



**1440/1460 Administrative Terminal System (ATS)**

**(1440-CX-07X and 1460-CX-08X)**

**Terminal Operator's Manual**

This system consists of control and functional programs that permit many different text-processing activities to be carried on simultaneously through different terminals. This manual is a reference manual which includes all information required by a terminal operator to use the program.

This revision (H20-0185-1) contains many clarifications and minor revisions to H20-0185-0. It should be reviewed in its entirety. The most significant changes are:

1. In the section "Storage Reports" all references to the ATTNg action should be replaced by references to ATTN !g, for Version 2 and later revisions of the program.
2. In the section "Storage and Retrieval from Tape", note that there is a message "TAPE" printed at the terminal if there are any errors in reading or writing magnetic tapes. The transfer request should be repeated if this message occurs.
3. In the section "Upper- and Lowercase Chain Printer Output" revised overstrike codes are provided in Version 2 and later revisions of the program to permit easy recognition of all 120 characters.

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## INTRODUCTION

The IBM Administrative Terminal System (ATS) consists of an IBM 1440 or 1460 Data Processing System connected by telephone lines to terminals which are similar to IBM SELECTRIC® typewriters. With the exception of a few simple computer console functions, operation of the system is obtained through the terminal keyboard.

The system, when properly instructed, can save every keystroke made by the operator. To alter the text, the operator directs the system to locate the characters to be changed and instructs it in what manner these are to be altered. If a copy of a document is requested, the system will produce and transmit it to the terminal.

The system also may be requested to perform any other operations defined herein, on stored characters. The operator may, for example, request the system to transmit a document to any terminal connected to the computer.

## THE TERMINAL

### GENERAL

The terminal is an IBM 2741 Communications Terminal which enables characters to be transmitted to and received from a computer. The terminal is identical to the conventional SELECTRIC typewriter, with one exception: An Attention key replaces the Index key and makes possible communication between the operator and the computer. The layout of the typewriter keyboard is shown in Figure 1.

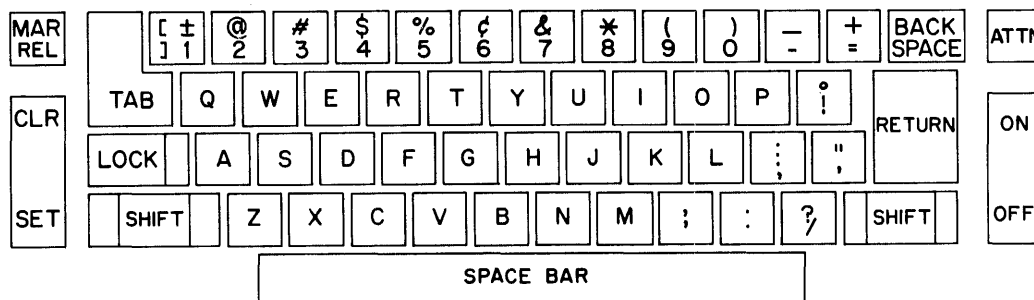


Figure 1. Administrative Terminal System keyboard.

Operation of the 2741 Communications Terminal is described in the System Reference Library Publication IBM 2741 Communications Terminal (A24-3415).

### THE ATTENTION KEY

Pressing the Attention key signals the computer that a request is about to be transmitted. Receipt of the underscore-backspace from the computer signifies that it is ready to receive the request.

When the carrier return key is pressed after an attention character has been received, the system analyzes and interprets the request. If acceptable, the request is processed. If the request is unacceptable, the system types a message indicating that the request must be repeated.

Each request for computer assistance is a sequence of characters that begins with the Attention character. Unless otherwise specified, the computer responds to this character by typing an underscore followed by a backspace, indicating to the operator that the system is ready.

## ENTERING TEXT

Characters or documents may be entered into the system in either of two different modes. In the uncontrolled mode, the system assumes no control over the format of the document; text entered in this mode is printed exactly as the system receives it. Normally, this mode is used when individual lines have a unique position on the page, as in a chart or the heading of a letter. In the automatic mode, the computer calculates line and paragraph formatting, the format specifications being supplied by the terminal operator. Automatic right margin justification is also a feature of this mode. Two special modes (Heading and Footing) are described later in this manual.

Whenever a new document is to be typed with computer assistance, the first request which must be made is a request for either the uncontrolled or the automatic mode. (The character sequence for these and all other operational requests will be found in Tables 1 and 2 at the end of the manual. The tables are cross-referenced to the sections of this manual which describe each request in detail.)

When documents are entered into the system in either mode, they are entered into the Working Storage belonging to the terminal from which they are entered. While they are in the Working Storage of a terminal, many things can be done to them. They may be printed, corrected, or transmitted to some other terminal or output device. They may also be stored in the Permanent Storage of the system and then recalled for further processing by any terminal.

In this and following sections, the attention, carrier return, tab, and backspace characters will be denoted by ATTN, CR, TAB, and BKSP, respectively.

### UNCONTROLLED MODE

All text entered in the uncontrolled mode will be printed back exactly as it is entered. All tabs, backspaces, spaces, and carrier returns will be saved by the computer whether text appears on the line or not. Special care must be taken with the carrier return key, as extra carrier returns will appear as blank lines on the printed document. The uncontrolled mode is especially suited for text requiring a unique position on the page: formulas, tabular material, the inside address of letters, etc.

The request for this mode is:

ATTN u CR

where ATTN signifies the first entry of a new line. The computer responds by typing:

UNCONTROLLED MODE

to acknowledge receipt of the request.

An example of copy prepared in the uncontrolled mode might be:

u  
UNCONTROLLED MODE

<u>Toys</u>	<u>Availability</u>	<u>Cost</u>
Bicycles	2 weeks	\$35.00
Books	6 weeks	\$ 5.00
Games	3 months	\$ 6.00
Dolls	5 days	\$ 4.95

Text that should not be broken up (such as the above example) is sometimes split between pages. This can be avoided by typing the number of the lines needed on the page before the following text is printed out. The above example might then appear:

u7  
UNCONTROLLED MODE

<u>Toys</u>	<u>Availability</u>	<u>Cost</u>
Bicycles	2 weeks	\$35.00
Books	6 weeks	\$ 5.00
Games	3 months	\$ 6.00
Dolls	5 days	\$ 4.95

When the computer is preparing the text to be typed back to the terminal, the 7 following the u indicates that no more text should be typed on the page unless there is space for seven lines. Thus, the lines of copy shown would appear all on one page.

In a similar manner, a page may be ended at any point selected by the operator if the u is followed by a number greater than any possible number of lines that could remain on the page. The number selected is usually 99, as seldom will anyone be working with a page size that would contain 99 lines of text. This request might appear as follows:

as stated previously by the district  
Director.  
u99  
UNCONTROLLED MODE  
CHAPTER II

### Collection-Procedures

This causes the typeout to terminate before the words CHAPTER II and eject to a new page.

All lines typed in the uncontrolled mode are numbered sequentially by the computer. This is done internally; no line number appears on the paper. This procedure allows the operator to refer to previously entered text for correction or editing purposes.

NOTE: Even a line consisting solely of a carrier return character is numbered and can be referenced at a later time by the operator.

## AUTOMATIC MODE

The automatic mode is especially suited to straight text. The operator specifies line width and other formatting requirements, but the computer determines where each word will be printed on the page. If so requested, the computer will also justify (make straight margins on both the left and right sides of the text) the portions of a document entered in the automatic mode. The operator is free to switch back and forth between the automatic and uncontrolled modes on the same document whenever necessary.

The automatic mode is requested by typing the sequence:

ATTN a CR

where ATTN signifies the first entry of a new line. The computer responds to this request by typing:

AUTOMATIC MODE

Text in the automatic mode is manipulated and numbered by the computer in "units". (A unit is any segment of text, usually a sentence, that is prefaced and followed by a double carrier return.) If a unit is too long, corrections will be difficult. In the automatic mode, the numbering of units is similar to the numbering of lines in the uncontrolled mode. Three units might be typed as follows:

John Glenn has just boarded the mis-  
sile gantry.

His last words were to the effect that  
he wasn't nervous.

All control systems had been completely  
checked out.

When printing is requested, these units will be printed one following the other to make the desired line width. A hyphen occurring as the last character of a line will be eliminated if the complete word is formatted by the computer on a single line. Where hyphens are desired regardless of where formatted margins occur, the hyphenated word must originally be entered as a single word without breaking it with a carrier return.

Paragraphs are indicated in this mode by typing one or more tab characters at the beginning of the first unit of the paragraph. The number of tab characters typed on the first line of that unit controls the format for the first line of the paragraph. A paragraph to be printed as a block with no indentations is indicated by typing a single tab at the beginning of the first line of the first unit of that paragraph.

As Entered

The 77974Q assembler  
does not yet read cards.  
  
This has made program  
checkout difficult.

As Printed

The 77974Q assembler does  
not yet read cards. This  
has made program checkout  
difficult.

The first line of the first unit in the above (left) example began with a single tab. The first unit was ended with a double carrier return and the second unit was then entered with no tabs. When printed back in the example on the right, the paragraph was printed flush, with no indentations, and the two units were run together.

Indentation is specified in relation to the positions of the tab stops set by the operator (see "Format Control" in the section "Entering Text"). A paragraph to be printed with the first line indented to the second tab stop, for example, is indicated by typing exactly two tab characters at the beginning of the first line of the first unit of that paragraph.

As Entered

The 77974Q  
assembler does not yet  
read cards.  
  
This has made program  
checkout difficult.

As Printed

The 77974Q  
assembler does not yet  
read cards. This has  
made program checkout  
difficult.

The first line of the example above was indented two tab stops and, as the example on the right shows, two tabs were used when printing back. Any number of tabs may be used, and as long as the number is greater than one, that many tab stops will be used to indent the first line of the paragraph.

If indentation to the first tab stop of all the lines following the first line of the printed paragraph is desired, then one tab character must be typed at the beginning of the second line of the first unit of that paragraph.

As Entered

The 77974Q assembler  
does not yet read  
cards.  
  
This has made program  
checkout difficult.

As Printed

The 77974Q assembler does  
not yet read cards.  
This has made program  
checkout difficult.

In the above example, only one tab was used on the first line and, according to the rule, there is no first line indentation. The second line of the first unit, however, is indented one tab stop and, when it was printed back, all the lines except the first were indented one stop. The second line of the first unit controls the indentation for the entire paragraph. Any number of tabs, including one, may be entered on this line and the body of the text will be indented that far. No matter how many units make up the paragraph, only the second line of the first unit need be indented for this type of format. The first unit must, of course, be at least two lines long.

By combining the indenting of the first line and the second line of the first unit of a paragraph, it is possible to get an indented blocked paragraph.

<u>As Entered</u>	<u>Margin</u>	<u>As Printed</u>
The 77974Q assembler does not yet read cards.	. . . . .	The 77974Q assembler does not yet read cards. This has made program checkout difficult.
This has made program checkout difficult.	. .	

In the above example, two tabs were used on the first line to cause two tabs to be used when printing back the first line. The two tabs used on the second line of the first unit cause all following lines to be printed back with two tabs.

It is possible that a small portion of a paragraph will fall on one page while the bulk of it is carried over to the next. This is obviously undesirable and tends to make reading more difficult. To avoid this, numbers may be entered after the "a" in the request for the automatic mode. For example:

ATTN a 7 CR

instructs the computer to print no further text on the page unless there are seven available lines remaining on the paper. Any number up to 999 may be used with this request. Operators frequently find it convenient to end a page with this action by using a larger number of lines than could possibly be on the page, such as:

ATTN a 99 CR

For example, a page might end thus:

however, the situation in the department  
is rapidly improving.

a99  
AUTOMATIC MODE

How To Get The Most From Your Secretary

The key to good relations with your  
secretary is basically appreciation.

WARNING: Before making an attention request in the automatic mode, the current unit must be ended by two carrier returns. If an attention request (with the exception of ATTN BACKSPACE and ATTN CR) is requested before a unit has been ended, the computer will type:

END YOUR UNIT

and ignore the request. In general, the correct action when the above message is received is to depress the carrier return and then reenter the attention request.

It is possible to suppress the one-line space that is normally inserted between paragraphs of text entered in the automatic mode when it is printed. This is done by entering the letter "s" after the "a" in the request for automatic mode. For example:

ATTN as CR

When the following text is printed no spaces will be inserted between paragraphs. This will continue for all text entered until an ATTN u or ATTN a request without an "s" is received. If it is desired to both suppress spaces between paragraphs and prevent a small section of text from appearing at the bottom of a page, either of the following requests may be used:

ATTN as DIGIT(S) CR

ATTN a DIGIT(S) s CR

"DIGIT(S)" is the minimum number of lines that must be available at the bottom of the page as described above.

#### ADDITIONAL LINES

It is often desirable to skip a specified number of lines when printing a document. Perhaps space is needed for a chart, photograph, or signature. It is possible to enter the desired number of lines while in the uncontrolled mode by consecutive carrier returns. Alternatively, the request:

ATTN + DIGIT(S) CR

will cause the computer to skip the number of lines specified by DIGIT(S) when the document is printed. For example:

+8

will cause eight carrier returns to occur when the document is printed back. This will result in 8 or 16 lines depending on the setting of the single or double space selection lever.

If the request exceeds the number of lines remaining on a page, these lines will be stepped off on the next page. If the number of additional lines requested exceeds the number of lines specified for a page, a single blank page will be ejected with heading and footing if present.

In the automatic mode, the plus lines action is the only method of inserting blank spaces on a page. The request is entered at the left-hand margin as the first entry of a new unit. If the operator fails to end the previous unit before entering the plus lines request, the computer will type:

END YOUR UNIT

## FORMAT CONTROL

### Tab Stops

If tabs are to be used, it is necessary to convey the position of the tab stops to the computer. This is done by the request:

ATTN ! (sequence of dashes and t's) CR

This action is necessary to allow the computer to format the necessary tabs for printout. Accuracy in indicating the required number of stops is essential. An incorrect number of tabs transmitted to the computer will cause errors in printout.

The entry of the tab stops might appear on the paper as follows:

!---t---t-----t-----tt-----t-t

where the t indicates a tab stop which is set and the dash a tab stop not set. Since the computer will retain the last setting of the tab stops indefinitely, the tab setting action need be taken only once, or when it is necessary to change the settings.

NOTE: The exclamation mark (!) occupies the first character position, which cannot be used for a tab stop.

HINT: It is often desirable to have the first tab stop in the second character position. This allows block-style paragraphs to be entered in a natural format.

Tabs should be used in preparing a document only when necessary. Tables and other material likely to be retrieved by several terminals should be typed using spaces so that variations in tab rack settings will not produce undesirable printing.

### Lines on a Page

The computer must be instructed how many lines are available on each page. For example, if the paper has a capacity of only 40 lines and there is a greater number of lines available for printing out, the number of available lines is conveyed to the computer by the action:

ATTN ! DIGIT(S) CR

This will appear on the paper:

!40

The computer will then divide the copy into pages of 40 lines each. This number includes any heading or footing lines which may be printed (see the section "Special Modes").

The number of lines per page may be set from 5 through 999. If a number less than or greater than these limits is selected, the computer will type:

UNACCEPTABLE NUMBER

and ignore the request.

### Printing Element Identification

One of the features of the SELECTRIC typewriter terminal is that the printing elements may be interchanged to allow use of different typefaces. This feature, however, causes an ambiguity with the numeral one. For example, the Manifold element prints the numeral one when the "1" key is depressed. However, when the Courier element is used, the "1" key causes a right bracket to be typed, since the lowercase "L" serves double duty by printing a "1". In order to have "1"s print as "1"s in system messages and storage reports (see "Storage Report" in the section "Storing the Document") the computer must know which element is currently being used. This information is conveyed by the action

ATTN ! 1 CR

where "1" is entered by depressing the key that prints as "1".

## PRINTING A DOCUMENT

Any of five types of printing requests may be made for text entered into a Working Storage of a terminal. These are described below.

### PRINTING

The request for printing is made by the action:

ATTN p DIGITS CR

where DIGITS is the desired number of characters per line and is between 30 and 130, inclusive. All text previously entered in the Automatic mode will be printed with the indicated width or less. For example, if the request ATTN p 45 CR is entered, the right-hand margin will be 45 character positions from the left-hand margin. Since no words are automatically hyphenated, the majority of the lines will be slightly less than 45 characters; however, a maximum line of 45 characters may be printed. Text entered in the uncontrolled mode will be printed exactly as entered. If no digits are entered, the computer will use a number of its own selection. The ATTN p request would appear as follows:

p65

When the print request is made, the computer will respond by typing:

SIGNAL WHEN READY

and wait for the operator to load fresh paper, an offset duplicating mat, or a stencil. During this idling period the keyboard is unlocked and variable text may be entered just as when the stop printing request (see the section "Stop Codes") is encountered. It is also possible to stop all further printing by using BKSP ATTN. When the Attention key is again depressed, the keyboard will be locked and printing will begin. The underscore-backspace usually printed by the computer upon receipt of this attention character is suppressed and does not appear on the printed document.

### JUSTIFICATION

Justified printing is accomplished only with text entered in the automatic mode. Text entered in the uncontrolled mode will be printed exactly as entered. Justification is requested by the sequence:

ATTN j DIGITS CR

where DIGITS is the number of characters desired on each line and is between 30 and 130, inclusive. If no digits are entered, the computer will use a number of its own selection. When this request is received by the computer, it will respond by typing:

SIGNAL WHEN READY

Fresh paper may then be loaded into the typewriter and any variable text entered. Upon the next depression of the Attention key, the keyboard will be locked and printing will begin. The underscore-backspace usually printed by the computer upon receipt of this Attention character is suppressed and does not appear on the printed document.

Justification is accomplished by padding spaces between words. This procedure will insert spaces from right to left on the first line and from left to right on the second line and so forth. This technique prevents any one side of the printed area from appearing lighter or more open than the other side.

NOTE: A word of caution is in order when underscoring. Since, to the computer, a word is a group of characters separated by spaces, underscoring should always look like this (underscoring each word before typing the next), and never like this. That is, a word to be underscored should be typed, backspaced over, and then underscored before going on to the next word. Incorrect underscoring will produce an unacceptable document when it is printed. This rule of underscoring should be observed when in the automatic mode if there is a possibility of the text being separated when printed out.

#### PRINTING AS ENTERED

Occasionally it is desirable to be able to print the text exactly as it was entered. This allows the operator to check to be sure that all the text was entered correctly, and that insertions, deletions, and erasures were properly executed. This request is made by the sequence:

ATTN p ZERO CR

where ZERO is the number 0. The computer will respond to this request by typing:

#### SIGNAL WHEN READY

Printing will begin upon the next depression of the Attention key. In addition to the text, the computer will also type out all u, a, +, h, and f requests. Stop codes within the text will print as underscores and will not stop the printing. Heading and footing lines will not be printed at the top and bottom of each page.

#### PRINTING WITH UNIT NUMBERS

In making corrections to documents it is necessary to know the unit numbers of each piece of text being changed. (Each line of text entered in uncontrolled mode is considered a unit.) A special mode of printing, with or without justification, is available that displays in the right margin of the page the unit number of the last unit of text that begins on that line. (in a few rare cases, the unit number may be omitted.) This mode of printing will occur whenever the letter "n" is added to an ATTN p or ATTN j request. Any of the following sequences can be used:

ATTN p n CR  
ATTN p n DIGITS CR  
ATTN p DIGITS n CR

ATTN p n ZERO CR  
ATTN p ZERO n CR  
ATTN j n CR  
ATTN j n DIGITS CR  
ATTN j DIGITS n CR

Except for the unit numbers in the right margin, the printed text will look exactly like that produced by the same attention request without the "n" included.

#### PRINTING A PARTICULAR PAGE

Sometimes it will be necessary to begin printing on a particular line or unit of a multipage document. This can be accomplished with either the ATTN p or ATTN j action by following the line width with a tab and then typing the line number where printing is to begin.

Examples are:

ATTN p 65 TAB 397 CR

or

ATTN j 75 TAB 265 CR

In either of the above two examples, the number following the tab is the line number of the first line to be printed. In effect, this action allows the option of beginning a printout at any page that is desired, or to see the effect of formatting the last few lines or units entered. From the line or unit number given, a full page will be typed containing the number of lines given with the ATTN ! action (see "Format Control" in the section "Entering Text"). Following pages will be printed in order as usual. Heading and footing lines will not be printed.

#### REPRINTING

Sometimes it is desirable to reprint a page, either because multiple copies are desired or because of a computer failure. In the latter case, if the computer should fail while the document is being printed, the reprint action will begin printing at the top of the page where failure occurred. With a multipage document, this feature is very important to maintain proper page numbers as well as to get a complete copy of the page. The request for reprint is made by typing:

ATTN r CR

The computer will respond to this request by typing:

SIGNAL WHEN READY

Upon depression of the Attention key, reprinting will begin from the top of the page last printed.

Note that this is a duplicating action; it should be requested only if the text was previously printed. Also, since the action is a request for an exact duplicate, no line width is necessary or permitted. If either of these restrictions is violated, that is, if a reprint

is requested when the text was not previously printed or the request is followed with digits to indicate a line width, the computer will type:

ILLEGAL ACTION

and ignore the request.

The reprint action may not be requested if lines were called out for correction between the last printing and the reprint request. If the operator inadvertently attempts this, the computer will type:

ILLEGAL ACTION

NOTE: If a reprint of a page is desired in a multipage document, the printing of the rest of the pages must be aborted by the action, BKSP ATTN, before the reprint is requested.

## CORRECTION PROCEDURES

### LINE DELETION

When entering text in the uncontrolled mode, the request:

ATTN CR

will erase the entire line being typed. This request may be made anywhere on the line and is particularly useful in deleting lines containing tab and backspace characters entered when the tab stops and margins are set. An example of a deletion might appear as:

What I really want to say is\_

In the automatic mode, the delete request will erase the entire unit being entered, regardless of the number of lines that make up the unit. An example of the deletion in the automatic mode might appear as follows:

Some people, as you know, are  
careless with their money to the  
point where they give it away  
indiscriminately to every beggar  
on the street.\_

In the above example, the entire unit (all five lines) will be deleted by the ATTN CR action.

The easiest way to delete a line or unit of text that has already been completely entered is to use an erase request. (see "Erasing Sections of Text (Bulk Erase)" below).

### CHARACTER ERASING

It is possible to correct individual characters entered on the terminal. When a miskeying occurs, the operator may depress the Attention key and backspace as far as desired. As the printing element passes over each character position, that character is erased from system storage. The correct characters may then be entered. A typical correction might look like this:

My aunt is a sad\_person.

The backspace key on the terminal may be "typamatic", that is, it operates continuously as long as it is depressed. If the operator should backspace further than desired, typing must again begin where the element stops. All characters, incorrect or not, passing under the element by this procedure are erased.

When a Tab key is pressed, the printing element may move across many character positions. When the operator attempts to erase by attention-backspacing over a tab character, this should erase all the characters that were covered by the tab. The second backspace given after attention-backspacing over a tab would indicate the erasure of the character immediately to the left of the character position at the beginning of the tab. These characters would almost certainly be far to the left of the printing element and the rule that characters passing under the printing element during an attention-backspace action are erased would be violated. For this reason attention-

backspacing over a tab character is not permitted. Should the operator inadvertently attempt to use the erase procedure incorrectly, the computer will respond by typing:

LINE CANCELED

The operator must then enter that line again, not the entire unit in automatic mode. To make a correction that would involve attention-backspacing over a tab, the line or unit should be ended and then called out using the replacement feature as explained in the next section.

#### REFERENCING PREVIOUSLY ENTERED TEXT

As previously mentioned in the section "Entering Text", all text entered into the system is numbered. In the uncontrolled mode it is numbered by the line; in the automatic mode it is numbered by the unit. To ascertain the number of a line or unit, the request:

ATTN n CR

is entered as the first entry of a new line. The computer will respond by typing:

NEXT NUMBER -- xxxx

where xxxx is the number of the next line to be entered. In other words, if the operator has just finished typing line or unit number 17, the computer will type:

NEXT NUMBER -- 18

After the number of a line or unit is ascertained, the corresponding text may be called out for erasing, editing, or deletion. To call out the desired line or unit the operator enters:

ATTN DIGIT(S) CR

at the beginning of a new line, where DIGIT(S) is the number of the desired unit. For example, if an error were found in the 15th unit of the document, the computer would type out the erroneous unit upon receiving the request ATTN 15 CR. The standard correction or deletion procedures can then be applied as if the unit had just been typed. An example might appear as follows:

The new look in fashion this year  
is bright colors, particularly orange  
and black, with modified bodice and  
three quarter length sleeves.  
ves.

In the above example, unit 15 was called out to correct the incorrectly spelled word "sleeves". The platen was rolled back manually, and the attention-backspace procedure was used to correct the word.

To avoid unnecessary printing of large amounts of text, the computer can be instructed to stop printing after the last unique correct word when calling out a line or unit. The request is:

ATTN DIGIT(S) TAB WORD CR

where DIGIT(S) is the number of the line or unit and WORD is the last unique valid word (or phrase) in the unit. Printing will stop following the word and all subsequent text in that unit will be discarded. It should be remembered that a word to the computer is separated by spaces, tabs, stop codes, or carrier returns. For example:

Sanguinely, Tom said "Sibboleth".

To get the computer to stop printing before the incorrectly spelled word "sibboleth", the action for calling out this sentence would be:

ATTN 2 TAB SAID CR

NOTE: Since all shift characters are ignored when making a comparison for the indicated word, the word SAID may be entered in either upper- or lowercase with this action.

If the delete action (ATTN CR) is used when a line or unit is called out, the deleted line or unit is automatically erased from system storage. The computer will then renumber the following text as though the deleted unit had never been entered.

If the operator should inadvertently call out the wrong line, no harm is done. In the uncontrolled mode, a carrier return may be made and the correct line called out. In the automatic mode, a double carrier return must be entered before another number is requested. Of course if printing stopped on the word indicated in what was found to be the wrong line, that line must be retyped from that point to the end.

If the operator should accidentally attempt to request another number without indicating the end of a unit (double carrier return) when calling out text in the automatic mode, the computer will respond by typing:

END YOUR UNIT

This message would also be printed if a line consisting solely of a CR were called out in the uncontrolled mode and not "put back" (by pressing the return key with or without other characters) before making a new attention request. In general, the correct action when the above message is received is to depress the carrier return and then re-enter the attention request.

In addition to calling out a line and stopping on a word, it is possible to replace words or phrases imbedded within a unit. This is accomplished by the action:

ATTN DIGIT(S) TAB ORIGINAL TAB REPLACEMENT CR

where ORIGINAL is the existing word or phrase and REPLACEMENT is what is to be inserted. The correction (REPLACEMENT) may be longer or shorter than the original. It should be emphasized that the incorrect word or phrase (ORIGINAL) must be exactly duplicated in the attention request, including all errors, backspaces and overstriking. If a phrase is entered (ORIGINAL), it may not overlap a line in the original entry of the unit designated. The comparison for phrases always begins anew when the computer scans a tab, carrier return or stop code in the original text stream. If the computer is successful in locating the word or phrase to be replaced, the unit will be printed with the correction (REPLACEMENT) inserted. If the computer is not successful, the original unit will be printed intact. In either case additional correction actions may be taken as in the standard calling out a line procedure.

HINT: Tab Characters at the beginning of a line may be replaced along with the first word of a line.

It is illegal to call out lines containing operational requests (ATTN a, ATTN u, etc.). Should the operator attempt this the computer will type:

#### ILLEGAL ACTION

The operator may then ask for another number.

HINT: These units may be displayed if an insertion request (see below) is made and then cancelled with ATTN CR.

If the operator attempts to call out a unit which contains a stop code (see "Stop Codes") on other than the last line of the unit, the unit in question will be printed only to the carrier return which forces the stop code to be on the last line.

If a line called out in the uncontrolled mode consists solely of a carrier return, the printing element will go into the upshift condition and return to downshift. To the operator, the ball will appear to "wiggle".

It is possible that, while in one mode (the uncontrolled mode, for example) the operator might reference text entered in the other mode (the automatic mode). This would create a problem, since the computer could not determine which mode should be used when the document is printed. As a consequence, the computer checks for this possibility and, should it occur, responds by typing:

"A" MODE REQUIRED  
or  
"U" MODE REQUIRED

where "A" or "U" is the mode in effect when the line or unit was first entered. After changing to the correct mode the text may be referenced without difficulty.

#### INSERTIONS

Often in tables and sometimes in text it is necessary to insert new information. This is possible by the insertion request:

ATTN i DIGIT(S) CR

where DIGIT(S) is the number of the line or unit immediately preceding the place where the insertion is to be made. To reassure the operator that the text is being inserted in the proper place, the computer types the first few words of the line or unit referenced. The next line or unit entered will be inserted automatically after that point. All lines or units subsequent to where the insertion was made will then be renumbered. If, after the computer types out the first few words of the preceding line or unit, it is found that the wrong number was given, the delete action (ATTN CR) should be entered to cancel the insert request.

It is illegal to try to insert automatic mode units when in the uncontrolled mode or uncontrolled mode lines when in the automatic mode. If this is attempted, the computer will type:

"A" MODE REQUIRED  
or  
"U" MODE REQUIRED

If the unit of text being inserted is not ended properly (one carrier return in uncontrolled mode, two carrier returns in automatic mode) before the next attention action is taken, an error message will be printed on the terminal. If the message

END YOUR UNIT

is typed, the Carrier Return Key should be struck the proper number of times and the attention action typed again. If the message is

LINE CANCELLED

is typed the last line entered should be typed again. This message does not delete earlier lines of a unit in the automatic mode.

In addition to inserting text it is possible to insert certain operational requests. For example, conditional page ejection request may be inserted. In the automatic mode, this action would appear as follows:

ATTN i DIGIT(S) CR  
ATTN a DIGIT(S) CR

Assume the paragraph beginning with unit 15 should not be printed unless there are four lines left on the page. This might appear on the terminal as follows:

i15  
The problem on Broadway  
a4

Other actions that may be inserted in this manner are:

ATTN u DIGIT(S) CR  
ATTN uc CR  
ATTN + DIGIT(S) CR

NOTE: If any attention action is inserted in the middle of a paragraph in the automatic mode, the paragraph will be ended at that point.

HINT: When insertions are being made, it is easiest to begin correcting a document from the end. This will mean that there will be no changes in the unit numbers of text that has not yet been corrected.

#### MOVING SECTIONS OF TEXT (BULK MOVE)

Occasionally it is necessary to rearrange paragraphs or sections of a document into a different order from that used when the document was created. Perhaps a table typed in the uncontrolled mode must be inserted in the middle of text typed in the automatic mode. These functions are also available in ATS.

The operator must first decide after what point the new material is to be placed. The insert request is then made referencing that line or unit number. A small part of the text corresponding to that number is typed out by the computer and the keyboard unlocked. To condition the system to prepare for a bulk move request, the operator keys:

ATTN DIGIT(S) TAB DIGIT(S) CR

The first DIGIT(S) refers to the first line or unit of the section of text to be moved and the second DIGIT(S) refers to the last number in that section. The second DIGIT(S) field may be omitted, in which case only a single line or unit will be affected by the action.

The system will type out a single line consisting of a small part of the first and last lines or units indicated, stopping at the end of that line. If this printout shows any error in line designation, the entire request may be canceled by pressing the Carrier Return Key. If there is no error, ATTN CR will cause the text to be erased from its present location and moved to its new location internally.

## ERASING SECTIONS OF TEXT (BULK ERASE)

Erasing individual lines or units in a document is possible by calling out that line (see "Referencing Previously Entered Text"), then striking the Attention and Carrier Return Keys. In addition to being time-consuming when many lines must be called out, this procedure does not apply to lines beginning with the attention character. In such cases the bulk erase should be used.

The bulk erase action is taken by typing:

ATTN e DIGIT(S) TAB DIGIT(S) CR

where the first DIGIT(S) refers to the first line or unit of the section of text to be erased and the second DIGIT(S) refers to the last number in that section. The second DIGIT(S) field may be omitted, in which case only a single line or unit will be affected by the action. The system will type out a single line consisting of a small portion of the first and last lines or units indicated, stopping at the end of that line. At that point, the printout represents the entire section of text. If there is no question that the text is to be erased or deleted, that line must be deleted with ATTN CR. If the operator does not wish the erasure to take place, only the CR should be keyed. This is similar to deleting documents in permanent storage (see "Deleting a Document from Storage" in the section "Storing a Document") and to moving sections of text discussed in the previous section.

Two examples of bulk erase follow:

```
e1847          9999
5.4.8 Helpful Hints (TO) Many of the irrita_
NEXT NUMBER -- 1847
e27
+2 (TO) +2
NEXT NUMBER -- 1846
```

When an erase is completed, the NEXT NUMBER message is automatically emitted. The act of erasing sections of text sometimes causes the system to generate, automatically, an ATTN-a or ATTN-u necessary to insure proper formatting. These are numbered, but because of their automatic generation may not be considered by the operator when referring to other lines. The typing of the next number should aid in ascertaining the correct numbers of text as stored in the computer.

The number 9999 may be used to indicate the last line of the document. This is useful when erasing from a given point to the end.

If the operator keys a second field of DIGIT(S) which is not greater than or equal to the first field, or if any DIGIT(S) designates a number for text not yet keyed (except 9999), the system will type:

UNACCEPTABLE NUMBER

and ignore the erase request. The operator is then free to make any desired system request. This action will cause the automatic deletion of trailing ATTN-u and ATTN-a lines at the end of the document. The terminal will be in the same mode as when the request was made.

An example of a bulk move might be:

```

i347
      B      EXIT      RETURN T
454      492
***** (TO)  XX14 DC =1_
NEXT NUMBER -- 671
```

When a move is completed, the NEXT NUMBER message is printed automatically. The act of moving uncontrolled mode text into automatic mode sections causes the system to generate, automatically, the ATTN-a's or ATTN-u's necessary to insure proper formatting. These are numbered, but because of their automatic generation, may not be considered by the operator when referring to other lines. The typing of the next number should aid in ascertaining the correct numbers of text as stored in the computer.

The number 9999 may be used to indicate the last line of the document. This would be useful when something is typed at the end of a document, then moved to its proper place. For example:

```

n
NEXT NUMBER -- 142
-----
-- END OF SECTION 4 --
-----
i82
"A" MODE REQUIRED
a
AUTOMATIC MODE

i82      In summary, the system is

142      9999
----- (TO) a
NEXT NUMBER -- 147
```

If the operator keys a second field of DIGIT(S) which is not greater than or equal to the first field, or if any DIGIT(S) designates a number for text not yet keyed (except 9999), the system will type:

LINE CANCELED

and permit the operator to select another range of numbers without taking the insert action again. It will also do this if the range of numbers specified encompasses the number specified on the insert request itself. If the operator does not wish to try another range of numbers, the insert must be aborted with ATTN CR action before any other action can be taken.

This action will cause the automatic deletion of ATTN-a and ATTN-u lines at the end of the document. The terminal, however, will be left in the same mode as when the action was made. For example, if the action is taken while the terminal is in the uncontrolled mode and automatic mode text is moved to the end of the document, an ATTN-u line will be generated to restore the terminal to the uncontrolled mode.

## STOP CODES

When the system is in the process of printing a document, it locks the keyboard, denying the operator access to the text until it is finished. Sometimes it is desirable, however, to key variable information, change printing elements, or alter margin stops. In order to do this, the operator may key a "stop printing" request in the appropriate position. This is accomplished by giving the request:

### ATTN ATTN CHARACTER

where CHARACTER is any character except backspace, carrier, return, or a shift. This request, unlike most operational requests, may be entered anywhere on the page. (When entering a stop code at the left margin, the sequence SPACE, BKSP, ATTN, ATTN, CHARACTER, must be used to differentiate it from other requests beginning with ATTN.)

WARNING: If stop codes are included in text entered in the automatic mode, this text should not be printed with the ATTN j action (justified printing). The line containing the stop code will not be correctly justified and will probably run past the right margin. Use the uncontrolled mode to enter lines containing stop codes, if the document is to be printed with justification.

An example of a Stop Code might appear on the page as follows:

u  
UNCONTROLLED MODE

It is our pleasure, Mr.    to welcome you  
to our organization and we know that you will  
appreciate the personal interest we take with  
our employees.

On the first line of the above unit, a stop code (ATTN ATTN COMMA) was entered after the word "Mr." When this document is printed, typing will stop after the word "Mr." and a name may be entered. Upon depression of the attention key, printing will resume, beginning with the ",," (comma).

When the computer reaches this code, it will stop printing and unlock the keyboard. The terminal can then be operated without computer assistance. It is not possible to enter operational requests while the system is idling at a stop code. Upon depression of the attention key, computer-controlled printing will resume. As explained above, the normal erase and delete procedures are not available while at a stop code. If an error should be made while variable text is being inserted, or if a serious error should be found in previously printed text, the operator can eliminate all unnecessary printing that would normally follow by typing BKSP ATTN. When this exact sequence is detected by the computer, it unlocks the keyboard and does not print the remaining text. The operator may then take any desired action.

When a line containing a stop code is called out, the platen will index twice at the point at which the stop code was entered. A line entered with a stop code and called out might appear as follows:

Entered: We are happy to acknowledge your order  
of    for \$400.00.

Called out: We are happy to acknowledge your order  
of  
  
for \$400.00.

If the operator attempts to call out a unit which contains a stop code on other than the last line of the unit, the unit in question will be printed only to the CR which forces the stop code to be on the last line.

## SPECIAL MODES

### HEADING MODE

It is often necessary for a heading, such as the title and chapter heading of a book or manual, to appear on every page of a document except the first. This may be done automatically using the heading mode. Copy entered once in the heading mode will appear at the top of every page of the document except the first.

The heading mode is like the uncontrolled mode in that all copy will be typed back exactly as it was entered. The mode is initiated by typing:

ATTN h CR

Upon receipt of this request, the computer will respond:

HEADING MODE

A stop code entered in this mode has a special meaning. It is interpreted as a request for automatic page numbering. If a stop code is entered, the page number will be printed on every page (beginning with the second) immediately following the stop code. No actual stop, however, will occur.

The following is an example of how the entered heading and printout may appear (h is the result of typing ATTN h CR; similarly for a, f, etc.):

<u>h</u> HEADING MODE TOY MANUFACTURERS' CONFERENCE  --  <u>a</u> AUTOMATIC MODE	December 25, 1964
-------------------------------------------------------------------------------------------------------	-------------------

The "--" is a stop code and was entered by the sequence: DASH ATTN ATTN DASH. The top of page 2 of this document would be printed:

TOY MANUFACTURERS' CONFERENCE  -2-  have been very encouraging. It is anticipated that sales and earnings will reach an all time high. Santa Claus is ...	December 25, 1964
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------

The heading is usually entered immediately following the initial request for the automatic or uncontrolled mode. If new headings are interspersed throughout a document, each will supersede the previous heading when the next page is printed. Heading lines end when the operator takes an ATTN a, ATTN u, or ATTN f action.

## FOOTING MODE

When specific lines are to appear at the foot of every page of a document, the request:

ATTN f CR

may be made. This is a request for the special footing mode. When the computer receives this request, it responds by typing:

## FOOTING MODE

Unlike the heading mode, footing material is not suppressed on the first page, but appears on every page, including the first. A stop code entered in this mode is interpreted as a request for automatic page numbering. If a stop code is entered, a page number will be printed on every page (including the first) immediately following the stop code. No actual stop, however, will take place.

The heading and footing modes are generally entered one after the other at the top of the first page. An example might be:

a  
AUTOMATIC MODE

h  
HEADING MODE

EDUCATION IN AMERICA

f  
FOOTING MODE

Page\_

a  
AUTOMATIC MODE

The heading and footing printed on each page of the document, after the first page, would be:

EDUCATION IN AMERICA

Page 65

The above page number was entered as:

Page ATTN ATTN SPACE CR

The footing mode text ends with an ATTN a, ATTN u, or ATTN h request. If new footings are interspersed throughout a document, minor page depth variations on the page receiving the new footing will occur.

## LINE CENTERING

Titles and examples which should be centered often occur in documentation. To indicate that the lines to be entered are to be centered, the operator must key:

ATTN uc CR

The system will respond by typing:

### UNCONTROLLED MODE

in the usual fashion. All subsequent lines (not units) typed after this action will be automatically centered by the system depending on the margin width specified on the print or justify request (see the section "Printing a Document"). This special centering mode ends when an ATTN a, u, h, or f request is made. Digits specifying conditional page eject points may be entered following the uc just as with a normal uncontrolled mode request (see the section "Entering Text").

## FORM LETTER MODE

The normal procedure when printing a document is to request the printing, receive the message

### SIGNAL WHEN READY

and then depress the Attention key after the appropriate paper has been inserted into the machine. When a second copy of the document is required, the procedure must be repeated.

When working with a document such as a form letter that must be printed many times, it is possible to abort the system message between printings by entering the Form Letter Mode. The action:

ATTN ! f CR

places the terminal in this mode. After the form letter has been printed, striking the Attention key will cause it to be printed again. The operator may exit from this mode by keying:

EKSP ATTN

## CLEARING WORKING STORAGE

After a document has been finished and before the next document is entered, working storage (that part of the computer's memory that stores the document while it is being composed) must be cleared. This is accomplished by typing:

ATTN c CR

This request destroys all material left in working storage and disconnects the terminal from the computer. When this request is received by the computer, it responds by typing:

CLEARED

Either the uncontrolled mode or the automatic mode request must be made to enter a new document. If a document is to be saved, it must be stored by the process described in the section "Storing a Document".

When a terminal is in the cleared state the computer will not save characters or respond to operational requests until a document is initiated by the request for either the automatic or uncontrolled mode. It has been found by experience that many operators forget to "go on line" (initiate a document with ATTN a or ATTN u) and enter large amounts of text before remembering that the terminal is cleared. Because of this experience, if an attention request other than ATTN a or ATTN u is attempted the computer will type:

GO ON-LINE

to remind the operator that the terminal is cleared.

It is generally a good practice to clear a terminal when first starting a new document. If the terminal responds with GO ON-LINE, only time is lost. If it responds CLEARED, the previous user was careless and left text material in the working storage which would have been combined with the keystrokes of the new document to be entered.

## EXAMPLE

The manual you are reading was produced on a terminal from handwritten copy. The document itself serves as an actual example of how the previously described operational requests may be employed. The footing mode was used to enter the page numbers on this and every other page. The erase and delete procedures received liberal use as did the calling out of previous lines for correction. All text was entered in the Automatic mode while the examples were entered in the Uncontrolled mode.

The original rough draft was entered into the system and then stored in permanent storage (this is explained in the next section). When the corrections and insertions were received by the terminal operator, only the areas of the manual needing correction required retyping.

The manual was printed with the request:

p72

and as you can see, all the text that was entered in the Automatic mode is printed with the maximum number of complete words on each line.

Since none of the corrections show on the finished copy, it might be interesting to repeat some of the procedures used. The third sentence of this section originally read:

The footing mode was used to enter the page numbers on this and every other page in this document.

One of the revisions that were made on this original copy was to delete the last three words in the sentence. To accomplish this, the terminal operator retrieved the document from permanent storage and corrected the sentence as follows:

<u>Action</u>	<u>Interpretation</u>
<u>125</u> other page	The erroneous line is called out for correction. (ATTN 125 TAB OTHER PAGE CR)
The footing mode was used to enter the page numbers on this and every other page.	The computer typed out the requested line stopping on the phrase "other page". The operator then typed a period and two carrier returns.

Following the second paragraph there was a sentence that was deleted in the revisions. The operator handled this correction like this:

<u>Action</u>	<u>Interpretation</u>
<u>130</u>	The erroneous line was called out.
From the writer's standpoint, turnaround time was very low._	The computer typed out the line. The operator used the delete procedure (ATTN CR) to delete the line.

The fifth sentence in the first paragraph was inserted as a revision. This operation appeared as follows:

<u>Action</u>	<u>Interpretation</u>
<u>1126</u>	The operator tells the computer that insertion after line 126 is desired.
The erase and delete pro	The computer typed the first few words of line 126 to reassure the operator that she was inserting in the proper place.
All text was entered in the automatic mode while the examples were entered in the uncontrolled mode.	The operator then typed the sentence and it was inserted automatically.

These pages as well as the entire document are permanently stored and may be retrieved immediately. More revisions will only require the altering of the specific lines in error, and typing out the corrected pages.

## STORING A DOCUMENT

Any text entered into the computer's working memory may be held in permanent storage. Documents stored in permanent storage will remain there indefinitely until they are deliberately deleted. Each document in storage must, however, have a unique number supplied by the operator. Documents are referenced in storage by this number.

HINT: It is often best to enter and store large amounts of text as a series of separate documents, each 5 to 10 pages long. These are easier and quicker to process. They can be combined, if necessary, for final printing.

### ENTERING TEXT INTO PERMANENT STORAGE

A document is stored (actually copied) by the request:

ATTN s DIGIT(S) CR

where DIGIT(S) may be any number, except zero, or a number ending in two zeros, having up to four digit positions. This number must not currently be assigned to any other document. All further references to the document are made by requesting this number. When the computer receives this request, it will respond by typing:

IDENT PLEASE:

The operator must then enter a minimum of ten characters (presumably a description of the document) to help anyone referencing the document to identify it. Up to the first 50 keystrokes of the identification or description entered will be saved. If the operator fails to do this, the computer will respond by typing:

IDENT PLEASE:

until the request is satisfied.

After the identification has been satisfactorily entered, the computer will type:

DOCUMENT xxxx \*\*STORED\*\*

where xxxx is the number of the document entered with the store request.

It is possible for the operator to try to store a document with a number that is already being used. When this occurs, the computer will respond by typing:

UNACCEPTABLE NUMBER

and will disregard the request.

The number 0 and any increment of one hundred (100, 200, 300, etc.) are special numbers, and it is illegal to associate a document in storage with them. Should this be attempted, the computer will type:

UNACCEPTABLE NUMBER

and ignore the request. If two terminals attempt to store documents with the same document numbers at the same time, the system will type:

ALREADY STORED

If the message appears, the store request should be made again with a different document number.

It is sometimes necessary to guard important documents against accidental deletion or unauthorized retrieval. This is accomplished by entering a tab immediately after the last digit of the store request and then typing one to five characters followed by a carrier return (CR). One to four characters will guard against accidental deletion. Five characters will guard against unauthorized retrieval as well as deletion. An example of a store request with a lock word might be:

ATTN s 3305 TAB SW4M9 CR

The characters following the tab are called a "lock word". In addition to printing characters, tabs, spaces and backspaces may also be used (shifts will be ignored). If an attempt is made to retrieve a document with a five-character lock word, without entering the exact lock word in the GET request, or if an attempt is made to delete a document without giving the exact lock word whatever its length, the computer will respond by typing:

ILLEGAL ACTION

and disregard the request.

NOTE: Care must be taken in keeping an accurate record of these lock words. Obviously, if the lock word were lost, the document would remain in the file "forever" and deletion of it would not be possible.

Lock

is not the same as the four-character lock word

Lock

since the five-character example begins with a space.

GETTING TEXT FROM STORAGE

A document is retrieved from storage by a "get" request. This request causes the requested stored text to be copied into working storage. The permanently stored document is not deleted or altered.

The get request is:

ATTN g DIGIT(S) CR

where DIGIT(S) is the number of the document. It will cause the requested text to be copied into working storage. If the number given

corresponds to a document in storage, the computer will load the document into working storage and type:

xxxx UNITS "X" MODE (ident)

where xxxx is the number of lines and/or units, "X" is either an "A" or a "U", and (ident) is the document identification entered when the document was stored. The operator may then perform any desired operation as if the document had just been entered.

If the operator should inadvertently ask for a number that has not been used to store a document, the computer will type:

NONE

and disregard the request.

If a document was stored with a lock word one to four characters in length, the lock word does not have to be part of the get action. If, however, the lock word is five characters long, a tab must be entered after the "g DIGIT(s)" and be followed by the exact lock word. An example might be:

ATTN g 3305 TAB SW4M9 CR

If a document locked with a five-character lock word is referenced without giving the lock word or with an incorrect lock word, the computer will respond by typing:

ILLEGAL ACTION

and ignore the request.

Any document that is retrieved from permanent storage is attached to the end of whatever is in working storage. Therefore, it is usually a good idea to clear working storage and go on line again before retrieving a document.

When a document is retrieved, the mode the terminal is in is automatically set to whichever mode (automatic or uncontrolled) was in effect on the last line or unit of the document retrieved.

#### DELETING A DOCUMENT FROM STORAGE

To delete a document from storage, the request:

ATTN d DIGIT(S) CR

(where DIGIT(S) is the number of the document) may be used. The computer responds by typing the identification line entered with the document. This is done so the operator may be certain of purging the correct material. The delete procedure is then given as though deleting one line (ATTN CR). The computer will then type:

DOCUMENT xxxx \*\*DELETED\*\*

where xxxx is the number of the document. If the wrong document is mistakenly called for deletion, a CR should be keyed, and the document will remain unharmed.

If an attempt is made to delete a document by requesting an unassigned number, the computer will respond by typing:

NONE

and will disregard the request.

In order to delete a locked document, the exact lock word must be used. The request is made by typing:

ATTN d DIGIT(S) TAB LOCK-WORD CR

where DIGIT(S) is the number of the document, and LOCK-WORD is the exact code used to lock the document. This request might appear like this:

ATTN d 25 TAB =='?) CR

If the lock word is entered incorrectly, the computer will respond by typing:

ILLEGAL ACTION

and will disregard the request. If the lock word is exactly correct, however, the delete document procedure is the same as above.

## STORAGE REPORTS

### Storage Reports on a Terminal

So that obsolete material may be destroyed, it is necessary to keep a record of documents in storage. To aid in this procedure the request:

ATTN !g DIGIT(S) CR

where DIGIT(S) is zero or any increment of 100 (i.e., 100, 200, 300, 400, etc.), will cause the document number and identification line for every document associated with a number in that hundred digit range to be printed. For example the request:

ATTN !g 1000 CR

will cause the printing of the identifications for every document from 1001 through 1099. If an ATTN !g1000 CR action were given, the report might appear like this:

DOC	H-T	UNITS	DATE	TRM	IDENT	4/15/65
1007	3	37	3-04-65	0	System Configuration Price List	
1011	2	54	10-11-64	1	Davis, sets 12 through 17 for MRN	
1044	23	1134	4-14-65	10	Jacobsen, Chap. 10-14, oper. manual	
1065	5	122	12-25-64	39	Holtsberg, McClintock & Nail Memo	
1076	1	5	3-07-65	1	Haug & Sons, Financial Report	

TOTAL HALF-TRACKS FOR DOCUMENTS 1001-1099 = 34

DOC is the number that was given with the store action when the document was stored. H-T (half-tracks) is the amount of physical space that the document occupies in disk storage. No document may occupy more than 99 half-tracks. A half-track contains about 875 characters (keystrokes) of entered text. (This column is totaled so that a tally may be kept of the total amount of storage used.) DATE is the date that the document was stored. TRM is the number of the terminal that stored the document. The rest of the columns are self-explanatory.

Note that all documents, regardless of lock words, will be listed by the storage report. Lock words, of course, are not printed.

If a report of every document in permanent storage is desired, it may be requested by the action:

ATTN ! g0 TAB complete CR

where 0 is zero or any multiple of 100 at which a "complete" storage report should begin. The printout is the same as described above, except that every document after the starting number is listed.

If the only item of interest is the total amount of physical space used by the documents in each hundreds band, the following action may be used:

ATTN !g0 TAB total CR

where 0 is either zero or any other starting point, as discussed above. If no documents are found in any hundreds band, no line is printed for that band. If an ATTN !g0 TAB total CR action were given, portions of the report might appear like this:

DOC	CYLS	UNITS	DATE	TRM	IDENT	10-31-65
TOTAL	HALF-TRACKS	FOR DOCUMENTS	NUMBERED	0-99	=3	
TOTAL	HALF-TRACKS	FOR DOCUMENTS	NUMBERED	10-199	=1	
TOTAL	HALF-TRACKS	FOR DOCUMENTS	NUMBERED	20-299	=1	
TOTAL	HALF-TRACKS	FOR DOCUMENTS	NUMBERED	30-399	=1	
TOTAL HALF-TRACKS = 519						

#### Storage Reports On A High Speed Printer Or Tape

If it is desired to output a storage report on either a high speed printer or on a tape, the report can be requested only from terminal zero with the ATTN !g action. The information entered following the ATTN !g is the same as described above for a storage report on a terminal, except that a third item, "tape" or "print", is added to indicate the device on which the report should be written. Examples of ATTN !g actions that may be taken from terminal zero follow. As before "0" is zero or any multiple of 100 at which the report should begin.

ATTN ! g 0 TAB complete TAB print CR

ATTN ! g 0 TAB total TAB tape CR

ATTN ! g 0 TAB TAB print CR

The last action in the example above should write a storage report on documents 1 through 99 on the high speed printer.

#### USING PERMANENT STORAGE

Examples of the store, get, and delete document requests with a five-character lock word might appear as follows:

<u>Entry</u>	<u>Explanation</u>
<u>s</u> 507      Locks	Computer is requested to store document in working storage associated with number 507 and locked with the code word "Locks".
IDENT PLEASE:	This message is typed out by the computer and is a request for a line of information to identify the document.
COBOL Management Problems	This is the ident entered by the operator.
DOCUMENT 507 **STORED**	The computer verifies that storing has taken place.
<u>c</u> CLEARED	Working storage is cleared.
<u>u</u> UNCONTROLLED MODE	The request for the "u" mode puts the terminal back "on line".
<u>g</u> 507      Locks	The document is requested from permanent storage for corrections or a printout.
125 UNITS "A" MODE (COBOL Management Problems)	This message is typed by the computer to indicate that the document was retrieved, the length of the document and mode that was in effect on the last line or unit of the document, and its identification. The terminal's mode is automatically changed to agree with the mode of the document.
<u>d</u> 507      Locks	This is the request for deletion of the document from permanent storage.
COBOL Management Problems_	The ident line is typed out so that the operator may be certain that the proper document is being deleted. If it is, as in this example, the operator performs the delete operation (ATTN CR).

## HINTS ON STORING DOCUMENTS

A terminal operator should keep a log of the numbers, identifications, and lock words used to store documents. This procedure becomes more indispensable as the number of documents stored increases.

Because tab settings often change with each different document, it is wise to insert the position of the tab stops at a fixed location by storing a line indicating this information with the document. It has been found convenient to insert "t"s and dashes as the second line of a document to indicate tab stops. Such an insertion might appear as follows where the t's represent positions at which the tabs should be set:

```
il  
u  
-t---t---t---t---t---t---t---t---t
```

When the document is retrieved, the tabs can be reset on the typewriter and this information conveyed to the computer.

## STORAGE AND RETRIEVAL FROM TAPE

The storing of documents described above utilizes the disk storage attached to the computer. Though capable of holding hundreds of pages of text, their capacity is not infinite.

An alternate approach is possible involving storing and retrieving documents from magnetic tape instead of disk storage. The storage capacity of tape is virtually infinite, but the time to manipulate it is considerably longer than that associated with disk storage. Tape could very well be thought of as an archive. Documents not likely to be needed in the near future could be transferred to tape and the disk space occupied by them could then be made available for other more immediately important work. If the documents stored on tape are ever needed, retrieval with a delay of a few minutes is possible.

The transferring of documents between disk and tape always involves permanent storage, never working storage. To request a document to be written on tape, the operator must type:

ATTN t DIGIT(S) TAB tape CR

where DIGIT(S) designates the number in permanent storage of the document that is to be transferred to tape.

If the tape is loaded and available to the program, the designated document will be written out on tape. When finished, the system will type:

TRANSFERRED TO Xxxxx

where Xxxxx is the five-character tape number of the document and consists of a letter followed by four digits. The operator has no control over what tape number will be assigned by the system. It is important that an accurate record be kept of all documents transferred to tape since they cannot be retrieved except by referencing this system-assigned number. The action to transfer a document numbered 5413 to tape would be:

t5413            tape  
TRANSFERRED TO A0104

If the word TAPE is typed out at the terminal taking this action instead of the TRANSFERRED TO message, the transfer action should be repeated. If the TAPE message is repeated, the terminal operator should contact the computer console operator for assistance, since this message indicates repeated difficulty in writing on the magnetic tape.

To retrieve a document stored on tape, the operator again makes a transfer request. This request is of the form:

ATTN t TAB Xxxxx TAB DIGIT(S) CR

where Xxxxx designates the tape number of the desired document, and DIGIT(S) indicates the number in permanent storage to receive the tape document. If the tape number has never been assigned by the system or if there is already a document in permanent storage with the number entered, the system will type:

UNACCEPTABLE NUMBER

and ignore the request. If the word TAPE is typed out at the terminal, the request action should be repeated. If the TAPE message is repeated, the terminal operator should contact the computer console operator for assistance, since this message indicates repeated difficulty in reading the magnetic tape.

A request may be made from any terminal to transfer any document to tape. Lock words, if any, are transferred with the document. Since retrieval always involves writing the tape document into permanent storage, knowledge of the lock word is always required to gain access to confidential information (assuming that the lock word is five characters long). It is not possible to delete documents on tape except by actually destroying or erasing the tape.

Once the transfer from tape to permanent storage has taken place, the system will type:

TRANSMITTED

The operator is then free to manipulate the newly retrieved document in the same manner as any document stored in permanent storage.

The tape must be mounted and available to the program before either of these transfer actions can be honored. If this is not the case, the system will type:

READY TAPE

and ignore the request. The terminal operator should then contact the computer room and inform the computer operator that a tape transfer request is not being honored.

Upon receiving a request to mount a given reel, the computer operator should locate the reel requested and mount it on any available drive. Using terminal 0, the computer operator should convey the presence of the tape to the system by typing:

ATTN ! r X DIGIT CR

where X is the letter designator of the tape and DIGIT is the single-digit tape drive number where the X reel has been mounted. The system will read the tape on unit DIGIT, to verify that it is the tape specified. When the tape is identified as the correct one, the system will index the platen or upshift-downshift the printing element, depending on whether the terminal is in the automatic or uncontrolled mode. If it is not the tape indicated, the system will type:

ILLEGAL ACTION

When a drive is required for other purposes, the tape mounted can be made unavailable to the system by typing:

ATTN ! r X CR

where X is the letter designator for the tape which is to be demounted. If the tape indicated is on the system, the computer will give a rewind and unload command. If it does not recognize the X as valid, the system will type:

ILLEGAL ACTION

and ignore the request.

## MESSAGE TRANSMISSION

Any terminal may transmit its working storage to any other terminal and as many messages as desired to the same terminal. When the message is received, it is moved into the working storage of the receiving terminal. This does not occur automatically, but must be specifically requested by the receiving terminal. Because the message will be added to whatever is in working storage, it is a wise procedure to clear before receiving.

A message that is transmitted will remain waiting to be received indefinitely, not being lost, like working storage, overnight. It is possible to save working storage overnight by transmitting it to yourself.

### TRANSMITTING MESSAGES

After an operator is satisfied that a message is correct, it may be transmitted to any terminal by typing the request:

ATTN t DIGIT(S) CR

where DIGIT(S) is the one- or two-digit address of the receiving terminal. An individual transmit request must be made for every terminal which is to receive the message. When the computer receives this request, it responds by typing:

TRANSMITTED

### RECEIVING MESSAGES

Transmitted messages are queued in the computer until the receiving terminals request them. To inform the operator that there is a message waiting, the computer will attract the operator's attention by typing the word:

(MSG)

whenever it has control of the keyboard and before typing one of the following system messages:

(MSG) AUTOMATIC MODE

(MSG) UNCONTROLLED MODE

(MSG) SIGNAL WHEN READY

(MSG) CLEARED

(MSG) NEXT NUMBER -

The request to receive a message is:

ATTN m CR

A terminal must clear its working storage before taking the ATTN M action.

When the computer receives this request and there is a message waiting, it will respond by typing:

XXXX UNITS "X" MODE, FROM TERMINAL yy

where XXXX is the number of lines and/or units, "X" is either A or U, and yy is the terminal number of the sending terminal. Once in working storage, the message may be typed by entering one of the print requests. If rushed, however, the operator may call out the second line of the message (presumably an identification line) and decide whether the message needs immediate attention. If it does not, it can be stored with the standard store request and retrieved when convenient. If the operator requests a message when there is none, the computer will respond by typing:

NONE

### Summary of Terminal Messages

There are a number of messages that may be sent to the terminal by the system. The following summary lists the more common messages and what should be done when they occur.

<u>Message</u>	<u>Problem and Action</u>
GO On-LINE	When asking for computer assistance, this means that one of the two operation modes has not been entered. <u>Action:</u> Type: ATTN a CR, or ATTN u CR.
*** LINE CANCELLED	The last <u>line</u> of information entered has been <u>lost</u> due to a data transmission error. <u>Action:</u> Enter the last <u>line</u> again. This does not cancel the <u>entire</u> unit in Automatic mode. If there is a question as to what has been lost, ask for the next unit number by typing ATTN n. Then reference this unit by typing ATTN DIGIT(S) CR. This will show what is in the system.
END YOUR UNIT	When asking for computer assistance, this means that the unit of text that was being entered previously has not been ended properly. <u>Action:</u> In the uncontrolled mode, strike the Carrier Return Key once. In the automatic mode, strike the Carrier Return Key twice.
UNACCEPTABLE NUMBER	<ol style="list-style-type: none"><li>1. When setting the number of lines per page for printouts with an ATTN ! DIGIT(S) action, this means that the number is too large or too small. <u>Action:</u> Take the ATTN ! DIGIT(S) action again with a number between 5 and 999.</li><li>2. When making a bulk move or bulk erase, this means that one of the unit numbers entered was for a unit of text that is not in the system. <u>Action:</u> For a bulk move, enter the <u>units</u> to be moved again by typing ATTN DIGIT(S) TAB DIGIT(S) CR again.</li></ol>

The insert request remains in the system. For a bulk erase, enter the entire request again.

3. When attempting to store a document, this means that the document number specified has already been used.  
Action: Enter a new store request with a different number, or if the document in the terminal working storage is to replace the document in storage, make a delete request first.

#### LINE CANCELLED

1. When erasing characters by typing ATTN BKSP, this means that the backspacing has erased a Tab entered earlier.  
Action: Enter the last line again. This does not cancel the entire unit in the Automatic Mode.
2. When entering text to be inserted following an ATTN i request, this means that the unit of text being inserted was not ended before requesting further computer assistance.  
Action: Enter the last line of text being inserted again. This does not cancel the entire unit in the automatic mode. If there is a question as to what has been lost call out the unit number one higher than the unit number used in the ATTN i request by an ATTN DIGIT(S) request.

#### ILLEGAL ACTION

1. When attempting to request computer assistance, this means that form of the request was not proper.  
Action: Type a correct request. Read the proper section of this manual to determine what this should be.
2. When attempting to get or delete a stored document, this means that the lockword was not properly entered.  
Action: Type the request again, entering the lock word exactly as it was entered originally. All Keystrokes in a lock word, including the function keys -- shift, space and tab -- must be identical with those used when the lock word was entered.
3. When attempting to call out a unit with an ATTN DIGIT(S) request, this indicates that the unit is an attention request line.  
Action: If it is desired to examine the contents of an attention request line, type in insert request (ATTN i DIGITS). This will display the line. The insert request must then be cancelled by typing ATTN CR.

END OF STORAGE

1. When entering text, this means that the terminal's Working Storage is full.  
Action: Store the contents of the terminal working storage as a document in Permanent Storage with an ATTN s request. Any document this long should probably be divided into several shorter documents by getting copies from premanent storage, erasing different sections, and storing the pieces as separate documents.
2. When attempting to store a document, this means that permanent storage is full.  
Action: Notify the computer console operator at once. Documents will have to be deleted or transmitted to tape from some other terminal to make permanent storage available.

ALREADY STORED

When storing a document, this means that another terminal has at the same time made a store request with the same document number.  
Action: Type the entire store request again using a different document number.

## SYSTEM FAILURE

### TRANSMISSION ERRORS

Although unlikely, it is possible for text to be lost when transmitted between the terminal and the computer. If this should happen while the operator is entering text, the computer will type:

\*\*\*  
LINE CANCELED

following depression of either the Attention or Carrier Return key.

### KEYBOARD LOCK

Whenever the Carrier Return or Attention key is depressed, the typewriter keyboard locks. The computer will always unlock the keyboard instantly unless it has work to perform, in which case the operator may experience a short wait. It sometimes happens, however, that the character that the computer receives is garbled. If this is the case, the computer may not recognize the ATTN or CR characters, and therefore will not unlock the keyboard. The solution for this problem is to turn the terminal (or 1051 Control Unit) OFF for two or more seconds and back ON again waiting five or more seconds. This will unlock the keyboard. However, because of the incorrect character, the entire last line will be in error and cause problems later. For this reason, the delete action (ATTN CR) should be performed and the line or unit retyped.

### COMPUTER FAILURE

As mentioned above, the keyboard always locks whenever the Attention or Carrier Return key is depressed. Unless the computer has work to do for the terminal, it will immediately unlock the keyboard. However, it is possible for certain error conditions to arise within the computer and cause the entire system to halt. The symptom of computer failure at the terminal when entering text is the failure of the keyboard to unlock after either the Attention or Carrier Return Keys have been pressed. The Attention Key should always give an immediate underscore, except when signaling for a printout. If no underscore is received, it is usually because failure has occurred. When the carrier return is pressed with no attention action on that line, and the keyboard locks, or if an attention action is taking an extremely long time, computer failure is likely. When receiving text, if the printing element stops part way across the page when no stop code was entered, or if the element stops at the left margin for a long time, failure has probably occurred. In all the above situations, no response can be elicited from the computer.

When computer failure is suspected, it is wise to wait for a short time before attempting corrective action; frequently, after an Attention action, the delay is merely a momentary saturation of the computer with many attention actions. It is also possible that delays may occur while the system is generating text. Some failures can be corrected almost immediately in the computer itself. However, if after waiting, the system still does not respond, turn the terminal or (1051 Control Unit) off then back on again. This should unlock

the keyboard. If, upon pressing the Attention or Carrier Return Keys, the keyboard locks again, failure is almost certain.

While waiting for operation to be restored, conventional typing can be done on the terminal if the terminal is set to LOCAL (or the 1051 Control Unit is turned off).

If the IBM 1051 Control Unit is on and the terminal keyboard is locked when the system is returned to operation, the computer will type:

SYSTEM RESTART COMPLETE. INSPECT THE LAST LINE OR TAKE THE  
REPRINT ACTION AS APPROPRIATE.

The computer will save all entered characters except possibly the last line or unit. The ATTN n CR action should be taken to ascertain how much text was lost. The ATTN r CR action will cause type-out to begin at the top of the page that was being printed when failure occurred.

If the Control Unit is not on, the above message will not be received and the operator will not know when the system is restored. If the terminal is on but the typewriter keyboard is unlocked, characters will be randomly typed when the above message is sent. This will cause no problem other than possible annoyance to the operator.

#### SYSTEM SHUTDOWN

The system may be shut down by the operator at terminal 0 taking the following action when online in either the automatic or the uncontrolled mode:

ATTN ! s CR

If there is no work for any ATS program, the system will execute a clear action (see the section "Clearing Working Storage") for every terminal and print certain statistical information on terminal zero. If there are jobs pending for any program or if a terminal other than zero takes this action, the system will type:

ILLEGAL ACTION

and ignore the request.

Since this action clears all terminals automatically, operators wishing to save their work overnight should store their working storage (see "Storing a Document") into permanent storage before shutting off their terminal for the day.

## SPECIAL FEATURES

### KEYPUNCHING

It is possible to keypunch from the terminal. This is accomplished by transmitting working storage to terminal 99 with the request:

ATTN t 99 CR

Text to be punched should be entered in the uncontrolled mode in card format, one card per line. Beginning with the margin each character position corresponds to a card column. The tab key is analogous to the Skip key on a keypunch. See Figure 2 for a summary of keypunch conventions.

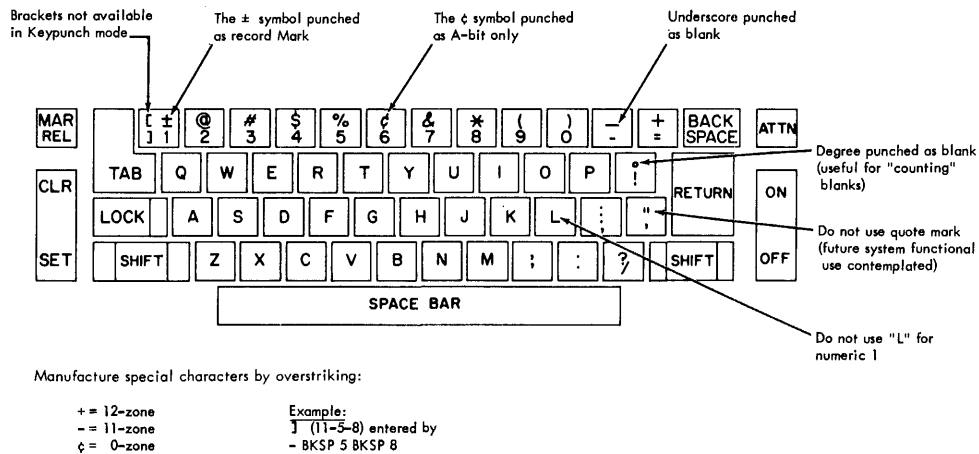


Figure 2. ATS keyboard conventions

Special characters, which are not on keyboard shown in figure 2, can be entered by overstriking as follows:

<u>Character</u>	<u>Card Code</u>	<u>Terminal Sequence</u>
Greater than (>)	6-8	6 BKSP 8
Tape mark (✓)	7-8	7 BKSP 8
Word separator (∨)	0-5-8	¢ BKSP 5 BKSP 8
Backward slash (\)	0-6-8	¢ BKSP 6 BKSP 8
Segment mark (++)	0-7-8	¢ BKSP 7 BKSP 8
Right bracket (])	11-5-8	- BKSP 5 BKSP 8
Delta (Δ)	11-7-8	- BKSP 7 BKSP 8
Left bracket ([)	12-5-8	& BKSP 5 BKSP 8
Less than (<)	12-6-8	& BKSP 6 BKSP 8
Groupmark (⌘)	12-7-8	& BKSP 7 BKSP 8

In general, to put a zone punch in any column, begin the punching for that column by the sequence:

<u>Zone Punch</u>	<u>Terminal Sequence</u>
0	¢ BKSP
11	- BKSP
12	& BKSP (+ BKSP may also be used)

Other zone and numeric punching with backspacing and overstriking for multiple punching should follow as required.

A special "program card" can be entered that will automatically define fields on the cards to be punched. This control card is entered in the Heading mode. It is possible to define fields (tab stops), sequence number, alter the left margin and duplicate with the program card. The entry of a program card might appear as follows:

```
u
UNCONTROLLED MODE
h
HEADING MODE
mssss-t-----t---t-----t-----t-----t-----dd
u
UNCONTROLLED MODE
```

The m signifies the margin of the card and indicates in which column punching will begin on each card. For example, if the information is to be punched beginning with the sixth column, five m's should be typed, in the first five character positions, as the first printing character of the control card. Such an indication would be entered as follows:

mmmmmm

The text may then be typed beginning at the left margin and will be moved so that the first character of every line falls in column 6. The margin request is optional; if it is not entered, the cards will be punched beginning with column 1. It is a good practice to reset the left margin stop to correspond with where the first columns are to be punched (position six in the above example) to avoid confusion.

The s indicates sequence number. The field described by the s's will contain a sequence number for every card punched. It is advisable to type the number 1 in the units position of the sequence field in the first card, or it will not be numbered. Numbering will begin on the second card with one plus the number in the first card.

The t's and -'s define fields on the cards. The t's should be set at the beginning of each field and the tab stops should be set to correspond. If a control card is not entered, or if the fields are not defined on the card, the position of the tab stops entered by the last ATTN ! action (see "Format Control" in the section "Entering Text") will be used.

The d's indicate that the information punched in the corresponding columns in the first card is to be duplicated into every card in the deck.

Once a program card has been set up for a particular card format it may be stored in permanent storage and retrieved each time it is needed. When typing a card deck all the normal correction and deletion procedures are available to the operator. Multiple control cards may be entered into the same document. Each control card applies to the cards which follow until superseded by a new control card.

An example of the entry of a card deck might appear as follows:

```
u
UNCONTROLLED MODE
h
HEADING MODE
ssss-t-----t---t-----t----- --dd
u
UNCONTROLLED MODE
0001 START      B      AT20   BRANCH TO START OF PROGRAM      01
                DCW    #3     TEMP STORAGE
                AT20    H      START  HALT
                END     START

t99
TRANSMITTED
```

These cards would be punched out in the following way:

```
0001 START      B      AT20   BRANCH TO START OF PROGRAM      01
0002            DCW    #3     TEMP STORAGE                    01
0003 AT20       H      START  HALT                            01
0004            END     START                                01
```

#### PRINTING WITH LINE NUMBERS

When making corrections with large documents it is often difficult to ascertain line numbers. In order to alleviate this problem it is possible to have the document printed on the computer's high-speed printer. This request may be made by the action:

ATTN t 98 CR

The resulting printout will be similar to an ATTN p0 request (see "Printing as Entered" in the section "Printing a Document") in that the original entry is duplicated including all ATTN a, u, h, f and + actions. The important exception is that the number of each unit is printed at the left-hand margin. The printout is obtained by the computer operator and routed to the terminal. The tab stop locations, stored in the computer for the terminal that makes this request will be used in printing the document.

#### TAPE OUTPUT

The standard procedure for assembling programs on most computers is to prestore the program deck on magnetic tape, and present the card images to the assembler in this form. This can be accomplished in ATS by punching a card deck (see "Keypunching" above) and then going card to tape. The unnecessary punching of cards can be avoided, however, by going directly to magnetic tape from working storage. The action:

ATTN t 97 CR

will cause BCD card images to be written out in 80-column format. The entry of the card images is the same as described in the section on keypunching, above. If a tapemark is desired at the end of a tape written in this manner, the last card-image record must have a tapemark in its first position. This is written from the terminal as "7 BKSP 8".

## UPPER- AND LOWERCASE CHAIN PRINTER OUTPUT

All output normally printed on the ATS terminal may be directed to the IBM 1403 Printer, Model 2, equipped with a special 120-character uppercase and lowercase chain. High quality output is produced by the chain when a special polyester film ribbon is used. This enables users with large volumes of text to be printed to use their terminals as input devices exclusively, receiving all their output on the high-speed printer.

To direct a document to the uppercase and lowercase chain printer, the operator should first ensure that all formatting parameters for the terminal are set properly. This means that the ATTN ! action should be used to convey the tab stop setting to the computer as well as the number of lines on a page (see "Format Control" in the section "Entering Text"). Further, the operator should actually make the ATTN p, ATTN j, ATTN pn, or ATTN jn request specifying the margin width for the printout. After the computer types SIGNAL WHEN READY, the operator should take the bksp attn action to abort the printout on the terminal. The document with its associated formatting information may then be sent to the uppercase and lowercase chain by the action:

ATTN t 96 CR

The printout will be obtained by the computer operator at his convenience.

In addition to all the characters on the normal Courier printing element, this chain also provides many special characters, which are shown in the table below. When the operator knows that the keystrokes being typed eventually will be printed on the uppercase and lowercase chain, the following multityped characters will be interpreted as a request for the special symbols as follows:

Type	Character	Graphic	Courier 72 Terminal Entry Sequence	Sample
Superscript	Superscript 0		0 BKSP* or °	0
	Superscript 1		1 BKSP*	1
	Superscript 2		2 BKSP*	2
	Superscript 3		3 BKSP*	3
	Superscript 4		4 BKSP*	4
	Superscript 5		5 BKSP*	5
	Superscript 6		6 BKSP*	6
	Superscript 7		7 BKSP*	7
	Superscript 8		8 BKSP*	8
	Superscript 9		9 BKSP*	9
Subscripts	Subscript 1		1 BKSP,	1
	Subscript 2		2 BKSP,	2
	Subscript 3		3 BKSP,	3
	Subscript n		n BnSP,	n
Box Drawing	Horizontal line		- BKSP° or °BKSP-	2
	Vertical line		/ BKSP°	7
	Crossed lines		+ BKSP°	4
	Upper left corner		[ BKSP,	1
	Upper right corner		] BKSP,	1
	Lower left corner		[ BKSP*	1
	Lower right corner		] BKSP*	2

Mathematical	Less than	( BKSP°	?
Relations	Less than or equal	( BKSP=	≤
	Greater than	) BKSP°	>
	Greater than or equal	) BKSP=	≥
	Not equal	/ BKSP=	≠
	Plus or minus	+ BKSP=	±
Miscellaneous	Up arrow	@ BKSP*	↑
	Left arrow	@ BKSP-	←
	High hyphen	- BKSP* .. *BKSP-	⚭
	Logical AND	& BKSP,	&
	Bullet	. BKSP°	•
	Numeral one	1 BKSP°	1
	Backward slash	/ BKSP-	↖
	Left brace	[ BKSP-	{
	Right brace	] BKSP-	}

This printout may be requested on a system with a normal print chain or train. In this case, all alphabetic characters will be uppercase. The digit 1 (lowercase L) will be printed as an uppercase L. Underscoring used with a normal print chain or train will cause the underscored characters to be overprinted with dollar signs. Characters that are not on the normal print chain may appear as some other character or may be blank.

#### SPECIAL PERIPHERAL OPTION

The standard procedure when going to a peripheral output device (that is, high-speed printer, card punch, or magnetic tape) is to transmit the document in the proper manner (see the first four subsections of this section, "Special Features") and then to store the document for future reference (see "Storing a Document"). The actual printing, punching, or writing of tape is accomplished by the computer operator at terminal zero with an attention action analogous to receiving a message (see "Receiving Messages" in the section "Message Transmission"). That is, typing:

ATTN m 99 CR

will cause any waiting messages for the card punch (Terminal 99) to be punched out;

ATTN m 98 CR

will cause waiting messages for the high-speed printer (Terminal 98) to be printed;

ATTN m 97 CR

will cause waiting messages for magnetic tape (Terminal 97) to be written out; and

ATTN m 96 CR

will cause waiting messages for the uppercase and lowercase chain to be printed.

After one peripheral operation is completed, the operator is free to accept messages for any other output device.

Although the above method works well, system performance can be improved by using an alternate procedure. After the terminal operator is satisfied that a document or program is ready to be transmitted to a peripheral device, it is stored. A short message is then transmitted to terminal zero stating where the document is stored, any lock word associated with it, to whom it belongs, and the peripheral device that is to be used. When the computer operator is ready to perform the peripheral operations, he collects all the waiting short messages with successive ATTN m actions (see "Receiving Messages" in the section "Message Transmission") and prints them out. After clearing and going back on line (see "Clearing Working Storage" and the first two subsections of "Entering Text") the operator gets a document from permanent storage (see "Getting Text from Storage" in the section "Storing a Document") and takes one of the following attention actions:

ATTN ! t 99 CR

for punching cards,

ATTN ! t 98 CR

for printing on the high-speed printer,

ATTN ! t 97 CR

for generating a magnetic tape, or

ATTN ! t 96 CR

for printing directly on the uppercase and lowercase chain printer.

After each operation is completed, the working storage of terminal zero is cleared automatically and the computer operator is free to go to the next document or program.

This alternate scheme is more efficient since the processing of messages is more time consuming than storing and getting documents from permanent storage.

In addition to being more efficient, this scheme gives great flexibility to the computer operator. The operator can see what work needs to be done and, thus, can better schedule his time. He also has complete control over the makeup of an assembly tape. Jobs for assembly can be written on tape according to priority by getting the programs from permanent storage in the proper sequence, inserting tapemarks in the appropriate places with the insert action, (see "Insertions" in the section "Correction Procedures"), and writing them out all at once.

Since the ATTN m99, m98, m97, m96 and ATTN !t99, !t98, !t97, and !t96 operations may be performed only when the various peripheral devices are ready to receive output, the computer operator must take them from terminal 0 (usually located adjacent to the computer). Should any terminal other than terminal 0 attempt these actions, the computer will type:

ILLEGAL ACTION

and ignore the request.

## INPUT FROM CARDS OR TAPE

Programs already punched on cards may be entered into the system through the card reader. Each card will be converted to internal SELECTRIC code. Tabs will be substituted for spaces where possible. After conversion the entire program will be stored in the working storage of terminal zero as though it had just been typed.

The program to be loaded should be preceded by a control card in exactly the same format as that used for keypunching. An s, indicating sequence number, in any column of the control card will force a blank in the corresponding column of the data cards. If the first card contains any characters other than those expected, the card-loading program will assume that no control card was included and will convert the card deck on substantially an 80-80 basis (no tabs). This deck, with or without a control card, should be loaded into the card reader followed by an end-of-file card (7-8 punch in Column 1) and two blank "pusher" cards so no reader hangup occurs. The Start key on the card Reader should be depressed to start the reader motor.

Terminal 0 should be placed on line in the uncontrolled mode. Reading and converting of the cards will take place when the following action is taken:

ATTN ! cd CR

where cd indicates card-to-disk. The deck will be read and loaded into the working storage of terminal zero. If a control card is included, it will be loaded as a Heading mode line as shown in the example in the section on keypunching. The MANIFOLD printing element will be assumed. Any special character encountered on a card which has no MANIFOLD equivalent will be converted to multicharacter overpunching in the same way that character would have been "keypunched" using the ATS terminal (for example, a group-mark would be converted to II BKSP 7). When the end-of-file card is read, the following message will be typed on terminal zero:

NEXT NUMBER -- xxxx

where xxxx is one more than the number of lines generated. If a control card is used, xxxx is four more than the number of cards read (the other three numbers are associated with the program-generated ATTN-u, ATTN-h, and ATTN-u lines "bracketing" the control card). If a control card is not used, xxxx is two more than the number of cards read.

After receiving the NEXT NUMBER message, the operator at terminal zero may store or transmit the converted program as though it had just been typed from a terminal (see the sections "Storing a Document" and "Message Transmission").

Input may alternatively be entered from a tape mounted on tape unit 1. Records should be unblocked and 80 or 84 characters long. Eighty-one character records containing a delta character as the first character are sometimes produced on the IBM 7070/7074 Data Processing System. These records are also acceptable. The delta character will be deleted and a 12 zone placed on Column 79 in the usual 7070/74 convention. An end-of-file mark should follow the last card. Reading and converting of the tape records will take place when the following action is taken:

ATTN ! td CR

where td indicates tape-to-disk. The deck will be read and loaded into the working storage of terminal zero. The only difference between this action and the cd action is that the card images are read from tape instead of from the card reader.

The importance of a control card in this operation should be emphasized. A control card with t's at the beginning of every field allows the program to substitute tab characters for multiple blank columns. This reduces the physical size of the document. Since the average card is 60 percent blank the space saved in disk storage using a control card is normally about 50 percent of the space used without it.

A special Document Mode is also provided for entry of test created by card images by other programs. It is described in the 1440/1460 Administrative Console System, Console Operator's Manual (H20-xxxx).

#### PERIPHERAL PROGRAM SELECTION

Concurrent with the operation of ATS terminals, the computer can simultaneously overlap many standard peripheral operations. These include card-to-tape and tape-to-printer functions. As many as three printers can be operated on the IBM 1460 Data Processing System. Card punching is possible, but introduces system delays.

A given installation may have several such peripheral programs stored in the ATS system. The operator at terminal 0 can load any one of them into core memory by typing:

ATTN ! p TAB NAME CR

where NAME is the name of the program as contained in the directory of programs loaded into the system at the time of installation.

No program is ever loaded automatically by the system. The action to load a disk dump program called DSKDM would appear as follows:

!p DSKDM

If the program is successfully loaded, the platen will index or the printing element will do an upshift-downshift, depending on whether the terminal is in the automatic or the uncontrolled mode.

This loading action may be taken at any time, but only at terminal zero. It does not affect the document being prepared at that terminal.

If the program name cannot be found in the internal directory, the system will type:

ILLEGAL ACTION

and ignore the request.

#### NUMBER OF USERS

For monitoring purposes, the number of active terminals at any moment may be found by the action:

ATTN ! u CR

The computer will respond by typing:

xx USERS

where xx is the number of terminals on line, including the requesting terminal.

## DESK COMPUTER

The ATS terminal may also be used as a desk computer. To do computing, the terminal operator must first clear his working storage and then go into the uncontrolled mode. Then, using any of the ATS correction features, all the numbers and formulas in the calculation are entered. When the result is to be found, the action:

ATTN ! c CR

will cause the computation to take place. (This action is analogous to actuating the Total key on an adding machine.)

One restriction on the use of the desk computer is that the "1" key and not the lowercase "L" must be used for the numeral one. For this reason, the Manifold or similar printing element should be used and the action ATTN ! 1 CR taken (see "Format Control" in the section "Entering Text"). If the operator should neglect to take the above action, the computer will type:

USE MANIFOLD FONT

and ignore the request.

Care must be taken that no BKSP ATTN or ATTN a, f, h, +, or stop code actions are entered while in the desk computer mode. Should any of the above actions be used, the system will type:

INVALID CHARACTER

and ignore the request. This message will also be printed if any tabs or backspaces are discovered in the characters entered.

## ENTERING NUMBERS

Numbers may be entered with or without decimal points and with the decimal point in any position. Thus, the numbers:

12  
.0005  
285769.3

may be added together and the computer will align the decimal point automatically.

The accumulator of the desk computer is nine digits long, and thus, the largest number of significant digits entered cannot exceed this amount. If the operator attempts a calculation with numbers exceeding nine significant digits, the computer will type:

INVALID FORMAT

and ignore the request.

Although a number nine digits long is quite large (approximately one billion), some calculations will require larger numbers. These very large numbers are entered by expressing the number multiplied by a power of ten. The size of the power of ten indicates the number of times the decimal point is to be shifted to the right. For example:

$$27567. \times 10^{\text{exp}(4)}$$

means that 4 zeros follow the number 27567, thus:

$$275670000$$

The ATS desk computer function uses the letter "E" to denote "times ten to the power". Thus:

$$275670000. = 27567E4$$

The highest number possible in the ATS desk computer is:

$$999999999. \times 10^{\text{exp}(999)}$$

This number would be typed as:

$$999999999E999$$

In addition to writing very large numbers as a number times a power of ten, very small numbers may be expressed as a number multiplied by a negative power of ten. (10 means 1/10) The size of the negative power of ten indicates the number of times the decimal point is to be shifted to the left. For example:

$$1 \times 10^{\text{exp}(-5)}$$

indicates that a decimal point and five zeros precede the "1":

$$.000001$$

This would also be typed in the "E" notation. Thus:

$$.000001 = .1E-5$$

The smallest number possible (other than zero) in the ATS desk computer is:

$$.000000001 \times 10^{\text{exp}(-999)}$$

This number would be typed as:

$$.000000001E-999$$

When working with numbers that are close to the limits of the system, it is possible to overflow the accumulator. If this should occur in either direction, the system will type:

OVERFLOW

and cease the calculation.

## ADDITION

The addition operation is indicated by either the plus sign or carrier return. Numbers in any acceptable notation may be added together using either addition indication mixed in the same computation. For example:

.001 + \3E-6 CR  
67 CR  
9765 CR

is an acceptable format.

## SUBTRACTION

The subtraction operation is indicated by the minus or dash key. Thus:

10 - 5

indicates 10 minus 5. In addition, the minus sign is used to express negative numbers. Thus, the above calculation could also be written:

-5 + 10

with the same result.

## MULTIPLICATION

The multiplication operation is indicated by the asterisk (upshift 8). Thus:

5\*10

means 5 times 10. Multiplication can also be implied by parentheses as described below.

## DIVISION

The division operation is indicated by the slash key. Thus:

10/2

means 10 divided by 2.

If an attempt is made to divide by zero, the system will type:

ZERO DIVISOR

and cease the calculation.

#### PRIORITY OF OPERATIONS

Calculations involving addition or subtraction and multiplication or division are handled in priority: multiplication and division first, then addition and subtraction. Thus, the calculation:

$$6+10*2$$

means 6 plus the quantity 10 times 2, and the calculation:

$$6-10/2$$

means 6 minus the quantity 10 divided by 2.

Multiple additions or subtractions and multiple multiplications and divisions are computed in order. Thus:

$$6*10/2*4$$

means 6 times 10, that quantity divided by 2, and that quantity multiplied by 4. The computed answer is 120.

#### PARENTHESES

When it is necessary to indicate a special priority of operations, expressions may be enclosed in parentheses. Thus:

$$(6*10)/(2*4)$$

means 6 times 10, that result divided by 2 times 4. The computed answer is 7.5.

Multiplication may be implied by parentheses. Thus:

$$2(10+5)$$

means 2 times 10-plus-5 and the result is 30. Multiplication may also be explicitly stated. The ATS desk computer will accept this format, and the above expression may be typed:

$$2*(10+5)$$

with the same result.

Nested parentheses may also be used. In this case the innermost expressions are evaluated first and then the outermost. For example, the calculation:

$$2((2+3)(4+7))$$

means 2 plus 3, that result times the total of 4 plus 7 and the resulting total times 2. The computed answer is 110. The maximum number of nested pairs of parentheses that may be used in a single expression is 40.

#### POWERS AND ROOTS

Powers are indicated by the single quote or prime. Thus:

$$3^4$$

means 3 to the fourth power and the result is 81.

Roots are indicated by the double quote or double prime. Thus:

$$27''^3$$

is the cube root of 27, which is 3.

A number may be raised to any integral power less than four digits in length or to any integral root less than 21. Fractional powers are expressed as follows:

$$(.0756'2)''^3$$

which means .0756 to the two-thirds power.

If an exponent in decimal fraction form is entered following the single or double quote mark or if the exponent is greater than the limits specified, the system will type:

INVALID EXPONENT

and ignore the request. The only valid exponents are integral variables or digits: exponents in parentheses or otherwise encumbered will be noted as invalid.

Powers and roots have priority over multiplication and division. Thus:

$$3^3/27''^3$$

means 3 cubed divided by the cube root of 27 and the result is 9.

Any number to the zero power is, by definition, equal to 1. Thus:

$$.007654^0$$

is equal to 1.

## FACTORIALS

In some calculations it is desirable to find factorials. (A factorial is a number times the number minus 1, times the number minus 2, etc., or  $N*(N-1)*(N-2)*\dots*1$ .) This operation is expressed using the exclamation mark. Thus:

$$4!$$

means 4 factorial and the result is 24.

This calculation is defined only for integral numbers and:

$$0!$$

is defined as equal to 1.

Like exponents, factorials have priority over multiplication and division. Thus:

$$24/4!$$

means 24 divided by 4 factorial and the result is 1.

## VARIABLES

In addition to computations with numbers, variables may also be used. A variable may be expressed as a single letter. This scheme will allow 26 variables to be used in a single computation.

All variables in an expression must be equated to a value. This value may be a number, another mathematical expression or another variable. Each variable is defined on a single line with the variable on the left. The definition of variable must always follow the expression where it is used. For example:

```
P((1+I/Q)^N)
X=Q*N
Q=4
N=1
P=100
I=.0485
```

The first line is the expression to be evaluated; this expression is a formula for finding the amount of money obtained with I interest compounded Q times a year for N years, given an initial principal of P.

NOTE: In every case the variable is defined after it is used in an expression.

In most computations of the above type, it is desirable to vary one or more of the variables to determine what happens to the value of the expression. This may be accomplished by typing the new value of the variable and taking the:

ATTN ! c CR

action again. The rule is that the last entered value of the variable is used in the computation. Thus, in the formula given above, the variable I (interest) might be varied by simply typing:

$$I = .049$$

and recomputing the problem. As many variables as desired may be varied in this manner. The last given value will be used in the calculation for each variable. The automatic clearing of the numbers entered is suppressed if any variable is entered or if any format error is recognized by the desk computer program.

If no definition of a variable is entered, the system will type:

X UNDEFINED

where X represents the letter designator of the first undefined variable. The operator may then equate that variable to a value and take the compute action again.

TABLE 1.

## OPERATIONAL REQUESTS

The following requests must be made when the carrier is at the left margin stop. Each request must end with Carrier Return.

<u>Mnemonic</u>	<u>Digit (s)</u> <u>Required</u>	<u>Meaning</u>	<u>Section Reference</u>
ATTN a	Optional	Automatic Mode	Entering Text
ATTN as	Optional	Automatic Mode - Suppress space between paragraphs	Entering Text
ATTN c	No	Clear Working Storage	Clearing Working Storage
ATTN d	Yes*	Delete Stored Document	Storing a Document
ATTN e	Yes	Erase Line(s) and/or Unit(s)	Correction Procedures
ATTN f	No	Footing Mode	Special Modes
ATTN g	Yes*	Get Document from Storage	Storing a Document
ATTN h	No	Heading Mode	Special Modes
ATTN i	Yes	Insert	Correction Procedures
ATTN j	Optional	Justify	Printing a Document
ATTN jn	Optional	Justify with Unit Numbers	Printing a Document
ATTN m	No**	Message	Message Transmission
ATTN n	No	Next Line or Unit Number	Correction Procedures
ATTN p	Optional	Print	Printing a Document
ATTN p0	No	Print as Entered	Printing a Document
ATTN pn	Optional	Print with Unit Numbers	Printing a Document
ATTN r	No	Reprint Page	Printing a Document
ATTN s	Yes***	Store	Storing a Document
ATTN t	Yes	Transmit Message	Message Transmission
ATTN t	Yes and No	Transfer Document to/from Tape	Storing a Document
ATTN u	Optional	Uncontrolled Mode	Entering Text
ATTN uc	Optional	Line Centering Mode	Special Modes
ATTN +	Yes	Additional Lines	Entering Text
ATTN	Yes	Reference to Previous Line/Unit	Correction Procedures
ATTN !		See Table 2	

The following requests may be made anywhere on the line, not necessarily at the left margin stop:

<u>Action</u>	<u>Meaning</u>	<u>Section Reference</u>
ATTN CARRIER RETURN	Delete Line or Unit	Correction Procedures
ATTN BACKSPACE(S)	Erase Character(s)	Correction Procedures
ATTN ATTN "CHARACTER"	Stop Code****	Stop Codes

\* In addition to the digits, a special "lock code" might be required.

\*\* Terminal zero is permitted to key digits to identify the output device for which a message is desired.

\*\*\* In addition to the digits, at least ten characters are required to identify the document. A special "lock code" is optional.

\*\*\*\* In the Heading and Footing modes this action is interpreted as a request for page numbering.

TABLE 2.

## ATTENTION EXCLAMATION ACTIONS

<u>Mnemonic</u>	<u>Meaning</u>	<u>Section Reference</u>
ATTN ! c	Compute	Desk Computer
ATTN ! f	Form letter Mode	Special Modes
ATTN !g	Storage Report	Storing a Document - Storage Reports
ATTN ! l	Type Element Identification	Entering Text - Format Control
ATTN ! DIGITS	Number of Lines on a Page	Entering Text - Format Control
ATTN ! -t--t	Tab Rack Setting	Entering Text - Format Control
ATTN ! u	Number of Users	Special Features
The following actions may only be taken from terminal zero.		
ATTN ! cd	Card to Disk or	Special Features - Input from Cards or Tape
ATTN ! cd	Tape to Disk	
ATTN ! p TAB Name	Peripheral Program Request	Special Features
ATTN ! r	Reel Mounting and Demounting	Storing a Document - Storage and Retrieval from Tape
ATTN ! s	Shutdown ATS System	System Shutdown
ATTN ! t96	Transmit to Upper/ Lower Case Chain Direct	Special Features - Special Peripheral Option
ATTN ! t97	Transmit to Tape Direct	Special Features - Special Peripheral Option
ATTN ! t98	Transmit to Printer Direct	Special Features - Special Peripheral Option
ATTN ! t99	Transmit to Punch Direct	Special Features - Special Peripheral Option



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