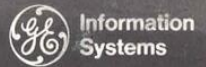


Mark I
Time-Sharing Service

Reference Manual



Time-Sharing
Service

Command System

GENERAL  ELECTRIC

INFORMATION SERVICE DEPARTMENT

Command System

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INFORMATION SYSTEMS

GENERAL  **ELECTRIC**

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Introduction

The General Electric Time-Sharing Service is a new concept in computer service. Time-Sharing, or the simultaneous access to a central computer system from many remote locations, is ideally suited for the rapid solution of problems, and for program updating and editing. Some additional benefits of time-sharing are:

- The effectiveness of members of your organization can be increased by giving them immediate access to a computer.
- You gain added efficiency and convenience by placing sending/receiving consoles right in the work area.
- Greater efficiency can be gained by utilizing additional office consoles as your requirements increase.
- Even if you have never used a computer before, you can quickly learn the user-oriented BASIC* language.
- FORTRAN and ALGOL are available for scientific computations.
- Since you create, edit, debug, update, and store your programs right at the console, the system lends itself to easy development of new programs and applications.
- You expand program use and reduce programming effort and file maintenance, since users in your organization can store and retrieve common programs and information.
- You can develop additional applications from the common programs available to all systems users.
- Your computing costs are greatly reduced because the system facilities are shared by other users.

*Developed by Dartmouth College

1. Using the Service

ACCESSING THE SYSTEM

The General Electric Time-Sharing Service is remarkably easy to use. To connect your teletypewriter to the system, press the ORIG key. You will then hear a dial tone. Dial your time-sharing telephone number. The telephone will ring only until you make contact with the computer. Then you will hear a beep and the message GE TIME-SHARING SERVICE will print on one line and the time and date on another line¹. After you have responded correctly to each system request the computer will print READY. Each response or input line must be terminated by a carriage return. A typical introductory conversation between you and the computer is illustrated below. (The answerback number is not shown.)

```
GE TIME-SHARING SERVICE

ON AT 10:03  W1  12/11/68

USER NUMBER--XXXXXX
PROJECT ID--ANY 18 CHARACTERS
SYSTEM--FORTRAN
NEW OR OLD--OLD
OLD FILE NAME--CAILOG***

READY
LIST
```

Sample Introductory Conversation.

In the illustration, and in succeeding examples, the underlining identifies the words that you type; the non-underlined words are typed by the time-sharing system². In addition, throughout this manual, system commands, requests, responses, and teletypewriter keys are identified by capital letters. A glossary of time-sharing terms is included in the Appendix.

If you wish to use a program/file which you had previously saved in the system, simply indicate OLD in answer to the system request NEW OR OLD. Give the name of the saved file when requested, and the computer will retrieve it. If you wish to enter an entirely new file simply type NEW and give the new name when requested.

¹ Sometimes a line is printed before the GE Time-Sharing Service line. This is part of the sign-on message and contains important user information.

² The system will request a Project Identification if you indicate to your General Electric Representative that you want this option. The Project Identification is then printed on your billing invoice along with all changes accumulated under that Project Identification number. Any 18 printable characters may be used for your number.

ENTERING YOUR PROGRAM

A program consists of statements (lines) each beginning with a line number. Line numbers may be a maximum of 5 digits and may be separated by one or more spaces from the rest of the statement. For example, in the statement 230 READ D(J,3),D(J,2) the number 230 is the line number.

The system always edits the program before responding to the system commands LIST, RUN, or SAVE and sorts the lines in sequence according to the numerical value of the line numbers.

Typing your own line numbers makes it easy and convenient to insert new lines in the program, to delete unnecessary lines, or to correct lines simply by retyping them. If your original sequence of line numbers is by an increment greater than one (e.g., 10) then you can insert new lines simply by giving intermediate line number values to the lines you wish to insert. For example, if the original sequence reads 10, 20, 30, 40, etc., and you wish to insert new lines between 30 and 40 and between 50 and 60, you can add 32 and 52. In addition, automatic renumbering is available (see RESEQUENCE). You can delete lines simply by typing the line number followed by a carriage return.

A program cannot contain more than 6144 characters or 256 lines. A line cannot contain more than 81 characters including the carriage return. When more than 256 lines are entered, the last 256 lines are retained while the first lines will be lost.

When the program has been entered, simply type the command RUN (without a line number) to cause the system to compile your source program, run it, and type out the answer. After your program has completed its run, the message USED XXXXX.XX UNITS types out (where XXXXX.XX is the number of seconds of CPU time used to the nearest 1/6 of a second).

SIGNING OFF

You will be disconnected from the system if you do not establish a valid user number within approximately one minute or, after accessing a program, you have been in idle status for ten minutes. After 9 minutes the system will trigger a warning bell in your terminal to notify you that your terminal will be disconnected within 1 more minute. When you are disconnected from the system, the message OFF AT XX:XX ELAPSED TERMINAL TIME = n MIN. types out (where XX:XX is the time of day).

When you type the system commands BYE or GOODBYE, the teletypewriter shuts itself off. You should not disconnect from the system by depressing the CLR key. Chapter 4 presents a detailed discussion covering the operation of the teletypewriter.

BUSY SIGNALS

A circuit overload occurs when all the telephone trunk lines are in use. The signal for an overload of this type is a sound similar to an ordinary telephone busy signal.

If you should encounter a circuit overload while dialing the General Electric Time-Sharing Service take the following action:

1. Use the telephone on the right-hand side of the teletypewriter to dial the telephone operator.
2. When she answers give her the number you are trying to dial and explain that she must disconnect from the line prior to the ring.
3. As soon as you hear the ring push the ORIG button on the teletypewriter and hang-up the telephone receiver.
4. If the telephone operator cannot get a ring by using this method then one of two problems exist:
 - a. both primary and secondary telephone trunks are being used.
 - b. all available ports on the computer are in use.

In either case you should try again within a few minutes.

2. Major Service Features

The major service features provided by time-sharing include: file security, programming languages, service library, shared programs capability, and graphic representation.

File security is maintained by user numbers and unique file names.

USER NUMBERS

The primary element of user security within the time-sharing system is the user number. User numbers are composed of one alphabetic character, followed by five numeric digits. The alphabetic character identifies the system. The two high-order digits identify the catalog, while the three low-order digits divide the catalog into subcatalogs.

Users associated with one catalog cannot access files listed in another catalog. Programs and data files (except when shared within a catalog) cannot be accessed through another user number in the same catalog. (See Shared Programs.)

User numbers are valid only when used with specific terminals. For detailed information concerning user number validation please consult your General Electric Representative.

FILE NAMES

Files stored in the file system are identified by unique names. These names are limited to a maximum of six characters in length. The first character must be alphabetic. The remaining characters, however, may be any combination of alphabetic or numeric characters. (See Shared Programs for special purpose characters.)

Files, however, cannot be named HEK, HEL, STN, STO, HELLO, STOP, or S because these words are interpreted as system commands.

TIME-SHARING LANGUAGES

Three programming languages, BASIC, FORTRAN, and ALGOL, are available. These languages are fast, requiring typically one to four seconds for the compilation and execution of a program. Because of this speed and because of the speed with which file changes are made, the program is recompiled at each run. Thus, no special debugging is required, and program development is straightforward and rapid. In addition, these languages permit interaction by the user with his program as it is being executed: not only can you obtain results printed by your teletypewriter, but by using on-line input statements you can read-in values of integers and floating point numbers to control the course of the program execution.

In the following example the same statement is written once in each of the three languages.

in BASIC,

```
100 INPUT I, Y(I)
```

in ALGOL,

```
100 READATA (TELETYPE, I, Y(I))
```

or in FORTRAN,

```
100 INPUT, I, Y(I)
```

Each statement, however, causes a question mark to be printed when the input statement is executed. The system then waits for a list to be typed equal in length to the specified list (in the above example, two numbers) terminated by a carriage return. Additional information about the three languages follows.

1. BASIC is an elementary algebraic language developed specifically for use with the General Electric Time-Sharing Service. Easy to learn and to use, BASIC can be applied to a variety of scientific and business problems. Refer to the BASIC Language Reference Manual, 202026, for complete instructions in the use of the language.
2. FORTRAN, standing for FORMula TRANslation, is a mathematically oriented computer language familiar to most engineers and scientists. Time-Sharing FORTRAN is especially adapted for remote terminal use. Refer to the Time-Sharing FORTRAN Reference Manual, 206046 for detailed programming information.
3. Time-Sharing ALGOL is a mathematical programming language useful for engineering and scientific calculations. Based on ALGOL 60, it meets the specific requirements of time-sharing. For programming instructions see the Time-Sharing ALGOL, Reference Manual, 706204.

For additional information about ALGOL consult any of the following:

- C. Anderson, An Introduction to ALGOL 60, Addison-Wesley (Reading, Mass., 1964)
 - F. L. Bauer and K. Samuelson, An Introduction to ALGOL, Prentice Hall (New York, 1965)
 - E. W. Dijkstra, A Primer of ALGOL 60 Programming, Academic Press
 - D. McCracken, A Guide to ALGOL Programming, Wiley (New York, 1962)
 - H. Bottenbruch, Structure and Use of ALGOL, Prentice Hall (New York, 1965)
 - M. Woodger, An Introduction to ALGOL 60, Computer Journal, July 1960
4. For a detailed description of the editing commands refer to the Time-Sharing Editing Commands, Reference Manual, 708209A.

SERVICE LIBRARY

As a user of the General Electric Time-Sharing Service you have at your fingertips an extensive library of programs available within seconds. The file, CATLOG, contains a complete index to Time-Sharing library programs.

The terms under which library programs are made available to subscribers may vary between programs, or they may vary with a given program from time to time. General Electric reserves the right to change these terms at its discretion. Any questions regarding use of library programs should be directed to your General Electric Representative.

To use a library program you select the program you wish, type the program name suffixed by three asterisks, e.g., CIRCLE***, and the system retrieves the program from the library. It is important to include the asterisks as they instruct the system to look for the program in

the system library rather than under your user number. Library programs are classified as follows:

On-Line Library Programs

On-line library programs can be accessed from any terminal that is connected to the system. The criteria for placing a library program on-line are its general utility and frequency of use. Unless classified as run-only (see below) on-line programs can be listed, modified, copied, or run at the discretion of the user.

Off-Line Library Programs

The off-line library consists of programs not in general demand. An index to the listings of off-line programs can be obtained by listing the library file CATOFF.

Off-line library programs are available for direct placement in your user catalog on request from your General Electric Representative.

Shared Files

You may find it desirable to share programs and/or data files within your subscription. You can do this by using an asterisk as the sixth character of the name of the file to be shared.

A shared file, however, can be replaced, edited, or otherwise altered only by the person under whose user number the file is saved.

Run-Only Programs

Another type of shared program is the run-only program. These programs cannot be permanently modified by the user but can be run by anyone having access to the catalog in which these programs reside. Run-only programs are identified by a dollar sign (\$) in the sixth character position of the program name. It is possible to have run-only programs in either the on-line or the off-line library.

Run-only programs cannot be listed, renamed, saved or used as data files. However, when new lines are inserted into a temporary copy of a run-only program the dollar sign (\$) cannot be used as a character.

TUTØR Library Programs

TUTØR¹ is the name of a group of library programs that teach BASIC programming through the use of the Time-Sharing system. The computer first explains a group of system commands or BASIC instructions, then gives you a quiz to determine if you have learned the lesson. Use the following sequence of commands to obtain the first TUTØR lesson. (This assumes that you have already dialed the computer and supplied your user number and your Project Identification, if you request this option.)

```
SYSTEM--BASIC
NEW ØR ØLD--ØLD
ØLD FILE NAME--TUTO15***
READY
RUN
```

The TUTØR series consists of programs TUT01\$ through TUT35\$.

DATA STORAGE MODE

Data Storage Mode (DSM) permits you to build data files without line numbers. Data may be entered from paper tape or from the keyboard. This mode may be entered by typing DSM after the READY which follows the file name. If data is to be entered from paper tape, however, you must type TAPE before entering DSM. The BREAK key or the Control/Shift/P must be used to exit this mode of operation.

¹ © Ford Motor Company

A data file created in the DSM mode can be read by a FORTRAN program using standard \$FILE or \$DATA statements. A file that has been created without line numbers can be changed by EDID MERGE and the EDIT string functions only. Since this can only be done out of DSM you must exit the DSM mode before using the Edit feature. Any commands issued while in DSM are treated as data.

Here are two examples that illustrate creating a new DSM file and appending an old DSM file.

Creating a New File

```
NEW (R)
NEW FILE NAME--JOHN (R)
READY
DSM (R)
READY
ABCDEF (R)
123456 (R)
U19840 (R)
(B)
STOP
READY
SAVD (R)
READY
```

Appending an Old File

```
OLD (R)
OLD FILE NAME--JOHN (R)
READY
DSM (R)
READY
XYZ124 (R)
(B)
STOP
READY
SAVD (R)
READY
```

In the above examples: Underscores indicate information you enter, (R) represents Carriage Return, and (B) represents BREAK. Note, that SAVD must be used to save the file. In extending a file, newly-provided data lines are not sequenced in any way, but are stored following the last line of data already in the file. The LIRD command must be used to list a DSM file. Using the normal LIST or SAVE commands will destroy your DSM file. When using Edit commands or string functions on a DSM File, EDID must be typed rather than EDIT. Using the normal EDIT command will destroy the DSM File.

SYSTEM INFORMATION

Three files INFORM***, ASSIST***, and STATUS*** are used to inform you of all improvements to the service. These improvements may include new programs, advance documentation, new commands, courses being offered, new telephone numbers, personnel changes, disc purge scheduling, etc. You may access these files at any time by responding to OLD FILE NAME with the name of the file. The files should only be LISTed.

INFORM*** -- A product-oriented, business-wide "bulletin board."

STATUS*** -- A local operations "bulletin board."

ASSIST*** -- A list of customer services and assistance available at the center.

Whenever INFORM***, ASSIST***, and STATUS***, are updated you are advised through the Sign-On message.

Since these files contain essential information you will find it profitable to have a current copy of each posted near your teletypewriter.

PLOTTERS AND PLOTTING ROUTINES

A plotter and related plotting routines expand further the GE Time-Sharing service making graphic displays of data possible. (A CalComp plotter or similar device may be used.)

It is easy to make graphs and charts in this manner. Simply enter your Time-Sharing FORTRAN program via the teletypewriter. Type PLOT. When the computer types READY, you type RUN. Seconds later your graph will start to form on the plotter paper. If it should be necessary to interrupt the plot simply press the BREAK key.

Complete instructions for using the Plot feature are contained in Time-Sharing FORTRAN Plotting Routines: Reference Manual, 708205.

3. Communicating with the System

Communication between you and the time-sharing system is established and controlled through:

- System Commands
- System Requests For Information
- User Responses To System Requests
- System Messages

SYSTEM COMMANDS

System commands direct the over-all system to carry out the specific actions which you request, e.g., RUN, STOP, CATALOG, SAVE, LIST.

In general, most commands are acknowledged by the word READY when the system is ready for a new command. Some exceptions are LIST, RUN, and normal line entries, which are acknowledged by a line feed. If the system is busy, it types WAIT before READY. If you are uncertain about the state of your program you can inquire by typing STATUS.

In case of typing errors, you can always delete a complete line by striking the ALT-MODE key (shown as ESC, for Escape, or control X on some teletypewriters), or you can delete the last few characters by depressing the SHIFT key and striking the key marked (←) once for each character to be deleted.

The system commands that are presently available are described below. For ease of use, these commands are summarized and listed alphabetically in Appendix A.

BREAK (key)
Control/SHIFT/P (key)
STOP

These commands cause the system to terminate execution of the command in process.

The BREAK key functions at any time. However, it also causes the keyboard to lock up; it must be reset by depressing the Break Release (BRK-RLS) button.

Control/SHIFT/P, which is accomplished by depressing the Control (CTRL) and SHIFT keys and striking the P key, also transmits a "break" signal to the system without the inconvenience of locking the keyboard.

The STOP command is effective only when no teletypewriter output sequence is in process. If entered in response to a call for teletypewriter input, it will terminate the run.

RETURN (key)

The RETURN (Carriage Return) key terminates a line of input,

and causes the system to interpret and act upon the input entered.

RUN

The RUN command causes the current program to be compiled (translated into computer instructions) and executed. During execution, the results of PRINT statements will be printed by your teletypewriter.

Execution of a RUN command is terminated either by completion of the program or by your issuing one of the execution-termination commands (BREAK, Control/SHIFT/P, STOP, or S.)

During the execution of a RUN command, the system will still respond to the STATUS, TTY, TAPE, and KEY commands; as well as the execution-termination commands.

SYSTEM

Use this command to indicate that you want to change the computer language. After the computer responds with NEW SYSTEM NAME, you simply type the name of the language you wish to use.

NEW

As a response to NEW OR OLD or as an initiating command tells the system to prepare to accept a new file. The system responds by asking for a name for the new file (NEW FILE NAME). A new file is one for which you must supply a name and the necessary program statements. If the name you select is already entered in your catalog the FILE ALREADY SAVED message prints out. You must select another name for this file if you intend to save it without losing the file already saved under that name.

OLD

As a response to NEW OR OLD--or as an initiating command tells the system to prepare to retrieve a saved file. The system responds by asking for the name of the old file (OLD FILE NAME).

SCRATCH

The SCRATCH command causes the system to release the temporary copy of the current file. The current file name remains in effect, and any permanent copy of the file in the file system is not affected.

RENAME

This command is used to change the name of your temporary file. When you type RENAME the system responds with NEW FILE NAME. At this point you type your new file name. If your new file name is already in your catalog the FILE ALREADY SAVED message prints out. In order to save this file without losing the one already saved under that name you must select another file name.

SAVE

SAVE is used to store the current temporary copy of a file in the file system and to reflect in your catalog where the file is stored. If the current file name already appears in your catalog the current file replaces the old file saved under the same name.

SAVD

Used to save a DSM file.

UNSAVE

UNSAVE removes the current file name from your catalog of permanent (saved) files, and releases the file system storage occupied by the file.

To minimize the file system storage assigned to you, you should unsave files whenever they are no longer needed.

L may be a single line number (100) or a pair of line numbers separated by a dash (100-150). A single line number causes only that line to be deleted. A pair of line numbers separated by a dash causes that entire range of line numbers to be deleted including the specified pair. Line numbers specified for deletion do not have to appear in the order that they appear in the file.

Only the temporary copy of the permanent file is selectively deleted. A subsequent SAVE is necessary if the permanent file is also to be changed.

The following is an example of a valid EDIT DELETE command:

```
EDIT DELETE 100-200,0-50,275,400-99999
```

The following command is invalid because of overlap of ranged pairs, and because a single line number appears implicitly within a ranged pair:

```
EDIT DELETE 50-100,85-250,175
```

A carriage return (RETURN) terminates the command entry, and initiates processing of the command.

EDIT EXTRACT

EDIT EXTRACT is the complement of the EDITDELETE command in that it retains the referenced portion of the temporary file and deletes the balance. Comments about DELETE are applicable to EXTRACT.

```
EDIT EXTRACT L1,L2,L3, . . . ,LN
```

EDIT LIST

When accompanied by file line references, this command permits selective listing of your current file. The ground rules for the use of line numbers with this command are identical to those associated with the EDIT DELETE and EDIT EXTRACT commands. Use of EDIT LIST has no effect upon the content of the current file.

```
EDIT LIST L1,L2,L3, . . . LN
```

EDIT RESEQUENCE

This command permits you to renumber the lines of the current temporary file by the specific increment you choose. In addition, if the file is a BASIC program, this command will cause all internal line number references to be replaced with the resequenced line numbers.

```
EDIT RESEQUENCE N,L,I
```

where N = new line number to be assigned to the line with which resequencing is to begin,

L = old line number with which resequencing is to begin,
and

I = incremental value (the numeric difference between line numbers).

If I, N, and L are not specified, the system will begin resequencing at the first line of the file with a starting resequence number of 100 and increment by 10.

When present, however, N, L and I must be separated by commas. No blanks are permitted except between EDIT, RESEQUENCE, and N.

If you wish to resequence a permanent file, you must first make that file the current temporary file.

EDIT WEAVE

This command permits you to combine two or more saved files into a single temporary file. To do this you must specify the names of the files to be interlaced.

```
EDIT WEAVE NAME1, NAME2, NAME3 . . . . .
```

where NAME1, NAME 2, NAME3

designate the file names.

File names can appear in any order since the files are processed in the named order. All file lines are sorted in ascending line number order, and all duplicated line numbers are deleted. The resultant file becomes the current temporary file, appearing in the command.

You can combine up to nine saved files in this manner, but be careful not to exceed the 6144 character limit or the 256 line file length limit.

EDIT MERGE

From two to nine saved files can be merged within a primary file without affecting the saved files. However, the same size limitations apply as described in EDIT WEAVE. After you have merged the files you should list the new version to insure that the merging was executed correctly.

To save a merged file, while preserving the original, you must rename the merged file.

```
EDIT MERGE, FILE, NAME1, NAME2, NAME3, . . .
      or FILE, NAME1, N1, NAME2, N2, . . .
```

FILE represents the primary file, and NAME1, NAME2, etc., represent the files to be merged into this primary file. N1, N2, etc., represent line numbers in the primary file after which NAME1, NAME2, etc., are to be inserted. File names and line numbers must be separated by commas.

EDIT MERGE resequences the merged files by increments of 10 starting with 100. All files are merged in the order specified in the command. Insert line numbers are optional. If they are omitted from the command, the designated files are sequentially inserted after the last line of the primary file.

LENGTH

This command prints the approximate length of your temporary file using the following format: ABOUT xxxx CHARS.

STATUS

This command causes the system to print your present status with respect to the system, i.e., idle, run, old, list, save, etc.

TTY

The TTY command causes the system to print the DATANET-30 channel number to which you are connected, your user number, your problem name, your current compiler (system) name, and your status.

TAPE	TAPE informs the system that the file should be read from the paper tape and not from the keyboard. The system normally acknowledges receipt of each line of input by transmitting back a line feed in response to each RETURN character. This is suppressed in the TAPE input mode to avoid fouling the printing.
KEY	System command KEY resets teletypewriter operation to the KEY input mode. This command is used to exit the TAPE mode.
PLOT	Prepares system to output plotter data from your program.
DSM	Allows entering lines of data without line numbers.

SYSTEM REQUESTS FOR INFORMATION

The following system requests are depicted as you would see them at your teletypewriter.

USER NUMBER	This is a request for you to enter the six-character user number which uniquely identifies you to the time-sharing system. This request is made each time a new user requests to use the time-sharing system.
PROJECT IDENTIFICATION	This is a request for the 18 character word or title, which is saved by the System and is billed with all charges incurred during this System Access. The billing invoice, at the end of each month, will contain charges broken down by your Project Id, for your ease in internal accounting.
SYSTEM	This is a request to enter the name of the programming language you wish to use. This request is usually made after your user number has been entered into the system. Valid responses are listed elsewhere in this section.
NEW OR OLD	NEW OR OLD requests you to specify whether you want to enter a new file into the system (in this case respond with NEW), or whether you want the system to retrieve a previously saved file (in this case respond with OLD).
NEW FILE NAME	This request that you type the name of the new file which you are about to create.
OLD FILE NAME	This request that you type the name of the saved file that you desire to access.
NEW SYSTEM NAME	It is a request to type the name of the new programming language you wish to use. This request is made in response to the entry of the SYSTEM command, indicating that you want to change the compiler language being used.
?	The question mark is used by the system to indicate that your running program requires input from the teletypewriter at this time.
MORE?	This indicates that the edit processor requires more information to complete the task implied by an edit command already issued.
WHAT?	The system did not understand the last input line and requires clarification.

RESPONSES TO SYSTEM REQUESTS

In the following discussion, verbatim responses are shown in upper case, while symbolic indications of responses are shown in lower case.

ALGOL	This response is made to the system request SYSTEM or NEW SYSTEM NAME when you want to use ALGOL.
BASIC	BASIC is the response made to the system request SYSTEM or NEW SYSTEM NAME when you want to use the BASIC compiler.
CATALOG***	This response should be made to the system request OLD FILE NAME when you want a list of the files in the program library. CATALOG*** is the name of a file in the program library which contains a directory of the files in the library. After you have entered CATALOG*** and the system has responded with READY, a LIST command must be given to cause the directory to be printed.
FORTRAN	The response FORTRAN is made to the system request SYSTEM or NEW SYSTEM NAME when you want to use FORTRAN.
NEW	The response NEW is made to the system request NEW OR OLD when you want to create a new file.
OLD	OLD is the response made to the system request NEW OR OLD. Use this response to retrieve a previously saved file.
File Name	This is the name of the file (program) that you wish to access. Make this response to the system request NEW FILE NAME or OLD FILE NAME.
User Number	This response is the six-character user number that you have been assigned. Make this response to the system request USER NUMBER.
Project Identification	This is any 18 character identification that you wish to have maintained by the accounting system and displayed on the billing invoice supplement. An open carriage return will cause the Project Id to be blank.

SYSTEM MESSAGES

These messages are printed when the computer does not fully understand the input or some corrective action is required.

DELETED	You have sent the system a delete character (control X), and the system has deleted the line in which the delete character occurred.
DISCONNECTED	In response to STATUS; you do not have an acceptable user number entered in the system.
file name 1 file name 2 . . file name n NOT SAVED	The system has been unable to find the named files that are used by your program.
GE TIMESHARING	The system responds with this when it receives a "Who-are-you" character, e.g., you may have pressed the WRU (control E) key on your teletypewriter.

GE TIMESHARING SERVICE	The System types this to identify itself when you first connect to the System and before typing the on message and requesting your user number.
IDLE	In response to STATUS; at this moment no action is being taken on your problem. This can occur during the running of your program.
ILLEGAL ID NUMBER	The system has found an unacceptable user number.
INCORRECT FORMAT RETYPE IT	The user number that you have just given the system does not conform to the format of one alphabetic character followed by five digits.
INPUT BUFFER HANGUP. PLEASE RE-READ TAPE.	This message is output when you type KEY after reading in a paper tape and means that the system was unable to transfer all of the information from the tape to the working storage area successfully.
VALIDATION ERROR PLEASE CALL YOUR G.E. REP FOR ASSISTANCE	You have given the system a user number which is not validated for your terminal.
LINE TOO LONG-RETYPE	Your input line has in excess of the maximum of 81 characters including the carriage return.
LIST	In response to STATUS; the system is preparing the listing output for you.
NO FILE	You have tried an operation (RUN, LIST, or SAVE) but have no characters or lines in your working storage area.
NO ROOM IN SAVE STORAGE	The system has run out of space in its saved file storage area--this message is rarely seen.
OLD	In response to STATUS; the system is retrieving a saved file for you.
FILE CURRENTLY SAVED-- NAME	A file in your catalog has the same name as that you just entered as a new one (NEW or RENAME command).
FILE NOT SAVED--NAME	The system cannot find an old file called NAME (OLD command).
FILE SIZE LIMIT	The file in the working storage area now contains the maximum number of characters (6144).
FILE TOO LONG	Your file has in excess of the maximum of 6144 characters or 255 lines.
READY	The system has completed action on the last command and is ready to receive another.
RENAME FILE	You have tried to save a file with either an * or \$ as the sixth character when there is already one by that name in your catalog but not under your user number.
RUN	In response to STATUS; your program currently running.
RUN ONLY	You have tried an operation not permitted with a RUN ONLY program.

RUNNING: USED
XXXXX.XX UNITS

This message indicates that you are in RUN status and have tried to change the state of your program with a command like SAVE, LIST, etc.

SAVE

In response to STATUS; the system is in the process of moving the file in working storage to permanent storage.

SYSTEM MALFUNCTION--
TRY AGAIN

During the execution of your last command the system experienced difficulties which could not be overcome and abandoned the task. Repeat the last command. If you continue to get this message after two or three tries, call your GE Time-Sharing Representative for assistance.

AAA NOT AVAILABLE--

You have tried to run a program using a language, AAA, not available in the time-sharing system.

THERE HAS BEEN A MAL-
FUNCTION.
TYPE -HELLO- AND START
AGAIN.

The system has encountered some difficulty. Programs that you have just saved will not be affected but everything else is lost. You must re-establish yourself as a user in order to continue.

WAIT

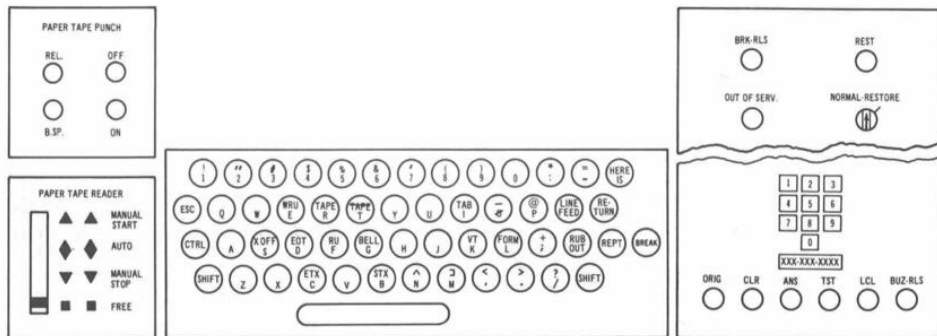
There will be a slight delay in processing your last command.

4. Use Of Teletypewriters

Time-Sharing Service is easy to use because the teletypewriter keyboard used for input is similar to an ordinary typewriter keyboard without lower case letters. Both the Model 33 and Model 35 teletypewriters are currently being used with the Time-Sharing Service. For complete operating instructions refer to the appropriate Bell Telephone Company teletypewriter publication.

MODEL 33 TELETYPEWRITER

The principal parts of the teletypewriter are the Control Unit, Keyboard, Paper Tape Punch (optional), and Paper Tape Reader (optional).



Model 33 Keyboard and Controls*

Control Unit

Control Unit operating features include the following:

- Telephone Dial For dialing telephone numbers.
- ORIG (Originate) Button is depressed to obtain a dial tone.
- CLR (Clear) Button is depressed to turn off teletypewriter.
- LCL (Local) Button is depressed to perform local off-line work such as tape punching. During local operation, you cannot connect with the system.

* On some Model 33 teletypewriters the upward arrow (↑) is replaced by the caret (^) and the backward arrow (←) with the underline (⎵).

BUZ-RLS (Buzzer Release)	Buzzer sounds when paper supply is low. Depress key to silence buzzer, then replace paper roll.
NORMAL-RESTORE	Should always point to NORMAL.
ANS and TST	Not used by the system.
BRK-RLS Break Release)	Depress to free keyboard after a break signal. (Break signal causes keyboard to lock.)
Loudspeaker	Usually located under the keyboard at the right. A volume control knob permits you to adjust the volume. When knob is turned fully counterclockwise the dial tone will not be audible.

Keyboard

The teletypewriter keyboard is used like a standard typewriter keyboard with the following exceptions (those keys on the keyboard not used by time-sharing are not discussed):

Letters	Letters of the alphabet are printed in capital letters only.
SHIFT and Control keys	These keys are non-locking and must be held depressed when typing.
RETURN	Returns the carriage to the left margin.
LINE FEED	Moves the paper up one line at a time.
REPT (Repeat)	To repeat a teletypewriter character, you must hold this key depressed while you strike the desired character key. Release the latter and hold the REPT key until the desired number of characters have been typed. (If it is an upper case character, the SHIFT key must be held along with the REPT key.)
RUBOUT	Use this non-printing key, following operation of the RETURN key, to end a program line of paper tape input. You may also use it in conjunction with the backspace button on the tape punch to delete errors in punching tape.
ALT MODE	This lets you delete the line currently being entered into the time-sharing system. This key is sometimes marked ESC.
HERE IS	Transmits and prints whatever is on the answerback drum.
BREAK	See list of commands.

Paper Tape Punch

The paper tape punch is used to produce one inch (8 level) fully perforated tape. To prepare a tape the punch generates a row of holes for each teletypewriter key character including the non-printing keys. The punch may be controlled from the local keyboard or from a remote location.

The following describe the paper tape punch controls and the preparation of a paper tape.

ON and OFF Buttons	Any typed or printed information may be punched on paper tape simply by turning the punch unit on (depressing the ON button). It continues to punch until the OFF button is depressed.
--------------------	--

- B.SP. (Backspace) Each time you depress this button, the paper tape moves backwards one character. This button is used with the RUBOUT key to delete errors in the tape. The character (or characters) in error are each moved back under the punch and then for each character to be deleted, the RUBOUT key is hit.
- REL (Release) This button frees the tape so that you can manually pull blank tape through the punch. (This tape cannot be read through the tape reader.)

Preparation of a Paper Tape

Observe the following when punching a paper tape:

1. Always hit the RUBOUT key several times to generate a leader before starting to punch any tape.
2. To punch a paper tape off-line, depress the LCL key to turn on the teletypewriter and then depress the paper tape ON key.
3. When preparing a paper tape off-line, you must press at the end of each line the CR (Carriage Return), LF (Line Feed), and RUBOUT key in that order or the message may not send accurately.
4. When sending data to the computer via tape, you must indicate this fact by typing the command TAPE. To tell the computer to return to normal keyboard operation, type the command KEY.
5. Only RUBOUT characters may precede the first character of a file or follow the last character of a file stored on paper tape.

Paper Tape Reader

The paper tape reader is located at lower left side of the teletypewriter and is used for transmitting information from paper tape. The tape reader has one four-position control switch with the positions marked below.

1. **MANUAL START** This non-locking position is used to start the tape moving through the tape reader.
2. **AUTO** The tape reader is normally in this position whenever the X-ON feature is used.
3. **MANUAL STOP** This non-locking position stops the tape reader. (Used primarily with LCL)
4. **FREE** Permits the tape to be pulled manually through the reader.

The following information describes how to operate the tape reader.

1. Open the clear plastic tape gate by pushing the gray lock on the right side to the right.
2. Place the tape surface facing upward with the tape feed holes (small holes) over the tape feed wheel (the smaller side of the tape to the left).
3. Place the code holes of the first character to be read slightly behind the sensing pins, preceded by any number of RUBOUT characters.
4. Close and lock the tape gate by pushing down. When ready to read, move the tape reader control switch to the MANUAL START position. Start the tape for each transmission to the computer. (Before starting, you must type the command TAPE.)

The tape will stop when the last punched character is read.

X-ON FEATURE. On requests for input to a running program, the question mark is followed by an X-ON. This allows the computer to activate the paper tape reader on all Model 35 ASR and some Model 33 ASR teletypewriters. The method of using this feature is shown in the following example:

It is desired to compute and print the sum of four numbers input to the program on paper tape. A BASIC program to do so might take the following form:

```

5      LET B = 0
10     FOR I = 1 to 4 STEP 1
20     INPUT A(I)
30     LET B = B+A(I)
40     NEXT I
50     PRINT B
60     END
    
```

Assuming the input numbers are 1, 1.5, 2, 2.5, then the paper tape input to the above program is punched as follows:

1 LF (X) (R) RO 1.5 LF (X) (R) RO 2 LF (X) (R) RO 2.5 LF (X) (R) RO

where:

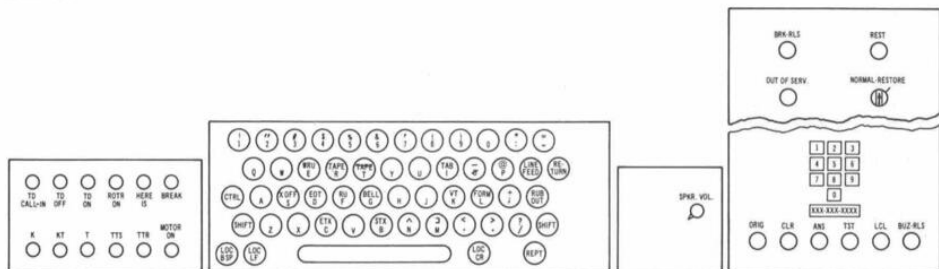
- LF = Line Feed
- (X) = X-OFF
- (R) = Carriage Return
- RO = Rubout

The sequence of characters after each number assures that the paper is spaced after each line, and that the reader is turned off after each number is read in.

If teletypewriter is not set for paper tape input (KT button pushed on the Model 35) the X-ON will have no effect.

MODEL 35 TELETYPEWRITER

The principal parts of this teletypewriter are the Control Unit, Keyboard, Paper Tape Punch, and Paper Tape Reader. The keyboard and controls of the Model 35 teletypewriter are shown below.



Model 35 Keyboard and Controls*

* On some Model 35 teletypewriters the upward arrow (↑) is replaced by the caret (^) and the backward arrow (←) with the underline (_).

Control Unit

The control unit of the Model 35 is similar in appearance and function to the Model 33 teletypewriter previously described.

The controls and indicators listed below are identical on both the Model 33 and Model 35 teletypewriters.

Telephone Dial	BRK-RLS
ORIG	NORMAL-RESTORE
CLR	Loudspeaker
LCL	ANS and TST
BUZ-RLS	

The following six lights, located on the upper right side of the Model 35 teletypewriter, are not used by the time-sharing system:

DIAL, BY, INCPT, NO CON, SVE, PA.

Control Buttons

The following control buttons are located to the left of the keyboard and are all equipped with lights.

TD CALL IN	Not used.
TD OFF	Turns local tape reader off (in KT, T, or TTS modes).
TD ON	Starts local tape reader (in KT, T, or TTS modes).
ROTR ON	Not used.
HERE IS	Transmits and prints whatever is on your answer-back drum.
BREAK	See list of System Commands.

Control Modes

The following controls are listed in the order that they appear on the panel to the left of the keyboard.

K (Keyboard)	For obtaining page copy only.
KT (Keyboard-Tape)	For obtaining page copy and perforating tape simultaneously or for transmitting, punching a copy tape, and printing a page copy simultaneously.
T (Tape)	For perforating tape only or transmitting tape with page copy.
TTS (Tape-to-Tape Send)	Transmits tape without page copy.
TTR (Tape-to-Tape Receive)	Perforates tape from a remote source without page copy.
MOTOR ON	Permits punching tape locally (without page copy) without placing station in the Local mode.

When originating a call, the station is automatically switched to the Tape (T) mode. If a request to the computer is made, the user must depress the K button before any transmission can be effected, and must depress K to release the keyboard after a break.

Keyboard

The keyboard operates like a standard typewriter with the following exceptions (keys on the keyboard which are not used by the system are not discussed):

Column Indicator	Located at upper right side of keyboard, this metal pointer indicates which column has just been printed (typed/punched).
End of Line (Red Light)	Indicates when end of line is approached and has no effect on computer or the teletypewriter.
Letters	Letters of the alphabet are printed in capital letters only.
SHIFT (Key)	The SHIFT key is non-locking and must be held depressed when typing characters in upper case positions.
RETURN	Returns the carriage to the left margin.
LINE FEED	Moves the paper up one line at a time.
REPT (Repeat)	To repeat any character this key must be held depressed while the desired character key is operated. The latter is released and the REPT key is held until the desired number of characters have been typed. (If it is an upper case character, the shift key must be held along with the REPT key.)
RUBOUT	This key has a non-printing function and is used following operation of the RETURN key to end a program line of paper tape input. It can also be used in conjunction with the backspace button on the tape punch to delete errors in punching tape.
ALT MODE	This permits you to delete the line currently being entered into the time-sharing system. Some teletypewriters do not have an ALT MODE key; use the ESC key instead.
X-OFF (Key)	This key is operated in conjunction with the control key. It is a non-printing, operational function activated by holding the CTRL (Control) key depressed and then striking the X-OFF key. X-OFF, when perforated in tape, turns tape reader off at the time it is read by the tape reader. X-OFF must always be followed by at least one RUBOUT character. This function has no effect when typed on-line. Control and Q can be used to turn on the tape reader.

Four red keys, two on each side of the space bar, are used only during local operation. These keys do not generate any code on a paper tape or transmit a code to the computer.

From left to right:

LOC B.SP.	Backspaces the paper tape in the punch, one space for each time it is depressed.
LOC LF	Spaces the carriage up one line and keeps repeating for as long as the key is depressed.
LOC CR	Returns the carriage to the left margin.
REPT	Repeats teletypewriter keyboard characters.

Paper Tape Punch

For perforating tape from the local keyboard or from a remote location, the punch generates a row of holes for each character (including the non-printing functions) on the teletypewriter. It produces one inch (8 level) fully perforated tape. The eighth level is punched with a keyboard generated code.

The following information describes how to operate the paper tape punch effectively.

1. Place the teletypewriter in Local (LCL) and in the KT mode for punching tape. (It also punches tape in the T mode but does not generate a page copy.)
2. Always hit the RUBOUT key several times to be sure that there is clean tape when starting to punch every tape.
3. To punch a paper tape off-line, depress LCL key to turn on the teletypewriter and then depress the paper tape ON key.
4. To prepare a paper tape off-line, press RETURN (Carriage Return) and LINE FEED at the end of each line. For clean copy, follow LINE FEED with RUBOUT.
5. When transmitting information from tape to the computer, indicate this by typing TAPE. Type KEY to tell the computer to return to keyboard operation after transmission is completed.
6. To delete errors on the tape, press the LOC B.SP. button for each character to be deleted, then hit the RUBOUT key for each character. (The RUBOUT generates a row of eight punches which is ignored by the tape system.)

Paper Tape Reader

The paper tape reader is located on the far left of the teletypewriter and is used for transmitting information from paper tape. The tape reader is controlled by a tape read switch which has two positions.

1. FREE - for freewheeling, to insert tape without raising the tape gate. This is a non-locking position of the switch. It must be held in this position.
2. RUN - Normal position of the switch.

Control of the tape reader is by means of the buttons TD ON and TD OFF. The teletypewriter must be in the KT, T, or TTS mode to operate the tape reader.

The following information describes the operation of the tape reader.

1. Press the square button to release the tape gate.
2. Place the tape surface facing upward with the tape feed holes (small holes) over the tape feed wheel (the smaller section of tape facing away from the operator).
3. Place the code holes of the first character to be read slightly behind the sensing pins: these must be preceded by any number of RUBOUT characters.
4. Close and lock the tape gate by pushing down. When ready to READ, press the TD ON button. You must start the tape for each transmission to the computer. (Before starting you must type the command TAPE.)

The tape will stop when the last punched character is read.

X-ON (See page 21.)

Appendix A Index of System Commands

ALT-MODE, Escape (ESC) or CTRL X	Deletes the current input line as if nothing has been typed, if carriage return has not been used.
Back Arrow (←)	Deletes the last character types including SPACE characters. The SHIFT key must be depressed. This is the character on the O key.
BREAK	Causes the system to stop whatever it is doing during printing.
BYE	Disconnects from the system.
CASALOG	Prints the name, length and coded date of the last access for each file saved in the user catalog.
CATALOG	Prints the name of each file saved in the user catalog.
DSM	Used to create files without line numbers.

EDITING COMMANDS (LINE FUNCTIONS)

EDIT	Describes current editing capabilities.
EDIT DELETE	Deletes portions of a file.
EDIT DUPLICATE	Used to repeat a single line or a series of lines in an existing file.
EDIT EXTRACT	Retains portions of a file.
EDIT LIST	Used to list single lines or blocks of lines in forward or reverse order.
EDIT MERGE	Combines saved files into your current temporary file re-sequences line numbers.
EDIT MOVE	Moves a single line or block of lines to a new position.
EDIT PAGE	Used to list files on numbered pages.
EDIT RESEQUENCE	Resequences line numbers in the current temporary file.
EDIT RUNOFF	Prints your saved file according to a predetermined format.
EDIT WEAVE	Combines saved files into the current temporary file without resequencing line numbers.

EDITING COMMANDS (STRING FUNCTIONS)*

EDIT \$ABORT	Prevents the processing of any input line containing a specific character.
--------------	--

* When using String functions on a DSM File, type EDID instead of EDIT.

EDIT \$BEGIN	Used to start a string search at the beginning of a file.
EDIT \$BREAK	Defines characters to be overlooked during a string search.
EDIT \$DUPLICATE	Used to repeat an existing string within a file.
EDIT \$END	Terminates the string mode.
EDIT \$FIND	Locates the string that you wish to alter.
EDIT \$IGNORE	Used to specify characters to be disregarded during a string search.
EDIT \$INSERT	Adds text to a string previously located by an EDIT \$FIND command.
EDIT \$LIST	Same as the command LIST but used with the string mode.
EDIT \$LOCATE	Searches the entire file for a specific string then prints the line numbers of all the lines that contain the string.
EDIT \$MOVE	Moves a single string from one location to another within a file.
EDIT \$MULTIPLE	Used to assign the same value to several characters.
EDIT \$PROGRAM	Used to search for a specific string which may include text, line numbers, carriage returns, etc.
EDIT \$REPLACE	Replaces the specified string with the input string.
EDIT \$RUNOFF	Same as EDIT RUNOFF but used with the string mode.
EDIT \$STRING	Prints the current string enclosed in quotation marks.
EDIT \$SUBSTITUTE	Used to define non-printing characters during a string search.
EDIT \$TEXT	Used to search for a specific string consisting only of text.
EDIT \$TIME	Prints the central processor run time in minutes and seconds.
EDIT \$TRANSLATION	Prints the translation table including the Ignore, Break, and Abort characters.
GOODBYE	Disconnects from the system.
HELLO	Initiates the validation sequence.
KEY	Resets terminal operation to keyboard after reading in paper tape.
LENGTH	Gives length of temporary file.
LISD	Lists a DSM file.
LIST	Lists the current temporary file.
LISTNH	Lists the current temporary file without heading information.
LIST--nnn	Lists the current temporary file beginning at line nnn, where nnn is a one to five digit line number.

LISTNHnnn	Lists the current temporary file without heading information, beginning at line nnn.
NEW	Introduces a new temporary file.
OLD	Retrieves from the file system a previously saved file.
PLOT	Used to address the output to the plotter.
RENAME	Changes the name of the current temporary file.
RETURN (key)	Terminates a program line, causes the system to take action based upon input entered, and acts as a normal carriage return.
RUN	Compiles and executes the current program.
SAVE	Stores permanently the current temporary file.
SAVD	Stores permanently a DSM file.
SCRATCH	Eliminates from the current temporary file everything but the file name.
STATUS	Used to request present relationship to the system (idle, run, old, list, etc.).
STOP	Causes the system to stop whatever it is doing (a BREAK character must be used when printing is occurring).
SYSTEM	Initiates a change in system.
TAPE	Informs the system that paper tape will be read in.
TTY	Used to request the channel number, user number, file name, system name, and status.
UNSAVE	Used to release and destroy a previously saved file.

Appendix B Glossary of Time-Sharing Terms

Answerback drum	A device used to identify a terminal.
Catalog	A list of user files.
Character	A numeric digit, letter of the alphabet, or special symbol.
Compile	To translate into computer language.
Data	That information which is processed by the program.
Data File	A user file composed of data records to be processed by user programs in the Time-Sharing system.
Executive program	The computer program which controls Time-Sharing system operation.
File	A series of program statements, words or characters.
File System	The repository for all permanent files kept within the Time-Sharing system.
Input Line	A group of characters ending with a carriage return (RETURN), which are entered into the Time-Sharing system by the user from his teletypewriter.
Library	The repository for Time-Sharing programs.
Line Feed	Rotation of the teletypewriter platen up one line, accomplished either by striking the LINE FEED key, or by receipt of a "line feed" character from the Time-Sharing system.
Off Line	Not connected to the computer through an input device.
On Line	Connected to the computer through an input device.
Message	Any information printed by the teletypewriter.
Plotter	A device used to convert computer output to a graphic display.
Permanent Files	Permanent files are files which are stored in the file system by explicit user command (SAVE). They are maintained in the file system until explicitly removed by user command (UNSAVE), although the user is not connected to the time-sharing system.
Program	The instructions and data required to solve a problem.
Program Execution	The processing of data according to the instructions of the program.

Run-Only Program	A proprietary program protected by the security procedures provided by the Time-Sharing system.
Statement	A line of information beginning with a line number.
Subscription	A contract to use the GE Time-Sharing Service.
System Commands	Commands used to direct the operation of the system, such as RUN, STOP, etc.
System Requests	Statements initiated by the system which request additional data or information from the user.
Teletypewriter	A type of terminal for communicating with the Time-Sharing system. At present, Model 33 or 35 teletypewriters are used for this purpose.
Temporary Files	Temporary files are files which are processed by the Time-Sharing system under the direction of a user connected to the system. Temporary files may be new files entered into the Time-Sharing system by the user; or they may be copies of permanent files which have been called out of the file system by the user for processing. They are stored in the file system only by explicit command from the user (SAVE). Temporary files in existence when the user signs off are released.
Terminal	A device with which you can converse with the Time-Sharing system, generally a teletypewriter.
User	Anyone who uses the GE Time-Sharing Service.
User Files	User files include both temporary and permanent files entered into the Time-Sharing system by the user.
User Validation Sequence	The security process employed by the Time-Sharing system to recognize and accept bonafide customers.

Appendix C Teletypewriter Character Codes

Teletypewriter Character	ASCII Octal	DATANET-30 Octal	Teletypewriter Character	ASCII Octal	DATANET-30 Octal
A	101	21	"	042	34
B	102	22	#	243	Special
C	303	23	\$	044	53
D	104	24	%	245	17
E	305	25	&	246	20
F	306	26	'	047	12
G	107	27	(	050	14
H	110	30	)	251	74
I	311	31	*	252	54
J	312	41	+	053	20
K	113	42	,	254	73
L	314	43	-	055	40
M	115	44	.	056	33
N	116	45	/	257	61
O	317	46	a	101	21
P	120	47	b	102	22
Q	321	50	c	303	23
R	322	51	d	104	24
S	123	62	e	305	25
T	324	63	f	306	26
U	125	64	g	107	27
V	126	65	h	110	30
W	327	66	i	311	31
X	330	67	j	312	41
Y	131	70	k	113	42
Z	132	71	l	314	43
[	333	75	m	115	44
\	134	17	n	116	45
]	335	Special	o	317	46
†	336	57	p	120	47
+	137	Special	q	321	50
0	060	00	r	322	51
1	261	01	s	123	62
2	262	02	t	324	63
3	063	03	u	125	64
4	264	04	v	126	65
5	065	05	w	327	66
6	066	06	x	330	67
7	267	07	y	131	70
8	270	10	z	132	71
9	071	11	(ALT. MODE)	175	Special
:	072	13	|	176	None
:	273	15	DEL (Rub-Out)	377	None
<	074	36			
=	275	16			
>	276	56			
?	077	35			
@	300	Special			
SPACE	240	60			
!	041	33			

NOTE

When a terminal is used that has lower case letters they are to be treated as shown.

Appendix D Paper Tape Code

		8	7	6	5	4	3	2	1	
@	SPACE									NULL
<u>A</u>	<u>!</u>					•		X		SØM
B	<u>"</u>							X		EØA
C	<u>#</u>					•	X	X		EØM
D	<u>\$</u>						•	X		EØT
E	<u>%</u>						•	X	X	WRU
F	<u>&</u>						•	X	X	RU
G	<u>'</u>						•	X	X	BELL
H	<u>(</u>					X	•			FE ₀
I	<u>)</u>					X	•		X	H. TAB
J	<u>*</u>					X	•	X		LINE FEED
K	<u>+</u>					X	•	X	X	V. TAB
L	<u>,</u>					X	•	X		FØRM
M	<u>-</u>					X	•	X	X	RETURN
N	<u>.</u>					X	•	X	X	SØ
Ø	<u>/</u>					X	•	X	X	SI
P	<u>0</u>			X		•				DC ₀
Q	<u>1</u>			X		•			X	X-ØN
R	<u>2</u>			X		•		X		TAPE ^{AUX} _{ON}
S	<u>3</u>			X		•		X	X	X-ØFF
T	<u>4</u>			X		•	X			TAPE ^{AUX} _{OFF}
U	<u>5</u>			X		•	X	X		ERROR
V	<u>6</u>			X		•	X	X		SYNC
W	<u>7</u>			X		•	X	X	X	LEM
X	<u>8</u>			X	X	•				S0
Y	<u>9</u>			X	X	•			X	S1
Z	<u>:</u>			X	X	•		X		S2
[	<u>;</u>			X	X	•		X	X	S3
ACK \	<u><</u>			X	X	•	X			S4
ALT MØDE]	<u>=</u>			X	X	•	X	X		S5
↓	<u>></u>			X	X	•	X	X		S6
RUB ØUT =	<u>?</u>			X	X	•	X	X	X	S7
		X	X	X						Control Functions (Non-typing)
		X	X	X						
		X	X	X						
		X	X	X						

- NOTES
1. The X represents a hole punched in the paper tape.
 2. The small dots in the unnumbered column (fourth from the right) represent the threading holes on the tape.