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# HP 3000 Computer Systems



**OPT/3000**

**ON-LINE PERFORMANCE TOOL**

**Reference Manual**



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**OPT/3000  
ON-LINE PERFORMANCE TOOL**

**Reference Manual**



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# PREFACE

This manual documents On-Line Performance Tool OPT/3000, a software performance measurement tool designed for use in an interactive environment on an HP 3000 System operating under MPE IV or later.

OPT/3000 allows you to investigate both existing and potential causes of performance-related problems on your system by monitoring the systems workload, memory and CPU usage, I/O traffic, and table utilization. Proper interpretation of the results of your investigation will help you implement necessary changes to your system to improve its performance.

This manual describes how to operate the OPT/3000 facility. It discusses the hardware and software requirements for running OPT/3000, provides directions on how to get from one display to another, and explains what each display means.

OPT/3000 is a powerful software performance tool that aids the trained user in improving and enhancing the performance of the HP 3000. Correct interpretation of the displays generated by OPT/3000 requires an understanding of the internal operation of the MPE Operating System. It is highly recommended that the potential user take the System Performance Analysis class in conjunction with reading this manual.

# CONVENTIONS USED IN THIS MANUAL

NOTATION	DESCRIPTION
nonitalics	Words in syntax statements which are not in italics must be entered exactly as shown. Punctuation characters other than brackets, braces and ellipses must also be entered exactly as shown. For example:  EXIT;
<i>italics</i>	Words in syntax statements which are in italics denote a parameter which must be replaced by a user-supplied variable. For example:  CLOSE <i>filename</i>
[ ]	An element inside brackets in a syntax statement is optional. Several elements stacked inside brackets means the user may select any one or none of these elements. For example:  $\left[ \begin{array}{c} A \\ B \end{array} \right]$ User <i>may</i> select A or B or neither.
{ }	When several elements are stacked within braces in a syntax statement, the user must select one of those elements. For example:  $\left\{ \begin{array}{c} A \\ B \\ C \end{array} \right\}$ User <i>must</i> select A or B or C.
...	A horizontal ellipsis in a syntax statement indicates that a previous element may be repeated. For example:  [, <i>itemname</i> ]...;  In addition, vertical and horizontal ellipses may be used in examples to indicate that portions of the example have been omitted.  A shaded delimiter preceding a parameter in a syntax statement indicates that the delimiter <i>must</i> be supplied whenever (a) that parameter is included or (b) that parameter is omitted and any <i>other</i> parameter which follows is included. For example:  <i>itema</i> [ $\blacksquare$ <i>itemb</i> ][, <i>itemc</i> ]  means that the following are allowed:  <i>itema</i> <i>itema,itemb</i> <i>itema,itemb,itemc</i> <i>itema,,itemc</i>

# CONVENTIONS (continued)

$\Delta$  When necessary for clarity, the symbol  $\Delta$  may be used in a syntax statement to indicate a required blank or an exact number of blanks. For example:

```
SET[(modifier)] $\Delta$ (variable);
```

underlining When necessary for clarity in an example, user input may be underlined. For example:

```
NEW NAME? ALPHA
```

In addition, brackets, braces or ellipses appearing in syntax or format statements which must be entered as shown will be underlined. For example:

```
LET var[[subscript]] = value
```

shading

Shading represents inverse video on the terminal's screen. In addition, it is used to emphasize key portions of an example.

The symbol      may be used to indicate a key on the terminal's keyboard. For example, RETURN indicates the carriage return key.

CONTROL *char*

Control characters are indicated by CONTROL followed by the character. For example, CONTROLY means the user presses the control key and the character Y simultaneously.



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# INTRODUCTION TO OPT/3000

SECTION

1

ON-LINE PERFORMANCE TOOL (OPT/3000) is the user's window into the system and allows monitoring of system workload, memory and CPU usage, I/O traffic, and table utilization. By viewing the activity in detail, you can modify your present system to improve performance and more efficiently design new applications.

## FEATURES OF OPT/3000

OPT/3000 is designed to run on version IV, or later versions of the MPE Operating System. The features that enhance OPT/3000 are listed below.

### Interactive Reporting

OPT/3000 is an interactive software tool that reports performance-related data in the form of dynamically updated video displays and allows you to control the display-update time interval. Once the sampling interval is set, the display will be updated automatically. In addition, a display can be updated between specified intervals by pressing the **RETURN** key. Where practical, the information reported by OPT/3000 is presented in graphic format. The video enhancements and line drawing character sets are available on the terminals that support this feature.

### Multiple Display Levels

System resource information is grouped into contexts. Displays contained within a particular context are "layered" such that each level provides more detailed information than the previous level.

### Simple and Flexible User Interface

Running OPT/3000 requires minimal interaction on your part. All commands consist of a single keyboard character, and you are automatically prompted if any additional information is required. A menu of available commands can be displayed at any time and defaults are provided within each context.

### Hard Copy Capability

A hard copy of each display can be generated on a line printer. Hard copies include all information from the interactive displays, but video enhancements and the line drawing character set are represented differently on the hard copy. In some cases, additional information is provided in the hard copy that cannot be displayed interactively due to space limitations on the terminal screen.



## **Periodic Summary Reporting of Resource Usage**

In addition to interactive reporting of performance-related information, OPT/3000 can generate hard copy summary reports of resource usage at regular intervals. The length of the interval is specified by the user. These reports can be used to detect trends in resource usage as well as to determine periods of peak demands on your system.

## **Internal Documentation Facility**

OPT/3000 provides a fully integrated HELP facility with multiple levels of documentation. Using this facility, you can obtain on-line documentation on general information or details specific to the current context. The documentation includes short descriptions, and where appropriate, legend and interpretation guidelines.

## **Log File**

The information used to generate the summary report can also be written to a disc file. The information is in the form of summary records. This file is provided to enable the extension of the OPT/3000 reporting capabilities.

## **Percentage Bars**

OPT/3000 displays some data as percentage bars.

# SPECIFICATIONS FOR RUNNING OPT/3000

SECTION

2

OPT/3000 will operate on any HP system operating under MPE IV or later revisions.

## TERMINALS

In order to fully utilize all display features of OPT/3000, an HP terminal with the following capabilities must be used:

- Line drawing character set.
- All video enhancements, (inverse video, half-bright, underline, and blinking)
- Upper and lowercase character sets.
- A minimum of 8K of display memory (12K for a system with more than 2 MB of memory)

For all supported terminals, with the exception of the 2640B and 2644, OPT/3000 will automatically set the terminal straps and latching keys and return them to their original settings when you exit the program.

### NOTE

Straps G and H need to be set correctly to read the terminal status. If it is necessary for OPT/3000 to alter them, they will not be restored to their original settings. OPT/3000 will leave the G strap OPEN and the H strap CLOSED if you are using a terminal type 11. If a terminal type 10 is in use, both the G and H straps will be left CLOSED.

If you are using a 2640B or 2644 terminal, you must set the terminal straps to conform with the requirements of OPT/3000 in the following way:

Strap B CLOSED	Strap G CLOSED
Strap C OPEN	Strap H CLOSED
Strap D CLOSED	

## Specifications for Running OPT/3000

In addition, the Latching Keys should be set as follows:

Block Mode UP  
Auto Lf UP  
Memory Lock UP

OPT/3000 will NOT reset the terminal straps on the 2640B or 2644 because these terminals do not allow programmatic setting of the straps. When Memory Lock is in effect, the Home-up operation of the 2640B and 2644 will not operate in the same fashion as a 2645, 2647, or 2648, causing two of OPT/3000's displays to appear improperly.

If the line drawing character set of your terminal is not in position B, OPT/3000's Control Operation command (#A) allows you to inform OPT/3000 of the actual position of the line drawing character set.

You must log on to the system with terminal type 10, 11, or 14 as terminal type created by workstation configuration, for OPT/3000 to perform correctly. If you log on with terminal type "11", OPT/3000 will change it to type "10" during execution, then return the terminal type to "11" upon termination. If terminal type 11 is in use, OPT/3000 will leave the G strap OPEN and the H strap CLOSED. If type "10" is in use, both the G and H straps will be left CLOSED.

Execution of OPT/3000 is permissible on both point-to-point and multipoint terminals. Users of multipoint terminals, however, should use a Terminal Type 14; OPT/3000 will recognize type "14" and not change it. Generation of hard copy is severely limited on multipoint terminals.

## Line Printer

A line printer is necessary if you wish to use the hard copy capability of OPT/3000. A printer with lowercase characters is necessary for some displays to be completely described. Two files are generated by OPT/3000 for report purposes - OPTREPT for summary reports and OPTLIST for hard copy displays.

## Operating System

OPT/3000 is designed to run on version IV or later of the MPE Operating System as a user program with Privileged Mode and Data Segment Capabilities.

The BREAK option is disabled during the execution of OPT/3000. You can, however, execute MPE commands within OPT/3000 by using the MPE Display Control command. This will be discussed in Section 3.

## Recoverability

OPT/3000 can create three different output files. Two of these, OPTREPT and OPTLIST, are spooled printer files. OPTREPT contains the summary reports produced either from a batch job or interactively from the Global Context. OPTLIST contains reproductions of the various screens produced by OPT/3000 interactively. The third file is the Summary Log file. This file is produced by the summary report (batch or interactively), and is written to a standard discfile.

In the event of a system failure, the output generated from OPT/3000 can be left in various states.

Open spoolfiles will be lost if the normal system functions are interrupted. Closed spoolfiles can be recovered if the system is restored to normal operations with a WARMSTART. If a WARMSTART is not used to restart the system, all spoolfiles not yet printed will be lost.

It is possible to recover all data written to a log file prior to the last summary report generated. The information for the most recent summary report may also be recovered unless the actual generation of the summary report is in progress when the failure occurs.

## OVERVIEW OF OPERATIONS

Figure 2-1, the Command Structure Diagram, summarizes the operation of OPT/3000. Note that the Memory Context has additional commands that further break down its histogram displays. For example, when looking at the existing code segments being used, you may wish to compare the code segments belonging only to the system (non-user segments (N)) with those segments belonging only to the user (User Segments (U)).

### Context Concept

OPT/3000 presents system information in the form of display contexts. There is a context for each of the system resources that OPT/3000 monitors and each context determines the commands and displays that are available. In turn, each context is divided into displays that define in graphic form (such as bar charts and histograms) the resource that it is associated with.

For example, there is an I/O Context that is divided into disc, printer, and tape activities. In addition, displays may have additional commands that perform a certain function or that break the display down into more detail.

### Command Syntax

All OPT/3000 commands consist of a single keyboard character. Lowercase alphabetic characters are shifted to their uppercase equivalents. A character with no meaning in the current display context will be treated as a **RETURN**. Pressing **RETURN** simply updates the current display.

If you type a control character that has no special meaning to MPE, it is also be treated as a **RETURN**. See the MPE Commands Manual (32033-90006) for a list of ASCII Control Characters which have special meanings within MPE.

Commands are accepted when OPT/3000 has completed generating the present display on the terminal and the cursor is at the bottom of the screen. At that time, you can change contexts, displays, or update the current display by pressing **RETURN**.

The same command may have different meanings in different contexts. For example, using the command "D" while in the I/O Context displays disc activity; using "D" under the Tables Context displays detailed table usage. See Figure 2-1, Command Structure Diagram.

There are three categories of commands used in OPT/3000:

- Display Control - These are "global" commands that have general system applications such as OPT/3000's HELP facility. They are accessible from any context.
- Control Operation - These commands allow you to access contexts and perform other special operations such as closing the hard copy listing file. They are accessible from all contexts by entering a pound sign (#) in association with a character. (e.g., "#P")
- Context - These commands access graphic displays of the current context's resources such as disc, printer or tape activities in the I/O Context. Context Commands are only accessible within their own specific context (i.e., displays of disc or printer activity are only available when you have accessed the I/O Context).

OVERVIEW OF OPERATIONS

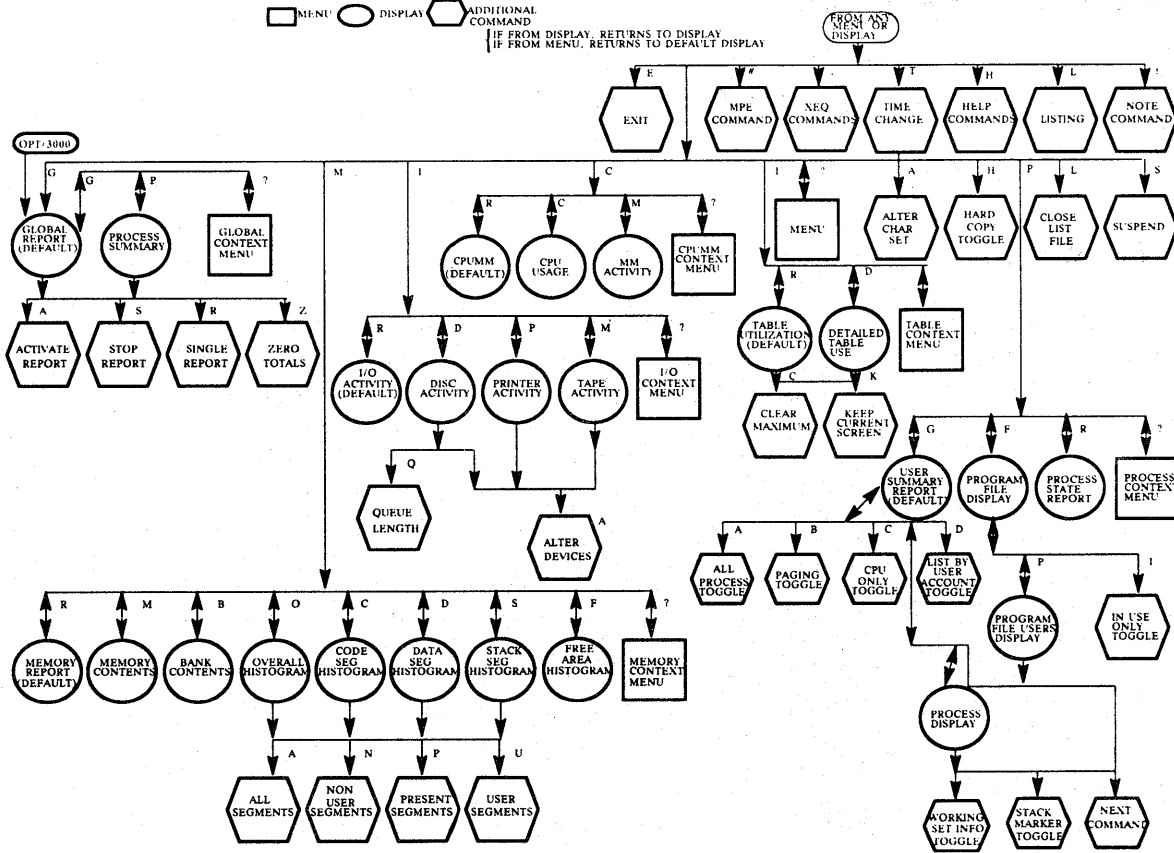


Figure 2-1. OPT/3000 Command Structure Diagram

If you are asked a YES or NO question, there are five valid responses:

**RETURN**, Y, N, YES, and NO. **RETURN** is interpreted as YES.

## EXECUTING OPT/3000

OPT/3000 is invoked by using the MPE RUN Command:

```
:RUN OPT.PUB.SYS
```

### Batch Access

Execution of OPT/3000 in Batch Mode is permissible, but periodic generation of global statistic summary reports and detailed table information reports are the only obtainable output. The default is generation of global statistics only. The user can use the PARM option on the RUN command. The parm values are as follows:

```
PARM = 0 --> Global Statistics (Def.)
PARM = 1 --> Detailed Table Statistics
PARM = 2 --> Both of the above
```

When OPT/3000 is run in BATCH MODE, OPT/3000 will read responses to the following five questions from the file \$STDIN:

	DEFAULT
MINUTES BETWEEN SUMMARY REPORTS?	(60)
REPORTS BETWEEN CLOSING OF REPORT FILE?	( 8)
FILE CLOSINGS BEFORE TERMINATION?	( 3)
NAME OF LOG FILE?	(none)
SUMMARY REPORT IDENTIFICATION (MAX OF 50 CHARS)	(none)

Responses to the first three questions must be positive integers. If not, the error message:

```
*** INPUT MUST BE A POSITIVE INTEGER ***
```

appears and OPT/3000 aborts with Fatal Error 100.

If you supply a non-blank name in response to the fourth question, OPT/3000 will use this input as the name of the log file. If the log file specified already exists, the old copy is automatically purged. The default is that no log file is created.

Your response to the last question is a label that appears on each of the summary reports. It can be a maximum of 50 characters. Responses to all of the above questions are echoed to the file \$STDLIST.

If an end-of-file is encountered, default values will be assumed for all remaining parameters. If a blank line or RETURN is entered for a specific parameter, the default value will be assumed for that parameter only.

If a non-default value is supplied for any of the above questions, a value or blank line must also be supplied for all inputs prior to the desired non-default value. For example, if you wish to input 2 as the response to the third question, you must also supply values (or blank lines) for the first two questions. OPT/3000 creates a permanent log file and a report file. The report file is a spoolfile.

For an example of a BATCH JOB FILE, see Appendix D.

For a discussion of summary report generation, see Global Context in Section 5.

## Interactive Access

After logging on, OPT/3000 displays a header message and verifies that the terminal is appropriately configured. Typically, successful logon and terminal configuration automatically generate the default display in the Global Context. If you want a default context other than the Global Context, use the PARM parameter to specify the initial context. The PARM values and the corresponding contexts are:

PARM	0	Global Context (default)
	1	Memory Context
	2	CPU/MM Context
	3	I/O Context
	4	Process Context
	5	Tables Context

You can then change the context itself or the displays within a context until you are ready to terminate execution of OPT/3000.

You can generate any display within the current context by entering the appropriate Context Command whenever commands are being accepted. The one exception is the Process Context where certain displays can be accessed only after generation of certain other displays. For example, in order to generate the Program File Users display in the Process Context, it is first necessary to generate the Program File Display. To generate a display in a non-current context, the appropriate Control Operation command is entered to get into the new context, so that the desired display within that new context can be specified.

Once you have selected a display within a context, that display is automatically and repeatedly updated at the sampling interval you have set. The display can also be updated by entering a **RETURN** whenever commands are being accepted. Whenever a new display is generated, the old contents of the terminal screen are cleared.

Data for the displays is obtained internally in two ways. Some information is gathered directly from MPE operating system tables and data structures, while the remainder is obtained from instrumentation embedded within MPE. The instrumentation updates a set of counters maintained in an extra data segment created for OPT/3000. These counters are accessed by OPT/3000 whenever any display is generated or updated, whether or not the counters are required for the display.



## Specifications for Running OPT/3000

If the time interval between samples is too long, it is possible for many of OPT/3000's counters to "wrap around" between successive samples of the instrumentation, causing OPT/3000 to report erroneous information. Therefore, the following warning message is displayed if the interval between samples exceeds the approximate threshold value of 15 minutes:

```
*** WARNING *** WARNING *** WARNING *** WARNING *** WARNING *** WARNING ***  
THE TIME INTERVAL BETWEEN SUCCESSIVE SAMPLES OF THE MPE  
INSTRUMENTATION EXCEEDED THE AMOUNT OF TIME IN WHICH SOME OF THE  
MPE COUNTERS CAN OVERFLOW. IT IS POSSIBLE THAT  
AN UNDETECTED OVERFLOW OCCURRED, WHICH MAY LEAD TO  
INCORRECT INFORMATION BEING REPORTED BY OPT. BE SUSPICIOUS OF  
ANY EXCEPTIONALLY LOW RATES OF SYSTEM ACTIVITY. YOU MUST  
ENTER A CARRIAGE RETURN TO RESUME EXECUTION.
```

Normal execution of OPT/3000 will resume as soon as a **(RETURN)** is entered.

## Terminating OPT/3000

To terminate OPT/3000 interactively, enter the Exit Command (E), which is a Display Control Command. The Control-Y trap mechanism of MPE also terminates interactive execution of OPT/3000. You will be prompted with:

```
CONTINUE EXECUTION? (YES/NO)
```

When you answer "NO", OPT/3000 terminates execution. OPT/3000 terminates automatically if executed in batch mode.

# DISPLAY CONTROL AND CONTROL OPERATION COMMANDS

SECTION

3

## DISPLAY CONTROL COMMANDS

Display Control and Control Operation Commands are available from anywhere within OPT/3000, and may be entered whenever OPT/3000 is accepting commands. Unlike Context Commands, whose meaning is dependent on the current context, Display Control Commands and Control Operation Commands maintain a unique meaning regardless of the current context.

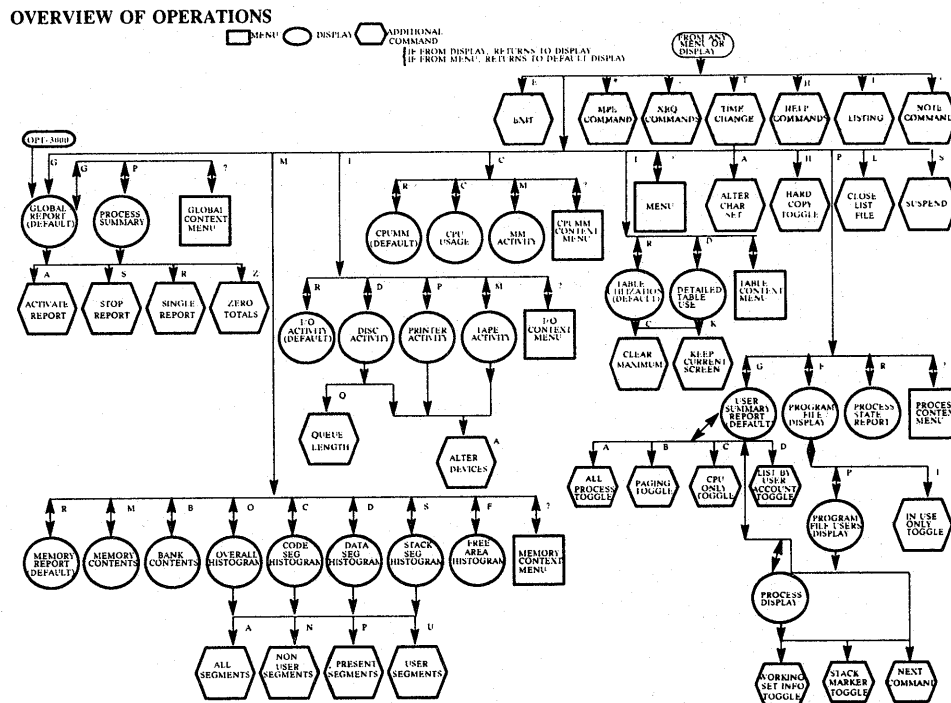


Figure 3-1. Display Control Commands

Display Control Commands access a set of auxiliary operations and are available from any display when OPT/3000 is accepting commands. Display Control Commands are:

- E Exit command
- H Help command
- L Listing command
- T Time Change command
- X XEQ command
- :
- ? Menu Display command
- !

## Exit Command (E)

The Exit command is used to terminate execution of OPT/3000. After entering "E", you are prompted with:

CONTINUE EXECUTION? (YES/NO)

If you respond "NO", OPT/3000:

- Turns on your terminal's echo, executes an automatic carriage return/line-feed, and restores any altered terminal straps and latching keys to their original settings. Remember, OPT/3000 cannot restore G and H straps if they were altered.
- Attempts to close the OPTREPT file. If the file is open, OPT/3000 will print the following message when the file is closed:

**SUMMARY REPORT GENERATION TERMINATED**

- Attempts to close the OPTLIST file. If the file is open, OPT/3000 will print the following message when the file is closed:

**FILE OPTLIST SENT TO LINE PRINTER**

- Terminates execution of OPT/3000.

If your reply is "YES", OPT/3000 updates the current display, continuing as if the Exit command had not been entered.

OPT/3000 can be exited only by using the Exit command or by using a Control-Y interrupt. Control-Y is not recognized during the generation or updating of a display. Control-Y or E must be entered between display updates when the program is accepting commands. The Control-Y interrupt generates the same prompt that is generated by the E command.

## Help Command (H)

This command allows access to online documentation for OPT/3000. The documentation is divided into seven categories, from general to specific, each with multiple levels of explanation.

When you enter "H", the following is displayed:

INDICATE WHICH TYPE OF INFORMATION YOU DESIRE

1. An explanation of the current display
2. General information about the current context
3. Information about a specific command in the current context
4. Information about a specific context
5. Information about control operation commands
6. Information about display control commands

7. General information about OPT/3000

OPT/3000 will then prompt with:

TYPE?

Entering any one of the seven digits (1 through 7) produces the appropriate documentation. When you press RETURN, OPT/3000 displays and automatically updates the current screen. Any other input causes the question to be repeated.

For example, if you enter "4" (Information about a specific context), OPT/3000 prompts you with:

ENTER CONTEXT:

If any character other than a valid Context Command is typed, an error message appears. The error message contains a list of valid answers; in this case G, M, C, I, P, or T. The error message appears as follows:

```
'Z' IS NOT A VALID CONTEXT
VALID CONTEXTS ARE G, M, C, I, P, T
```

The error message and the prompt are repeated until a valid response is entered. In the help section, RETURN is not a valid response to this prompt.

Entering "3" for assistance (a specific command within the current context) produces the prompt:

ENTER COMMAND:

Any currently valid command character can be typed at this time. Entering an invalid character, or a character that is valid only in another context, will generate the error message and a list of currently valid command characters. In this example, a "Y" was entered.

```
'Y' IS NOT A VALID COMMAND IN THIS CONTEXT
VALID COMMANDS ARE c1,c2 ..... ,cn
```

where c1,c2,...,cn is the list of valid commands for this prompt. OPT/3000 repeats the error message and the prompt until a legal character is typed. RETURN is not a valid response to this prompt. When a valid command is entered, the appropriate documentation will be displayed.

You can respond to this prompt with a pound sign (#) if you want information about a Control Operation command. This input produces a second prompt. Any Control Operation command character produces the appropriate documentation. This prompt is:

ENTER CHARACTER FOR CONTROL OPERATION COMMAND

If you respond with an invalid Control Operation command, you will receive the message:

```
'Y' IS NOT A VALID CONTROL OPERATION COMMAND
VALID COMMANDS ARE A,C,G,H,I,L,M,P,S,T,?
```

As with the other prompts in the help section, this prompt is repeated until you enter a valid Control Operation command, and RETURN is not valid.

## Display Control and Control Operation Commands

When you have indicated the type of assistance desired, and have entered a valid response, OPT/3000 will begin to display the requested documentation. This documentation is divided into sections where practical. You are given the choice of continuing or stopping at the end of each section, or after each screen is filled, via the prompt:

CONTINUE? (YES/NO)

If you enter "YES" or RETURN, an additional section of documentation is displayed. This prompt will appear at the end of each additional section except for the last. At any of these prompts, you may stop the documentation by entering "NO".

When all sections of documentation have been displayed or you have stopped the display of that section, you may request further documentation or return to the current screen display. OPT/3000 will ask:

DO YOU WISH INFORMATION ON ANOTHER SUBJECT? (YES/NO)

Entering "YES" or RETURN, will again display the seven types of information available, and the above dialog will be repeated.

"NO" clears the terminal screen and regenerates the current display.

## Listing Command (L)

The Listing command generates a hard copy of the current display. This command attempts to duplicate the terminal displays onto paper, but some reformatting is done to compensate for the lack of video enhancements.

Each hard copy display heading includes:

- Name of the display
- The version number of OPT/3000 used
- A copyright notice
- The date and time at which the display data was collected
- User specified label (maximum of 25 characters)
- A page number

Hard copies are generated to the file OPTLIST. This file is automatically opened by OPT/3000 when the first hard copy is requested. OPTLIST remains open until it is explicitly closed by the Close Listing File command (#L) or is implicitly closed by exiting OPT/3000. If you use the Close Listing File command (#L), a subsequent request for hard copy causes the file to be opened again. Page numbers are not reset if the file is opened more than once during one execution of OPT/3000.

When the file OPTLIST is opened, you are prompted with the following:

```
ENTER HARD COPY IDENTIFICATION (max of 50 chars)
```

```
>
```

You can then enter up to 50 characters which will appear on the heading line of each hard copy. If the listing file is closed by using the Close Listing File command, you will be prompted for a new heading the next time a hard copy is requested.

OPTLIST is opened with a default device class of LP. If a line printer with lowercase characters is available, a file equation should be used to direct the file to that device to enable more complete descriptions of some displays. If OPT/3000 is unable to open OPTLIST, the message:

```
UNABLE TO OPEN FILE 'OPTLIST'
```

is displayed along with the file system error message and no hard copy is generated.

While hard copy generation is in progress, the message:

```
*** Generating hard copy listing -- DO NOT DISTURB ***
```

is displayed at the terminal. When hard copy generation is finished, this message is replaced by:

```
GENERATION OF HARD COPY COMPLETE
```

OPT/3000 then pauses for approximately three seconds, erases the message, and updates the current display.

In order to generate hard copy for some displays, OPT/3000 must actually read the current contents of the screen. If this is not possible due to the terminal type or strap settings, the message:

```
UNABLE TO GENERATE HARD COPY FOR THIS DISPLAY ON THIS TERMINAL
```

is displayed and no hard copy is generated.

## Time Change Command (T)

This command allows you to change the delay interval between display updates. This time interval is the number of seconds between the completion of one display and the beginning of the next. When the Time Change command (T) is entered, you will receive the prompt:

```
ENTER THE DELAY BETWEEN DISPLAYS? (CURRENT= 15, MAX=900 SECONDS)
```

The display interval must be between 1 and 900 seconds (15 minutes). If the interval is not within these bounds, you receive the message:

```
DELAY MUST BE BETWEEN 1 AND 900 SECONDS
```

and the prompt is repeated.

If you press **RETURN**, OPT/3000 assumes the default of 15 seconds. Once you have specified a valid delay interval, the above dialogue is erased from the terminal screen and the current display is updated.

## Display Control and Control Operation Commands

The current interval is the display interval plus some overhead due to OPT and the MPE instrumentation. The overhead is usually about 1.5 seconds. When the current interval is displayed, it includes this overhead.

### **XEQ Command (X)**

The XEQ command lets you specify a sequence of commands of up to 50 characters. This sequence becomes the source of commands for OPT/3000. OPT/3000 continually executes this sequence until another XEQ (X) command is entered.

You enter your command sequence at the following prompt:

ENTER SEQUENCE OF COMMANDS TO BE EXECUTED

OPT/3000 interprets each character in the command string. After each command is interpreted, OPT/3000 pauses for the predefined time interval before acting on the next command. When the end of the string is reached, OPT/3000 restarts at the beginning of the string.

If an illegal character is entered after a pound sign (#), OPT/3000 prompts you for a valid command character. Any other time an illegal character is found, the current display is simply updated. Therefore, in some cases, an illegal command can be used to refresh the current display. When a valid command is found, OPT/3000 takes the appropriate action.

Any OPT/3000 command can be included in the character sequence. Commands that require a response, however, produce a prompt on the screen and wait for a response. The execution of the XEQ command string will be suspended, and there will be no display updates until the prompt has been satisfied.

There are two responses that can be included within the XEQ command sequence. The first is the response that satisfies the question produced by entering a new context. The second is the response to the question generated by entering the Bank Contents Display in the Memory Context.

There are five contexts that offer a choice of which display to produce upon entering that context. These contexts are: CPU-Memory Manager, I/O, Memory, System Tables and Process. When one of these contexts is entered, a Context command can be included in the sequence to specify which display to produce. A space produces the default display.

When entering the Bank Contents Display in the Memory Context, OPT/ 3000 asks for the number of the bank to be displayed. This bank number can be included in the XEQ command string. The bank number is a two digit octal number which is zero relative. If the Bank Contents Display command (B) is used, and it is not followed by two octal digits, OPT/3000 prompts for the bank number.

Any character can appear in an XEQ command string. The current display is updated when a character is not identified as a Display Control, Control Operation, or Context command.

For example, assume that the following string is entered:

```
#M MO#C #I L#PF#TDL#GRL
```

The following would occur:

- Memory Context entered (#M)
- Memory Report Display generated ( )
- Memory Contents Display generated (M)
- Overall Histogram Display generated (O)
- CPU-Memory Manager Context entered (#C)
- CPU-Memory Management Report Display generated ( )
- CPU-Memory Management Report Display updated ( )
- I/O Context entered (#I)
- I/O Activity Report Display generated ( )
  
- Hard copy generated for current display (L) (Note that you are asked to enter hard copy identification if the listing file is not already open).
- Process Context entered (#P)
- Program File Display displayed (F)
- System Tables Context entered (#T)
- Detailed Table Use Display generated (D)
- Produce Hard Copy of Detailed Table Display (L)
- Global Context entered (#G) (The Global Resource Usage Report is automatically generated after entering the Global Context)
- Single Summary Report generated (R)
- Hard copy generated for current display (L)

The XEQ string commands are executed at the interval defined by the Time Change command (T). By simply entering RETURN, you can execute the next command in the sequence without waiting for the entire delay interval.

The string will be re-executed until another XEQ (X) command is found. An "X" can be located in the command string or entered from the terminal. Pressing RETURN at the XEQ prompt terminates XEQ control, OPT/3000 returns to its normal mode of operation and the XEQ sequence will no longer be defined.



## MPE Command (:)

This command enables you to enter any MPE command which can be programmatically invoked via the COMMAND intrinsic. When the command ":" is entered, you are prompted with:

```
ENTER MPE COMMAND BELOW    (<CR> to return to display)
:
```

Now you may enter an MPE command. If the command is executed with no errors, the message:

```
COMMAND SUCCESSFULLY EXECUTED
```

is displayed. If your command was not recognized by the COMMAND intrinsic, the message:

```
CANNOT EXECUTE COMMAND PROGRAMMATICALLY - MAY BE UNDEFINED COMMAND
```

is displayed. If an error was detected in the command, the message:

```
ERROR xxx DETECTED
```

is displayed and the appropriate CI error message is generated. After one of the above three messages is displayed, OPT/3000 repeats the initial prompt. At this point you may enter another MPE command or simply press **RETURN** to return to the current display. In the second case, OPT/3000 will erase the above dialogue (including any output generated by the MPE Commands) and then generate the current display).

## Menu Display Command (?)

This command generates a list of commands that are available in the current display context. When space permits, a brief set of instructions also appears. Once the menu appears, you are prompted for a command. If you enter an invalid command or a **RETURN**, the default display for the context is generated.

Note that if you request a hard copy at this point, you obtain a hard copy of the default of the current context. Any erroneous command only generates the default display of the current context.

Figure 3-2 shows a Menu of Commands display generated within the Global Context. The left side of the screen shows which commands are available within the current context (in this case, Global). The right side of the screen lists all Control Operation (#command) and Display Control commands.

***** MENU OF COMMANDS --- GLOBAL DISPLAY CONTEXT *****	
<p>***DISPLAYS***</p> <p>G GLOBAL RESOURCE USAGE REPORT (default)</p> <p>P PROCESS SUMMARY</p>	<p>***CONTROL OPERATIONS***</p> <p>#A ALTER LINE DRAWING CHAR SET POSITION</p> <p>#C ENTER CPU-MEMORY MANAGER CONTEXT</p> <p>#G ENTER GLOBAL CONTEXT</p> <p>#H CONTINUOUS HARD COPY GENERATION</p> <p>#I ENTER I/O CONTEXT</p> <p>#L CLOSE LISTING FILE</p> <p>#M ENTER MEMORY CONTEXT</p> <p>#P ENTER PROCESS CONTEXT</p> <p>#S SUSPEND OPT (UNTIL USER INPUT)</p> <p>#T ENTER SYSTEM TABLES CONTEXT</p> <p>#? MENU OF CONTROL OPERATION COMMANDS</p>
<p>***SUMMARY REPORT COMMANDS***</p> <p>A ACTIVATE SUMMARY REPORT GENERATION</p> <p>R GENERATE SINGLE SUMMARY REPORT</p> <p>S STOP SUMMARY REPORT GENERATION</p> <p>Z ZERO TOTALS</p>	<p>***DISPLAY CONTROL***</p> <p>E EXIT</p> <p>H HELP</p> <p>L LISTING (GENERATE HARD COPY)</p> <p>T TIME CHANGE (OF UPDATE INTERVAL)</p> <p>X DEFINE XEQ SEQUENCE</p> <p>: MPE COMMAND</p> <p>? MENU DISPLAY</p> <p>↑ NOTE COMMAND</p>
<p>Upon entry to the global context the global resource usage report is automatically generated</p>	<p>COMMAND?</p>

Figure 3-2. Menu of Commands - Global Display Context

## Note Command (!)

This command allows you to place a note in the hard copy file, OPTLIST. After entering "!", you will be prompted with:

```
ENTER NOTE TO BE PRINTED ON FILE OPTLIST (enter ! to terminate)
>
```

Each line you enter is copied directly to the file OPTLIST. If the file is not already open, the normal procedure for opening the hard copy file is followed. (See the Listing command (L)). The prompt ">" is repeated until you enter a line consisting of a single exclamation point "!". Then the message:

```
NOTE PRINTED ON FILE OPTLIST
```

is displayed. OPT/3000 pauses for approximately three seconds, the screen is cleared, and the current display is regenerated.

## Control Operation Commands (#)

The Control Operation commands allow control of the various functions of OPT/3000. They are invoked by entering a pound (#) sign. Like Display Control commands, Control Operation commands maintain a unique meaning regardless of the current display context.

The Control Operation commands will be discussed in two groups. The first group contains operations that provide information or provide some type of program control. The second group of commands provide access to specific contexts.

The following is a list of Control Operation commands.

- #? Menu Display for Control Operation commands
- #A Alter Line Drawing Character Set Position
- #H Continuous Hard Copy Generation Toggle
- #L Close Listing File
- #S Suspend OPT/3000
  
- #C Enter CPU-Memory Manager Context
- #G Enter Global Context
- #I Enter I/O Context
- #M Enter Memory Context
- #P Enter Process Context
- #T Enter System Tables Context

These commands are available from any context whenever OPT/3000 is accepting commands. Upon entering a pound (#) sign, you are prompted with:

ENTER CHARACTER FOR CONTROL OPERATION COMMAND

Any character can be entered at this time. A character that is associated with a particular operation causes that operation to be executed. Any character that is not defined as a Control Operation command causes an error message. This error message echoes the illegal input, (in this case "Y" is used as an example) and then lists all valid commands. This error message is followed by another prompt:

'Y' IS NOT A VALID CONTROL OPERATION COMMAND  
VALID COMMANDS ARE A,C,G,H,I,L,M,P,S,T,?

Only Control Operation commands are accepted as valid input. A **RETURN** or any other character is illegal. The error message, the list of Control Operations, and the prompt will be repeated until a valid character is entered.

Figure 3-3 illustrates the first group of Control Operation Commands.

OVERVIEW OF OPERATIONS

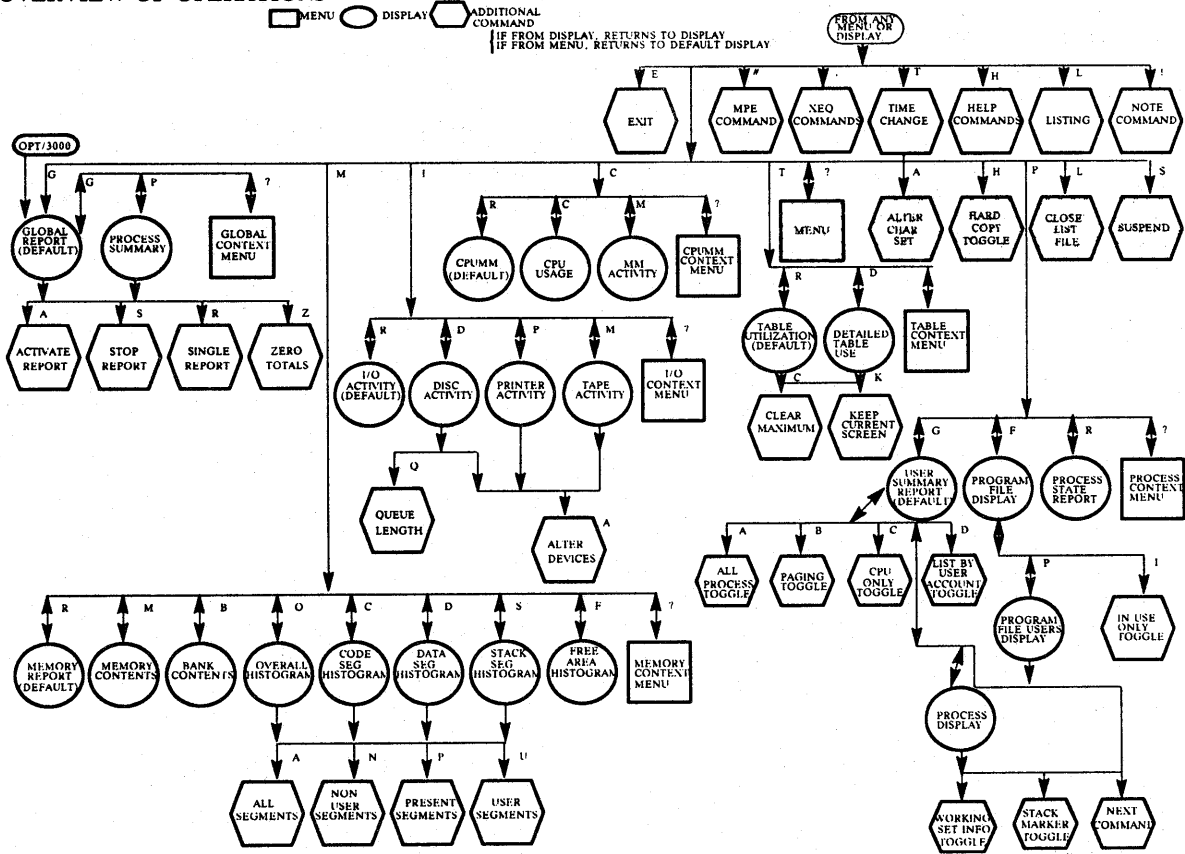


Figure 3-3. Control Operation Commands (non-context)

## Menu of Control Operation Commands (#?)

This command generates a menu of Control Operation commands as illustrated in Figure 3-4. All Control Operation commands are described in this menu.

```
***MENU OF CONTROL OPERATION COMMANDS***  
-----  
#A - ALTER LINE DRAWING CHARACTER SET POSITION          (if not in position B)  
#C - ENTER CPU-MEMORY MANAGER CONTEXT                  (user prompted for initial display)  
#G - ENTER GLOBAL CONTEXT          (global resource usage report will be generated)  
#H - CONTINUOUS HARD COPY GENERATION TOGGLE           (turn automatic hard copy on/off)  
#I - ENTER I/O CONTEXT                                (user prompted for initial display)  
#L - CLOSE LISTING FILE                               (file OPTLIST sent to line printer)  
#M - ENTER MEMORY CONTEXT                             (user prompted for initial display)  
#P - ENTER PROCESS CONTEXT                            (program file display will be generated)  
#S - SUSPEND OPT                                     (until next user command is entered)  
#T - ENTER SYSTEM TABLES CONTEXT                     (user prompted for initial display)  
#? - MENU DISPLAY OF CONTROL OPERATION COMMANDS (this display)  
                                             COMMAND?
```

Figure 3-4. Menu of Control Operation Commands

Notice the difference in function between the two types of menu commands. The Control Operation Commands Menu (#?) allows access to the different contexts and program control commands. These commands allow you to shift from one context to another.

The Context Command Menu (?) allows access to the displays in a particular context, Display Control commands, and Control Operation commands. These commands generate the different screen displays within a context.

## Alter Line Drawing Character Set Position Command (#A)

This command is used to inform OPT/3000 of the position of the line drawing character set if the character set on your terminal is not in position B. Generally, if your terminal has a line drawing character set, it will be in position B. While OPT/3000 assumes that the set is in position B, it can be operated when the character set is in positions A, C, or D. You must, however, notify OPT/3000 of the location with the (#A) command.

The line drawing character set on your terminal is probably not in position B if the vertical and horizontal lines in the displays appear as commas or "funny" characters or if no lines appear at all. If this occurs and you wish to determine what position the character set is in, run a terminal test by pressing the TEST key or by using the terminal test softkeys. Consult your terminal reference manual to determine the location of the line drawing character set. Once you have found the location, you can use Alter Line Drawing Character Set Position Command (#A) to inform OPT/3000 of the correct position.

ENTER POSITION OF LINE DRAWING CHARACTER SET (A, B, C, or D)

If you do not reply with one of the values specified above, the following message appears:

POSITION MUST BE EITHER A, B, C, OR D

The error message and a new prompt will be repeated until valid input is received. When the location has been changed, OPT/3000 prints the following message, where "Z" represents the new location.

**LINE DRAWING CHARACTER SET POSITION IS NOW Z**

OPT/3000 pauses for approximately three seconds, erases the above dialogue, and updates the current display.

## Continuous Hard Copy Generation Toggle Command (#H)

This command allows you to control the continuous generation of hard copies of context displays. The continuous copy toggle is set OFF when OPT/3000 is entered. Typing the Continuous Hard Copy Command (#H) sets the toggle ON. When the toggle is ON, each display that is generated or updated is copied to the line printer. The copying of context displays to the printer continues until another Continuous Hard Copy Command (#H) is entered. This command will set the toggle OFF. When the toggle is ON, the context displays are copied to the OPTLIST file.

When the continuous generation of hard copies is enabled, OPT/3000 prints the following message:

**CONTINUOUS HARD COPY GENERATION STARTED**

With each new display or each update of a display, OPT/3000 prints the following message:

**\*\*\* Generating hard copy listing -- DO NOT DISTURB \*\*\***

When the hard copy toggle is set to OFF, OPT/3000 prints the following message:

**CONTINUOUS HARD COPY GENERATION TERMINATED**

Setting the hard copy toggle to the OFF position does not close the OPTLIST file. This file is closed upon termination of OPT/3000. OPTLIST can also be closed by the Close Listing File command (#L).

## Close Listing File Command (#L)

This command closes the file OPTLIST on which the hard copy displays are written. If the operation is successful, the following message is displayed on your terminal:

**FILE OPTLIST SENT TO LINE PRINTER**

If the file closing fails for any reason, OPT/3000 displays the following message:

**UNABLE TO CLOSE FILE OPTLIST**

If no hard copy displays have been produced since the last file closing or since the start of execution, the following error message is displayed:

**NO HARD COPY LISTINGS HAVE BEEN GENERATED**

After one of the above three messages is displayed, OPT/3000 pauses for approximately three seconds, erases the message, and returns your screen to its original state, at which point normal operation continues. This command has no effect on the setting of the flag that controls the continuous generation of hard copy displays. This command only closes the OPTLIST file. (To stop hard copy generation, re-enter the #H command.)

## Suspend Command (#S)

This command causes OPT/3000 to enter a suspended state, allowing you to examine your current display without it being updated. Normal operation is resumed as soon as you enter a character. The character which you enter to resume operation is treated as normal command input and thus may lead to a new display being generated. Suspension is limited to a maximum of 15 minutes (900 seconds), at which time your current display is updated.

Figure 3-5 illustrates the remaining Control Operation commands. These commands produce the effect of transferring you to a different context.

OVERVIEW OF OPERATIONS

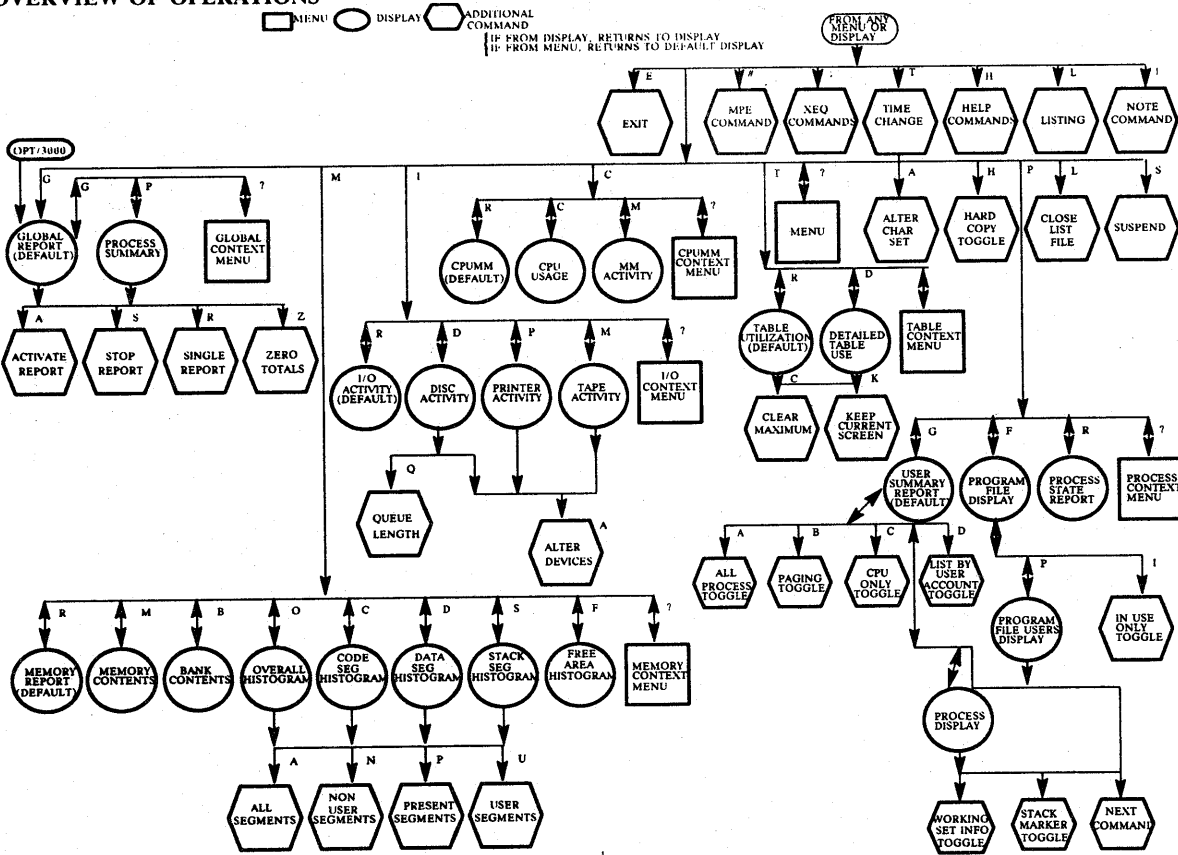


Figure 3-5. Control Operation Commands (context entry)

### Enter CPU-Memory Manager Context Command (#C)

This command is used to change the current context to the CPU-Memory Manager Context. Upon entering the command, you are prompted for the desired display in the context. For further information, refer to the CPU-Memory Manager Context in Section 6.

### Enter Global Context Command (#G)

This command is used to change the current context to the Global Context. Upon entering the command, the default display in the Global Context (Global Resource Usage Report) is generated. For further information, refer to Global Context in Section 5.

### Enter I/O Context Command (#I)

This command is used to change the current context to the I/O Context. Upon entering the command you will be prompted for the desired display in the context. For further information, refer to I/O Context in Section 8.



## **Enter Memory Context Command (#M)**

This command is used to change the current context to the Memory Context. Upon entering the command, you are prompted for the desired display in the context. For further information refer to Memory Context in Section 7.

## **Enter Process Context Command (#P)**

This command is used to change the current context to the Process Context. Upon entering the command, you are prompted for the desired display in the context. For further information, refer to Process Context in Section 9.

## **Enter Systems Tables Context Command (#T)**

This command is used to change the current context to the System Tables Context. Upon entering the command, you are prompted for the desired display in the context. For further information refer to System Tables Context in Section 10.

# CONTEXT COMMANDS

OPT/3000 consists of six contexts, each of which provides a detailed look at a specific system resource or entity. These six contexts are:

- Global Context
- CPU-Memory Manager Context
- Memory Context
- I/O Context
- Process Context
- System Tables Context

The Global Context is the default context and is automatically selected when you run OPT/3000.

Within each context there is a default display. Immediately upon entering the Global Context the default display is automatically generated. When entering all other contexts, you will be prompted for display selection, and the default appears only after an unprogrammed command or **RETURN**.

Figure 4-1 provides a summary of the six contexts and the displays within each context.

OPT/3000  
CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 4-1. OPT Contexts and Displays



# GLOBAL CONTEXT (#G)

The Global Context provides an overview of system memory, CPU, and disc activity; and a summary of jobs and sessions currently running. For problem solving, the Global Context indicates which resources warrant further investigation in another context. The Global Context can be accessed from any context by entering #G" between display updates, or whenever OPT/3000 accepts commands.

OPT/3000  
CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT R	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 5-1. Global Context

Two displays and one menu of commands are available in this context.

- (?) Menu of Commands - Global Display Context
- (G) Global Resource Usage Report Display (default)
- (P) Process Summary Display

The Global Resource Usage Report (G) is the default display and is automatically generated when you enter this context. You also automatically enter this display when OPT/3000 is initially invoked.

Global Context (#G)

By entering "?" once you are in a context, you produce a menu of commands for that context, as illustrated in Figure 5-2.

```

***** MENU OF COMMANDS --- GLOBAL DISPLAY CONTEXT *****

```

<pre> ***DISPLAYS*** G GLOBAL RESOURCE USAGE REPORT (default) P PROCESS SUMMARY </pre>	<pre> ***CONTROL OPERATIONS*** #A ALTER LINE DRAWING CHAR SET POSITION #C ENTER CPU-MEMORY MANAGER CONTEXT #G ENTER GLOBAL CONTEXT #H CONTINUOUS HARD COPY GENERATION #I ENTER I/O CONTEXT #L CLOSE LISTING FILE #M ENTER MEMORY CONTEXT #P ENTER PROCESS CONTEXT #S SUSPEND OPT (UNTIL USER INPUT) #T ENTER SYSTEM TABLES CONTEXT #? MENU OF CONTROL OPERATION COMMANDS </pre>
<pre> ***SUMMARY REPORT COMMANDS*** A ACTIVATE SUMMARY REPORT GENERATION R GENERATE SINGLE SUMMARY REPORT S STOP SUMMARY REPORT GENERATION Z ZERO TOTALS </pre>	<pre> ***DISPLAY CONTROL*** E EXIT H HELP L LISTING (GENERATE HARD COPY) T TIME CHANGE (OF UPDATE INTERVAL) X DEFINE XEQ SEQUENCE : MPE COMMAND ? MENU DISPLAY ! NOTE COMMAND          COMMAND? </pre>
<pre> Upon entry to the global context the global resource usage report is automatically generated </pre>	

Figure 5-2. Menu of Commands - Global Display Context

Responding to the menu prompt:

COMMAND?

with an unprogrammed command (or **RETURN**) generates the above context's default display.

The periodic generation of hard copy summary reports and the optional writing of the summary information to a disc log file is also controlled through the Global Context.

## GLOBAL RESOURCE USAGE REPORT DISPLAY (G)

The Global Resource Usage Report Display is generated automatically upon entry to the Global Context. To access this display from elsewhere in the Global Context, enter "G" when OPT/3000 is accepting commands. This display provides information about system memory usage, CPU activity, and disc I/O activity.

HP32238A.00.28 OPT/3000 GLOBAL RESOURCE USAGE REPORT 9:26 AM

ACTIVITY IN CURRENT INTERVAL 4.1 SECONDS

10 20 30 40 50 60 70 80 90 100%  
 MEMORY USAGE MC CS SD DX X

CPU STATE B BPI IX

10 20 30 40 50 60 70 80 90 100 per second  
 DISC I/O ACTIVITY SX (0/1/1)

ACTIVITY OVER ALL INTERVALS 13.4 MINUTES

10 20 30 40 50 60 70 80 90 100%  
 CPU STATE B BPI IX XO

10 20 30 40 50 60 70 80 90 100 per second  
 DISC I/O ACTIVITY SX (0/1/2)

MEMORY USAGE LEGEND:		CPU STATE LEGEND:		DISC ACTIVITY LEGEND:					
M	Resident MPE	C	Code segments	B	CPU Busy	P	Pause for I/O	X	Cached I/O
S	Stacks	D	Data segments	I	Idle	G	Garbage coll	\$	Segment Manager I/O
X	Cached Disc Domains	X	Cach Man	O	Overhead	U	User I/O		

Figure 5-3. OPT/3000 Global Resource Usage Report

### Display Description

This display is divided into three sections. The first shows the memory usage, CPU state, and disc I/O activity for the current interval. The current interval is the time between display updates that matches as closely as possible to the interval length. The current interval length may be slightly longer than the time set with the Time Change command due to overhead in OPT and the MPE instrumentation. The current interval is measured in seconds.

The second portion of the screen shows the CPU state and disc I/O activity since the summary report totals were last reset. The overall interval is displayed in minutes.

The bottom section of the display is the legend that defines each section of each bar graph.

## Interpretation Guidelines

- The percentage of memory allocated to resident MPE depends on the actual memory size and configuration percentages.
- A true CPU utilization factor is obtained by adding together the CPU busy, cache management, and overhead percentages.
- No idle time should be observed as long as at least one batch job is active.

## Legend

Memory usage is reported as the percentage of memory occupied by each of the following categories:

Memory Resident MPE (M)	Memory permanently allocated to MPE for system tables and code.
Code Segments (C)	Linked memory currently occupied by code segments.
Stack Segments (S)	Linked memory currently occupied by stack segments.
Data Segments (D)	Linked memory currently occupied by non-stack data segments.
Cached Disc Domains (X)	Linked memory currently occupied by disc cache domains.

Any memory not allocated to one of the above uses is free space.

CPU usage is reported as the percentage of time during the interval that the CPU is in each of the following states:

Busy (B)	CPU time used for system and user processes.
Paused (P)	CPU waiting for completion of user and/or memory management disc I/O.
Idle (I)	No process requires service.
Garbage Collection (G)	CPU time spent performing memory garbage collection.
Cache Management (X)	CPU time devoted to managing disc caching.
Overhead (O)	CPU time spent executing on the ICS (Interrupt Control Stack) and CPU time used for memory allocation.

All percentages for Memory and CPU usage are rounded to the nearest 2 percent. Percentages for CPU usage are adjusted after rounding to ensure that they total 100 percent.

Disc activity is reported as the mean number of disc I/O's completed per second for each of the following three categories, rounded to the nearest integer:

Cached I/O (X)	Disc I/O completed for cache I/O.
Segment Management (S)	Disc I/O completed for memory management.
User I/O (U)	Disc I/O completed on behalf of a user or system process (includes spooling I/O).

Both user and Memory Manager rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed. The maximum combined rate that can be displayed is 100 per second. The rates are shown in the form (user I/O rate/segment manager I/O rate/cache I/O rate).





The maximum observed values refer only to values recorded in the current Process Summary Display. For example, if there were 20 sessions while the current display was the Global Resource Usage Report and there were 19 sessions while the current display was the Process Summary Report, the maximum would be shown as 19.

## Interpretation Guidelines

- A large number of processes in the dispatch queue (greater than 5) may indicate excessive contention for either the CPU or for discs.
- The number of system processes should remain relatively constant.
- Additional information about the number of processes in the various process states can be obtained using the Process State Report Display in the Process Context.
- The number of current processes reported on the top of the screen should equal the total of the system processes, CI processes, user processes multiplied by two, and created processes.

### NOTE

Since the number of CI processes does not include those processes where users are running a program the number of user processes must be counted twice.

## Legend

Processes are detailed in the second grouping of the display. They include System, Command Interpreter, User, and Created processes.

System	Includes such processes as spoolers and memory logging.
Command Interpreter	Includes only those CI processes that are not waiting on a son process (i.e., the user is running a program or is in break).
User	The son processes of CI processes (user main processes).
Created	The son of a user process or the son of another created process.

Processes in the Dispatch Queue are essentially ready to run and are waiting for the CPU, an absent segment to be brought into memory, or a disc I/O to complete. A process in the Dispatch Queue may have some of its memory taken away in order to satisfy a memory management request, but it will remain in the Dispatch Queue. If so, the process will be marked as requiring scheduling attention.

## Global Context (#G)

A process in the "no queue" state is waiting for some long term event such as a terminal READ completion or the acquisition of a RIN. Once the event occurs, the process in the "no queue" state will be placed in the Dispatch Queue.

Dispatch Queue

The process is ready to run and is on a short term wait.

No Queue

The process is waiting for a long term event after which it will be placed back in the Dispatch Queue.

# SUMMARY REPORT

The Summary Report provides an overall view of your system on hard copy. This report can be produced interactively or in batch mode.

Global Context (#G)

SUMMARY REPORT HP32238A.00.28 OPT/3000  
 (C) HEWLETT-PACKARD COMPANY 1979, 1980  
 INTERVAL LENGTH: 413.154 SECONDS ( 6.9 MINUTES)

OPT summary report TUE, OCT 7, 1986, 10:45 AM PAGE 1

CPU ACTIVITY SUMMARY

CPU STATE	MEAN	MAX	LENGTH	COUNT	TOTAL TIME
CPU BUSY	20%	41%	.009	9304	80.727
PAUSE DISC & SWAP	0%	0%	.027	2	.053
PAUSE DISC	4%	17%	.026	591	15.347
PAUSE SWAP	1%	5%	.032	169	5.377
PAUSE IDLE	67%	85%	.132	2142	281.687
GARBAGE COLLECTION	0%	0%		0	.000
SEGMENT MAM-ICS	1%	2%	.003	932	2.505
CACHE MAM-PROC STK	4%	12%	.003	4971	16.131
CACHE MAM-ICS	0%				.767
OVERHEAD	3%				10.560

MEMORY ALLOCATION SUMMARY

RESULT	MEAN	COUNT
RECOVERY	0%	1
FREE SPACE	98%	915
OVERLAY CAND	0%	1
GIVE UP	2%	15
HARD REQUEST	0%	0

LAUNCH ACTIVITY AND ADDITIONAL MEMORY MANAGEMENT ACTIVITY SUMMARY

PROCESS LAUNCHES	PROCESS SWAP-INS	PROCESS PREEMPTS	MEMORY ALLOCS	SPECIAL REQUESTS	MM I/O READS	MM I/O WRITES	RELEASE DATA SEG	RELEASE CODE SEG	CLOCK CYCLES
COUNT	9304	931	1663	972	185	362	150	2	0
RATE	22.5	2.3	4.0	2.4	.4	.9	.4	.0	0
MAX RATE	37	8	9	8	1	2	1	0	0

SUMMARY OF DISC ACTIVITY

	COUNT/RATE		
	ALL I/O	READS	WRITES
ALL DISC	1971/ 4.8	721/ 1.7	967/ 2.3
DISC 1 (LDEV 1)	776/ 1.9	316/ .8	388/ .9
DISC 2 (LDEV 2)	547/ 1.3	144/ .3	271/ .7
DISC 3 (LDEV 3)	227/ .5	108/ .3	88/ .2
DISC 4 (LDEV 4)	421/ 1.0	153/ .4	220/ .5

MAXIMUM RATE (USER/MM AND CACHE)

READS	WRITES	CONTROL OP
0/ 5	2/11	3
0/ 3	1/ 5	1
0/ 2	1/ 4	2
0/ 2	0/ 3	1
0/ 2	1/ 6	1

SUMMARY OF LP ACTIVITY

	COUNT/RATE		
	ALL I/O	WRITES	CONTROL OPS
ALL LP	0/ .0	0/ .0	0/ .0

MAXIMUM RATE

WRITES	CONTROL OP
0	0

SUMMARY OF TAPE ACTIVITY

	COUNT/RATE		
	ALL I/O	READS	WRITES
ALL TAPE	0/ .0	0/ .0	0/ .0

MAXIMUM RATE

READS	WRITES	CONTROL OP
0	0	0

Figure 5-5. Summary Report

## Global Context (#G)

In an interactive environment, the Summary Report is controlled from the Global Context. The commands to control the report are:

- A - Activate Summary Report generation
- S - Stop Summary Report generation
- R - Generate Single Summary Report
- Z - Zero Totals command

These commands are discussed in detail in the additional commands section.

In batch mode, the Summary Report is controlled by supplying the answers to five questions in a stream file. (See Appendix D for an example of a Batch Job File). They control the number of reports, the availability of the reports and the interval over which the reports are to be generated. A listing is defined as one closing and reopening of the report file, and may include several summary reports. The questions are:

```
MINUTES BETWEEN SUMMARY REPORTS?  
REPORTS BETWEEN CLOSING OF REPORT FILE?  
FILE CLOSINGS BEFORE TERMINATION?  
NAME OF LOG FILE?  
SUMMARY REPORT IDENTIFICATION? (max of 50 chars)
```

The first question allows you to specify the approximate interval (in minutes) between summary reports. The interval may actually be slightly larger because of the time necessary to generate the reports. The default interval is 60 minutes. The largest interval that may be specified is 32,767 minutes.

The second question determines the number of summary reports that are generated before the spool file is closed and reopened. The page numbering is continuous throughout all of the summary reports. The default is 8 reports. The maximum number of reports allowed before closing the spool file is 32,767.

The third question determines the number of listings produced. The default is three listings and the maximum is 32,767 listings. One listing is produced each time the spool file is closed.

The fourth question determines whether a log file is generated. The default does not produce a log file. When you answer with a name, a log file will be produced under that name. If a file already exists with that name, one of two things happens. In batch mode, the old file is purged and a new file built. In interactive mode, you will be asked if the old file is to be purged so that a new file can be produced. See Appendix B for additional information about the log file.

The fifth question asks for a title which will be used to label the summary reports. The default input is no title. You can enter up to 50 characters for a title.

If an end-of-file is encountered in the stream file before you answer all five questions, the default answers are assigned to the remaining questions. You may also choose to answer only particular questions and let the others assume the default values, by answering with a **(RETURN)** or blank record in the stream file. Any question answered without any data supplied assumes the default value.

One final summary report summarizes the information over all intervals. Each of the previous reports cover only one interval.

When generating summary reports in batch mode using all the default values, you will receive three line printer listings. Each listing contains eight summary reports. The OPT/3000 program runs for approximately 24 hours. The fourth listing contains the final summary report. Note that pagination is continuous throughout all of the reports.

## Display Description of the Summary Report

The report is divided into six parts:

- CPU Activity Summary
- Memory Allocation Summary
- Launch Activity and Additional Memory Management Activity Summary
- Summary of Disc Activity
- Summary of LP Activity
- Summary of Tape Activity

The CPU Activity Summary displays the use of the CPU in terms of time. The activities are broken down into individual states that are measured. Each state is described by five quantities: mean, max, length, count and total time. The mean is the overall average of the individual summary report intervals. The max is the largest percentage measured in the current interval. The final summary report will show the maximums encountered during the entire summary report generation period. The length is the mean time in seconds that the CPU remained in that particular state. The count is the number of times that the CPU entered in a particular state. The total time is the total amount of time the CPU spent in any particular state within the current interval.

The Memory Allocation Summary gives a breakdown of the action taken by the Memory Manager. The result column is the identification of each type of action that the Memory Manager can take when a memory request is made. The mean is the percentage of times that the Memory Manager performed a particular type of action. The count is the actual number of times that the Memory Manager performed a particular type of action.

The Launch Activity and Additional Memory Management Activity Summary shows the different types of activity initiated by the dispatcher. These activities show the various actions of the operating system broken down into the different types of activities. The count is the actual number of times that a particular type of activity took place. The rate is the average rate of activities per second. The max rate is the highest rate obtained in the current interval. The final summary report shows the maximums encountered during the entire summary report generation period.

The summaries of device activity appear at the bottom of the summary report. There are three summaries: Summary of Disc Activity, Summary of LP Activity, and Summary of Tape Activity. Each has entries for each device of a particular type and an entry for the total activity of all the devices of that type. The activity is broken down into reads, writes, control operations, and all I/O (the sum of reads, writes, and control operations). The activity of each device is measured by a count, a rate per second, and a maximum rate.

## Interpretation Guidelines

- Process swap-ins can cause memory allocs and/or special requests.
- Process swap-ins  $\leq$  memory allocs + special requests.
- The line printer and tape are not accessed by the Memory Manager.
- Total user wait time  $\leq$  pause disc + pause disc & swap.
- Total system wait time  $\leq$  pause disc + pause disc & swap.

## Legend

The CPU Activity Summary provides detailed information about CPU utilization over the time interval. This activity is divided into occurrences of various CPU states. These states are:

Busy	CPU time for system and user processes.
Pause Disc & Swap	CPU waiting for completion of both user and memory management disc I/O.
Pause Disc	CPU waiting for completion of user disc I/O.
Pause Swap	CPU waiting for completion of memory management disc I/O.
Pause Idle	No process requiring service.
Garbage Collection	CPU time on garbage collection.
Segment MAM-ICS	CPU time on memory allocation.
Cache MAM-PROC STK	CPU time on disc caching while executing on user stack.
Cache MAM-ICS	CPU time on disc caching while executing on the Interrupt Control Stack.
Overhead	System activity not included in above categories such as interrupt handling and process scheduling.

The Memory Allocation Summary section further breaks down memory allocation into:

Recovery	Segment recovered from overlay candidate state, either at the time of a fault or during a process swap-in (i.e., no disc activity).
Free Space	Free space (available region) was found for the segment.
Overlay Candidates	One or more new overlay candidates were made.
Give Up	The attempt to allocate memory was postponed for one of the following reasons:

- More urgent pending activity.
- The clock cycle rate for the clock algorithm exceeded the threshold value.

**Hard Request**

A hard request was used to satisfy the request. If a memory allocation fails, for the highest priority process in the dispatch queue due to excessive memory contention, a hard request is issued to force the segment into memory.

The Launch Activity and Additional Memory Management Activity Summary shows the activity associated with the dispatch of processes. These different types of activity are:

<b>Process Launches</b>	Number of times the dispatcher launched a process. This includes system processes.
<b>Process Swap-Ins</b>	Number of times the dispatcher swapped-in a process. This indicates that the process required one or more memory allocations before it could be launched.
<b>Process Pre-empts</b>	Number of times a process was preempted in order to launch a more urgent process.
<b>Memory Allocations</b>	Number of memory allocations attempted by the Memory Manager. The allocation of space may require more than one attempt.
<b>Special Requests</b>	Number of times there was a request for a segment lock or some form of segment expansion.
<b>MM I/O Reads</b>	Number of times the Memory Manager read a segment into memory.
<b>MM I/O Writes</b>	Number of times the Memory Manager wrote data segments to virtual memory.
<b>Release Data Segments</b>	Number of data segments released by the Memory Manager.
<b>Release Code Segments</b>	Number of code segments released by the Memory Manager.
<b>Clock Cycles</b>	Number of times the Memory Manager returns to the start of linked memory while attempting to make overlay candidates.

The Summary of Disc Activity provides information about each individual disc. This summary also includes an overall summary of all the discs on the system.

<b>All I/O</b>	Number and rate of all reads, writes, and control operations.
<b>Reads</b>	Number and rate of reads.
<b>Writes</b>	Number and rate of writes.
<b>Control Ops</b>	Number and rate of control operations.



## Global Context (#G)

### (Maximum Rates)

Reads	Maximum rate of reads in an interval (USER/MM).
Writes	Maximum rate of writes in an interval (USER/MM).
Control Ops	Maximum rate of control operations in an interval (USER/MM).

The Summary of LP Activity provides information about each individual LP. This summary also includes an overall summary of all the LPs on the system.

All I/O	Number and rate of all writes and control operations.
Writes	Number and rate of writes
Control Ops	Number and rate of control operations.

### (Maximum Rates)

Writes	Maximum rate of writes in an interval.
Control Ops	Maximum rate of control operations in an interval.

The Summary of Tape Activity will give information about each individual tape. This summary also includes an overall summary of all the tapes on the system.

All I/O	Number and rate of all reads, writes, and control operations
Reads	Number and rate of reads
Writes	Number and rate of writes
Control Ops #	Number and rate of control operations

### (Maximum Rates)

Reads	Maximum rate of reads in an interval
Writes	Maximum rate of writes in an interval
Control Ops	Maximum rate of control operations in an interval

## ADDITIONAL COMMANDS

The additional commands in the Global Context allow you to control the generation of hardcopy summary reports. These commands are available from both the Global Resource Usage Report Display and the Process Summary Display in addition to the menu for this context. The commands are:

A - Activate Summary Report Generation

S - Stop Summary Report Generation

R - Generate Single Summary Report

Z - Zero Totals Command

### Activate Summary Report Generation Command (A)

This command activates periodic generation of summary reports and disc file logging. The summary reports are generated on the file OPTREPT with a default device class of "LP".

The command "A" can only be accessed from within the Global Context. When the command is entered, you will be prompted with a four question dialog:

```
MINUTES BETWEEN SUMMARY REPORTS?
REPORTS BETWEEN CLOSING OF REPORT FILE?
NAME OF LOG FILE?
ENTER SUMMARY REPORT IDENTIFICATION (max of 50 chars)
```

The first question allows you to specify the approximate interval at which summary reports are generated. The interval may actually be slightly longer than you have requested because the summary report interval is checked by OPT/3000 after each display interval. For example, suppose the Summary Report interval is set for one minute and the display interval is set at 25 seconds. The first Summary Report will be generated at one minute and 15 seconds. (The display interval elapses at 25 seconds, 50 seconds, one minute 15 seconds, and so on. The first interval to elapse after the one minute Summary Report time is the interval at one minute 15 seconds).

Your response must be a positive integer. If it is not, the message:

```
*** RESPONSE MUST BE POSITIVE INTEGER ***
```

is displayed and the prompt repeated.

The second question allows you to specify the number of summary reports you want to generate before closing the file OPTREPT. This feature is primarily provided to allow the printing of the summary reports before OPT/3000 terminates. It also reduces the possibility of summary reports being lost in the event of a system failure. Note that page numbers on the reports are not reset when OPTREPT is closed.

## Global Context (#G)

If you do not respond with a positive number, you receive the warning:

**\*\*\* RESPONSE MUST BE POSITIVE INTEGER \*\*\***

The third question allows you to identify a log file. If you respond with a **RETURN**, no log file is created. When you specify a valid file name, OPT/3000 checks to see if the file already exists, and if so, prompts you with:

**PURGE OLD COPY OF LOG FILE? (YES/NO)**

If you reply "NO", the log file name prompt is repeated.

If, for some reason, OPT/3000 cannot purge the old copy of your log file, you receive the following message:

**UNABLE TO PURGE OLD COPY OF FILE**

followed by a file system error message and the repeat of log file prompt.

If, for any reason, OPT is unable to open the log file you have specified, you will receive the message:

**UNABLE TO OPEN LOG FILE**

followed by a file system error message. The log file name prompt is repeated. For a description of the log file format, see Appendix B.

The final prompt received after entering the Activate command "A" is:

**ENTER SUMMARY REPORT IDENTIFICATION (max of 50 chars)**  
>

You should now enter a string of up to 50 characters that you want to appear in the heading of each summary report generated. This heading is different from the identification that is specified for the heading of each hard copy display.

Once the above dialog is successfully completed, you are notified by:

**SUMMARY REPORT GENERATION ACTIVATED**

OPT/3000 pauses for approximately three seconds, erases the terminal screen and updates the current display. If the Summary Report is already activated when you enter the Activate Command (A), OPT/3000 displays the message:

**SUMMARY REPORT GENERATION ALREADY ACTIVATED**  
**DO YOU WISH TO TERMINATE REPORT GENERATION? (YES/NO)**

A "NO" response allows Summary Report generation to continue and the previous display to be updated. "YES" terminates the existing report generation and initiates the Activate Command dialog described above.

## Stop Summary Report Generation (S)

This command terminates generation of summary reports. It can only be accessed from the Global Context. When entered, it closes the OPTREPT file if any summary reports have been generated since the last closing of OPTREPT. An overall summary report is produced for the entire time during which summary reports were generated. Note, however, that activity between the last summary report and the termination of summary report generation is not included in the overall summary report.

If the Summary Reporting is not active, entering the Stop (S) command generates the message:

```
SUMMARY REPORT GENERATION NOT ACTIVE
```

If you requested a log file in the Activate (A) command and OPT/3000 is unable to close it, the message

```
UNABLE TO CLOSE LOG FILE
```

is displayed, followed by a file system error message and the prompt:

```
PRESS RETURN TO CONTINUE
```

OPT/3000 pauses until you enter a RETURN.

After Summary Report generation is terminated, OPT informs you by displaying:

```
SUMMARY REPORT GENERATION TERMINATED
```

All totals are reset to zero and OPT/3000 pauses for approximately three seconds before erasing your screen and updating the current display.

## Generate Single Summary Report (R)

This command generates a single copy of a summary report on the file OPTLIST. The command is accessed from the Global Context by entering "R", and is available only when summary report generation is not active. Trying to use this command while summary report generation is active will produce the message:

```
COMMAND NOT ALLOWED WHILE SUMMARY REPORT GENERATION IS ACTIVE
```

If you enter the command (R) under the correct conditions (while summary report generation (A) is not active), OPT/3000 will generate the following message:

```
ENTER HARD COPY IDENTIFICATION (max of 50 chars)
>
```

You should enter a string of up to 50 characters that you want to appear in the heading of each summary report generated.

## Global Context (#G)

Once the above dialog is successfully completed, you are notified by:

**SINGLE SUMMARY REPORT GENERATED ON OPTLIST**

OPT/3000 then pauses for approximately three seconds, erases the above message and updates the current display. Similar to periodic summary report generation, totals are not reset to zero after the single summary report is generated.

## Zero Totals Command (Z)

This command sets the totals used to provide information about the summary reports to zero. It is accessed from the Global Context and is not allowed while summary report generation is active.

If you enter the command while summary report generation is active, the message:

**COMMAND NOT ALLOWED WHILE SUMMARY REPORT GENERATION IS ACTIVE**

is displayed. If the command is entered when summary reporting is not active, OPT/3000 confirms the reset with:

**ALL TOTALS RESET TO ZERO**

OPT/3000 pauses for approximately three seconds, erases the above message, and updates the current display.

# CPU/MEMORY MANAGEMENT CONTEXT (#C)

SECTION

6

The CPU-Memory Manager Context details memory allocation by the Memory Manager and monitors CPU activity.

OPT/3000  
CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT R	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 6-1.  
CPU Memory Manager Context

This context is accessed by entering "#C" between display updates or whenever when OPT/3000 is accepting commands.

Three displays and one menu of commands are available in this context. They are:

- (?) Menu of Commands - CPU-Memory Manager Context
- (R) CPU Memory Management Report Display **\*\*default\*\***
- (C) CPU Usage Display
- (M) Memory Management Activity Display

The CPU-Memory Management Report Display gives a general overview of both the CPU and the Memory Management activity and is the default display. The CPU Usage Display and the Memory Management Activity Display give more detailed analyses of these two system resources.

CPU/Memory Management Context (#C)

Upon entering the CPU-Memory Manager Context, OPT/3000 prompts:

ENTER COMMAND FOR DISPLAY (? FOR MENU):

If you enter an unprogrammed command or **RETURN**, the default display will be generated. By entering a "?", OPT/3000 details display options within this context and all Display Control Commands. This is illustrated in Figure 6-2.

```
***** MENU OF COMMANDS --- CPU-MEMORY MANAGER DISPLAY CONTEXT *****
```

***DISPLAYS***	***CONTROL OPERATIONS***
C CPU USAGE	#A ALTER LINE DRAWING CHAR SET POSITION
M MEMORY MANAGEMENT ACTIVITY	#C ENTER CPU-MEMORY MANAGER CONTEXT
R CPU-MEMORY MANAGEMENT REPORT (default)	#G ENTER GLOBAL CONTEXT
	#H CONTINUOUS HARD COPY GENERATION
	#I ENTER I/O CONTEXT
	#L CLOSE LISTING FILE
	#M ENTER MEMORY CONTEXT
	#P ENTER PROCESS CONTEXT
	#S SUSPEND OPT (UNTIL USER INPUT)
	#T ENTER SYSTEM TABLES CONTEXT
	#? MENU OF CONTROL OPERATION COMMANDS

***DISPLAY CONTROL***
E EXIT
H HELP
L LISTING (GENERATE HARD COPY)
T TIME CHANGE (OF UPDATE INTERVAL)
X DEFINE XEQ SEQUENCE
: MPE COMMAND
? MENU DISPLAY
! NOTE COMMAND

COMMAND?

Figure 6-2. Menu of Commands - CPU Memory Manager Display Context

Responding to the menu prompt:

COMMAND?

with an unprogrammed character (or a **RETURN**) generates this context's default display.

**CPU-MEMORY MANAGEMENT REPORT DISPLAY (R)**

The CPU-Memory Management Report Display is accessed by entering "R" while in the CPU-Memory Manager Context.

```

CPU-MEMORY MANAGEMENT REPORT          CURRENT INTERVAL:    3.9 SECONDS  10:22 AM
                                       OVERALL INTERVAL:    .1 MINUTES

PROCESS LAUNCHES      10  20  30  40  50  60  70  80  90  100 per second
                        *!                                     (20/19)
PROCESS SWAP-INS     $                                     (4/4)

MEMORY ALLOCATIONS   $                                     (4/4)
-----
CURRENT CPU STATE    B  10  20  30  40  50  60  70  80  90  100%
OVERALL CPU STATE    B  10  20  30  40  50  60  70  80  90  100%
                        BI                                     IXXO
                        BI                                     IXXO

CURRENT MM ACTION    F                                     F      (15)
OVERALL MM ACTION    F                                     F      (19)
-----
LEGEND: CPU STATE
B CPU busy           I Idle
P Pause swap & disc G Garbage collection
D Pause / disc I/O M Mem alloc (seg)
S Pause/segment swap O Overhead (ICS)
X Cache Management for Process

LEGEND: MM ACTION
R Recover OL cand
O Made overlay cand G Give up
F Found free space  H Hard request
-----
LEGEND: PROCESS LAUNCHES & SWAP-INS, & MEMORY ALLOCATIONS
! CURRENT          ! MAX      * MEAN    $ BOTH MEAN & CURRENT
ENTER: C CPU DISPLAY
           M MM DISPLAY

```

Figure 6-3. CPU-Memory Management Report

This display is the default for the context and provides summary level information about CPU and memory management activity in three different areas:

- Information about the rate per second occurrence of:

Process launches  
Process swap-ins  
Memory allocations

- Breakdown of CPU states
- Breakdown of the results of all memory allocation attempts



## Display Description

The first section of the screen features a bar graph measuring the rate per second of process launches, process swap-ins, and memory allocations. The gray area (inverse video half-bright) shows the rate per second during the current sampling interval of the three events and is delimited with an ! at the end. The white area (inverse video, full bright) of the bar indicates the maximum rate per second over all intervals. The asterisk (\*) denotes the average rate per second over all intervals since the last summary report was generated. The current interval is measured in seconds and the overall interval is measured in minutes. All rates are measured per second. If the current rate portion of the bar (!) and the mean are in the same location, a "\$" is displayed there. All rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed. If no gray area appears, the rate for the current interval is less than 0.5 per second. If no white area is present, the current rate is also the maximum rate. OPT/3000 also displays the rate in the form (current rate / maximum rate) to the right of the bar.

The second section of the screen features a percentage bar that breaks CPU activity and memory management into subcategories. Subcategories of CPU activity are shown as a percentage of overall CPU activity. Subcategories of memory management appear as a percentage of all memory allocations requested. All percentages are rounded to the nearest two percent and are then further adjusted so that they total 100 percent. The total number of memory management actions during the current and overall intervals is displayed in parentheses to the right of the respective bar graph.

The bottom third of this display contains a legend for the CPU and Memory Manager activity bars and a separate legend for process activity and memory allocation rate bars.

## Interpretation Guidelines

- A true CPU utilization factor is obtained by adding the CPU busy, memory allocation, garbage collection, cache management, and ICS overhead percentages.
- Background garbage collection takes place only when the CPU would otherwise pause (disc & swap, disc, swap, or or idle pauses).
- No idle time should be observed as long as at least one batch job is active.
- Total user wait time  $\leq$  pause disc + pause disc & swap.
- Total system wait time  $\leq$  pause swap + pause disc & swap.

## Legend

The following three events are tallied on rate per second bars:

Process Launch	Number of times the dispatcher launched a process, including system processes.
Process Swap-In	Number of times the dispatcher swapped-in a process. This indicates that the process required one or more memory allocations, before it could be launched.
Memory Allocation	Number of memory allocations attempted by the Memory Manager. The allocation of space may require more than one attempt.

## CPU State Descriptions

The CPU state percentage bars detail the CPU time spent in each of the nine following states:

B (BUSY)	CPU time for system and user processes.
P (PAUSED FOR DISC AND SWAP)	CPU waiting for completion of both user and memory management disc I/O.
D (PAUSED FOR DISC)	CPU waiting for completion of user disc I/O only.
S (PAUSED FOR SWAP)	CPU waiting for completion of memory management disc I/O only.
I (IDLE)	No process requires service.
G (GARBAGE COLLECTION)	CPU time on global garbage collection.
M (MEMORY ALLOCATION)	CPU time on memory allocation.
O (ICS OVERHEAD)	CPU time while executing on the Interrupt Control Stack.
X (CACHE MANAGEMENT FOR PROCESS)	CPU time for cache management for system and user processes.

## Memory Management Action Descriptions

The memory management action bars detail the percentage of methods used in response to memory requests. Five memory management actions are possible:

- |                       |  |
|-----------------------|--|
| R (RECOVERY)          | Segment was recovered from overlay candidate state, either at the time of a fault or during a process swap-in (i.e., no disc activity).  |
| F (FREE SPACE)        | Free space (available region) was found for the segment.   |
| O (OVERLAY CANDIDATE) | One or more new overlay candidates were made.  |
| G (GIVE UP)           | The attempt to allocate memory was postponed for one of the following reasons: <ul style="list-style-type: none"><li>• More urgent activity pending.</li><li>• The clock cycle rate for the clock algorithm exceeded the threshold value.</li><li>• Another process will be ready to run soon.</li></ul> |
| H (HARD REQUEST)      | A hard request was used to satisfy the request. If a memory allocation fails for the highest priority process in the dispatch queue due to excessive memory contention, a hard request is issued to force the segment into memory.   |

### CPU USAGE DISPLAY (C)

The CPU Usage Display is accessed by entering "C" while in the CPU-Memory Manager Context. This display provides detailed information about CPU usage during both the current sampling interval and since the last summary report was generated. Information is provided about the occurrence of various CPU states during the interval and the rate of process launches and pre-emptions.

CPU USAGE DISPLAY		CURRENT INTERVAL:		14.1 SECONDS	9:36 AM							
		OVERALL INTERVAL:		2.5 MINUTES								
		10	20	30	40	50	60	70	80	90	100%	
CURRENT CPU STATE	B	BDDI										IXXO
OVERALL CPU STATE	B	BDI										IXO
PROCESS LAUNCHES			*	!								per second
PROCESS PREEMPTS			*	!								(20/21)
											(5/4)	
CPU STATE INFO	AVG TIME IN STATE (ms)		STATE PERCENTAGES		AVERAGE CPU TIME PER TRANSACTION OF INTERACTIVE PROCESSES							
	CURRENT	OVERALL	CURRENT	OVERALL								
CACHE MAM-PROC STK	48	35	3.4%	1.8%	CURRENT: 258 MS MAXIMUM: 288 MS							
CACHE MAM-ICS	0	0	.3%	.1%								
SEGMENT MAM - ICS	3	3	.7%	.3%								
PAUSED DISC & SWAP			.0%	.0%								
PAUSED FOR DISC	20	26	3.2%	1.5%								
PAUSED FOR SWAP	15	23	.4%	.4%								
IDLE	224	166	79.2%	80.5%								
GARBAGE COLLECTION			.0%	.0%								
CPU BUSY	6	9	11.3%	14.0%								

B CPU busy	P Pause disc & swap	D Pause disc	S Pause swap	! CURRENT	MAX * MEAN
I Idle	G Garbage collect	M Mem all-seg	O Overhead	\$ BOTH MEAN & CURRENT	

Figure 6-4. CPU Usage Display

### Display Description

The top section of the display reflects current and overall use of the CPU. The CPU state is broken down into categories by a percentage bar with each subcategory shown as a percentage of the overall category. All percentages are rounded to the nearest two percent and are then further adjusted so that they total 100 percent. The inverse video half- and full-bright are used to distinguish between the nine CPU states. As indicated at the top of the screen, current interval length is shown in seconds and overall interval length is shown in minutes.

## CPU/Memory Management Context (#C)

The second section of this display shows the rate per second of process launches and process preemptions. The gray area, or inverse video half-bright area of the bar used here, shows the rates per second during one sampling interval and is delimited by an exclamation mark (!) to denote the end. The white, or inverse video full-bright area of the bar, indicates the maximum rate per second observed during any interval. The presence of an asterisk (\*) indicates the average rate per second of launches or preemptions since the last summary report was generated. If the end of the current rate of the bar (!) and the mean fall in the same location, a "\$" is displayed.

All rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed. If no gray area is present, the rate for the current interval is less than 0.5 per second. If no white area is present, the current rate is also the maximum rate. The current and maximum rates will appear to the right of the bar in the form (current rate / maximum rate).

The third section of the screen shows the mean time the CPU spent in various states, measured in seconds, for both the current and overall intervals. The ICS overhead state is not shown in this particular portion of the display. The average time indicated is the number of milliseconds that the CPU spent in the specified state until the dispatcher was next entered. If no value is displayed for a particular state, then the state did not occur during the interval.

Also shown in this section is the percentage of time in each state for the current and overall intervals. Note that the interval length at the top of the screen is measured in seconds and must be converted to milliseconds in order to calculate the percentages shown.

The fourth part of the screen shows the average CPU time per transaction of interactive processes. It shows both a mean time and a maximum time in milliseconds.

## Interpretation Guidelines

- A true CPU utilization factor is obtained by adding the CPU busy, CPU on memory allocation and caching, and ICS overhead percentages.
- The average time in the CPU state is the CPU time between process quiesces.
- Large "average short transitions" value means that the workload of the system consists of mainly CPU-bound transactions.
- No idle time should occur if at least one batch job is active.
- ICS overhead includes dispatcher activity and interrupt handling.
- Total user wait time  $\leq$  pause disc + pause disc & swap.
- Total system wait time  $\leq$  pause swap + pause disc & swap.

**Legend****CPU State**

Subdivides elapsed time for the interval into nine CPU states on a percentage bar.

The nine CPU states are:

B	(BUSY)	CPU time for system and user processes.
P	(PAUSED FOR DISC AND SWAP)	CPU waiting for completion of both user and memory management disc I/O.
D	(PAUSED FOR DISC)	CPU waiting for completion of user disc I/O.
S	(PAUSED FOR SWAP)	CPU waiting for completion of memory management disc I/O.
I	(IDLE)	No process requiring service.
G	(GARBAGE COLLECTION)	CPU time on garbage collection.
M	(MEMORY ALLOCATION)	CPU time on memory allocation.
O	(ICS OVERHEAD)	CPU time while executing on the Interrupt Control Stack.
X	(CACHE MANAGEMENT)	CPU time for cache management.

**Process Launches**

Rate per second the dispatcher launched a process, including system processes.

**Process pre-empts**

Rate per second of process pre-empts in order to launch a more urgent process.

## MEMORY MANAGEMENT ACTIVITY DISPLAY (M)

The Memory Management Activity Display is accessed by entering "M" while in the CPU-Memory Management Context.

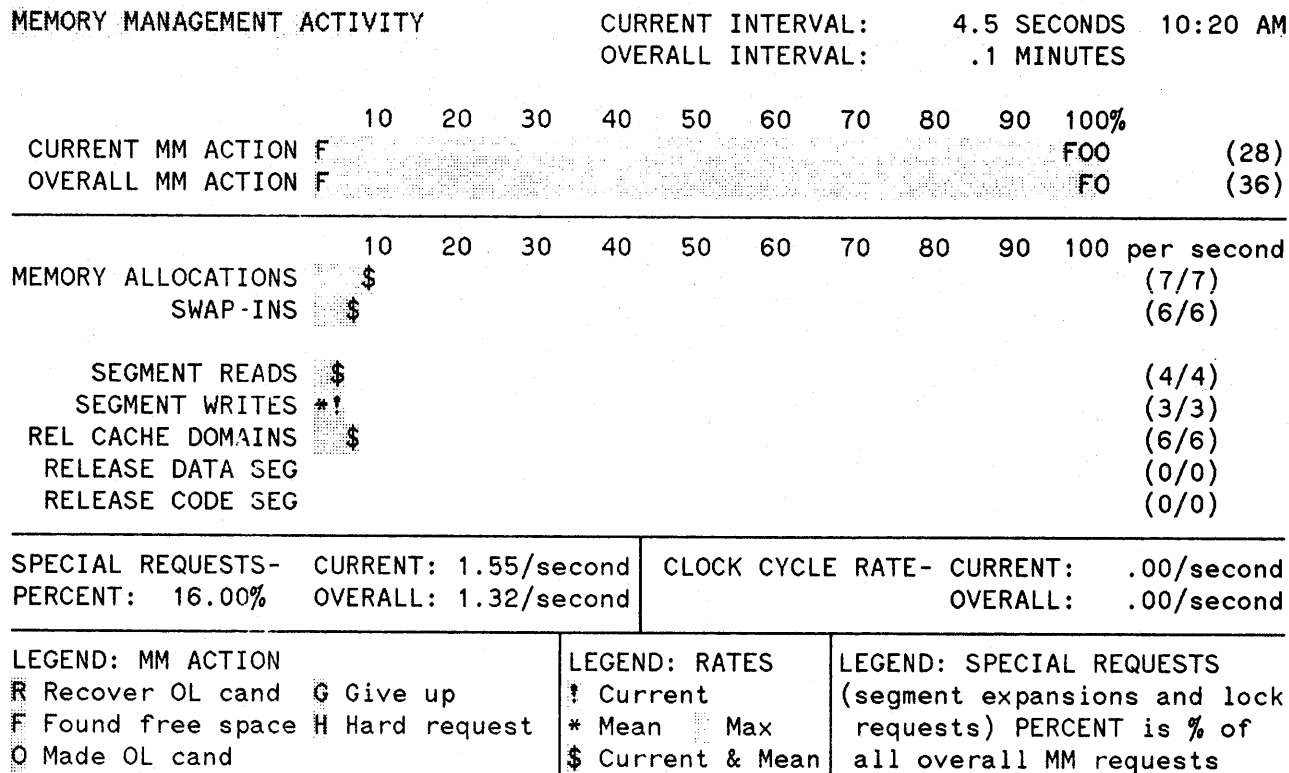


Figure 6-5. Memory Management Activity

This display provides detailed information on Memory Management Activity for the current sampling interval and since the last summary report was generated. Specifically, the screen displays the rate of memory allocation attempts by the Memory Manager, the results of the attempts, the amount of memory management-related disc I/O's, and the number of segments released from memory by the Memory Manager.

### Display Description

The first section of this screen displays current and overall memory management action on a percentage bar. This bar breaks down memory management actions into subcategories with each subcategory shown as a percentage of the total. All percentages are rounded to the nearest two percent and adjusted after rounding so they total 100 percent. The total number of memory management actions during the current and overall intervals is displayed in parentheses to the right of the respective bar graph.

The second section measures the rate per second of current and overall memory allocations, process swap-ins, segment reads and writes, and the release of cache domains, data and code segments. The rates are also displayed in numerical form on the right. The format is (current rate/overall rate).

The gray area (inverse video half-bright) shows the rate during the current sampling interval and is delimited by an "!". The white area (inverse video full-bright) shows the maximum rate per second during any interval. The asterisk indicates the mean rate per second since the last summary report was generated. As indicated at the top of the screen, length of the current display is shown in seconds and length of the overall interval is shown in minutes. A "\$" indicates that the end of the current rate bar equals the mean rate.

All rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed. If no gray area appears, the rate for the current interval is less than 0.5 per second. If no white area appears, the current rate is also the maximum rate.

The third section on the Memory Management Activity Display provides information about memory management special requests and memory management clock cycles. A special request is either a lock request or some form of segment expansion. A clock cycle occurs when the Memory Manager returns to the start of linked memory while attempting to make overlay candidates. Both of these events are measured by their current and overall rates per second.

The percentage of special requests to the Memory Manager is also shown. Because of the relative infrequency of these events, the current and overall rates per second are shown to the nearest two decimal places.

## Interpretation Guidelines

- Because the majority of special requests are for segment expansions, each such request normally requires one memory management I/O read and one memory management I/O write.
- If the percentage of special requests is high (greater than ten percent), then either an excessive number of special requests is occurring, or memory management requests are very few, which in turn makes the special request percentage high.
- If the combined rate of memory management I/O reads and writes is high (greater than ten percent), then this may be an indication of memory pressure due to the current workload. If disc caching is enabled, you should also examine the memory management disc I/O rate. If rate greater than 5-10 per second, then it is excessive.
- If the combined rate of data, cache domains and code segment releases is high (greater than ten per second), then this may be an indication of memory pressure due to the current workload.



## Legend

### Memory Management Action

Subdivides all memory allocation attempts (both during swap-ins and at the time of a fault) into five possible actions on a percentage bar. The total number of attempts appears to the right of each bar.

The following five Memory Management actions are represented:

- |   |                     |   |
|---|---------------------|---|
| R | (RECOVERY)          | Segment recovered from overlay candidate state, either at the time of a fault or during a process swap-in (i.e., no disc activity).   |
| F | (FREE SPACE)        | Free space (available region) was found for the segment.  |
| O | (OVERLAY CANDIDATE) | One or more new overlay candidates were made.   |
| G | (GIVE UP)           | The attempt was postponed for one of the reasons below: <ul style="list-style-type: none"><li>• More urgent pending activity.</li><li>• The clock cycle rate for the clock algorithm exceeded the threshold value.</li></ul>        |
| H | (HARD REQUEST)      | A hard request was used to satisfy the request. If a memory allocation fails, for the highest priority process in the dispatch queue due to excessive memory contention, a hard request is issued to force the segment into memory. |

# MEMORY CONTEXT (#M)

The Memory Context provides detailed information on the system's use of main memory. This context can be accessed from any context by entering "#M" between display updates, or whenever OPT/3000 is accepting commands.

OPT/3000  
CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT R	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 7-1. - Memory Context

Eight displays and one menu of commands are available in this context. They are:

- (? ) Menu of Commands - Memory Context
- (R ) Memory Report Display
- (M ) Memory Contents Display
- (B ) Bank Contents Display
- (O ) Overall Histogram Display
- (C ) Code Segment Size Histogram Display
- (D ) Data Segment Size Histogram Display
- (S ) Stack Segment Size Histogram Display
- (F ) Free Area Size Histogram Display

## Memory Context (#M)

The Memory Report, Memory Contents, and Bank Contents Displays are layered, so that each display provides more detailed information than the previous display. The Memory Report provides global information about the utilization and contents of main memory, and is the default display for this context. The Memory Contents Display provides more detailed information about the current contents of memory, and the Bank Contents Display breaks the contents of memory down even further into individual banks of memory (64K words) and their current contents.

The Overall Histogram Display and the three segment size histogram displays are layered in a similar fashion. The Overall Histogram Display indicates the distributions of segment sizes for code, stack, and data segments, while the individual segment size histogram displays provide higher resolution distributions for each individual type of segment.

Upon entering the Memory Context, OPT/3000 prompts you for the context display you wish to see with:

ENTER COMMAND FOR DISPLAY (? FOR MENU):

If you enter an unprogrammed command, or **RETURN**, the Memory Report is generated by default.

If you choose the Menu (?) you can obtain a menu screen of display options and all the Display Control Commands within this context. See Figure 7-2.

### \*\*\*\*\* MENU OF COMMANDS --- MEMORY DISPLAY CONTEXT \*\*\*\*\*

***DISPLAYS***	***CONTROL OPERATIONS***
B BANK CONTENTS	#A ALTER LINE DRAWING CHAR SET POSITION
C CODE SEGMENT SIZE HISTOGRAM	#C ENTER CPU-MEMORY MANAGER CONTEXT
D DATA SEGMENT SIZE HISTOGRAM	#G ENTER GLOBAL CONTEXT
F FREE AREA SIZE HISTOGRAM	#H CONTINUOUS HARD COPY GENERATION
O OVERALL HISTOGRAMS	#I ENTER I/O CONTEXT
M MEMORY CONTENTS	#L CLOSE LISTING FILE
R MEMORY REPORT (default)	#M ENTER MEMORY CONTEXT
S STACK SEGMENT SIZE HISTOGRAM	#P ENTER PROCESS CONTEXT
	#S SUSPEND OPT (UNTIL USER INPUT)
	#T ENTER SYSTEM TABLES CONTEXT
	#? MENU OF CONTROL OPERATION COMMANDS
***HISTOGRAM OPTIONS***	***DISPLAY CONTROL***
A ALL SEGMENTS	E EXIT
N NON-USER (SYSTEM) SEGMENTS ONLY	H HELP
P PRESENT SEGMENTS ONLY (default)	L LISTING (GENERATE HARD COPY)
U USER SEGMENTS ONLY	T TIME CHANGE (OF UPDATE INTERVAL)
***OTHER MEMORY CONTEXT COMMANDS***	X DEFINE XEQ SEQUENCE
K KEEP CURRENT MEMORY BLOCK	. MPE COMMAND
	? MENU DISPLAY
	! NOTE COMMAND
	COMMAND?

Figure 7-2. Menu of Commands - Memory Display Context

The display will prompt you with:

COMMAND?

Responding with an unprogrammed command (or a **RETURN**) will generate this context's default display.

## MEMORY REPORT DISPLAY (R)

The Memory Report Display is the default display for the Memory Context. It is accessed by entering "R" from within the Memory Context.

```

MEMORY REPORT DISPLAY 64 BANKS: 4131328 WORDS OF LINKED MEMORY          9:41 AM

      10  20  30  40  50  60  70  80  90 100%
ALL MEMORY MC      CS SD DX                                     X
LINKED MEMORY F FA                                     AO
CODE SEGMENTS U      US      S
                P      PC      C
STACK SEGMENTS U      US S
EXTRA DATA SEGMENTS U      US S
                    N      NF      FT T
  
```

LEGEND: ALL MEMORY	LEGEND: LINKED MEMORY	LEGEND: SEGMENT TYPES
M Resident MPE	A Active Segments	U User Segments
C Code Segments	O Overlay Candidates	N Non-special EDS
S Stack Segments	F Frozen, Locked, or	S System Segments
D Extra Data Segments	I/O Frozen Segment	F File System EDS
X Cache Domains		P Program File
		J Job Management
		C CST Segments
		T System Tables
		K KSAM Segments
		I IMAGE Segments

Figure 7-3. Memory Report Display

This display provides information about current memory contents and utilization. The Memory Report Display provides a global overview of current memory contents and is less detailed than the Memory Contents or Bank Contents Displays.

### Display Description

The display divides memory usage into five categories: all of memory, linked memory, code segments, stack segments, and extra data segments. Each of these categories is further divided into subcategories, and the percentage of subcategory is indicated, rounded to the nearest two percent. The number of memory banks and the size of linked memory (in words) are shown at the top of the screen.

### Interpretation Guidelines

- If a high percentage of linked memory is locked, frozen, or I/O-frozen, the Memory Manager may have difficulty finding a place in memory for large segments, depending upon the location of the frozen segments.
- If the amount of memory occupied by a particular type of segment is small (e.g., extra data segments), then the breakdown of segment usage for that category is not of major importance.

## Legend

ALL MEMORY - 100% represents all configured main memory. The unhighlighted portion of memory is freespace.

(M)	Memory Resident MPE	Memory permanently allocated to MPE for system tables and system code.
(C)	Code Segments	Linked memory that currently contains code segments.
(S)	Stack Segments	Linked memory that currently contains stack segments.
(D)	Extra Data Segments	Linked memory that currently contains data segments, excluding stacks.
(X)	Cache Domains	Linked memory that currently contains cached disc domains.

LINKED MEMORY - 100% represents all memory except memory resident MPE.

(A)	Active Segments	Segments that have been recently referenced.
(O)	Overlay Candidates	Segments selected by Memory Manager for possible removal from memory.
(F)	Frozen, Locked, and I/O frozen	Segments that cannot be removed from memory by the Memory Manager.

Code and Data segments are categorized by usage and by source. The top part of the bar shows what percentage of the segments in memory are user segments and what percentage are system segments. The bottom portion of the bar indicates the source of the segment.

CODE SEGMENTS - 100% represents all memory occupied by code segments

### USAGE

(U)	User Segments	Segments not marked as system segments.
(S)	System Segments	Segments marked as system segments.

### SOURCE

(P)	Program File	Segments from a program file.
(C)	CST Segments	Segments from a system, account, or group segment library (SL).

STACK SEGMENTS - 100% represents all memory occupied by stack segments.

- |     |                 |   |
|-----|-----------------|---|
| (U) | User Segments   | Segments not marked as system segments. |
| (S) | System Segments | Segments marked as system segments.     |

EXTRA DATA SEGMENTS - 100% represents all memory occupied by data segments that are not stacks.

#### USAGE

- |     |                 |   |
|-----|-----------------|---|
| (U) | User Segments   | Segments not marked as system segments. |
| (S) | System Segments | Segments marked as system segments.     |

#### SOURCE

- |     |                |  |
|-----|----------------|--|
| (N) | Non-special    | Extra data segments whose usage could not be determined.                                 |
| (F) | File System    | Extra data segments obtained by the file system.   |
| (J) | Job Management | Extra data segments obtained by the system for information related to sessions and jobs. |
| (I) | IMAGE/3000     | Extra data segments obtained by IMAGE/3000.  |
| (K) | KSAM/3000      | Extra data segments obtained by KSAM/3000.   |
| (T) | System Tables  | Extra data segments containing MPE tables that do not reside in memory resident MPE.     |

# MEMORY CONTENTS DISPLAY (M)

MEMORY CONTENTS DISPLAY		9:47 AM
BANK	1 2 3 4 5 6	%ACTIVE
020	x x x xxx x c x S xx x x x x x x P x x	80.1
021	x xxFxxx xx P x D F x xxxxx x Fx x x x x x xx	80.7
022	xt x c x x x xxxx S x C c x xx	73.8
023	S x C xxxx c x x x P D x xxx t x xx x x	74.0
024	c P x F Dx x x xx F D S F x xx D c x	93.0
025	c x x xxxx c xxxx c p x S x x P xxxx c x x	97.9
026	xx Dx x x x x x x x x x x x P xp	55.1
027	S xx F x P xxxxxxxxxxxx x	66.2
030	c S xxxx P P xxx C c xxxxxxxxxxxx x P xx x P x x xxxx	90.2
031	xxxxx DD x x F xx x xxxx xxx x x x x x c xxx t F xxx c xx D	87.3
032	c x xx x S x x P xx xxxx C x P Dxx c x x x x	97.5
033	P xx D I F F xx F x P F x D S Dxxx x x c x	85.2
034	x S xxxx x x xxxx x x x C x x C x x xxx D	96.1
035	D x x x x C x S xxxx P x x D x x C S x D	98.2
036	x x x x x Ix C P P c C x D	82.8
037	x x x x F x c c x t D F x x x x x S	70.3

LINKED MEMORY STATISTICS (ACTIVE)		OVERLAY CANDIDATE STATISTICS	
NUMBER OF SEGMENTS:	404	TOTAL WORDS:	870528
# FROZEN SEGMENTS:	0	NUMBER OF SEGMENTS:	44
# LOCKED SEGMENTS:	0	TOTAL WORDS:	66048
% OF MEMORY:	21.1%	% OF MEMORY:	1.6%

Figure 7-4. Memory Contents Display

To access the Memory Contents Display, enter "M" from anywhere within the Memory Context while OPT/3000 is accepting commands.

This display generates an image of the current contents of each bank of main memory, and provides summary statistics about memory contents. The display provides a more detailed look at memory than does the Memory Report Display, but provides less detail on current memory than does the Bank Contents Display.

The Memory Contents Display requires a minimum of 8K terminal display memory. Insufficient display memory generates the following message:

```
THIS TERMINAL HAS INSUFFICIENT DISPLAY MEMORY.
TO COMPLETELY DISPLAY ALL OF MEMORY. A MINIMUM
OF (8K/12K) MEMORY IS REQUIRED FOR THE FULL DISPLAY.
DO YOU WISH TO TRY ANYWAY?
```

Replying "NO" updates the previous display.

A maximum of 16 banks (2MB) can be displayed on a screen at one time. Each time the screen is updated the next 16 banks are displayed. If you want to keep the same set of 16 banks in the display, enter K. To see the next 16 banks, enter a K a second time.

## Display Description

The Memory Contents Display can consist of up to 16 lines, where each line represents one bank (64 K words) of memory. Each character position represents approximately 1 K words of memory. Note that each individual segment is shown in either inverse video or inverse video half-bright. As with the Bank Contents Display, the color has no significance other than to distinguish between adjacent segments. Free areas are not explicitly shown.

The right side and bottom of the screen are used to display the summary statistics. To the right, the percentage of linked memory within a bank occupied by active segments is indicated for each bank of memory. An active segment is any segment that is not an overlay candidate.

<b>NOTE</b>
-------------

Percentages displayed on the right do not necessarily correspond to the length of the line since some character positions can represent segments of less than 1K memory. The restriction on the size of a character position limit the data that can be graphed. The numerical values are the most accurate.

The bottom of the display provides the following statistics for all of memory:

- Number of active segments
- Number of frozen and I/O-frozen segments
- Number of locked segments
- Number of overlay candidates
- Total size of all active segments (words)
- Total size of all overlay candidates (words)
- Percentage of linked memory occupied by active segments
- Percentage of linked memory occupied by overlay candidates

The summary statistics provided in the hard copy of the Memory Contents Display are slightly different from those shown on your terminal. In addition to the percentage of active memory in each bank, the number of segments, and the percentage of linked memory occupied by each of the following categories are provided:

- Stacks
- Mapped cache domains
- Unmapped cache domains
- Code segments from segmented libraries (CST)
- Code segments from program files (CSTX)



## Memory Context (#M)

- System table data segments
- File system data segments
- Job management data segments
- IMAGE/3000 data segments
- KSAM/3000 data segments
- Data segments (usage unknown)
- Active segments
- Overlay candidates
- Frozen, locked, and I/O-frozen data segments

## Interpretation Guidelines

- Frozen segments (blinking) in the middle of a bank cause problems for the Memory Manager. I/O-frozen segments typically remain in that state for only one or two display updates. Segments which blink for long periods of time are most likely frozen.
- Locked segments are near bank boundaries.
- A segment "changes color" if the number of segments preceding it in the bank have changed. A change of color does not signify change in the usage or status of the segment.
- Keep in mind that an individual segment can be both swapped into memory and swapped out of memory between display updates. This display does not provide a complete history of the contents of memory.

## Legend

The number of characters used to represent a segment is determined by the following steps. The region or subregion headers are included in this calculation.

- The size of the segment is rounded to the nearest multiple of 1 K (1024) words.
- The number of character positions is the number of 1K blocks in the rounded segment size.

Because all segments use at least one character position, it is possible that more than 64 characters are required to represent the contents of a bank. The numbers which appear along the top of the display do not indicate the starting position of a segment within a bank, but rather are supplied to help you determine the approximate size of a segment. The memory-resident portion of MPE is indicated in the line for bank zero.

The usage of each segment can be determined from the display by the letter appearing in the area representing the segment as follows:

- C - Code segment from system, account, or group segmented library (SL)
- D - Extra data segment (usage unknown)
- F - File system data segment
- I - IMAGE/3000 data segment
- J - Job management data segment
- K - KSAM/3000 data segment
- P - Code segment from program file
- S - Stack
- T - System table data segment
- X - Cache Domain

A segment is further qualified by the following:

- Lowercase letter - System segment or unmapped cache domain
- Upper case letter - User segment or mapped cache domain
- Underlining - Segment is overlay candidate
- Blinking - Segment is locked, frozen, or I/O frozen



If your response is not an octal integer, the message

BANK NUMBER MUST CONSIST OF OCTAL DIGITS

is displayed, and you will be prompted again for an octal number. Once you have entered an octal integer, OPT/3000 checks to ensure it is a valid bank number. If it is invalid, the following appears:

BANK NUMBER MUST BE BETWEEN 0 AND X

where X represents the number of banks in your memory configuration. You are then prompted to enter another bank number.

## Display Description

The numbers at the left margin and top reference segment addresses; those at the left are the most significant numbers and those at the top are the least significant.

Each Bank Contents Display consists of 16 lines with room for 64 (77 octal) characters in each line. Each character position represents 64 words of memory, allowing for representation of 4096 memory words per line. Each segment in the display is shown in either inverse video full-bright (white) or inverse video half-bright (gray). The color has no significance in the bank displays other than to distinguish between adjacent segments. Free areas are represented by dark (blank) areas.

OPT/3000 internally rounds segments to the nearest multiple of 64 words, and segments smaller than 64 words do not appear in the main display, but rather appear at the bottom of the display in the section labeled "SEGMENTS TOO SMALL TO DISPLAY". The starting address, segment type, and segment size (in words) are indicated for each segment in this section. Information for up to 12 segments can be provided in this area.

The far right side of the screen provides summary statistics for the bank under examination. For each of eight categories, statistics detail the number of segments or areas in the category and the percentage of linked memory within the bank occupied by segments in that category. The categories for which summary statistics are provided include:

Active segments - (not marked as overlay candidates)

Free areas

Overlay candidates

Code segments

Stack segments

Extra data segments (not including stacks)

Cache domains

Frozen, locked, and I/O-frozen segments

## Memory Context (#M)

A hard copy of the Bank Contents Display provides the following additional categories:

Active segments

Overlay candidates

Code segments from segmented libraries (SL)

Code segments from program files

Stacks

File system data segments

IMAGE/3000 data segments

KSAM/3000 data segments

Job management data segments

System table data segments

Data segments (usage unknown)

Frozen, locked, and I/O-frozen data segments

Free areas

Mapped Cache domains

Unmapped cache domains

## Interpretation Guidelines

- A single segment (or free area) may span more than one line of the display.
- All guidelines listed for the Memory Contents Display also apply to this display.

## Legend

The type of each segment appearing on the display is determined from the letter printed on the bar. Lack of space precludes a Legend section on this screen, so the following information is only available in this manual and from the Help (H) command:

- R - MPE memory resident segment
- C - Code segment from system, account, or group segmented library (SL)
- D - Extra data segment (usage unknown)
- F - File system data segment
- I - IMAGE/3000 data segment
- J - Job management data segment
- K - KSAM/3000 data segment
- P - Code segment from program file
- S - Stack
- T - System table data segment
- X - Cached disc domains

In addition, the segment is qualified in the following way:

- Lowercase letter - System segment or unmapped cache domain
- Upper case letter - User segment or mapped cache domain
- Underlining - Segment is overlay candidate
- Blinking - Segment is locked, frozen, or I/O frozen

As mentioned in the Display Description section, each character position represents 64 words. The number of characters used to represent a segment is determined not by the size of the segment, but rather by the location of the start and end of the segment within the bank. The region and subregion headers or free space preceding the segment are considered part of the segment when these calculations are performed. The number of character positions used to represent an area is determined as follows:

- The start and end addresses of the area are rounded to the nearest multiple of 64.
- The number of character positions required is the number of 64-word blocks between the rounded start and end addresses.
- If the rounded start and end addresses are identical, (possible if the segment is smaller than 64 words), the segment is not shown in the primary display, but is listed in the "SEGMENTS TOO SMALL TO DISPLAY" area of your screen.

## OVERALL HISTOGRAM DISPLAY (O)

The Overall Histogram Display is accessed by entering "O" from anywhere in the Memory Context when OPT/3000 is accepting commands.

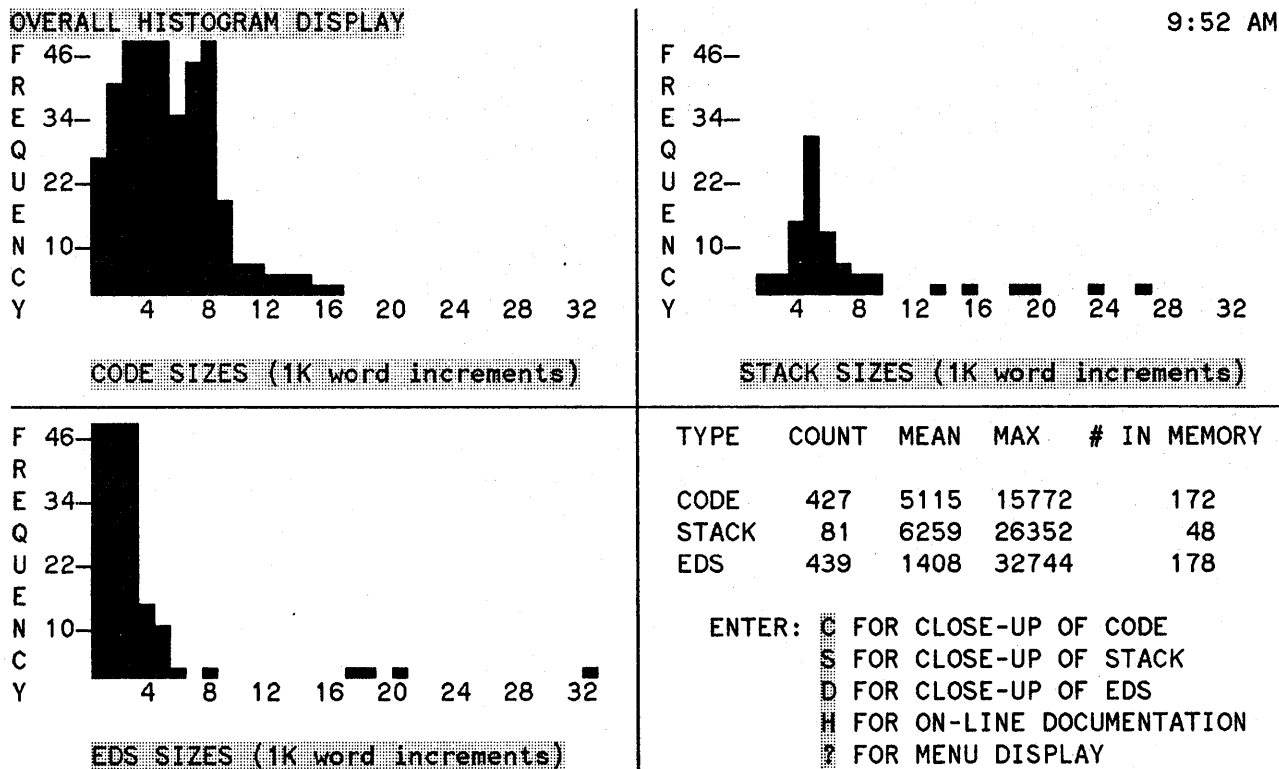


Figure 7-6. Overall Histogram Display

This display is the highest level histogram display available and provides frequency distribution bars and summary statistics for code, stack, and extra data segment sizes. Depending on user input of additional commands (explained at the end of Memory Context Section), segments actually included in the display vary.

### Display Description

The display is divided into four sections, one for each of the three histograms, and one for the summary statistics. The line drawing character set on your terminal produces the histograms. The horizontal axis represents the segment size in 1K word increments, so that the first column includes all segments between 0 and 1K words, the second column includes all segments between 1K and 2K words, and so on. The height of the column indicates the frequency count or the number of segments of a given size. All counts are rounded up to the nearest multiple of two, so counts of 1 and 2, for example, are indistinguishable. The line drawing character set allows a resolution of three units per character position, so the maximum frequency count that can be represented is 48.

## Interpretation Guidelines

- Frequency counts greater than 48 are truncated to 48.
- The tick marks and labels on the vertical axis are aligned with the middle of a character position, not the top of the position.
- The "A" additional command includes absent segments (such as data segments in virtual memory) in addition to the segments in main memory.
- If the distributions indicate a significant number of large segments (greater than 10K), then the memory manager may have difficulty satisfying requests for absent segments.

## Legend

Four statistics are reported on each of the three histograms:

- The number of segments included in the histogram.
- The mean size (number of words) of all segments included in the histogram.
- The largest segment size (number of words) included in the histogram.
- The number of segments included in the histogram which are currently in memory (present).



## CODE SEGMENT SIZE HISTOGRAM DISPLAY (C)

The Code Segment Size Histogram Display is one of three segment histograms that make up the Overall Histogram Display. It uses higher resolution than the overall histogram, and describes distribution more precisely. Use it when the maximum frequency count of 48 has been reached on the code segment portion of the Overall Histogram Display. (You can, however, access it from any display in the Memory Context by entering "C" while OPT/3000 is accepting commands).

### CODE SEGMENT SIZE HISTOGRAM DISPLAY

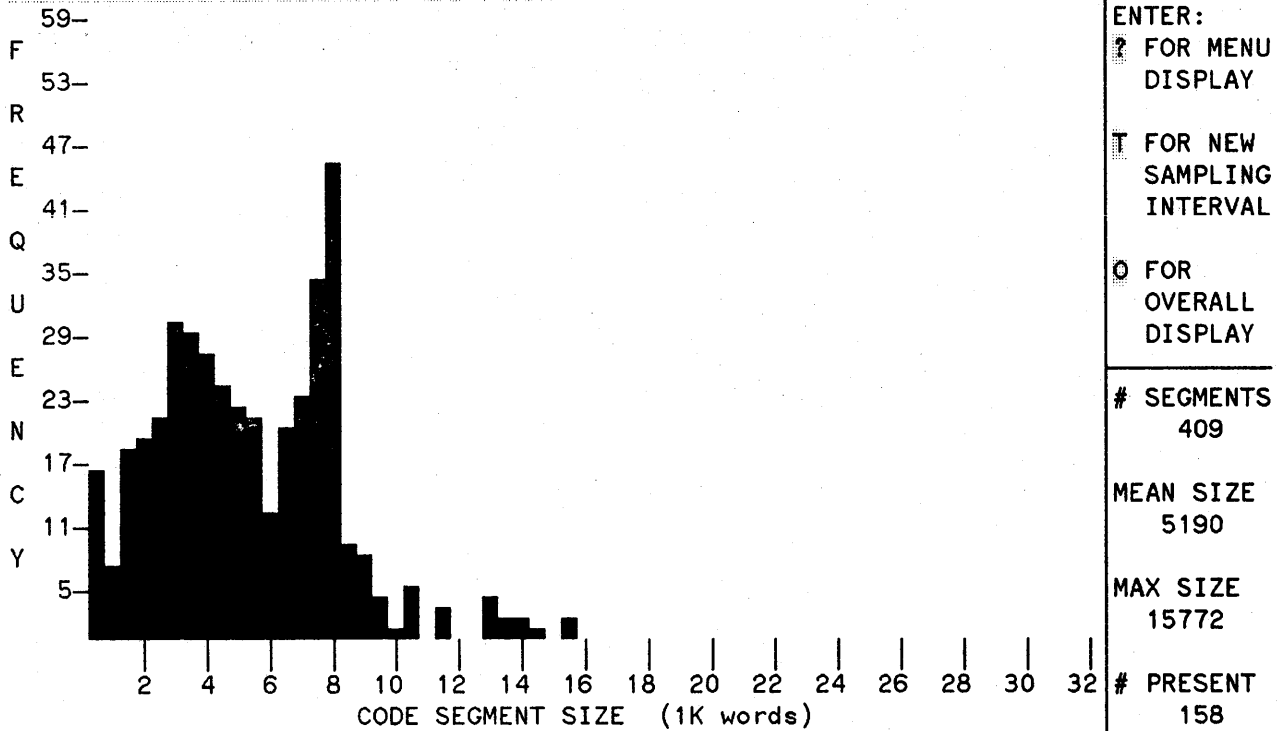


Figure 7-7. Code Segment Size Histogram Display

The Code Segment Size Histogram Display generates a histogram describing the distribution of code segment sizes and provides summary statistics about the code segments included in the histogram. The segments included in this display also depend on the histogram additional commands you choose.

This histogram provides more detail than that of the Overall Histogram Display by utilizing the following enhancements:

- The horizontal axis uses 512 word increments instead of 1K word increments.
- The frequency counts are not rounded, making it possible to determine exactly the number of segments of a particular size.
- The maximum frequency count is 60 instead of 48.

## Display Description

The display is a histogram that represents distribution of segment sizes in 512-word (1/2KW) increments along the horizontal axis, and a frequency count of the number of segments of a particular size along the vertical axis. The maximum displayable frequency count on the screen is 60, but the maximum frequency count displayed on hard copy is 54.

The horizontal axis is labeled "1 K words" just as the horizontal axis is labeled on the Overall Histogram. The space between increments, however, is doubled, so that there are eight character spaces between 0 and 4 on the display above.

## Interpretation Guidelines

- The tick marks and labels on the vertical axis are aligned with the middle of a character position, not the top of the position.
- The "A" additional command includes absent segments (such as data segments in virtual memory) in addition to the segments in main memory.

## Legend

Four summary statistics are reported:

- The number of segments included in the histogram.
- The mean size of the segments (number of words).
- The size (in words) of the largest segment included in the histogram.
- The number of segments included in the histogram that are currently in memory (present).

## DATA SEGMENT SIZE HISTOGRAM DISPLAY (D)

The Data Segment Size Histogram Display is one of three segment histograms that make up the Overall Histogram Display. This display expands upon the information presented in the Overall Histogram and more precisely describes the distribution by using a higher resolution. You will want to reference this display when the maximum frequency count of 48 has been reached on the data segment portion of the Overall Histogram. To access this display, enter "D" from anywhere within the Memory Context while OPT/3000 is accepting commands.

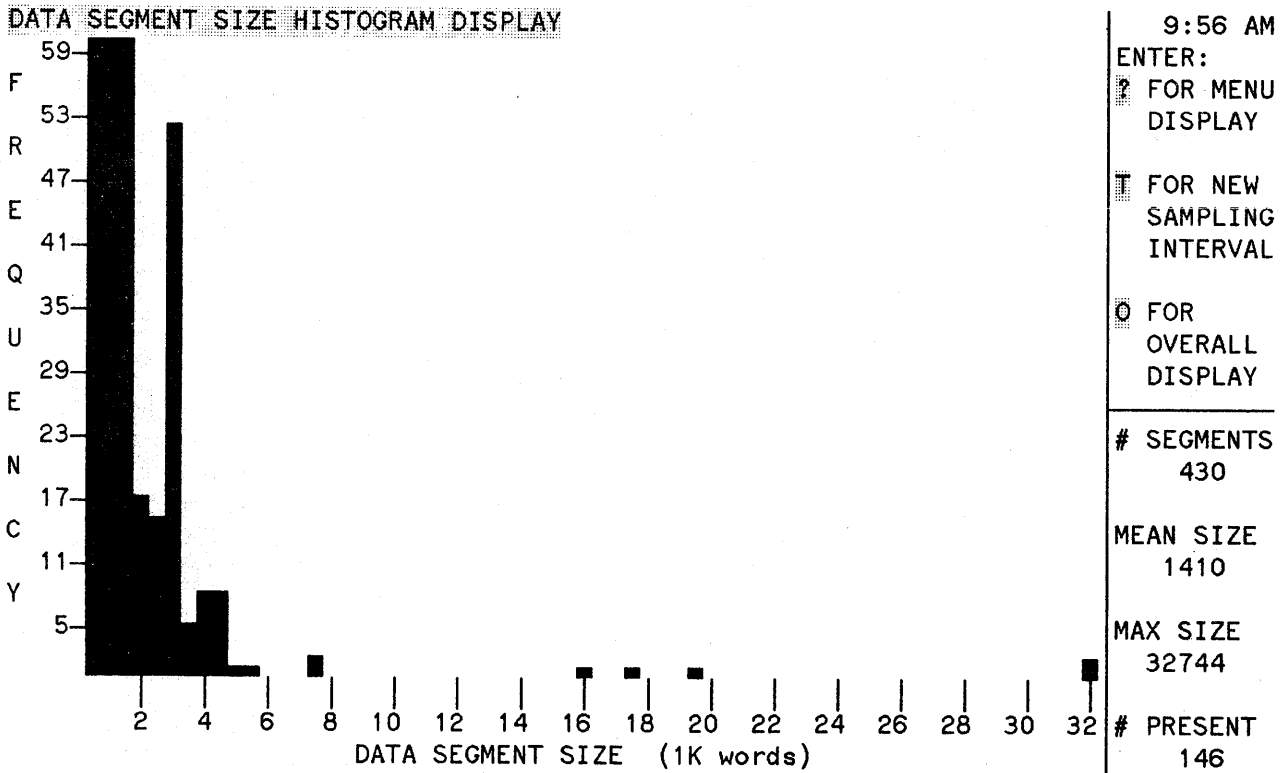


Figure 7-8. Data Segment Size Histogram Display

This Data Segment Size Display generates a histogram that describes the distribution of data segment sizes, excluding stacks. The segments included in this display are also dependent upon the histogram options you choose. Summary statistics about the segments included on your display will appear to the right of your screen.

### Display Description

The display represents the segment size in 512 word (1/2KW) increments along the horizontal axis, and provides a frequency count of the number of segments of a particular size along the vertical axis. The frequency count is not rounded as it is in the overall histogram. The maximum displayable frequency count is 60. If the count is higher, it is truncated to 60. Note that the maximum displayable frequency count on hard copy is 54.

## Interpretation Guidelines

- The tick marks and labels on the vertical axis are aligned with the middle of a character position, not the top of the position.
- The "A" additional command includes absent segments (such as data segments in virtual memory) in addition to the segments in main memory.

## Legend

The following four summary statistics are reported for the data segments in this display:

- The number of segments included in the histogram.
- The mean size (number of words) of all segments included in this display.
- The largest segment size (number of words) included in the histogram.
- The number of segments included in the histogram that are currently in memory (present).

## STACK SEGMENT HISTOGRAM DISPLAY (S)

The Stack Segment Histogram gives a more detailed view of stack size distribution than on the Overall Histogram. You should access this display if the maximum frequency count of 48 is reached on the stack segment portion of the Overall Histogram. You can access this display by entering "S" from anywhere within the Memory Context whenever OPT/3000 is accepting commands.

### STACK SEGMENT SIZE HISTOGRAM DISPLAY

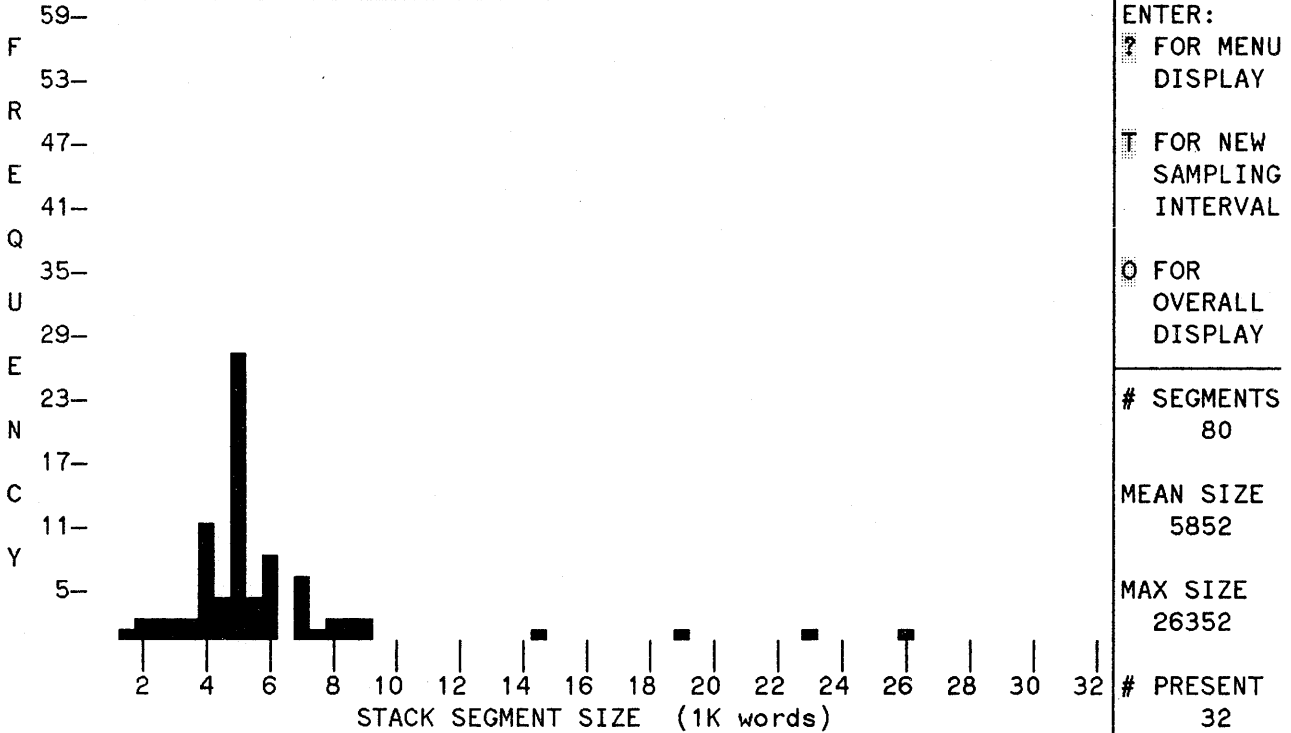


Figure 7-9. Stack Segment Size Histogram Display

This display generates a histogram describing the distribution of stack segment sizes and provides summary statistics about the stack segments included in the histogram. The stack segments displayed depend on the histogram options you specify.

### Display Description

The display is a histogram that shows the distribution of stack size in 512-word (1/2KW) increments along the horizontal axis, and a frequency count of the number of segments of a particular size along the vertical axis. The frequency count is not rounded as it is in the Overall Histogram. The maximum frequency count that can be displayed for this histogram is 60. If the count is higher, it is truncated to 60. The maximum frequency count that can be displayed on a hard copy is 54.

## Interpretation Guidelines

- The tick marks and labels on the vertical axis are aligned with the middle of a character position, not the top of the position.
- The "A" additional command includes absent segments (such as data segments in virtual memory) in addition to the segments in main memory.

## Legend

Four summary statistics are reported on your display screen for stack segments:

- The number of segments included in the histogram.
- The mean size (number of words) of all stack segments included in the histogram.
- The largest stack segment size (number of words) included in the histogram.
- The number of stack segments included in the histogram that are currently in memory (present).

## FREE AREA HISTOGRAM DISPLAY (F)

This histogram displays the distribution and frequency of free areas within linked memory. This display is accessed by entering "F" from anywhere within the Memory Context whenever OPT/3000 is accepting commands. Note that the additional commands do not apply to the Free Area Size Histogram.

### FREE AREA SIZE HISTOGRAM DISPLAY

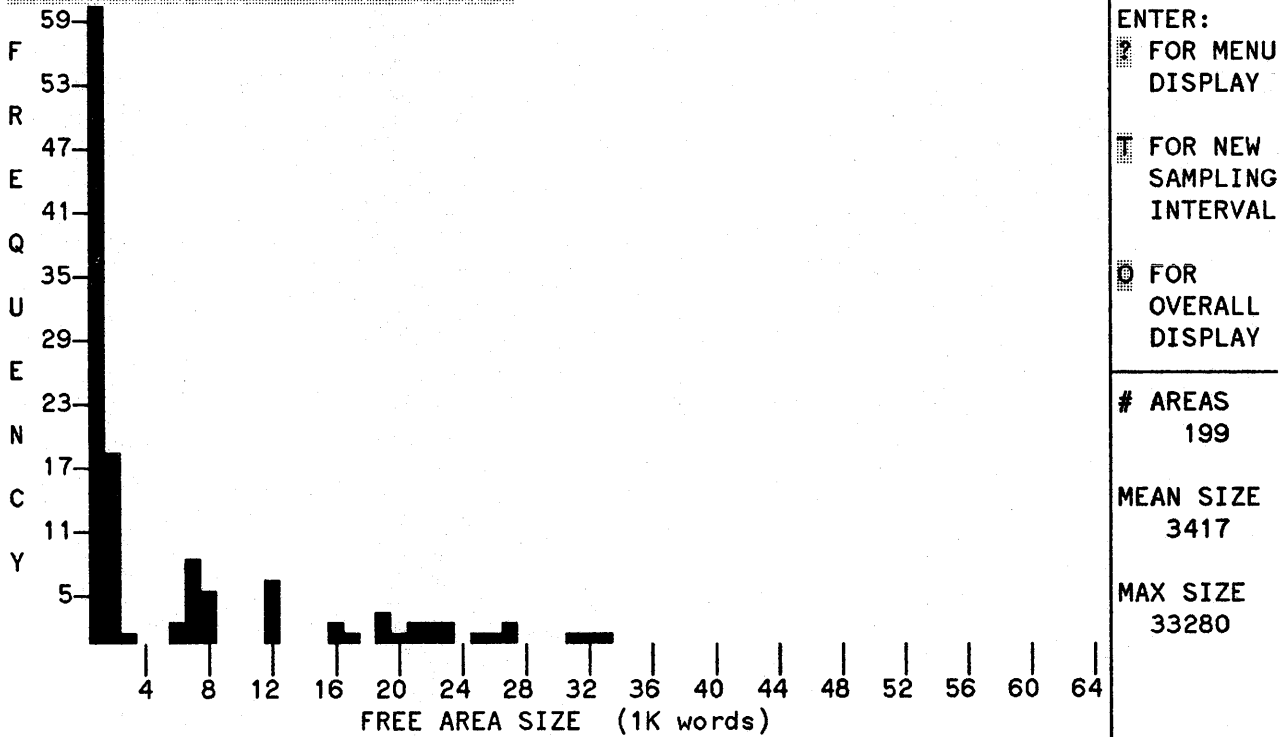


Figure 7-10. Free Area Size Histogram Display

### Display Description

The horizontal axis measures free area size in increments of 1K words and the vertical axis provides a frequency count of free areas. The maximum displayable frequency count is 60. The maximum frequency count that can be displayed on hard copy is 54.

### Interpretation Guidelines

The tick marks and labels on the vertical axis are aligned with the middle of a character position, not the top of the position.

## Legend

Three statistics are reported for the Free Area Histogram:

- The number of free areas included in the histogram.
- The mean size (words) of all free areas included in the histogram.
- The largest free area size (words) included in the histogram.

Note that the number in memory statistic is not reported for this histogram since all free areas of memory are present.



## ADDITIONAL COMMANDS

The histogram additional commands allow selection of segments to display on the various histograms. These commands are useable within the overall and individual histogram displays, except the Free Area Display. The additional commands are:

- A - Include all segments (including those absent from main memory).
- P - Include only present segments (default).
- U - Include only user segments.
- N - Include only non-user (system) segments.

With the exception of the "A" additional command, the commands currently in effect are indicated in a box in the statistics section of the screen. The "P" (present) command is automatically in effect upon entering the Memory Context. If the current display is not a histogram, entering a histogram command will only update the current display, but the specified histogram command will take effect upon returning to any histogram display.

Additional commands can be utilized simultaneously. For example, to look at present user segments enter both the "P" and "U" commands, one at a time. This enables both commands simultaneously. Any commands specified remain in effect until either the Memory Context is exited, or another command is specified that overrides the first. For example, the "U" Command overrides the "N" Command, and vice versa. The "A" Command cancels any other command that is in effect.

<b>NOTE</b>
-------------

Segments in memory-resident MPE are not considered in any histogram.

## All Segment Histogram (A)

Under this histogram additional command, all segments known to MPE are included in the histograms, including those not currently in main memory. This command cancels the effect of the Non-User Only (N), Present Only (P), and User Only (U) commands. This command is not highlighted on your screen as are the other three histogram commands.

## Non-User Segment Only Histogram (N)

Using this additional command causes the histogram to display only those segments marked as system segments. This command cancels the effect of the User Only (U) command.

## Present Segment Histogram (P)

This additional command allows only present main memory segments to be included in the histogram. It is the default command under Memory Context.

## User Segment Only Histogram (U)

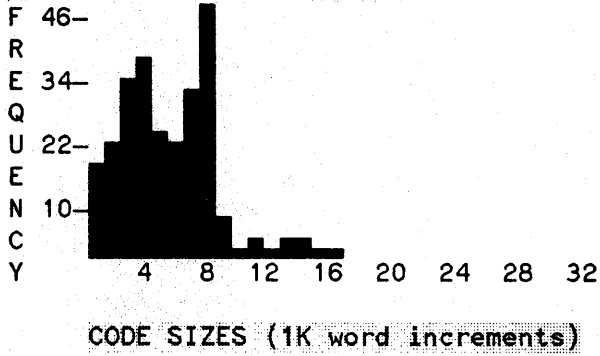
This additional command allows only those segments not marked as system segments to appear in the histograms. This command cancels the effect of the Non-User Only (N) Histogram. Figures 7-11, 7-12, 7-13, and 7-14 illustrate the effect of the "U" command on the various histograms on which this command is available.

## Keep Current Memory Block (K)

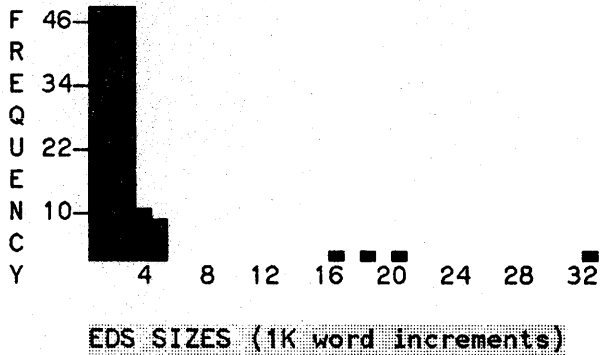
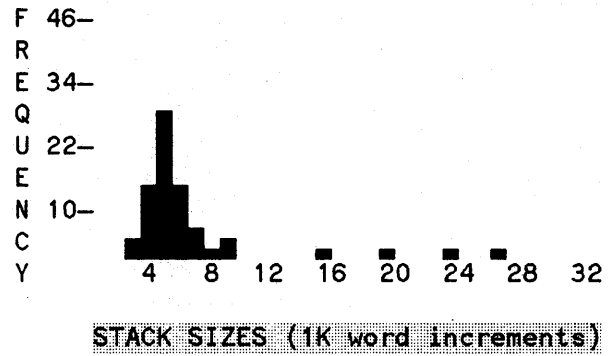
This command is a toggle. The first time you enter K, the current 16 banks are redisplayed. The next 16 banks are not displayed. The next time you enter K, the next 16 banks are displayed, replacing the current 16 banks.

Memory Context (#M)

OVERALL HISTOGRAM DISPLAY



10:09 AM



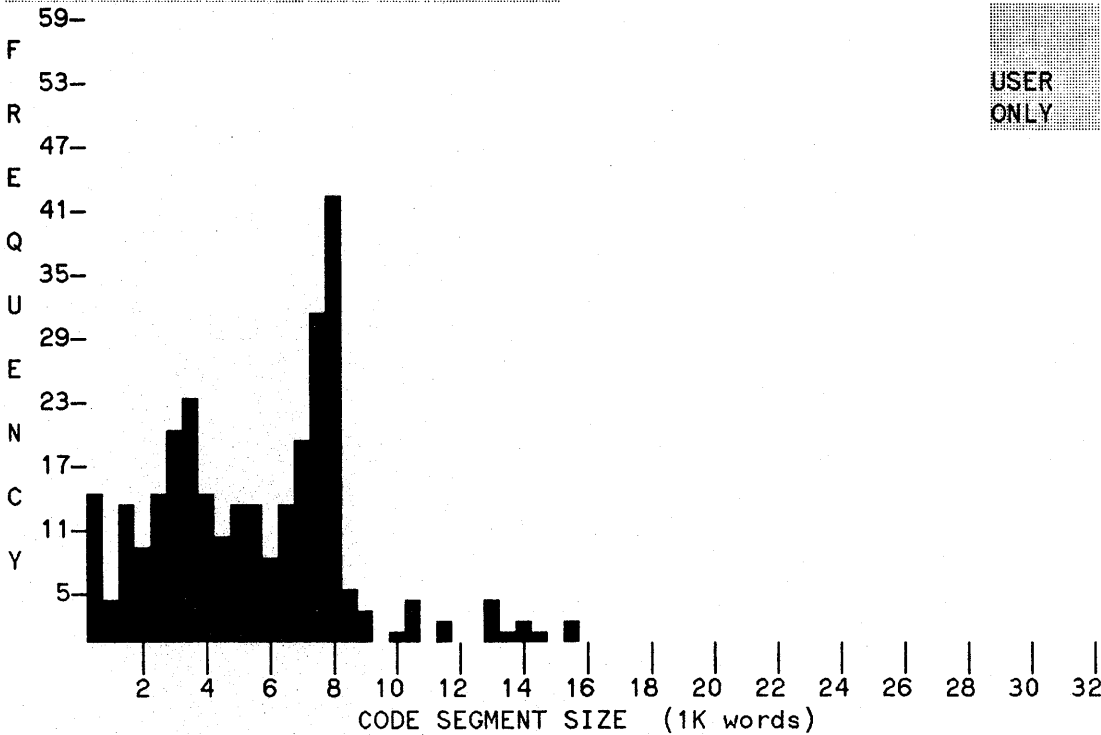
TYPE	COUNT	MEAN	MAX	# IN MEMORY
CODE	285	5407	15772	80
STACK	72	6106	26352	33
EDS	414	1355	32744	117

ENTER: C FOR CLOSE-UP OF CODE  
 S FOR CLOSE-UP OF STACK  
 D FOR CLOSE-UP OF EDS  
 H FOR ON-LINE DOCUMENTATION  
 ? FOR MENU DISPLAY

USER ONLY

Figure 7-11. Overall Histogram Display (user segments)

CODE SEGMENT SIZE HISTOGRAM DISPLAY



USER ONLY

10:16 AM  
 ENTER:  
 ? FOR MENU DISPLAY  
 T FOR NEW SAMPLING INTERVAL  
 O FOR OVERALL DISPLAY

# SEGMENTS	285
MEAN SIZE	5406
MAX SIZE	15772
# PRESENT	75

Figure 7-12. Code Segment Size Histogram Display (user segments)

DATA SEGMENT SIZE HISTOGRAM DISPLAY

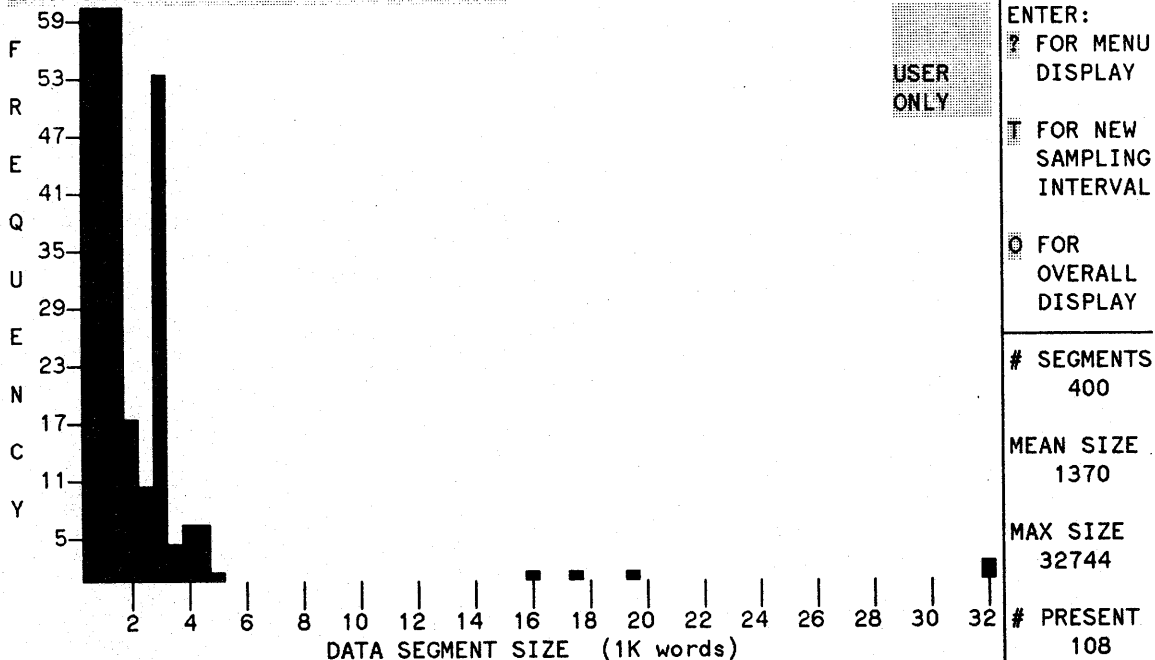


Figure 7-13.  
Data Segment Size Histogram Display (user segments)

STACK SEGMENT SIZE HISTOGRAM DISPLAY

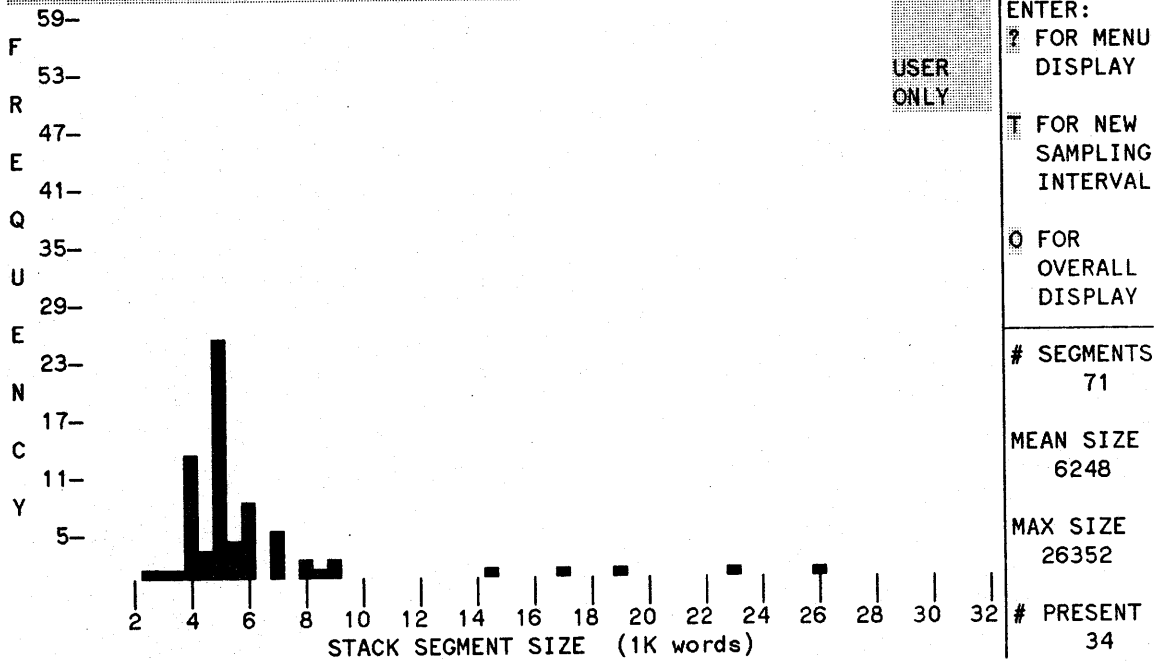


Figure 7-14.  
Stack Segment Size Histogram Display (user segments)



# I/O CONTEXT (#I)

The I/O Context measures the input and/or output rates of the disc, printer, and tape devices. This context can be accessed from any context by entering "#I" between display updates or whenever OPT/3000 accepts commands.

OPT/3000  
CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT R	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 8-1. Command Structure Diagram - I/O Context

Four displays and one menu of commands are available in this context. They are:

- (?) Menu of Commands - I/O Context
- (R) I/O Activity Report Display (default)
- (D) Disc Activity Display
- (P) Line Printer Activity Display
- (M) Magnetic Tape Activity Display

Upon entering the I/O Context, OPT/3000 prompts you for the context display you wish to see with:

ENTER COMMAND FOR DISPLAY (? FOR MENU)

Responding with an unprogrammed command (or a **RETURN**) generates this context's default display. Entering "?" produces a menu display option within this context. This is illustrated in Figure 8-2.

I/O Context (#I)

\*\*\*\*\* MENU OF COMMANDS --- I/O DISPLAY CONTEXT \*\*\*\*\*

<p>****DISPLAYS****</p> <p>D DISC ACTIVITY</p> <p>M MAGNETIC TAPE ACTIVITY</p> <p>P LINE PRINTER ACTIVITY</p> <p>R I/O ACTIVITY REPORT (default)</p>	<p>****CONTROL OPERATIONS****</p> <p>#A ALTER LINE DRAWING CHAR SET POSITION</p> <p>#C ENTER CPU-MEMORY MANAGER CONTEXT</p> <p>#G ENTER GLOBAL CONTEXT</p> <p>#H CONTINUOUS HARD COPY GENERATION</p> <p>#I ENTER I/O CONTEXT</p> <p>#L CLOSE LISTING FILE</p> <p>#M ENTER MEMORY CONTEXT</p> <p>#P ENTER PROCESS CONTEXT</p> <p>#S SUSPEND OPT (UNTIL USER INPUT)</p> <p>#T ENTER SYSTEM TABLES CONTEXT</p> <p>#? MENU OF CONTROL OPERATION COMMANDS</p>
<p>****OTHER COMMANDS****</p> <p>A ALTER DISPLAYED DEVICES</p> <p>Q DISPLAY DISC QUEUE INFO (only one disc will be displayed at a time.)</p> <p>N DISPLAY NEXT DEVICES</p>	<p>****DISPLAY CONTROL****</p> <p>E EXIT</p> <p>H HELP</p> <p>L LISTING (GENERATE HARD COPY)</p> <p>T TIME CHANGE (OF UPDATE INTERVAL)</p> <p>X DEFINE XEQ SEQUENCE</p> <p>: MPE COMMAND</p> <p>? MENU DISPLAY</p> <p>! NOTE COMMAND <b>COMMAND?</b></p>

Figure 8-2. Menu of Commands - I/O Display Context

Responding to the menu prompt:

COMMANDS?

with an unprogrammed character (or a **RETURN**) generates this context's default display.

## I/O ACTIVITY REPORT DISPLAY (R)

This display provides summary information about I/O activity on the discs, line printers, and magnetic tape drives. Information is reported for all devices for both the current sampling interval and since the last summary report was generated. To access this display, enter "R" from anywhere within the I/O Context whenever OPT/3000 is accepting commands. This is the default display for the I/O Context.

### I/O ACTIVITY REPORT

8:53 AM

ACTIVITY IN CURRENT INTERVAL

17.2 SECONDS

DISC I/O ACTIVITY **XX** 10 20 30 40 50 60 70 80 90 100 per second  
(0/0/4)

TAPE I/O ACTIVITY

PRINTER ACTIVITY

ACTIVITY OVER ALL INTERVALS

.4 MINUTES

DISC I/O ACTIVITY **USXX** 10 20 30 40 50 60 70 80 90 100 per second  
(1/1/3)

TAPE I/O ACTIVITY

PRINTER ACTIVITY

LEGEND: DISC I/O

**X** Cached I/O**U** User I/O**S** Segment Manager I/OENTER: **D** FOR DISC ACTIVITY DISPLAY**M** FOR MAGNETIC TAPE ACTIVITY DISPLAY**P** FOR LINE PRINTER ACTIVITY DISPLAY**H** FOR ON-LINE DOCUMENTATION

Figure 8-3. I/O Activity Report

## Display Description

The I/O Activity report shows the I/O completion rates per second for disc, tape, and printer. All I/O rates and counts represent physical activity not logical disc activity that was handled by MPE disc caching. The bars on the first section of your screen indicate I/O completion rates per second for each of the three device types during the current sampling interval. The second section of the screen indicates the number of completed I/O's per second over all intervals since the last summary report was generated. The rate bars further subdivide disc I/O's into cached I/O, user I/O and Segment Manager I/O, these are represented by "X", "U", and "S", respectively.

A rate of less than 0.5 per second is not displayed. The disc activity is also shown to the right of the bar in the form (user I/O rate / segment manager I/O rate / cached I/O rate.)



## Interpretation Guidelines

- Each I/O completed for line printer roughly corresponds to one line printed.
- All I/O rates and counts represent physical disc activity, not logical disc activity that was handled by MPE disc caching.

## Legend

For each of the device types, the following types of I/O are included in the completion rates:

- |               |  |
|---------------|--|
| Disc          | - Read, write, and control operations. |
| Line Printer  | - Write and control operations.        |
| Magnetic Tape | - Read, write, and control operations. |

Three types of I/O are indicated on the disc bars:

- |                     |   |
|---------------------|---|
| CACHED I/O (X)      | - Disc I/O completed for cached I/O.                            |
| USER (U)            | - Disc I/O completed on the behalf of a user or system process. |
| SEGMENT MANAGER (S) | - Disc I/O completed for segment management.                    |

## DISC ACTIVITY DISPLAY (D)

The Disc Activity Display provides performance information about disc I/O for both the current interval and since a summary report was last generated. To access this display, enter "D" from anywhere within the I/O Context whenever OPT/3000 is accepting commands.

```

DISC ACTIVITY DISPLAY                CURRENT INTERVAL: 10.1 SECONDS  8:56 AM
OVERALL INTERVAL:                   .2 MINUTES

      10  20  30  40  50  60  70  80  90  100 per second
CURRENT ALL DISC  RW W                (1/5/0)
OVERALL ALL DISC  RW WC               (1/6/1)

CURRENT LDEV  1
OVERALL LDEV  1 W                      (0/1/0)

CURRENT LDEV  2
OVERALL LDEV  2 R                      (1/0/0)

CURRENT LDEV  3 W W                    (0/5/0)
OVERALL LDEV  3 W W                    (0/5/0)

CURRENT LDEV  4
OVERALL LDEV  4

```

MAXIMUM RATES:	ALL	LDEV 1	LDEV 2	LDEV 3	LDEV 4	ENTER:	LEGEND:
READS	1/ 5	0/ 1	0/ 3	0/ 0	1/ 1	N NEXT DEVICE	R Reads
WRITES	0/ 9	0/ 3	0/ 1	0/ 5	0/ 1	Q Q LEN INFO	W Writes
CONTROL	3	1	1	0	0	(toggle)	C Control

Figure 8-4. Disc Activity Display

Activity is monitored for all discs combined, and for each individual disc. Due to space limitations on your terminal screen, information can be provided for no more than four individual discs at one time. If your system has more than four disc devices configured, the following message is displayed when you request the Disc Activity Display:

AT MOST FOUR DEVICES CAN BE DISPLAYED SIMULTANEOUSLY.  
SELECT FOUR DEVICES FROM THE FOLLOWING LIST:

- 1 LOGICAL DEVICE x1
- 2 LOGICAL DEVICE x2
- 3 LOGICAL DEVICE x3
- 4 LOGICAL DEVICE x4

N LOGICAL DEVICE xn

DEVICES TO BE DISPLAYED?

## I/O Context (#1)

You should respond by entering four integers between 1 and N, separated by commas, corresponding to the individual devices you want to observe. If any of your responses are not in the 1 to N range, the message:

'Z' IS NOT IN THE RANGE 1 TO N

is displayed, and the prompt repeated. If you enter fewer than four integers, only those devices chosen are displayed. If you enter the same device twice, the second input is ignored, and if more than four responses are given, OPT/3000 accepts only the first four different devices of your response. For example, if you respond with an input of 1,2,1,3,4, the devices displayed are 1, 2, 3, and 4. A **RETURN** will display the first four devices and more devices when you type "N". If only one device is requested, the queue length information for that device is also displayed.

## Display Description

This display consists of rate per second bars that measure combined disc activity and also four individual discs at a time. The bar measuring all disc devices may include some devices for which no individual rate bar is shown.

The top half of each bar measures current disc I/O activity and the bottom half of each bar measures overall activity since a summary report was last generated. Each measurement bar of each disc monitored is further broken down by function:

Read Operations

Write Operations

Control Operations (non-read, non-write I/O)

The three actual rates also appear in parentheses to the right of the bar in the form (read-rate / write-rate / control-rate). All rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed.

The bottom portion of the display provides the maximum observed rate per second for each type of I/O operation (read, write, control) for each device and all devices combined. Here, maximum rates include both user and memory management I/O operations and appear in the form (user maximum / memory management maximum). These rates indicate the highest rate observed during any interval since the last summary report was generated.

## Interpretation Guidelines

- If the disc I/O's are not evenly distributed over the different discs on the system, it may be possible to decrease disc contention by spreading the files more effectively.
- If more than four disc devices are configured, the all disc rate bar may include individual disc not shown in the display.
- All I/O rates and counts represent physical disc activity, not logical disc activity that was handled by MPE disc caching.
- Heavy use of just one disc on a multiple disc system MAY mean that just one file or application is causing the disc activity.

## Legend

Three types of disc I/O operations are detailed:

- |             |   |
|-------------|---|
| R (READ)    | - A read operation                                      |
| W (WRITE)   | - A write operation                                     |
| C (CONTROL) | - Neither a read nor a write (for example, a file open) |

Each rate bar is labeled with its appropriate ldev number.

## MAGNETIC TAPE ACTIVITY DISPLAY (M)

The Magnetic Tape Display provides data on I/O performed by tape(s). Tape activity is displayed for both the current sampling interval and since a summary report was last generated. To access this display, enter "M" from anywhere within I/O Context whenever OPT/3000 is accepting commands.

```

MAGNETIC TAPE ACTIVITY DISPLAY          CURRENT INTERVAL:  7.8 SECONDS  8:57 AM
                                         OVERALL INTERVAL:   .4 MINUTES

                                         10  20  30  40  50  60  70  80  90 100 per second

CURRENT ALL TAPE
OVERALL ALL TAPE

CURRENT LDEV  7
OVERALL LDEV  7

CURRENT LDEV 10
OVERALL LDEV 10
    
```

MAXIMUM RATES:	ALL	LDEV 7	LDEV 10	ENTER:	LEGEND:
	----	-----	-----	N NEXT DEVICE	R Reads
READS	0	0	0		W Writes
WRITES	0	0	0		C Control
CONTROL	0	0	0		

Figure 8-5. Magnetic Tape Activity Display

Activity is monitored for all tapes combined and for individual tapes. Due to space limitations on your terminal screen, information can be provided for no more than four individual tapes at one time. If more than four tape drives are configured, the following is displayed when you request Tape Activity Display:

AT MOST FOUR DEVICES CAN BE DISPLAYED SIMULTANEOUSLY.  
 SELECT FOUR DEVICES FROM THE FOLLOWING LIST:

- 1 LOGICAL DEVICE x1
- 2 LOGICAL DEVICE x2
- 3 LOGICAL DEVICE x3
- 4 LOGICAL DEVICE x4

N LOGICAL DEVICE xn

DEVICES TO BE DISPLAYED?

You should respond by entering four integers between 1 and N, separated by commas, corresponding to the individual devices you want to observe. If any of your responses are not in the 1 to N range, the message:

'Z' IS NOT IN THE RANGE 1 TO N

is displayed and the prompt repeated. If you enter fewer than four integers, only those devices chosen are displayed. If you enter the same device twice, the second input is ignored and if more than four responses are given, OPT/3000 accepts only the first four different devices of your response. For example, if you respond with an input of 1,2,1,3,4, the devices displayed are 1, 2, 3, and 4. **RETURN** displays the first four devices and the rest of the devices when you type "N".

## Display Description

This display consists of rate per second bars that measure combined tape activity and also four individual tapes at a time. The bar measuring all tape devices may include some devices for which no individual rate bar is shown.

The top half of each bar measures current tape I/O and the bottom half of each bar measures overall activity since a summary report was last generated. Each measurement bar of each tape monitored is further broken down by function:

Read Operations

Write Operations

Control Operations (non-read, non-write I/O)

The actual rates will be indicated in parentheses to the right of the bar in the form (read-rate / write-rate / control rate). All rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed.

The bottom portion of the display provides the maximum observed rate per second for each type of I/O operation (read, write, control) for each tape device and all tape devices combined. These rates indicate the highest rate observed during any interval since the last summary report was generated.

## Interpretation Guidelines

- A single tape drive may be represented by four logical devices (units 0-3). If this is the case, they cannot all be in use simultaneously.
- If more than four such devices are configured, the "all tapes" rate bar may include individual devices which are not shown in the display.

## Legend

Three types of I/O operations are monitored:

- R (READ) - A read operation
- W (WRITE) - A write operation
- C (CONTROL) - Neither a read nor write (for example, a file open)

## LINE PRINTER ACTIVITY DISPLAY (P)

The Line Printer Activity Display provides line printer I/O data. Printer activity is displayed for the current interval and for all intervals since a summary report was last generated. To access this display, enter "P" from anywhere within the I/O Context whenever OPT/3000 is accepting commands.

```

LINE PRINTER ACTIVITY DISPLAY          CURRENT INTERVAL: 6.1 SECONDS 11:05 AM
                                         OVERALL INTERVAL: .3 MINUTES

          10  20  30  40  50  60  70  80  90  100 per second
CURRENT ALL LP  W  W
OVERALL ALL LP  W  W

CURRENT LDEV 6
OVERALL LDEV 6

CURRENT LDEV 79 W W
OVERALL LDEV 79 W

CURRENT LDEV 80 W W
OVERALL LDEV 80 W  W

CURRENT LDEV 86
OVERALL LDEV 86

```

MAXIMUM RATES:	ALL	LDEV 6	LDEV 79	LDEV 80	LDEV 86	ENTER:	LEGEND:
	-----	-----	-----	-----	-----	N NEXT DEVICE	W Writes
WRITES	0	0	0	0	0		C Control
CONTROL	0	0	0	0	0		

Figure 8-6. Line Printer Activity Display

Activity is monitored for all printers combined and for individual printers. Due to space limitations on your terminal screen, information can be provided for no more than four individual printers at one time. If your system has more than four line printers configured, the following message is displayed when you request the Line Printer Activity Display:

AT MOST FOUR DEVICES CAN BE DISPLAYED SIMULTANEOUSLY  
SELECT FOUR DEVICES FROM THE FOLLOWING LIST:

- 1 LOGICAL DEVICE x1
- 2 LOGICAL DEVICE x2
- 3 LOGICAL DEVICE x3
- 4 LOGICAL DEVICE x4

.  
.  
.

N LOGICAL DEVICE xn

DEVICES TO BE DISPLAYED?



You should respond by entering four integers between 1 and N, separated by commas, corresponding to the individual devices you want to observe. If any of your responses are not in the 1 to N range, the message:

'Z' IS NOT IN THE RANGE 1 TO N

is displayed and the prompt repeated. If you enter fewer than four integers, only those devices chosen are displayed. If you enter the same device twice, the second input is ignored. If you enter more than four responses, OPT/3000 accepts only the first four different devices. For example, if you respond with an input of 1,2,1,3,4, the devices displayed are 1, 2, 3, and 4. **(RETURN)** displays the first four devices and the rest of the devices when you type "N".

## Display Description

This display consists of rate per second bars that measure combined line printer activity and also four individual printers at a time. The bar measuring all printer devices may include some devices for which no individual rate bar is shown.

The top half of each bar measures current printer I/O and the bottom half of each bar measures overall since a summary report was last generated. Each measurement bar of each printer shown is further broken down by function:

WRITE OPERATIONS

CONTROL OPERATIONS (NON-READ, NON-WRITE I/O)

The actual rates are also indicated in parentheses to the right of the bar in the form (write-rate / control-rate). All rates are rounded to the nearest integer, so a rate of less than 0.5 per second is not displayed.

The bottom portion of the display provides the maximum observed rate per second for each type of I/O operation (write, control) for each device and all devices combined. These rates indicate the highest rate observed during any interval since the last summary report was generated.

## Interpretation Guidelines

The "all LP" rate bar may include individual devices which are not shown in the display, if more than four such devices are configured.

## Legend

Two types of I/O operations can be shown for the separate and combined line printers:

W (WRITE) - A write operation

C (CONTROL) - Neither a read nor a write (for example, a file open)

## ADDITIONAL COMMANDS

In addition to the displays, three additional commands are available in this context.

### Alter Displayed Devices Command (A)

This command is used to alter the list of individual devices you want displayed in the disc activity, line printer activity, and magnetic tape activity displays. This command can be accessed by entering "A" within a device activity display when more than four devices of any one type are configured. If fewer than four devices of any one type are configured, "A" is treated as a RETURN and your current display is updated. If the command is recognized, OPT/3000 gives you a list of the devices that are currently displayed and a list of all devices of the type that are configured:

CURRENT DEVICES DISPLAYED ARE:

SLOT 1: LOGICAL DEVICE x1  
 SLOT 2: LOGICAL DEVICE x2  
 SLOT 3: LOGICAL DEVICE x3  
 SLOT 4: LOGICAL DEVICE x4

SELECT DEVICES FROM THE FOLLOWING LIST:

1 LOGICAL DEVICE x1  
 2 LOGICAL DEVICE x2  
 .  
 .  
 N LOGICAL DEVICE xn

DEVICES TO BE DISPLAYED?

In response, enter four integers between 1 and n, separated by commas, indicating the four individual devices you wish displayed. If any of your responses are not in the 1-n range, the message:

'Z' IS NOT IN THE RANGE 1 TO N

is displayed and the prompt repeated. If you specify fewer than four devices, only the specified devices are displayed. RETURN displays the first four devices. To display more devices, enter "N". Once devices have been selected, OPT/3000 erases the dialog and updates the current display.

### Display Next Devices Command (N)

This command is used in the disc activity, line printer activity and magnetic tape activity displays when more than four devices have been selected for display. Each time you enter "N", the next four devices are displayed unless there are less than four devices still to be displayed. If so, the remaining devices are displayed. The next display starts from the beginning of the list. If disc queue lengths are also currently being displayed, only one disc is displayed per screen.

## Display Disc Queue Information Command (Q)

This command is a toggle that enables or disables the display of queue length information. The information is displayed for one disc at a time. To display the queue length for the next disc drive, use the NEXT (N) command. The display shows the counts and the percentages for the current and the overall intervals.

For each disc request completion, the number of disc requests queued for that device is sampled. The count fields indicate the number of the samples that found a queue length of 0, 1, 2, ... 5, >=6, respectively. The percentages display these counts as a proportion of the total disc requests for the device.

# PROCESS CONTEXT (#P)

SECTION

9

The Process Context provides detailed information about process activity and usage of program files. This context can be accessed from any other context by entering "#P" between display updates or whenever OPT/3000 accepts commands.

Several displays contain more information (in list form) than is possible to illustrate on one screen. To view all available data, the "roll up" and "roll down" keys on the terminal should be used. These keys should not, however, be used while the current screen is updating.

OPT/3000  
CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT R	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 9-1. Process Context

Five displays and a menu of commands are available within this context:

- (?) Menu of Commands - Process Context
- (G) User Summary Display (Default)
- (F) Program File Display
- (U) Program File Users Display
- (P) Process Display
- (R) Process State Report Display

The Program File Display, Program File Users Display, and Process Display are nested. Each display provides more detailed information than the preceding one. The Program File Users Display can only be generated after the Program File Display has been accessed and the Process Display can only be accessed from the Program File Users Display or the User Summary Report.

## Process Context (#P)

Upon entering the process context, OPT/3000 prompts you for the context display you wish to see with:

ENTER COMMAND FOR DISPLAY (? FOR MENU):

Entering a **RETURN** or an unprogrammed command will generate the User Summary Report display by default.

Entering "?" in Process Context, generates a menu of the display options within the Process Context and all the Display Control commands. (Figure 9-2.) Responding to the menu prompt:

COMMANDS?

with an unprogrammed command (or **RETURN**) generates this contexts default display.

```
***** MENU OF COMMANDS --- PROCESS DISPLAY CONTEXT *****
```

<pre>*****DISPLAYS**** G USER SUMMARY (default) F PROGRAM FILE U PROGRAM FILE USERS P PROCESS R PROCESS STATE REPORT</pre>	<pre>*****CONTROL OPERATIONS**** #A ALTER LINE DRAWING CHAR SET POSITION #C ENTER CPU-MEMORY MANAGER CONTEXT #G ENTER GLOBAL CONTEXT #H CONTINUOUS HARD COPY GENERATION #I ENTER I/O CONTEXT #L CLOSE LISTING FILE #M ENTER MEMORY CONTEXT #P ENTER PROCESS CONTEXT #S SUSPEND OPT (UNTIL USER INPUT) #T ENTER SYSTEM TABLES CONTEXT #? MENU OF CONTROL OPERATION COMMANDS</pre>
<pre>*****OTHER PROCESS CONTEXT COMMANDS**** S LIST SIR INFORMATION A LIST ALL PROCESSES IN USER SUMMARY B PAGING ON/OFF C LIST CPU ACTIVE PROCESSES ONLY D LIST PROCESSES BY USER ACCOUNT I IN USE ONLY (F display) N NEXT (used with P and U display) W LIST WORKING SET SEGMENTS   (used with P and U displays) M LIST STACK MARKERS (P display)</pre>	<pre>*****DISPLAY CONTROL**** E EXIT H HELP L LISTING (GENERATE HARD COPY) T TIME CHANGE (OF UPDATE INTERVAL) X DEFINE XEQ SEQUENCE : MPE COMMAND ? MENU DISPLAY ! NOTE COMMAND</pre>

COMMAND?

Figure 9-2. Menu of Commands - Process Display Context

## SECURITY RESTRICTIONS

Some Process Context displays are subject to the following security restrictions:

(a) Process Display

To obtain access to the Process Display, you must have at least one of the following attributes:

SM capability

OP capability

AM capability for the account in which the program file being executed by the process in question is stored

Creator of the program file being executed by the process in question

For example, if the program file being executed by the process is CAT.CARRI.USERS, the only users besides those with SM or OP capability that can generate a Process Display are the creator of CAT.CARRI.USERS and the USERS Account Manager.

(b) Program File Users Display

You must have at least one of the following attributes to gain access to the Program File Users Display:

SM capability

OP capability

AM capability for the account under which the program file is stored

Creator of the program file in question

Logged on under the same group account as the program file in question UNLESS execute capability for the file has been restricted to the creator only. In this case, you are prompted for any lockword before the display is produced.

(c) Program File Display

Information provided in the Program File Display is limited, depending on your attributes, in the following way:

The actual name of a program file is included in the display ONLY if one of the following conditions is met:

The file resides in PUB.SYS

You are allowed to generate a Program File Users Display (see above) for the program file. Note that the lockword prompt is not made.

Process Context (#P)

For example, assume that the following files are the program files currently in use on a system:

CAT.PUB.SYS  
EDITOR.PUB.SYS  
TEST.CARRI.USERS  
REPORT.JOAN.USERS  
GAME.PUB.GAMES

If you have SM or OP capability, the names of all five program files are provided on the display.

The Account Manager for the account USERS are provided the names of four program files: CAT, EDITOR, TEST, and REPORT.

If you are the creator of the file REPORT.JOAN.USERS, you are provided the names of three program files: CAT, EDITOR, and REPORT.

If you are logged onto the group PUB.GAMES, you are provided the names of three program files: CAT, EDITOR, and GAME.

If you are logged onto the group MATT.SUPPORT, you are provided with the program files CAT and EDITOR. (Files in PUB.SYS are available to anyone on the system after logon.)

The above restrictions refer to the program name only. All other information about a program file, such as number of users and size of the working set, are provided to any user of OPT/3000. If you do not have the needed capabilities to obtain the program name on your display, USER PROGRAM FILE replaces it.

## USER SUMMARY REPORT (G)

The user summary display is the highest level display concerned with individual process information. This display shows the CPU usage, the queue that the process is executing in, the current priority, the pin number, the job/session number, the user and account names and the program name. To access this display from any other display in the process context, enter "G".

USER SUMMARY REPORT Filters:				A (all processes)	C (CPU users only)	9:36 AM	
				B (paging)	D (user account)		
PIN	J/S#	USER.ACCOUNT	PROGRAM NAME (command)	CPU	%	Q	PRI
28	S18	MEL.ES	USER PROGRAM FILE	424	0	C	152
49	J7	MANAGER.SYS	USER PROGRAM FILE	21316	0	D	202
50	J6	HALEY.SYS	USER PROGRAM FILE	565	0	L	100
54	J9	MANAGER.SYS	USER PROGRAM FILE	40016	0	D	202
60	J11	MGR.RSPOOL	USER PROGRAM FILE	56849	0	C	152
61	J12	MGR.RSPOOL	USER PROGRAM FILE	54975	0	C	152
62	J11	MGR.RSPOOL	USER PROGRAM FILE	90416	0	C	152
63	J12	MGR.RSPOOL	USER PROGRAM FILE	110514	1	C	152
124	S36	SCOTT.SM	USER PROGRAM FILE	8780	0	C	152
171	S44	TOM.CSC	USER PROGRAM FILE	1794	0	C	152
192	S24	MGR.PERFDEV	TDP.PUB.SYS	12796	0	C	152
202D	S41	RAT.PERFDEV	OPT78.LACH.PERFDEV	1619	10	C	156

Figure 9-3. Users Summary Report

## Display Description

Each line of this display represents one active process in the system. To the far left of the line is the process's PIN number followed by the job/session number. A capital D is appended to the end of the PIN number if the process is executing on the dispatch queue. The user and account name is listed next, followed by the fully qualified program name if it is a user process. For an active C.I. process (i.e., a C.I. process without an active user son process), a C.I. followed by its last executed command in parenthesis replaces the program name. percentage of time the CPU was used by the process during the last sample interval is displayed next, followed by the queue that the process is executing on and the current priority. CPU time can be displayed in milliseconds (S) or minutes (M). Processes shown for the first time appear in inverse video.

The initial display contains only user processes, but an A command displays all active processes (including system processes and CI processes waiting on son processes). The A command is a toggle, and a second A command displays only user processes. Similarly, the C command displays only CPU active processes. This command is also a toggle. A paging command, B, is also a toggle and is initially turned on. When the command is on, you are prompted at the end of each screen to continue or not. At this point, you can stop the printing of the rest of the display. This saves time if many processes are executing. When the paging toggle is turned off, all processes are displayed without any pauses.



## Process Context (#P)

There are four toggles available on this display:

<u>TOGGLE</u>	<u>ON</u>	<u>OFF</u>	<u>INITIALLY</u>
A	Display all active processes.	Display only user processes.	OFF
B	Paging on.	Paging off.	ON
C	Display only CPU active processes.	Display all processes.	OFF
D	Display only processes in the specified user account.	Display all processes.	OFF

The toggle commands in effect at any time appear highlighted in inverse video at the top of the display. For more details on these commands, see the Additional Commands at the end of this section.

These toggles can be used in any combination. When the 'D' and 'A' toggles are both on, all system processes are displayed, as well as those CI and user processes in the specified user account. If a non-existent user account is specified for the D toggle, the message "NO VALID USER ACCOUNT" will be displayed, and the toggle will be turned off. This will also happen if both the C and D toggles are on, and there are no CPU active processes in the specified user account. All commands are toggled by entering the appropriate letter, but to turn off the D toggle, a carriage return must be entered at the user account name prompt.

## Interpretation Guidelines

Any process that has a large percentage of CPU time is not necessarily using other processes' share of CPU time, especially if its priority is low. Use the process display to obtain more information.

## Legend

The total CPU time is in milliseconds unless noted by "S" (seconds) or "M" (minutes) on the display.

## PROGRAM FILE DISPLAY (F)

The Program File Display concerns itself with program file usage, identifying all program files which are either allocated, auto-allocated, or are currently in use. Information about the combined working sets of each program file is provided, as well as the working sets of system processes and Command Interpreter processes. This display can be accessed from other displays within the Process Context by entering "F".

PROGRAM FILE DISPLAY					10:34 AM				
NAME OF PROGRAM FILE			CODE SEG INFO	#PS	COMBINED WORKING SET INFORMATION				
			COUNT:SIZE		CST:PROG:	DST:STACK:	TOT. SIZE		
1	OPT76	.LACH .PERFDEV	37:131428	1	0	5	1	1	27944
2	IDAT5	.PUB .SYS	1: 13904	1	1	0	4	1	25716
3	MANSION	.LEONG .LEONG	1: 312	1	2	1	1	1	18780
4	FORMSPEC	.PUB .SYS	22: 86696	1	0	6	0	1	40992
5	HPDRAW	.PUB .SYS	41:276724	1	0	0	5	1	50888
6	HPTREND	.HPTREND .SYS	1: 1512	1	0	1	2	1	10920
7	PBXUSEP	.PBX .SYS	2: 3316	1	0	0	3	1	10220
8*	DICTDBM	.PUB .SYS	16: 95916	0	0	0	0	0	0
9	RSPOOL	.PUB .RSPOOL	2: 6464	2	0	0	6	2	12664
10	DSMON	.PUB .SYS	3: 3500	3	1	1	11	3	41720
11*	QEDIT	.PUB .ROBELLE	13: 71596	1	0	4	0	1	27556
12*	INFORM	.PUB .SYS	11:116276	0	0	0	0	0	0
13*	TRANCOMP	.PUB .SYS	11: 79104	0	0	0	0	0	0
14*	TRANSACTION	.PUB .SYS	11:116280	3	1	0	13	3	75668
15*	SPOOK2	.PUB .SYS	3: 12308	2	0	0	5	2	31364

ENTER **U** TO GENERATE A PROGRAM FILE USERS DISPLAY FOR ANY OF THE ABOVE PROGRAMS

Figure 9-4. Program File Display

## Display Description

Each line of this display represents one program file or set of system processes, and there are four primary sections of information provided in each line.

- At the left of each line is an identifier (SP, CI, 1..N) that is used for subsequent references to individual program files when you access the Users Display. "SP" refers to the set of system processes, "CI" to the Command Interpreter, and the integers 1..N to individual program files. Note that the integer identifier may change when the display is updated.
- The second segment on the display is the code segment information, labeled "CODE SEG INFO". It contains the number of code segments in the program file, and the total size of the program file in words. This information is not listed for the system processes or Command Interpreter.
- The third section is headed "#PS" and indicates the number of processes sharing the program file on each line. Note that the count may be zero for allocated program files.
- The fourth section of information concerns the combined working sets of all processes represented by the line. It shows:

The number of SL code segments

The number of program file code segments

The number of data segments (non-stack)

## Process Context (#P)

The number of stack segments

The total size of all segments in the combined working set

Note that a specific segment may be in more than one working set of a combined working set, but it is counted only once.

By default, allocated and autoallocated program files with no current users are not included in this display. To include such files, use the In-Use-Only command. See Additional Commands at the end of this section.

## Interpretation Guidelines

- Allocating a program file reduces the overhead. Program files that are frequently run (required for the first execution of the program) should be reviewed for possible allocation.
- Under normal circumstances, the working set of a single process should consist of no more than four segments. The current code segment for the process, the process stack, the DST to which DB is set, and a DST with a disc I/O pending against the segment. This implies that the total size of the combined working sets for a program is not a true indicator of memory requirements.

## Legend

- An asterisk next to the identifier indicates that the program file has been allocated via the :ALLOCATE command.
- An @ next to the identifier indicates that the program file has been auto-allocated via the :AUTOALLOCATE command.
- The count for the Command Interpreter under the #PS section is the number of CI processes not waiting on a SON process.

## PROGRAM FILE USERS DISPLAY (U)

The Program File Users Display provides information about each process sharing a particular program file, or each process in a set of system processes.

PROGRAM FILE USERS DISPLAY for SYSTEM PROCESSES

10:22 AM

PIN #	USER NAME	J/S # Q	STACK SIZE	STACK UTIL	MAX Z-DL	CPU USED	# FO	# XD	STATUS	FLAGS
6	MEMLOGP	L	6808	67.0%	2112	2608	1	0	IMP	
7	PVPROC	L	1404	25.9%	768	11	0	0	JUNK	
8	UCOP	L	2036*	4.3%	768	164539	0	0	JUNK,TIME	
9	PFAIL	L	2748	1.2%	2304	0	0	0	JUNK,MEM	
10	DEVREC	L	7532*	57.2%	4352	43826	0	0	I/O,JUNK	
11	LOAD	L	4972*	34.5%	7603	1726	S 2	0	MSG	
12	(unknown)	L	2600*	1.5%	2301	291703	0	0	JUNK	
13	SPOOLER-6	L	7072	71.4%	1880	584	0	0	FA	
15	SPOOLER-80	L	3636*	38.7%	1880	7552	0	0	SON,FA	
16	SPOOLER-86	L	3636*	38.7%	1880	2290	0	0	SON,FA	
17	SPOOLER-91	L	4148*	33.0%	1880	40417	0	0	SON,FA	
59	(unknown)	L	6984*	12.1%	6424	444025	0	0	I/O,MSG	
61	(unknown)	L	6984*	12.1%	6424	213614	0	0	I/O,MSG	
62	(unknown)	L	6984*	10.3%	6424	4550	S 0	0	I/O	
121	SPOOLER-79	L	3636*	38.7%	1880	2706	0	0	SON,FA	

ENTER P TO GENERATE A PROCESS DISPLAY FOR ANY OF THE ABOVE PROCESSES

Figure 9-5. Program File Users Display (system processes)

This display can only be accessed by entering "U" after the generation of the Program File Display. Entering the command at any other time produces the message:

**DISPLAY CAN ONLY BE REQUESTED WHEN CURRENT DISPLAY IS PROGRAM FILE DISPLAY**

and the current display is updated.

After entering a "U", you will be prompted for the indices of the program files for which the Program File Users Display is to be generated:

ENTER INDICES OF PROGRAMS ON WHICH INFORMATION IS DESIRED ('@' OR <CR> FOR ALL)  
>

To access system processes, enter SP. To access command interpreter processes, enter CI in reply to this prompt.

PROGRAM FILE USERS DISPLAY for TDP.PUB.SYS

11:39 AM

PIN #	USER NAME	J/S	# Q	STACK SIZE	STACK UTIL	MAX Z-DL	CPU USED	# FO	# XD	STATUS	FLAGS
199	JOAN .SM	S	790 C	4000*68.4%	3258	2243	6	0	BIO		
224	MARCIA .ES	S	773 C	4504*58.8%	3258	5146	6	0	BIO		
35	JERRY .PERFDEV	S	736 C	4544*66.8%	3258	782	7	0	BIO		
198	ED .SM	S	646 C	5112*50.9%	3258	4430	6	1	BIO		
108	ARTHUR .SS	S	727 C	5104*58.2%	3258	2167	7	1	BIO		
125	SS .SS	S	751 C	5112*50.6%	3258	21895	6	0	BIO		
150	TOM .HENNEMAN	S	753 C	4944 50.7%	4938	28368	6	0	SON		
237	ED .WRIGHT	S	749 C	4944*52.6%	4930	13623	6	1	BIO		
94	HANK .SM	S	717 C	5104 58.2%	3258	1763	7	0	BIO		

ENTER P TO GENERATE A PROCESS DISPLAY FOR ANY OF THE ABOVE PROCESSES

Figure 9-6. Program File Users Display (User Program)

These indices correspond to the identifiers listed in the Program File Display. You must separate multiple identifiers with commas. Entering a **RETURN** instead of indices will generate a display for each program file in succession. If you enter an index that doesn't reference an entry in the Program File Display, OPT/3000 prints the following message:

'Z' IS INVALID

and repeats the prompt.

After the desired list of indices has been entered, OPT/3000 generates the Program File Users Display for the first identifier specified, and continues to update that display at the usual update interval until you enter a valid command that changes the current display. Entering the N command will cause OPT/3000 to generate the Users Display for the next specified identifier or, if the end of the list has been reached, generate the Program File Display.

If all processes sharing the program file terminate while the display is still current, the message:

**NO PROCESSES EXECUTING THIS PROGRAM FILE**

is generated. If a process terminates execution while OPT/3000 is in the process of gathering information to generate or update the display, the message:

**PROCESS NO LONGER EXECUTING THIS PROGRAM FILE**

appears on the line for that process. When the display is updated, new processes sharing the program file are added to the display and processes no longer sharing the program file are removed from the display.

## Display Description

Each line of this display represents one process using a particular program file. The name of the program file appears at the top of the screen. Figure 9-5 shows each of the system processes currently operating on a system. These particular processes were generated by entering the identifier "SP" in response to the prompt within Program File Display.

There are nine primary sections of information on each line. From left to right these are:

- The PIN number indicated in decimal and the user and account name under which the process was created. If the display is for a system process, the name of the system process will be shown here.
- The session or job number of the process and the queue in which the process is executing (L, C, D, E).
- The current stack size in words.
- Stack utilization.
- Maximum size of the Z-DL or user portion of the stack.
- CPU usage.
- Current number of open files (#FO) for the process
- Number of extra data segments (#XD) explicitly obtained by the process.
- Current status (STATUS FLAGS) of the process.

Explanations for these items are given in the "LEGEND" section.

You can obtain additional information about the combined working sets of all processes represented in this display by using the List Working Set Segments (W) command. If (W) is performed information about each segment in the combined working sets is displayed in three columns as follows:

- DST,CST, or CSTX index (displayed in octal)
- Size of the segment in words
- Working set count

For more information about the (W) command, see the discussion under the "List Working Set Segments Command" in this section.

## Interpretation Guidelines

- Batch jobs executing in the "C" queue may be causing performance problems.
- Sessions executing in the "D" queue are probably getting poor response times.
- Stack utilization may fluctuate dramatically for processes with small stacks depending on the value of the S register when the sample is taken. Values which are consistently low, however, may indicate that a reduction in the stack size (either programmatically or in the initial size) could improve performance.
- The MAX Z-DL figure can be used to determine if a MAXDATA value is too large. An excessive MAXDATA value wastes virtual memory disc space.
- Processes that frequently wait on RIN's or impedes may be having performance problems.
- Under normal circumstances, the working set of a single process should consist of no more than four segments: the current code segment for the process, the process stack, the DST to which DB is set, and a DST with a disc I/O pending against the segment. This implies that the total size of the combined working sets for a program file is not a true indication of the memory requirements.

## Legend

- L = linearly scheduled process on the AS or BS subqueues or Master queue (very high priority).
- C = circularly scheduled process on the CS subqueue (interactive sessions).
- D = circularly scheduled process on the DS subqueue (batch jobs).
- E = circularly scheduled process on the ES subqueue (processes scheduled in a very low priority).
- Stack size is the total size of the stack segment, including the PCBX area appended to the stack by MPE. An asterisk (\*) after the stack size indicates that the stack is present in memory.
- Stack utilization is estimated by dividing the current value of the S register by the current value of the Z register.
- The maximum size of the user portion (Z-DL) of the stack may be smaller than the current stack size since it does not include the PCBX area.
- CPU usage is the number of milliseconds of CPU time charged to the process. If the number of milliseconds exceeds 999999 milliseconds, then it is displayed in seconds and an "S" is appended in the field.
- Status Flags

A set of WAIT FIELDS in the PCB are used to describe the reason or reasons a process is not active. A process is suspended because it cannot get access to a resource or because it is waiting for another event to be completed. The resource could be disc I/O, RIN's, MEMORY, or the process could be waiting for its SON or FATHER to "wake it up". The interpretation of the bits in the WAIT FIELDS is:

- MRNG (Mourning Wait) - The process is waiting for its SON to complete.
- GRIN (Global RIN) - The process is waiting for a global RIN.
- LRIN (Local RIN) - The process is waiting for a local RIN.
- MAIL (Mail Wait) - The process is waiting for the completion of a MAIL transaction.
- BIO (Blocked I/O) - The process has issued a blocked request for I/O and for I/O completion before continuing. Most applications are blocked for I/O on each read or write.
- I/O (Unblocked I/O) - This process has issued a request for NO-WAIT I/O, has subsequently finished its interim processing, and called the IOWAIT intrinsic.
- UCOP (UCOP Wait) - Either the process is waiting for service by UCOP or the process is waiting for a REPLY as a result of an entry in the RIT (reply information table).
- JUNK (Junk Wait) - Miscellaneous waits used by system processes.
- TIME (Timer Wait) - The process is waiting for a timer requested interrupt.
- MSG (Message Wait) - The process is waiting for the completion of I/O to message files.
- SON (Son Wait) - The process is waiting to be activated by its SON.
- FA (Father Wait) - The process is waiting to be activated by its FATHER. Both the FATHER WAIT and SON WAIT bits can be set at the same time.
- IMP (Impeded) - The process is impeded. Impedes are generated for many reasons. Examples are waiting for an IMAGE data base lock, waiting to access an IMAGE data base control block and waiting for available system table entries.
- SIR (SIR Wait) - The process is waiting for a SIR.
- TOUT (Timeout Wait) - The process is waiting for a "time-out" to occur.
- MEM (Memory Wait) - The process is waiting for one or more segments to be swapped into memory.

Note that more than one of these conditions can occur at any one time.



## PROCESS DISPLAY (P)

The Process Display is the most detailed display of the Process Context and provides information about a single process sharing a program file, including a system program.

PIN: 5 SYSTEM PROCESS LOG USER: ( ) 10:26 AM

STACK INFORMATION				CPU TIME: 455606 MSEC	STATUS FLAGS:				
DST:	101*	SYSOV:	572 22.7%	PRIORITY:	50	MRNG	GRIN	LRIN	MAIL
SIZE:	2524	DL-DB:	0 .0%	CAPABILITIES:	SM AM	BIO	I/O	UCOP	JUNK
MAXDATA:	2524	DB-QI:	177 7.0%	AL GL DI OP CV UV LG		TIME	MSG	SON	FA
MAX Z-DL:	1792	QI-Q:	10 .4%	SP PS NA NM CS ND SF		IMP	SIR	TOUT	MEM
		Q-S:	9 .4%	BA IA PM MR DS PH					
		S-Z:	1756 69.6%						

XDS USAGE SON  
DST# SIZE PROCESS OPEN FILES

LOG1540

Figure 9-7. Process Display (system processes)

This display can only be accessed by entering "P" while OPT/3000 is accepting commands, and only after you have generated the Program File Users Display or the User Summary Report Display or when you first enter the Process Context. If you attempt to enter the display at another time, the error message:

**DISPLAY CAN ONLY BE REQUESTED WHEN CURRENT DISPLAY IS PROGRAM FILE USERS DISPLAY**

is generated and the current display is updated.

PIN: 194 OPT78.LACH.PERFDEV

USER: RAT.PERFDEV

(S 41) 9:33 AM

STACK INFORMATION				CPU TIME: 1287 MSEC	STATUS FLAGS:
DST: 661*	SYSOV: 557	3.8%		PRIORITY: 152	MRNG GRIN LRIN MAIL
SIZE: 14588	DL-DB: 6616	45.4%		CAPABILITIES: AM AL	BIO I/O UCOP JUNK
MAXDATA: 31223	DB-QI: 4940	33.9%		GL ND SF BA IA PM MR	TIME MSG SON FA
MAX Z-DL: 29859	QI-Q: 44	.3%		DS PH	IMP SIR TOUT MEM
	Q-S: 263	1.8%			
	S-Z: 2168	14.9%			

```

XDS USAGE      SON
DST#  SIZE      PROCESS  OPEN FILES
-----
                                $STDIN  $STDLIST $STDINX

```

Figure 9-8. Process Display (user program)

Once this display is accessed, you are prompted for a list of process identification numbers (PIN's) for which you want the Process Display generated.

ENTER PINS OF PROCESSES FOR WHICH INFORMATION IS DESIRED ("@" or <CR> FOR ALL)

The PIN's you specify must be among those appearing in the current display and must be separated from one another by commas. If you enter an invalid number, (i.e., a number that does not reference a PIN in the current display), the message:

\*\*\*WRONG PIN NO. ENTER CORRECT PIN AGAIN OR <CR> TO USER SUMMARY REPORT\*\*\*

is displayed and the prompt repeated. Entering **RETURN** instead of PIN numbers causes a Process Display to be generated for each process in the current display. If there is only one process in the display, OPT/3000 prompts you, but automatically generates the Process Display for that process.

Once you have entered the PIN numbers, OPT/3000 generates the Process Display for the first PIN specified, and continues to update that display at the set update interval until you enter the Next command (N) or one of the other Process Context commands. Entering the NEXT (N) command causes OPT/3000 to generate the Process Display for the next PIN on your list. When the end of the list is reached, the previous display is generated.

If the process being displayed terminates execution while the display is being updated, OPT/3000 displays the message

\*\*\*PROCESS NO LONGER EXECUTING\*\*\*

and automatically executes a NEXT command at the time of the next display update.

<b>NOTE</b>
-------------

Access to this display is subject to certain security restrictions. See the "SECURITY RESTRICTION" section at the beginning of this context for further information.

## Display Description

There are 7 main areas of information shown in this display in addition to the heading. Working set information may also be included if you have set the List Working Set Segments flag.

The heading includes the PIN number (decimal), the fully-qualified program file name, the user and account of the process creator, and the job/session number. If the process is a system process, the name of the system process replaces the program file name. The user name, account name, and job/session number will be omitted.

The first area of information concerns the stack and includes:

DST number of the stack (octal)

Size of the stack in words

The MAXDATA specified for the stack (words)

The maximum size of the Z-DL area of the stack in words

Each of the following are shown as their size in words, and their percentage of the entire stack:

System Overhead (SYSOV) - This includes PCBX plus stack overflow

DL-DB area

DB-initial Q area

Initial Q-current Q area

Q-S area

S-Z area

Note that an asterisk (\*) appears after the stack DST number if the stack is present in memory.

The area immediately to the right of the stack information area contains the following miscellaneous information about the process:

CPU time - CPU time used by the process in either milliseconds or seconds.

Priority - Process priority (NOTE: Processes are executed in ascending order of priority).

Capability List - The list of the users' capabilities. The capabilities are listed in three groups:

Group 1. SM,AM,OP,AL,GL

Group 2. DI,UV,LG,ND,SF,CS,CV,SP,PS,NA,NM

Group 3. PM,PH,DS,MR,IA,BA

The upper right area of your screen indicates the current status of the process. Each of the 16 Status Flags is shown, and those currently set are highlighted with inverse video. The Status Flags are defined in the Legend section below.

The lower left area lists all information about all extra data segments that have been explicitly obtained by the process. For each extra data segment, the following information is reported:

DST number of the segment (octal)

Size of the data segment in words

In addition, an asterisk (\*) appears following the DST number if the segment is currently in main memory.

The area to the right of the extra data segment area lists all son processes created by the process, indicated by the son process' PIN number (decimal).

The final area of information, located to the middle of your screen, lists all files currently opened by the process. Up to six files may be listed on each line. A fully-qualified name is not listed. A question mark (?) in the list of file names indicates a file opened with no file name specified.

## Interpretation Guidelines

- If the S-Z portion of the stack is consistently large (greater than fifty percent), the stack is probably larger than necessary.
- Processes with large extra data segments may be causing performance problems.
- Under normal circumstances, the working set of a single process should consist of at most four segments: the current code segment for the process, the process stack, the DST to which DB is set, and a DST with a disc I/O pending against the segment. This implies that the total size of the working set for a program file is NOT a true indication of the memory requirements.

## Legend

There are 16 Status Flags, more than one of which may apply at once.

A set of WAIT FIELDS in the PCB explain why a process is not active. A process is suspended if it cannot get access to a resource, or if it is waiting for another event to be completed. The resource could be disc I/O, RIN's, MEMORY, or the process could be waiting for its SON or FATHER to "wake it up". The interpretation of the bits in the WAIT FIELDS follows:

- |                      |   |  |
|----------------------|---|--|
| MRNG (Mourning Wait) | - | The process is waiting for its SON to complete.  |
| GRIN (Global RIN)    | - | The process is waiting for a global RIN.   |
| LRIN (Local RIN)     | - | The process is waiting for a local RIN.  |
| MAIL (Mail Wait)     | - | The process is waiting for the completion of a MAIL transaction.   |
| BIO (Blocked I/O)    | - | The process has issued a blocked request for I/O and waits until the I/O is completed, before continuing. Most applications are blocked for I/O by each read or write. |
| I/O (Unblocked I/O)  | - | This process has issued a request for "no-wait" I/O, has subsequently finished its interim processing, and called the IOWAIT intrinsic.                                |

## Process Context (#P)

- UCOP (UCOP Wait) - Either the process is waiting for service by UCOP or the process is waiting for a REPLY as a result of an entry in the RIT (reply information table).
- JUNK (Junk Wait) - Miscellaneous waits used by system processes.
- TIME (Timer Wait) - The process is waiting for a timer requested interrupt.
- MSG (Message Wait) - The process is waiting for the completion of I/O to message files.
- SON (Son Wait) - The process is waiting to be activated by its SON.
- FA (Father Wait) - The process is waiting to be activated by its FATHER. Both the FATHER WAIT and SON WAIT bits can be set at the same time.
- IMP (Impeded) - The process is impeded. Impedes are generated for many reasons. Examples are waiting for an IMAGE data base lock, waiting to access an IMAGE data base control block and waiting for available system table entries.
- SIR (SIR Wait) - The process is waiting for a SIR.
- TOUT (Timeout Wait) - The process is waiting for a "time-out" to occur.
- MEM (Memory Wait) - The process is waiting for one or more segments to be swapped into memory.

**NOTE**

Not all of these bits are shown on all displays. They are included in the documentation for completeness.

**PROCESS STATE REPORT DISPLAY (R)**

The Process State Report display can be accessed by entering "R" from within the Process Context whenever OPT/3000 is accepting commands.

## PROCESS STATE REPORT

10:30 AM

SESSIONS: 41	SYSTEM PROCESSES: 20	DISPATCH QUEUE: 1
JOBS: 4	CI PROCESSES: 26	NO QUEUE: 84
	USER PROCESSES: 19	
IN BREAK: 0	CREATED PROCESSES: 2	

## DISTRIBUTION OF PROCESS STATES

	DISPATCH QUEUE	NO QUEUE
	-----	-----
SHORT WAIT		
LONG WAIT	1	68
TERM READ WAIT	1	38
BLOCKED I/O WAIT		40
I/O WAIT		5
MEMORY WAIT		1
SON WAIT		22
FATHER WAIT		5
RIN WAIT		
SIR WAIT		
IMPEDED		1
SCHED ATTN REQ		

Figure 9-9. Process State Report

This display provides detailed summary information about all processes known to the system and describes the state of the system at the time the display is generated. Included in this information is the type of process, the number of sessions and jobs, and the distribution of process states between queues. No averages over time are reported.

**Display Description**

A horizontal line divides the screen into two parts. The top half displays summary information about each type of process (CI, System, User, and Created), and statistics about how many processes are in the Dispatch Queue.

The bottom half of the display distinguishes between process states in the Dispatch Queue and those not in a queue. The number of processes in each state is reported for each of the queue categories.

## Interpretation Guidelines

- If the number of processes on the dispatch list is large (greater than five), CPU contention may be a problem.
- If the number of processes on a short wait is large (greater than five on any single configured controller - See #I context for further analysis), disc contention may be a problem.

## Legend

### PROCESSES

CI Processes	- CI processes that are not waiting on a SON process.
SYSTEM Processes	- Processes such as the SPOOLER or MEMORY LOGGING.
USER processes	- Processes that are sons of CI processes.
CREATED Processes	- Processes that are sons of user processes of other processes.

A set of WAIT FIELDS in the PCB explain why a process is not active. A process is suspended if it cannot get access to a resource or because it is waiting for another event to be completed. The resource could be disc I/O, RIN's, or MEMORY, or the process could be waiting for its SON or FATHER to "wake it up". The interpretation of the bits in the WAIT FIELDS follows:

If a process is waiting, it is usually in a SHORT WAIT or a LONG WAIT. There are some special cases for which neither bit is set.

MRNG (Mourning Wait)	- The process is waiting for its SON to complete.
GRIN (Global RIN)	- The process is waiting for a global RIN.
LRIN (Local RIN)	- The process is waiting for a local RIN.
MAIL (Mail Wait)	- The process is waiting for the completion of a MAIL transaction.
BIO (Blocked I/O)	- The process has issued a blocked request for I/O and waits until the I/O is completed, before continuing. Most applications are blocked for I/O by each read or write.
I/O (Unblocked I/O)	- This process has issued a request for "no-wait" I/O, has subsequently finished its interim processing, and called the IOWAIT intrinsic.
UCOP (UCOP Wait)	- Either the process is waiting for service by UCOP or the process is waiting for a REPLY as a result of an entry in the RIN (reply information table).
JUNK (Junk Wait)	- Miscellaneous waits used by system processes.
TIME (Timer Wait)	- The process is waiting for a timer requested interrupt.

- MSG (Message Wait) - The process is waiting for the completion of I/O to message files.
- SON (Son Wait) - The process is waiting to be activated by its SON.
- FA (FATHER Wait) - The process is waiting to be activated by its FATHER. Both the FATHER WAIT and SON WAIT bits can be set at the same time.
- IMP (Impeded) - The process is impeded. Impedes are generated for many reasons. Examples are waiting for an IMAGE data base lock, waiting to access an IMAGE data base control block and waiting for available system table entries.
- SIR (SIR Wait) - The process is waiting for a SIR.
- TOUT (Timeout Wait) - The process is waiting for a "time-out" to occur.
- MEM (Memory Wait) - The process is waiting for one or more segments to be swapped into memory.

<b>NOTE</b>
-------------

Not all of these bits are shown on all displays. They are included in the documentation for completeness.

A given process may be in one or more of the above states. Therefore, the total for a column will probably be greater than the number of processes in the category represented by that column.



## ADDITIONAL COMMANDS

In addition to the five displays, these commands are provided in this context:

- (I) "In Use Only" Command
- (N) Next Command
- (W) List Working Set Segments Command
- (S) List SIR Information
- (A) All Process Command
- (C) Display Processes for Active CPU Users Only
- (B) Turn Paging On or Off
- (M) List Stack Markers
- (D) List User Account Only

### In Use Only Command (I)

This command allows you to include allocated and autoallocated program files with no current users in the Program File Display.

PROGRAM FILE DISPLAY		CODE SEG INFO		COMBINED WORKING SET INFORMATION				10:19 AM
NAME OF PROGRAM FILE	COUNT:SIZE	#PS	CST:PROG:	DST:STACK:	TOT.	SIZE		
SP SYSTEM PROCESSES		20	4 :	6 :	22 :	20 :	150528	
CI COMMAND INTERPRETER		24	4 :	0 :	57 :	23 :	198412	
1 OPT76 .LACH .PERFDEV	37:131428	1	0 :	4 :	1 :	1 :	25776	
2 MANSION .LEONG .LEONG	1: 312	1	2 :	1 :	1 :	1 :	18780	
3 FORMSPEC .PUB .SYS	22: 86696	1	0 :	6 :	0 :	1 :	40992	
4 HPDRAW .PUB .SYS	41:276724	1	0 :	0 :	5 :	1 :	50888	
5 HPTREND .HPTREND .SYS	1: 1512	1	0 :	1 :	2 :	1 :	10920	
6 PBXUSEP .PBX .SYS	2: 3316	1	0 :	1 :	4 :	1 :	10468	
7 RSPOOL .PUB .RSPOOL	2: 6464	2	0 :	0 :	6 :	2 :	16228	
8 DSMON .PUB .SYS	3: 3500	3	1 :	1 :	13 :	3 :	42200	
9*QEDIT .PUB .ROBELLE	13: 71596	1	0 :	4 :	0 :	1 :	27556	
10*TRANSACT .PUB .SYS	11:116280	3	1 :	0 :	13 :	3 :	75668	
11*SPOOK2 .PUB .SYS	3: 12308	2	0 :	0 :	6 :	2 :	16648	
12*TDP .PUB .SYS	27: 84436	6	1 :	0 :	19 :	6 :	50728	

ENTER I TO GENERATE A PROGRAM FILE USERS DISPLAY FOR ANY OF THE ABOVE PROGRAMS

Figure 9-10. Program File Display (In use only toggle on)

The command acts as a toggle that controls the setting of a flag. If the flag is "OFF", allocated and autoallocated program files with no users are included in the File Display. See Figure 9-10. To turn the flag "ON", enter the command again. This command is recognized only when the current display is the Program File Display, and is interpreted as a **RETURN** if entered at any other time. The flag is "ON" upon entering the Process Context.

## Next Command (N)

This command allows you to terminate the updating of a Program File Users Display or a Process Display. Entering "N" causes OPT/3000 to either:

- Generate the current display for the next program file or process specified (if multiple program files or processes were specified) or,
- Return to the screen display before entering the current display or if the last program file or process has been displayed.

The NEXT command is only applicable to the Program File Users Display and the Process Display. If you attempt to enter it from any other display, it is recognized as a **RETURN**.

## List Working Set Segments Command (W)

This command allows control of the List Working Set Segments flag, which determines whether or not working set information is displayed in the Program File Users Display and the Process Display. The flag flips to the opposite state ("ON" or "OFF") each time the W command is entered. The flag is in an "OFF" position upon entry to the Process Context.

The working set information is interpreted as follows:

- |      |  |
|------|--|
| CST  | - Code segments from an SL.  |
| CSTX | - Code segments from a program file.   |
| DST  | - Data segments (An "S" to the right of an index entry) indicates a stack segment. An asterisk (*) to the right of an index entry indicates a stack present in memory. Segment size is shown in words. |

Process Context (#P)

XDS USAGE SON  
 PIN: 101 OPT76.LACH.PERFDEV USER: RAT.PERFDEV (S 745) 11:34 AM

STACK INFORMATION				CPU TIME: 1280 MSEC	STATUS FLAGS:			
DST: 331*	SYSOV: 557	3.8%		PRIORITY: 152	MRNG	GRIN	LRIN	MAIL
SIZE: 14800	DL-DB: 6488	43.8%		CAPABILITIES: SM AM	BIO	I/O	UCOP	JUNK
MAXDATA: 31223	DB-QI: 4940	33.4%		AL GL DI OP CV UV LG	TIME	MSG	SON	FA
MAX Z-DL: 14243	QI-Q: 44	.3%		SP PS NA NM CS ND SF	IMP	SIR	TOUT	MEM
	Q-S: 263	1.8%		BA IA PM MR DS PH				
	S-Z: 2508	16.9%						

DST#	SIZE	PROCESS	OPEN FILES		
-----	-----	-----	\$STDIN	\$STDLIST	\$STDINX
CST #	SIZE	CSTX #	SIZE	DST #	SIZE
-----	-----	-----	-----	-----	-----
		27-023*	3172	456*	104
		27-024*	2160	331*S	14800
		27-025*	2604		
		27-026*	2748		
		27-027*	3360		

Figure 9-11. Process Display (Working set toggle on)

The Working Set Segments command is recognized only when your current display is the Program File Users Display or the Process Display. If you enter it at any other time, it is interpreted as a **RETURN**.

### List SIR Information (S) Command

This command is available anywhere within the Process Context. It lists the SIR number and name, the current holding PIN number, and a list of all PIN's working on the SIR for all currently-locked SIR's.

### List Stack Markers (M) Command

This is a toggle command available in the Process Display. It lists the stack marker trace of the processes displayed. The toggle is OFF when a new process is displayed.

### List All Processes (A) Command

This is a toggle command available in the User Summary Report Display. When the toggle is ON, all active processes (including system processes and CI processes waiting on SON processes to be displayed) are displayed. When the toggle is OFF (the default), only user processes are displayed.

## **Paging (ON/OFF) Command**

This is a toggle command available in the User Summary Report display. When ON (the default), you are prompted at the end of each screen:

CONTINUE? (YES/NO)

If you enter YES, the next process is displayed. Enter NO and no further processes are displayed.

## **List CPU Active Processes Only (C) Command**

This is a toggle command available in the User Summary Report display. When ON, only processes that used any CPU time during the interval displayed are shown. When OFF (the default), processes that did not use CPU time during the interval are also shown.

## **List By User Account (D) Command**

This is a toggle command available in the User Summary Report. When ON, only processes in the user account you specify are shown. When OFF (the default), all processes are displayed.



# SYSTEM TABLES CONTEXT (#T)

The System Tables Context provides information about the usage of MPE tables, data structures, and queues.

## OPT/3000 CONTEXTS

	GLOBAL CONTEXT #G	CPU-MEMORY MANAGER CONTEXT #C	MEMORY CONTEXT #M	I/O CONTEXT #I	PROCESS CONTEXT #P	SYSTEM TABLES CONTEXT #T
D	GLOBAL RESOURCE USAGE REPORT G	CPU-MEMORY MANAGEMENT REPORT R	MEMORY REPORT DISPLAY R	USER ACTIVITY REPORT R	USER SUMMARY REPORT G	TABLE UTILIZATION REPORT R
I	PROCESS SUMMARY DISPLAY P	MEMORY MANAGEMENT ACTIVITY DISPLAY M	MEMORY CONTENTS DISPLAY M	DISC ACTIVITY REPORT D	PROGRAM FILE DISPLAY F	DETAILED TABLE INFORMATION DISPLAY D
S		CPU USAGE DISPLAY C	BANK CONTENTS DISPLAY B	MAGNETIC TAPE ACTIVITY DISPLAY M	PROGRAM FILE USERS DISPLAY U	
P			OVERALL HISTOGRAM DISPLAY O	LINE PRINTER ACTIVITY DISPLAY P	PROCESS DISPLAY P	
L			CODE SEGMENT SIZE HISTOGRAM DISPLAY C		PROCESS STATE REPORT DISPLAY R	
A			DATA SEGMENT SIZE HISTOGRAM DISPLAY D			
Y			STACK SEGMENT HISTOGRAM DISPLAY S			
S			FREE AREA HISTOGRAM DISPLAY F			

Figure 10-1. Tables Context

This context is accessed by entering "#T" whenever OPT/3000 is accepting Control Operation Commands. There are two displays and a menu of commands available in this context. They are:

- (?) Menu of Commands - System Tables Context
- (D) Detailed Table Information Display
- (R) Table Utilization Report Display (default)

When the System Table Context is entered, you are prompted for the initial display with:

ENTER COMMAND FOR DISPLAY (? FOR MENU)

If you enter an unprogrammed command (or a RETURN), the default display (R) is generated.

By entering a question mark (?) you can obtain a menu screen giving you the display options within this context and all the Display Control commands. This is illustrated in Figure 10-2.

System Tables Context (#T)

\*\*\*\*\* MENU OF COMMANDS --- SYSTEM TABLES DISPLAY CONTEXT \*\*\*\*\*

<p><b>***DISPLAYS***</b></p> <p>D DETAILED TABLE INFORMATION DISPLAY</p> <p>R TABLE UTILIZATION REPORT (default)</p>	<p><b>***CONTROL OPERATIONS***</b></p> <p>#A ALTER LINE DRAWING CHAR SET POSITION</p> <p>#C ENTER CPU-MEMORY MANAGER CONTEXT</p> <p>#G ENTER GLOBAL CONTEXT</p> <p>#H CONTINUOUS HARD COPY GENERATION</p> <p>#I ENTER I/O CONTEXT</p> <p>#L CLOSE LISTING FILE</p> <p>#M ENTER MEMORY CONTEXT</p> <p>#P ENTER PROCESS CONTEXT</p> <p>#S SUSPEND OPT (UNTIL USER INPUT)</p> <p>#T ENTER SYSTEM TABLES CONTEXT</p> <p>#? MENU OF CONTROL OPERATION COMMANDS</p>
<p><b>***OTHER TABLES CONTEXT COMMANDS***</b></p> <p>C CLEAR OBSERVED MAXIMUMS COMMAND</p> <p>K KEEP CURRENT TABLE DISPLAY</p>	<p><b>***DISPLAY CONTROL***</b></p> <p>E EXIT</p> <p>H HELP</p> <p>L LISTING (GENERATE HARD COPY)</p> <p>T TIME CHANGE (OF UPDATE INTERVAL)</p> <p>X DEFINE XEQ SEQUENCE</p> <p>. MPE COMMAND</p> <p>? MENU DISPLAY</p> <p>! NOTE COMMAND <b>COMMAND?</b></p>

Figure 10-2. Menu of Commands - System Tables Display Context

OPT/3000 generates the prompt:

COMMANDS?

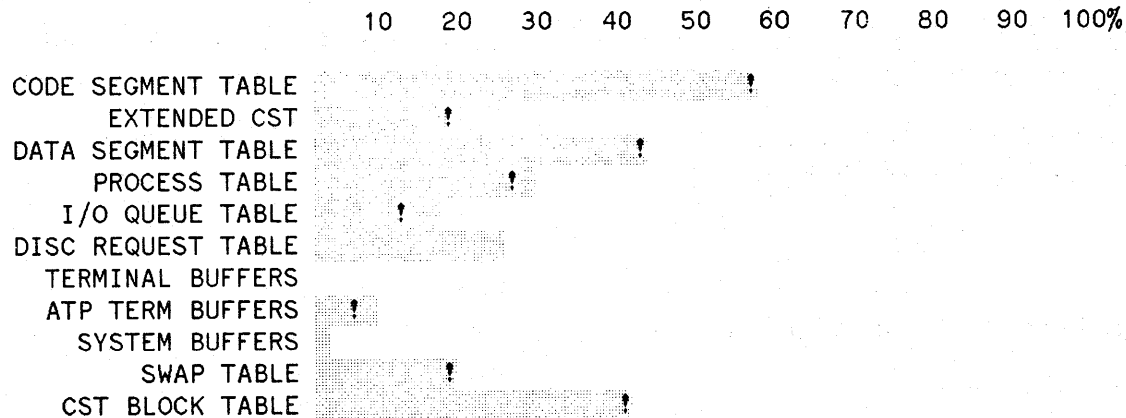
Responding to the menu prompt with an unprogrammed command (or a **RETURN**) generates this context's default display.

## TABLE UTILIZATION REPORT DISPLAY (R)

This display provides information about current and maximum utilizations of various system tables, queues, and data structures. The Table Report Utilization Display is the default display within this context and displays table information in the form of bars. It provides less detail than does the Detailed Table Information Display. To access this display, enter "R" from anywhere within the System Tables Context whenever OPT/3000 is accepting commands.

### TABLE UTILIZATION REPORT

9:29 AM



<b>LEGEND:</b> ! CURRENT UTILIZATION MAXIMUM UTILIZATION (observed maximum for some items.)	VIRTUAL MEMORY AND SPOOLER SPACE ARE IN TERMS OF DISC SECTORS. ALL OTHER ITEMS ARE IN TERMS OF THE NUMBER OF ENTRIES IN USE.	<b>ENTER:</b> D FOR DETAILED INFORMATION (includes configured size and entry size of each table listed above.) K KEEP CURRENT TABLE DISPLAY
---	---	--

Figure 10-3. Table Utilization Report

## Display Description

Each system table or data structure is represented in the display by one line. The line shows the current utilization with the dark portion of the bar and the maximum utilization with the white portion of the bar. If no white portion is present, the current utilization is the maximum utilization. All utilization percentages are rounded to the nearest two percent. A (!) is used to delimit the end of the dark portion of the bar.

For most of the items listed, the maximum utilization is the maximum since the last system start-up. This information is not always available, so the stated value sometimes is the maximum observed by OPT/3000.

The tables are spread over two displays, displayed in alternating fashion. The K command is a toggle. The first time you enter K, the current set of tables is kept in display. The next time you enter K, the next set of tables are displayed.



## Interpretation Guidelines

- Any item with a maximum utilization that is low (less than 30 percent) may be configured too large.
- Any item with a maximum utilization that is high (greater than 90 percent) may be configured too small.
- Current utilization of the Interrupt Control Stack is always zero.
- The detailed table information Display can help determine the amount of memory that will be saved or used if the configured size of a table is changed.
- Tables which consistently have low utilizations could probably be configured to be smaller, resulting in additional available memory. Peak loads must be considered before reconfiguration.
- Tables which have high utilizations may be causing poor performance. Configuring these tables to be larger may improve system performance.

## Legend

The following is the list of tables included in this display:

* Code Segment Table	(CST)
* Code Segment Table Extension	(CSTX)
* Data Segment Table	(DST)
* Process Control Block Table	(PCB)
* I/O Queue Table	(IOQ)
* Disc Request Table	(DRQ)
* Terminal Buffers	(TBUF)
* ATP Terminal Buffers	(ATPBUF)
* System Buffers	(SBUF)
Interrupt Control Stack	(ICS)
CST Block Table	(CSTBLK)
Swap Table	(SWAPTAB)
Job Process Count Table	(JPCNT)
* Virtual Memory Disc Table	(VMEM)
Spooler Disc Space	(SPOOL)
Primary Message Table	(PMT)

Secondary Message Table	(SMT)
Special Request Table	(SRT)
UCOP Request Queue	(UCOPQ)
Breakpoint Table	(BPT)
* Timer Request List	(TRL)
RIN Table	(RIN)

As mentioned, an asterisk (\*) preceding the table name means the reported maximum is for the time since the last system startup.

## DETAILED TABLE INFORMATION DISPLAY (D)

This display provides detailed information about system tables and data structures, including the configured size of each table, the entry size for each, and the current and maximum table utilizations. To access this display, enter "D" from anywhere within the Tables Context whenever OPT/3000 is accepting commands.

DETAILED TABLE INFORMATION DISPLAY

9:10 AM

	CONFIGURED	CURRENT USAGE		MAXIMUM USAGE			ENTRY	
	ENTRIES	IN USE	UTIL	OBSVD	IN USE	UTIL	SIZE	
CODE SEGMENT TABLE	383	229	59.8%	229	229	59.8%	4 W	
EXTENDED CST	1536	254	16.5%	254	330	21.5%	4 W	
DATA SEGMENT TABLE	1023	422	41.3%	422	666	65.1%	4 W	
PROCESS TABLE	256	64	25.0%	64	101	39.5%	21 W	
I/O QUEUE TABLE	255	29	11.4%	29	70	27.5%	12 W	
DISC REQUEST TABLE	825	11	1.3%	11	171	20.7%	17 W	
TERMINAL BUFFERS	****	Table is not accessible from this system					****	
ATP TERM BUFFERS	317	13	4.1%	13	40	12.6%	69 W	
SYSTEM BUFFERS	40	0	.0%	0	3	7.5%	129 W	
SWAP TABLE	2051	334	16.3%	334	334	16.3%	6 W	
CST BLOCK TABLE	72	26	36.1%	26	27	37.5%	1 W	

MAX IN USE INDICATES A 'HIGH WATER' MARK MAX OBSVD IS HIGHEST 'CURRENT IN USE' SINCE THE TABLES CONTEXT WAS ENTERED	W - WORDS B - BYTES S - SECTORS	ENTER: C TO CLEAR OBSVD MAXIMUMS R FOR TABLE UTIL DISPLAY K TO KEEP CURRENT DISPLAY
---	---------------------------------------	--

Figure 10-4. Detailed Table Information Display

## Display Description

The tables detailed in this display are documented in the LEGEND section. For each table, one line of information is reported as follows:

CONFIGURED ENTRIES		Number of configured entries in the table; reported in words, bytes, or sectors (See ENTRY SIZE below).
CURRENT USAGE	IN USE	Number of entries currently in use.
	UTIL	Current table utilization (%).
MAXIMUM USAGE	OBSVD	Maximum number of entries in use observed by OPT/3000 while in the System Tables Context.
	IN USE	Maximum number of entries in use since last system startup for most items; high water mark as observed by OPT/3000 for the others. See list of tables in next section to determine which is reported for each item.
	UTIL	Maximum in use table utilization (%).
ENTRY SIZE		Entry size in words (W), bytes (B), or disc sectors (S).

## Interpretation Guidelines

The number of configured entries reported for the CST,DST, PCB, Swap table and Special Request table in OPT differ from those values reported by SYSDUMP. The reasons for the differences are attributed to table headers and entries required by the Operating System. OPT reports the number of entries configured by the user plus those configured by the operating system. SYSDUMP reports only entries configured by the user.

## ADDITIONAL COMMANDS

In addition to the displays, two additional commands are available in this context.

### Keep Current Tables Command (K)

This command is a toggle that controls the table display. The first time you enter the K command, you "keep" the display for the current set of tables and prevent display of the next set of tables. The second time you enter the K command, you cause the next set of table to be displayed.

### Clear Maximums Display Command (C)

This command clears the observed maximum number of entries in use for all tables in the Detailed Table Information Display. To invoke this command, enter "C" from either display in the Tables Context. After the command is entered, the totals are cleared and the message:

**OBSERVED MAXIMUMS CLEARED**

is displayed. OPT/3000 then pauses, erases the message, and updates the current display.

# LIST OF OPT/3000 COMMANDS

APPENDIX

A

## CONTROL OPERATION COMMANDS

#? Menu Display for Control Operation Commands

To Enter New Context

- #C CPU-Memory Manager Context
- #G Global Context (defaults to Global Report)
- #I I/O Context
- #M Memory Context
- #P Process Context
- #T Systems Tables Context
- #A Alter line drawing character set position
- #H Continuous hard copy generation toggle
- #L Close listing file
- #S Temporarily suspend display updating

## DISPLAY CONTROL COMMANDS

- E Exit
- H Access on-line HELP facility
- L Hard copy list of current display
- T Change update time interval
- X Define sequence of commands
- ? Menu display command for current context
- : Execute MPE Commands
- ! Generate note

## BATCH ACCESS CONTROL

Defaults:

Minutes between summary reports?	(60)
Reports between closing of report file?	(8)
File closings before termination?	(3)
Name of log file?	(none)
Summary report identification?	(none)

# CONTEXTS

## ADDITIONAL COMMANDS

### #C CPU/Memory Manager Context Commands

Displays:       ?    CPU Context Menu  
                  C    CPU Usage  
                  M    Memory Management Activity  
                  R    CPU-Memory Management Report  
                          (default)

### #G Global Context Commands

Displays:       ?    Global Context Menu  
                  G    Global Resource Usage Report            A S R Z  
                          (default)  
                  P    Process Summary                         A S R Z

Additional       A    Activate summary report generation  
Commands:       R    Generate single summary report  
                  S    Stop summary report generation  
                  Z    Zero totals

### #I I/O Context Commands

Displays:       ?    I/O Context Menu  
                  D    Disc Activity                            A N Q  
                  M    Magnetic Tape Activity                 A N  
                  P    Line Printer Activity                    A N  
                  R    I/O Activity Report (default)

Additional       A    Alter Displayed Devices  
Commands:       Q    Display Disc Queue Information  
                  N    Display Next Device

## ADDITIONAL COMMANDS

### #M Memory Context Commands

Displays:	?	Memory Context Menu	
	B	Bank Contents	
	C	Code Segment Size Histogram	A N P U
	D	Data Segment Size Histogram	A N P U
	F	Free Area Size Histogram	
	M	Memory Contents	K
	O	Overall Histograms	A N P U
	R	Memory Report (default)	
	S	Stack Segment Size Histogram	A N P U
Additional Commands:	A	All Segments	
	N	Non-user Segments Only	
	P	Present Segments Only (default)	
	U	User Segments Only	
	K	Keep Current Memory Block	

### #P Process Context Commands

Displays:	?	Process Context Menu	
	F	Program File Display	S I
	P	Process Display	S N W M
	R	Process State Report	S
	U	Program File Users Display	S N W
	G	User Summary (default)	S A B C D
Additional Commands:	I	In Use Only	
	N	Next	
	W	List Working Set Segments	
	S	List SIR Information	
	A	List All Processes in User Summary	
	C	List CPU Active Processes Only	
	B	Paging ON/OFF	
	M	List Stack Markers	
	D	List by User Account	

### #T System Tables Context Commands

Displays:	?	System Tables Context Menu	
	D	Detailed Table Information	C K
	R	Table Utilization Report Display (default)	C K



**Additional  
Commands:**

- C** Clear Observed Maximums
- K** Keep Current Table Display

# DESCRIPTION OF OPT/3000 LOG FILE

APPENDIX

B

## Description of OPT/3000 LOG FILE

On the following pages the format of the OPT disc log file is described. The file is a binary, fixed length record file, and is created with a file code of 1130. The size of the records will depend upon the number of discs, line printers, and magnetic tape drives on the system being monitored. Once the file is opened, the intrinsic FGETINFO can be used to determine the record size. The first record of the file is the header record, and includes the time and date at which summary report generation was activated. This record also includes the number of discs, line printers, and tape drives on the system, as well as the logical device number for each such device. The number of discs, line printers, and tape drives must be used in order to correctly unpack the information in the remaining summary records.

The remaining records in the file are the summary records. Each record includes the summary report number, time and date for the start of the summary interval, and all of the summary information used to generate the line printer summary report. One word of the summary record is used as a flag to indicate the last summary record in the file. This summary record must be treated differently, since it is actually a summary of all of the previous summary records in the file.

Description of OPT/3000 Log File

FORMAT OF RECORD 0 (HEADER RECORD)

0	SIZE OF RECORDS (WORDS)	0
1	START DATE (FROM "CALENDAR")	1
2	START TIME (FROM "CLOCK")	2
3		3
4	NUMBER OF DISC DEVICES	4
5	NUMBER OF LINE PRINTER DEVICES	5
6	NUMBER OF MAGNETIC TAPE DEVICES	6
7	LOGICAL DEVICE # FOR DISC 1	7
10	.	8
11	.	9
12	LOGICAL DEVICE # FOR DISC N	10
13	LOGICAL DEVICE # FOR LP 1	11
14	.	12
15	.	13
16	LOGICAL DEVICE # FOR LP N	14
17	LOGICAL DEVICE # FOR TAPE 1	15
20	.	16
21	.	17
22	LOGICAL DEVICE FOR TAPE N	18
REMAINDER OF THIS RECORD CONSISTS OF ZEROS UNTIL LAST 5 WORDS		

## FORMAT OF RECORDS 1-N (SUMMARY RECORDS)

0	SUMMARY REPORT NUMBER	0
1	TRUE: THIS IS OVERALL REPORT	1
2	(UNUSED)	2
3	DATE FROM "CALENDAR" INTRINSIC	3
4	CLOCK TIME FOR START OF INTERVAL OBTAINED FROM "CLOCK" INTRINSIC	4
5		5
6	ELAPSED TIME FOR THE INTERVAL (MILLISECONDS)	6
7		7
10	TOTAL CPU BUSY TIME (MILLISECONDS)	8
11		9
12	TOTAL TIME PAUSED FOR DISC & SWAP (MILLISECONDS)	10
13		11
14	TOTAL TIME PAUSED FOR DISC (MILLISECONDS)	12
15		13
16	TOTAL TIME PAUSED FOR SWAP (MILLISECONDS)	14
17		15
20	TOTAL TIME PAUSED BECAUSE IDLE (MILLISECONDS)	16
21		17
22	TOTAL CPU ON GARBAGE COLLECTION (MILLISECONDS)	18
23		19
24	TOTAL CPU ON MEMORY ALLOCATION (MILLISECONDS)	20
25		21

Description of OPT/3000 Log File

26	TOTAL CPU ON USER CACHE MANAGEMENT (MILLISECONDS)	22
27		23
30	TOTAL CPU SPENT ON ICS CACHE MANAGEMENT (MILLISECONDS)	24
31		25
32	TOTAL CPU SPEND ON CACHE MEMORY ALLOCATION (MILLISECONDS)	26
33		27
34	NUMBER OF DISC CACHE READ HITS	28
35		29
36	NUMBER OF DISC CACHE WRITE HITS	30
37		31
40	# PROCESS LAUNCHES	32
41		33
42	# TIMES PAUSED FOR DISC & SWAP	34
43		35
44	# TIMES PAUSED FOR DISC	36
45		37
46	# TIMES PAUSED FOR SWAP	38
47		39
50	# TIMES PAUSED BECAUSE IDLE	40
52		41
52	# TIMES GARBAGE COLLECTION ATTEMPTED (BACKGROUND)	42
53		43
54	# PROCESS SWAP-INS	44
55		45

56	# PROCESS PREEMPTIONS	46
57		47
60	# CODE SEGMENTS RELEASED	48
61		49
62	# DATAS SEGMENTS RELEASED	50
63		51
64	# MEMORY MANAGEMENT DISC READS	52
65		53
66	# MEMORY MANAGEMENT DISC WRITES	54
67		55
70	# MEMORY MANAGEMENT SPECIAL REQUESTS	56
71		57
72	# MEMORY ALLOCATIONS	58
73		59
74	# MEMORY MANAGEMENT CLOCK CYCLES	60
75		61
76	# DISC CACHE DOMAIN RELEASES	62
77		63
100	# OF MEMORY ALLOCATION ATTEMPT RESULTS	64
101	SUMMARIZED IN THE FOLLOWING 5 COUNTS	65
102	# MEMORY ALLOCATION ATTEMPTS RESULTING	66
103	IN SEGMENT RECOVERIES	67
104	# MEMORY ALLOCATION ATTEMPTS	68
105	RESULTING IN USE OF FREE SPACE	69

Description of OPT/3000 Log File

106	# MEMORY ALLOCATION ATTEMPTS RESULTING IN THE MAKING OF OVERLAY CANDIDATES	70
107		71
110	# MEMORY ALLOCATION ATTEMPTS RESULTING IN GIVE-UPS	72
111		73
112	# MEMORY ALLOCATION ATTEMPTS RESULTING IN SUCCESSFUL HARD REQUESTS	74
113		75
114	(UNUSED)	76
115		77
116	(UNUSED)	78
117		79
120	(UNUSED)	80
121		81
122	# MM DISC READS (ALL DISCS)	82 Disc Device Information
123		83
124	# MM DISC WRITES (ALL DISCS)	84
125		85
126	# CONTROL OPERATIONS (ALL DISCS)	86
127		87
130	# USER DISC READS (ALL DISCS)	88
131		89
132	# USER DISC WRITES (ALL DISCS)	90
133		91
134	# DISC CACHE READS (ALL DISCS)	92
135		93

Description of OPT/3000 Log File

136	# DISC CACHE WRITES	(ALL DISCS)	94
137			95
140	DISC QUEUE LENGTH=0	(ALL DISCS)	96
141			97
142	DISC QUEUE LENGTH=1	(ALL DISCS)	98
143			99
144	DISC QUEUE LENGTH=2	(ALL DISCS)	100
145			101
146	DISC QUEUE LENGTH=3	(ALL DISCS)	102
147			103
150	DISC QUEUE LENGTH=4	(ALL DISCS)	104
151			105
152	DISC QUEUE LENGTH=5	(ALL DISCS)	106
153			107
154	DISC QUEUE LENGTH>=6	(ALL DISCS)	108
155			109
156	# MM DISC READS	(DISC 1-N)	110
	# MM DISC WRITES	(DISC 1-N)	

This is repeated for each disc device



# CONTROL OPERATIONS	(DISCS 1-N)
# USER DISC READS	(DISCS 1-N)
# USER DISC WRITES	(DISCS 1-N)
# DISC CACHING READS	(DISCS 1-N)
#DISC CACHING WRITES	(DISCS 1-N)
DISC QUEUE LENGTH =0	(DISC 1-N)
DISC QUEUE LENGTH =1	(DISC 1-N)
DISC QUEUE LENGTH =2	(DISC 1-N)
DISC QUEUE LENGTH =3	(DISC 1-N)
DISC QUEUE LENGTH =4	(DISC 1-N)
DISC QUEUE LENGTH =5	(DISC 1-N)
DISC QUEUE LENGTH >=6	(DISC 1-N)
# WRITE OPERATIONS	(ALL LPs)

#CONTROL OPERATIONS	(ALL LPs)
# WRITE OPERATIONS	(LP 1-N)
# CONTROL OPERATIONS	(LP 1-N)
# READ OPERATIONS	(ALL TAPES)
# WRITE OPERATIONS	(ALL TAPES)
# CONTROL OPERATIONS	(ALL TAPES)
# READ OPERATIONS	(TAPEs 1-N)
# WRITE OPERATIONS	(TAPEs 1-N)
# CONTROL OPERATIONS	(TAPEs 1-N)



# OPT/3000 FATAL ERRORS

APPENDIX

C

## Quit Number Error Message

INCOMPATIBLE VERSION OF MPE FOR THIS OPT  
2 INCOMPATIBLE TERMINAL FOR USE WITH OPT  
3 UNABLE TO ENABLE MPE INSTRUMENTATION  
4 UNABLE TO EXPAND DL AREA  
5 UNABLE TO SAMPLE MPE INSTRUMENTATION

100 INVALID NUMERIC INPUT  
101 READ FROM \$STDIN FAILED (NOT EOF)  
102 UNABLE TO PURGE OLD LOG FILE  
103 UNABLE TO OPEN SPECIFIED LOG FILE

200 OPEN OF FILE 'OPTREPT' FAILED  
201 UNABLE TO WRITE TO OPT LOG FILE  
202 UNABLE TO OBTAIN EXTRA DATA SEGMENT  
203 UNABLE TO WRITE TO EXTRA DATA SEGMENT  
204 UNABLE TO READ FROM EXTRA DATA SEGMENT

Errors 100-103 are applicable only to the batch execution of OPT.

Errors 200-204 are associated with the generation of summary reports.

UNABLE TO OPEN #STDINX - this message appears when OPT/3000 is unable to open the file #SDTINX, along with the file system error number.

INVALID DATA! - this message appears in place of the percentage bars in the case of system data corruption or corruption of data from the measurement interface. OPT/3000 continues execution. If you receive this message, contact the Response Center.



# EXAMPLE BATCH JOB FOR OPT/3000

APPENDIX

D

```
!JOB optbatch,manager.sys;restart;OUTCLASS=epoc,2
!RUN OPT.PUB.SYS
30
4
3
optlog
Example batch stream job for OPT.
!EOJ
```



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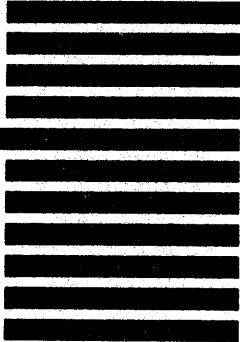
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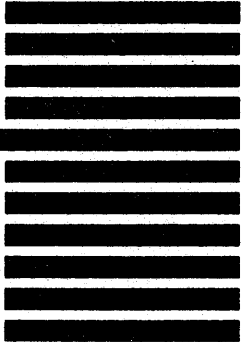
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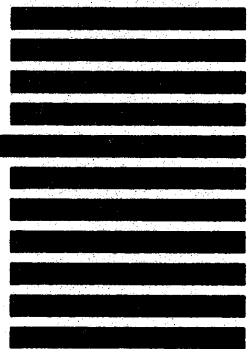
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