

The HP 2000F time sharing system

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3980  IF 10000 THEN 3980
3981  NAT UNDER1,10100
3982  NAT INPUT 2
3983  FOR J=1000 TO 100
3984  A(J)=1000/J
3985  NEXT J
3986  HEAD N1,N1
3987  GOSUB 3988
3988  HEAD N1,(N1*1)+2*(N1*1)
4000  GOTO 3988
4010  PRINT "FILE IS LOADED"
4020  GOTO 1100
4100  REM***PUNCH
4110  PRINT "N OF FIRST RECORD TO BE PUNCHED"
4120  INPUT N3
4130  IF N3=9999 THEN 3400
4135  IF END N1 THEN 4170
4140  FOR I=N3 TO 129
4150  READ N1,I
4155  IF TYP(-1)>2 THEN 4170
4160  NEXT I
4170  N4=I-1
4220  PRINT "TAPE LEADER OK (YES/NO)"
4230  INPUT Z5
4240  IF Z5="9999" THEN 3400
4250  IF Z5(1,1)="Y" THEN 4310
4260  IF Z5(1,1)="N" THEN 4220
4270  PRINT "AFTER THIS PROGRAM HALTS, TURN ON TAPE PUNCH."
4280  PRINT "PUNCH SUFFICIENT LEADER, THEN TURN OFF PUNCH."
4290  PRINT "THEN RUN THIS PROGRAM AGAIN."
4300  STOP
4310  PRINT "YOU HAVE 5 SECONDS TO TURN ON TAPE PUNCH."
4320  FOR I=1 TO 15000
4330  NEXT I
4340  PRINT N4
4342  PRINT N1
4345  FOR I=1 TO N1
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The HP 2000F - Fast response for multiple users.

The 2000F Time Sharing System was designed to provide interactive problem solving and data handling capability in a dedicated environment to the small computer system user. Five major software subsystems make up the Hewlett-Packard 2000F.

1. Executive Program — The executive program supervises input/output demands, bulk memory transfers, program execution, library usage and the accounting system. It operates sequentially and/or on an interrupt basis giving rapid response and creating the illusion for each user that he has the computer to himself. Here are some of its unique operational features:

User ID Codes — Up to 3072 different user codes can be selected from 26,000 combinations. Each user code has a changeable password which can be non-printing characters.

User/Operator Communication — Messages can be sent from the system console to any port and from any port to the console. This allows users to queue up for off-hour jobs and allows the operator to warn all users of a pending shutdown.

Input/Output — Programs and data files can be loaded from terminal keyboard or off line 9-track magnetic tape and written to terminal display or printer, off line 9-track magnetic tape or on-line line printer.

Simple System Activation — After initial installation, a loader is read in through the high speed photoreader, a few commands are entered at the system console, and the magnetic tape copy of the system is loaded onto the system disc. The current date and time of day are entered at the system console and the system is up and running.

No Operator Intervention Required — The system will automatically list on the system console the logging on and off of all users of the system as well as any messages from users desiring to contact the system operator.

Simple Alteration of User Parameters — A single command at the system console will create a new user identification code or modify any of the parameters of an existing user: password, maximum time allowed or maximum storage allowed. A single operator command will add a new user I.D. to the system.

Simple System Deactivation — A single command at the console logs off all users, packs the programs and files stored on the discs and copies all system software and user programs and files on magnetic tape.

Security Backup — Magnetic tape provides for security backup of system software, programs, and files as well as serving as an off line high speed input/output device.

Magnetic Tape Loading of User Files and Programs — User programs and files can be loaded into the system's libraries from magnetic tape or copied from the system's libraries to magnetic tape under control of the system console at lead time.

User Programs/Files Can Be Placed On System Fixed Head Disc — A single command can move a user program/file to the system disc to improve system performance.

Mass Storage — The system accommodates fixed head mass storage in sizes ranging from 524,000 to 786,000 words. Moving head mass storage is available in one of two configurations.

- A. Up to 8 removable cartridge disc drives, each capable of storing 4.8 million bytes.
- B. Up to 8 removable disc packs files, each capable of storing 23.5 million bytes.

Program Storage — Programs can be stored as source code or semi-compiled code. Semi-compiled code allows faster program execution, particularly where many programs are chained together.

On-Line Line Printer — Program output can be directed from the user terminal under user command to a high speed line printer.

Program Execution Using Floating Point Arithmetic Implemented in CPU Hardware — User programs are executed with floating point arithmetic operations implemented in hardware. Computational portions of user programs can be expected to execute several times as rapidly as on previous HP time sharing systems.

Self Diagnosis of System Hardware Status — Built into the system software is the ability to diagnose the status of all hardware components. In many cases of hardware failure, the faulty components will be identified to the system operator and can be locked out for later repair without halting the system. Failure of a critical component will halt the system immediately and display the system's self diagnosis in the computer's register lights. For these cases emergency recovery procedures and other operating instructions are available.

2. Multiplexer Control Program — The multiplexer control program operates in response to inputs from the system terminals via a hardware multiplexer supporting multispeed terminals.

32 Ports — The 2000F can handle from 1 to 32 simultaneous terminals. Each port can be wired directly for a distance of up to 1000 feet to a terminal or wired to a telephone data set. One data set can support from three to five data phone-connected terminals.

Communications Processor — The 2000F system has a front end processor to remove the burden of terminal handling and communication with the on-line line printer from the system computer.

Multispeed Terminals — The multiplexer control program for the 2000F supports a mixture of 10 to 240 character/second ASCII compatible terminals. This multispeed capability supports the following terminals and any terminals compatible with these:

— ASR-33, 35	(10 CPS)
— ASR-37	(15 CPS)
— HP 2605A or UNIVAC DCT 500	(10, 15, 30 CPS)
— UNIVAC DCT 500	(10, 15, 30 CPS)
— Execuport	(10, 30 CPS)
— HP 2600A CRT	(10 CPS — 240 CPS)
— DATA POINT 3300	(10 CPS — 240 CPS)
— Memorex 1240	(10, 30, 60 CPS)
— GE Terminet 300	(10, 15, 30 CPS)
— IBM 2741 Selectric (CALL 360 Correspondence code and PTTT/EBCD Code supported)	(14.8 CPS)

Sophisticated User Scheduler — The scheduler assigns priorities to users based on the task they are performing. A time slice method is employed and the system's resources are allocated first to the interactive user who has the highest response requirements.

3. Accounting System — The accounting system can be used to control access to the computer and accumulate information for usage studies or for billing users.

System Access Control — Each user has an assigned password and account number which he must type in order to gain access to the system.

System Status Reporting — System data is accumulated by the system until reset by the system operator. From the system console with a single command, the following reports can be generated:

REPORT — For each user lists time used to date and disc storage currently in use.

DIRECTORY — For each user lists last date accessed, location and length of all programs and data files.

STATUS — Describes current hardware configuration and utilization.

ROSTER — Informs the operator as to which user, if any, is logged onto each port.

4. Library System — Three levels of libraries are maintained in mass storage by the 2000F executive program. Public library programs are available to any user but can be modified only by the system master. Group libraries are available for up to 100 user codes and are administered by a group master. Each user also has a private library accessible only by his unique ID code and password. Commands are available to allow easy transfer of programs from one library to another and to restrict library programs to run only for most users. Over 400 user contributed library applications programs written in BASIC are available with the 2000F. A special contributed program of interest to all users is the text editor, TIDE. A general purpose file management system called FINDIT is also

available as a contributed program. It enables a user to store and retrieve information in 2000F files without a detailed knowledge of the 2000F file structure.

Several handbooks are also available that contain programs contributed by Educational Institutions. These programs are oriented toward users from elementary levels (Huntington Project, Volume II) through graduate school (Stanford Business School, Volume IV). All BASIC programs on the 2000A, B, C, or E can be loaded and run on the 2000F.

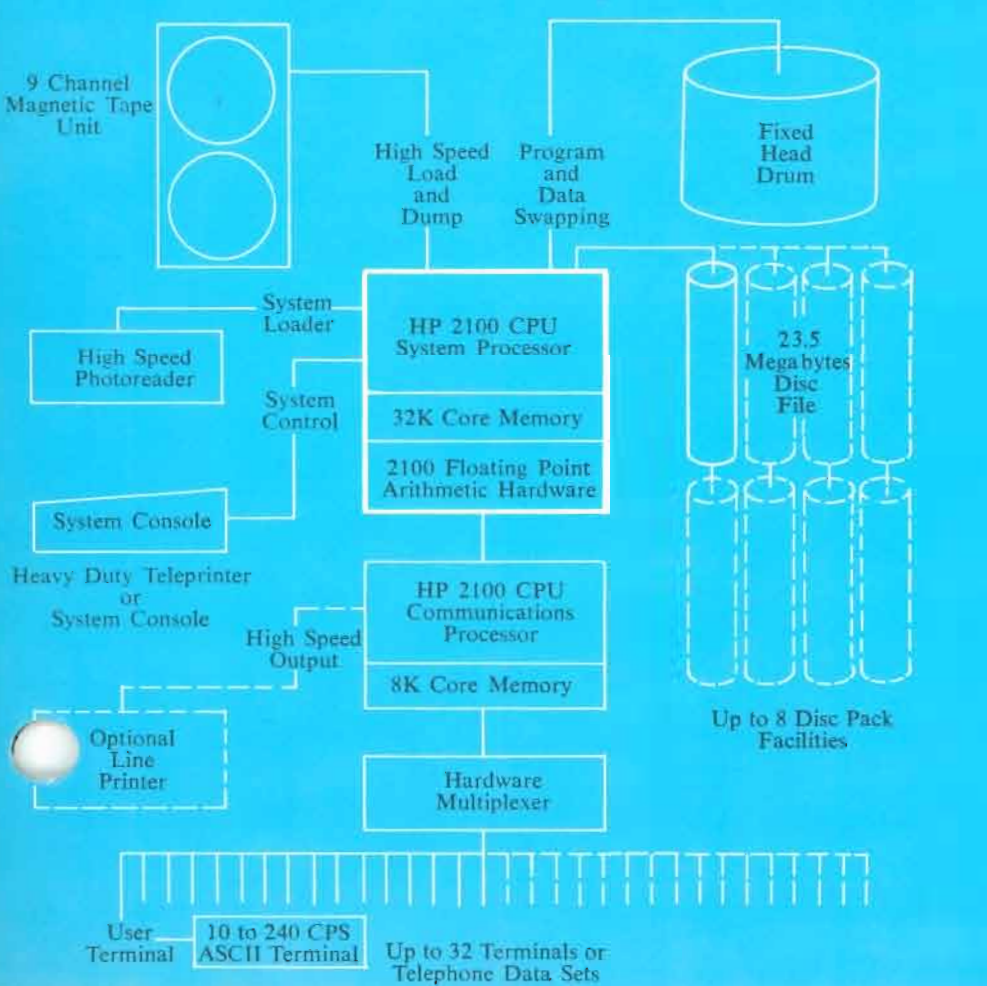
5. Other Operating Modes — The hardware of the 2000F time sharing system can be used for other purposes by sleeping the system to magnetic tape.

Disc Operating System — This batch oriented operating system can be configured on the 2000F hardware when time sharing capability is not required to permit the system to run programs written in FORTRAN, ALGOL, and Assembly Language in a load and go batched environment. Utility routines are provided to allow operator-selected 2000F time share files to be processed in the Disc Operating System Mode and to allow Disc Operating System files to be used by 2000F Time Sharing users.

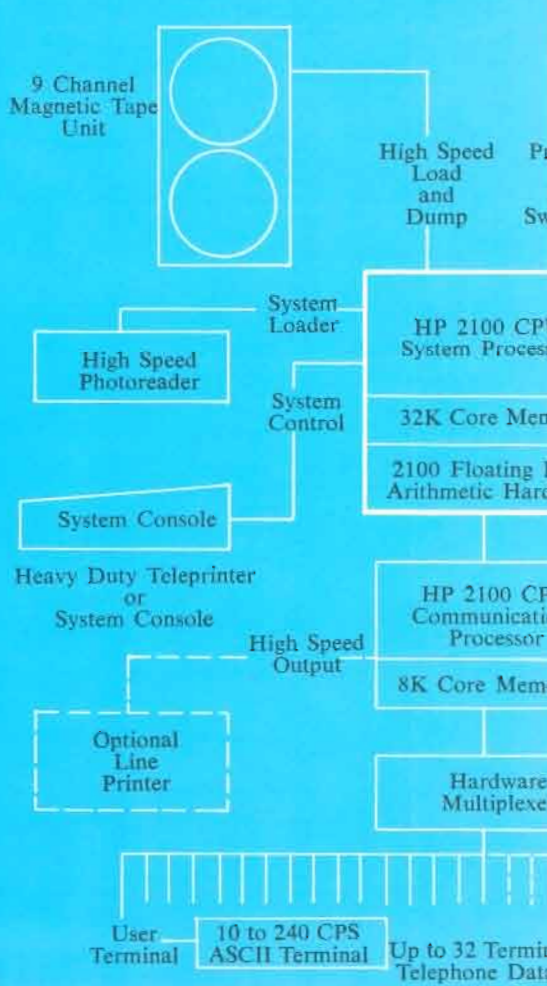
9600 E/F Real Time Executive — This real time oriented operating system can be configured on the 2000F hardware when time sharing capability is not required to permit the system to run programs written in HP FORTRAN, HP ALGOL, and HP Assembly Language in a background/foreground environment.

Basic Control System — This operating system provides an efficient loading and input/output control capability for relocatable programs produced by the HP Assembler, HP FORTRAN, or HP ALGOL.

2000F Time Sharing System Hardware Block Diagram (Disc File Mass Storage Configuration)



HP 2000F Time Sharing System (Cartridge Disc Mass Storage)



2000F Basic System Hardware

The basic configuration for the 2000F Time Sharing System consists of these components:

HP 2100 System Computer with the following:

- 32K Word Memory
- Floating Point Arithmetic Hardware
- Direct Memory Access
- Time Base Generator

HP 2100 Communications Computer with the following:

- 8K Word Memory
- Time Base Generator
- Telephone **Auto-Disconnect** for 16 lines

Hardware **Multiplexor** (16 terminals)

Processor **Interconnecting Hardware**

High Speed **Tape Reader and Interface**

System Console (Modified ASR-33)

Fixed Head **Mass Storage** (1048K bytes, expandable)

Power Supply and Interface

Moving Head Mass Storage Cartridge Disc (4.8 M bytes)

Power Supply, Cabinet and Interface

Magnetic Tape Storage (9 channel, 30,000 char/sec) and Interface

Two Bay Cabinet with doors (208V, 3 ϕ , 60Hz power)

System Integration, Software and Accessories



2000F System Options

These may be added to the basic configuration when required:

Additional Cartridge Disc Storage — 2 Disc Drives (9.6 megabytes)

23.5 Megabyte Disc File Storage and Interface to Replace

4.8 Megabyte Cartridge Disc Storage

32 Terminal Expansion Capability, including an additional

524K bytes of fixed head mass storage

System Operation with 230V, 50Hz

Heavy Duty System Console (Modified ASR-35) and Interface

Line Printer (80 column, 300 LPM) and Interface

Line Printer (132 column, 200 LPM) and Interface

Additional Single Bay Cabinet with door

2000F Optional Peripheral Equipment

Additional Moving Head Mass Storage Cartridge Disc

(4.8 megabytes for systems not using 23.5 megabyte cartridge disc files) — HP 712960 A-010

Additional 23.5 Megabyte Disc File Storage (for systems not using cartridge discs) — HP 2883A

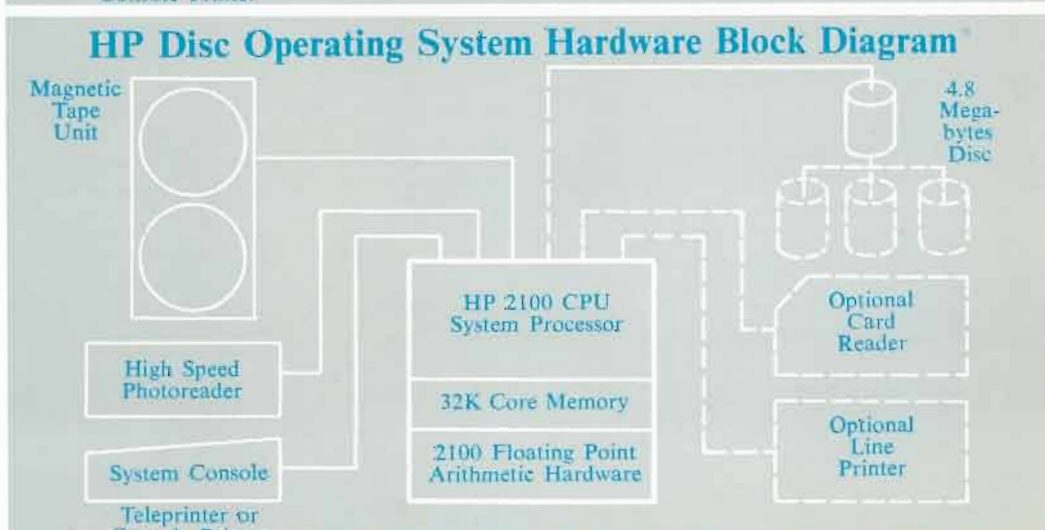
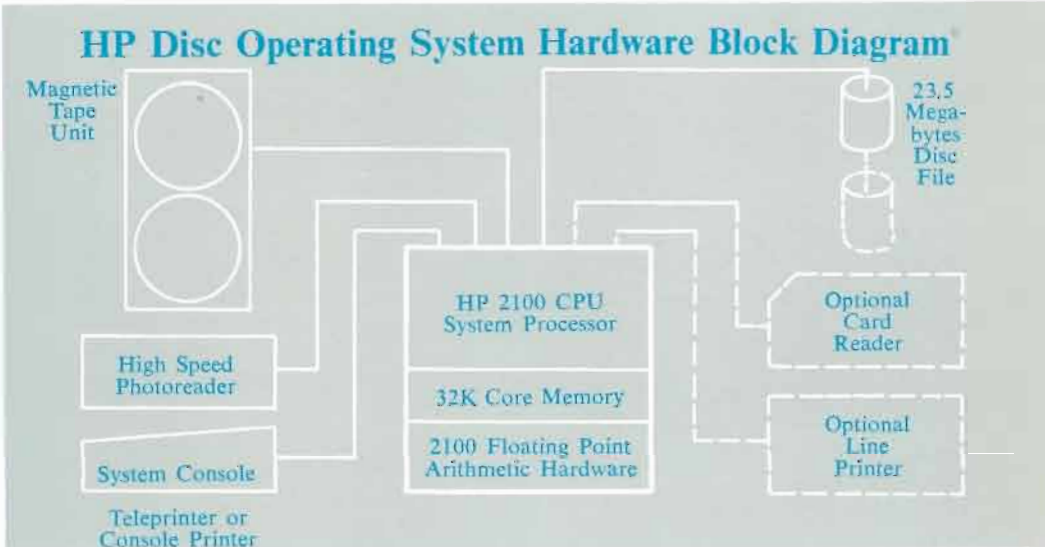
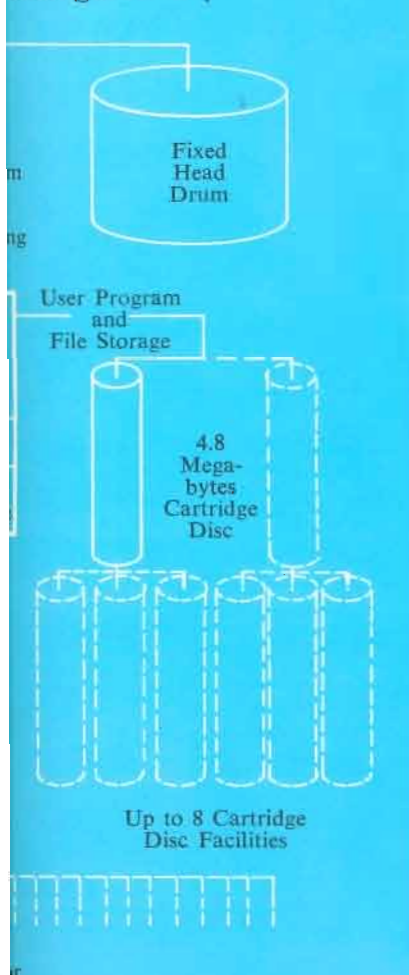
Teletypewriter Terminal — HP 2749A Teleprinter (modified

teletype ASR33 with X-ON/X-OFF reader control option)

Keyboard Display Terminal — HP 2600A

Console Printer Terminal — HP 2605A

Hardware Block Diagram Configurations



*Utilizing 2000F Cartridge Disc Mass Storage Configuration Hardware

HP time shared basic on the 2000F



Effective User/System 2000 communication is provided with Hewlett-Packard's own implementation of the BASIC language — HP Time Shared BASIC. This language was chosen to provide the user great flexibility in his terminal programming applications. This language, identical with the Extended BASIC on the HP 2000C has been self-tested and proven on over 200 System 2000's currently installed. Below are the language features that allow you to utilize the full power of the Hewlett-Packard 2000F Time Sharing System.

Standard Dartmouth BASIC

The full capability of Standard Dartmouth BASIC is a subset of HP Time Shared BASIC.

Matrix Operation

One or two dimensional arrays can be handled as easily as single valued variables. Addition, subtraction, multiplication, inversion, and transposition of matrices are available with only one program statement. A single statement creates an identity matrix or loads a matrix with all ones or zeroes. In the 2000F up to a maximum of 5000 matrix elements are allowed for each program.

Character String Manipulation

The user is allowed to define, manipulate, and store ASCII character strings. All numbers, upper and lower case alphabetic characters, and most other printing and non-printing ASCII characters can be assigned to string variables. They can be input and output at the terminal and stored and retrieved from data files. Substrings as small as one character and as large as 126 characters in length can be printed or compared to other strings for the purpose of branching or sorting. Maximum length of one string is 126 characters. Easy intermixing of string and numeric data is provided for program and file input and output.

Data Files

Data files may be created and saved under any user number. Data can be arranged either serially or on a record basis with random access capability of any record of the file. Maximum address time for a record is 60 milliseconds. Each data file can contain up to 8.4 million 16 bit words of data. This capacity translates to 4.2 million floating point numbers or 16.3 million alphanumeric characters or a combination of numbers and characters. A data file on the 2000F is not limited to a specific data type but uses a particular file for all data types. A BASIC program on the 2000F can have access to system files available from private user, group user, or public library at time of execution.

Simultaneous Data File Access

Multiple terminals can simultaneously access the same data file, but only in the READ-ONLY Mode. Within a special group of user numbers, multiple terminals can also write simultaneously to the same data file.

Extra Data File Protection

A data scrambler is available which allows a user to define a mask which scrambles his data before it is written to a data file preventing anyone without knowledge of the mask from interpreting data in the file. This feature does not need to be utilized if such a level of protection is not required.

Unlimited Number of Data Files Accessible by User Program

Each user program can have open 16 simultaneous data files. The names of any of these data files may be dynamically changed during program execution, thereby allowing any one program to effectively access an unlimited number of data files. Maximum size of one file is 8.4 million 16 bit words.

Time Input

The number of seconds it takes a terminal user to respond to a request from a user written program can be measured and limited. The maximum allowable response time is four minutes. After the maximum has been reached, the program will continue execution even when no response has been received.

Port Identification

Single and multiple ports may be identified as specifically available for data entry applications in response to user program queries.

Formatted Output

A PRINT USING statement is available in addition to the standard PRINT statement which allows reference to a format in a form similar to the FORMAT statement of other languages. This format can be either pre-programmed or dynamically defined at time of execution and accommodates output lines of any width up to 256 characters.

Program Chaining and Program Common

One BASIC program can call in another at time of execution, variables can be passed from one program to another through the COMMON statement. If a program is too large to execute, it can be broken down into multiple programs and then chained together providing for virtually unlimited program lengths. The calling program can CHAIN to a specific line number of a called program. The line number CHAINED to in a call program may be a variable label.

Large User Program Size

Maximum program length without chaining is 10,240 16 bit words which translates to approximately 1000 lines of BASIC program statements.

System CLOCK

Access to the system clock allows time of day, day of the year, and year to be read internally by a program at time of execution. This allows the user to identify each of several runs of the same program.

Diagnostics

HP Time Shared BASIC is implemented as an interpreter providing the capability to check each statement for format and syntax as it is entered, as well as performing certain program structural checks during execution. If an error is found, an English language diagnostic message is typed on request.

Program Compatibility

All HP Time Shared BASIC programs written for the HP 2000A, HP 2000B, HP 2000C, and HP 2000E can be loaded on the HP 2000F with no modification.

Operator Commands

Command	Function
ANNounce	Sends a message from the operator to a specified user or to all users.
BEStow	Transfers programs and/or files from one user to another.
CHAnge	Modifies password, time or disc limit of a user.
COPy	Copies a program or file in one user's library to another user's library.
DESecrate	Moves a user program or file from the drum to the disc.
DIRectory	Prints a directory of library programs and files.
DISC	Informs system that a new moving-head disc has been added or an old one removed. (Note 1)
DRUm	Informs the system that a new fixed-head drum has been added or an old one removed. (Note 2)
DUMp	Writes a copy of specified program(s) or file(s) onto magnetic tape. (Note 1)
HIBernate	System shutdown command. Can incorporate a message to users. Use of magnetic tape is mandatory.
KILlid	Removes a user from the system.
LOAD	Reads a copy of specified program(s) or file(s) from magnetic tape. (Note 1)
LOCK	Prevents the system from using specified tracks of the drum. (Note 2)
MAGtape	Informs system of the addition or removal of a magnetic tape unit.
MLOCK	Prevents the system from using specified blocks on the moving-head disc. (Note 2)
MUNlock	Makes specified blocks on the moving-head disc available for use. (Note 2)
NEWid	Enters a new user into the system.
PHOnes	Sets number of seconds allowed user to sign on.
PORT	Prints a list of information concerning the configured transfer rates for the specified ports.
PRInter	Informs the system that a line printer is connected or removed.
PROtect	Allows a system library program to be only fetched and executed by a group user and prevents a system library file from access by a group user.
PURge	Removes library programs and files which have not been used since a specified date.
REPort	Prints a list of all users with time and disc space used to date.
RESet	Resets terminal time clock of any user.
ROSter	Lists all currently active users.
SANctify	Moves a user program or file from the disc to the drum.
SDIRectory	Prints a directory of SANctified programs and files.
SLEep	System shutdown command. Can incorporate a message to users. Use of magnetic tape is optional.
SPEed	Sets specified ports to specified speeds.
STAtus	Returns information about system status.
UNLock	Makes specified tracks of a drum available for use. (Note 3)
UNProtect	Files and programs formerly protected with the PROTECT command are made available to all group users.

Notes: Unless otherwise noted, these commands are used while the system is in its normal operating mode.

1. Used only during system loading or start-up
2. Used either during normal operation or during loading or start-up
3. Available only to privileged users

