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2100 series computers

2000F TIME-SHARED BASIC operator's guide

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Preface

This manual is a system operator's guide to operation of the Hewlett-Packard 2000F Time-shared BASIC system. The manual is divided into five major sections. Section I contains an introduction to the HP 2000F TSB system in general terms. Section II discusses the system and its hardware and software environment. Section III describes the operator interfaces with the TSB system. Section IV presents the operating procedures. The fifth section contains the appendices. Included are a list of error messages, a description of disc errors and drum errors, suggestions for storing system shut-down tapes, preparation requirements for new discs, a table of user terminal characteristics, a description of the COLD DUMP routine, and a discussion of system recovery following a power failure.

A glossary of terms used in this guide and an index follow the appendix section.

Use of the BASIC programming language, which is beyond the scope of this document, is presented in *HP 2000F Time-shared BASIC Programmer's Guide (02000-90073).*

Contents

FIGURES

TABLE

Effective Use Of This Guide

This operator's guide is applicable to the HP 2000F Time-shared BASIC (TSB) system. This system is available in several optional versions. Four options are available in each of two power source categories - - Options 200, 205, 210, and 215 operate at 115V, 60 Hz; Options 500, 505, 510, and 515 operate at 230V, 50 Hz. The option number dictates the type of mass storage device or devices supported by a particular system. For example, Options 200 and 500 require at least one HP 7900 moving-head disc while Options 210 and 510 require at least one HP 7900 moving-head disc plus one HP 2766 fixed-head drum. Table 1 shows the mass storage supported by each 2000F TSB system option.

Table 1. 2000F TSB System Options

Power Source		HP 7900 Disc	HP 2883 Disc	HP 2766 Drum
110V, 60 Hz	230V, 50 Hz			
200	500	X		
205	505		X	
210	510	X		X
215	515		X	X

TEXT CONVENTIONS

Although the fixed-head mass storage device physically may be a disc, in this manual it is always referred to as a drum to differentiate it from the moving-head mass storage (disc) devices.

References to "the TSB system" or to "the system" include all options. Portions of the manual that apply only to a specific option or options are marked accordingly.

SECTION I
General Information

INTRODUCTION

The Hewlett-Packard 2000F Time-shared BASIC system consists of a system (main) computer and a communications (I/O) processor. These computers provide support for mass storage devices, an operator's console, a paper tape photoreader terminal, multiplexers, an optional line printer, and a software program to supervise the system.

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

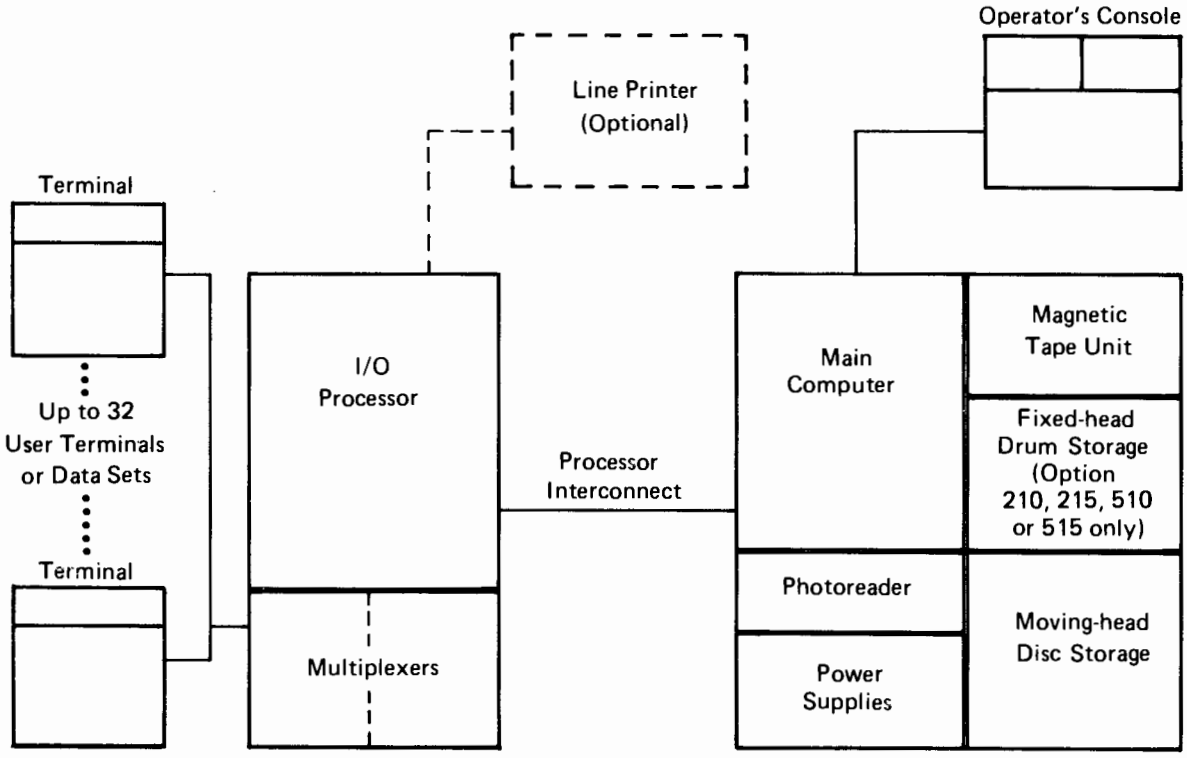

Figure 1-1. HP 2000F TSB System Organization

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 210/215/510/515 only)

At least one logical drum storage device is required to operate the HP 2000F (Options 210/215/510/515) TSB system. Up to four logical devices can be supported by the system. Under Options 210/215/510/515, 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 under Options 200/205/500/505.

OPERATOR'S CONSOLE

The operator communicates with the TSB system through an HP 2754A/B teleprinter. Using this console, 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.

PHOTOREADER

An HP 2748 Photoreader 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. Details of photoreader operation are contained in the *Software Operating Procedures, Peripheral Equipment Manual Functions Section, (5951-1373).*

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

Seven types of user terminals, of which six are ASCII code generating terminals, can be connected to the TSB system. (The IBM 2741 Communications 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.

- HP 2600A Keyboard-Display Terminal
- HP 2749B Teleprinter Terminal
- General Electric TermiNet 300 Data Communications Terminal, Model B (10/15/30 cps transfer rates) with Paper Tape Reader/Punch, Option 2

  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

MINIMUM HARDWARE REQUIREMENTS

Main Computer

For the HP 2000F TSB systems the main computer is an HP 2100S or HP 2100A computer. The main computer must be equipped with the following options:

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 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)
- One Data Set Control Interface for each set of 16 user terminals supported (two interfaces maximum)

HP 2100A

- 8K Memory
- Processor Interconnect Kit
- Time Base Generator

- One Asynchronous Channel Multiplexer for each set of 16 user terminals supported (two multiplexers maximum)
- One Data Set Control Interface for each set of 16 user terminals supported (two interfaces maximum)

HP 2114B or HP 2116B/C

- 8K Memory
- Power Fail/Auto Restart
- Memory Parity Check
- Processor Interconnect Kit
- Time Base Generator
- One Asynchronous Channel Multiplexer for each set of 16 user terminals supported (two multiplexers maximum)
- One Data Set Control Interface for each set of 16 user terminals supported (two interfaces maximum)

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 Photoreader
- Operator's Console
- Magnetic Tape Unit
- Up to 32 User Terminals
- One Moving-head (Disc) Storage Device
- One Fixed-head (Drum) Storage Device (Option 210/215/510/515 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 2000F TSB (Option 210/215/510/515) system.

HARDWARE CONFIGURATION

Main Computer

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

HP 2000F (Options 200/205/500/505)

I/O channel	Contents
$10\text{-}11_8$	Processor Interconnect
12_8	System Operator's Console Device Controller
13_8	Photoreader Device Controller
14_8	Time Base Generator
$15\text{-}16_8$	First Moving-head Disc Device Controller - - up to four HP 7900 disc devices (Options 200/500) or up to two HP 2883 disc devices (Options 205/505) can be associated with this controller
$17\text{-}20_8$	Magnetic Tape Device Controller

Notes: 1) Additional disc device controllers can be assigned to any pair of I/O channels up to $26\text{-}27_8$ 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.

HP 2000F (Options 210/215/510/515)

I/O channel	Contents
$10\text{-}11_8$	Processor Interconnect
12_8	System Operator's Console Device Controller
13_8	Photoreader Device Controller
$14\text{-}15_8$	First Fixed-head Drum Device Controller - - one drum device can be associated with this controller

I/O channel	Contents
16_8	Time Base Generator
$17\text{-}20_8$	First Moving-head Disc Device Controller - - up to four HP 7900 disc devices (Options 210/510) or up to two HP 2883 disc devices (Options 215/515) can be associated with this controller
$21\text{-}22_8$	Magnetic Tape Device Controller

Notes: 1) Additional disc device controllers can be assigned to any pair of I/O channels up to $26\text{-}27_8$ 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
$10\text{-}11_8$	Processor Interconnect
12_8	Time Base Generator
$13\text{-}14_8$	Multiplexer
15_8	Data Set Control Interface
16_8	Line Printer (optional)

17 to 32 Terminals

I/O channel	Contents
$10\text{-}11_8$	Processor Interconnect
12_8	Time Base Generator
$13\text{-}14_8$	First Multiplexer
15_8	Data Set Control Interface for First Multiplexer
$16\text{-}17_8$	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 16_8 to 24_8 inclusive.

MINIMUM SOFTWARE REQUIREMENTS

The appropriate system software must be selected to supervise the TSB system, as follows:

- HP 2000F (200/205/500/505) TSB system software
- HP 2000F (210/215/510/515) TSB system software

In addition, the HP 2000 Series I/O processor program is required as well as the appropriate TSB loader program. Figure 2-1 is a diagram of the software configuration.

Required Software	HP 2000F TSB System Options			
	200/500	205/505	210/510	215/515
HP 2000 Series I/O Processor Program	X	X	X	X
Option 200/205/500/ 505 System Program	X	X		
Option 210/215/510/ 515 System Program			X	X
Option 200/500 Loader	X			
Option 205/505 Loader		X		
Option 210/510 Loader			X	
Option 215/515 Loader				X

Figure 2-1. HP 2000F TSB System Software Configuration

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 *2000F Time-shared BASIC: Programmer's Guide (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 messages, and messages from users.

SYSTEM SHUT-DOWN

The operator must use either the HIBERNATE or SLEEP command (Section III) 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 BASIC Programmer's Guide. 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				√		
A100		√	√	√		GROUP #2
A101				√		
:				:		
A199				√		
:				√		:
B000		√	√			GROUP #11
B001					√	
:					:	
B099					√	
B100		√	√			GROUP #12
B101					√	
:					:	
B199					√	
:						:
C000		√	√			GROUP #21
C001					√	
:					:	
C099					√	
C100		√	√			GROUP #22
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 Option 210/215/510/515

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. Operator interfaces with the system are accomplished through the operator's console device.

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

When the TSB system is loaded, the operator's console status switch must be set ON LINE (Figure 3-1).

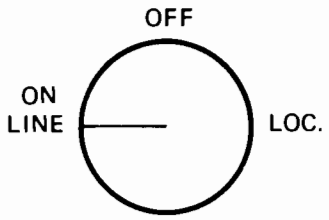

Figure 3-2. Teleprinter Status Switch

The console mode switch has five positions; only three are enabled: K, T, and KT. During system operation, the mode switch is set to one of these positions (Figure 3-2).

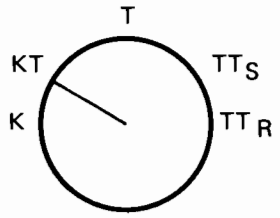

Figure 3-3. Teleprinter Mode Switch

The KT position is the normal setting. In this position, all system messages to the operator are printed at the console; only LOGON and LOGOFF messages are also punched on paper tape. When set to K, the teleprinter prints only; it does not punch paper tape. When set to T, the teleprinter both prints and punches all messages.

If switch register bit 0 of the system computer is set ON, all input from the console (except a break request) is ignored by the system.

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 back arrow (←) character performs as a delete key. Press this key once for each previous character to be deleted. For example, the sequence:

```
ABC←←DE←F
```

is 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:

$$RES\text{-}\left\{\begin{matrix} idcode \\ ALL \end{matrix}\right\}\ [,\ time\ used]$$

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:

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

port number	A decimal value from 0 to 31 designating a specific user port. If selected, the character string is transmitted to this port number.
ALL	If selected, the character string is transmitted to all ports.
character string	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-idcode$_1$,idcode$_2$ [,name]

idcode$_1$	The identification code of the current owner of the program or file to be transferred.
idcode$_2$	The identification code of the destination owner of the program or file to be transferred.
name	An optional parameter indicating the program or file name to be transferred from idcode$_1$ to idcode$_2$. If omitted, the entire library of idcode$_1$ is transferred to the library of idcode$_2$.

Use of the BESTOW command results in the removal of one element or all elements in the library of the user designated by idcode$_1$ and placement of the element or elements in the library of the user designated by idcode$_2$. Elements in the library of idcode$_1$ that duplicate names in the library of idcode$_2$ 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]

idcode	The identification code assigned to a specific user (see NEWID command).
password	If specified, this becomes the new password associated with the specified idcode.
time limit	If specified, this becomes the new terminal usage time limit (in minutes) associated with the specified idcode. This value cannot exceed 65535.
disc space	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-idcode$_1$*,name*$_1$*,idcode*$_2$*,name*$_2$

idcode$_1$	The identification code of the user in whose library the element to be copied resides.
name$_1$	The name of the element to be copied to another user.
idcode$_2$	The identification code of the destination user in whose library the element is to be copied.
name$_2$	The new name of the library element as it appears in the library of user idcode$_2$. This name can be the same as name$_1$ but cannot dupiicate an existing name in the library of user idcode$_2$.

The ownership of the library element is not transferred. The original owner retains the element identified by name$_1$ while the destination owner has a copy identified by name$_2$.

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 210/215/510/515 Only)

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 210/215/510/515 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 only for 2000F TSB (Options 210/215/510/515) systems. 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

disc number	A value from 0 to 7 designating the logical disc number.
select code	An octal value designating the lower-numbered select code of the controller to which the disc is connected.
unit number	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). Options 200/205/500/505 require approximately 1600 blocks. Options 210/215/510/515 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 options 200/205/500/505, disc-0 can be specified with a select code value of 15_8; under options 210/215/510/515, disc-0 can be specified with a select code value of 17_8. 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 21-22$_8$ and is unit 2 on the controller.

DIS-1,0

removes disc-1 from the system.

DRUM (Options 210/215/510/515 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 14_8. 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 $14\text{-}15_8$ contain a 128-track drum and channels $21\text{-}22_8$ 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 210/215/510/515, 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 210/215/510/515 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,track$_1$ *[, track*$_2$*]*

n	A single-digit integer, 0-3, representing the drum logical unit number.
track$_1$	Track number; 1 or 2 digits, 0-63; first or only track to be locked.
track$_2$	Optional track number; 1 or 2 digits, 0-63; last track to be locked in a range beginning at track$_1$. If specified, track$_2$ must be greater than or equal to track$_1$.

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$_8$.

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$_8$.

MLOCK

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

MLOCK-block$_1$ [, block$_2$]

block$_1$	Block number; must be greater than 3, maximum value depends on size of disc; first or only block to be locked.
block$_2$	Block number; must be greater than 3, maximum value depends on size of disc; last block to be locked in a range beginning at block$_1$. If specified, block$_2$ must be greater than or equal to block$_1$.

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 210/215/510/515, 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 (Options 200/205/500/505)
DISC/DRUM ERROR; CAN'T DO IT (Options 210/215/510/515)

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-block$_1$ *[, block*$_2$*]*

block$_1$	Block number; must be greater than 3, maximum value depends on the size of the disc; first or only block to be unlocked.

block$_2$	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 block$_1$. If specified, block$_2$ must be greater than or equal to block$_1$.

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 (Options 200/205/500/505)
DISC/DRUM ERROR; CAN'T DO IT (Options 210/215/510/515)

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

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

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^{C}I^{C}C^C, 100,200

enters user Q123 with the password BAS^{C}I^{C}C^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:

$$RESET\text{-}\left\{\begin{matrix} idcode \\ ALL \end{matrix}\right\}\ [,\ time\ used]$$

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 210/215/510/515 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 210/215/510/515 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 210/215/510/515, 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, { *port number* *[,port number, ...]* / *ALL* }

baud rate	The data transfer rate of the user terminal type for which the port is to be configured (see Appendix F).
character size	A digit, 1 or 2, or an asterisk depending on the type of user terminal (see Appendix F).
port number	A decimal value, 0-31, representing a specific port to be configured; more than one port number may be specified.
ALL	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. Thsi 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 2000F TSB system option selected. Under Options 200/205/500/505, the report is printed in the following format:

system-id date time

MAG= LINE PRINTER= USER=

DISCS

LOGICAL UNIT	SELECT CODE	UNIT NUMBER	FIRST BLOCK	LAST 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-wwww where aaaaaa is the address (decimal) of the starting block and wwww 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:

2000F TSB (Options 200/205/500/505)

```
STATUS

    SYSTST              001/73    1133

MAG= 23       LINE PRINTER = 16*      USER = 00

DISCS
  LOGICAL      SELECT       UNIT        FIRST       LAST
   UNIT         CODE       NUMBER      BLOCK       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 210/215/510/515, the report is printed in the following format:

```
      system-id              date                       time

   MAG=                 DRUM=

   DISCS
      LOGICAL      SELECT       UNIT        FIRST       LAST
       UNIT         CODE       NUMBER       BLOCK       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:

2000F TSB (Options 210/215/510/515)

```
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 210/215/510/515 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, track$_1$ [, track$_2$]

n	A single-digit integer, 0-3, representing the drum logical unit number.
track$_1$	Track number; 1 or 2 digits, 0-63; first or only track to be unlocked.
track$_2$	Optional track number; 1 or 2 digits, 0-63; last track to be unlocked in a range beginning at track$_1$. If specified, track$_2$ must be greater than or equal to track$_1$.

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

SYSTEM LOADING

The programs that constitute the Time-shared BASIC system exist on punched paper tape. Primarily, some of the system generation and maintenance procedures involve loading programs through the paper-tape photoreader. Included are procedures for loading the I/O processor program, the TSB loader program, and the system program as well as procedures for initial system generation, system updating, and the daily operation of the system. These procedures are described in this section. Detailed operating instructions for all equipment, and use of the binary loaders (BBL, BBDL, and BMDL) are described in the *HP 2100 Series Software Operating Procedures (5951-1376).*

Loading the I/O Processor Program

Place the power switch on both computers in the ON position. The Automatic Restart switch on the I/O control board should be set to ARS; the Parity Error switch on the I/O Buffer board should be set to HALT; the Protect/Override switch on HP 7900 Disc devices should be set to PROTECT; the Format switch on HP 2883 Disc devices should be set to ON.

The I/O processor paper tape contains two programs. This tape must be loaded to begin initial system generation, update the I/O processor with a new version of the program, or restore the program if it has failed or if the I/O processor has been disturbed. Normally, this program is loaded only once. It should not have to be reloaded so long as only the I/O processor ON/OFF switch is used. The I/O processor program must be loaded through the main computer because the photoreader is connected to the main computer.

ACTIVITY ON THE MAIN COMPUTER

The main computer can be an HP 2100S or an HP 2100A. The steps to load or update the I/O processor follow:

HP 2100S or HP 2100A:

1. 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.)

2. Place the I/O processor paper tape into the photoreader 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 first program on the paper tape will be loaded.)

6. After the main computer halts (102077_8), set the program starting address (P-register) at 2_8.

7. Press the RUN button to start the program running.

ACTIVITY ON THE I/O PROCESSOR

The I/O processor can be an HP 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 2100S or HP 2100A:

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.

7. Go to the section titled "Loading the TSB Loader".

HP 2114B:

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 program starting address (P-register) at location 2_8.
7. Press the I/O processor's RUN button to start the program running.
8. Go to the section titled "Loading the TSB Loader".

HP 2116B/C:

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.

The steps required to load the TSB loader program and begin either an initial system generation or a system update follow:

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 photoreader 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 is run, it asks whether a magnetic tape or disc library exists; the following query is printed at the operator's console:

LIBRARY?

At this point, place the first TSB system paper tape into the photoreader and ready that device.

When generating a new system there is no existing library: type NO and go to the section titled "Initial System Generation".

When updating a system (preserving the existing library) type YES and go to the section titled "System Update".

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 210/215/510/515, 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 (102077_8). 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 (102077_8). 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 210/215/510/515, 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 (102077_8). 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 210/215/510/515, 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 Options 200/205/500/505, 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 (Options 200/205/500/505 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: The appropriate protected loader (BMDL 7900/7901 or BMDL 2883) must be resident in the Main computer to access the disc bootstrap. If the protected loader is not the appropriate one, if the bootstrap fails repeatedly, or if block-0 of the system disc has been disturbed, use the procedure described under "Start-up From Disc with Paper Tape Loader (Options 200/205/500/505)".*

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. On the main computer, press the HALT button, then press INTERNAL PRESET and EXTERNAL PRESET.

5. Set the binary loader starting address (P-register) at location 77750_8.

6. Press the LOADER ENABLE button.

7. 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".

8. If the correct halt occurred in step 7, press the RUN button. The TSB loader begins execution.

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.

Start-up From Disc and Drum (Options 210/215/510/515 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 210/215/510/515)".*

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. On the main computer, press the HALT button, then press INTERNAL PRESET and EXTERNAL PRESET.

5. Set the binary loader starting address (P-register) at location 77760_8.

6. Press the LOADER ENABLE button.

7. 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".

8. If the correct halt occurred in step 7, press the RUN button. The TSB loader is in execution.

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

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.

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 on the option selected, as follows:

OPTIONS 200/205/500/505

1. On the main computer, press HALT, then INTERNAL PRESET and EXTERNAL PRESET.
2. Place the TSB loader paper tape into the photoreader 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. 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.
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 210/215/510/515

1. On the main computer, press HALT, then press INTERNAL PRESET and EXTERNAL PRESET.

2. Place the TSB loader paper tape into the photoreader 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. 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.

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 Options 200/205/500/505, the sequence begins at step 2. Under Options 210/215/510/515, 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 210/215/510/515, 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. On the main computer, press HALT, then INTERNAL PRESET and EXTERNAL PRESET.

3. Place the TSB loader paper tape into the photoreader and ready that device.

4. Set the main computer binary loader starting address (P-register) at location 77700_8.

5. Press the LOADER ENABLE button.

6. Press the RUN button.

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

7. The main computer will halt (102077_8).

8. Set the main computer program starting address (P-register) at location 2000_8.

9. The loader prints:

   LIBRARY?

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

10. 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.

11. The loader prints:

    CONFIGURATION OPTIONS?

    To change the system configuration, type YES and continue at step 12.

    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.

12. 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.

13. 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.

14. 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).

15. 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.

16. 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.

17. 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.

18. Under Options 210/215/510/515, 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).

19. 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.

20. 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.

21. 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 22.

    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 210/215/510/515, 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.

22. 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

23. 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

24. 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 HP 2000 Series Time-shared BASIC 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 2000F TSB system is assigned two System Level codes, as follows:

System Level	Code
2000F (Options 200/205/500/505)	3000
2000F (Options 210/215/510/515)	3500

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 2000F TSB system. This code is:

Feature Level	Code
2000F (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 (Options 200/205/500/505 Only)

Note: Disc errors not associated with system start-up appear in Appendix B.

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 $15\text{-}16_8$ and that the drive is ready, then restart the procedure from step 1.

If a Halt 1 (102001_8 in the main computer MEMORY DATA register) 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 main computer performs a halt 2 (102002_8 in the MEMORY DATA register), 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. Reinstate 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 (210/215/510/515 Only)

Note: Disc and drum errors not associated with system start-up appear in Appendix B

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 $14\text{-}15_8$ and that the device is up to operating speed, then restart the procedure from step 1.

If a Halt 0 (102000_8 in the main computer MEMORY DATA register) occurs, a read error occurred while reading drum sector 0. Restart the procedure from step 1.

If a Halt 1 (102001_8 in the main computer MEMORY DATA register) occurs, a read error occurred while reading drum sector 1. Restart the procedure from step 1.

If the main computer performs a Halt 2 (102002_8 in the MEMORY DATA register), 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 $17\text{-}20_8$ 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. Reinstate 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 (102077_8). 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 210/215/510/515 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 Error Messages

COMMAND ERROR MESSAGES

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 210/215/ 510/515 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 210/215/ 510/515 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 (Option 200/205/500/505)	Disc error occurred during command execution.

Command	Message	Meaning
MLOCK (Continued)	DISC/DRUM ERROR; CAN'T DO IT (Option 210/215/510/515)	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.
	NONEXISTENT DISC	Specified disc does not exist.
MUNLOCK	DISC ERROR; CAN'T DO IT (Option 200/205/500/505)	Disc error occurred during command execution.
	DISC/DRUM ERROR; CAN'T DO IT (Option 210/215/510/515)	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.
	NONEXISTENT DISC	Specified disc does not exist.
NEWID	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 (Option 210/215/ 510/515 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 (Option 210/215/ 510/515 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 (Option 200/205/500/505)	Disc error occurred during command execution.
	DISC/DRUM ERROR; CAN'T DO IT (Option 210/215/510/515)	Disc or drum error occurred during command execution.
	ILLEGAL FORMAT	Command entry did not conform to format rules given in command description (Section III).
UNLOCK (Option 210/215/ 510/515 only)	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.
	NONEXISTENT DRUM	Specified drum does not exist.

LOAD-TIME ERROR MESSAGES

The following error messages may result from errors occurring during system loading. The first group of messages can be produced by all options. The second group is applicable only to Options 200/205/500/505 and the last group is applicable only to Options 210/215/510/515.

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_8) 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.

Options 200/205/500/505

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 210/215/510/515

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

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 2000F TSB systems. Drum errors can occur only under Options 210/215/510/515.

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, restart the TSB loader (which will remain in core) at location 2000_8.

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.

While the system is running, the disc and/or drum driver inserts the message into a special queue if there is room. 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. 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 core, 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 (Options 200/205/500/505) or from the drum and disc (Options 210/215/510/515). 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
130	29900
140	32200
150	34500
160	36800
170	39100
180	41400
190	43700
200	46000

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
0	0
1	9744
2	19488
3	29232
4	38976
5	48720
6	58464
7	68208

Table D-7. HP 7900 Disc

Cylinder Number	First Relative Block
0	0
10	480
20	960
30	1440
40	1920
50	2400
60	2880
70	3360
80	3840
90	4320
100	4800
110	5280
120	5760
130	6240
140	6720
150	7200
160	7680
170	8160
180	8640
190	9120
200	9600

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 designed to assist in preserving information necessary to identify the cause of software system failures. Correct usage minimizes system down-time because the routine captures essential data for subsequent off-line analysis. This feature allows recovery procedures to proceed in parallel with the fault diagnosis. Note that the COLD DUMP routine is not useful for diagnosing hardware problems.

A COLD DUMP report form is included in this appendix. Additional forms can be obtained from your local HP representative. This form provides space for data pertinent to the dumping procedure (such as register contents at the time of the software failure).

A list of system halts and their meanings follow:

Halt Number (octal)	Meaning
2	Erroneous system transfer has occurred. Recovery is not possible. Use of the COLD DUMP routine is recommended.
5	A parity error has occurred. Recovery is not possible. Use of the COLD DUMP routine is recommended.
11	Unexpected interrupt from the processor interconnect. Recovery is not possible. Use of the COLD DUMP routine is recommended.
30	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.
31	Disc called is not present. Recovery is not possible. Disc error messages(s) at the operator's console will be associated with this halt. Use of the COLD DUMP routine is recommended.

Halt Number (octal)	Meaning
32	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.
33	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.
34	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.
35	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.
36	Power failure has occurred. Check Automatic Restart switch position (should be ARS). See Appendix G for recovery procedures.
37	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.

*Recovery is possible only via the emergency recovery procedure. An HP software representative should be consulted before attempting to recover from an emergency shutdown.

Following any of the above error conditions, do not attempt to reload (or restart) the system from disc storage.

> **Caution:** *The instructions given below must be followed rigorously. Manipulate only those hardware switches required to collect the requested information or to perform the indicated action.*

To use the COLD DUMP routine:

1. If the main computer is still in execution, press HALT. If the failure caused the main computer to halt, record the halt number (octal value) on the report form.

   In either case, record the octal contents of the P-register.

2. If the I/O processor is still in execution, DO NOT PRESS HALT - - go to step 4.

3. If the communications processor (I/O processor) halted, record the halt number (octal) and the octal values in the P-, A-, B-, E-, and O-registers. (The I/O processor may halt with a parity error. In this case, a halt number will not be displayed.)

   If the I/O processor halts again, proceed to step 4.

4. Mount a reel of magnetic tape (write enabled) on the tape unit attached to the main CPU.

5. Press RESET, LOAD, and ON-LINE on the tape drive (if the drive is an HP 7970, select unit 0).

6. Set the COLD DUMP routine starting address (77000_8) into the P-register.

7. Set the high priority (lower numbered) magnetic tape unit select code (octal) into the switch register.

8. Press RUN.

The COLD DUMP routine begins execution with results as follows:

a. Magnetic tape activity begins immediately. If HALT 77_8 is achieved, remove the magnetic tape (after it rewinds), label it with the appropriate identification, and present it to your HP representative along with the report form for analysis. Recovery action may now be attempted.

b. If the tape remains at load point (no activity) check for the following conditions:

HALT 11_8	Incorrect magnetic tape unit select code. Place the correct value into the switch register and press RUN.
HALT 33_8	Write not enabled. Remount the tape with a write ring in place and press RUN.
HALT 44_8	Tape unit off-line or HP 7970 not set to unit 0. Correct condition and press RUN.

   If no halt code appears, press HALT on the main CPU only. Ensure that the select code in the switch register is correct. If not, place the correct value into the switch register and restart the routine at 77000_8. If the correct select code exists in the switch register, see point d below.

c. If the COLD DUMP routine begins writing on the magnetic tape but does not achieve a HALT 77_8 check for the following conditions:

HALT 22_8	Logical disc 0 not ready. Correct this condition and press RUN.
HALT 55_8	The magnetic tape is bad or too short. Replace the tape and press RUN.

   If no halt occurs, see point d below.

d. In case of no halt, manually halt the main CPU. In case of a halt other than those described in points b and c, record the halt number. In either case, record the register values and manually rewind and remove the magnetic tape. Present the tape and the report form to your HP representative.

e. It is possible that a software failure can destroy the core-resident COLD DUMP routine. If so, an attempt to run the routine may result in the symptoms leading to point d above. If a stand-alone copy of the COLD DUMP routine is available for the system and version of your installation, use the protected loader to read it into core and retry the dumping procedure (use a different magnetic tape).

Note: Do not use the loader utility to load the stand-alone copy of the COLD DUMP routine.

HEWLETT hp PACKARD

2000 SERIES TSB SYSTEM COLD DUMP REPORT

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_8 YES ☐

Halt 22_8 YES ☐

Halt 55_8 YES ☐

DID THE **COLD DUMP** ACHIEVE A HALT 77_8? 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.

DATA SYSTEMS/CUSTOMER ENGINEERING

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 2749B 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
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 (HP 2100A/S or 2116B/C), certain conditions must be met to effect a successful restart. These conditions follow:

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 LOADING

A power failure during any type of load (magnetic tape, paper tape, or disc) causes a halt (103004_8) when power is restored. The load procedure must be restarted from the beginning.

For a paper tape or magnetic tape load, the loader is left intact in memory and may be restarted at location 2000_8. For a disc bootstrap load, 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, disc 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 user 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 *complete* copy to magnetic tape.

Word	Definition
IDCODE	An alphanumeric code consisting of one letter and three digits. Each idcode has associated with it a password, the amount of terminal time allowed, the amount of time used, the amount of disc space used, and the maximum amount of disc space allowed. Each user on a terminal must have an idcode, although more than one user 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 user types a HELLO command on his terminal together with the correct idcode, password, and terminal sub-type code, he is logged onto the system and time begins accumulating on his idcode. Whenever a user types a BYE command while logged in, or disconnects from his modem, he is logged off the system. Messages are printed on the operator console 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 operator commands through the operator console.
OPERATOR COMMANDS	On-line commands that the operator types on the operator console to control operation of a TSB System. Commands modify the ID-table, directory, hardware configuration, system status, and terminal usage.
OPERATOR CONSOLE	An HP 2754 teleprinter that the operator uses to communicate with the TSB System.
PASSWORD	A combination of up to six characters, printing or non-printing, that is associated with each idcode. When a user logs on to the system, he must give his password.

Word	Definition
PRIVILEGED USER	User idcode, A000, called the System Master is privileged; programs and files that are stored in the library by A000 become system library programs and can be accessed by all users regardless of idcode. 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 libraries as the System Master has with respect to the System Library. 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.
SEMI-PRIVILEGED USER	Any user idcode beginning with an "A" (e.g., A067) is semi-privileged. When a semiprivileged idcode is logged on to more than one terminal, the current users with that idcode can all alter their files simultaneously. Nonprivileged users, 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.
SLEEP THE SYSTEM	To issue a SLEEP command through the operator console that causes the system to log all the current users off the system, 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.
SYSTEM LIBRARY	A collection of BASIC language programs and files stored by user A000, the privileged user, which can be used by all user idcodes, with certain limitations.
TERMINAL	A keyboard device through which a user communicates with the TSB System. Terminals are connected to the system through direct wiring or over telephone lines. Up to 32 terminals can be logged on the system at a time, and each has an assigned number between 0 and 31.

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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