER key or the user may make a change to any of the lines in the output area and press the ENTER key. (The DSR will interpret any changed line(s) in the output area as the user's input.)

Messages in Synchronous Mode

In synchronous input mode the following five messages can be displayed in the message area "C" shown in Figure 2:

SYSTEM INPUT -- means that a privileged routine has requested input from the user; normal user response is a command, or input data.

USER INPUT -- means a non-privileged routine has requested input from the user. This message occurs when the routine has executed a GATRD or GTWAR macro. Normally, the user understands the input response that is required or has been prompted by the non-privileged program.

** WORKING ** -- means the task is not requesting input; normally the task is executing.

SCREEN COMMAND ERROR -- means the screen command acronym entered is invalid, and has been ignored.

SCREEN FULL : 'ENTER' -- see the Hx screen command discussed later.

Asynchronous Input Mode

Asynchronous input or input buffering mode provides the capability for the user to enter another field or line of input or several fields simultaneously, while the task is still processing or executing the user's previous input; the user does not have to wait for his task to prompt for input. As soon as the keyboard is enabled, the user can enter the next input field.

On the 3277 there are two ways for the user to activate asynchronous input. The best way is to issue the command:

```
DEFAULT INMODE=S
```

By doing it this way, TAMII will be expecting asynchronous input and can protect against timing windows.

The second way is to dynamically switch modes. This is done when the user is in synchronous input mode (INMODE=W), presses the RESET key to enable the keyboard, and ENTERs one or more lines of input; by doing it this way, the user may experience a tim-

ing problem, as discussed in the note below. There is no timing problem, if the user enters multiple lines at the time the task is prompting for input. The line closest to the top of the screen will be used to satisfy the task prompt and the rest of the lines will be queued for fulfilling subsequent reads.

Note: The timing window can occur when the user is in synchronous mode and attempts to enter data asynchronously by pressing RESET and ENTERing one or more lines before a prompt message is received. If the task has just passed reading an empty queue as the ENTERing is done, the input is queued by the DSR but temporarily ignored by the task, and a prompt for more input is sent by the task to the terminal. If the user responds with more input, this input is read before the previously entered input that is now in the queue. If the user simply presses the ENTER key the task will go back to read the queue, but if the user was in edit mode, a blank line is generated before the queue is read.

Messages in Asynchronous Mode

In asynchronous mode the following five messages can be displayed in the message area "C" shown in Figure 2:

WAITING FOR INPUT -- means a privileged or non-privileged program has requested input; normally, this message implies that the task is not executing and that the input queue is empty.

RESPONSE REQUIRED -- means that a privileged or non-privileged routine has executed a GTWSR or TGTWSR macro instruction, requiring an "unexpected" input response from the user. Since the user may be, asynchronously, entering normal input and may continue to do so while this "unexpected" input prompt remains unfulfilled, the DSR must have some means of distinguishing between normal input and the "unexpected" input response. This is done with a 'wsr' character (discussed later). The DSR interprets any input line prefixed with a 'wsr' character as the "unexpected" input response; it strips the 'wsr' character from the input line before passing it to the requesting routine, and replaces the RESPONSE REQUIRED message (with one of the other two messages). All other input is interpreted as normal input and is added to the input queue.

** WORKING ** -- means the task is not requesting input; normally the task is executing.

SCREEN COMMAND ERROR -- means the screen command acronym entered is invalid, and has been ignored.

SCREEN FULL : 'ENTER' -- see the Hx screen command discussed later.

DEVICE CONTROL COMMANDS (SCREEN COMMANDS)

The complete list of 3277 device control commands, sometimes called screen commands, follows; those marked with an "*" are not supported in asynchronous input (input buffering) mode.

*Ax -- The alarm command controls the use of the audible alarm (if available), which is normally sounded when the DSR enables the keyboard for an input request.

AN -- The alarm is not sounded when the DSR enables the keyboard.

AY -- The alarm is sounded.

*CCx -- The carriage control command determines how the carriage control character (discussed later) is processed.

CCD -- The carriage control character is displayed as a normal data character. (This is for de-bugging user programs.)

CCN -- The carriage control characters are ignored and all lines are single spaced.

CCY -- The carriage control characters are used to control the display.

*CFx -- The cursor fixing command specifies cursor placement before input operations.

CFr c -- The cursor is "fixed" to row "r" column "c" of the display; a blank is inserted between "r" and "c".

CFr -- The cursor is "fixed" to row "r" column 1 of the display.

CF -- The cursor is temporarily "not fixed"; it is positioned as specified by the CPx command described below, for the next read operation.

*CPx -- The cursor position command specifies cursor placement for the next input operation. Normal positioning as defined by the CF command (above) resumes after the next input operation. The row numbers are specified as in the CF command above.

DQ -- This command displays on the screen any pending input (the queue). The command uses the panel display function which places the screen in a frame hold status. When the user has finished and wishes to see any output, the user must issue the "frame restore" (F) command. The user can change any line on the screen which will be read as a new line and will be added to the end of the pending queue. By pushing the PA2 key the DSR will update the display so that any lines added will be shown, and any lines already read by the task will be deleted

Note: There is no way to change a pending input line once it has been read by the DSR.

Fx -- The frame command causes the output frame to be changed as follows:

F	-- Restore the latest frame
Fn	-- Go to frame number "n"
FRn	-- Move right "n" columns
FLn	-- Move left "n" columns
FFn	-- Move forward "n" frames
FBn	-- Move backward "n" frames
FFnL	-- Move forward "n" lines
FBnL	-- Move backward "n" lines
FH	-- Hold current frame until an F or Fx command is given

When FH is active and Fn, FFn or FBn is entered, the new frame that is displayed will also be in "hold" mode. These screen commands plus the TSS command UPDATE and the keyboard control keys provide the 3277 user with a full screen edit capability (discussed later).

Hx -- The halt command specifies what happens when the output area is full.

HN -- Processing does not halt when the display is full. In page mode (MP), a delay set by the TP command is introduced before the next page is displayed.

HY -- Processing halts when the display is full. A message

SCREEN FULL : 'ENTER'

is displayed in the screen message area (see area "C", Figure 2); to continue, press ENTER without any input data.

HFx -- The hold frame command HFY or HFN is identical to the FH or F commands respectively; use of the F- commands is recommended.

Ix -- The input command specifies how the input will be handled.

*IB -- The input area is located at the bottom of the display and limited to a length of 200 characters (mutually exclusive with IM).

*IC -- The input area is cleared to null characters before input operations i.e., after each pressing of the ENTER key (mutually exclusive with IR).

ID -- The input data is discarded after the input processing is complete; that is, the input lines do not appear in the conversation buffer or in the display (mutually exclusive with IS).

*II -- The input area is a non-display field; i.e., typed characters are invisible (mutually exclusive with IV).

*IM -- The input area moves. It is always located just under the last output line and varies in length from 239 to 200 characters (mutually exclusive with IB).

*IR -- The last input line is repeated in the input area before input operations; this is useful if many similar (and successive) lines are to be typed as input (mutually exclusive with IC).

IS -- The input lines are to be saved in the conversation buffer and appear in the output area after they are ENTERed (mutually exclusive with ID).

*IV -- The input area is a display field; that is, typed characters are visble (mutually exclusive with II).

*ILx -- Input area length is set to x. IL sets the size of the moving input (IM mode) area, but has no effect on IB mode; x may be from 79 (one line) to 239 (three lines) characters; default is 239.

Note: it is possible to have one command from each of the pairs: IB/IM, IC/IR, IS/ID, II/IV simultaneously active.

LLx -- The line length command defines the width of the output buffer; x may range from 1 to a maximum of 255. When x is set greater than 79, F commands can be used to view the entire line; when x=79, all input lines greater than 79 (up to 239) will appear in the output display as two or three lines.

*Mx -- The output mode command defines the manner in which output lines are presented, as follows:

MB -- The display operates in "buffer" mode, with the output stored until the task makes an input request. Then only the last page (frame) or partial page of the stored output is displayed, with the rest of the output available for display with F commands. For example, if a PC? is issued and the resultant output is several pages (frames), only the last page, or partial page is displayed; if the PC? generated only a few lines of output the entire output would be displayed.

ML -- The display operates in "line" mode, with each line displayed as soon as it has been generated. The TL command can be used to set a delay between lines to reduce flickering.

MP -- The display operates in "page" mode, with the output stored until the display (frame or page) becomes full or until a task input request is made.

*Nx -- The numbering command defines the use of a column numbering scale.

N -- This turns the scale on if it is off and off if it is on (flip-flop).

NI -- The scale is defined as an input scale which remains fixed with respect to the input area.

NO -- The scale is defined as an output scale and it moves, as new output lines are generated, such that it is always immediately above the last output line generated on the display.

NP -- The new page command causes the next output line to appear at the top of the display. This is similar to pressing the CLEAR key.

OFx -- The output forcing command determines if the first output line after a task read should be displayed immediately (applies to MB or MP).

OFN -- The first line of output after a task read does not appear.

OFY -- The first line of output after a task read does appear as soon as it is received or generated. (This shows that a process is running, even if buffer mode or page mode is in effect.)

PDx -- The parameter definition command specifies the control character which identifies substitutable parameters for the user-defined PF key text. The parameters may have the names "X1" through "X9".

PFx -- The program function key command allows a character string to be associated with a PF key so that pressing the key is equivalent to typing the string and pressing the ENTER key. For example, if PF5=abcdef, the string "abcdef" will be presented to the task as input each time the PF key, number "5" is pressed.

PO -- The pop command restores a previously saved set of screen commands. see the "push" (PU) command below.

PSx -- The parameter separator command defines the separator for any input parameters typed which are to be inserted in user-defined PF key text. For example, 'PS;' means that the semicolon is defined as the separator character.

PU -- The push command saves the current set of screen commands so that a new set can be defined. Later, the saved set can be restored. (See the "pop" (PO) command above.) This is especially useful in PROCDEFs which can "push", issue DCMD commands, and "pop" to restore initial conditions.

REx -- The repeat command specifies the number of lines from the previous page to be repeated at the top of a new page. For example, if RE11 is specified, when a new page is displayed, the last 11 lines from the previous page are included at the top of the new page. This is perhaps most useful when combined with the HN and ML screen commands.

RPFx -- The reassign program function key command makes available to an application program (within the user's task) the asynchronous interrupts generated when the PFx program function key is pressed. For example, if RPF6 is typed and the TEST REQ key is pressed, then every pressing of the PF6 key will generate an asynchronous interrupt that is passed to the user's task. This assumes the user has previously issued a SIR macro instruction for an interrupt routine which performs specific functions on receipt of the interrupt from the PF6 key. Specifying either

PF6=... or SF6=...

returns the control of the key to the DSR.

Sx -- The speak command specifies which language the DSR program will use for messages.

SE -- messages will be in English
SD -- messages will be in German (Deutsch).

SFx -- The screen function key command is similar to the PF command, except that the character string is processed as a screen command, just as if the string had been typed and the TEST REQ key pressed.

Tx -- The time delay command controls the rate at which information is presented on the display.

TLn -- causes a time delay of "n" milliseconds between lines in ML mode.

TPn -- causes a time delay of "n" milliseconds between frames in MP mode.

WSRx -- The write with synchronous response command tells DSR which character is to be used to denote an "unexpected" response line. This character is stripped from the front of the response line before it is passed to the system or user's task. When the application program or the system issues a GTWSR or TGTWSR macro and input buffering is active, the DSR will display the message RESPONSE REQUIRED in the message area. The user must prefix the response with the 'wsr' character; otherwise the line will be assumed to be normal input and placed in the input queue. This was done because a GTWSR or TGTWSR is assumed to be an unexpected condition and the user may already have started typing the next input line. The system default is the pound sign #.

DISPLAY ENVIRONMENT

Much of the flexibility associated with using the 3277 is derived from the use of the screen commands. These commands are divided into two types called action commands and environmental commands. Action commands, such as the 'frame' and 'display' cause some immediate and (usally) temporary action, such as displaying previous lines from the conversational buffer. Environmental commands, such as 'input' and 'mode', establish some characteristic of the display support that remains in effect until changed by a counter command, or until the user logs off.

The current environment commands and program function key definitions are shown in a special display called the '3277 STATUS DISPLAY'. This display is shown on the screen by pushing TEST REQ on the 3277, or by typing the 'dcmd' character without any input data and pressing the ENTER key. An example of the status display that shows the display environment in effect when the user is first joined to the TSS is shown in Figure 4.

The top portion of the status display shows the current program function key values, after they are defined by the user, with the PF, SF and RPFK screen commands. The environmental commands currently in effect are shown in the lower part of the display. The program function key definition and environmental commands are shown in screen command format on brightened lines. To return from the status display the user presses the TEST REQ key or enters a 'dcmd' character without any input data and presses the ENTER key. The status display itself is not stored in the virtual buffer.

DEFINING PROGRAM FUNCTION KEYS

Any of the twelve program function keys can be associated with any screen command, or with normal TSS input. Thereafter, the pressing of the program function key is equivalent to both typing that input at the keyboard and pressing the ENTER or TEST REQ key.

An example of temporarily setting the PF keys is shown below. To set or define the PF keys as shown, press TEST REQ to obtain the 3277 STATUS DISPLAY frame, move the cursor, and type, or simply type the following (with separators) and press TEST REQ:

```
SF1 =ff11l

PF2 =usage

PF3 =any meaningful data ...

PF4 =go

SF5 =pu,an,hn,re5,sf1=fb5l
  .
  .
  .
```

The PF1 key has been set to the screen command "frame forward 11 lines"; note that the P in PF1 was changed to an S (for screen command). PF2 has been set to the USAGE command which will be executed each time PF2 is pressed. PF3 has been set to a long character string that is intended to be repeatedly inputted when creating data sets. PF4 is set equal to a heavily-used command. PF5 causes the current screen environment (including all PF key

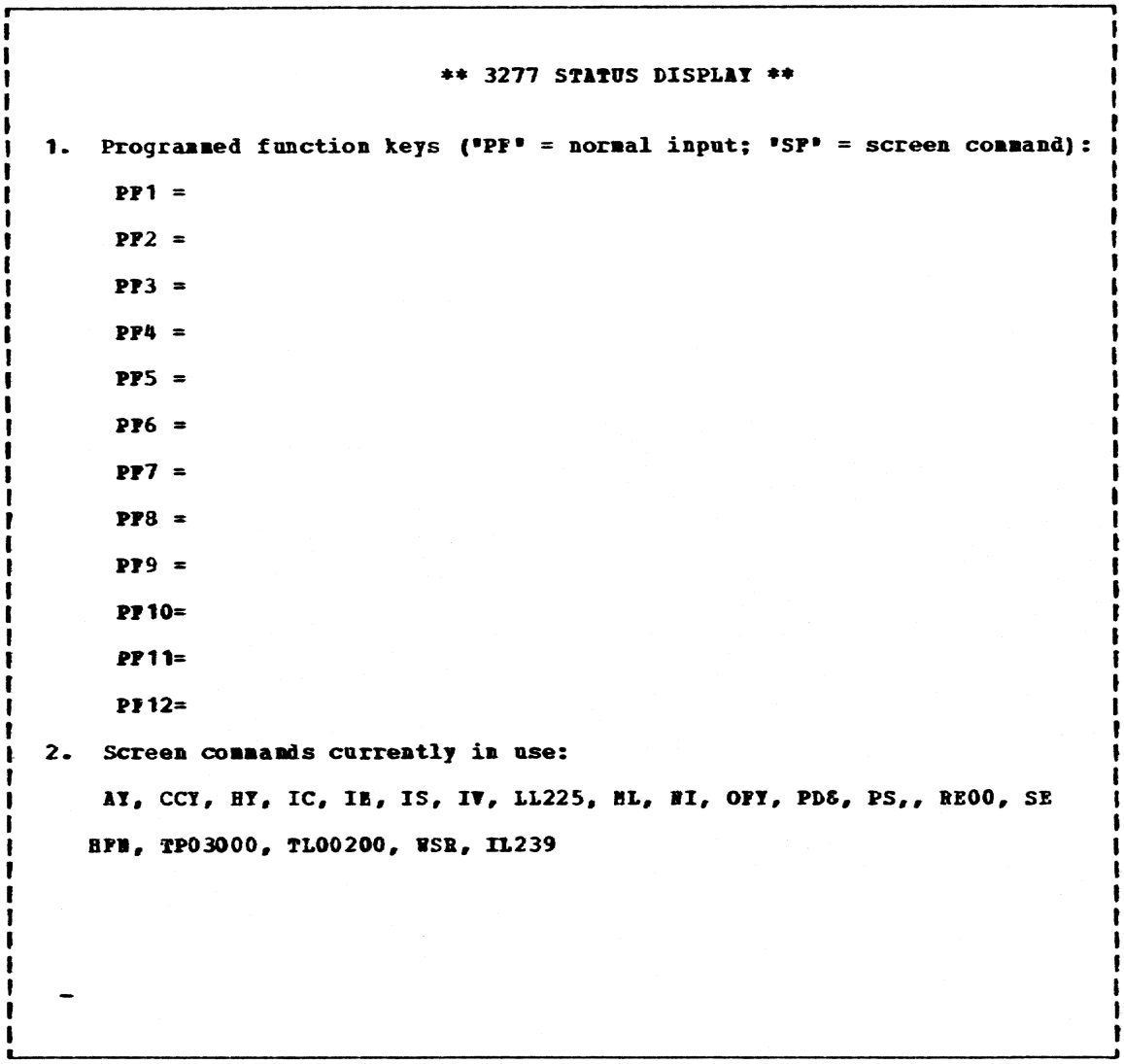


Figure 4. Status Display Example

definitions) to be saved, changes several environment screen commands, and the definition of the PF1 key.

The PF key definitions shown above remain in effect until again changed during the current task, or for the duration of the current task only. To make changes permanent, use the PROFILE mechanism of TSS (discussed later).

It is possible to include symbolic parameters within the PF key definitions. The parameters are positional and have the names "&1" through "&9", where the definition character ("&" in this case) can be specified by the user. These nine names can be used freely in defining a character string. The parameter values are typed in at the keyboard and are delimited by a separator character which can also be specified by the user. Then when the PF key is pressed, a direct substitution will be made and the resulting character string will be processed. The resulting character string must not exceed 256 characters in length; else, the string will be truncated back to the last complete parameter.

Note: The effect of pushing a program function key can also be obtained by entering the program function key number as a screen command: for example, if PF1 =usage were previously defined, then typing 1 and pressing TEST REQ will cause the USAGE command to be executed. This is chiefly used

with display terminals lacking the optional PF keys.

Parameter substitution is done by typing the PF key number, blank, and parameter values. Several screen commands, separated by commas or semicolons, may be given together. The command and its parameters may be separated by '='; blanks are ignored, except to delimit numbers.

EXECUTING SCREEN COMMANDS

The execution of an "action" screen command causes an immediate, visible result; for example, typing MI and pressing TEST REQ causes a ruler-type scale to appear on the screen immediately. The execution of an "environment" screen command also causes an immediate result, but may not be immediately visible to the user; for example, typing RE5 and pressing TEST REQ will not show visible results until a new page or frame is to be displayed. In each case however, the DSR reads and executes the screen command immediately after it is entered.

Screen commands can be entered or sent to the DSR six ways, as follows:

1. By typing the command acronym on the keyboard and then pressing the TEST REQ key. This may be done at any time whether input is expected or not. If the keyboard is disabled, press RESET first.

2. By simply pressing the PFx key that was previously defined (or set equal to) a screen command; if the keyboard is disabled, first press RESET.

3. By including one or more screen commands as parameters in the TSS DCMD command in a PROCDEF; for example,

```
PROCDEF ABC
PARAM ...
DCMD N,'MP,LL72','RE15;HE',
     'PF1=EXHIBIT UID'
   .
   .
   .
```

4. By the S carriage control character in a TGATWR macro; for example,

```
TGATWR OUTADDR=MSG,OUTLGH=MSGLGH,
       CC=Y
   .
   .
   .
MSGLGH  DC A(L'MSG)
MSG     DC C'SN,MP,RE15,PF1=USAGE'
```

5. By the TDCMD macro; for example,

```
   .
   .
   .
TDCMD  OUTADDR=MSG,OUTLGH=MSGLGH
   .
   .
   .
MSGLGH  DC A(L'MSG)
MSG     DC C'N,MP,RE15,PF1=USAGE'
```

6. They can be typed in on the keyboard, preceded by the 'dcmd' character and then the ENTER key is pressed. This is useful for those terminals without a TEST REQ key; for example,

```
 $sf1=fb1    (then press ENTER key)
```

   where the "$" is defined as the 'dcmd' character. The 'dcmd' character is defined using the MCAST command:

```
 MCAST DCMD=desired character
```

   The system default is the "cent sign" character.

If an incorrect screen command is entered via the TEST REQ key, or the 'dcmd' character, an error message is displayed in the message area. Incorrect screen commands entered with the TSS command DCMD will also result in an error message from TSS. Incorrect commands entered in the other ways mentioned above are simply ignored and no error indication is given. Screen commands are not stored in the conversational buffer, and are not displayed after being entered.

CHANGING THE DISPLAY ENVIRONMENT

Temporary Screen Command Changes

A temporary change may be made to the display environment at any time. It is effective immediately and remains in effect until changed again, or until LOGOFF. One or all of the screen environment commands can be changed by simply typing the new command acronym and pressing the TEST REQ key; for several changes at one time use commas to separate the screen command acronyms; for example,

```
type:  AY,MP,LL72,PF1=EXHIBIT UID
press: TEST REQ
```

If the keyboard is disabled, press RESET first.

The push (PU) and pop (PO) screen commands are useful for maintaining several screen display environments for a single task. Simply type PU and press the TEST REQ key to save the present environment and change the screen commands for a new environment as desired. To reactivate the saved display environment, type PO and press TEST REQ.

The only limitation on the number of environments that can be saved is the amount of virtual storage available. When several environments have been saved, successively type PO and press TEST REQ until the desired environment is displayed on the screen.

Permanent Screen Command Changes

Each user can tailor the display environment according to individual needs. For permanent changes, a series of names has been chosen for use with the TSS DEFAULT command. These names are divided into the following three groups.

The first group of names consists of "SCPF1" through "SCPF12". Values associated with these names become text for the correspondingly numbered PF keys. The text is used for normal input when the PF key is pressed.

The second group of names consists of "SCSF1" through "SCSF12". Again the values become text for the PF keys but pressing the key corresponding to an "SCSF" name causes the text to be processed by the DSR as screen command input. An "SCSF" name overrides an "SCPF" name for the same key.

The third group of names consists of "SC0" through "SC9" and is used for the other screen commands. The value for each name is taken as a string of screen commands, exactly as if it had been typed and sent to the DSR by pressing the TEST REQ key. The commands in names with larger numbers override those with smaller numbers, in case two or more names happen to include the same screen commands. For example, if SC1='ML,...' and SC2='MP,...' MP would be the "mode" command in effect.

An example of permanent tailoring using all three groups of names is as follows:

```
DEFAULT SC1='ML,HN,R5'
DEFAULT SCPF1='USAGE'
DEFAULT SCSF2='CP 7'
PROFILE
```

This sets up a default screen environment such that the DSR operates in line mode, does not halt when the display is full, and repeats 5 lines at the top of each new page. The PF1 key is used to transmit the TSS command USAGE, and the PF2 key moves the cursor to line 7. These values are not effective until the next LOGON or ABEND is executed. In the example above, the PROFILE command makes these values permanent and thus available at the next logon of that USERID. (The PROFILE command is best given directly after logon; otherwise forgotten, unwanted synonyms and defaults may be captured.)

INPUT PROCEDURES

The 3277 DSR supports the use, as input, of any line or lines appearing in the output area. The user may move the cursor up to the specified line, make changes to it, or simply retype any character if changes are not desired, and press the ENTER key. The DSR will read the specified line as input. Because of hardware considerations on the 3277, a change must be made to the line before the DSR can read it. Retyping the same character (any character in the line) is considered a change by the hardware. The 3277 DSR reads multiple lines changed with one read operation, queuing each line in a top to bottom sequence and presenting each line to the task as a separate input operation.

When input buffering (asynchronous mode) is active the following screen commands and other DSR functions are maintained:

a. The input area is maintained at the bottom of the screen in order to allow the system to write when output is ready. The input area is cleared to nulls after every read.

b. Cursor fixing and positioning commands are not active. (However, the keys controlling movement of the cursor are usuable.)

c. The input repeat function does not work. (However, the input repeat area is maintained and when input buffering is deactivated, the input repeat area contains the last input line entered.)

d. All input is saved in the buffer. At the time the buffer is read by the task, the output area is updated so the user can determine which line of input the task has just read and is executing (processing).

e. Input (line) numbering and the alarm screen commands have no effect.

f. Asynchronous mode has its own set of messages (discussed earlier under Operating Charactersitics).

g. As with non-input buffering, screen or device commands may be entered at any time.

INITIATION PROCEDURE

Once installed, the 3277 is (physically) always connected to TSS. To ready the 3277 for use, proceed as follows:

1. Pull-out the outer part of the cylindrical switch that is located at the bottom left of the display.

2. Wait about 15 seconds for warmup; then, three images are possible:

   a. Only the cursor appears at the upper left corner of the screen; this means that TSS is not operative.

   b. In addition to the cursor, the message "LINE HELD BY OPERATOR, LINE DISCONNECTED" appears at the bottom left of the screen; this means that TSS is operative, but not (yet) available for user sessions.

   c. In addition to the cursor, the TSS/370 image appears in the center of the screen; this means TSS is operative, and is available to a user.

3. If necessary, vary the image light intensity and sharpness by rotating the outer and inner parts, respectively, of the (cylindrical) switch at the bottom left of the display.

4. Type in your LOGON or BEGIN command and press the ENTER key; you will receive a message (that may vary daily at your installation) that contains any special instructions or information necessary or helpful to you for the remainder of your user session or task.

   (Note: It may be necessary to press the ENTER key before and after typing in your LOGON or BEGIN command.)

ENTERING LINES

Lines or fields can be input in one of the following five ways:

1. Type the field in the input area and press the ENTER key.

2. If the input mode is IR (i.e., the previous input line is displayed in both the input and output areas after the ENTER key was pressed), retype one or more characters of the field displayed in the input area and press the ENTER key.

3. Move the cursor to an output line or lines, retype or correct at least one character (per line), and press the ENTER key.

   (Note: The entire output line will be read as input; if line numbers are not part of the input, they must be DELeted before pressing the ENTER key.)

4. Press the PFx key that was previously set equal to an input line.

5. If the input field is your answer to a RESPONSE REQUIRED prompt, the first character of the input field must be a 'wsr' character.

Canceling Lines

To cancel an entire input line that has just been typed, and before ENTER is pressed:

a. Press the PA2 key (the line or lines are erased and the cursor is repositioned to the beginning of the input area).

To cancel part of an input line that was being typed:

a. If the part of the line to be cancelled is at the beginning or in the middle, move the cursor under the first character to be cancelled and press the DEL key. After the DEL key is pressed the character (including a blank) is deleted and the rest of the line that is to the right of the cursor moves left one character position such that the next character to be deleted is directly above the cursor. Continue pressing the DEL key until all unwanted characters are deleted. If necessary use the cursor positioning keys to "move over" characters that are to be retained.

   (Note: If the input consists of two or three lines, pressing the DEL key does not cause characters to move between lines; if such is desired, you must move the characters from one line to the other "manually".

b. If the entire last part of an input field is to be cancelled move the cursor to the left-most character (to be cancelled) and press the ERASE EOF key. Unlike the DEL key, the ERASE EOF key affects subsequent

lines in a multiple-line input field; for example, if the cursor is located directly under a character in the middle of th first line of a multiple line input field and the ERASE EOF key is pressed, all characters to the right of the cursor and all characters on the second and third lines (if any) will also be erased.

Correcting Lines

To correct an input line:

1. Move the cursor directly beneath any input character (including a blank) to be deleted and press the DEL key; the character is deleted and each of the characters to the right moves left one character position; the cursor does not move. (Also, a null character is inserted at the end of the line.)

2. Move the cursor directly beneath any input character to be replaced and type the new character; the old character is deleted and the new character takes its place; the length of the input line and the number of null characters at the end of the line (if any) remain the same.

3. To insert characters, first press the INS MODE key. Then move the cursor one character position to the right of where the insertion is to start, and type the insertion. As each character is inserted, all characters to the right move right one character position.

   Note: For each character to be inserted, a null character must exist at the end of the line; if a null character does not exist, the keyboard becomes locked, and the INPUT INHIBITED area lights. To proceed, press RESET to unlock the keyboard, and delete enough characters with the DEL or ERASE EOF key to accommodate the insertion. For multiple input lines, each line must be separately manipulated: that is, inserting characters in line 1 of a multiple-line input field will not cause the characters at the end of line 1 to move to the beginning of line 2, etc.

Full Screen Editing

The 3277 screen commands and the TSS edit commands provide the user with a full screen edit capability. The following is a typical sequence of commands for using this facility for editing an existing data set:

a. type: EDIT datasetname
   press: ENTER key

b. type: LIST
   press: ENTER key

c. type: UPDATE
   press: ENTER key

d. type: FBx
   press: TEST REQ key

   Note: x is the frame number to be displayed; if you want to display the first frame, x=the number shown in area D of Figure 2.

e. type: FH
   press: TEST REQ key

f. Move the cursor to the line where cancelling, deleting, or changing is desired and use the appropriate editing and data input keys to make the changes.

g. When all changes have been made on the screen, press the ENTER key.

h. type: FF1
   press: TEST REQ key

i. Repeat steps f, g, and h until all changes have been made to the data set.

j. type: _END

Notes: (1) Steps f and g may be repeated as many times as desired on the same frame.

(2) Changes made on a frame will not be effective until the ENTER key is pressed; for example, if changes are made to a frame and a new frame command or TSS command is issued before the ENTER key is pressed, all changes are effectively deleted and the frame returns to its original condition or state.

(3) Once 'frame hold' (step e) has been entered, it is effective until an F screen command is issued. Even if FF1 or FB1 is issued, the new frame displayed will be in 'frame hold' mode.

(4) Any TSS command may be executed while in 'frame hold' mode. However, because the output lines (including command error messages) are not immediately visible in frame hold mode, be especially careful when doing this, particularly with the INSERT command.

(5) All changed lines can be viewed on the frame(s) following the LISTed data set. Type F and press TEST REQ to display the last frame. Then "frame backward" (type FBx and press TEST REQ) as necessary until the first frame containing changed lines appears.

(6) Any changes made to a frame appear on the frame only as long as the frame is being displayed: for example, if 'frame 1' is changed and ENTERed, and then FF1 and FB1 screen commands are successively executed, 'frame1' would again appear, but in its original state. To view 'frame 1' with the changes made to it in its entirety, you must reLIST the lines in 'frame 1'.

(7) Once the UPDATE command has been issued, the issuing of any other TSS command must be preceded by an underscore.

(8) To delete an input line while in TSS editing mode, after the ENTER key has been pressed, wait until the line appears on the screen as output; then issue:

_EXCISE linenumber

or

_REVISE linenumber...

and, to continue,

_INSERT LAST

Note: An input line that has already been ENTERed and processed (i.e., it appears on the screen as output) cannot be cancelled by moving the cursor up to the beginning of the line and pressing the ERASE EOF key; it must be EXCISEd or REVISEd.

PROGRAMMING CONSIDERATIONS

Carriage Control Characters

The following summarizes the allowed carriage control characters for the 3277. These characters are used for control if the screen command CCY is in effect.

b (blank) shows that the next output data should begin on a new line.

\+ (plus sign) treated like a blank, because the 3277 hardware cannot perform the "print/no-space" function. This control character has the additional meaning, however, that any output lines which have been collected by the DSR but which have not yet been displayed will be immediately written to the display. This is a reasonable way for programs to cause printing of accumulated lines (DSR in EB or EP mode).

0 (zero) causes double spacing.

\- (minus sign) causes triple spacing.

1 (a one) specifies that a new page is to be used for the next output data. The HN and HY screen commands have no effect upon the creation of this page.

* (an asterisk) causes a bright line and is otherwise like a blank.

@ (at-symbol) is processed as a 1, except that the first line of the new page is bright.

M (letter "M") defines the line as a message to overlay the usual "user input" message. The message may be up to 24 characters in length; a null message restores the standard message.

S (letter "S") causes the output data that follows to be interpreted as screen commands which will be executed immediately by the DSR.

Note: The P and W characters are reserved.

Through the use of the carriage control and TAMII options, application programs can indirectly format the screen display. Any program that changes the screen environment (through type S carriage control or the DCMD TAMII macro) should first save the current environment with the push screen command and restore the saved environment on exiting with the pop screen command. Programs that do screen formatting typically set page or buffered mode. Carriage control '1' is used to start a new frame, and control '+' is used to force out the current buffer.

It is possible for a user to take over complete formatting control of the display terminal. To do this the user must have an understanding of how the display terminal operates and understand the way the display terminal is supported by RTAM. The user must also remember that the application program will be device dependent if the display format control is overridden.

DSR Transparency Mode

The 3277 is supported by the transparency option of the TAMII macros. By using the SIC parameter, the user may do his own screen formatting and input decoding. When using transparency, there is a set of rules

and restrictions which the user must follow. Transparency is allowed on all TAMII macros which involve data transfer, except the TFREE macro with a disconnect message. The 3277 support handles read requests as a passive request. The support assumes a previous write request has enabled the keyboard and has placed a cursor on the screen for the terminal user. When using transparency, it is the application programmer's responsibility to enable for input by a previous write. The rules and restrictions are as follows:

1. Maximum data length for output is 4000 bytes. Minimum data length (device dependent) for the 3277 is 4 characters (WCC,SBA,ADDR,ADDR).

2. Each macro must contain a screen header control block (CHASHDR) as the first 16 bytes of the output data. (See DSECT CHASHDR.) This is used for passing extra information to RTAM. All input will be preceded by a 16 byte SHDR built by RTAM to return certain control information pertaining to the current active screen display.

3. For a 3277 all output data must contain a WCC,SBA,ADDR,ADDR sequence as the first four bytes of actual transmission data. This is tested for by TAMII and the request will be aborted if the SBA character is not the second character following the SHDR in the output data. For TWRTLST macros only the first entry must contain the SHDR followed by the WCC,SBA sequence. All following write entries must start with a SBA sequence. TAMII concatenates a TWRTLST request into one data stream and does only one write.

4. The following TCNTRL requests are available:

   TYPE=ERASE — this control request causes the screen to be erased and the buffer to be set to nulls. The cursor will be positioned at the first buffer position -- row 0, column 0.

   TYPE=SETCURSR -- this control request causes the cursor to be positioned at the location specified by the field SHDRCURS in the SHDR control block specified by the parameters OUTADDR and OUTLGH. See description of CHASHDR DSECT for flag byte modifications.

   TYPE=ENABINP -- this control request allows an application program to position the cursor, unlock the keyboard and clear the input area in preparation for the next input line. The cursor position is specified by the field SHDRCURS in the SHDR control block (parameters OUTADDR and OUTLGH). See description of the CHASHDR DSECT for other flag byte modifications.

   TYPE=BELL -- this control request allows the application program to ring the alarm on the 3277. (Alarm is a feature and may not be installed, in which case this operation only causes the screen to blink.)

Screen Header Control Block DSECT Description

```
CHASHDR   DSECT
SHDRFG1   DS  X          FLAG BYTE 1
SHDRFG2   DS  X          FLAG BYTE 2
SHDRZLN   EQU SHDRFG2    ZERO INPUT LINE
SHDRZLN   EQU X'80'      1 - YES
SHDRZMG   EQU SHDRZMGM   ZERO MESSAGE AREA
SHDRZMGM  EQU X'40'      1 - YES
SHDRZIA   EQU SHDRFG2    ZERO BOTTOM INPUT
*                        AREA
SHDRZIAM  EQU X'20'      1 - YES
SHDRZIP   EQU SHDRFG2    ENABLE INPUT
SHDRZIPM  EQU X'10'      1 - YES
SHDRCURS  DS  2X         POSITION FOR
*                        CURSOR
SHDRTIM   DS  F          TIME BEFORE NEXT
*                        SIO IN MS
SHDRFRAM  DS  XL8
SHDRLGH   EQU *-CHASHDR
```

SHDRFG1 - this flag byte is set up by TAMII. User's contents will be zeroed.

SHDRFG2 - this flag byte is used to modify the action of a TCNTRL TYPE=SETCURS or TYPE=ENABINP request.

SHDRZLN - this flag causes the line pointed to by the SHDRCURS field to be cleared to nulls.

SHDRZMG - this flag causes the message area at the bottom of the screen to be cleared.

SHDRZIA - this flag causes the bottom input area to be cleared.

SHDRCURS - this is the position given in a y,x format at which the cursor is to be set.

SHDRTIM - specifies the minimum time delay before the next write is to be done to the screen. No screen displays will be done

until after the given time interval(in milliseconds) has passed.

SHDRFRAM - this field is reserved by TAMII and the user's area will be zeroed.

MTT Support for 3277

The TSS MTT support for the display terminals is the same as the TSS user's support. The MTT user has use of the full range of the device control commands and program function keys. The MTT user may also dynamically switch into input buffering mode without application program intervention or knowledge. This gives the user the full screen edit capability of the 3277 hardware.

The MTT support currently allocates and maintains for each MTT user a 64K (16 page) conversational buffer. In order not to adversely affect the application's virtual storage space, these MTT user buffers are allocated in disconnected segments using the "named segment" facilities of TSS . The total user storage needed for MTT has been increased by 128K (32 pages) only when 3277s are used as MTT user terminals. The 128K is the amount of space reserved for connecting the MTT user's conversational buffers.

VSS and RSS Support of the 3277

VSS/RSS support uses the same screen format as does the normal TSS support. VSS and RSS support only synchronous input mode and synchronous device control command input. If the user causes an interrupt at any other time, VSS and RSS assume that the interrupt was an attention, and halt any current command string. VSS shares the task's conversational buffer with TSS. The user must remember this and be careful about 'at' placement in the conversational buffer support routines in TAMII.

RSS maintains its own conversational buffer. This buffer may be hard copied using the RSS command string 'SPRINT A'. This buffer contains all system error messages and SYSERRS. It is 16 pages in length and does wrap, so that old data and messages can be lost.

VSS and RSS support device control commands and program function keys, just like the TSS support. VSS and RSS each have their own PF key tables which are separate from the TSS tables. VSS has its own separate environment status area and changes this when a device command is entered. Both VSS and RSS have hard coded default values for the program function keys (see table 4). VSS and RSS only support a limited set of device commands as follows:

1. Ax - alarm command
2. Fx - all "frame" commands except 'frame hold'.
3. PDx - parameter definition command
4. PFx - parameter function key definition command.
5. PSx - parameter separator definition command
6. REx - repeat command
7. Sx - speak command
8. SFx - screen function key definition command
9. LLx - line length definition command.
10. Mx - mode command; only mode 'L' (line) or 'P' (page) are valid in VSS/RSS.

Note: The RE and LL commands for VSS and TSS update the same field. RE or LL in VSS will also affect the TSS displays.

VSS/RSS Display Defaults

The default VSS/RSS program function key definitions are as follows:

```
PF1 =DISPLAY $R(0):$R(15)
PF2 =DISPLAY $R(&1)
PF3 =RUN
PF4 =DISPLAY $ID(L'&1')
PF5 =AT &1.(X'&2') DISPLAY C'&1,&2';STOP
PF6 =REMOVE $AT.&1.(X'&2')
SF7 =FB1
SF8 =FF1
PF9 =
SF10=FB5L
SF11=FF5L
SF12=F
```

(Note: PF5 and PF6 are not defined for RSS.)

The screen environment command values defaulted are:

AY, LL255, PD&, PS,, RE00, SE, ML

IBM 2741 COMMUNICATIONS TERMINAL

The IBM 2741 Communications Terminal consists of an IBM Selectric typewriter on a typewriter stand. (See Figure 5.) The stand includes the electronic controls needed for communication with the time sharing system. The only auxiliary component possibly required or used with the 2741 is a telephone-like modulator-demodulator, or modem. If the terminal is permanently wired to the time sharing system, no dial-up facility is needed; merely turning on the terminal results in communication with the computer. Instructions for operating the 2741 in the time sharing system are given below. For a detailed de-

scription of the terminal, refer to the publication IBM 2741 Communications Terminal.

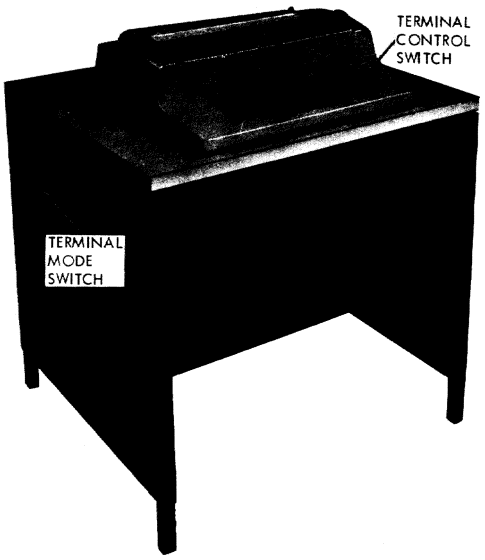


Figure 5. IBM 2741 Communications Terminal

INITIATION PROCEDURE

To ready the 2741 for use with the time sharing system, proceed as follows:

1. Check that the terminal mode switch (on left side of typewriter stand, as shown in Figure 5) is set to LCL. This ensures that the terminal is disconnected from the communications line to the computer.

2. Set the terminal power switch (on right side of terminal keyboard, shown in Figure 5) to on by pressing down the ON portion of the switch. The red area of the switch should now be exposed, and the terminal is functioning as a Selectric typewriter.

3. Check that margin stops are at 0 and 130. The stops are visible above the keyboard on the typing position guide. If necessary, reset the stops by pushing them in, moving them to their new positions, and releasing.

4. Check that tab stops are set at desired intervals by tabbing a line, using the TAB key. If the settings prove satisfactory, skip to step 7. If resetting is needed, proceed with step 5.

5. To clear all tab stops, move the carrier to the right margin by pressing the TAB key and/or the space bar; press and hold the CLR portion of the tab control; and press the RETURN key. The tab control is labeled CLR SET. This and the other controls involved are shown in Figure 6.

6. Release the tab control, strike the space bar the desired number of times, and then press down SET portion of tab control. Repeat this step until tab stops have been set for the entire line.

7. Press RETURN key to position carrier at left margin.

8. Set the terminal mode switch, on left side of typewriter stand, to COM.

   Note: If the terminal has no dialing facility, press the ATTN key to begin LOGON. Steps 9 and 10 are performed only if the terminal has a dial-up modem.

9. Using the modem attached to the terminal, press the button labeled TALK, lift the receiver, and dial the time sharing system number.

10. When a continuous tone is heard, press the button labeled DATA on the modem and replace receiver.

The terminal is now operational and the LOGON command may be entered. For a description of the LOGON command, refer to Command System User's Guide or Manager's and Administrator's Guide.

Keyboard Operation

All controls for the typewriting functions of the terminal, such as the line space lever, paper release lever, impression control lever, etc., are identical to the corresponding controls on any IBM Selectric typewriter and operate accordingly. The keyboard may be compatible with

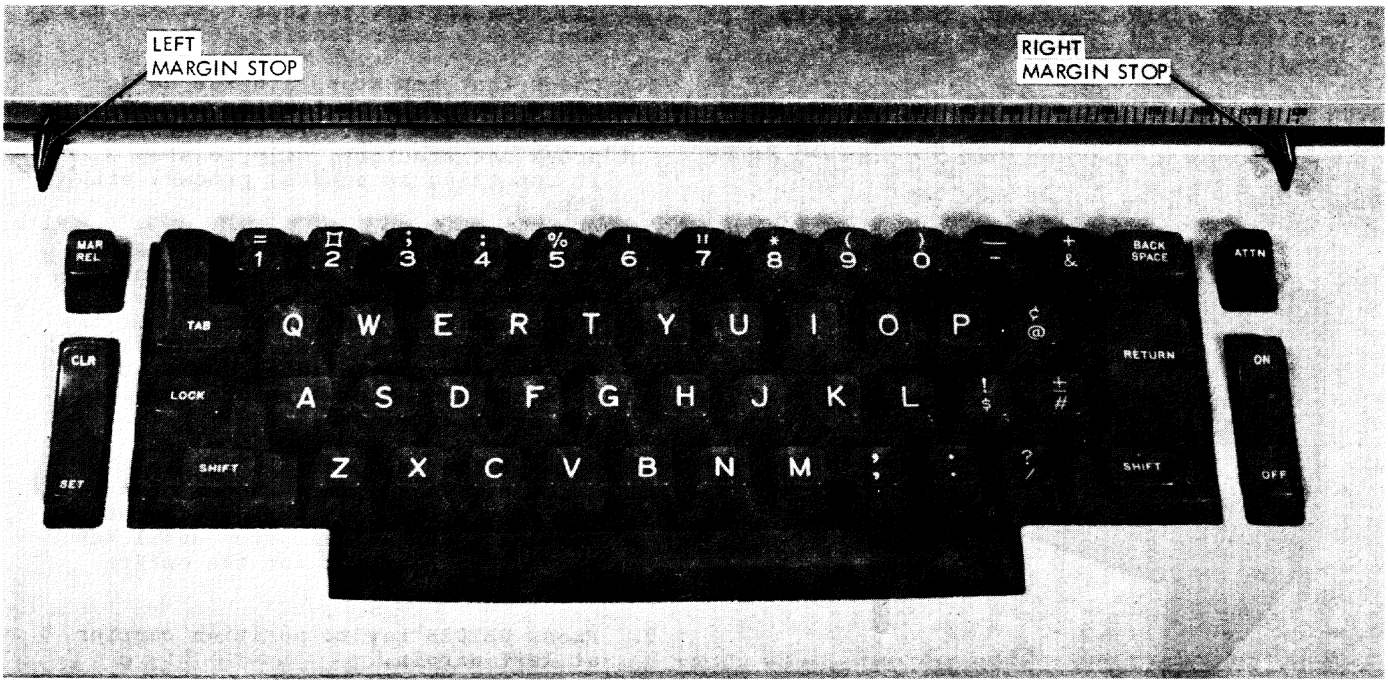


Figure 6. IBM 2741 Controls

that of the Selectric typewriter (in which case the terminal is known as the 2741 correspondence terminal), or it may be as shown in Figure 6. (To work correctly with TSS, the correspondence terminal requires the Interrupt Feature 4708 and the Transmit Interrupt RPQ E-40681.)

Figure 6 shows the keys and controls of a 2741 keyboard. The numeric and special character keys, the space bar, and the LOCK, SHIFT, MAR REL, and TAB keys operate in the same way as standard IBM typewriter keys. Note, however, that unless a specific command is entered to determine the mode (see "Specifying SYSIN Device and Character Sets," in this section, and Appendix A) no distinction is made between uppercase and lowercase alphabetic (A-Z) characters; they are all interpreted as uppercase characters by the system. See Appendix A for the 2741 character sets.

Three keys having special time sharing functions -- ATTN, RETURN, and BACKSPACE -- are explained below.

ATTN key
: this is used to generate an attention interruption. It may be pressed at any time (it cannot be locked out), and it will always be recognized but perhaps not immediately. If the user has not taken control of attention interruptions, the system will respond to one by printing an underscore, an exclamation mark, or an asterisk, asking for the user's next command. The system's response to the attention interruption depends on what was happening when the interruption occurred. These responses are listed in Appendix D .

RETURN key
: this key causes a carrier return-line feed and an end-of-transmission character each time it is pressed. The last of these actions, in effect, locks out the keyboard so that it will neither type nor print and transfers control to the time sharing system. The RETURN key is pressed to end every line of input from the keyboard. It is also pressed to mark a default when replying to a system message. The keyboard will be unlocked when the system is ready for the next input line.

BACKSPACE key
: this is used to correct one or more erroneous characters in a line. See "Correcting a Line," in this section. Backspace characters will be edited out of the input stream automatically and thus will not appear in the data stored. They are transmitted, however, and do count in the 260-character maximum allowed for each line.

Entering Lines

The basic physical input record from the terminal is a line. It consists of 1 to 130 characters, terminated by an end-of-line sequence. When the end-of-line sequence is transmitted, the keyboard is locked out -- except for the ATTN key -- and control passes to the time sharing system.

The end-of-line sequence is generated by pressing the RETURN key, which results in a carrier return, line feed, and an end-of-transmission character being transmitted to the computer.

If a logical record of a time sharing system command requires more than one line, the hyphen key must be pressed once as the last character of each line except the one that completes the logical record. (The resulting hyphen character does not become part of the record. It serves merely as a signal.) The RETURN key must still be pressed to mark the end of each line. For source language continuation conventions, see the pertinent language manual.

Note: Where limits are imposed by TSS, for example, the 120-character text limit for line data sets, an over-length record is rejected and the user is requested to enter it correctly.

Specifying SYSIN Character Sets

Two commands, KA and KB, allow the user to specify the SYSIN character set to be used. These are described in Appendix A.

Canceling Lines

If a line is to be canceled before depressing the RETURN key, the user may enter the "line kill character." This character, usually defined as the number sign (#), will cause the line just typed to be ignored if it is the last character before the RETURN. The system will then expect a corrected line to be entered without additional prompting.

If the incorrect line has already been interpreted, it cannot be canceled. The user must then employ some indirect way of rectifying his mistake, such as using the MODIFY command, to correct data in a line data set. (See Command System User's Guide.)

Correcting a Line

A character correction character is available in the system. This is defined initially as a backspace. Whenever a backspace occurs, the preceding character and the backspace are deleted from the input line. This action is repeated until no more character-kill characters remain in the input line.

Proceed as follows to correct one or more erroneous characters in a line that has been typed but has not yet been interpreted:

1. Backspace a number of times equal to the number of characters to be replaced, using the BACKSPACE key. Count blanks and spaces as well as printed characters.

2. Type in the correct characters and continue entering the line. For example, to correct the word CHNAGE after the letter "E" was just typed, press the BACKSPACE key four times and then type ANGE. The result looks like this:

```
CHNAGE
  ANGE
```

Normal Termination Procedure

The user marks the end of his task by entering a LOGOFF command. After this command has been completed, close down the terminal by pressing the OFF portion of the terminal power switch.

Emergency Termination Procedure

If the terminal must be shut down while the user's task is running, interrupt by pressing the ATTN key. When the system types out an underscore requesting the next command, perform the normal termination procedure.

If, for any reason, the user is unable to terminate his task, he should immediately call the system operator who will terminate it for him. The user will be expected to supply his user ID.

Error Conditions

Table 1 shows error conditions that the user may encounter, their probable cause, and the corrective action to be taken for the 2741 terminal. If some other type of error occurs, or if the error condition cannot be corrected, local maintenance personnel should be informed.

Table 1. IBM 2741 error conditions

Condition	Probable Cause	Corrective Action
No power	Terminal power switch not set to on: terminal not plugged in.	Check switch position: check that unit is plugged in.
Keys do not operate	Keyboard locked out; power off; communication line broken.	If the system is not currently ready to receive your next line, pause and then try keyboard again. If keys are still locked, check that DATA light on data-phone is on. If not, communication line has been disconnected; initiation procedure must be repeated. If DATA light is on, check terminal power switch setting. If after a minute the keys are still locked out, try to press ATTN key. No response indicates a broken communication line; in that case, call system operator to terminate the task and then inform maintenance personnel.
Error in typing	Operator error.	Use line correction or cancelation technique described earlier (if line has not yet been completed by pressing the RETURN key). If line has been completed, make use of command system capabilities to eliminate the error.
Accidental pressing of ATTN key	Operator error.	Refer to Appendix D for results to be expected. Action should then be taken accordingly.

TELETYPE MODEL 33/35 KSR

The Teletype* Model 33 or 35 KSR (Keyboard Send-Receive) consists of a printer, a four-row keyboard, and a control unit, all mounted on a special cabinet. (See Figures 7 and 8.) No controls except those mounted on the cabinet are needed to operate the teletypewriter. Instructions for operating the teletypewriter with TSS are given below. For a detailed description of the teletypewriter, see the appropriate manuals prepared by the Teletype Corporation.

Initiation Procedure

To ready the teletypewriter for use with TSS, proceed as follows:

1. Check paper supply. If a fresh roll is needed, insert paper as directed in Appendix C.

2. Press the ORIG button. The lamp should light under the button, and the teletypewriter will be on.

3. The dial tone should not be heard. Volume adjustments may be made with the SPKR VOL control.

4. Dial the TSS number. A high-pitched sound will be heard momentarily when the connection is made.

The teletypewriter is now ready to operate with TSS, and the LOGON procedure begins.

Keyboard Operation

The alphameric and special-character keys, the SHIFT key, and the space bar operate like their counterparts on conventional typewriters (except that the SHIFT

---

*Trademark of Teletype Corporation, Skokie, Illinois. Terminals which are equivalent to those explicitly supported may also function satisfactorily. The customer is responsible for establishing equivalency. IBM assumes no responsibility for the impact that any changes to the IBM-supplied products or programs may have on such terminals.

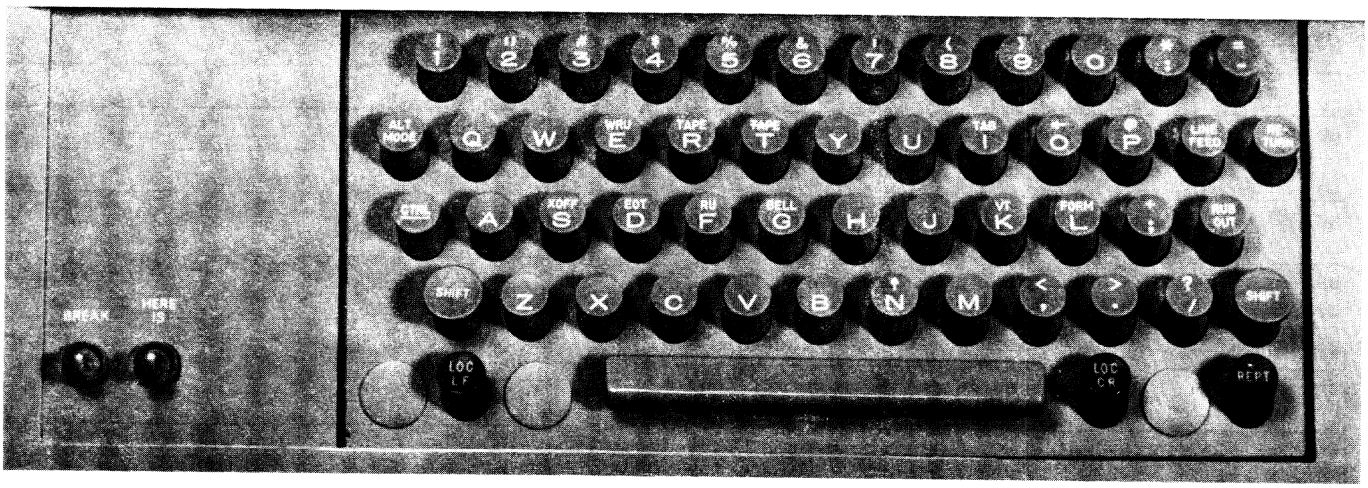


Figure 7. Teletypewriter Keyboard

key does not lock in the down position). Only uppercase letters are possible; lowercase letters are not provided.

The control unit and the keyboard itself also have a number of keys and controls with special functions. These are explained below. The following keys and controls should not be used with TSS: ALT MODE, ANS, BELL, EOT, FORM, HERE IS, INCPT, REST, RUB OUT, RU, TAPE, TST, VT, WRU.

The names and functions of special controls and keys on the teletypewriter keyboard are shown in Table 2.

Entering Lines

The line is the basic input record from the teletypewriter and consists of from 1 to 80 characters. Each line is terminated by an end-of-block signal. To transmit an end-of-block signal, hold down the CTRL key and push the key containing X OFF on its upper half.

X OFF transmits an end-of-block signal to the system; it also generates an end-of-line sequence, thus providing a carrier return and line feed.

The teletypewriter keyboard can be locked out only when the system breaks in while you are typing. If such a break signal is received, the lamp underneath the BRK-RLS key goes on and the keyboard cannot be used. To restore the keyboard to operation, push the BRK-RLS key and then the K key.

If you need more than one line to complete a command statement, press the hyphen key as the last character of the continued line. For source language continuation conventions, see the pertinent language manual.

Canceling a Line

If a line has been typed incorrectly but has not yet been interpreted, (that is, the end-of-line sequence has not yet been given), the entire line may be eliminated as follows:

1. Simultaneously press the SHIFT key the key containing the pound sign (#) in its upper half.
2. Enter the end-of-line sequence.

The line can now be retyped correctly. The cancellation has no effect upon any operation being performed by TSS.

If the incorrect line has already been interpreted, it cannot be canceled. You must then employ some indirect way of correcting a mistake, such as using the text editor to correct data in a region data set.

Correcting a Line

Proceed as follows to correct one or more erroneous characters in a line that has been typed but has not yet been interpreted:

1. Press both SHIFT and keys a number of times equal to the number of characters to be replaced. Count blanks and spaces as well as printable characters. Keys must be pressed simultaneously.

Table 2. Teletypewriter controls and keys

Control	Function
ORIG	Used to turn on the terminal and initiate a dial tone.
CLR	Used to disconnect the terminal from the computer.
LCL	Used to put the terminal in local mode. In this mode, the teletypewriter can be used like an electric typewriter, without connection to the computer.
BUZ-RLS	Used to silence the buzzer that sounds when the paper supply is low. The light within this button will remain on until a fresh supply of paper is provided.
Rotary dial	Used to dial the TSS number.
OUT OF SERV. button	Used when inserting paper or changing ribbon.
NORMAL - RESTORE control	Used when inserting paper or changing ribbon.
BRK-RLS button	Used to resume keyboard operation after a break signal is received. The computer can transmit a break signal to break in on the user's transmission, and in doing so locks out the teletypewriter. To unlock, the BRK-RLS button is pressed.
DIAL light	Lights when dial tone tone is present.
BY light	Lights when a busy signal is received.
NO CON light	Lights when there is no connection, i.e., when a connection is not established within a specified time.
SVC light	Lights to indicate that some malfunction has occurred while a call is in progress.
PA light	Lights to indicate that paper supply is low or exhausted.
BREAK button	Used to generate an attention interruption.
SPKR VOL control	Used to control volume of teletypewriter loud-speaker.
Red light	Lights to indicate that only six to eight more characters can be typed before end of line. This serves the same function as a warning bell on a standard typewriter.
CTRL key	Used in combination with a key whose non-printing function is indicated on the upper part of the key top. For example, CTRL and X OFF must be pressed simultaneously to send an end of block signal.
LOC LF key	Used to cause line feeds at the teletypewriter without signaling the computer. Line feeding continues as long as this key is depressed.
← (left arrow)	Used to cancel lines or to replace erroneous characters. See "Canceling a Line" and "Correcting a Line."
TAB	Used for horizontal tabulation. Must be pressed in combination with the CTRL key.
LINE FEED key	Used to move the paper up one or two lines, according to the line space setting, each time it is pressed.
RETURN key	Used to return the printing element to the left margin.
X OFF	Used to send an end-of-block character and end-of-line sequence to the computer. Must be pressed in combination with the CTRL key.
EOT	Not used. Warning--if depressed with CTRL, will disconnect terminal from CPU.
LOC CR key	Used to return the printing element to the left margin, without sending a signal to the computer.
REPT key	Used in combination with another key, causes repetition of the character printed until the character key is released. Valid for printable characters only.
] (right bracket)	This is the uppercase character on the M key. In TSS, it is the equivalent of the underscore, which the teletypewriter lacks. Thus the right bracket will be printed when other terminals would print an underscore prompting for a command. (In this case the bracket will be followed by a left arrow, the teletypewriter's equivalent of the backspace.) The right bracket is also used as the break character for commands while entering data for the text editor; the underscore is the break character on the other terminals.
# (pound sign)	This is the line-kill character. Entering it as the last character of a line, followed by an end-of-line sequence, cancels the line.

Figure 8. Teletypewriter Control Unit

2. Type in the correct characters and continue entering the line. For example, to change PRESANT to PRESENT after the "T" has just been typed, enter ← three times, and then type ENT. The result looks like this:

PRESANT←←←ENT

Normal Termination Procedure

You end your task by entering a LOGOFF command. After this command has been completed, close down the teletypewriter by pressing the CLR button on the control unit.

Emergency Termination Procedure

If the teletypewriter must be shut down while your task is running, interrupt by pressing the BREAK button. When the system types out a right bracket and left arrow requesting the next command, perform the normal termination procedure.

If for any reason you are unable to terminate your task, call the system operator, who will terminate it.

Error Conditions

Table 3 shows error conditions, their probable cause, and the corrective action to be taken for the teletypewriter. If some other type of error occurs, or if the error condition cannot be corrected, inform local maintenance personnel.

Table 3. Teletypewriter error conditions

Error Indication	Probable Cause	Corrective Action
Buzzer sounds; BUZ-RLS button lights; PA light is on	Low or exhausted paper supply.	Press BUZ-RLS button to silence buzzer. Lamp will remain on until new paper supply is inserted. Insert new paper as directed in Appendix C. Press CLR button to release BUZ-RLS button.
BY light is on	Busy signal.	Press CLR button to turn off teletypewriter. Reinitiate teletypewriter after waiting briefly.
NO CON light is on	Connection has not been established.	Press CLR button to turn off teletypewriter. Reinitiate teletypewriter after waiting briefly.
SVC light is on	A malfunction has occurred, which demands service.	Contact maintenance personnel.
DIAL light is on	Dial tone is present.	None. This is not an error indication.
ORIG light does not come on	Lamp failure; no power	If keyboard operates, the lamp failed. Continue operations. If power is off, contact maintenance personnel.
Error in typing	Operator error.	Use line correction or cancellation technique described in preceding pages if line has not yet been ended by end-of-line sequence. If line has been ended, make use of command language capabilities to eliminate the error.
Accidental pressing of BREAK button	Operator error.	Refer to Table 1 for results to be expected. Action should then be taken accordingly.
Keys are locked and will not operate	The system has locked out the keyboard.	Press BRK-RLS button and press the K key once to restore the keyboard.
Printing faint	Worn ribbon.	Replace teletypewriter ribbon as directed in Appendix C.

SPECIFYING SYSIN CHARACTER SETS

Two commands are used to specify the mode of character set translation for input to the system:

KA - specifies that the full EBCDIC character set will be used during keyboard input.

KB - specifies that the lower-case alphabetics (a-z) are to be translated into their upper-case EBCDIC internal equivalents (A-Z), and that the characters @ or ¢, # or ", and $ or !, are to be translated as @, #, and $. This translation is termed "folding." Thus, to store a capital A, the user may enter either an uppercase A or a lowercase a.

When the user initiates a conversational task, the system assumes the KB mode of translation. The KB mode remains in effect until another SYSIN character set command is issued. While KB mode is in effect, the system accepts the lowercase letters and translates them into their uppercase equivalents. This eliminates many of the shifting operations that would otherwise be required for entering commands, source statements, and data. It also eliminates two of the most frequently made errors related to shifting: failure to shift to uppercase for letters and forgetting to shift down for numbers.

If a user operating in KB mode desires the full EBCDIC character set, he must issue a KA command to change the mode of translation. A typical situation in which this might occur is illustrated below:

(Assume the user has logged on.)

```
User:   data testa,i

 S,U:   100 this data will be stored in
        uppercase.

 S,U:   200 THIS DATA WILL BE STORED IN
        UPPERCASE.

 S,U:   300 %end

User:   ka

User:   DATA TESTB,I

 S,U:   100 this data will be stored in
        lowercase.

 S,U:   200 THIS DATA WILL BE STORED IN
        UPPERCASE.

 S,U:   300 %END
```

Note that the KA command must be issued before the DATA command.

Table 4. IBM 3277/2741 character set

Lowercase Graphic Character	EBCDIC Equivalent (Hexadecimal)	Uppercase Graphic Character	EBCDIC Equivalent (Hexadecimal)
.	4B	¬ (Note 1)	5A
$	5B	!	5A
,	6B	| (Note 2)	4F
#	7B	>	6E
@	7C	(Note 3)	4A
&	50	+	4E
-	60	_	6D
/	61	?	6F
0	F0	)	5D
1	F1	=	7E
2	F2	< (Note 4)	4C
3	F3	;	5E
4	F4	:	7A
5	F5	%	6C
6	F6	'	7D
7	F7	"	7F
8	F8	*	5C
9	F9	(	4D
a	81	A	C1
b	82	B	C2
c	83	C	C3
d	84	D	C4
e	85	E	C5
f	86	F	C6
g	87	G	C7
h	88	H	C8
i	89	I	C9
j	91	J	D1
k	92	K	D2
l	93	L	D3
m	94	M	D4
n	95	N	D5
o	96	O	D6
p	97	P	D7
q	98	Q	D8
r	99	R	D9
s	A2	S	E2
t	A3	T	E3
u	A4	U	E4
v	A5	V	E5
w	A6	W	E6
x	A7	X	E7
y	A8	Y	E8
z	A9	Z	E9
blank	40	blank	40

Notes:
1. 3277 only.
2. The plus-or-minus sign on the 2741 correspondence terminal is translated into the logical-or, or vertical bar.
3. ≠ on the 3277 and ← on the 2741.
4. The degree sign on the 2741 correspondence terminal is translated into the less-than sign.

Table 5. IBM 2741 function codes

Function Characters	EBCDIC Equivalent
TAB	05
SHIFT (up)	36[1]
SHIFT (down)	06[1]
BACKSPACE	16[2]
RETURN (new line)	15
LINE FEED	25
BYPASS (stop printer)	24
RESTORE (start printer)	14
EOT (end of transmission)[3]	37

[1]This character is used by TSS for translation but is not kept in lines entered from terminal.
[2]This character is used by TSS to delete and replace characters in an input line; this character is not retained in lines entered from terminal.
[3] This character is nonprinting; usually originated automatically when transmitting from 2741 terminal.

Table 6. IBM 3277 function orders

Function Orders	EBCDIC Equivalent
Start field (SF)	1D
Program tab (PT)	05

Table 7. Teletypewriter function characters

Teletypewriter Key (Used With CTRL Key)	Translated To	Function
EOT	04	PUNCH OFF[1]
DCA	17	Idle, Not Used[1]
PN	34	PUNCH ON[1]
TAPE ON	34	PUNCH ON[1]
LF	25	LINE FEED
ACK	2E	None[1]
X ON	11	None[1]
WRU	2D	None[1]
CR	0D	Carrier Return
X OFF	13	Transmitter Off (EOB)
BEL	2F	CU3[1]
←	16	Backspace

[1]Not used with TSS.

Table 8. Teletypewriter character set

TTY Graphic	Stored As	EBCDIC Graphic
@	73	@
blank	40	blank
(	4D	(
$	5B	$
,	6B	,
\[1]	5F	¬
<	4C	<
=	7F	=
*	5C	*
:	7A	:
&	50	&
.	4B	.
←	4F	¦
>	6E	>
!	5A	!
)	5D	)
%	6C	%
-	60	-
]\[3]	6D	_
=	7E	=
#	7B	#
+	4E	+
[\[2]	4A	
;	5E	;
"	7D	"
/	61	/
?	6F	?
A	C1	A
B	C2	B
C	C3	C
D	C4	D
E	C5	E
F	C6	F
G	C7	G
H	C8	H
I	C9	I
J	D1	J
K	D2	K
L	D3	L
M	D4	M
N	D5	N
O	D6	O
P	D7	P
Q	D8	Q
R	D9	R
S	E2	S
T	E3	T
U	E4	U
V	E5	V
W	E6	W
X	E7	X
Y	E8	Y
Z	E9	Z
0	F0	0
1	F1	1
2	F2	2
3	F3	3
4	F4	4
5	F5	5
6	F6	6
7	F7	7
8	F8	8
9	F9	9

[1]The backward slash (\) is the uppercase shifted character on the "L" key.
[2]The left bracket ([) is the uppercase shifted character on the "K" key.
[3]The right bracket (]) is the uppercase shifted character on the "M" key.

Screen Command Summary

Command	Function
A{Y|N}	{sound|don't sound} alarm on input request
CC{Y|N|D}	{obey|ignore|display} carriage control character
CPr c	fix cursor at row "r" column "c"; blank is req'd
CPr c	temporarily move cursor to row "r" column "c"; blank is req'd
DQ	display current buffered input queue
F{F|B}n[L]	frame {forward|back} {"n" pages|"n" lines}
F{R|L}n	frame {right|left} "n" columns
FH	hold current frame until released
F	restore latest output frame
H{N|Y}	{halt|don't halt} at end of page
I{B|M}	input area is {at bottom|beneath output}
I{C|R}	input area is {cleared|repeated}
I{S|D}	input is {saved|not saved} in buffer
I{V|I}	input is {visible|invisible}
ILn	set input area length to "n"; 79 to 239
LLn	set line length to "n"; 1 to 256
M{B|L|P}	output mode {buffer|line|page}
N	turn on/off number scale (flip-flop)
N{I|O}	number scale is {input-fixed|output-floats}
NP	start a new page
OF{Y|N}	{force|don't force} output after input
PDx	"x" is PF key parameter definition character
PFn=string	string associates input "string" with PF key "n"
PO	pop {restore previously pushed} environment
PSx	"x" is PF key parameter separator
PU	push (save) current screen environment
REn	repeat "n" lines from previous page
RPFx	release PF key "x" for application use.
S{E|D}	screen messages in {English|German}
SFn=	string associates screen commands with PF key "n"
TLn	delay "n" milliseconds in line mode
TPn	delay "n" milliseconds between pages if "HN" is active
WSRx	"x" is to be the "response required" character

APPENDIX C: TELETYPEWRITER MAINTENANCE

INSERTING PAPER

To insert paper in the teletypewriter, proceed as follows:

1. If BUZ-RLS and PA lamps are lit and buzzer is sounding, press BUZ-RLS button to silence buzzer. Press OUT OF SERV. button.
2. Raise cover.
3. Move paper release lever back, lift the paper fingers, and pull the paper out from under the platen.
4. Lift out the used roll.
5. Remove the spindle from the core of the used roll, insert it in the new roll, and place the new roll in the machine with the spindle in the spindle grooves. Have the paper feed from underneath the roll.
6. Feed paper over paper straightener rod, down under the platen, and up between the platen and the paper fingers.
7. Pull paper up a few inches beyond top of platen. Straighten the paper and then lower the paper fingers onto the paper.
8. Move the paper release lever forward.

   Note: When inserting paper, do not disturb the ribbon or type box latch. After paper is in place, check that ribbon is properly threaded through ribbon guides and that type box latch has not been disengaged.
9. Lower cover, making sure that end of paper feeds out through top of cover.
10. Press CLR button.
11. Turn NORMAL-RESTORE control to RESTORE position until a dial tone is present. Allow control to return to NORMAL position.

CHANGING RIBBON

To change the teletypewriter ribbon, proceed as follows:

1. Press OUT OF SERV. button if teletypewriter is on.
2. Raise cover.
3. Lift the ribbon spool locks to a vertical position and remove both spools from their ribbon spool shafts.
4. Remove the ribbon from the ribbon rollers, ribbon reverse levers, and ribbon guides.
5. Unwind and remove the old ribbon from one of the spools.
6. Hook end of new ribbon to hub of empty spool and wind the ribbon until the reversing eyelet is on the spool. If the ribbon does not have a hook at the end, use the barb on the spool to pierce the ribbon.
7. Replace spools on the ribbon spool shafts, making sure the spools are down on the shafts and that the ribbon feeds from the outside of the spools. Turn the ribbon spool locks down to horizontal position.
8. Thread ribbon forward around both ribbon rollers, through the slots in the ribbon reverse levers, and through the ribbon guides. Take up slack by turning the free spool. Check that reversing eyelet is still between spool and reverse lever.
9. Check that type box latch was not disengaged, then close cover, making sure paper feeds out the top.
10. Press CLR button.
11. Turn NORMAL-RESTORE control to RESTORE position until a dial tone is present.

3277/2741 Attention Responses

When the ATTENTION key is pressed, the system responds with one of three condition symbols:	! (to denote the interruption of nonprivileged programs or commands)	* (to denote the interruption of an unfinished, privileged command string)	_ or user's command prompt (to denote the completion of a program or command string)
By these actions, the user calls for the system reaction listed in the block under the corresponding condition symbol:			
By issuing the GO command...	the current user program is resumed	the most recently interrupted user program is resumed and intervening command strings are canceled	
By issuing any system command...	the command is executed	the command is executed and the current command string is canceled	the command is executed
By pressing: RETURN key (2741)... ENTER key (3277)...	the current user program is resumed	the current command string is resumed	the system prompts the user to enter a command
By pressing: ATTENTION key (2741)... RESET & PA1 (3277)...	the system returns an exclamation point (nothing is changed)	the system returns an asterisk (nothing is changed)	the system prompts the user to enter a command
Note: If the user creates his own attention interruption handling program by means of the AETD macro instruction or the USATT macro instruction, the responses will be as he prescribes.			

INDEX

In this index, "3277" refers to the IBM 3277 Display Station, "2741" to the IBM 2741 Communications Terminal, and "TTY" to the Teletypewriter. All references are within plus or minus one of the indicated page number.