

HP 20854A
Timeshared BASIC/2000, Level F
system operator's manual



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Preface

This manual is a system operator's guide to Hewlett-Packard 20854A Timeshared BASIC/2000, Level F (hereafter called the TSB system). The TSB system can be used to control programming activity in a variety of HP 2000 Computer Systems.

This manual has four sections and several appendices. Section I introduces the TSB system. Section II defines the TSB system hardware and software environment. Section III describes all system operator interfaces with the TSB system. Section IV details the operating procedures a system operator must follow to operate the TSB system effectively. The appendices include information about the TSB system error messages, disc and drum errors, storing TSB system shut-down tapes, formatting new discs, a cold-dump routine, user terminal characteristics, and TSB system recovery after a power failure. A glossary of terms and an index conclude the manual.

This manual presumes that the system operator knows how to operate the equipment in his TSB system environment. Programming considerations for the TSB system are beyond the scope of this manual; they are described in the 20854A Timeshared BASIC/2000, Level F reference manual, part number 02000-90073.

While this manual is designed to support the operation of this TSB system, it can be used as an operator's guide to several, earlier, versions of Hewlett-Packard Timeshared systems. The following table lists the TSB system operating procedures which are equivalent to the earlier TSB systems.

If the TSB system is:	Then the operating procedures and capabilities in this manual are equivalent to these TSB systems:	
20854A	2000F (options 200 and 500)	
20854A-001	2000F (options 205 and 505)	
20854A-002	2000F (options 210 and 510)	2000C (High-speed option)*
20854A-003	2000F (options 215 and 515)	2000C (High-speed option)*
20854A-004	2000F (1600 BPI tape)	

*The instructions in this manual presume that the main processor in a system is a 21MX, 2100A or 2100S. Therefore, 2000C (High-speed option) systems which have a 2116B/C as a main processor have some procedures different from those described in this manual. Order the obsolete manual, part number 02000-90017, from the Hewlett-Packard Customer Service Center for these instructions.

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SECTION I

General Information

INTRODUCTION

The TSB system must consist of a system (main) computer and a communications (I/O) processor to provide support for mass storage devices, an operator's console, a paper tape reader, multiplexers, an optional line printer, and the TSB system software.

Figure 1-1 shows the logical organization of the TSB system.

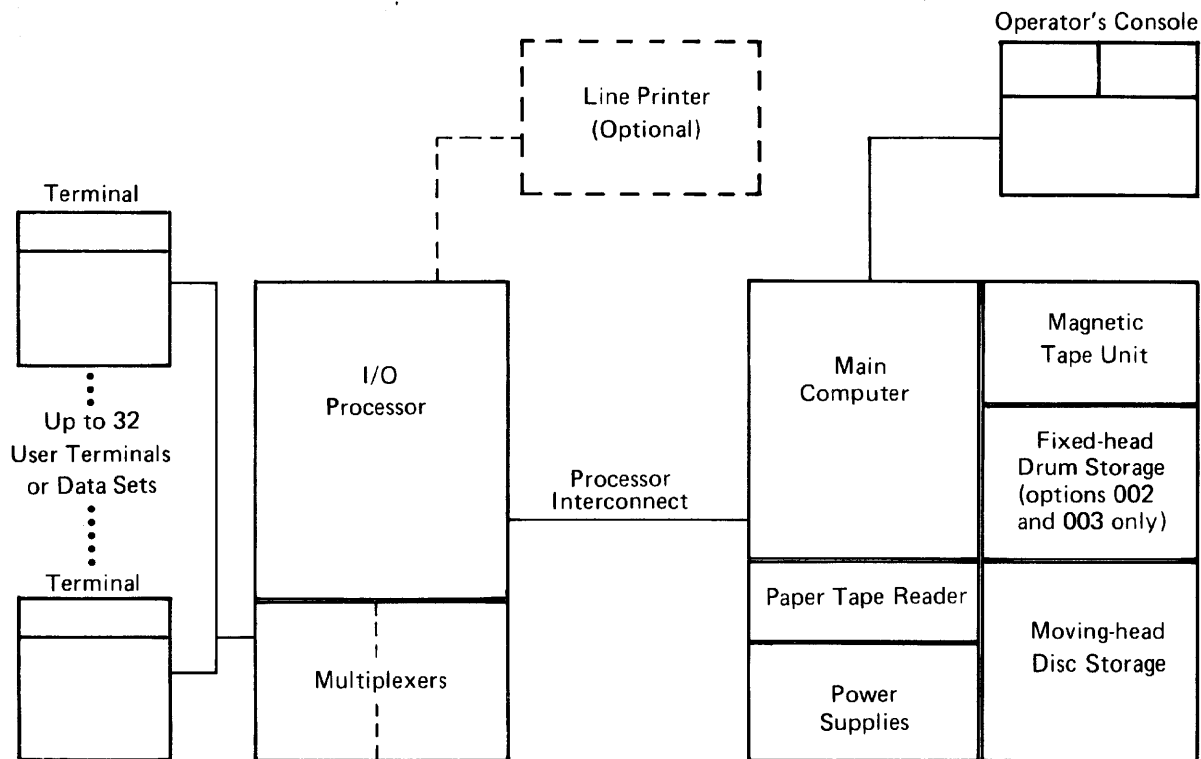


Figure 1-1. TSB System

MASS STORAGE DEVICES

Magnetic Tape Unit

One HP 7970 magnetic tape unit is required by the TSB system. The magnetic tape unit is used for system shut-down and for subsequent system start-up. In addition, it may be used to selectively load or dump programs or files during system loading.

Moving-head Disc Storage

One disc storage device is required to operate the TSB system. The system can support up to eight disc devices. Disc storage can be either HP 7900 devices or HP 2883 devices. Up to four HP 7900 disc devices are supported by one controller interface. Up to two HP 2883 disc devices are supported by one controller interface.

Fixed-head Drum Storage (options 002 and 003 only)

If option 002 or 003 is selected, at least one logical drum storage device is required to operate the TSB system. Up to four logical devices can be supported by the system. Under options 002 and 003, the system drum (logical Drum-0) is assumed present. Additional drums (logical Drum-1 through Drum-3) can be added to and removed from the system via the DRUM command (see Section 3).

The HP 2766 is the physical storage device supported by these options. One controller interface is required for each HP 2766 device connected to the system.

Drum storage is not supported or permitted with the base system or option 001.

OPERATOR'S CONSOLE

The operator communicates with the TSB system through an HP 2754A/B teleprinter (all versions), or an HP 2762A Terminal Printer (base system and option 001 only). Using one of these consoles, the operator generates or updates the TSB system, controls and monitors user access to the system, configures ports to a variety of data transmission rates, modifies or examines disc usage directories, changes the hardware configuration on-line, and checks user port activity. In addition, the operator can systematically shut down the TSB system through the console.

PAPER TAPE READER

An HP 2748 paper tape reader is used for entering the loader, I/O processor, and system programs from paper tape into the TSB system during initial generation and subsequent updates to the system.

MULTIPLEXERS AND DATA SET CONTROL

Each multiplexer installed in the channel slots of the I/O processor (two maximum, see Hardware Configuration, Section II) supports up to 16 user ports for terminals that are connected directly to the processor (hardwired). In addition, a data set control interface is associated with each multiplexer. The data set control interface allows terminal connection to the TSB system through telephone data sets. Any combination of data sets and hardwired terminals may be connected and operated concurrently.

If connection is through a data set, the TSB system allows the user 120 seconds within which to log on after telephone connection to the computer is established. If the user does not log on within this time limit, an automatic disconnect occurs. The TSB system operator may use the PHONES command to change the limit.

LINE PRINTER

Optionally, a line printer may be obtained as peripheral equipment for the TSB system. One line printer may be logically connected to (and subsequently disconnected from) the TSB system by the operator using the PRINTER command. The line printer may be one of the following models:

- HP 2610A Line Printer
- HP 2614A Line Printer
- HP 2767A Line Printer
- HP 2778A Line Printer

USER TERMINALS

Eight types of user terminals, of which seven are ASCII code generating terminals, can be connected to the TSB system. (The IBM 2741 Communication Terminal generates non-ASCII code.) Except for the Hewlett-Packard terminals, the capability to interface with the TSB system is based on the terminal manufacturer's current specifications. If these specifications change in future models, the interfacing capability may be lost.

At system generation, the user ports are configured to a system default data transfer rate. It is the operator's responsibility to reconfigure the user ports to the appropriate data transfer rates using the SPEED command. The following user terminals are supported by the TSB system.

- General Electric TermiNet 1200
- HP 2600A Keyboard-Display Terminal
- HP 2749A/B Teleprinter Terminal
- General Electric TermiNet 300 Data Communications Terminal, Model B (10/15/30 cps transfer rates) with Paper Tape Reader/Punch, Option 02

Note: This terminal must be strapped for "ECHO-PLEX".

- Memorex 1240 Communications Terminal (10/15/30 cps transfer rates)

Note: This terminal must be equipped with the even parity checking option.

- Execuport 300 Data Communications Transceiver Terminal
- ASR-37 Teleprinter Terminal with Paper Tape Reader/Punch

Note: If this terminal is equipped with the Shift Out (SO) feature, SO must be disabled because the TSB system does not permit use of this feature.

- IBM 2741 Communication Terminal

Note: This terminal should be connected to the computer over telephone lines. In addition, it must be equipped with the following features:

- 1. Interrupt, Receive (IBM #4708) and Transmit (IBM #7900) associated with the terminal's ATTN key.*
- 2. Dial-up (IBM #3255) to enable system connection through a 103A type modem or acoustic coupler.*

Terminals equipped with the automatic linefeed feature (user selectable) must be operated with this feature OFF.

Additional terminal characteristics are given in Appendix F.

Note: Although cursor, form feed, horizontal and vertical tabulation, and various special function keys are provided on specific types of user terminals, these capabilities are not supported by the TSB system.

Data Transfer Rates

The TSB system provides for symmetrical rates of data transfer between user terminals and the I/O processor. The operator can use the SPEED command to configure ports for a specific data transfer rate required by the characteristics of a user terminal.

Modem Restrictions

Any 103 type modem that operates in full duplex mode supports data transmission up to the rated speed of the modem and telephone line. Normally, the maximum speed is 300 baud but can be higher.

SECTION II

TSB System Environment

SOFTWARE REQUIREMENTS

The TSB system software is ordered either as a base system, 20854A, or one of four possible options: 20854A-001, -002, -003, or -004. The environment of the TSB system determines which option is ordered, as shown in the following table:

If the TSB system you order is:	Then the environment may include the following devices:				
	as mass storage			as operator's console	
	HP 7900	HP 2883	HP 2766	HP 2754A/B	HP 2762A
20854A	Yes	No	No	Yes	Yes
20854A-001	No	Yes	No	Yes	Yes
20854A-002	Yes	No	Yes	Yes	No
20854A-003	No	Yes	Yes	Yes	No
20854A-004	(substitutes 1600 bpi tape for 20854A 800 bpi tape)				

In this manual, references to the TSB system include all options, as well as the base system. However, the portions of this manual which pertain only to certain options are marked accordingly.

MINIMUM HARDWARE REQUIREMENTS

Main Computer

The main computer for the TSB system is an HP 21MX, 2100S or 2100A computer. The main computer must be equipped with the following options:

HP 21MX

- 32K Memory
- Disc ROM Bootstrap Loader
- Dual Channel Port Controller
- Time Base Generator

HP 2100S

- 32K Memory

HP 2100A

- 32K Memory
- Direct Memory Access (DMA)
- Time Base Generator
- Floating Point Hardware

I/O Processor

The TSB system I/O processor may be an HP 21MX, 2100S, 2100A, 2114B, or 2116B/C computer. The computer must be equipped with the following options:

HP 2100S

- Processor Interconnect Kit
- One Asynchronous Channel Multiplexer for each set of 16 user terminals supported (two multiplexers maximum)

HP 2100A, HP 21MX

- 8K Memory
- Processor Interconnect Kit
- Time Base Generator
- One Asynchronous Channel Multiplexer for each set of 16 user terminals supported (two multiplexers maximum)

HP 2114B or HP 2116B/C

- 8K Memory
- Power Fail/Auto Restart
- Memory Parity Check
- Processor Interconnect Kit
- One Asynchronous Channel Multiplexer for each set of 16 user terminals supported

In addition, the HP 2114B requires an I/O Extender to support more than 16 user terminals (to a maximum of 32).

Required Peripheral Equipment

The following peripheral equipment is required to support the TSB system:

- Paper Tape reader
- Operator's Console
- Magnetic Tape Unit
- Up to 32 User Terminals
- One Moving-head (Disc) Storage Device
- One Fixed-head (Drum) Storage Device (options 002 and 003 only)

Optional Peripheral Equipment

One line printer can be added to the TSB system.

Note: If this option is selected, a line printer interface board is required (See Hardware Configuration).

Up to seven additional moving-head (disc) storage devices can be added to the TSB system (additional controllers may be required, see Mass Storage Devices - - Section I).

One additional Asynchronous Channel Multiplexer and associated Data Set Control Interface can be added to the TSB system (each multiplexer/data set control interface supports 16 users terminals).

Up to three additional logical fixed-head (drum) storage devices can be added to the TSB system (options 002 and 003 only).

HARDWARE CONFIGURATION

Main Computer

Hardware I/O channel assignments depend on the TSB system option selected. The assignments are as follows:

Base System and Option 001

I/O channel	Contents
10-11 ₈	Processor Interconnect
12 ₈	System Operator's Console Device Controller
13 ₈	Photoreader Device Controller
14 ₈	Time Base Generator
15-16 ₈	First Moving-head Disc Device Controller - - up to four HP 7900 disc devices (base system) or up to two HP 2883 disc devices (option 001) can be associated with this controller
17-20 ₈	Magnetic Tape Device Controller

Notes: 1) Additional disc device controllers can be assigned to any pair of I/O channels up to 26-27₈ provided no previous I/O channels are left empty. It is recommended that any additional disc device controllers be assigned consecutive I/O channel pairs adjacent to the first disc device controller channels.

2) The magnetic tape device controller can be assigned to any free I/O channels with preceding empty channels permitted.

Options 002 and 003

I/O Channel	Contents
10-11 ₈	Processor Interconnect
12 ₈	System Operator's Console Device Controller
13 ₈	Photoreader Device Controller
14-15 ₈	First Fixed-head Drum Device Controller - - one drum device can be associated with this controller
16 ₈	Time Base Generator
17-20 ₈	First Moving-head Disc Device Controller - - up to four HP 7900 disc devices (option 002) or up to two HP 2883 disc devices (option 003) can be associated with this controller
21-22 ₈	Magnetic Tape Device Controller

Notes: 1) Additional disc device controllers can be assigned to any pair of I/O channels up to 26-27₈ provided no previous I/O channels are left empty. It is recommended that any additional disc device controllers be assigned consecutive I/O channel pairs adjacent to the first disc device controller channels.

2) The magnetic tape device controller and additional drum device controllers can be assigned to any free I/O channels with preceding empty channels permitted.

I/O Processor

The I/O processor configuration depends on the number of user terminals supported, as follows:

1 to 16 Terminals

I/O channel	Contents
10-11 ₈	Processor Interconnect
12 ₈	Time Base Generator
13-14 ₈	Multiplexer
15 ₈	Data Set Control Interface
16 ₈	Line Printer (optional)

17 to 32 Terminals

I/O channel	Contents
10-11 ₈	Processor Interconnect
12 ₈	Time Base Generator
13-14 ₈	First Multiplexer
15 ₈	Data Set Control Interface for First Multiplexer
16-17 ₈	Second Multiplexer
20 ₈	Data Set Control Interface for Second Multiplexer
21 ₈	Line Printer (optional)

Note: The line printer can be assigned any I/O channel from 16₈ to 24₈ inclusive.

SECTION III

Operator Interfaces with the System

SYSTEM ORGANIZATION

The TSB system software supervises the operation of the main computer, I/O processor, operator's console, mass storage devices, photoreader, and the multiplexers. In normal operating mode, the system does not require operator supervision. After the operator has brought the system to its normal operating condition, the system recognizes properly identified users, acknowledges legitimate requests, and permits controlled user access to three levels of mass storage libraries. Messages showing user logging activity are printed and/or punched at the operator's console.

COMMUNICATIONS

The main communications channel -- that between the TSB system and the user -- is described in the reference manual for 20854A Timeshared BASIC/2000, Level F, part number 02000-90073.

Communication between the system operator and the users is confined to messages sent by the operator to all ports during system shut-down (SLEEP and HIBERNATE commands) or by the ANNOUNCE command which may be directed to a specific port or to all ports at any time. A user command, MESSAGE, permits users to send messages to the operator.

Communication between the system and the operator is extensive during start-up, consisting largely of a dialogue initiated by the system requesting specific information from the operator. During normal operation the operator may request reports from the system or request on-line changes to the system status; otherwise, the only communication from the system are the reports of user logging activity, error halts and messages, and messages from users.

SYSTEM SHUT-DOWN

The operator must use either the HIBERNATE or SLEEP command (this section) to shut down the TSB system in an orderly manner. This permits subsequent quick start-up of the system with no loss of data. Either command causes the entire system (except for the bootstraps) to be written to disc storage.

Under execution of the HIBERNATE command, the contents of the disc are dumped to magnetic tape. Verification of the transferred data is performed if desired by the operator. (Data verification ensures the integrity of the system back-up.) Additional reels of magnetic tape are requested until the disc is dumped completely.

The SLEEP command permits, but does not require, use of magnetic tape. If a dump to magnetic tape is selected, only system information and those user programs and files that have been created or changed since the last successful hibernate operation are transferred. Although back-up sleep tapes are optional, their consistent use substantially improves system reliability. If hardware problems make it impossible to regenerate the TSB system from disc, the operator can use the latest sleep tape and the latest hibernate tape to recover to the point in time that the last sleep tape was written.

For added reliability, additional copies of either hibernate or sleep tapes can be produced immediately following the completion of the original shut-down operation (see HIBERNATE and SLEEP command descriptions). It is recommended that several "generations" of both hibernate and sleep tapes be kept for additional back-up in case the latest tapes are physically damaged or cannot be read. Appendix C contains some suggestions for organizing the storage of shut-down tapes.

Two types of shut-down procedures are provided because of the storage capacity of the TSB system. In a system with very large user libraries, hibernation of all of the libraries is time consuming and requires many reels of tape. If most of the libraries are used simply for storage and are not changed frequently (the elements in the libraries are referenced but seldom altered), a sleep tape of the same system could be accomplished quickly on a comparatively small amount of magnetic tape. In a small system, or in a system in which most of the user library is modified frequently, there is little difference in either time or tape quantity used which shut-down command is used. In this case, the HIBERNATE command is recommended.

Frequency of shut-down depends on the application of the system. Where the TSB system is shut down daily and the hardware used for other purposes, the HIBERNATE or SLEEP command must be used daily. On a dedicated system that runs around the clock, some down-time should be scheduled for a sleep operation (preferably once a day) and a hibernate operation (weekly) to protect user's data.

The TSB system must be hibernated at least once every six months for proper date verification.

USERS

To log on to the TSB system, each user must enter an identification code, a password, and depending on the user terminal, a terminal-type parameter. The identification code is a single alphabetic character followed by three decimal digits, A000 through Z999. The password may consist of as many as six characters (some or all may be non-printing characters for privacy). Both the identification code and the password are assigned to the user by the system operator (see NEWID and CHANGE commands in this section). The terminal-type parameter is a single digit defined by system requirements and described along with the user command, HELLO, in the TSB system reference manual. The identification code and password are not associated with a specific terminal or port, and the same user code can be in active use on a number of terminals simultaneously. The operator is notified by a logging message on the console giving user identification, the time, and the port number each time a user logs on or off any terminal on the system.

USER ORGANIZATION

The users are classified by group according to identification code. Each group is comprised of 100 user codes. For example, A000 through A099 is a group, A100 through A199 is another group, and so on through the last possible group, Z900 through Z999. The first identification code within each group is assigned to a user designated as Group Master. The identification code A000 has special status - - it is assigned to a user designated as System Master. The library associated with identification code Z999 can be used to store a program named HELLO which is executed at each user's port at log on time (Z999 is a nonprivileged user identification).

In addition, the users are classified as privileged, semiprivileged, and nonprivileged.

Privileged Users

Privileged users have powers not available to the normal TSB user. They have responsibilities for maintaining the common libraries. The System Master (A000) and all Group Masters are privileged users.

Semiprivileged Users

Users with identification codes beginning with the character A, specifically A000 through A999, are semiprivileged users. When semiprivileged users with the same identification code are logged on at more than one terminal, they can alter their files simultaneously. Nonprivileged users can only read files simultaneously. Note that some semiprivileged users are also privileged users (A000, A100, . . . , A900).

Nonprivileged Users

All users assigned identification codes greater than A999 who are not Group Masters are nonprivileged users. For example, B001 through B099, B101 through B199, and so forth.

Figure 3-1 is a diagram of user classifications.

LIBRARY ORGANIZATION

Each user has access to three levels of libraries - - his own private library, a group library, and the system library.

USER IDENTIFICATION CODE	SYSTEM MASTER	GROUP MASTER	PRIVILEGED USER	SEMI-PRIVILEGED USER	NON-PRIVILEGED USER	
A000	✓	✓	✓	✓		GROUP #1
A001				✓		
:				:		
A099				✓		GROUP #2
A100		✓	✓	✓		
A101				✓		
:				:		
A199				✓		:
:				✓		
B000		✓	✓			GROUP #11
B001					✓	
:					:	
B099					✓	GROUP #12
B100		✓	✓			
B101					✓	
:					:	
B199					✓	:
:						
C000		✓	✓			GROUP #21
C001					✓	
:					:	
C099					✓	GROUP #22
C100		✓	✓			
C101					✓	
:					:	
C199					✓	:
:						
Z000		✓	✓			GROUP #251
Z001					✓	
:					:	
Z099					✓	:
:						
Z900		✓	✓			GROUP #260
Z901					✓	
:					:	
Z999					✓	

Figure 3-1. TSB System User Classification

Users Private Library

A private library can be created and maintained by each identification code/password combination. This library is completely under control of the user assigned that code and password. The user can enter, modify and delete programs and files within his private library.

Group Master and Group Library

The library associated with each Group Master identification code is a common library accessible only to members of the group. The Group Master is responsible for creating and maintaining elements (programs and files) within his Group Library. He can enter, modify, and delete elements in the library in the same manner that normal users do with their private libraries. However, the Group Master has use of two special commands not available to normal users - - PROTECT and UNPROTECT. The PROTECT command adds restrictions to the use of specific elements in the Group Library. A protected program can be executed (RUN) by any member of the group; it cannot be referenced in a SAVE, CSAVE, PUNCH, XPUNCH, or LIST command. A protected file cannot be accessed in any manner by members of the group. The UNPROTECT command removes the restrictions from specified library elements. Unprotected elements are generally available to all members of a specific group.

Files within the Group Library can be "mask protected" to insure security of data within the file. This is accomplished through use of the BASIC language ASSIGN statement. The mask protected status remains with the file until it is removed from the library with a KILL command. A file with mask protected status can be accessed only by the Group Master or by a protected program which has not been modified.

Users other than the Group Master may not modify an element within the Group Library or write it back into the Group Library.

System Master and System Library

The TSB system has exactly one System Master identification code - - A000. The basic functions of the System Master are similar to those of the Group Master, but more extensive.

The System Master exercises complete control over the System Library which is available to all other users. He can enter, modify, and delete elements in the System Library and has use of the PROTECT and UNPROTECT commands.

Files within the System Library can be "mask protected" to insure security of data within the file. This is accomplished through use of the BASIC language ASSIGN statement. The mask protected status remains with the file until it is removed from the library with a KILL command. A file with mask protected status can be accessed only by the System Master or by a protected program which has not been modified.

In addition to being able to protect or unprotect elements in the System Library, the System Master is permitted to use several system commands otherwise reserved for use by the system operator. These commands are PORT, REPORT, STATUS, DIRECTORY, and (under options 002 and 003

only) SDIRECTORY. The System Master has no access to the system through the operator's console, but must gain access through one of the user terminals. If the system operator also acts as System Master, a user terminal independent of the operator's console must be available to the operator.

Although the system operator may also act as System Master, the functions and responsibilities of the two jobs are distinct. The operator controls the system, but has little control over the System Library other than allocating storage and purging the library of inactive elements. The System Master has extensive control of the System Library, but no control over the operation of the system.

Note: Anyone with the proper password can use identification code A000 and modify the System Library; using control characters (non-printing) in this password can help maintain security.

THE SYSTEM OPERATOR

Although the TSB system is designed to operate with minimum attendance, the system operator is responsible for loading and initiating the system, and for periodic start-up and shut-down of the system.

System Halts

TSB system halts may occur; see Appendix A for a description of those halts and possible corrective action.

Operator Commands

The TSB system provides a group of commands that are accepted through the operator's console device. Included are commands to assign and delete user identification codes, to add or remove user access to peripheral storage or communication devices, to manipulate the elements contained in system and user libraries, to generate reports, to perform system shut-down, and so forth.

Operator Messages

The system provides two types of messages to the operator - - standard operating messages and error messages.

STANDARD OPERATING MESSAGES. The standard operating messages make requests for operator input or action and provide current system activity information to the operator. The operating messages are presented with the operating procedures in Section IV.

ERROR MESSAGES. The error messages inform the operator of errors that occur during system activity. These messages may be printed during system start-up or loading as well as during system execution. Error messages and descriptions are listed in Appendix A.

CONSOLE OPERATION

The system operator's console (sometimes called the system console) can be an HP 2754A/B Teleprinter (available with all options), or an HP 2762A Terminal Printer (available with the base system and option 001 only). When the TSB system is loaded, certain switches on these consoles must be set.

HP 2754A/B Switch Settings

The Status Switch must be set to ON LINE.

The Mode Switch must be set to either:

- KT to print all system messages at the console and punch LOGON and LOGOFF messages on paper tape (this is the normal setting)
- K to print all system messages at the console, but not punch any messages on paper tape
- T to print all system messages at the console and punch all messages on paper tape.

HP 2762A Switch Settings

The Auto Linefeed Switch must be set to OFF.

The All Caps Switch must be set to ON.

The On Line Switch must be set on (lighted) for the computer to communicate with the console. Both the On Line *and* the Ready switches must be on for the operator to communicate with the computer through the console.

The channel type switch must be set to FULL (for full-duplex operation).

The Rate Switch should be set to 30 cps (for efficient operation).

Note: If switch register bit zero of the system (main) computer is set on (lighted), all input from the console (except for a break request) is ignored by the TSB system.

Note: The operator should be familiar with the 2762A escape sequences and control codes. Refer to Operator's Manual 2762A Terminal Printer (part number 02762-90011).

System Log

A log, indicating user logging activity, is normally printed and punched at the operator's console. Each LOGON and LOGOFF message includes user identification code, current time, and port number.

Command Entry

Upon entry of any system command, only the first three characters of each command are significant; the remaining characters are superfluous and need not be included. For example, the STATUS command may be entered in any of the following forms:

```
STA
STAT
STATU
STATUS
```

If the command requires or permits parameters, a hyphen must separate the command from the parameter string. For example:

```
PURGE-186/73
```

If more than one parameter is required or permitted, a comma must separate the parameters. For example:

```
DISC-1,21,2
```

Blanks imbedded in the command string are ignored, except within messages specified in SLEEP, HIBERNATE, and ANNOUNCE commands.

Each command string entered must be terminated with a carriage return. If the system cannot interpret an entered command, three question marks are printed at the operator's console, thus:

```
???
```

Specific keys on the console are designated to assist the operator during command entry. These keys permit deletion of characters or command strings and halting of output being printed at the console.

All numbers entered or printed on the system console are decimal integers, except for I/O select codes specifying or reporting the location of the hardware peripherals. These I/O select codes are octal integers.

CHARACTER DELETION. If a typographical error is made while typing in a command, the underscore character () on the 2762A or the back arrow character (←) on the 2754A/B performs as a delete key (sometimes called a backspace character). Press this key once for each previous character to be deleted. For example, the sequences:

```
ABC←←DE←F (on the 2754A/B console), and
ABC_ _DE_ F (on the 2762A console)
```

perform the same function and are both equivalent to the sequence ADF.

COMMAND STRING DELETION. To delete an entire command string (prior to entry of the terminating carriage return) enter the control character X^C (press and hold the CONTROL key, simultaneously press the X character key, then release both keys). When the system encounters this control character, the line being typed is ignored and a back slash character (\) is printed followed by a carriage return and a linefeed.

COMMAND PRINTOUT TERMINATION (BREAK REQUEST). The printing of output produced as a result of command entry can be terminated by pressing any key on the console. Printing then terminates at the end of the current line.

COMMAND DESCRIPTIONS

The system commands available to the operator are described on the following pages. Certain conventions are utilized in describing the system commands.

Command Description Conventions

In the following descriptions, the full commands are shown in uppercase characters. In the examples, only the required characters are shown. Parameters associated with the commands are shown in lowercase characters.

When required parameters are shown, a hyphen separates the parameter string from the command.

When parameters are optional, the parameter string is enclosed in brackets, [].

A parameter list enclosed in braces, { }, indicates the operator must choose one parameter from the list.

EXAMPLES:

The following parameters are required:

NEW-idcode, password, time limit, disc space

The following parameter is optional:

DIR [-idcode]

In the following command, the first parameter is required; only one may be specified. The second parameter is optional:

RES- { idcode } [, time used]

ANNOUNCE

The system operator may use the ANNOUNCE command to send a one-line message to a specific port or to all ports. The command is entered in the form:

$$\text{ANNOUNCE-} \left\{ \begin{array}{l} \textit{port number} \\ \textit{ALL} \end{array} \right\}, \textit{character string}$$

<i>port number</i>	A decimal value from 0 to 31 designating a specific user port. If selected, the character string is transmitted to this port number.
<i>ALL</i>	If selected, the character string is transmitted to all ports.
<i>character string</i>	A message of up to 66 characters including blanks. The message is transmitted to the port or ports specified by the first parameter.

The message is printed literally, including blanks, at the designated port or at all ports.

This command should be used with care because any output being printed at the user's terminal is interrupted with unexpected text. It is appropriate, however, to warn users shortly before system shutdown (see SLEEP and HIBERNATE commands).

Note: The message is not transmitted to a port that currently has the line printer assigned as its output device.

The user has a complementary command, MESSAGE with which to send a message to the operator.

EXAMPLES:

ANN-ALL,SYSTEM WILL BE SHUT DOWN IN 15 MINUTES.

warns user of approaching system shutdown.

ANN-10,YOUR REQUEST FOR MORE FILE SPACE IS GRANTED.

informs user at port 10 that his request for more file space has been granted.

BESTOW

This command is used to transfer programs or files from the library of one user to that of another user. The command is entered in the following form:

BESTOW-idcode₁,idcode₂ [,name]

<i>idcode₁</i>	The identification code of the current owner of the program or file to be transferred.
<i>idcode₂</i>	The identification code of the destination owner of the program or file to be transferred.
<i>name</i>	An optional parameter indicating the program or file name to be transferred from <i>idcode₁</i> to <i>idcode₂</i> . If omitted, the entire library of <i>idcode₁</i> is transferred to the library of <i>idcode₂</i> .

Use of the BESTOW command results in the removal of one element or all elements in the library of the user designated by *idcode₁* and placement of the element or elements in the library of the user designated by *idcode₂*. Elements in the library of *idcode₁* that duplicate names in the library of *idcode₂* are not removed or transferred.

A protected program or file transferred via the BESTOW command to another user's library loses its protected status following the transfer. A mask protected file retains its mask protected status following the transfer.

The BESTOW command should be used only when no users are logged on to the system because users cannot gain access to the system when this command is in execution, and any active files named in the BESTOW command will be transferred.

If the transfer of library elements cannot be completed, one of the following messages is printed:

NO ENTRIES FOR OLD ID
NO SUCH NEW ID
LIBRARY SPACE FULL
NO SUCH ENTRY
INVALID NAME
DUPLICATE ENTRY
DUPLICATE ENTRIES

EXAMPLES:

BES-D123,B324

transfers the entire library of user idcode D123 to the library of user idcode B324.

BES-B444,C227,AAAAA

transfers a program or file named AAAAA from the library of user idcode B444 to the library of user idcode C227.

BREAK

The BREAK command permits the operator to enable the BREAK capability at a specified port. The command should be used only to override a BREAK capability disabled condition when the user's program is in an infinite loop during execution. The command is entered in the form:

BREAK-port number

port number A decimal value from 0 to 31 designating the specific user terminal (port).

Entry of this command does not initiate a BREAK condition but enables the user to do so. The BREAK command remains in effect until the user's program has run to completion, the program terminates because of an execution error, the user terminates the program with the BREAK key, or until the user breaks the communication connection (hangs up or turns the terminal off).

If an illegal port number or more than one port number is specified, the message ILLEGAL FORMAT is printed. If the indicated port is not logged on, the message USER NOT LOGGED ON is printed.

EXAMPLE:

BRE-25

causes the BREAK capability disabled condition at port 25 to be overridden.

CHANGE

The system operator uses the CHANGE command to modify any or all of the parameters of an existing user identification code. The command is entered in the form:

CHANGE-idcode,[password],[time limit],[disc space]

<i>idcode</i>	The identification code assigned to a specific user (see NEWID command).
<i>password</i>	If specified, this becomes the new password associated with the specified idcode.
<i>time limit</i>	If specified, this becomes the new terminal usage time limit (in minutes) associated with the specified idcode. This value cannot exceed 65535.
<i>disc space</i>	If specified, this becomes the new disc space size limit associated with the specified idcode. This value cannot exceed 65535.

At least one parameter other than idcode should be specified. The parameters must be entered in the order shown and a comma must be entered as a place holder for any omitted parameter (trailing commas are not required).

If the specified idcode does not exist or is not recognized by the system, the message NO SUCH ID is printed.

EXAMPLES:

CHA-Q123,BASIC

changes the password of user Q123 to BASIC. The time limit and disc space limitations remain unchanged.

CHA-Q123,,1000

changes the terminal time limit allotment of user Q123 to 1000 minutes. The other parameters remain unchanged.

CHA-Q123,,,500

changes the disc space allotment of user Q123 to 500 blocks. The other parameters remain unchanged.

COPY

This command is used to reproduce an element (program or file) from the library of one user within the library of another user. The command is entered in the form:

COPY-idcode₁,name₁,idcode₂,name₂

idcode₁ The identification code of the user in whose library the element to be copied resides.

name₁ The name of the element to be copied to another user.

idcode₂ The identification code of the destination user in whose library the element is to be copied.

name₂ The new name of the library element as it appears in the library of user *idcode₂*. This name can be the same as *name₁* but cannot duplicate an existing name in the library of user *idcode₂*.

The ownership of the library element is not transferred. The original owner retains the element identified by *name₁* while the destination owner has a copy identified by *name₂*.

A protected program or file retains its protected status in the original library, but the copy in the new library is not protected. A mask protected file retains its mask protected status in the original file as well as the copy in the new library. The COPY command should be used only when no

users are logged on to the system because users cannot gain access to the system while this command is in execution.

If the copying function cannot be completed, one of the following messages is printed:

INVALID NAME
NO SUCH ENTRY
ILL-STORED PROGRAM
LIBRARY SPACE FULL
SYSTEM OVERLOAD
DUPLICATE ENTRY
UNSUCCESSFUL
NO SUCH NEW ID

EXAMPLES:

COP-G476,ABC,M935,DEF

produces a copy of an element named ABC from the library of user G476 in the library of user M935. The copy is named DEF.

COP-E722,1AMD,B079,1AMD

produces a copy of an element named 1AMD from the library of user E722 in the library of user B079. The copy has the same name as the original.

DESECRATE (options 002 and 003)

The DESECRATE command is used to return a sanctified program or file (see SANCTIFY command) from drum storage to the disc. This command is entered in the form:

DESECRATE-idcode,name

idcode The identification code assigned to a specific user (see NEWID command). This is the idcode of the user requesting the return of a sanctified program or file to the disc; it must be the same idcode as that used originally in the SANCTIFY command.

name The name of the program or file to be returned to the disc.

Specification of both parameters is required. The program or file must have been previously sanctified and cannot be in use when the DESECRATE command is executed. The specified program or file is returned to its original location on the disc. The drum space it occupied is returned to the system.

If execution of this command cannot be completed, one of the following messages is printed:

ENTRY NOT PRESENT
ENTRY NOT SANCTIFIED
BAD TRANSFER, FILE DESTROYED
FILE IN USE

EXAMPLE:

DES-H325,MYFIL

results in the return of a sanctified file named MYFIL from the drum to the disc library of user H325.

DIRECTORY

This command is available to the system operator and the System Master (user idcode A000) to obtain a printed list of library programs and files according to user idcode. Either a complete list or a partial list can be obtained. The command is entered in the following form:

DIRECTORY[-idcode]

idcode The identification code assigned to a specific user. If specified, the directory listing begins with this idcode and continues through the end of the directory entries. If omitted, the listing includes all entries in the directory.

The directory listing is headed by the system identification and the current date and time. The idcodes are listed in the first column. The second column contains the library element names (program or file) associated with each idcode. The remaining columns contain information pertinent to each element, as follows:

Date and Element Type	The data given is the date this element was last referenced (day-of-year/last two digits of year) followed by one or more of the characters C, F, P, or blank. The character C indicates a program in semi-compiled form. The character F appears if the element is a file. The character P indicates a protected element. A blank indicates that the element is a program in uncompiled form.
Length	The element length in words (program) or in records (file). Length is given in decimal notation.
Disc	The disc location (logical block number, decimal) of the library element.

Drum

The drum information column is printed under options 002 and 003 only. The drum location (drum-number/track/sector) of sanctified elements (see DIRECTORY command).

If the command cannot be executed, the following message is printed:

CAN'T READ DIRECTORY TRACK

EXAMPLE:

DIR						
2000F						
053/73 1443						
ID	NAME	DATE		LENGTH	DISC	DRUM
A000	AAA	053/73	F	00002	000516	
	BUDGET	053/73		03431	000968	
	C	050/73	F	00031	000982	
	GT	042/73	F	00128	001512	
	XY	043/73	F	00256	001640	
A111	ASTEST	042/73		00029	001896	
	FILE2	042/73	F	00012	001897	
	MYFILE	042/73	F	00012	001909	
B111	APRIN	042/73	C	00024	003972	
	ASST	042/73		00043	003973	
	COMI	041/73		00016	003974	
	TAR	048/73		00595	003975	
	TARGET	048/73	C	00624	003978	
B122	A	047/73	F	00003	003981	0/00/004
	CHAR.F	047/73	F	00001	003984	
	CHAR.P	047/73		00032	003985	
	CHARX	047/73		00055	003986	
	FILCHK	048/73		00021	003987	0/00/003
	FILFIL	048/73		00131	003988	
	TEST	042/73		00027	003989	
Z999	HELLO	050/73		00320	004664	
	HSAV1	048/73		00128	004666	

Note: The column labeled DRUM appears for options 002 and 003 only. In this example, file A and program FILCHK under idcode B122 are sanctified and appear on both the disc and drum.

DISC

The DISC command can be used only during system loading. It is used to add moving-head discs to or remove them from the system. The format of the command follows:

DISC-disc number, select code, unit number

<i>disc number</i>	A value from 0 to 7 designating the logical disc number.
<i>select code</i>	An octal value designating the lower-numbered select code of the controller to which the disc is connected.
<i>unit number</i>	A value indicating the disc's physical unit number on the controller.

System information and user libraries are stored on the moving-head discs. The system references information on the discs as a linear sequence of blocks; each block is 256 words in length (decimal). The base system and option 001 require approximately 1250 blocks on a 16-port system and 2000 blocks on a 32-port system. Options 002 and 003 require approximately 500 blocks. The remainder of the disc space is for user programs and files. Included are the system library, group libraries and the private user libraries.

To remove a disc from the system, enter the command with a select code value of zero. In this case, the unit number parameter and preceding comma are not permitted.

Disc-0 is assumed to be present by the loader; it can be neither moved nor removed from the system. Under the base system and option 001, disc-0 can be specified with a select code value of 15₈; under options 002 and 003, disc-0 can be specified with a select code value of 17₈. No other select code values are permitted for disc-0. This has no effect on disc-0.

The messages associated with system loading are given in Appendix A.

EXAMPLES:

DIS-1,21,2

adds disc-1 to the system. The disc is associated with the controller in I/O slot 21-22₈ and is unit 2 on the controller.

DIS-1,0

removes disc-1 from the system.

DRUM (options 002 and 003 only)

The DRUM command can be used only during system loading. This command is used to add fixed-head drum storage to or remove it from the system. The command is entered in the form:

DRUM-drum number, select code

drum number A value from 0 to 3 designating the logical drum number.

select code An octal value designating the lower-numbered select code of the controller to which the drum is connected.

The DRUM command informs the TSB system that a drum is added or removed. Drum-0 is assumed present by the loader; it can be neither moved nor removed from the system. Thus, only the values 1 through 3 should be specified as the drum number parameter. Drum-0 can be specified with a select code value of 14₈. This has the effect of unlocking any locked tracks on drum-0. No other select code is permitted for drum-0.

Whenever a drum is added to the system, all 64 tracks of the drum referenced in the DRUM command are unlocked even if the specified drum is already present on the system.

To remove a drum from the system, enter the command with a select code value of zero.

Up to 256 tracks of 128 sectors each are defined as drum storage in the TSB system. The tracks are allocated into four logical drums of 64 tracks each, numbered 0 through 3, regardless of the physical arrangement of the drum tracks. A drum unit having 128 tracks is defined as two logical drums of 64 tracks each, a 192-track drum as three logical drums. If the physical drum has fewer than 64 tracks or a number of tracks not evenly divisible by 64, any non-existing tracks must be locked using the LOCK command.

For example, a 48-track (physical) drum would be considered a 64-track (logical) drum with tracks 48 through 63 locked. A 96-track (physical) drum would be one full 64-track logical drum and a second logical drum of 64 tracks with tracks 32 through 63 locked.

Note: If this locking procedure is not followed during configuration of the system, the system will attempt to store information on nonexistent drum tracks.

When a drum has more than 64 logical tracks and is used as more than one logical drum, the order of entering DRUM commands determines the relation of drum numbers to tracks. Each DRUM command entered assigns the lowest available block of 64 tracks to the drum number specified in the command. For example, if the following commands are entered on a system where channels 14-15₈ contain a 128-track drum and channels 21-22₈ contain a 96-track drum:

DRU-1,14
DRU-2,21
DRU-3,21
LOC-3,32,63

Drum-0 is assumed as tracks 0-63 of the first drum and DRU-1 refers to tracks 64-127 of the first drum. DRU-2 refers to tracks 0-63 of the second drum. DRU-3 refers to tracks 64-95 of the second drum. The LOCK command locks the remaining tracks (actually nonexistent) of the second drum.

DUMP

The DUMP command is a loader command. It can be entered by the operator only if the configuration options segment is selected during system updating or system start-up. At one point in the configuration options segment, the loader query "LOAD OR DUMP COMMANDS?" is printed. The DUMP command may be entered at this time. It is not valid during normal operation of the TSB system.

DUMP command usage is described under "System Update" in Section IV.

HIBERNATE

This command is used to shut down the system while retaining a complete copy of the system and user libraries on magnetic tape. The command provides a systematic shut-down procedure that allows easy start-up at a later time. The format of the HIBERNATE command is:

HIBERNATE [-character string]

character string An optional message which, if specified, is sent to active users.

Entry of the HIBERNATE command results in the following actions:

- a. If specified, a message is sent to the active users.
- b. Active users are disconnected from the TSB system.
- c. The current TSB system is copied onto disc storage.

Under options 002 and 003, sanctified programs and files are copied from drum storage back to their reserved positions on disc storage.

- d. The entire TSB system is dumped onto magnetic tape for subsequent reloading. After writing each tape, the system prints the query VERIFY? Respond YES to rewind and compare the tape. If a tape verification fails, the system prints TAPE BAD and the main computer halts. To try the dump again, use either the same tape or mount a new reel, then press RUN on the main computer. If more than one tape is required, the system calls for more tapes until the complete system is dumped. Additional tapes must not be mounted until requested. To bypass verification, respond NO. Do not remove the tape reel until after the NO response is entered.

- e. After a successful system hibernation, the message DONE is printed and the main computer halts (the I/O processor does not halt). If another copy of the dump is desired, mount a new tape and press RUN on the main computer; the entire magnetic tape dump procedure is repeated.
- f. The system may now be powered down.

It is appropriate that the ANNOUNCE command be used to warn active users of an impending system shut-down shortly before the HIBERNATE command is entered.

If the magnetic tape device select code was not defined prior to entry of the HIBERNATE command, the following error message is printed:

NO MAG TAPE

Enter the MAGTAPE command with the appropriate select code and enter the HIBERNATE command again.

EXAMPLES:

HIB

shuts down the TSB system with no communication to the active users.

HIB- GOOD BYE. TSB IS DOWN, WILL RETURN AT 0800 TOMORROW.

shuts down the TSB system with an informational message to the active users.

KILLID

The KILLID command allows the operator to remove a specified user from the TSB system. Command format follows:

KILLID-idcode

idcode

The identification code of the user to be removed from the system.

The specified user is completely removed from the system directory. Any disc files or programs assigned to the user are removed and the space is returned to the system. If the user is currently logged on at a terminal, he is immediately disconnected from the system. The System Master identification code (A000) may not be specified in this command. A Group Master identification code is not accepted if any member of his group is logged on when the KILLID command is entered. If a Group Master is removed from the system, his Group Library is also removed.

Possible error messages resulting from entry of this command are:

A000 NOT ALLOWED
NO SUCH ID
GROUP LIBRARY IN USE

EXAMPLE:

KIL-Q123

removes the user assigned the identification code Q123 from the system.

LOAD

This command is a loader command. It can be entered by the operator only if the configuration options segment is selected during system updating or system start-up. At one point in the configuration option segment, the loader query "LOAD OR DUMP COMMANDS?" is printed. The LOAD command may be entered at this time. It is not valid during normal operation of the TSB system.

LOAD command usage is described under "System Update" in Section IV.

LOCK (options 002 and 003 only)

The LOCK command allows the operator to make specific drum tracks unavailable to the TSB system. The command is entered in the form:

LOCK-n, track₁ [, track₂]

n A single-digit integer, 0-3, representing the drum logical unit number.

track₁ Track number; 1 or 2 digits, 0-63; first or only track to be locked.

track₂ Optional track number; 1 or 2 digits, 0-63; last track to be locked in a range beginning at *track₁*. If specified, *track₂* must be greater than or equal to *track₁*.

The LOCK command can be used to replace a drum in the TSB system by locking all tracks of the drum. When the new drum is installed, the tracks can be unlocked. (Adding a drum via the DRUM command automatically unlocks all 64 tracks.) The LOCK command is also used to eliminate physically faulty tracks.

The first three sectors in track 0 of drum-0 are reserved for the system bootstrap loaders; if this track is referenced in a LOCK command (for example, LOC-0,0) all sectors of track 0 except the first three are made unavailable to the system.

Drums that do not have exactly 64 tracks can be used by locking those tracks that do not physically exist; that is, locking tracks 32-63 of the second logical drum of a 96-track physical drum.

When the system is reloaded from magnetic tape or disc, any tracks can be locked without loss of information.

If a LOCK command references an area containing sanctified user programs, the programs are returned automatically to disc storage (see the DESECRATE command). If a referenced area contains sanctified files, the files are destroyed and their associated disc space is returned to the system. If the area contains TSB system tables, the command is rejected because the system tables cannot be removed without destroying the system.

If the LOCK command cannot execute to completion, possible error messages are:

ILLEGAL PARAMETERS
CAN'T LOCK TRACK tt
NO SUCH DRUM
LOCK FEWER TRACKS
DISC/DRUM ERROR; CAN'T DO IT

EXAMPLES:

LOC-3,5

locks track 5 of drum-3.

LOC-3,5,7

locks tracks 5, 6, and 7 of drum-3.

MAGTAPE

The MAGTAPE command is used to inform the TSB system of the logical addition or removal of the magnetic tape unit. The command is entered in the form:

MAGTAPE-select code

select code

An octal value indicating the I/O channel select code (high priority, lower number of the channel pair) of the magnetic tape unit; or, to remove the tape unit from the system, zero.

Once the TSB system is informed of the presence of the tape unit via the MAGTAPE command, a copy of the system software is written to magnetic tape each time a HIBERNATE or SLEEP command is entered by the operator. This copy can be used to reload the system, if necessary. The magnetic tape unit must be present on the system to use the LOAD, DUMP, and HIBERNATE commands. Its presence is optional for the SLEEP command.

It is of prime importance to specify the correct select code with the MAGTAPE command (see Hardware Configuration in Section II) because the system does not check this code before attempting to access the tape unit. If the wrong select code is specified, the system may become involved in an infinite loop. One indication of this type of error is the lack of activity on the tape unit.

To remove system access to the magnetic tape unit, enter the MAGTAPE command with a select code value of zero.

EXAMPLES:

MAG-21

informs the system that the magnetic tape unit is accessible on I/O channels 21-22.

MAG-0

removes magnetic tape unit accessibility from the system.

MAG-17

informs the system that the magnetic tape unit is accessible on I/O channels 17-20.

MLOCK

The MLOCK command allows the operator to make specific disc blocks unavailable to the TSB system. MLOCK command format follows:

MLOCK-block₁ [, block₂]

block₁ Block number; must be greater than 3, maximum value depends on size of disc; first or only block to be locked.

block₂ Block number; must be greater than 3, maximum value depends on size of disc; last block to be locked in a range beginning at block₁. If specified, block₂ must be greater than or equal to block₁.

This command is used primarily to eliminate physically faulty areas on the disc.

When the TSB system is reloaded from magnetic tape or loaded from paper tape, any blocks can be locked without loss of information. However, at least 150 blocks on logical disc 0 must not be locked because portions of the system software must reside on this disc.

Once the MLOCK command is executed, the disc blocks remain locked until they are unlocked via a MUNLOCK command. This is true even if a different TSB system is initiated. Each disc maintains a table of its locked blocks.

If an MLOCK command references an area containing user programs, the programs are lost. If a referenced area contains TSB system tables, the command is rejected; system tables cannot be removed without destroying the system. Any referenced blocks already locked are unaffected by entry of this command. For options 002 and 003, referencing an area containing space reserved for a sanctified entry causes the entry to be lost and its drum space returned to the system.

The system message:

LOCK FEWER BLOCKS

indicates that the system will not have room to store interim tables if the requested number of blocks are locked. Lock disc blocks in smaller portions.

Other system messages include the following:

ILLEGAL PARAMETERS
BAD PARAMETER
LOCKED BLOCKS TABLE FULL
CAN'T LOCK BLOCK xxxxxx
DISC ERROR; CAN'T DO IT (base system and option 001)
DISC/DRUM ERROR; CAN'T DO IT (options 002 and 003)

EXAMPLES:

MLO-525

locks disc block 525.

MLO-525,530

locks disc blocks between 525 and 530 (inclusive).

MUNLOCK

This command is used by the operator to unlock disc blocks. The command is entered in the form:

MUNLOCK-block₁ [, block₂]

block₁

Block number; must be greater than 3, maximum value depends on the size of the disc; first or only block to be unlocked.

block₂ Block number; must be greater than 3, maximum value depends on the size of the disc; last block to be unlocked in a range beginning at *block₁*. If specified, *block₂* must be greater than or equal to *block₁*.

Any blocks referenced in the MUNLOCK command which were not previously locked remain unaffected by this command.

Possible system error messages are:

ILLEGAL PARAMETERS
BAD PARAMETER
NONEXISTENT DISC
LOCKED BLOCKS TABLE FULL
DISC ERROR; CAN'T DO IT (base system and option 001)
DISC/DRUM ERROR; CAN'T DO IT (options 002 and 003)

EXAMPLES:

MUN-525

unlocks disc block 525.

MUN-525,530

unlocks disc blocks between 525 and 530 (inclusive).

NEWID

The NEWID command is used to enter a new user into the TSB system. The command is entered in the following form:

NEWID-idcode, password, time limit, disc space

<i>idcode</i>	The identification code assigned to a user; consists of a letter followed by three decimal digits.
<i>password</i>	The user's password associated with <i>idcode</i> ; consists of from 0 to 6 printing or non-printing characters
<i>time limit</i>	Maximum number of minutes (decimal) of total terminal time the user is allowed to accumulate. The value may not exceed 65535 minutes.
<i>disc space</i>	Maximum number of disc blocks (decimal) the user is allowed for storage of programs and files. The value may not exceed 65535 blocks.

If the password has zero characters, a comma must be included in the command string as a place holder for the parameter. For example:

NEWID-G362,,65535,65535

Characters in the password can be specified as non-printing characters by holding down the CONTROL key while entering a character. This combination is symbolized in text by a superscript "c" following the character, such as Z^c. Using this feature, the user can define a password which is not printed on the user's terminal.

Note: The following characters are not permitted in the password parameter: line delete (X^c), NULL (@^c), RETURN (M^c), LINEFEED (J^c), X-OFF (S^c), RUBOUT, COMMA (I^c), SPACE (^^c), or BACK ARROW (←), or UNDERSCORE (_).

If the identification code specified already exists within the system, the operator receives the following message:

DUPLICATE ENTRY

If the system id-table cannot accommodate another entry, the following message is printed:

ID TABLE FULL

EXAMPLES:

NEW-B100,GROUP,6000,150

enters user B100 with the password GROUP into the system with 6000 minutes (100 hours) of terminal time, and 150 blocks (38,400) words of disc storage space allowed.

NEW-Q123,BAS^cI^cC^c, 100,200

enters user Q123 with the password BAS^cI^cC^c into the system (S, I, and C are non-printing characters; they are entered while the CONTROL key is held down so only B and A appear at the user's terminal). This user has 100 minutes of terminal time and is allotted 200 blocks (51,200 words) of disc storage space.

PHONES

When connection is established through a data set, the TSB system allows the user 120 seconds to log on. The system operator uses the PHONES command to reset or change the number of seconds allowed. The command is entered in the form:

PHONES- nnn

nnn

A decimal value from 1 to 255 representing the number of seconds allowed to log on. If omitted, the system returns the ILLEGAL FORMAT message.

If the user fails to log on within the time allowed, a disconnect occurs.

EXAMPLES:

PHO-90

allows the user 1-1/2 minutes to log on after the system acknowledges his call.

PHO-180

allows the user 3 minutes to log on.

PORT

Entry of this command returns a list of port configurations. The command format is:

PORT

A list of the ports' current configuration is returned to the operator. This command is also available to the System Master (user A000) from any user terminal. This list shows the character-size followed by the baud-rate for which the port is configured. The list appears as up to four rows of eight items each. The items in row 1 correspond to port 0 through port 7; the items in row 2 correspond to port 8 through port 15, and so forth. The items are displayed in the form:

c-bbb

where c = character-size
 bbb = baud-rate

The character-size and baud-rate for each user terminal are given in Appendix F.

EXAMPLE:

PORT

2-007	** -106	1-023	2-130	2-064	2-130	2-130	2-064
** -106	2-032	2-130	2-130	2-130	2-015	2-064	2-130
1-095	2-130	2-007	1-011	1-047	1-095	2-130	2-130
2-032	1-005	2-015					

This system is configured for 27 ports. Ports 0 and 18 support a data transfer rate of 160 characters per second (cps). Ports 1 and 8 support IBM 2741 terminals at 14.9 cps. Port 2 supports 60 cps. Ports 3, 5, 6, 10, 11, 12, 15, 17, 22, and 23 support 10 cps. Ports 4, 7, and 14 support 20 cps. Ports 9 and 24 support 40 cps. Ports 13 and 26 support 80 cps. Ports 16 and 21 support 15 cps. Port 19 supports 120 cps. Port 20 supports 30 cps. Port 24 supports 40 cps. Port 25 supports 240 cps.

PRINTER

The **PRINTER** command is used to logically connect or disconnect the line printer. The command is entered in the following form:

*PRINTER- select code [* or **]*

select code An octal value indicating the I/O channel select code of the system line printer; or, to remove access to the line printer, zero.

*** Specification required immediately following the select code (imbedded blanks are illegal) if the line printer is an HP 2610A or HP 2614A.

**** Specification required immediately following the select code (imbedded blanks are illegal) if the line printer is an HP 2767.

No indication is required for the HP 2778 line printer.

The system line printer is a user peripheral device. It can be accessed only from a user terminal and not from the operator's console.

EXAMPLES:

*The following commands represent legal forms of the **PRINTER** command:*

*PRI-21***
PRI-17
*PRI-21**
PRI-0
PRI-21

PROTECT

The PROTECT command is a user command, available only from a user terminal and only to privileged users (the System Master and Group Masters). The command is entered in the form:

PROTECT- name

name A program or file name from 1 to 6 characters. The program or file must exist in the user's library.

A protected program in the System Library can be accessed and executed by any user but cannot be listed, punched, or saved except by user A000. A protected file in the System Library cannot be accessed at all by any user except user A000. Each Group Master can apply the PROTECT command to programs and files in his Group Library. The same restrictions apply to Group Library elements. If a program is to allow access to a "mask protected" file by other than the file's owner, the program must be protected.

NOTE: If a protected program is obtained and modified, the old version killed, and the new version saved, the new version is unprotected.

EXAMPLE:

PRO-ABCDE

provides protected status to an element named ABCDE in the users library.

PURGE

The operator can use the PURGE command to remove user library programs and files from the system directory which have not been used since a specific date. The disc space thus made available is returned to the system. Command format follows:

PURGE- ddd/yy

ddd A decimal value, 1-366, representing a day-of-year. The specified value must be less than or equal to the current day-of-year.

/ The slash character is required to separate the elements of this parameter.

yy A decimal value representing the year; that is, 73 for 1973. The value must be less than or equal to the current year.

If the date specified has not occurred, the following message is printed:

ILLEGAL PARAMETER

If any file is in use, the PURGE command is not allowed and the following message is printed:

BUSY FILES

The system does not inform the operator which programs and files are removed. The DIRECTORY command should be used before and after the PURGE command to obtain this information.

A program named HELLO in the library of user identification code Z999 cannot be purged, but its last referenced date is changed to the current date upon execution of the PURGE command.

EXAMPLE:

PUR-32/73

results in the removal of any library programs or files which have not been used since February 1, 1973.

REPORT

The report command is available to the system operator and to the System Master (A000). It is used to obtain a printed report showing the user identification codes in the system, the total terminal time, and the disc storage space used by each one. The command is entered in the form:

REPORT [-idcode]

idcode

The identification code of a specific user. If specified, the report begins with this idcode and continues through the last entry in the directory. If omitted, the report lists the entire directory.

The report is printed in ascending alphanumeric order by user identification code. The list is preceded by a heading giving the system identification, current date, and current time.

EXAMPLE:

```

REPORT
      2000F      091/73      2109

  ID  TIME  SPACE      ID  TIME  SPACE      ID  TIME  SPACE
A000 01150 01157      A001 00275 00001      A111 01083 00025
A201 00216 00103      A300 00254 00004      A301 01706 00438
A810 05442 00893      A920 00181 00023      B000 00020 00086
B050 01188 00257      B100 00001 00000      B111 00214 00133
G000 02326 00665      G100 00000 00000      G101 00000 00000
H000 00000 00000      H100 02728 00349      H111 03637 00019
Q111 00000 00000      X001 00193 00030      Z999 00842 00010
  
```

RESET

The system maintains a record of total terminal time used by each user. The RESET command is used by the operator to change the recorded value in the system for a specific user or for all users. The command is entered in the form:

RESET- { *idcode* } [, *time used*]
 ALL }

idcode The identification code of a user; if selected, the time used value recorded for this user is changed.

ALL If selected, the time used value recorded for all users is changed.

time used A decimal value, 0-65535 representing minutes of time used. If specified, this value is used to change the time used record. If omitted, the value is assumed to be zero.

If the identification code specified cannot be found the system prints the error message:

NO SUCH ID

EXAMPLES:

RES-Q123,20

resets the time used record of user Q123 to 20 minutes of terminal time used.

RES-S356,0 *or* *RES-S356*

both forms reset the time used record of user S356 to zero.

RES-ALL,20

resets the time used record of all users to 20 minutes.

ROSTER

A list of currently active ports can be obtained by the operator via the ROSTER command. This command is entered in the form:

ROSTER

Up to 32 users can be logged on to the TSB system at one time. The port roster is a list appearing in four rows of eight items each. Each item corresponds to a port. The first row reads left to right and represents ports 0 through 7. The second row, ports 8 through 15. The third row, 16 through 23 and the fourth row, ports 24 through 31.

An active port is denoted by the user's identification code. An inactive port is denoted by four consecutive dots (. . . .). The same identification code can be active at more than one port.

EXAMPLES:

ROS

.....	.....	.....	.....	.....	.....	A000	.....
.....	.....	.....	.....	.....	.....	A000	.....
.....
.....

Currently, user A000 is logged on ports 6 and 14. The remaining terminals are inactive.

ROS

.....	B453	.....	B555	.....	Q123	Z999	.....
A000	.....	.....	.....	.....	.....	.....	A000
.....	.....	.....	T707	T708	T709	.....	.....
F913	.....	.....	.....	.....	.....	.....	J325

Currently, user B453 is on port 1, B555 on port 3, Q123 on 5, Z999 on 6, A000 on ports 8 and 15, T707 on 19, T708 on 20, T709 on 21, F913 on 24, and J325 on 31. The remaining ports are inactive.

ROS

.....
.....
.....
.....

Currently, no users are logged on to the TSB system.

SANCTIFY (options 002 and 003 only)

A user can request that an element (program or file) be moved to drum storage from his library to improve access time. The TSB system operator uses the **SANCTIFY** command to effect this move. The command is entered in the form:

SANCTIFY- idcode, name

idcode The identification code of the user from whose disc library the element is obtained.

name The actual name of the element to be sanctified.

The named element cannot exceed 8192 decimal words (32 disc blocks) in length. A file cannot be sanctified if it is busy.

Upon execution of this command, the named element is moved from the library of the specified user identification code to drum storage. The disc area from which the element being sanctified is obtained is retained. When the system is shut down (**SLEEP** or **HIBERNATE** commands) the element is written back into its reserved area on the disc. Upon subsequent reloading from magnetic tape or disc, sanctified elements are put back onto drum storage if there is room. Elements for which there is no available drum storage space lose their sanctified status but remain in disc storage.

While the system is running, a sanctified element remains on the drum until it is returned to disc storage by the operator via the **DESECRATE** command or removed from the system by the operator via a **KILLID**, **LOCK**, or **PURGE** command or removed from the system by the user **KILL** command.

Users should save programs in semi-compiled form via the **CSAVE** command before requesting the operator to sanctify them.

A sanctified program (but not a file) that cannot be read because of a faulty drum track can usually be retrieved from the disc by desecrating it or by locking the drum track which has the same effect (see **DESECRATE** and **LOCK** commands).

If the **SANCTIFY** command cannot execute to completion, possible error messages are:

ENTRY NOT PRESENT
ENTRY TOO LONG
ENTRY ALREADY SANCTIFIED
FILE IN USE
INSUFFICIENT DRUM SPACE

EXAMPLE:

SAN-G535,PROGR

moves an element named PROGR from the library of user G535 to drum storage.

SDIRECTORY (options 002 and 003 only)

The SDIRECTORY command is available to the system operator and the System Master (user A000) to obtain a printed list of sanctified programs and files according to user idcode. Either a complete list or a partial list can be obtained. The command is entered in the form:

SDIRECTORY [-idcode]

idcode The identification code assigned to a specific user. If specified, the listing begins with this idcode and continues through the end of the directory entries. If omitted, the listing includes all sanctified entries in the directory.

Execution of this command causes the system to print a list in the same format as the DIRECTORY command, but listing only sanctified elements (those on drum storage). The list is preceded by a heading giving the system identification, the current date and the current time.

If the command cannot be executed, the system prints:

CAN'T READ DIRECTORY TRACK

EXAMPLE:

SDI						
2000F		053/73		1451		
ID	NAME	DATE		LENGTH	DISC	DRUM
B122	A	047/73	F	00003	003981	0/00/004
	FILCHK	048/73		00021	003987	0/00/003

Note that only the two entries having drum addresses in the DIRECTORY command example (under idcode B122) appear in the sanctified directory of the same system.

SLEEP

The SLEEP command is used to shut down the system when a complete magnetic tape copy of the user libraries is not required. The command is entered in the form:

SLEEP [-character string]

character string An optional message which, if specified, is sent to active users.

This command provides a systematic shutdown procedure that allows easy start-up at a later time. Entry of the SLEEP command results in the following actions:

- a. If specified, a message is sent to the active users.
- b. Active users are disconnected from the TSB system.
- c. The current TSB system is copied onto disc storage.
Under options 002 and 003, sanctified programs and files are copied from drum storage back to their reserved positions on disc storage.
- d. If a magnetic tape unit is available (see "MAGTAPE command"), the system is dumped onto magnetic tape along with the library programs and files that have been created or changed since the last system hibernation. After writing each tape, the system prints the query VERIFY? Respond YES to rewind and compare the tape, or NO to bypass verification. If a tape verification fails, the system prints TAPE BAD and the main computer halts. To try the dump again, use either the same tape or mount a new reel, then press RUN on the main computer. If more than one tape is required, the system calls for more tapes until the dumping is completed. Any additional tapes must not be mounted until requested.
- e. After a successful dump or verify, or if no magnetic tape was specified, the system prints DONE at the operator's console and the main computer halts. If another copy of the system is desired, mount a new magnetic tape and press RUN on the main computer; the entire magnetic tape dump procedure is repeated.
- f. The system may now be powered down.

It is appropriate to use the ANNOUNCE command to warn active users of an impending system shut-down shortly before the SLEEP command is entered.

EXAMPLES:

SLE

shuts down the system with no communication to the active users.

SLE-GOOD BYE. TSB IS SHUT DOWN FOR BACK-UP.

shuts down the system with a message to the active users.

SPEED

Initially, all ports are configured for a baud rate of 130 and a character size of 2. Port configuration can be changed with the SPEED command. The command is entered in the form:

SPEED- baud rate, character size, $\left\{ \begin{array}{l} \textit{port number} \quad [,\textit{port number}, \dots] \\ \textit{ALL} \end{array} \right\}$

<i>baud rate</i>	The data transfer rate of the user terminal type for which the port is to be configured (see Appendix F).
<i>character size</i>	A digit, 1 or 2, or an asterisk depending on the type of user terminal (see Appendix F).
<i>port number</i>	A decimal value, 0-31, representing a specific port to be configured; more than one port number may be specified.
<i>ALL</i>	If chosen in place of port number, all ports are reconfigured.

User terminal characteristics including type, speed, character composition, bit rate, baud rate, and character size are given in Appendix F.

The baud rate for a specific user terminal type can be computed using the following formula:

$$\text{BAUD RATE} = \frac{14400}{\text{bit rate}} - 1$$

where bit rate is the terminal's speed (characters per second) times character composition (total bits per character including start and stop bits). The resultant BAUD RATE must be rounded to the nearest whole number, if necessary.

The character size is defined as the least significant octal digit of the total number of data bits and stop bits in a character. The character size is either 1 or 2 except for the IBM Communication Terminal; an asterisk must be entered as the character size if the user terminal is an IBM 2741.

If the port to be configured is active (a user is logged on at the port) configuration does not occur and the following message is printed:

NO CONF. DONE

EXAMPLES:

SPE-64,2,1,3,5,7

reconfigures ports 1, 3, 5, and 7 for the HP 2600 Keyboard-Display terminal at 220 baud (20 cps).

SPE-106,,31*

reconfigures port 31 for the IBM 2741 Communication Terminal.

SPE-47,1,ALL

reconfigures all ports for any terminal at 300 baud (30 cps).

STATUS

The STATUS command is used by the TSB system operator to obtain information about the mass storage devices. In addition, the command is available to the System Master (user idcode A000). The command is entered in the form:

STATUS

This command should be used at least once each day to record the location of data on the drum and/or disc. This information is necessary for diagnostic purposes in case of system problems. A system status report requested from the operator's console will be interrupted by user log on and log off messages. This does not occur on a user terminal when a report is requested by the System Master.

If errors occur while executing the STATUS command, the system prints:

DISC/DRUM ERROR; CAN'T DO IT

or,

DISC ERROR; CAN'T DO IT

Status report format depends on the TSB system option selected. Under the base system and option 001, the report is printed in the following format:

system-id	date	time		
MAG=	LINE PRINTER=	USER=		
DISCS				
LOGICAL	SELECT	UNIT	FIRST	LAST
UNIT	CODE	NUMBER	BLOCK	BLOCK
LOCKED DISC BLOCKS				
DISC ALLOCATION				
IDT				
ADT				
DIREC				
SYSTEM				
USERS				

The following information is printed for each heading:

Note: Disc addresses are printed as logical block addresses of six decimal digits.

Heading	Information
system-id	System identification furnished by the operator at system initialization.
date	Date in the form ddd/yy where ddd is the current day-of-year and yy is the last two digits of the current year.
time	Time of day in the form hhmm where hh is the current hour (24-hour clock) and mm is the current minute.

MAG=

LINE PRINTER=

USER=

Select code of the magnetic tape controller.

Select code of the line printer controller; code is followed by one asterisk if the printer is an HP 2610 or 2614, by two asterisks if the printer is an HP 2767A. Otherwise, it is an HP 2778A.

Port number of the user terminal assigned use of the line printer (blank if printer is unassigned).

DISCS

LOGICAL
UNIT

SELECT
CODE

UNIT
NUMBER

FIRST
BLOCK

LAST
BLOCK

Information is printed for each disc in the system. The first four blocks of each disc are reserved for system information and are omitted from the status report. Block addresses are given in six decimal digits.

LOCKED DISC BLOCKS

A list of disc blocks locked with the MLock command by the operator.

DISC ALLOCATION

IDT
ADT
DIREC
SYSTEM
USERS

The TSB system idcode table (IDT), available disc table (ADT), directory track addresses (DIREC), system track addresses (SYSTEM), and user swap area addresses (USERS) are printed.

The DT, ADT, and DIREC reports are given in the form:

aaaaaa-wwwww

where aaaaaa is the address (decimal) of the starting block and wwwww is the length (decimal) in words.

Heading

Information

The SYSTEM report is in the form:

aaaaaa-bbb

where aaaaaa is the address (decimal) of the starting block and bbb is the length (decimal) in blocks.

The USERS report is in the form:

aaaaaa

where aaaaaa is the starting block address. USERS swap areas have an implied length of 40 blocks (decimal).

EXAMPLE FOR BASE SYSTEM AND OPTION 001:

STATUS

SYSTST 001/73 1133

MAG= 23 LINE PRINTER = 16* USER = 00

DISCS

LOGICAL UNIT	SELECT CODE	UNIT NUMBER	FIRST BLOCK	LAST BLOCK
0	21	0	000004	009743

LOCKED DISC BLOCKS

DISC ALLOCATION

IDT
000144-0080 000192-0000

ADT
000240-0033

DIREC
000288-8172 000336-8172

SYSTEM				
000368-091	000004-001	000005-004	000009-001	000010-018
000028-016	000044-016	000060-016	000076-012	000088-001
000089-003	000092-016	000108-022	000130-004	

USERS							
000480	000528	000576	000624	000672	000720	000768	000816
000864	000912	000960	001008	001056	001104	001152	001200
001248	001296	001344	001392	001440	001488	001536	001584
001632	001680	001728	001776	001824	001872	001920	001968

Under options 002 and 003, the report is printed in the following format:

system-id	date	time		
MAG=	DRUM=			
DISCS				
LOGICAL UNIT	SELECT CODE	UNIT NUMBER	FIRST BLOCK	LAST BLOCK
LOCKED DRUM TRACKS				
LOCKED DISC BLOCKS				
LINE PRINTER=	USER=			
IDT				
ADT				
DISC ADTS				
DIREC				
SYSTEM				
USERS				
DISC ALLOCATION				
IDT				
DISC ADT				
DIREC				
SYSTEM				

The following information is printed for each heading:

Note: Disc addresses are printed as logical block addresses of six decimal digits.

Drum addresses are printed as three decimal numbers, separated by slashes, in the form d/tt/sss where d is the drum logical number, tt is the track number, and sss is the sector number. For example, the drum address 0/22/013 indicates drum-0, track 22, sector 13.

Heading		Information
system-id		System identification furnished by the operator at system initialization.
date		Current date in the form ddd/yy where ddd is the day-of-year and yy is the last two digits of the year.
time		Current time of day in the form hhmm where hh is the hour (24-hour clock) and mm is the minute.
MAG=		Select code of the magnetic tape controller.
DRUM=		Select code(s) of the drum(s).
DISCS		
LOGICAL UNIT	SELECT CODE	UNIT NUMBER
		FIRST BLOCK
		LAST BLOCK
		Information is printed for each disc on the system. The first four blocks of each disc are reserved for system information and are omitted from the status report. Block addresses are given in six decimal digits.
LOCKED DRUM TRACKS		Information is printed giving the logical unit number of each drum containing locked tracks and a list of tracks locked by the operator.
LOCKED DISC BLOCKS		A list of disc blocks locked with the MLOCK command by the operator.
LINE PRINTER=	USER=	
		Select code of the line printer controller; code is followed by one asterisk if the printer is an HP 2610 or 2614, by two asterisks if the printer is an HP 2767A. Otherwise, it is an HP 2778A.
		Port number of the user terminal assigned use of the line printer (will be blank if printer is unassigned).
IDT		The drum location of the TSB system idcode table and the decimal number of words stored there. Each distinct user idcode recognized by the TSB system requires an eight-word entry in the IDT. Up to three tracks can be reserved.
ADT		The drum location of the available drum table, and the decimal number of words used. Every two words in the ADT represent an area of available drum storage. A full track is reserved.
DISC ADTS		Drum addresses and length of each disc ADT. Each disc ADT requires a full track. Every three words in a disc ADT represent an area of available disc storage.

Heading	Information
DIREC	Up to 80 drum locations and lengths of each track, each containing a portion of the directory of user library programs. The number of directory tracks allocated equals the number of discs that have been defined on the TSB system times the number of directory tracks per disc. The total directory consists of an alphabetic list, ordered first by idcode and then by program or file name, of all library programs that have been saved by users. Each program and file requires a twelve-word entry.
SYSTEM	The location of drum tracks containing the TSB system modules. Three tracks are reserved.
USERS	The drum addresses of user swap areas. Each address refers to an area of 10,240 words (1-1/4 tracks).
DISC ALLOCATION	Disc addresses of area reserved for storage of system information when the system is shut down. Each disc area reserved for IDT, DISC ADT, and for the directory (DIREC) is 32 blocks long. Lengths are stated in blocks for portions of the system.

EXAMPLE FOR OPTIONS 002 AND 003:

STATUS
TEST1 232/73 1343

MAG= 21 DRUM= 14 00 00 00

DISCS
LOGICAL SELECT UNIT FIRST LAST
UNIT CODE NUMBER BLOCK BLOCK
0 17 0 000004 046689

LOCKED DRUM TRACKS

LOCKED DISC BLOCKS

LINE PRINTER = 00 USER =

IDT 0/43/000 0032

ADT 0/42/000 0026

DISC ADTS
0/01/000 0003

DIREC
0/44/000 2328 0/45/000 3480 0/46/000 0012 0/47/000 0000
0/48/000 0000 0/49/000 0000

SYSTEM 0/50/000 0/51/000 0/52/000

USERS
0/02/019 0/03/052 0/04/083 0/05/115 0/07/019 0/08/051 0/09/084 0/10/096
0/12/019 0/13/051 0/14/070 0/15/096 0/17/019 0/18/051 0/19/083 0/20/117
0/22/020 0/23/053 0/24/085 0/25/115 0/27/019 0/28/051 0/29/083 0/30/115
0/32/019 0/33/051 0/34/084 0/35/115 0/37/019 0/38/051 0/39/084 0/40/106

DISC ALLOCATION

IDT
000268

DISC ADT
000300

DIREC
000332 000364 000396 000428 000460 000492

SYSTEM
000134 134 000004 001 000005 004 000009 001 000010 018
000028 016 000044 016 000060 016 000076 012 000088 001
000089 003 000092 016 000108 022 000130 004

UNLOCK (options 002 and 003 only)

The function of this command is the opposite of the LOCK command. The UNLOCK operation makes the specified drum tracks available to the TSB system. Command format is identical to that for the LOCK command:

UNLOCK-n, track₁ [, track₂]

<i>n</i>	A single-digit integer, 0-3, representing the drum logical unit number.
<i>track₁</i>	Track number; 1 or 2 digits, 0-63; first or only track to be unlocked.
<i>track₂</i>	Optional track number; 1 or 2 digits, 0-63; last track to be unlocked in a range beginning at <i>track₁</i> . If specified, <i>track₂</i> must be greater than or equal to <i>track₁</i> .

The first three sectors in track 0 of drum-0 are reserved for the system bootstrap loaders. If track 0 of drum-0 is referenced in an UNLOCK command, only the sectors beyond the first three are affected by execution of the command.

If the UNLOCK command cannot execute to completion, possible error messages are:

ILLEGAL PARAMETERS

NONEXISTENT DRUM

DISC/DRUM ERROR; CAN'T DO IT

EXAMPLES:

UNL-3,5

unlocks track 5 of drum-3.

UNL-3,5,7

unlocks tracks 5, 6, and 7 of drum-3.

UNPROTECT

The UNPROTECT command is a user command, available only from a user terminal and only to privileged users (the System Master and Group Masters). The command is entered in the form:

UNPROTECT- name

name A program or file name of 1 to 6 characters. The program or file must exist in the user's library.

Upon execution of this command, the formerly protected program or file named is made available to all users in the system or group.

EXAMPLE:

UNP-ABCDE

returns an element named ABCDE to normal (unprotected) status within the users library.

SECTION IV

Operating Procedures

The programs which make up the Timeshared BASIC system are distributed on punched paper tapes. These tapes are:

- I/O Processor Program (on one paper tape roll)
- TSB Loader Program (on one paper tape roll)
- TSB System Program (on three paper tape rolls)

The operating procedures in this section are used to generate a TSB system and then to maintain it; the procedures include generating an initial TSB system, updating an existing TSB system with revised software, and typical daily procedures for a working TSB system.

I/O PROCESSOR PROGRAMS

The I/O Processor paper tape roll contains two programs. These programs must be loaded to:

- begin an initial system generation
- update the I/O processor with a new version of the I/O Processor Programs
- restore the I/O processor if the I/O Processor Programs or the I/O Processor have failed or have been disturbed.

Note that the I/O Processor Programs are loaded using the main processor and its paper tape reader, as the reader is connected to the main processor, not the I/O processor.

Preparing to Load the I/O Processor Programs

Procedures used for a 21MX are different from those used with the other computers.

For each 21MX, perform the following:

- a. Set the STANDBY/OPERATE/LOCK/R switch to the OPERATE position.
- b. Set the ARS/ARS switch on the rear of the central processor unit PCA to the ARS position.

- c. Set the HLT PE/INT-IGNORE switch on the rear of the central processor unit PCA to the HLT PE position. Then set the Protect/Override switch (7900/7901 discs) to the Protect position; set the Format switch (2883 discs) to ON.

For the 2100A, 2100S, 2116B/C, or 2114B perform the following:

- a. Set the power switch on both computers to the ON position.
- b. Set the Automatic Restart switch on the main computer's I/O control board to the ARS position.
- c. Set the Parity Error switch on the main processor's I/O data board to the HALT position.
- d. Set the Protect/Override switch (7900/7901 discs) to the Protect position; set the format switch (2883 discs) to ON.

Loading the I/O Processor Programs

The procedures required to load the I/O Processor Programs from a 21MX main processor are different from those followed when the other computers are used as main processors. Also, activity during these procedures is divided into activity at the main processor and activity at the I/O processor.

ACTIVITY AT THE MAIN PROCESSOR. The main processor is a 21MX or a 2100A or a 2100S.

For the 21MX, perform the following:

- a. Press the HALT switch.
- b. Press the PRESET switch.
- c. Go to the I/O processor, press the HALT and PRESET switches there.
- d. At the main processor, load the I/O Processor Programs paper tape into the paper tape reader, and ready that device.
- e. Store the following bit configuration in the S-register: bits 9, 7, and 6 must be set; all other bits must be clear.
- f. Press the IBL switch.
- g. Press RUN. The first program on the I/O Processor Program paper tape is now read into memory. A halt then occurs, with 102077 displayed (in the T-register).
- h. Store an octal 2 in the P-register.
- i. Press RUN. Nothing will happen; the system is waiting for you to activate the I/O processor.

For the 2100S or 2100A perform the following:

- a. Press the HALT button, then press INTERNAL PRESET and EXTERNAL PRESET. (At this point, if the I/O processor is an HP 2100S or 2100A, press its HALT, INTERNAL PRESET

and EXTERNAL PRESET buttons; if the I/O processor is an HP 2114B or 2116B/C, press its HALT and PRESET buttons.)

- b. Place the I/O Processor Programs paper tape into the paper tape reader and ready that device.
- c. Set the main processor binary loader starting address (P-register) at location 77700_8 .
- d. Press the LOADER ENABLE button.
- e. Press the RUN button.
(The first program on the paper tape will be loaded.)
- f. After the main computer halts (102077_8), set the program starting address (P-register) at 2_8 .
- g. Press the RUN button. Nothing will happen; the system is waiting for you to activate the I/O Processor.

ACTIVITY ON THE I/O PROCESSOR. The I/O processor can be an HP 21MX, 2100S, 2100A, 2116B/C, or 2114B. After preparing the main computer as described above, the following steps are required to complete either loading or updating the I/O processor program:

HP 21MX (go to "Loading the TSB Loader" after these steps):

1. Store the following bit configuration in the S-register: set bit 9; clear all other bits.
2. Press the IBL switch.
3. Press RUN. (The second program on the paper tape will be loaded.)
4. When the I/O processor halts (102077 displayed in the T-register), press the HALT switch on the main processor.

HP 2100S or HP 2100A (go to "Loading the TSB Loader" after these steps):

1. Set the I/O processor binary loader starting address (P-register) at location 17700_8 .
2. Press the LOADER ENABLE button.
3. Press the RUN button. (The second program on the paper tape will be loaded.)
4. When the I/O processor halts (102077_8), press HALT on the main computer.
5. On the I/O processor, set the program starting address (P-register) at location 2_8 .
6. Press the I/O processor's RUN button to start the program running.

HP 2114B. (go to "Loading the TSB Loader" after these steps):

1. Set the I/O processor binary loader starting address (P-register) at location 17700_8 .
2. Set the LOADER ENABLE switch in the ON position.
3. Press the RUN button. (The second program on the paper tape will be loaded.)
4. When the I/O processor halts (102077_8), press HALT on the main computer.

5. On the I/O processor, set the LOADER ENABLE switch in the NORMAL position.
6. Set the I/O processor starting address (P-register) at location 2_8 .
7. Press the I/O processor's RUN button to start the program running.

HP 2116B/C (go to "Loading the TSB loader" after these steps):

1. Set the I/O processor binary loader starting address (P-register) at location 17700_8 .
2. Set the LOADER toggle switch to ENABLED.
3. Press the RUN button. (The second program on the paper tape will be loaded.)
4. When the I/O processor halts (102077_8), press HALT on the main computer.
5. On the I/O processor, set the LOADER toggle switch to DISABLED.
6. Set the I/O processor's program starting address (P-register) at location 2_8 .
7. Press the I/O processor's RUN button to start the program running.

LOADING THE TSB LOADER

A TSB loader paper tape must be loaded into the main computer in order to initialize vital information, generate the main system program, and start the system running. The I/O processor should be in RUN mode.

The system operator provides most of the vital information in response to the TSB loader's questions, printed at the operator's console. Throughout the loading process, the operator's responses on the keyboard determine subsequent loader action.

For a 21MX main processor, perform the following:

- a. Go to the main processor. If it is in RUN mode, press HALT then PRESET.
- b. Load the TSB loader program paper tape in the paper tape reader and ready that device.
- c. Store the following bit configuration in the S-register: set bits 9, 7, and 6; clear all other bits.
- d. Press the IBL switch.
- e. Press RUN. The program is read into memory; then a halt occurs with 102077 displayed (in the T-register).
- f. Store an octal 2000 in the P-register.
- g. Go to the system console, and ensure that it is on, and on-line.
- h. Come back to the main processor and press RUN. A message is printed on the system console.
- i. Go to the instructions contained in the paragraph titled "Loading the System Program".

HP 2100S or HP 2100A:

1. If the I/O processor program was loaded just prior to this point, proceed to step 2. Otherwise, on the main computer, press HALT and then press INTERNAL PRESET and EXTERNAL PRESET.
2. Place the TSB loader tape into the paper tape reader and ready that device.
3. Set the main computer binary loader starting address (P-register) at location 77700_8 .
4. Press the LOADER ENABLE button.
5. Press the RUN button.
(The TSB loader program on the paper tape will be loaded.)
6. When the main computer halts (102077_8), set the program starting address (P-register) at location 2000_8 .
7. Press the RUN button to start the program running.

LOADING THE SYSTEM PROGRAM

When the TSB loader program begins, it prints these questions on the operator's console:

IS THE SYSTEM CONSOLE AN HP 2762A?

Respond YES if the console is a 2762A, otherwise respond NO. (Note that this question only appears when the base system or option 001 is present.)

LIBRARY?

Before responding, place the first TSB system paper tape into the paper tape reader and ready that device. Then, respond YES if a magnetic tape or disc library exists (you are updating a system and preserving the existing library) and proceed to the paragraph titled "System Update."

Respond NO if no magnetic tape or disc library exists (you are generating a new system and not preserving any existing library) and proceed to the paragraph titled "Initial System Generation."

INITIAL SYSTEM GENERATION

1. The loader prints:

SYSTEM IDENTIFICATION?

Since a new system is being generated, it has no identification. Type any unique name of up to ten printing characters to differentiate this system from any other system that may be run on the same hardware. (A carriage return alone signifies that no system identification is desired.)

2. The loader prints:

CONFIGURATION OPTIONS?

Respond YES. The loader starts a sequence of questions that set up the new system.

Note: If NO or a carriage return (implied NO) is typed here, the loader assumes all the default conditions described below and skips to step 9.

3. Depending on the installed system option, the loader starts by printing:

DISC OR DRUM MODIFICATIONS?

or,

DISC MODIFICATIONS?

Enter any number of the requested commands (see Section III). The loader repeats the question after each command is entered. The sequence of commands is terminated by either typing NO or a carriage return. At this point, the loader reads the label on each disc and may type messages as follows:

DISC NUMBER *n* NOT LABELED FOR TSB

DO YOU WANT IT LABELED?

The loader may print:

(NOW LABELED FOR DOS)

between the above two messages, indicating that the disc has been used for DOS-M or DOS-III. If the response is YES, logical disc *n* is given a TSB label which includes the system identification, logical disc number, and other information. (System information occupies the first four blocks of each disc on the system.) If the response is NO, and *n* is zero, the loader prints the message:

DISC 0 MUST BE PRESENT

and repeats the previous question. If the response is NO, and *n* is non-zero, the disc is removed (logically) from the system.

4. Depending on the installed system option, the loader prints:

LOCK, MLOCK, UNLOCK, OR MUNLOCK COMMANDS?

or,

MLOCK OR MUNLOCK COMMANDS?

Enter any number of the specified commands (see Section III). The loader repeats the question after each command is entered. The sequence is terminated by typing either NO or a carriage return.

5. The loader prints:

NUMBER OF PORTS?

Respond with a decimal integer between 1 and 32, inclusive, to indicate the number of ports available on the system. A carriage return alone is interpreted as 32.

6. The loader prints:

NUMBER OF DIRECTORY TRACKS PER DISC?

Respond with a decimal integer between 1 and 10, inclusive, to indicate how many tracks should be reserved, per disc, for the system directory. The directory can accommodate 682 entries per track. If a carriage return alone is typed, the default value is assumed; the value is 1 for HP 7900 devices, and 6 for HP 2883 devices.

7. The loader prints:

NUMBER OF ID TRACKS?

Respond with a decimal integer 1, 2, or 3 to indicate the number of tracks to be reserved for the idcode-table. Each track can accommodate 1024 user idcodes and related information. A carriage return alone is interpreted as 1.

8. Under options 002 and 003, the loader prints:

DISC OPERATING SYSTEM PRESENT?

Respond with YES if the Disc Operating System is present on drum storage; otherwise, type NO or a carriage return (implied NO).

9. The loader begins to read in the TSB system from paper tape. At the end of the first tape, the loader prints:

END OF TAPE

and the main computer halts (102077₈). Place the next TSB system paper tape in the photoreader, ready that device, and press RUN on the main computer. The loader begins reading in the next paper tape. This sequence is repeated until all TSB system paper tapes have been loaded.

10. After all tapes have been loaded, the loader prints:

DATE?

Respond with the date in the form: ddd/yy, where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

11. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

12. Finally, the system prints:

READY

indicating that loading is complete, and that the system is running.

SYSTEM UPDATE

1. The loader prints:

MAG TAPE SELECT CODE?

Type a carriage return. The system is being updated from paper tape; the magnetic tape unit is not needed at this time.

2. The loader prints:

CONFIGURATION OPTIONS?

To change the system configuration, type YES and continue to step 3.

To retain the same system configuration, type NO. The loader begins to read in the TSB system from paper tape. At the end of the first tape, the loader prints:

END OF TAPE

and the main computer halts (102077₈). Place the next TSB system paper tape in the photoreader, ready that device, and press RUN on the main computer. The loader begins reading in the next paper tape. This sequence is repeated until all TSB system paper tapes have been loaded. Go to step 6.

3. Under options 002 and 003, the loader prints:

LOCK OR UNLOCK COMMANDS?

If any drum tracks are to be locked or unlocked, enter any number of the specified commands (see Section III). The loader repeats the question after each command is entered. The sequence is terminated by typing either NO or a carriage return (implied NO).

4. The loader prints:

NUMBER OF PORTS?

Respond with a decimal integer between 1 and 32, inclusive, to indicate the number of ports available on the system. A carriage return alone retains the existing number of ports. The loader begins to read in the TSB system from paper tape. At the end of the first tape, the loader prints:

END OF TAPE

and the main computer halts (102077₈). Place the next TSB system paper tape in the photoreader, ready that device, and press RUN on the main computer. The loader begins reading in the next paper tape. This sequence is repeated until all TSB system paper tapes have been loaded.

5. The loader prints:

LOAD OR DUMP COMMANDS?

If selective loading or dumping of programs and files is not desired, type NO or just a carriage return and go to step 6. Otherwise:

- a. If it is desired to selectively load additional programs or files from sleep, hibernate, or dump tapes, or files externally prepared to resemble TSB files, mount the appropriate magnetic tape and type LOAD.
- b. If it is desired to selectively dump programs and files from the system to magnetic tape, mount a blank magnetic tape with a write enable ring and type DUMP.
- c. In either case, the loader prints:

ENTER NAME LIST, ONE PER LINE; TERMINATE WITH 'END'

For each program or file that is to be selectively loaded or dumped, enter the user identification code, a comma, and the program or file name. If just an identification code is specified, all entries belonging to that user are loaded into or dumped from his library.

Each line is examined on entry by the loader. If it is legitimate, the loader generates a linefeed and allows another to be typed. Illegal entries result in appropriate error messages.

Programs and files that duplicate names already in the system are not loaded. Terminate the name list by typing END.

EXAMPLE:

LOAD OR DUMP COMMANDS? LOAD
ENTER NAME LIST, ONE PER LINE; TERMINATE WITH 'END'
C732,FILE1
M935
X222,PROG
END

In this example, system output is underscored. This does not occur in actual system output. The LOAD command was selected to load an element named FILE1 associated with idcode C732. An element named PROG associated with idcode X222 is loaded from magnetic tape into the library associated with idcode X222. In addition, all of the elements associated with idcode M935 on magnetic tape are loaded into the library associated with idcode M935.

- d. The loader prints:

MAG TAPE SELECT CODE?

Respond with the I/O channel select code (high priority, lower number of the channel pair) of the magnetic tape unit.

The loader attempts to carry out the requested action.

- e. For selective dumping, the specified entries are written to the magnetic tape. After writing is complete, the loader prints:

VERIFY?

Respond YES to rewind and compare the tape or NO to bypass verification. Additional tapes will be requested if needed. Do not mount additional tapes until they are requested by the TSB system. The verify question is asked for each tape. After a successful dump the loader prints:

DONE

If a tape verification fails, the message TAPE BAD is printed, and the main computer halts. To repeat the dumping operation, either use the same tape or mount a new one and press RUN on the main computer.

- f. For selective loading, the loader searches for specified entries on the magnetic tape provided. During selective loading, the same error messages and requests for more tapes are printed as those generated by the loader during normal loading from magnetic tape.

Under options 002 and 003, selectively loaded programs and files are never placed on the system drum.

- g. When each load or dump operation is completed, the loader requests another load or dump command. To end this sequence, type NO or just a carriage return.

Each dump operation must start a new magnetic tape.

6. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

Note: Under the base system and option 001, there will be a noticeable wait just prior to the printing of "DATE?" while the loader adjusts various tables on the disc.

7. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

8. Finally, the system prints:

READY

Indicating that loading is complete, and that the system is running.

DAILY PROCEDURES

If the TSB system was properly shut down at the end of the last operating session using the SLEEP or HIBERNATE command and if all the equipment is operating properly, system start-up consists of reading the system from disc storage into the main computer. If no changes are required to the system configuration, this procedure is simple and can be started as soon as all system devices are in ready condition.

If the system cannot be read from the disc, the latest sleep tape (if it is more recent than the hibernate tape) and the latest hibernate tape must be used to reload the system.

Procedures for each of these situations are described on the following pages. If the system program is to be updated or if a new TSB system is to be generated, it must be initiated from paper tape as described in the beginning of this section.

Start-up From Disc (base system and option 001 only)

When the system was last shut-down with the HIBERNATE or SLEEP command, essential portions of the loader were written to block 0 of the system disc. If this block has not been disturbed, use the following steps to start up the system from disc:

Note: If the following procedure fails repeatedly, use the procedure described under "Start-up From Disc with Paper Tape Loader (base system and option 001)".

1. Ensure that both computers and all peripheral equipment have power and that the hardware configuration is correct.
2. Ensure that the same discs (either cartridge or disc packs) used when the system was last shut down are in place on the disc device and that the disc device select codes have not been changed (cartridges must be in the same physical unit, but packs other than disc-0 need not be). In addition, the disc drives must be up to full operating speed.
3. The I/O processor should be in RUN mode. (If the I/O processor program has been disturbed, see "Loading the I/O Processor Program" at the beginning of this section.)
4. Use the procedures for your main processor:

21MX

- a. Press the HALT switch.
- b. Press the PRESET switch.
- c. Store the following bit configuration into the S-register: Set bits 14, 9, 8, and 6; clear all other bits.
- d. Press the IBL switch.

2100A, 2100S

- a. Press the HALT button; then press INTERNAL PRESET; then press EXTERNAL PRESET.
- b. Set the binary loader starting address (P-register) at location 77750 (octal).
- c. Press the LOADER ENABLE button.

5. Press the RUN button.

The computer will halt (102077_8). If no halt, or any other halt, occurs see the section titled "Mass Storage Errors During Start-up".

6. If the correct halt occurred in step 5, press the RUN button. The TSB loader begins execution.
7. The loader prints:

CONFIGURATION OPTIONS?

If the system configuration is to be changed, type YES and go to the section titled "Configuration Options".

If the current system configuration is to be retained, type NO or just a carriage return. Continue at step 8.

8. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

Note: There will be a noticeable wait just prior to the printing of "DATE?" while the loader adjusts various tables on the disc.

9. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

10. The loader checks the entered date and time against the date and time the system was last shut down. Any discrepancy (for example, a date and time earlier than those of the last shut-down, or a date more than five days later than that of the last shut-down) results in the loader printing:

ARE YOU SURE THAT'S TODAY'S DATE?

Respond with YES or NO. If the response is YES, the specified date and time are accepted; if NO, the date and time request is printed again.

11. The system prints:

READY

indicating that loading is complete, and that the system is running. Users may now log on.

Note: Entering a STATUS command immediately after starting the system provides a map showing where copies of vital system information are located in mass storage. Such information is useful in diagnosing system failures.

Start-up From Disc and Drum (options 002 and 003 only)

When the system was last shut down, essential portions of the loader were written on sectors 0, 1, and 2 of the system drum (Drum-0). If these sectors have not been disturbed, use the following steps to start up the TSB system:

Note: If the first three sectors of the system drum have been disturbed, or if drum read errors persist, use the procedure described under "Start-up From Disc with Paper Tape Loader (options 002 and 003)".

1. Ensure that both computers and all peripheral equipment have power and that the hardware configuration is correct.
2. Ensure that the same discs (either cartridge or disc pack) used when the system was last shut down are in place on the disc device and that the disc device select codes have not been changed (cartridges must be in the same physical unit, but packs need not be). In addition, the disc drives and the drum must be up to full operating speed.
3. The I/O processor should be in RUN mode. (If the I/O processor program has been disturbed, see "Loading the I/O Processor Program" at the beginning of this section.)
4. Use the procedures for your main processor:

21MX

- a. Press the HALT switch.
- b. Press the PRESET switch.
- c. Store the following bit configuration into the S-register: Set bits 14, 9, 8, and 6; clear all other bits.
- d. Press the IBL switch

2100A, 2100S

- a. Press the HALT button; then press INTERNAL PRESET; then press EXTERNAL PRESET.
- b. Set the binary loader starting address (P-register) at location 77750 (octal).
- c. Press the LOADER ENABLE button.

5. Press the RUN button.

The main computer will halt (102077_8). If no halt, or any other halt, occurs see the section titled "Mass Storage Errors During Start-up".

6. If the correct halt occurred in step 5, press the RUN button. The TSB loader is in execution.
7. The loader prints:

CONFIGURATION OPTIONS?

If the system configuration is to be changed, type YES and go to the section titled "Configuration Options".

If the current system configuration is to be retained, type NO or just a carriage return. Continue at step 8.

8. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

9. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

10. The loader checks the entered date and time against the date and time the system was last shut down. Any discrepancy (for example, a date and time earlier than those of the last shut-down, or a date more than five days later than that of the last shut-down) results in the loader printing:

ARE YOU SURE THAT'S TODAY'S DATE?

Respond with YES or NO. If the response is YES, the specified date and time are accepted; if NO, the date and time request is printed again.

11. The system prints:

READY

indicating that loading is complete, and that the system is running. Users may now log on.

Note: Entering a STATUS command immediately after starting the system provides a map showing where copies of vital system information are located in mass storage. Such information is useful in diagnosing system failures.

Start-up From Disc with Paper Tape Loader

The procedure to follow for starting up the system from disc storage using the paper tape loader depends on the option selected. For all options:

1. Ensure that both computers and all peripheral equipment have power and that the hardware configuration is correct.
2. Ensure that the same discs (either cartridge or disc pack) used when the system was last shut down are in place on the disc device and that the disc device select codes have not been changed (cartridges must be in the same physical unit, but packs other than disc-0 need not be). In addition, the mass storage drive devices must be up to full operating speed.

3. The I/O processor should be in RUN mode. (If the I/O processor program has been disturbed, see "Loading the I/O Processor Program" at the beginning of this section.)

Subsequent operator action depends both on the main processor and the option selected, as follows:

Base System and Option 001

21MX

2100A, 2100S

- | | |
|---|---|
| <ol style="list-style-type: none">1. Press HALT; then PRESET.2. Load the TSB loader program paper tape into paper tape reader; ready that device.3. Store the following bit configuration into the S-register: set bits 9, 7, and 6; clear all other bits.4. Press the IBL switch. | <ol style="list-style-type: none">1. Press HALT; then INTERNAL PRESET; then EXTERNAL PRESET.2. Place the TSB loader paper tape into the paper tape reader; ready that device.3. Set the main processor binary loader starting address (P-register) at location 77700_8.4. Press the LOADER ENABLE button. |
|---|---|
5. Press the RUN button. (The TSB loader program on the paper tape will be loaded.)
 6. The main computer will halt (102077_8).
 7. Set the main computer starting address (P-register) at location 14000_8 .
 8. Press the RUN button. The TSB Loader Program is now executing.
 9. The loader prints:

CONFIGURATION OPTIONS?

If the system configuration is to be changed, type YES and go to the section titled "Configuration Options".

If the current system configuration is to be retained, type NO or just a carriage return. Continue at step 10.

10. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

Note: There will be a noticeable wait just prior to the printing of "DATE?" while the loader adjusts various tables on the disc.

11. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

12. The loader checks the entered date and time against the date and time the system was last shut down. Any discrepancy (for example, a date and time earlier than those of the last shut-down, or a date more than five days later than that of the last shut-down) results in the loader printing:

ARE YOU SURE THAT'S TODAY'S DATE?

Respond with YES or NO. If the response is YES, the specified date and time are accepted; if NO, the date and time request is printed again.

13. The system prints:

READY

indicating that loading is complete, and that the system is running. Users may now log on.

Note: Entering a STATUS command immediately after starting the system provides a map showing where copies of vital system information are located in mass storage. Such information is useful in diagnosing system failures.

Options 002 and 003

21MX

1. Press HALT; then PRESET.
2. Load the TSB loader program paper tape into paper tape reader; ready that device.
3. Store the following bit configuration into the S-register: set bits 9, 7, and 6; clear all other bits.
4. Press the IBL switch.

2100A, 2100S

1. Press HALT; then INTERNAL PRESET; then EXTERNAL PRESET.
 2. Place the TSB loader paper tape into the paper tape reader; ready that device.
 3. Set the main processor binary loader starting address (P-register) at location 77700_8 .
 4. Press the LOADER ENABLE button.
5. Press the RUN button. (The TSB loader program on the paper tape will be loaded.)
 6. The main computer will halt-(102077_8).
 7. Set the main computer program starting address (P-register) at location 14000_8 .
 8. Press the RUN button. The TSB loader program is now executing.

9. The loader prints:

DISC OPERATING SYSTEM PRESENT?

Respond with YES if the Disc Operating System is present on drum storage; otherwise, type NO or just a carriage return (implied NO).

10. The loader prints:

CONFIGURATION OPTIONS?

If the system configuration is to be changed, type YES and go to the section titled "Configuration Options".

If the current system configuration is to be retained, type NO or just a carriage return. Continue at step 11.

11. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

12. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

13. The loader checks the entered date and time against the date and time the system was last shut down. Any discrepancy (for example, a date and time earlier than those of the last shut-down or, a date more than five days later than that of the last shut-down) results in the loader printing:

ARE YOU SURE THAT'S TODAY'S DATE?

Respond with YES or NO. If the response is YES, the specified date and time are accepted; if NO, the date and time request is printed again.

14. The system prints:

READY

indicating that loading is complete, and that the system is running. Users may now log on.

Note: Entering a STATUS command immediately after starting the system provides a map showing where copies of vital system information are located in mass storage. Such information is useful in diagnosing system failures.

Configuration Options

Each time the system is started, the operator is asked whether the configuration is to be changed. Configuration changes include changing the number of ports available on the system, and selective magnetic tape loading and dumping. If the operator responds YES to the CONFIGURATION OPTIONS? query during the start-up procedure, the following sequence occurs:

Note: Under the base system and option 001, the sequence begins at step 2. Under options 002 and 003, the sequence begins at step 1.

1. The loader prints:

LOCK OR UNLOCK COMMANDS?

If any drum tracks are to be locked or unlocked, enter any number of LOCK or UNLOCK commands (see Section III). The loader repeats the query after each command is entered. The sequence is terminated by typing NO or a carriage return in response to the question.

2. The loader prints:

NUMBER OF PORTS?

Respond with a decimal integer between 1 and 32, inclusive, to indicate the number of ports available on the system. A carriage return alone indicates that the current number of ports is to be retained.

3. After the system and library have been read, the loader prints:

LOAD OR DUMP COMMANDS?

If selective loading or dumping of programs and files is not desired, type NO or just a carriage return and go to step 4.

Otherwise:

- a. If it is desired to selectively load additional files or programs from sleep, hibernate, or dump tapes, or files externally prepared to resemble TSB files, mount the appropriate magnetic tape and type LOAD.
- b. If it is desired to selectively dump programs and files from the system to magnetic tape, mount a blank magnetic tape with a write ring and type DUMP.

- c. In either case, the loader prints:

ENTER NAME LIST, ONE PER LINE; TERMINATE WITH 'END'

For each program or file that is to be selectively loaded or dumped, enter the user identification code, a comma, and the program or file name. If just an identification code is specified, all entries belonging to that user are loaded into or dumped from his library.

Each line is examined on entry by the loader. If it is legitimate, the loader generates a linefeed and allows another to be typed. Illegal entries result in appropriate error messages.

Programs and files that duplicate names already in the system are not loaded.

Terminate the name list by typing END.

EXAMPLE:

```
LOAD OR DUMP COMMANDS? LOAD  
ENTER NAME LIST, ONE PER LINE; TERMINATE WITH 'END'  
C732,FILE1  
M935  
X222,PROG  
END
```

In this example, system output is underscored. This does not occur in actual system output. The LOAD command was selected to load an element named FILE1 associated with idcode C732 from magnetic tape into the library associated with idcode C732. An element named PROG associated with idcode X222 is loaded from magnetic tape into the library associated with idcode X222. In addition, all of the elements associated with idcode M935 on magnetic tape are loaded into the library associated with idcode M935.

- d. The loader prints:

MAG TAPE SELECT CODE?

Respond with the I/O channel select code (high priority, lower number of the channel pair) of the magnetic tape controller.

The loader attempts to carry out the requested action.

- e. For selective dumping, the specified entries are written to the magnetic tape. After writing is complete, the loader prints:

VERIFY?

Respond YES to rewind and compare the tape or NO to bypass verification. Additional tapes will be requested if needed. Do not mount a new tape until requested by the TSB system. The verify question is asked for each tape. After a successful dump the loader prints:

DONE

If a tape verification fails, the message TAPE BAD is printed, and the main computer halts. To repeat the dumping operation, either use the same tape or mount a new one and press RUN on the main computer.

- f. For selective loading, the loader searches for specified entries on the magnetic tape provided. During selective loading, the same error messages and requests for more tapes are printed as those generated by the loader during normal loading from magnetic tape.

Under options 002 and 003, selectively loaded programs and files are never placed on the system drum.

- g. When each load or dump operation is completed, the loader requests another load or dump command. To end this sequence, type NO or just a carriage return.

Each dump operation must start a new magnetic tape.

- 4. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

- 5. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

6. Finally, the system prints:

READY

indicating that loading is complete, and that the system is running. Users may now log on.

Note: Entering a STATUS command immediately after starting the system provides a map showing where copies of vital system information are located in mass storage. Such information is useful in diagnosing system failures.

Start-up From Magnetic Tape

If system information cannot be read from drum storage or disc storage, the following magnetic tape procedure must be used. If the system was last shut down with a HIBERNATE command, use those tapes. If the system was shut down with a SLEEP command, use the sleep tapes plus the most recent hibernate tapes.

1. The I/O processor should be in RUN mode. (If the I/O processor program has been disturbed, see "Loading the I/O Processor Program" at the beginning of this section.)

2. Follow the procedures for your main processor:

21MX

2100A, 2100S

- | | |
|---|--|
| a. Press HALT; then PRESET | a. Press HALT; then press INTERNAL PRESET; then press EXTERNAL PRESET. |
| b. Load the TSB Loader Program paper tape into the paper tape reader; ready that device. | b. Load the TSB Loader Program paper tape into the paper tape reader; ready that device. |
| c. Store the following bit configuration into the S-register: set bits 9, 7, and 6; clear all other bits. | c. Set the main computer binary loader starting address (P-register) at location 77700_8 . |
| d. Press the IBL switch. | d. Press LOADER ENABLE. |

3. Press the RUN button.

(The TSB loader program on the paper tape will be loaded.)

4. The main computer will halt (102077_8).
5. Set the main computer program starting address (P-register) at location 2000_8 .

- 6a. For the base system and option 001, the loader prints:

IS THE SYSTEM CONSOLE AN HP 2762A?

Respond YES if the operator's console is a 2762A, otherwise respond NO.

- 6b. For all options, the loader prints:

LIBRARY?

Because the TSB system is being loaded from magnetic tape, respond YES.

7. The loader prints:

MAG TAPE SELECT CODE?

Mount the first reel of magnetic tape on the magnetic tape unit (a write enable ring is not required). Use the most recent set of sleep tapes before using any hibernate tapes.

Type the I/O channel select code of the magnetic tape controller.

8. The loader prints:

CONFIGURATION OPTIONS?

To change the system configuration, type YES and continue at step 9.

If the current system configuration is to be retained, type NO or a carriage return (implied NO); the loader reads in the system from magnetic tape and skips to step 22.

9. The loader prints:

SYSTEM IDENTIFICATION?

If the current system identification is to be retained, type a carriage return.

To change the system identification, enter a string of up to 10 printing characters, followed by a carriage return.

10. Depending on the installed TSB system option the loader prints:

DISC OR DRUM MODIFICATIONS?

or,

DISC MODIFICATIONS?

Enter any number of the requested commands (see Section III). The loader repeats the question after each command is entered. The sequence of commands is terminated by either typing NO or a carriage return. At this point, the loader reads the label of each disc and may type messages as follows:

DISC NUMBER n NOT LABELED FOR TSB

DO YOU WANT IT LABELED?

The loader may print:

(NOW LABELED FOR DOS)

between the above two messages, indicating that the disc has been used for DOS-M or DOS-III. If the response is YES, logical disc n is given a TSB label which includes the system identification, logical disc number, and other information. (System information occupies the first four blocks of each disc on the system.) If the response is NO, and n is zero, the loader prints the message:

DISC 0 MUST BE PRESENT

and repeats the previous question. If the response is NO, and n is non-zero, the disc is removed (logically) from the system.

11. Depending on the installed TSB system option, the loader prints:

LOCK, MLOCK, UNLOCK, OR MUNLOCK COMMANDS?

or,

MLOCK OR MUNLOCK COMMANDS?

Enter any number of the requested commands (see Section III). The loader repeats the question after each command is entered. The sequence is terminated by typing either NO or a carriage return (implied NO).

12. The loader prints:

NUMBER OF PORTS?

Respond with a decimal integer between 1 and 32, inclusive, to indicate the number of ports available on the system. A carriage return alone causes the current number of ports specified in the system on magnetic tape to be retained.

13. The loader prints:

NUMBER OF DIRECTORY TRACKS PER DISC?

Respond with a decimal integer between 1 and 10, inclusive, to indicate how many tracks should be reserved per disc for the system directory. The directory can accommodate 682 entries per track. A carriage return alone causes the current number of directory tracks specified in the system on magnetic tape to be retained.

14. The loader prints:

NUMBER OF ID TRACKS?

Respond with a decimal integer 1, 2, or 3 to specify how many tracks should be reserved for the idcode-table. Each track can accommodate 1024 user idcodes and related information. A carriage return alone causes the current number of tracks specified in the system on magnetic tape to be retained.

15. Under options 002 and 003, the loader prints:

DISC OPERATING SYSTEM PRESENT?

Respond with YES if the Disc Operating System is present on drum storage; otherwise, type NO or a carriage return (implied NO).

16. The loader prints:

ALTERNATE ALLOCATION OPTION?

- a. If NO, or just a carriage return, is entered at this point, the loader obtains disc space for the files and programs it reads from magnetic tape in the normal manner. That is, the number of programs and files is divided as evenly as possible among the available discs with adjacent directory entries on different discs, if possible. In addition, the programs and files are compacted toward the beginning of each disc. The only spaces between files and programs on each disc are those caused by locked blocks.
- b. If YES is typed in response to the loader query, each file and program is put back onto the same logical disc that it resided on when the system was last shut down. Each entry will be placed before or after any locked areas on the disc that it was before or after, respectively, when the system was last shut down. Within these constraints, entries are compacted as much as possible toward the beginning of each disc. This procedure guarantees that a system shut down with either the SLEEP or HIBERNATE command can be reloaded if the following conditions are met:
 - The same discs are present in the same logical positions on the system.
 - No new areas on these discs have been locked.
 - No more directory and idcode-table tracks are present than existed on the shut-down version of the system.

This option should be selected (a YES response) only if the normal method has been attempted and failed to find disc space for all programs and files. The alternate method also may be used if a new disc has been added to the system, and it is desired to keep this disc free for new entries.

17. When either response is made to the alternate allocation option query, the loader reads in the system from magnetic tape. Any of the magnetic tape error messages listed in the section titled "Mass Storage Errors During System Start-up" may be printed during loading from magnetic tape.

18. When the system and library have been read, the loader prints:

LOAD OR DUMP COMMANDS?

If selective loading or dumping of programs and files is not desired, type NO or a carriage return (implied NO) and go to step 19.

Otherwise:

- a. If it is desired to selectively load additional programs or files from sleep, hibernate, or dump tapes, or files externally prepared to resemble TSB files, mount the appropriate magnetic tape and type LOAD.
- b. If it is desired to selectively dump programs or files from the system to magnetic tape, mount a blank magnetic tape with a write enable ring and type DUMP.
- c. In either case, the loader prints:

ENTER NAME LIST, ONE PER LINE; TERMINATE WITH 'END'

For each program or file that is to be selectively loaded or dumped, enter the user identification code, a comma, and the program or file name. If just an identification code is specified, all entries belonging to that user are loaded into or dumped from his library.

Each line is examined on entry by the loader. If it is legitimate, the loader generates a linefeed and allows another to be typed. Illegal entries result in appropriate error messages.

Programs and files that duplicate names already in the system are not loaded.

Terminate the name list by typing END.

EXAMPLE:

```
LOAD OR DUMP COMMANDS? LOAD  
ENTER NAME LIST, ONE PER LINE; TERMINATE WITH 'END'  
C732,FILE1  
M935  
X222,PROG  
END
```

In this example, system output is underscored. This does not occur in actual system output. The LOAD command was selected to load an element named FILE1 associated with idcode C732 from magnetic tape into the library associated with idcode C732. An element named PROG associated with idcode X222 is loaded from magnetic tape into the library associated with idcode X222. In addition, all of the elements associated with idcode M935 on magnetic tape are loaded into the library associated with idcode M935.

- d. The loader attempts to carry out the requested action.
- e. For selective dumping, the specified entries are written to the magnetic tape. After writing is complete, the loader prints:

VERIFY?

Respond YES to rewind and compare the tape or NO to bypass verification. Additional tapes will be requested if needed. Do not mount a new tape until requested by the system. The verify question is asked for each tape. After a successful dump the loader prints:

DONE

If a tape verification fails, the message TAPE BAD is printed, and the main computer halts. To repeat the dumping operation, either use the same tape or mount a new one and press RUN on the main computer.

- f. For selective loading, the loader searches for specified entries on the magnetic tape provided. During selective loading, the same error messages and requests for more tapes are printed as those generated by the loader during normal loading from magnetic tape.

Under options 002 and 003, selectively loaded programs and files are never placed on the system drum.

- g. When each load or dump operation is completed, the loader requests another load or dump command. To end this sequence, type NO or a carriage return (implied NO).

Each dump operation must start a new magnetic tape.

- 19. The loader prints:

DATE?

Respond with the date in the form: ddd/yy where ddd is the current day-of-year (up to three digits) and yy is the last two digits of the current year. For example, June 1, 1973 is entered: 152/73

- 20. The loader prints:

TIME?

Respond with the current time of day (24-hour clock) as a four digit integer, two each for the hour and minute. For example, 2:15 p.m. is entered: 1415

21. Finally, the system prints:

READY

indicating that loading is complete, and that the system is running. Users may now log on.

Note: Entering a STATUS command immediately after starting the system provides a map showing where copies of vital system information are located in mass storage. Such information is useful in diagnosing system failures.

SYSTEM AND FEATURE LEVEL CODES

A protective scheme has been developed for the TSB systems. A System Level code is assigned to each TSB loader and its associated system. This code uniquely identifies that system (but, in general, not different versions of that system). In addition, each system is assigned a Feature Level code that identifies the level of features supported by that system.

System Level Codes

Currently, the 20854A TSB system is assigned two System Level codes, as follows:

System Level	Code
base system and option 001	3000
options 002 and 003	3500

Note: The 2000C (High-Speed System) has a System Level code of 2000.

Each time a system is loaded, the loader verifies that it has the correct code for that option.

- At initial system generation or system update (paper tape start-up) the loader verifies that the paper tape contains its System Level code.
- For a magnetic tape start-up, the loader verifies that the set of magnetic tapes was generated by its system.
- For disc start-ups (bootstraps) the loader verifies that the system on the disc(s) is its system.

In any case, if the system being loaded is not acceptable, the loader prints:

ILLEGAL SYSTEM CODE, LOAD/DUMP ABORTED

and terminates the loading process.

Feature Level Code

Each system is assigned a Feature Level code identifying the level of features it supports. Currently, only one level exists for the 20854A TSB system. This code is:

Feature Level	Code
20854A (all options)	200

The Feature Level code is used by the loader to ensure that a system is not loaded with a library containing programs with features it does not support. When selectively loading programs and files from magnetic tape, if the set of tapes were produced by a system with a higher Feature Level code, the loader prints:

TAPE MAY CONTAIN FEATURES NOT SUPPORTED ON THIS SYSTEM (xxx VS yyy)
DO YOU TAKE RESPONSIBILITY?

where xxx is the Feature Level code of the system and yyy is the Feature Level code from the magnetic tape.

The operator may respond NO to bypass this selective load. The "LOAD OR DUMP COMMANDS?" request will be repeated to allow loading to continue. If the operator knows that in fact none of the programs or files to be loaded contain the extra features, he may respond YES and the selective load will be performed. Any other response causes repetition of the message:

DO YOU TAKE RESPONSIBILITY?

When performing a system update (paper tape start-up), if the Feature Level code of the disc-resident library is higher than that of the system being loaded, the loader prints:

DISC MAY CONTAIN FEATURES NOT SUPPORTED ON THIS SYSTEM (xxx VS yyy)
DO YOU TAKE RESPONSIBILITY?

where xxx is the Feature Level code of the system which generated the library and yyy is the Feature Level code of the system being loaded.

The operator may answer NO; the message "LOAD/DUMP ABORTED" will be printed and loading terminates. If the operator responds YES, the system update will proceed. Any other response causes repetition of the message:

DO YOU TAKE RESPONSIBILITY?

MASS STORAGE ERRORS DURING START-UP

Disc Error Conditions (base system and option 001 only)

Note: Disc errors not associated with system start-up appear in Appendix B. A complete set of halt codes is contained in Appendix A.

If the main computer fails to halt within approximately five seconds after the start-up procedure is initiated, press HALT. Ensure that a system disc is mounted on unit 0 of the controller in select code slots 15-16_g and that the drive is ready, then restart the procedure from step 1.

If the 102001 halt occurs, ensure that a system disc is mounted on unit 0 of the controller in select code slots 15 and 16 and that the drive is ready, then restart the procedure from step 1.

If the 102002 halt occurs, a read error occurred while reading disc blocks 1 and 2. Press RUN to retry the read.

If any blocks in question have been overwritten, the results are unpredictable. Repeated errors of the type described above imply that the TSB loader paper tape should be used.

The system may type:

NOT READY SEL CODE m UNIT n

indicating that the specified disc drive is not in the READY condition. Correct the problem and press RUN.

READ ERROR SEL CODE m UNIT n

The label on the specified pack cannot be read. This is probably due to a hardware problem with the disc or drive, or it could be caused by an unformatted pack. If the problem can be corrected, do so and press RUN

NO TSB LABEL SEL CODE m UNIT n

A wrong pack has displaced the expected pack on the specified drive. Reinststate the correct pack on the drive and press RUN.

INCONSISTENT LABELS SEL CODE m UNIT n

The specified pack has a logical number which is not expected by the system or which duplicates one already found. In the former case, load the correct pack. In the latter case, determine the problem and resolve it. Press RUN.

WRONG SYSTEM ID SEL CODE m UNIT n

The specified pack is not part of the system specified by logical disc 0. Load the correct one. Press RUN.

Disc and Drum Error Conditions (options 002 and 003 only)

Note: Disc and drum errors not associated with system start-up appear in Appendix B. A complete set of HALT codes is contained in Appendix A.

If the main computer fails to halt within approximately five seconds after the start-up procedure is initiated, press HALT. Ensure that the fixed-head drum is associated with select code slots 14-15₈ and that the device is up to operating speed, then restart the procedure from step 1.

If the 102000 halt occurs, a read error occurred while reading drum sector 0. Restart the procedure from step 1.

If the 102001 halt occurs, a read error occurred while reading drum sector 1. Restart the procedure from step 1.

If the 102002 halt occurs, a read error occurred while reading disc blocks 1 and 2. Ensure that a system disc is mounted on unit 0 of the controller in select code slots 17-20₈ and that the drive is ready, then press RUN.

If any sectors or blocks in question have been overwritten, the results are unpredictable. Repeated errors of the type described above imply that the TSB loader paper tape should be used.

The system may type:

NOT READY SEL CODE m UNIT n

indicating that the specified drive is not in the READY condition. Correct the problem and press RUN.

READ ERROR SEL CODE m UNIT n

The label on the specified pack cannot be read. This is probably due to a hardware problem with the disc or drive, or could be caused by an unformatted pack. If the problem can be corrected, do so and press RUN.

NO TSB LABEL SEL CODE m UNIT n

A wrong pack has displaced the expected pack on the specified drive. Reinststate the correct pack on the drive and press RUN.

INCONSISTENT LABELS SEL CODE m UNIT n

The specified pack has a logical number which is not expected by the system or which duplicates one already found. In the former case, load the correct pack. In the latter case, determine the problem and resolve it. Press RUN.

WRONG SYSTEM ID SEL CODE m UNIT n

The specified pack is not part of the system specified by logical disc 0. Load the correct one. Press RUN.

Magnetic Tape Error and Loading Messages

Any of the following messages may be printed by the loader while the system and library are being read from magnetic tape:

TAPE ERROR idcode name LOST

The loader has not been able to read the specified entry from the tape, so it has not been recovered. It will have to be loaded from another tape if available.

NO ROOM FOR idcode name

The loader has found the specified entry on the tape, but cannot find sufficient space for it. The entry will be deleted from the directory. If it is desired to put this particular entry on the system, the system must be brought up again with more discs or, if the current load is not using the alternate allocation option, the loading procedure may be attempted again using this option.

If the alternate allocation option was selected and if a program or file is read from the tape, but the correct logical disc is not present, the loader prints:

DISC n NOT PRESENT, LOAD/DUMP ABORTED

and the loading procedure must be restarted.

If the system being loaded occupies more than one reel of magnetic tape and the end of any but the last reel is reached, the loader prints:

MOUNT REEL # n. PRESS RUN

and the main computer halts (102077₈). Mount the next reel in the series and press RUN. The loader checks for the correct reel and continues the loading process.

If one or more entries residing in the tape directory have not been recovered, the loader prints:

UNRECOVERED ENTRIES. ANOTHER SET AVAILABLE?

This situation could occur because the loader could not read some entries on the set of tapes just loaded or because the set was generated by a SLEEP command that did not dump some programs and files because they were unchanged. If there is another set of tapes available (an earlier sleep version or the previous hibernate tapes that can provide the missing entries), mount the first reel of the earlier set and type YES. Otherwise, type NO or a carriage return (implied NO).

If the response to ANOTHER SET AVAILABLE? above was YES, the loader begins reading the tape mounted on the magnetic tape unit. The date of this tape must be earlier than that on the reel just read or the loader types BAD DATE ORDER and repeats the previous question.

If the loader ascertains that it is the correct reel of an acceptable set, the loading process continues; if not, the loader types BAD TAPE LABEL and repeats the previous question.

Once an acceptable set of tapes is found, the loader begins reading. Entries on the tape that have already been recovered and entries that do not appear in the directory of the first set of tapes are ignored. During selective loading, the loader ignores the directory (if any) and merely searches for the requested entries.

If the response to ANOTHER SET AVAILABLE? above was NO, the loader prints:

FOLLOWING ENTRIES NOT FOUND:

A list of those entries in the directory that have not been recovered from any of the tapes read is printed. In addition, these entries are deleted from the directory.

Under options 002 and 003 only, the following message may be printed:

INSUFFICIENT DRUM SPACE; idcode name DESECRATED

The specified entry was sanctified on the system written to tape. However, the loader has not been able to find space for it on the drum. Thus, the entry has been put only on the disc.

APPENDIX A

System Halt Codes and Error Messages

SYSTEM PROGRAM HALT CODES

The following halt codes can occur during operation of the TSB System Program:

Halt Code	Processor	Meaning
102000	I/O	CPU failure: the I/O processor cannot execute an instruction. Recovery is possible.* There are no messages associated with this halt.
102002	MAIN	Erroneous system transfer has occurred. Recovery is not possible. Use of the COLD DUMP routine is recommended.
102005	MAIN or I/O	A parity error has occurred. Recovery is not possible. Use of the COLD DUMP routine is recommended.
102011	MAIN	Unexpected interrupt from the processor interconnect. Recovery is not possible. Use of the COLD DUMP routine is recommended.
102030	MAIN	Disc driver is busy. Recovery is not possible. Disc error message (s) at the operator's console will be associated with this halt. Use of the COLD DUMP routine is recommended.
102031	MAIN	Disc called is not present. Recovery is not possible. Disc error message(s) at the operator's console will be associated with this halt. Use of the COLD DUMP routine is recommended.
102032	MAIN	Hardware malfunction. Disc error while writing a system track. System track has been moved and all tables have been updated. Recovery is possible.* Disc error message(s) at the operator's console will be associated with this halt.
102033	MAIN	Hardware malfunction. Disc error while reading track or writing nonessential track. Recovery is possible.* Disc error message(s) at the operator's console will be associated with this halt.

*Recovery is possible, but only through an emergency recovery procedure initiated by an HP software representative: contact him before attempting recovery.

Note that halt codes associated with startup of a TSB system are described in Section IV, in the paragraph titled "Mass Storage Errors During Startup." The COLD DUMP routine is described in Appendix G.

Halt Code	Processor	Meaning
102034	MAIN	Hardware malfunction. Disc error occurred causing the system tables to be incompatible. Recovery is not possible. Disc error message(s) at the operator's console will be associated with this halt.
102035	MAIN	A directory track could not be found. Recovery is not possible. Disc error message(s) at the operator's console will be associated with this halt. Use of the COLD DUMP routine is recommended.
102036	MAIN	Power failure has occurred. Check Automatic Restart switch position (should be ARS). See Appendix G for recovery procedures.
102037	MAIN	Bad ADT disc address generated. Recovery is not possible. Disc error message(s) at the operator's console will be associated with this halt. Use of the COLD DUMP routine is recommended.

COMMAND ERROR MESSAGES

The TSB system program outputs these messages to the system console.

Command	Message	Meaning
ANNOUNCE	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
BESTOW	DUPLICATE ENTRY (IES)	Specified program or file name(s) already exist in new idcode library.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	INVALID NAME	Program or file name specified in illegal form.
	LIBRARY SPACE FULL	No room in new idcode library.
	NO ENTRIES FOR OLD ID	System cannot find named program or file, or specified old idcode library is empty.
	NO SUCH ENTRY	System cannot find named program or file.
	NO SUCH NEW ID	New idcode specified does not exist.

Command	Message	Meaning
BREAK	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	USER NOT LOGGED ON	Port number specified is not an active port.
CHANGE	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	NO SUCH ID	Specified idcode does not exist.
COPY	DUPLICATE ENTRY	Specified program or file name already exists in new idcode library.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	ILL-STORED PROGRAM	Named program improperly stored; it cannot be copied.
	INVALID NAME	Program or file name specified in illegal form.
	LIBRARY SPACE FULL	No room in new idcode library.
	NO SUCH ENTRY	System cannot find named program or file.
	NO SUCH NEW ID	New idcode specified does not exist.
	SYSTEM OVERLOAD	No directory or disc space available for new entry.
	UNSUCCESSFUL	Disc error occurred during copy operation.

Command	Message	Meaning
DESECRATE (options 002 and 003 only)	BAD TRANSFER, FILE DESTROYED	Named file could not be read from drum or written to disc; file is not recoverable.
	ENTRY NOT PRESENT	System cannot find named program or file.
	ENTRY NOT SANCTIFIED	Named program or file exists but is not a sanctified program or file.
	FILE IN USE	Named file is currently being accessed by a user.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
DIRECTORY	CAN'T READ DIRECTORY TRACK	System cannot read track containing directory entries.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
HIBERNATE	CHANGE MAG TAPE TO AUTO	Magnetic tape unit must be on-line before hibernate can proceed. Put unit on-line, then press RUN on main computer.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	NO MAG TAPE	MAGTAPE command must be entered before HIBERNATE command.

Command	Message	Meaning
KILLID	A000 NOT ALLOWED	System Master's idcode may not be removed.
	GROUP LIBRARY IN USE	Group Master idcode specified while a member of his group is logged on; command is ignored.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	NO SUCH ID	Specified idcode does not exist.
LOCK (options 002 and 003 only)	CAN'T LOCK TRACK tt	Track tt required for system use.
	DISC/DRUM ERROR; CAN'T DO IT	Disc or drum error occurred during command execution.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	ILLEGAL PARAMETERS	Parameters specified in illegal form or out of range.
	LOCK FEWER TRACKS	Track specification infringes on system requirements; re-enter command with smaller specification.
	NO SUCH DRUM	Specified drum does not exist.
MAGTAPE	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
MLOCK	CAN'T LOCK BLOCK xxxxxx	Block xxxxxx required for system use.
	DISC ERROR; CAN'T DO IT (base system and option 001)	Disc error occurred during command execution.

Command	Message	Meaning
MLOCK (Continued)	DISC/DRUM ERROR; CAN'T DO IT (options 002 and 003)	Disc or drum error occurred during command execution.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	ILLEGAL PARAMETERS	Parameters specified in illegal form or out of range.
	LOCKED BLOCKS TABLE FULL	No room in system table of locked blocks.
	LOCK FEWER BLOCKS	Block specification infringes on system requirements; re-enter command with smaller specification.
MUNLOCK	NONEXISTENT DISC	Specified disc does not exist.
	DISC ERROR; CAN'T DO IT (base system and option 001)	Disc error occurred during command execution.
	DISC/DRUM ERROR; CAN'T DO IT (options 002 and 003)	Disc or drum error occurred during command execution.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	ILLEGAL PARAMETERS	Parameters specified in illegal form or out of range.
NEWID	LOCKED BLOCKS TABLE FULL	No room in system table of locked blocks.
	NONEXISTENT DISC	Specified disc does not exist.
	DUPLICATE ENTRY	Specified idcode already exists.
	ID TABLE FULL	No room in system idcode table.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).

Command	Message	Meaning
PHONES	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
PORT	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
PRINTER	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
PURGE	BUSY FILES	Qualifying files currently being accessed by a user; command is ignored.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	ILLEGAL PARAMETER	Specified date has not occurred; it must be less than or equal to current date.
RESET	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	NO SUCH ID	Specified idcode does not exist.
ROSTER	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).

Command	Message	Meaning
SANCTIFY (options 002 and 003 only)	ENTRY ALREADY SANCTIFIED	Named program or file already exists as a sanctified entry.
	ENTRY NOT PRESENT	System cannot find named program or file.
	ENTRY TOO LONG	Named program or file exceeds 8192 words (32 disc blocks).
	FILE IN USE	Named file currently being accessed by a user.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	INSUFFICIENT DRUM SPACE	No room on drum for named program or file.
SDIRECTORY (options 002 and 003 only)	CAN'T READ DIRECTORY TRACK	System cannot read track containing directory entries.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
SLEEP	CHANGE MAG TAPE TO AUTO	If magnetic tape dump is selected, magnetic tape unit must be on-line. Put unit on-line and then press RUN on main computer.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
SPEED	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
	NO CONF. DONE	Qualifying port logged on; command not allowed for active ports.

Command	Message	Meaning
STATUS	DISC ERROR; CAN'T DO IT (base system and option 001)	Disc error occurred during command execution.
	DISC/DRUM ERROR; CAN'T DO IT (options 002 and 003)	Disc or drum error occurred during command execution.
	ILLEGAL FORMAT	Command entry did not con- form to format rules given in command description (Section III).
UNLOCK (options 002 and 003 only)	DISC/DRUM ERROR; CAN'T DO IT	Disc or drum error occurred during command execution.
	ILLEGAL FORMAT	Command entry did not con- form to format rules given in command description (Section III).
	ILLEGAL PARAMETERS	Parameters specified in illegal form or out of range.
	NONEXISTENT DRUM	Specified drum does not exist.

LOAD-TIME ERROR MESSAGES

The following error messages may result from errors which occur when the TSB Loader program is executing. The first group of messages can be produced by all options. The second group is applicable only to the base system and option 001 and the last group is applicable only to options 002 and 003. The messages are output to the system console.

All Options

Message	Meaning
BAD DATE ORDER	During a magnetic tape reload or selective load, an additional set of tapes has a more recent date than the preceding set.
BAD DELIMITER	Specified delimiter is illegal, missing, or not recognized.
BAD LOGICAL UNIT NUMBER	Specified unit number is illegal or out of range.
BAD TAPE LABEL	Alleged first tape of a set of magnetic tapes has a missing, unreadable, or incorrect label.
CHANGE MAG TAPE TO AUTO	Magnetic tape unit must be on-line. Put unit on-line and press RUN on main computer.
CHECKSUM ERROR	During a paper tape read operation, a checksum error is detected. Restart system generation or update.
DISC ALREADY IN USE	Disc number specified in DISC command is already on system.
DISC n NOT PRESENT, LOAD/DUMP ABORTED	During a magnetic tape reload using "alternate allocation option", one of the previously existing discs is absent or has had portions locked with the MLOCK command.
DISC 0 MUST BE PRESENT	Logical disc-0 is not labeled for TSB and the operator did not okay request to so label it.

Message	Meaning
DISC ERROR idcode name LOST	Magnetic tape dump or selective dump cannot retrieve program or file from disc but dump operation continues. May cause "TAPE ERROR idcode name LOST" message on subsequent use of tape for system loading or selective load.
DISC MAY CONTAIN FEATURES NOT SUPPORTED ON THIS SYSTEM (xxx VS yyy) DO YOU TAKE RESPONSIBILITY?	During system update, the loader encounters a feature level code higher than that of the system being loaded.
DISC RELOAD NOT POSSIBLE	Unable to sleep or hibernate the system to disc. The system attempts to complete the magnetic tape dump unless no tape unit is present and the operator refuses to supply one (in which case, a recoverable halt occurs (102032 _g) allowing the operator to press RUN and supply a tape unit).
ENTRY ALREADY PRESENT	Named entry already exists on TSB system.
FIRST TAPE TOO SHORT	Furnished reel of magnetic tape is too short. During dumping of system tables, about 200 feet of good tape are required on the first reel.
FOLLOWING ENTRIES NOT FOUND idcode name, DELETED : : : idcode name, DELETED	After a magnetic tape load or selective load is completed, any entries not recovered are listed in this form.
ILLEGAL ADDRESS	The paper tape being loaded has an address outside the area of memory containing TSB system code.
ILLEGAL DATE	Date must be specified in correct form: ddd/yy where ddd is day-of-year and yy is last two digits of current year. For example, June 1, 1973 is entered: 152/73
ILLEGAL INPUT	Invalid response to system request for information.

Message	Meaning
ILLEGAL SELECT CODE	Specified select code is illegal or out of range.
ILLEGAL SYSTEM CODE, LOAD/DUMP ABORTED	During system loading or system update, the system on paper tape or magnetic tape is not the correct one for the TSB loader being used. Also, during a disc reload, the bootstrap encounters alien discs that have been introduced to the pre-existing system.
ILLEGAL TIME	Time must be specified in correct form: hhmm where hh is the hour (24-hour clock) and mm is the minute. For example, 2:15 p.m. is entered: 1415
ILLEGAL UNIT NUMBER	Specified unit number is illegal or out of range.
INSUFFICIENT TABLE SPACE ALLOCATED, LOAD/DUMP ABORTED	The magnetic tape tables are larger than the new table space allocation.
INVALID BLOCK NUMBER	Specified block number is illegal or out of range.
MOUNT REEL #nn. PRESS RUN	During a magnetic tape load or selective load, system requests reel number nn of a set of tapes. If the tape mounted is not the correct one or cannot be read, the message is repeated as a diagnostic message.
NO MAG TAPE	The magnetic tape device must be added to the system with a MAGTAPE command before the desired operation can be executed.
NO ROOM FOR idcode name	During magnetic tape reload or selective load, a requested program or file cannot be placed in the library because of a lack of disc space.
NO ROOM IN DIRECTORY	The TSB system directory is full.
NO SUCH ENTRY	The entry specified cannot be found.
NO SUCH ID	The idcode specified cannot be found.

Message	Meaning
OUT OF DISC SPACE, LOAD/DUMP ABORTED	Insufficient disc space to load the system or library.
SYSTEM LIBRARY OVERFLOW, LOAD/DUMP ABORTED	Disc space allocated for system library is insufficient for the system library being loaded.
SYSTEM NOT SLEPT; MUST RELOAD FROM MAG TAPE	Attempt made to load TSB system from disc prior to a sleep operation.
TAPE CANNOT BE READ, LOAD/DUMP ABORTED	Magnetic tape read error.
TAPE BAD	Write or verify failure during magnetic tape dump in sleep or hibernate operation or during selective dump. Retry by pressing RUN.
TAPE ERROR idcode name LOST	During magnetic tape reload or selective load, a program or file cannot be recovered from the tape.
TAPE MAY CONTAIN FEATURES NOT SUPPORTED ON THIS SYSTEM (xxx VS yyy) DO YOU TAKE RESPONSIBILITY?	A requested selective load is from a tape created by a system with features not present on the current system and may contain programs and files not within the current system's capability.
TOO MANY DISC ERRORS, LOAD/DUMP ABORTED	Attempted selective dump or sleep or hibernate magnetic tape dump has an excessive number of otherwise recoverable disc errors.
UNEXPECTED END OF FILE, idcode name, LOST	Entry on magnetic tape does not correspond with directory expectations during magnetic tape reload or selective load.
UNEXPECTED END OF FILE, LOAD/DUMP ABORTED	End-of-file found in system portion of either sleep or hibernate tape.
UNRECOVERABLE ENTRIES. ANOTHER SET AVAILABLE?	The last set of magnetic tapes used in a magnetic tape reload of selective load did not supply (or contained unreadable versions of) part of the user library expected by the system.
WRITE NOT ENABLED	Write enable ring must be placed on magnetic tape reel to execute desired operation.

Base System and Option 001

Message	Meaning
BEGIN WITH 'DISC'	Illegal response to "DISC MODIFICATIONS?" query from system — response must be NO, carriage return, or a DISC command in the correct format.
DISC 0 MUST BE IN 15, 0	Select code for disc-0 must be 15; unit number for disc-0 must be 0.

Options 002 and 003

Message	Meaning
BAD TRACK #	Specified track number is illegal or out of range.
BEGIN WITH 'DISC' OR 'DRUM'	Illegal response to "DISC OR DRUM MODIFICATIONS?" query from system — response must be NO, carriage return, or a DISC or DRUM command in the correct format.
DIRECTORY READ ERROR ENTRIES BETWEEN idcode name AND idcode name HAVE BEEN LOST	System is unable to retrieve part of directory from drum storage during a sleep or hibernate operation. Thus, library entries in listed range are lost.
DISC 0 MUST BE IN 17, 0	Select code for disc-0 must be 17; unit number for disc-0 must be 0.
DRUM FAILURE: n/tt, LOAD/DUMP ABORTED	Read/write failure on drum-n, track tt.
DRUM 0 MUST BE IN 14	Select code for drum-0 must be 14.
INSUFFICIENT DRUM SPACE: idcode name DESECRATED	During system reload, a lack of drum space caused the named entry to be desecrated. It is still available from the disc library.

Message	Meaning
<p>LOADER NOT CONFIGURED FOR TSB, LOAD/DUMP ABORTED</p>	<p>A drum-resident DOS system already exists and requires a non-TSB hardware configuration.</p>
<p>LOCKED BLOCKS TABLE FULL</p>	<p>No room in system table of locked blocks.</p>
<p>OUT OF DRUM SPACE, LOAD/DUMP ABORTED</p>	<p>Insufficient drum space for requested system tables.</p>
<p>SANCTIFIED FILE idcode name, DESTROYED</p>	<p>System unable to retrieve sanctified file from drum storage during a sleep or hibernate operation.</p>

APPENDIX B

Disc and/or Drum Errors

This appendix discusses error conditions that may be encountered during the transfer of information to and from the disc and/or drum storage devices. Note that disc errors can occur on all TSB systems. Drum errors can occur only under options 002 and 003.

Errors which occur during transfers to and from the disc and/or drum are handled by the system in various ways, depending on the nature of the attempted transfer. In any case, a disc and/or drum error while the system is running or a disc error during the loading procedure or shutdown procedure, causes one of the following messages to be printed on the system console:

DISC FAILURE SEEKING TO BLOCK xxxxxx. STATUS yyyyyy
DISC FAILURE READING nn BLOCKS AT xxxxxx. STATUS yyyyyy
DISC FAILURE WRITING nn BLOCKS AT xxxxxx. STATUS yyyyyy
DRUM FAILURE READING nnn SECTORS AT u/tt/sss. STATUS yyyyyy
DRUM FAILURE WRITING nnn SECTORS AT u/tt/sss. STATUS yyyyyy

(x = disc block number; y = hardware status of disc and/or drum; n = count of disc blocks or drum sectors; u = drum unit; t = drum track; s = drum sector.

When a disc failure occurs during loading from paper or magnetic tape, the computer halts, terminating the loading procedure. If the cause of the error can be corrected (see Appendix A), restart the TSB loader (which will remain in main memory) at location 2000₈.

When a disc failure occurs during a sleep or hibernate procedure, the computer halts, terminating the procedure. Recovery depends on *when* the failure occurred. If the system is writing to magnetic tape, this indicates that the system has already successfully been written on the disc. Follow the normal start-up procedure in Section IV, and attempt the sleep or hibernate procedure again. If the system has not started writing to magnetic tape when a disc failure occurs during sleep or hibernate procedure, the system has probably not been written to the disc successfully. In this case the system must be reloaded from the most recent successful sleep and/or hibernate magnetic tapes.

Failure of certain system operations may cause two or more related error messages to be printed.

If an error occurs while a user is reading or writing one of his own files or programs, the user receives the appropriate error message. The task is terminated, but system operation is not affected. Specifically, this procedure applies to the user commands SAVE, CSAVE, OPEN, GET, and APPEND and to executing CHAIN statements and reading from or writing to files. The system operator may lock the offending area (LOCK or MLOCK command) if the problem is a local one.

An error while a user's program is being written to or read from his swap area will cause that user's port to be made permanently unavailable until the system is reloaded. The user's current program and results are lost, but overall system operation is unaffected. A message is printed on the operator's console and on the user's terminal.

Disc and/or drum errors when system segments or tables are being accessed usually cause the system to halt, though it may well be possible to recover from such halts. (See Appendix A). In a few cases, such as a directory track read error while a catalog or directory is being printed, the system does not shut down, though such an error obviously indicates a problem with possible serious effects. On fatal errors, the shut-down procedure varies with the specific transfer that fails. Several possibilities are described here. Users are informed of system shut-down from any fatal error with the message:

HARDWARE FAILURE - - SYSTEM DOWN.

- a. If the system cannot read a library routine, the list of files in use, the id-table, or some other segment which it needs to continue running, it prints on the system console any messages remaining in the queue, followed by the message

CAN'T ACCESS SYSTEM SEGMENT OR TABLE. RECOVERY POSSIBLE.

and then halts. An HP software representative should be consulted for appropriate recovery procedures.

- b. If the system has updated a portion of a table in main memory, such as a directory track or id-track, but cannot write it back correctly, and if recovery might be possible if this information can be salvaged, then the system will attempt to write the table in another area. If successful it prints any messages remaining in the queue, followed by the message

MOVED SYSTEM TRACK. RECOVERY POSSIBLE.

and halts. If the salvage attempt fails, the system prints any messages remaining in the queue and then the message

CAN'T WRITE SYSTEM TRACK. RECOVERY OUT OF THE QUESTION.

and halts. In this case, recovery should not be attempted since the original system track may contain bad information even if it can be read.

- c. Certain routines involve updating several system tables. If one of these routines is in progress and if some, but not all, of the tables have been altered when a disc and/or drum failure occurs, then recovery is not possible because the tables contain conflicting information. The system prints any messages remaining in the queue followed by the message

SYSTEM TABLES INCOMPATIBLE. RECOVERY IMPOSSIBLE.

and halts.

- d. The fourth 256-word logical block of each moving head disc is reserved by the system as the locked blocks table. Its entries specify those areas of the disc which have been locked (MLOCK command) by the operator. The table is cleared only when a TSB label is written onto the disc pack, not each time a new system is brought up on it. If a disc failure occurs while the system is writing to a locked blocks table, the result may be disastrous; whatever may have been written to the table will remain there as long as the pack has a TSB label. Therefore, the system prints any remaining messages followed by

LOCKED BLOCKS TABLE DESTROYED. RECOVERY IMPOSSIBLE.

and halts. The next time a system is brought up on the affected disc, the operator should issue a STATUS command to check that the correct blocks are locked (MLOCK command).

All disc and/or drum errors discussed thus far have been those in which a requested transfer has not been successfully completed. If a transfer fails, the system, in many instances, reissues the request several times. If one of the subsequent requests succeeds, operation of the system continues normally. However, a retry message similar to the failure messages described at the beginning of this section is sent to the operator. It takes one of the following forms:

DISC RETRY READING nn BLOCKS AT xxxxxx. STATUS yyyyyy

DISC RETRY WRITING nn BLOCKS AT xxxxxx. STATUS yyyyyy

DRUM RETRY WRITING nnn SECTORS AT u/tt/sss. STATUS yyyyyy

DRUM RETRY READING nnn SECTORS AT u/tt/sss. STATUS yyyyyy

Such messages do not require operator response but frequent messages may indicate impending trouble on the disc and/or drum involved.

APPENDIX C

Storing System Shut-down Tapes

The use of SLEEP and HIBERNATE commands and the procedures are explained in Section III. The normal method of starting a TSB system is to reload from the disc (base system and option 001) or from the drum and disc (options 002 and 003). If it is not possible to read data from the mass storage devices, a hibernate tape (or tapes) must be used if the system was last shut down with a HIBERNATE command. If the system was last shut down with a SLEEP command, that sleep tape plus the latest hibernate tape(s) must be used. If the most recent hibernate and/or sleep tapes cannot be read, the next most recent tapes should be used.

ORGANIZATION OF TAPE STORAGE

All tapes written by a single SLEEP or HIBERNATE command must be labeled with the same set number. When more than one tape is required, tapes must be labeled in order (for example: "HIB Set 1, Reel 1 -- HIB Set 1, Reel 2 -- HIB Set 1, Reel 3 -- etc."). Sleep tapes should be identified as sleep tapes and, if more than one tape is required, kept in sets in the same manner. The number of tape sets stored depends upon the number of tape reels available and on the amount of space devoted to tape storage.

Note: When loading the system from sleep and/or hibernate sets made up of more than one tape, all tapes must be from the same set and must be loaded in the same order in which they were written.

TAPE REQUIREMENTS

In the worst hibernate case, each HP 2883 or HP 2884 pack-type disc requires 8400 feet of magnetic tape to back up. The maximum probable requirement is 4000 feet; this total may be used for calculations for most systems. The minimum requirement, of course, depends on how many files or programs are present; it is less than 100 feet if there are none.

Multiply the appropriate footage by the number of disc drives present to determine the total footage required for the hibernate set.

When calculating the number of reels of tape required, remember that each reel has 50 feet of leader and trailer (a 2400 foot reel has only 2350 usable feet). In addition, reels may have footage stripped as bad spots develop. (Commonly, the first 10 feet of a reel becomes unusable and is discarded, and a new load point marker is affixed.)

Tape footage required for system SLEEP is normally less than that required for HIBERNATE and can often be a single reel. The length of a sleep tape is determined by the amount of new or changed information on the system. If the system consists of frequently changed files, the set of sleep tapes may be as large as the set of hibernate tapes. In this case, little advantage is gained; the system backup should be restricted to use of the HIBERNATE command.

STORAGE SCHEMES

EXAMPLE 1:

Some installations may wish to save a copy of all sleep tapes for some period of time.

An example of a tape rotation scheme to meet such a requirement (four-week retention) uses five hibernate sets (H1, H2, H3, H4, H5) and 25 sleep sets (S1, S2, S3, . . . S25).

A hibernate set is used once every Saturday and a sleep set is used each weekday. The oldest set is always the set that is overwritten.

	Sat.	Mon.	Tue.	Wed.	Thur.	Fri.
Week 1	H1,	S1,	S2,	S3,	S4,	S5
Week 2	H2,	S6,	S7,	S8,	S9,	S10
Week 3	H3,	S11,	S12,	S13,	S14,	S15
Week 4	H4,	S16,	S17,	S18,	S19,	S20
Week 5	H5,	S21,	S22,	S23,	S24,	S25
Week 6	H1,	S1,	S2,	S3,	S4,	S5

This schedule provides complete four-week retention and a very simple calendar schedule. However, it requires a substantial tape inventory which cannot usually be justified. (A system with a 2883 and a 2884 would require 65 2400-foot reels of tape.)

EXAMPLE 2:

In an installation where archival storage is not needed, schedules that drastically reduce the requirements for tape storage can be implemented. However, such a reduction is usually accompanied by an increased confusion factor concerning which tape set to use.

It is desirable in producing such schedules to consider the possibility of tape read errors occurring. The usual procedure is to ensure that any single tape error will not cause the loss of any file or program that has been on the system more than one day. This requirement is usually coupled with the provision that a disc failure might occur while writing sleep or hibernate sets.

Subject to these constraints, the following example schedule has been prepared. It uses seven sets of tapes, which is the minimum number that can meet all of the requirements.

Three sets of tapes are used for hibernate (H1, H2, H3). Each hibernate set may contain more than 1 tape.

Four sets of tapes are used for sleep (S1, S2, S3, S4). Each set will probably consist of a single reel of tape for the average system.

The first system backup should be a hibernate (H1). At regular intervals the system should be hibernated onto the next set in order (H2, H3, H1, H2, etc.), overwriting the contents of the oldest set. (Once a week is recommended; do not exceed six months between hibernates, because the date check will no longer operate correctly.)

The sleep command should be issued each weekday, at shutdown. The tape set used should be the oldest sleep set (except that the sleep set that was last used before a hibernate should be saved until one more hibernate is taken). The reason for this will become clear when tape errors are discussed.

Using this scheme, a typical order of hibernates and sleeps for a system hibernated on Saturday and slept daily would be:

	Sat.	Mon.	Tue.	Wed.	Thur.	Fri.
Week 1	H1,	S1,	S2,	S3,	S4,	S1
Week 2	H2,	S2,	S3,	S4,	S2,	S3
Week 3	H3,	S1,	S4,	S2,	S1,	S4
Week 4	H1,	S3,	S2,	S1,	*S3,	S2
Week 5	H2					

Reloading From The Magnetic Tapes

Assume that a hardware failure occurs at the point marked by the * in the above example and that the system must be reloaded from magnetic tape.

The first set to be used is S-1. If the loader prints "UNRECOVERED ENTRIES, ANOTHER SET AVAILABLE?" at the end of the set, mount set H1 and type "YES." The remaining user library entries would be recovered from that set.

Tape Errors

If the loader indicates that an entry was lost because of a tape error, that entry might still be recovered from some of the other sleep or hibernate tapes.

Error While Reading The Sleep Tape

Sleep tapes written after the last hibernate tape may contain copies of the last entry. Always use the most recent tape first. Once a sleep tape is read without any tape errors, go immediately to the hibernate set.

In the example, if a tape error occurred while reading tape S1, S2 would be mounted next. If further errors were encountered (unlikely), S3 could be mounted.

Error While Reading The Hibernate Tape

Recovery here is similar. Always use the most recent set first (the Loader demands the correct order). In the example, an error while reading H1, would indicate that S4 and then H3 would be tried. If after reading H3, there were still unrecovered entries, "NO" would be typed in answer to the "... ANOTHER SET AVAILABLE?" question. (Set H2 could be used in the event that tape errors occurred on both H1 and H3.)

If a tape error occurs, the file or program that is finally recovered is probably an earlier version and it is imperative that the user be notified of this possibility (also if the entry is deleted).

New Systems

If a hibernate tape is not significantly longer than a sleep tape, a situation common for new systems without large data bases, hibernate should be used instead of sleep because of the added backup at minimal cost.

APPENDIX D

Formatting New Discs

When new discs are introduced, they must be formatted by running the disc diagnostic program. At this time, bad sectors may be discovered. If so, they should be locked with the MLOCK command when the TSB System is loaded. The tables in this section may be used to convert the hardware disc addresses to the block numbers used by TSB. Two sets of tables are provided: one for 2883 discs and one for 7900 discs.

To convert a hardware disc address (cylinder, head, sector) to a TSB logical block number:

1. Determine the first block of the logical unit being used from Table D-1, or Table D-6.
2. Determine the first relative block on the cylinder from Tables D-2 and D-3 or Tables D-7 and D-8.
3. Determine the first relative block corresponding to the head from Table D-4 or Table D-9.
4. Determine the block corresponding to the sector from Table D-5 or Table D-10.
5. Add these four numbers.
6. Truncate this total to the nearest integer.
7. The result is the first block to be locked with the MLOCK command.
8. The diagnostic often detects errors while reading or writing several blocks of data. If this is the case, the last block which should be locked may be determined from the following table:

Word count on diagnostic error	Number of additional blocks to be locked
257-512	1
513-768	2
769-1024	3

EXAMPLES:

HP 2883 Disc Device

While running the diagnostic on the disc to be used as logical unit 1, the diagnostic prints:

*H46 READ IN S3
E64 STATUS IS 000003 SHOULD BE 000000
H51 CYL 047 HEAD 13 SECTOR 07 WORD COUNT 0662*

The calculations to determine the affected logical blocks are as follows:

*logical unit 1 = 46690
cylinder 40 = 9200
cylinder 7 = 1610
head 13 = 149 1/2
sector 7 = 3 1/2
First block to
be MLOcked = 57653*

Since the word count was 662, 2 extra blocks must be MLOcked. Therefore the needed command at load time is:

MLO - 57653, 57655

HP 7900 Disc Device

*logical unit # 0
cylinder # 173
head # 1
sector # 5*

*logical unit 0 = 0
cylinder 170 = 8160
cylinder 3 = 144
head 1 = 12
sector 5 = 2 1/2
Total = 8318 1/2*

*The block to be
MLOcked: 8318*

Table D-1. HP 2883 Disc

Logical Disc Number	First Block
0	0
1	46690
2	93380
3	140070
4	186760
5	233450
6	280140
7	326830

Table D-2. HP 2883 Disc

Cylinder Number	First Relative Block
0	0
10	2300
20	4600
30	6900
40	9200
50	11500
60	13800
70	16100
80	18400
90	20700
100	23000
110	25300
120	27600

Table D-3. HP 2883 Disc

Cylinder Number	First Relative Block
0	0
1	230
2	460
3	690
4	920
5	1150
6	1380
7	1610
8	1840
9	2070

Table D-4. HP 2883 Disc

Head Number	First Relative Block
0	0
1	11 1/2
2	23
3	34 1/2
4	46
5	57 1/2
6	69
7	80 1/2
8	92
9	103 1/2
10	115
11	126 1/2
12	138
13	149 1/2
14	161
15	172 1/2
16	184
17	195 1/2
18	207
19	218 1/2

Table D-5. HP 2883 Disc

Sector Number	Block
0	0
1	1/2
2	1
3	1 1/2
4	2
5	2 1/2
6	3
7	3 1/2
8	4
9	4 1/2
10	5
11	5 1/2
12	6
13	6 1/2
14	7
15	7 1/2
16	8
17	8 1/2
18	9
19	9 1/2
20	10
21	10 1/2
22	11

Table D-6. HP 7900 Disc

Logical Disc Number	First Block	Cylinder Number	First Relative Block
0	0	0	0
1	9744	10	480
2	19488	20	960
3	29232	30	1440
4	38976	40	1920
5	48720	50	2400
6	58464	60	2880
7	68208	70	3360

Table D-7. HP 7900 Disc

Cylinder Number	First Relative Block
80	3840
90	4320
100	4800
110	5280
120	5760

Table D-8. HP 7900 Disc

Cylinder Number	First Relative Block
0	0
1	48
2	96
3	144
4	192
5	240
6	288
7	336
8	384
9	432

Table D-9. HP 7900 Disc

Head Number	First Relative Block
0	0
1	12
2	24
3	36

Table D-10. HP 7900 Disc

Sector Number	Block
0	0
1	1/2
2	1
3	1 1/2
4	2
5	2 1/2
6	3
7	3 1/2
8	4
9	4 1/2
10	5
11	5 1/2
12	6
13	6 1/2
14	7
15	7 1/2
16	8
17	8 1/2
18	9
19	9 1/2
20	10
21	10 1/2
22	11
23	11 1/2

APPENDIX E

Cold Dump Routine

The cold dump routine is a standard TSB system feature which helps you preserve information necessary to identify the cause(s) of software system failures. Correct usage of the cold dump routine minimizes system downtime, as the routine captures essential data for subsequent off-line analysis by HP representatives, and allows recovery procedures to proceed in parallel with the fault diagnosis.

A list of system halts, their meanings and possible corrective action is contained in Appendix A; when these halts require use of the cold dump routine, follow the instructions below. Note that the cold dump routine is not useful for diagnosing hardware problems.

A cold dump form is included in this appendix; use this form to record data pertinent to the cold dump procedures (for example, the register contents at the time of the software failure). Additional forms can be obtained from your HP representative.

COLD DUMP ROUTINE OPERATING PROCEDURES

Rigorously follow these instructions; manipulate only those hardware switches required to collect the requested information or to perform the indicated action.

1. If the main processor is still executing, press HALT. If the failure caused the main processor to halt, record the halt code on the report form.
2. Record the value of the P-register.
3. If the I/O processor is still executing, go to step 5. **DO NOT PRESS HALT!**
4. If the I/O processor is halted, record the halt code and the values in the P-, A-, B-, Extend, and Overflow registers. (Note that the I/O processor may have halted with a parity error; in this case, there will be no halt code displayed.) Then restart the I/O processor at 2₈. If the I/O processor halts again, go to step 5.
5. Mount a reel of magnetic tape (write enabled) on the tape unit.
6. Select tape drive unit zero, then press RESET, LOAD, and ON-LINE.
7. Set the cold dump routine starting address (octal 77000) into the P-register.
8. Set the high priority (lower numbered) magnetic tape unit select code into the S-register.

9. Press RUN. The cold dump routine begins, with these results possible:
- a. Magnetic tape activity begins immediately. If a HALT, with 102077 displayed occurs, remove the magnetic tape (after it rewinds), label it with the appropriate identification, and present it to your HP representative along with the cold dump report form.
 - b. If the magnetic tape remains at load point (no activity) and the main processor halts, check for the following halt codes, and take corrective action:

102011 Incorrect magnetic tape unit select code. Place the correct value into the S-register and press RUN.

102033 Write not enabled. Remount the tape with a write-enable ring inserted, and press RUN.

102044 Magnetic tape unit off-line or not set to unit zero. Correct condition, and press RUN.

If no halt code appears, press HALT on the main processor only. Insure that the select code in the S-register is correct (if not, place the correct value into the S-register and restart the routine at octal 77000). If the correct select code is in the S-register, go to point d, below.

- c. If the cold dump routine begins writing on the magnetic tape, but does not achieve a halt with 102077 displayed, check for the following halt codes and take corrective action:

102022 Logical disc zero not ready. Correct this condition; then press RUN.

102055 The magnetic tape is bad or too short. Replace the tape; then press RUN.

If no halt code occurs, go to point d, below.

- d. In case of no halt, manually halt the main processor. In case of a halt other than those described in points b and c, record the halt code. In either case, record the register values on the cold dump report form and rewind (manually) the magnetic tape. Remove the magnetic tape from the drive and present it and the report form to your HP representative.

NOTE: It is possible that a system failure can destroy the cold dump routine (which is main-memory resident). If so, an attempt to run the routine may result in the symptoms leading to point d, above.

SYSTEM and VERSION: _____ DATE: _____
 CUSTOMER NAME: _____ TELEPHONE: _____
 CUSTOMER ADDRESS: _____

SOFTWARE MODIFIED? NO YES MAGNETIC TAPE MODEL, OPT. _____

DID I/O PROCESSOR HALT? NO (Note: do NOT halt I/O processor)
 YES : Halt number ___
 P-register _____
 A-register _____
 B-register _____
 E-register ___ O-register ___

DID MAIN PROCESSOR HALT? NO (Note: halt main processor for COLD DUMP)
 YES : Halt number ___

P-REGISTER VALUE _____

DID ANY OF THE FOLLOWING (RECOVERABLE) HALTS OCCUR DURING THE COLD DUMP ?

Halt 11_g YES
 Halt 22_g YES
 Halt 55_g YES

DID THE COLD DUMP ACHIEVE A HALT 77_g? YES NO

If answer is 'no':

Did any halt occur? NO (Note: halt main processor)
 YES : Halt number
 P-register _____
 A-register _____
 B-register _____
 E-register ___ O-register ___

REMARKS: _____

Please attach system console log if available. Submit this report and the COLD DUMP magnetic tape to the appropriate Hewlett-Packard representative.

APPENDIX F

User Terminal Characteristics

Characteristics of the user terminals supported by the TSB system follow. The baud rate and character size information given is pertinent to the SPEED and PORT commands.

Terminal Type	Speed (cps)	Character Composition	Bit Rate (baud)	Baud Rate (decimal)	Character Size
HP 2749A/B Teleprinter (ASCII code)	10	8 data bits + 1 start bit + 2 stop bits	110	130	2
HP 2600A Keyboard-Display (ASCII code)	10	8 data bits + 1 start bit + 2 stop bits	110	130	2
	20	8 data bits + 1 start bit + 2 stop bits	220	64	2
	40	8 data bits + 1 start bit + 2 stop bits	440	32	2
	80	8 data bits + 1 start bit + 2 stop bits	880	15	2
	160	8 data bits + 1 start bit + 2 stop bits	1760	7	2
	15	8 data bits + 1 start bit + 1 stop bit	150	95	1
	30	8 data bits + 1 start bit + 1 stop bit	300	47	1

Terminal Type	Speed (cps)	Character Composition	Bit Rate (baud)	Baud Rate (decimal)	Character Size
HP 2600A Keyboard-Display (ASCII code) (Continued)	60	8 data bits + 1 start bit + 1 stop bit	600	23	1
	120	8 data bits + 1 start bit + 1 stop bit	1200	11	1
	240	8 data bits + 1 start bit + 1 stop bit	2400	5	1
GE TermiNet 300 (ASCII code)	10	8 data bits + 1 start bit + 2 stop bits	110	130	2
	15	8 data bits + 1 start bit + 1 stop bit	150	95	1
	30	8 data bits + 1 start bit + 1 stop bit	300	47	1
Memorex 1240 (ASCII code)	10	8 data bits + 1 start bit + 2 stop bits	110	130	2
	15	8 data bits + 1 start bit + 1 stop bit	150	95	1
	30	8 data bits + 1 start bit + 1 stop bit	300	47	1
	60	8 data bits + 1 start bit + 1 stop bit	600	23	1
Execuport 300 (ASCII code)	10	8 data bits + 1 start bit + 2 stop bits	110	130	2
	15	8 data bits + 1 start bit + 1 stop bit	150	95	1

Note: A manufacturer's option is available which provides 2 stop bits in the character composition of data transferred at 15 cps. If this option is selected, the terminal characteristics are as follows:

Terminal Type	Speed (cps)	Character Composition	Bit Rate (baud)	Baud Rate (decimal)	Character Size
	15	8 data bits + 1 start bit + 2 stop bits	165	86	2
	30	8 data bits + 1 start bit + 1 stop bit	300	47	1
ASR-37 (ASCII code)	15	8 data bits + 1 start bit 1 stop bit	150	95	1
GE TermiNet 1200 (ASCII code)	10	8 data bits + 1 start bit + 2 stop bits	110	130	2
	30	8 data bits + 1 start bit + 1 stop bit	300	47	1
	120	8 data bits + 1 start bit + 1 stop bit	1200	11	1
IBM 2741 (CALL/360 or PTTC/EBCD code)	14.9	7 data bits + 1 start bit 1 stop bit	134.5	106	*(see Note)

Note: The operator must specify an asterisk in the SPEED command to indicate character size for the IBM 2741 Communication Terminal. The software will automatically determine whether CALL/360 or PTTC/EBCD code is being transmitted from the terminal.

APPENDIX G

Recovery After Power Failure

If electrical power should fail completely or drop below the minimum required voltage, an orderly shut-down of the TSB system is initiated. The computers remain in a halted condition until proper operating voltages are supplied to them. When power is restored, a restart routine is entered automatically.

Caution: *DO NOT TOUCH THE COMPUTER FRONT PANEL SWITCHES at any time during power-down or power-up processing.*

The computers resume normal system operation after all system equipment is ready, which can take from a few seconds to a few minutes. The system restarts any mass storage transfers interrupted by the power failure.

Depending on the type of computer certain conditions must be met to effect a successful restart. These conditions follow:

HP 21MX

There are two conditions which will permit/prevent an automatic restart of the TSB System after a power failure. These conditions are:

1. The Automatic Restart switch on the 21MX (at the rear of the central processor PCA) must have been set to the ARS position. If this switch is not set properly, there can be no automatic restart routine.
2. The 21MX battery automatically sustains the contents of memory upon power failure (it also covers line voltage drops). Only after the battery runs down does the main processor lose memory contents. Thus, a properly-connected and fully charged battery permits the automatic restart routine.

If the battery cannot sustain memory, the POWER FAIL/BATTERY light flashes: the automatic restart routine has been prevented. In this case, the operator must reload the TSB system.

HP 2100A/S

The Automatic Restart switch on the I/O control board (A7) has two positions — ARS and $\overline{\text{ARS}}$. This switch must be set to the ARS position for an automatic restart of the system to be performed.

For either a power failure or low line voltage, the panel lights remain out until proper power is restored.

HP 2116B/C

The switch located on the Power Fail/Auto Restart board must be in the RESTART position.

For a power failure, the panel lights remain out until proper power is restored. If the problem is low line voltage, the computer displays a halt (103004_8) in the MEMORY DATA register until proper power is restored.

POWER FAILURE DURING A SYSTEM SHUT-DOWN PROCEDURE

If power fails during execution of a HIBERNATE or SLEEP command, a halt (103004_8) occurs when power is restored.

If the system message DONE has been printed on the operator's console, the shut-down was completed before the power failed and no action is required.

If this was to be a hibernate or sleep operation to magnetic tape and the system had not begun writing to tape, an emergency recovery may be necessary. An HP software representative should be consulted for recovery procedures. If the first write to magnetic tape had already taken place, the system should be loaded from disc and the HIBERNATE or SLEEP command issued again.

POWER FAILURE DURING START-UP

A power failure during any type of start-up (loading from magnetic tape, paper tape, or disc) causes a halt (103004_8) when power is restored. The start-up procedure must be restarted from the beginning.

For a paper tape or magnetic tape start-up the TSB loader is left intact in memory and may be restarted at location 2000_8 . For a disc bootstrap start-up, the procedure must be restarted from the beginning.

Glossary

Underlined words are defined elsewhere in the glossary.

Word	Definition
DIRECTORY	A table within the TSB System that records all library programs and files, including for each the name, <u>disc</u> location, last date referenced, and other information. To determine the location of the directory tracks, use the STATUS command.
DISC	Mass storage device used to store the TSB System and <u>user</u> files; a disc is defined here as a moving-head rotating disc memory.
DRUM	Mass storage device used to store the TSB Loader and many system tables, and as a user swap area; a drum is defined here as a fixed-head rotating storage device.
GROUP LIBRARY	A collection of BASIC language programs stored by any user with an idcode ending in 00. They are available with certain limitations to all users having an idcode with the same first letter and digit as the Group Master.
HIBERNATE THE SYSTEM	To issue a HIBERNATE command through the operator console that causes the system to log all current users off the system, dump a copy of itself onto the moving-head disc(s) and onto a magnetic tape, and halt the system. The HIBERNATE command writes a <i>complete</i> copy to magnetic tape.

Word	Definition
IDCODE	An alphanumeric code consisting of one letter and three digits. Each idcode has associated with it a <u>password</u> , the amount of <u>terminal</u> time allowed, the amount of time used, the amount of <u>disc</u> space used, and the maximum amount of <u>disc</u> space allowed. Each <u>user</u> on a <u>terminal</u> must have an idcode, although more than one <u>user</u> can use the same idcode at the same time.
ID-TABLE	A table within the TSB System that records the information associated with each idcode. To determine the location of the ID-table on the drum or disc, use the STATUS command.
LOGGING ON (AND OFF) THE SYSTEM	Whenever a <u>user</u> types a HELLO command on his terminal together with the correct <u>idcode</u> , <u>password</u> , and terminal sub-type code, he is logged onto the system and time begins accumulating on his <u>idcode</u> . Whenever a <u>user</u> types a BYE command while logged in, or disconnects from his modem, he is logged off the system. Messages are printed on the <u>operator console</u> to record these events.
OPERATOR	The person who is responsible for starting, monitoring, controlling access to, and shutting down a TSB System and carries out these functions by entering <u>operator commands</u> through the <u>operator console</u> .
OPERATOR COMMANDS	On-line commands that the operator types on the <u>operator console</u> to control operation of a TSB System. Commands modify the <u>ID-table</u> , <u>directory</u> , hardware configuration, system status, and terminal usage.
OPERATOR CONSOLE	An HP 2754A/B or HP 2762A teleprinter that the <u>operator</u> uses to communicate with the TSB System.
PASSWORD	A combination of up to six characters, printing or non-printing, that is associated with each <u>idcode</u> . When a <u>user</u> <u>logs on to the system</u> , he must give his password.

Word	Definition
PRIVILEGED USER	<p><u>User idcode, A000</u>, called the System Master is privileged; programs and files that are stored in the library by A000 become <u>system library</u> programs and can be accessed by all <u>users</u> regardless of <u>idcode</u>. A000 has two system commands, PROTECT and UNPROTECT, that allow him to control access to his programs and files. The System Master also has access to several operator commands used in obtaining system reports. Any user idcodes ending in 00 (for example B100, G500) are considered Group Masters, and have the same privileges with respect to their individual group <u>libraries</u> as the System Master has with respect to the System Library.</p> <p>Each Group Master can PROTECT and UNPROTECT programs and files in his own group's library, but has no privileges with respect to other group libraries or the system library.</p>
SEMI-PRIVILEGED USER	<p>Any <u>user idcode</u> beginning with an "A" (e.g., A067) is semi-privileged. When a semiprivileged <u>idcode</u> is <u>logged</u> on to more than one <u>terminal</u>, the current users with that idcode can all alter their files simultaneously. Nonprivileged <u>users</u>, however, can only read their files simultaneously; only one user of several having the same idcode (specifically, the first user with that idcode to access the file) can write on a given file at a time.</p>
SLEEP THE SYSTEM	<p>To issue a SLEEP command through the <u>operator console</u> that causes the system to <u>log</u> all the current <u>users off the system</u>, dump a copy of itself onto disc and onto a magnetic tape (if available), and halt the system. The system can be restarted from the disc or from the magnetic tape copy. The SLEEP command copies onto magnetic tape only those programs and files changed since the last HIBERNATE command was executed.</p>
SYSTEM LIBRARY	<p>A collection of BASIC language programs and files stored by <u>user A000</u>, the <u>privileged user</u>, which can be used by all <u>user idcodes</u>, with certain limitations.</p>
TERMINAL	<p>A keyboard device through which a <u>user</u> communicates with the TSB System. Terminals are connected to the system through direct wiring or over telephone lines. Up to 32 terminals can be <u>logged on</u> the system at a time, and each has an assigned number between 0 and 31.</p>

Word

Definition

USER

A person with access to a legal idcode and a terminal. More than one user can use the same idcode at the same time.

WORD

A 16-bit unit of data capable of being stored in one computer location.

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20854A Timeshared BASIC/2000, Level F
System Operator's Manual

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