

WATCH V5.0

OpenVMS System Monitor

By Saiga Systems

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Overview

This section gives a brief description of the WATCH utility. WATCH allows OpenVMS system managers to monitor resource usage on Alpha AXP or VAX systems. It is a diagnostic tool which provides a minute-by-minute summary of critical resources on a Alpha AXP or VAX system running OpenVMS.

Watch shows CPU utilization, page faults, disk performance, cache hits and other useful system performance indicators. It presents important summary numbers rather than masses of detail data and all data is presented on one readable screen.

WATCH is easy to learn and use since it looks and acts like a OpenVMS utility. OpenVMS standards and coding conventions have been adhered to as closely as possible. Command defaults have been selected to minimize keystrokes and errors. WATCH commands look like regular DCL commands.

WATCH provides comprehensive on-line OpenVMS-style HELP. You can access the help from the DCL level.

NOTE: WATCH requires OpenVMS V5.0 or later. No additional OpenVMS layered products or licenses are necessary.

TERMINALS THAT WATCH WILL WORK WITH

Watch has been tested and runs successfully with the VT100 family of terminals (with the Advanced Video Option), VT2xx, VT3xx, and in DECterm windows under DECWindows. Watch has also been used successfully with several terminal emulation packages providing LAT or direct dial-in connections.

After starting Watch if the screen doesn't appear to be formatted correctly be sure you are configured to emulate one of the above terminals.

Installing WATCH

WATCH is easy to install on your Alpha AXP or VAX system using the Digital supplied VMSINSTAL procedure. It only takes a few minutes and can be safely done while there are users on the system. For the complete installation instructions refer to the Product Installation Guide.

Version 5.0 New Features

- * WATCH can now record data for more than the current day. When using WATCH to record data for subsequent use you may now specify date and time with the /START_TIME and /END_TIME qualifiers. Previously they accepted only time and no date information.
- * A new summary report has been added to watch. WATCH/REPORT=SUMMARY will read the contents of a watch record file and generate a two page report. Use /START_TIME and /END_TIME to summarize only a portion of the recorded information. A new /OUTPUT qualifier has been added to direct this report into a file instead of to the screen.
- * The WATCH user screen can now be limited to displaying on active processes by defining the logical WATCH\$ACTIVE to be "YES" before starting WATCH. Due to rounding some processes may still appear to be inactive; they have actually used less than ½ of 1 percent of the resources.
- * WATCH is Year 2,000 compliant. All dates are reported and specified with a 4 digit year. The main WATCH screen now shows the year as well as month and day.
- * WATCH can now run on systems with up to 2,000 processes; the previous limit was 1,000.
- * WATCH/VERSION now gives a multiple line display including the version and some license information.

Running WATCH in a VAXCluster

WATCH is set up to collect and view data on one system at a time. You cannot switch from one node to another from within the program. It always runs on the CPU you logged on to.

WATCH will not summarize statistics from a number of nodes into a single performance indicator.

Disk performance data may not be accurate on cluster wide disks because WATCH will only display usage for a disk on the node it's currently running on; a disk may show no usage and yet have usage on another node

Obtaining Technical Support

If you try the above suggestions and still continue to have problems, please contact Saiga Systems Technical Support :

by telephone at 1-800-561-8876 between 8:00 am and 5:00 pm Mountain Time
by e-mail at support@saiga.com

Please have the following information available or include it in your e-mail:

whether you are running on Alpha, VAX or both and what version of OpenVMS
your company name
WATCH version (from WATCH/VERSION output)

We will verify that you have a support agreement and speak to you or reply to your e-mail as quickly as possible.

You may wish to check our web page or ftp site for known problems and patches:

WWW <http://www.saiga.com/>
FTP <ftp.saiga.com> - anonymous login is supported

Using WATCH to Monitor Your System

To invoke WATCH, type WATCH at the command level along with the desired qualifiers. You can use the following qualifiers with the command:

```
/BASE  
/COMPARISON=type-of-display  
/DISK=(drive_specification[,...])  
/END_TIME=n  
/INTERVAL=n  
/NODISPLAY  
/PRIORITY=n  
/PLAYBACK=file-name  
/PRINT record-file-name output-file-name  
/RECORD=file-name  
/START_TIME=n  
/TOP=field-name  
/VERSION
```

For more detailed information on WATCH qualifiers, refer to the chapter on commands in this manual.

You can press CTRL-C or CTRL-Z or type EXIT to terminate a WATCH session.

You can enter "HELP WATCH" at the DCL command level if the WATCH help text was added into the system help library, or "HELP @WATCH" if it was added into a private, user help library.

WATCH and the OpenVMS MONITOR Utility

This chapter describes the relationship between WATCH and the OpenVMS MONITOR utility.

The Monitor Utility (MONITOR) is a system management tool supplied by Digital. It enables you to obtain information on operating system performance. It provides summary and detailed information about a vast array of system performance indicators. WATCH is a supplement to the MONITOR utility. It does not in any sense replace it.

WATCH condenses critical performance indicators from eight separate MONITOR screens onto a single screen. Only the important fields are present and their representation is as meaningful as possible. It also provides information such as response time and files open that MONITOR doesn't provide. Finally, it provides detail information about large numbers of processes, information about disks, and information about single processes on a single screen. Use WATCH to identify the problem area. Then use MONITOR to gather detail information and review it offline. Together, they form a potent system tuning facility.

MONITORING THE SYSTEM SUMMARY STATISTICS (The Main Screen)

When WATCH is first started the main screen appears. This screen contains a wealth of system resource usage information. A sample screen is shown below, followed by a detailed explanation of the information it contains.

```

CPU          TMEMORY %Used 74 ( 74) TSoft  0 ( 0) TBIO   4 ( 4) T10:09:16
%Used 100 (100) *Free  8209 ( 8209) *Hard  0 ( 0) *DIO   53 ( 52) *JAN 26
%Sys  61 ( 60) *Mod   1052 ( 1052) *Total 0 ( 0) *Split 0 ( 0) * 1996
DISK          I/O Rate  Que Length  Response  %Free  Files      * CACHE %Hit %Avg
EAGLE$DKA300  0 ( 0)  0.0 (0.0)  0 ( 0)    4      2          * Dir   0 ( 96)
EAGLE$DKB300 13 ( 2)  0.1 (0.0)  8 ( 12)   13     9          * Hdr   0 ( 98)
FALCON$DKA100 22 ( 1)  0.2 (0.0)  9 ( 10)   35    232        * Quo   0 ( 0)
                                           * Ext   0 (100)
                                           * Btmp  0 ( 0)
TOP          PID Username  Image      %Used  * Interactive 7 ( 7) * COM  2
BIO  0441E SYSTEM  WATCH      100    * Batch        0 ( 0) * SWPO  0
DIO  0431B GILBERTS  VDM_REPORTS 45     * Network      0 ( 0) * LEF   6
FAULT 044C4 GILBERTS  DECW$SESSION 0      * Other        18 ( 18) * HIB  16
WS   00096 GILBERTS  DECW$TERMINA 12     * Image Act.   0 ( 0) * OTHER 1
PID Username  Image      State Type  BIO DIO  Pages  Flts Pri  Imact  %CPU
0431B GILBERTS  VDM_REPORTS COM  I    0  24 1549/ 5200  0  4  4  36
0015A GILBERTS  VDM_REPORTS LEF  I    0  18 1758/ 5200  0  4  4  25
00159 GILBERTS  VDM_REPORTS COM  I    0  12 1697/ 5200  0  4  4  20
00096 GILBERTS  DECW$TERMINA LEF  O    0  0 2821/ 9582  0  6  2  2
0441E SYSTEM  WATCH      CUR  I    4  0  535/ 8222  0  4  39 1
00117 GILBERTS  LEF  I    0  0  317/ 6869  0  5  24 0

```

- NOTES:
- The screen is grouped into boxes using the graphics line-drawing characters.
 - Group headings are shown in uppercase and reverse video to identify groups.
 - The field name used for selection in the process display is in reverse video.
 - If a field overflows the value is replaced with asterisks (*).

Fields

This following pages describe the fields that appear on the WATCH screen. The first section describes the types of fields that can appear on the screen, the second describes the method WATCH uses to compare current and previous data and the third section describes each screen field in detail.

TYPE OF FIELDS

WATCH displays three different types of fields on the screen:

PERCENTAGES Percentages show the amount used out of 100. They are rounded to the nearest integer (ie 87.3 becomes 87 and 26.9 becomes 27). The field name starts with '%' to identify the data fields as percentages. MEMORY %USED is an example of a percentage field.

In many cases, 100% is represented as '**' rather than '100'. This was done to conserve screen space by reducing field sizes and to highlight extreme values (ie, if your MEMORY %USED is 100%, you almost certainly have memory problems).

MEASURED COUNTS A measured count is a snapshot of the number as it existed at the time of data collection. BIO is an example of a measured count.

ACCUMULATED COUNTS There are two types of accumulated counts:

*** SINCE PREVIOUS**

These numbers indicate how many of the events have happened since the last data collection run. DIO is an example of a SINCE PREVIOUS count.

*** SINCE PROCESS START**

These numbers indicate how many of the events have happened since the process itself was started. IMACT in the process display area is an example of a SINCE ACTIVATION count.

CURRENT AND COMPARISON DATA

WATCH displays two numbers in each field, a CURRENT number and a COMPARISON number. These values facilitate comparisons between successive screen updates.

CURRENT The first number, the one on the left, is the CURRENT number. This value was in effect when the data was collected.

COMPARISON The second number, the one on the right, is the COMPARISON number, the one that was in effect on the PREVIOUS data collection. You can display comparison numbers in four formats:

*** ACTUAL**

Under the actual alternative, the number shown is the previous value. Actual values are shown in brackets "(78)" to make them visually different from the DIFFERENCE format.

*** DIFFERENCE**

Under the difference alternative, the number shown is the DIFFERENCE between the current and previous values. Difference values are shown with a sign, for example "-12" or "+45". This method highlights the CHANGE in the data from the previous sample.

*** AVERAGE**

Under the average alternative, the number shown is the average value since the start of WATCH.

*** MAXIMUM**

Under the maximum alternative, the number shown is the maximum value since the start of WATCH.

You select actual, difference, average, or maximum comparisons using the /COMPARISON qualifier.

NOTE: In some cases, an average is shown in the differences field. The field descriptions indicate which fields this applies to.

Field Descriptions

CPU Group

The CPU group contains the following fields:

- | | |
|-------|--|
| %USED | This field indicates what percentage of time the CPU is being used by all processes (including system processes). |
| %SYS | This field indicates what percentage of time the CPU is being used by OpenVMS rather than user programs. This is time spent in kernel and interrupt modes. |

MEMORY Group

The memory group contains the following fields:

- | | |
|-------|---|
| %USED | This field indicates what percentage of available memory is allocated to processes. |
| FREE | This field indicates the number of pages on the free page list. |
| MOD | This field indicates the number of pages on the modified page list. |

FAULTS Group

The FAULTS group contains the following fields:

SOFT	This field show the number of soft faults per second over the data collection interval.
HARD	This field show the number of hard faults per second over the data collection interval.
TOTAL	This field shows the number of page faults (hard and soft) per second over the data collection interval.

I/O Group

The I/O group contains the following fields:

BIO	This field shows the total number of buffered I/O's (to terminals and printers) per second over the data collection interval.
DIO	This field shows the number of direct I/O's (to disk and tape) per second over the data collection interval.
Split	This field show the number of split I/O's per second over the data collection interval.

TIME

This field indicates the hour, minutes, and seconds that the screen was updated. The time is obtained from the system clock when the data is collected.

DATE

This field shows the current month and day just below the current time. The date is obtained from a system service.

DISK Group

The disk group shows the status of up to five drives, specified with the /DISK qualifier when starting watch or with the WATCH internal command DISK/MODIFY. It contains the following fields:

DISK	This field shows which drive the statistics apply to. You can select up to five (5) drives for display using the /DISK=(<i>n</i>) qualifier.
I/O RATE	This field shows the number of I/O operations per second over the data collection interval. This number is rounded to the nearest whole number.

QUE LENGTH	This field shows the average number of I/O requests that were queued prior to being serviced.
RESPONSE	This field shows the response time in milliseconds. The formula used to calculate this number is the one given in "Guide to OpenVMS Performance Management". It approximates the number of milliseconds that an I/O request must wait before being serviced. It is NOT the length of time required to do an average IO operation. If the I/O RATE is low (ie less than 2 per second), the response calculation is not very meaningful.
%FREE	This field shows the percentage of the disk that is not allocated at the current moment.
FILES	This field show the number of open files on each drive at the current moment.

CACHE Group

The cache group shows how often the system finds data in the cache rather than going to disk. The numbers show successful hits rather than the number of attempts. The hit rate is 0% if no attempts are made. The current hit rate and the average hit rate are shown for several types of cache including:

Dir	This field shows hit rates and averages for the directory cache.
Hdr	This field shows hit rates and averages for the file header cache.
Quo	This field shows hit rates and averages for the quota cache.
Ext	This field shows hit rates and averages for the extent cache.
Btmp	This field shows hit rates and averages for the disk bitmap cache.

TOP Group

The TOP group identifies the top users of critical resources. There is a line for each of the following resources:

- * CPU
- * DIO
- * BIO
- * FAULT
- * WS

The rest of the line contains the PID, Username and Image name of the top user. The last field on the line (labelled %Used) shows what percentage of the resource is being consumed by the top process. Only FOUR of the five resources listed are shown in this area. The fifth

is displayed in the process display area. You select which resource is shown in the process area using the /TOP qualifier. Only the rightmost 5 digits of the PID and the leftmost 12 characters of the image name are displayed. If one of the values is zero (ie. no buffered I/O's occurred during data collection) the top sorted process is shown with 0 in the %Used column.

PROCESS SUMMARY Group

The process group shows how many processes are running on the system. The following types of processes are identified:

INTERACTIVE	This field shows the number of interactive processes running on the system. An interactive process is defined as one which is logged into a terminal.
BATCH	This field shows the number of batch processes running on the system. A batch process is defined as one which is running in a batch queue.
NETWORK	This field shows the number of network processes running on the system. A network process is defined as one which is running from a remote node. Some applications that create their own user processes may create network instead of interactive processes..
OTHER	This field shows the number of other processes running on the system. An other process is defined as one that does not fit into the above categories.
IMAGE ACT.	This field shows the total number of images which have been activated since last data collection.

STATES Group

The state group shows the number of processes in different states. It contains the fields:

COM	This field shows the number of processes which are ready to run.
SWPO	This field shows the number of processes which are swapped out. (ie. HIBO, LEFO, COMO ...)
LEF	This field shows the number of processes which are in Local Event Flag wait state.
HIB	This field shows the number of processes which are hibernating.
OTHER	This field shows the number of processes which are in some state other than the ones listed above. (ie. PFW, RWAST ...)

PROCESS DISPLAY

The process area shows detailed information about the top six users of a resource, listed in descending order. You can select which resource using the "TOP=field_name" command. The selected field name, ("DIO", "CPU", etc.) is shown in reverse video so that you can easily tell which selection is in effect.

Each line contains the following fields:

PID	This field gives the Process Identification of the process. Only the rightmost 5 digits of the PID are displayed.
USERNAME	This field shows the Username associated with the process.
IMAGE	This field shows the image associated with the process. Note that only the leftmost 12 characters of the image name are displayed.
STATE	This field shows the current state of the process.
TYPE	This field show the type of the process in a single character form. (ie. 'I' for Interactive, 'B' for Batch, 'N' for network, and 'O' for Other)
BIO	This field shows the number of buffered I/O's per second generated since the last update.
DIO	This field shows the number of direct I/O's per second generated since the last update.
PAGES	This field shows the current working set and the peak virtual address size (ie., physical memory and page file space).
FLTS	This field shows the number of page faults per second generated since the last update.
PRI	This field shows the process priority.
IMACT	This field shows the number of images activated since the process began.
%CPU	This field shows the percentage of the CPU used by the process.

POP-UP ONE LINE WINDOWS

Watch has pop-up one line windows to enter commands and to display messages. When you type a character, a command window appears to record the command. When you press the enter key at the end of the command, the window disappears and WATCH executes the command.

If you accidentally hit a key, hit the delete key until the window disappears.

When WATCH has a message, it creates a window to display it. When you press enter the window disappears.

USER SCREEN

This section describes the WATCH user screen.

In addition to showing a summary of critical performance indicators, WATCH will display an expanded list of processes on the system. In essence, this expands the number of lines in the process display area from 6 to 20. The information shown for each process remains the same. The intent is to allow the operator to obtain information about processes known to be running but not consuming large amounts of resources. If more than 20 processes are active, WATCH displays the first set. You can bring up the next screen by pressing any key, or enter R to return to the regular WATCH screen.

You can use the process screens to watch a large number of processes. You select the types of processes to display by using the /INCLUDE=process-mode qualifier. For example, /INCLUDE=INTERACTIVE would show only interactive processes. Valid values are:

- * INTERACTIVE
- * BATCH
- * NETWORK
- * OTHER
- * ALL

If /INCLUDE is not specified, it defaults to /INCLUDE=ALL. If the logical name WATCH\$ACTIVE is defined to be YES this display will show only active users.

Sample User Screen

PID	Username	Image	State	Type	BIO	DIO	Pages	Flts	Pri	Imact	%CPU
00046	SYSTEM	CONFIGURE	HIB	O	0	0	168/ 1384	0	10	0	0
00048	SYSTEM	IPCACP	HIB	O	0	0	79/ 1325	0	10	0	0
.											
044D5	GILBERTS	WATCH	CUR	I	9	0	787/ 8222	4	4	10	1
00216	GILBERTS	VDM_REPORTS	COM	B	0	103	1671/ 5040	0	4	4	138
00297	GILBERTS	REPORT_DISK	LEF	B	4	76	1711/ 5040	273	4	4	131
0455E	RASMUSSONA	RTPAD	HIB	N	38	0	317/ 4741	0	6	8	3

Press: `P` for process screen `R` to return any other key to continue

PROCESS SCREEN

This chapter describes the WATCH process screen.

The WATCH process screen is similar to the SHOW PROCESS/CONTINUOUS screen. You can now monitor a single process without having to exit WATCH. The difference between the SHOW PROCESS/CONTINUOUS screen and the WATCH process screen is that the WATCH process screen shows the current mode and number of subprocesses and also shows the CPU time, BIO's, DIO's, and PAGE FAULTS on a per interval and per second basis. Some of the fields in the SHOW PROCESS/CONTINUOUS screen like the current PC and PSL were left out because they are less relevant than other fields.

The process screen can be reached from the main or user screens. To reach it from the main screen, just type PROCESS/ID=pid. This will show a separate screen with the important information about that process. To exit that screen, hit any key and WATCH will return you to the main screen. To reach it from the USER screen, just type the letter 'P' for process and the command PROCESS/ID= will show on the bottom of the screen waiting for the user pid. It will accept a minimum of 3 and a maximum of 5 digits. To exit that screen, hit any key and WATCH will return you the USER screen. Some of the fields shown in the process screen are:

- * Username
- * Process name
- * Current and Base Priority
- * Number of Sub-processes
- * Current Image running
- * Accumulated CPU time
- * Bio's, Dio's and Page Faults

Sample Process Screen Display

```
Username      : GILBERTS      PID           : 20A043DF
Process Name  : GILBERTS_3    UIC           : [000200,000012]
State        : LEF           Mode          : Interactive
Curr Priority : 5             Base Priority  : 4
Subprocesses : 0             WS/Virtual Peak : 1490/ 5221
```

```
Current Image: FALCON$DKA100:[VDM.EXE.VAX]VDM_REPORTS.EXE;2
```

	Per Second	Per Interval	Since Login
Cpu Time:	26	262	8342
Buffered I/O`s:	0	1	79
Direct I/O`s:	15	152	4443
Page Faults:	0	0	9434

Press any key to return

DISK SCREEN

This section describes the WATCH disk screen.

This screen is the same format as the disk window on the main screen, but can display a lot more disks.

In order to view the disks screen the file DISKNAMES.DAT must exist in the WATCH_EXE directory. If you want to re-create this file, execute the CREATE_DISK_FILE.COM procedure in the [WATCH.COM] directory. If you want to remove any of the disks from that screen, you can edit the DISKNAMES file with any text editor and remove that diskname.

If there are more than 20 disks in the file, WATCH will show the first 20 and you hit enter to view the next 20, and so on. To exit this screen just hit the 'R' key.

Sample Disk Screen

Disk	I/O Rate	Que length	Response	%Free	Open
\$1\$DKA100:	30 (28)	0.0 (0.0)	0 (0)	35	232
\$1\$DKA300:	0 (0)	0.0 (0.0)	0 (0)	4	2
\$1\$DKB300:	12 (12)	0.0 (0.0)	0 (0)	13	9
\$2\$DKA200:	17 (17)	0.0 (0.5)	0 (29)	43	2
\$2\$DKA300:	0 (0)	0.0 (0.0)	0 (0)	5	1

Press any key to continue

R to return

ADVISE SCREEN

WATCH performs the calculations suggested in the OpenVMS documentation for determining if you have a performance problem on your system. A complete list of these calculations is given in the Advise section of the chapter on Internal WATCH Commands, later in this manual. Any calculations that result in values that the documentation suggests may be causing a performance problem are reported.

Sample ADVISE Screen

```
WATCH ADVISE
Hardware: VAXstation 4000-VLC          Nodename: FALCON
VMS: V6.0          Number of cpus: 1    Nodes in system: 3
Total memory:     32000 pages          Avail memory:     9359 pages
```

QUOTA cache hit percentage is low (below 70%)

AWSA voluntary decrementing is turned off

LONGWAIT is high (greater than 20 seconds)

Press any key

Recording WATCH Data for Subsequent Viewing/Printing

This section describes how to record, playback, and print WATCH data files. In addition to watching the system in interactive mode, WATCH allows you to record the information in a file and play it back at a later time. Using record it's possible to collect WATCH information with a batch job without tying up a terminal, then review it at a later date.

RECORD

To record information, use the `/RECORD=file_name` qualifier. As the information is collected, it will be written to the file. If you don't specify any directory information, the data file is created in the account from which WATCH was run. Use `/START_TIME` and `/END_TIME` to control when recorded starts and stops. The `/NODISPLAY` qualifier can be added to the WATCH command to prevent WATCH data from being displayed; using this qualifier it is possible to set up DCL command procedures and batch jobs to collect and analyze system data.

PLAYBACK

To view data from a previously recorded file, use the `/PLAYBACK=file-name` qualifier. In this case, the `/INTERVAL=time` indicates the viewing interval rather than the collection interval. You can record data with an interval of 60 seconds then play it back with an interval of 5 seconds. This shortens the viewing time dramatically.

You can use the `/START_TIME` qualifier to specify a starting time for viewing the record file. This allows you to skip around in the file and view different time intervals easily. The time specified is an absolute time, in OpenVMS standard time format. If the start time is not specified, it defaults to the start of the record file.

You cannot change the `/TOP` qualifier when you view a recorded file and you cannot issue the `USERS` command.

You also use the `/PLAYBACK` qualifier when generating a `/REPORT=SUMMARY` to indicate which previously recorded data file is to be used for input.

NOTE: When doing a playback, the time field shows the time at the moment of data collection, not the current time.

PRINT

To print data from a previously recorded file, use the `/PRINT` qualifier. It requires two parameters - the record filename and the output or destination filename. The report consists of two WATCH screens per page of output. You can print part of the data using the `/START_TIME` and `/END_TIME` qualifiers. The `/COMPARISON` qualifier can also be used to specify the format of the comparison numbers. See the section on Watch external commands for the proper syntax.

SUMMARY

Version 5 of WATCH includes a new two-page summary report. To summarize data from a

previously recorded file use the new /REPORT=SUMMARY qualifier-keyword combination. The summary will be generated to the screen or can be directed to a file with the new /OUTPUT qualifier. An example of this new report is in Appendix B. You can use /START_TIME and /END_TIME to summarize only a portion of the data file.

A sample WATCH batch procedure is included in WATCH_COM called WATCH_MONITOR.COM. This procedure can be easily modified to suit your site's requirements. It resubmits for 24 hours later, records data for a 24 hour period and then generates three summary reports; peak-usage time, prime time and non-prime time. These reports are mailed to the system manager.

Logicals You Need to Run WATCH

This chapter shows you the logicals WATCH uses and how to define them.

To use WATCH you must define several logicals. Here is a description of each logical that may be defined on your system for WATCH.

WATCH_CDU - This logical points to the [WATCH.CDU] directory. It is used to access the WATCH command definition table. WATCH_CDU is optional.

WATCH_COM - This logical points to the [WATCH.COM] directory. It is used to access WATCH DCL command procedures. WATCH_COM is optional.

WATCH_DAT - This logical points to the [WATCH.DAT] directory. It is used to access the data files, including the DISKNAME.DAT file for the DISKS screen. WATCH_DAT is required and must be defined in the system logical table.

WATCH_DOC - This logical points to the [WATCH.DOC] directory. The help files are stored in this directory. WATCH_DOC is optional.

WATCH_EXE - This logical points to the [WATCH.EXE] directory. It is used to access the WATCH executables. It is required and must be defined in the system logical table. If you cannot access WATCH check to see that this logical is defined in the system table.

WATCH\$ACTIVE - Define this logical to be YES in your process table before starting WATCH and only active processes will be displayed on the user screen.

Privileges You Need to Run Watch

This section describes the privileges WATCH requires to run. WATCH requires WORLD and CMKRNL privileges.

WATCH checks for the appropriate privileges and issues an error message if it doesn't have them.

It should be run out of a privileged account or be given privilege when it is installed.

NOTE: If you have ALTPRI, you can run WATCH at an elevated priority by specifying /PRIORITY=n, where n is the priority you wish to run at. If the /PRIORITY qualifier is not specified, WATCH will execute at priority 4.

The Priority WATCH Needs to Run

WATCH should be run at elevated priority to ensure accurate data collection. To run WATCH at an elevated priority, use the /PRIORITY=n qualifier, where 'n' is the desired priority, when you start it.

WATCH does not allow you to specify a priority higher than 15 because priorities 16 to 31, while valid, can cause conflicts with system processes. If the /PRIORITY qualifier is not specified, WATCH will run at priority 4.

Watch Internal Commands

This section describes the commands which can be issued while WATCH is running. Issuing these commands will cause WATCH to switch to an alternate screen that provides more detailed information.

NOTE: You cannot edit internal WATCH commands, they must be typed correctly.

ADVISE

This command instructs WATCH to inform you of system performance statistics and sysgen parameter values that may be of interest. WATCH will advise you when any of the following events occur:

- * Any disk has a HEAVY I/O rate (more than 25 per second)
- * The HARD FAULT rate is high (above 10%)
- * Any disk has a high DISK RESPONSE TIME (above 40 ms)
- * Number of computable processes is greater than 3 (low responsiveness)
- * KERNEL mode time is high (above 25%)
- * INTERRUPT stack time is high (above 20%)
- * Cache hit percentages are low (below 70%)
- * AWSA voluntary decremting is turned off
- * AWSA voluntary decremting is turned on
- * Working set sizes cannot grow (WSINC is zero)
- * Page Fault Rate High/Low unreasonable (PFRATH is less than PFRATL)
- * Page Fault Rate High may be unreasonable (PFRATH is greater than 500)
- * Page Fault Rate High may be unreasonable (PFRATH is less than 10)
- * FREEGOAL is less than FREELIM
- * FREEGOAL may be too low (FREEGOAL is less than 3*FREELIM)
- * Number of free pages low (close to FREELIM)
- * AWSTIME may be too low (AWSTIME is less than QUANTUM)
- * LONGWAIT is low (less than 3 seconds)
- * LONGWAIT is high (greater than 20 seconds)

FORMAT

ADVISE

EXAMPLE

```
$ WATCH/TOP=FAULT/INTERVAL=15
```

ADVISE

After starting WATCH, with or without additional parameters, enter the word ADVISE to switch you to the ADVISE screen. Watch will ADVISE you if any of the above listed conditions is true, these conditions are mentioned in the OpenVMS Guide to System Performance as potentially impacting system performance.

DISKS

The DISKS command has 2 functions. Its first one is to allow you to respecify disks from within WATCH, without having to exit and restart. Its second function is to show the disk screen. The file DISK NAMES.DAT must exist in the WATCH_EXE directory with the

disknames you want to show in the disks screen.

FORMAT

DISKS/MODIFY=(dev:,...)

To modify the current list of disks being displayed on the main screen. The list you specify here will replace the existing one, be sure to list all disks you wish to see displayed.

DISKS

Switch to the DISKS screen showing more detailed statistics on all the disks listed in the WATCH_DAT:DISKNAME.DAT file.

KEYWORDS

dev:

Is any diskname valid on the node that watch is running on.

EXAMPLES

\$ WATCH/DISK=(DISK1\$,DISK2\$)

DISKS/MODIFY=(DISK2\$,DISK3\$,DISK4\$)

Run WATCH showing disk statistics for DISK1\$ and DISK2\$, subsequently the disk display is changed to show DISK2\$, DISK3\$ and DISK4\$.

\$ WATCH

DISKS

After starting WATCH enter DISKS to change to the DISKS screen which displays usage statistics on all the disks in your DISKNAME.DAT file.

EXIT

This command terminates WATCH. You can also use CTRL/Z to exit. The screen is cleared when you exit from the program.

FORMAT

EXIT

KEYWORDS None

EXAMPLE

\$ WATCH

EXIT

MONITOR

WATCH will accept any valid MONITOR command. Enter the command and WATCH will create the subprocess and go directly into MONITOR.

FORMAT

MONITOR valid-monitor-item

KEYWORDS

Valid-monitor-item

Refer to the OpenVMS System Management Utilities Reference Manual: M-Z (OpenVMS V6.0 documentation) or the Performance Management Guide, Monitor Utility (VMS V5.x documentation) for a description of valid monitor classes and items.

EXAMPLE

\$ WATCH

Monitor processes

After starting WATCH the user entered MONITOR PROCESSES to be attached to a subprocess running the OpenVMS monitor utility to monitor the processes class.

PROCESS

This command will show the process screen. This screen is similar to the SHOW/PROCESS/CONTINUOUS command. The screen will update itself every interval. This command can also be issued from the user screen by typing the letter 'P' and entering the process id.

FORMAT

PROCESS/ID=process-id
from the main WATCH display screen

P
process-id
from the WATCH user screen

KEYWORDS

process-id

A valid OpenVMS process-id that you want to display.

EXAMPLE

```
$ WATCH  
PROCESS/ID=202000A3
```

After running WATCH the display is switched to the process screen for process #202000A3.

```
$ WATCH  
USER  
P  
000A3
```

After running WATCH and switching to the user screen the user enters P to switch WATCH to the process screen after entering the process number (at least the last 3 characters) when prompted.

REPAINT

This command redisplay the screen. It is used to redraw the screen after a message has been broadcast to the screen. You can also use CTRL/W to repaint the screen.

FORMAT

```
REPAINT
```

KEYWORDS None

EXAMPLE

```
$ WATCH  
REPAINT
```

Repaint the screen after it was altered by a broadcast message.

SPAWN

This command creates a subprocess within the current process. SPAWN is used to temporarily leave WATCH, so that you can execute DCL commands, observe processes, and then return to WATCH. When the SPAWN command is issued a "\$" appears. You can enter any normal OpenVMS command such as "SHOW QUEUE/FULL" and "MONITOR". When you log out of the sub-process, the WATCH screen will reappear.

FORMAT

```
SPAWN
```

KEYWORDS None

EXAMPLE

```
$ WATCH/RECORD=TODAY.WAT  
SPAWN  
DIRECTORY /SINCE *.WAT  
LOGOUT
```

In this example the user has started watch and specified that it record the session. To verify that recording is taking place they SPAWNed to a subprocess, did a directory and were returned to WATCH when they logged the subprocess out.

TOP

This command selects the type of jobs to be displayed in the process area. It acts in the same manner as the qualifier /TOP.

FORMAT

TOP field-name

KEYWORDS

"CPU"

Show top CPU processes.

"BIO"

Show top Buffered Input/Output processes.

"DIO"

Show top Direct Input/Output processes.

"FAULT"

Show top page faulting processes.

"WS"

Show processes with the largest working sets.

EXAMPLE

```
TOP FAULT
```

Change the process portion of the main display to show the top six page faulting process in descending order by page fault rate.

USERS

This command expands the process display to a full screen. The screen is cleared, and all the processes are displayed 20 per screen. When the screen is full, WATCH waits until you hit any key, then it continues showing processes. Press R to return to the main screen.

FORMAT

USERS[/INCLUDE=(process-mode[,...])]

KEYWORDS

process-mode

When switching to the user screen it is possible to limit the types of processes WATCH displays by using the /INCLUDE qualifier. If the /INCLUDE qualifier is not specified the USERS screen defaults to /INCLUDE=ALL. Valid qualifier values are:

"INTERACTIVE"

Show only interactive processes.

"BATCH"

Show only batch processes.

"NETWORK"

Show only network processes

"OTHER"

Show only processes that are not interactive, batch or network processes

"ALL"

Show all processes on the system.

EXAMPLE

\$ WATCH

USERS/INCLUDE=INTERACTIVE

After starting WATCH switch to the USERS screen and show information on the interactive processes on the system.

WATCH Qualifier List

This page contains a complete list of all WATCH qualifiers. Subsequent pages contain detailed descriptions of each qualifier.

/BASE	Show base priority instead of current.
/COMPARISON	Format of comparison numbers
/DISK	Names of disks to display
/END_TIME	Absolute time to end record
/INTERVAL	Time (in seconds) between screen updates
/NODISPLAY	Suppress screen display during /RECORD
/OUTPUT	Direct the output from a summary report to a file
/PRIORITY	Execute at elevated priority
/PLAYBACK	Display data from a file created by /RECORD
/PRINT	Print /RECORD file
/RECORD	Store statistics in a file for later use
/REPORT=SUMMARY	Generate a summary report on data contained in a record file
/START_TIME	Absolute time to start viewing of /RECORD file
/TOP	Type of resource to monitor in detail
/VERSION	Show current version of WATCH

/BASE

The /BASE qualifier will show the base priority in the process section of the WATCH screen. If this qualifier is not used, the current priority is shown.

FORMAT

/BASE

KEYWORDS

None

EXAMPLE

\$ WATCH/BASE

/COMPARISON

The comparison qualifier is used to specify the format for displaying the comparison numbers on the screen. There are four choices for type-of-display.

FORMAT

/COMPARISON=type-of-display

KEYWORDS

"ACTUAL" (default)

Shows the actual number that was previously displayed as the current number.

"DIFFERENCE"

Shows the change from the previous number as a positive or negative number.

"AVERAGE"

Shows the average number since the start of Watch.

"MAX"

Shows the maximum number since the start of Watch.

EXAMPLE

\$ WATCH/COMPARISON=DIFFERENCE

Monitor the system showing the comparison value as a positive or negative number indicating the change from the previous value.

/DISK

The /DISK qualifier is used to select disk drives for display on the screen. The default is none. If you omit this qualifier the DISK portion of WATCH's main screen will be blank.

FORMAT

/DISK=(device-name[,...])

KEYWORDS

device-name

Device-name is the name of a disk drive that you want to display i/o statistics in the main screen for. The selected drive can consist of a single drive in the form

/DISK=DRA0: or a list of up to 5 drive specifications in the form

/DISK=(DRA1:,DRA2:,USER\$DISK1:).

The drive specifications can contain logical names. These are translated to physical names for display.

If you use volume sets, you must specify each drive individually, not just the first drive of the volume.

EXAMPLES

\$ WATCH/DISK=(DRA0:,DRA1:,USER\$DISK2:)

WATCH the system and include disk statistics for DRA0:, DRA1: and USER\$DISK2:.

\$ WATCH/DISK=\$1\$DIA0:

WATCH the system and include disk statistics for \$1\$DIA0.

/END_TIME

The END_TIME qualifier is used in conjunction with the /RECORD qualifier to indicate the time when the data collection is to end. It is used primarily in batch and there is no default.

FORMAT

/END_TIME=absolute-time

KEYWORDS

absolute-time

Absolute-time can be any absolute time, in valid OpenVMS date format.

EXAMPLE

\$ WATCH/END_TIME=17:30/RECORD=PEAK.WAT

Tells WATCH to begin recording system monitor information, recording is to stop at 17:30 (5:30 pm).

/INTERVAL

The interval qualifier indicates the number of seconds between data collections. The default interval is 10 seconds.

FORMAT

`/INTERVAL=time-in-seconds`

KEYWORDS

time-in-seconds

Valid values are in the range of 5 to 900. If you are using large intervals (greater than 30), you may miss significant events. For example, subprocesses that use a lot of CPU but are initiated and completed within the interval time.

EXAMPLES

\$ WATCH/INTERVAL=15

Run WATCH using a data collection interval of 15 seconds

\$ WATCH/RECORD=JAN05.WAT/INTERVAL=60/END=23:59:59

Run WATCH, recording usage statistics every minute, until midnight tonight.

/NODISPLAY

The /NODISPLAY qualifier suppresses screen display during a /RECORD operation. It is the default when WATCH is run from a batch.

FORMAT

`/NODISPLAY`

KEYWORDS

none

EXAMPLE

\$ WATCH/NODISPLAY/RECORD=WATCH.WAT/END_TIME=12:00

Run WATCH without displaying usage statistics but recording them in the file WATCH.WAT for future analysis. Stop recording at 12:00.

/OUTPUT

The OUTPUT qualifier is used in conjunction with the /REPORT qualifier to specify that a report be written to a file rather than displayed on the users terminal.

FORMAT

/OUTPUT=filename

KEYWORDS

filename

The filename specified can be any valid OpenVMS filename. The filename is required, WATCH will not default it.

EXAMPLES

\$ WATCH/REPORT=SUMMARY/OUTPUT=PEAK.RPT/PLAYBACK=PEAK.WAT

Summarize the recorded data in the file PEAK.WAT and write the summary report to a file called PEAK.RPT. Since no starting or ending times have been specified the entire record file will be summarized.

**\$ WATCH /REPORT=SUMMARY /START_TIME=14:30 /END_TIME=16:00 -
/PLAYBACK=PEAK.WAT /OUTPUT=WATCH_REPORT.LIS**

Generate a summary report for the afternoon peak usage period in data previously recorded in PEAK.WAT. The report will be written to a file called WATCH_REPORT.LIS.

/PLAYBACK

The playback qualifier indicates that the data is to be taken from the specified file, which was previously generated with WATCH, rather than from the running system. You can use /RECORD to record system performance data when the system is heavily loaded and use /PLAYBACK to play it back when the system has spare capacity.

You can use the /START_TIME qualifier to specify a starting time for viewing the record file. This allows you to skip around in the file and view different time intervals easily. The time specified is an absolute time, in OpenVMS standard time format. If the start time is not specified, it defaults to the start of the record file.

FORMAT

/PLAYBACK=record-file-name

KEYWORDS

record-file-name

Indicates a file created by the /RECORD qualifier that contains previously recorded WATCH data.

EXAMPLE

\$ WATCH/START_TIME=17:30/PLAYBACK=SYS\$LOGIN:WATCH.WAT

Replay the information WATCH collected and recorded in SYS\$LOGIN:WATCH.WAT beginning with information from 17:30 and playing back to the end of the collected data.

/PRINT

The /PRINT qualifier allows you to generate printed copies of information stored in the /RECORD file. It requires 2 parameters - the record filename and the output or destination filename. The report consists of 2 WATCH screens per page of output. You can print part of the data using the /START_TIME and /END_TIME qualifiers.

When you specify this qualifier you may use the following qualifiers to help select the data you want to have printed: /START_TIME, /END_TIME and /COMPARISION

FORMAT

/PRINT record-file-name output-file-name

KEYWORDS

record-file-name

A WATCH record file that has been previously created and contains the data you would like to print.

output-file-name

The file that WATCH should write the data to, formatted as ASCII text for printing.

EXAMPLE

**\$ WATCH/PRINT/START_TIME=2:00/END_TIME=4:00/COMPARISON=MAX -
SYS\$LOGIN:WATCH.WAT SYS\$LOGIN:WATCH.LIS**

Format the recorded data in the file WATCH.WAT for printing, writing the recorded data to WATCH.LIS. Only the data recorded between 2:00 and 4:00 should be formatted for printing.

/PRIORITY

WATCH normally runs at elevated priority to ensure accurate data collection. On a heavily loaded system, this can degrade performance. The /PRIORITY=priority-number qualifier tells WATCH to run at a specified base priority.

FORMAT

/PRIORITY=priority-number

KEYWORDS

priority-number

The priority-number is a numeric value between 0 and 31 that you wish WATCH to have as its' base priority. The default OpenVMS base priority is 4 so specifying 5 or 6 should give WATCH the necessary priority to record information accurately. Digital strongly suggests not to specify a base priority over 15 for any process because of potential conflicts with the systems' detached processes.

EXAMPLE

```
$ WATCH/PRIORITY=6
```

Run WATCH at a base priority of 6 to help ensure accurate data collection

/RECORD

The record qualifier indicates that the data is to be written to a file as well as displayed on the screen. This data file can then be used for playback. Using this qualifier, you can record system performance data, and then play it back at an accelerated rate by specifying a different interval.

FORMAT

```
/RECORD=record-file-name
```

KEYWORDS

record-file-name

A valid OpenVMS filename that WATCH should record information into.

EXAMPLE

```
$ WATCH/RECORD=SYS$LOGIN:WATCH.WAT
```

Begin WATCHing the system, recording information displayed to the screen in a file WATCH.WAT in your default login directory.

/REPORT

The REPORT qualifier is used in conjunction with the /PLAYBACK and /OUTPUT qualifiers to generate a summary report of previously recorded data. This allows you to skip around in the file and view different time intervals easily. If the start time or end time are not specified, the report will summarize the entire record file.

FORMAT

```
/REPORT=keyword
```

KEYWORDS

summary

Generate a summary report of previously recorded data.

EXAMPLES

\$ WATCH/REPORT=SUMMARY/OUTPUT=PEAK.RPT/PLAYBACK=PEAK.WAT

Summarize the recorded data in the file PEAK.WAT and write the summary report to a file called PEAK.RPT. Since no starting or ending times have been specified the entire record file will be summarized.

**\$ WATCH /REPORT=SUMMARY /START_TIME=14:30 /END_TIME=16:00 -
/PLAYBACK=PEAK.WAT /OUTPUT=WATCH_REPORT.LIS**

Generate a summary report for the afternoon peak usage period in data previously recorded in PEAK.WAT. The report will be written to a file called WATCH_REPORT.LIS.

/START_TIME

The START_TIME qualifier is used in conjunction with the /PLAYBACK and /PRINT qualifiers to specify a starting time for viewing or printing a record file. This allows you to skip around in the file and view different time intervals easily. If the start time is not specified, it defaults to the start of the record file.

FORMAT

/START_TIME=absolute-start-time

KEYWORDS

absolute-start-time

The time specified is an absolute time, in OpenVMS standard time format.

EXAMPLES

\$ WATCH/START_TIME=17:30/PLAYBACK=PEAK.WAT

Start playback of recorded data in the file PEAK.WAT at 17:30 (5:30 pm). Playback will show one screen every 10 seconds, the default interval).

\$ WATCH/PRINT/START_TIME=17:30 PEAK.WAT WATCH_REPORT.LIS

Reformat for printing the recorded data in file PEAK.WAT from 17:30 (5:30 pm) to the end of the recorded data.

/TOP

The top qualifier indicates the type of resource to be monitored in the process display area on the screen. When you choose a category, the process display area shows the top six users in descending order of usage. The heading of the field that processes are being selected on is highlighted.

FORMAT

/TOP=field-name

KEYWORDS

"CPU" (default)

Show top CPU processes.

"BIO"

Show top Buffered Input/Output processes.

"DIO"

Show top Direct Input/Output processes.

"FAULT"

Show top page faulting processes.

"WS"

Show processes with the largest working sets.

EXAMPLE

\$ WATCH/TOP=FAULT

Run WATCH showing the top processes in terms of page faults in the process block of the main screen.

/VERSION

This qualifier will display the current version of WATCH that you are running.

FORMAT

/VERSION

KEYWORDS

None

EXAMPLE

\$ WATCH/VERSION

% WATCH-S-VERSION, You are currently running WATCH Version 5.0

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Current date: 10-AUG-1996 00:00:59.16

Node name: EAGLE

VMS version: V5.5-1

HW type: MicroVAX 3100

Cluster member: Y

Number of nodes: 3

Appendix A, Error Messages

WATCH uses OpenVMS-style error messages. This appendix lists every WATCH error message in alphabetical order along with an explanation and recommended actions. When messages are displayed they will be categorized as:

* Warning	% WATCH-W-	WATCH should still run
* Informational	% WATCH-I-	WATCH will still run
* Fatal	% WATCH-F-	WATCH will terminate
* Error	% WATCH-E-	WATCH will terminate

CANTOPENDISK, Can't open DISKNAME.DAT, please check WATCH_EXE directory
There has been an error opening the watch disk file. There should be error messages that follow this message that further explain the reason for the error.

EOF, End of file encountered
The end of the PLAYBACK file has been reached unexpectedly. This is an internal error message. It should never be signaled. Call Saiga Systems.

ERROPEFILE, Error opening the file <filename>
There has been an error opening the output file. There should be error messages that follow this message that further explain the reason for the error.

ERROPEIN, Error opening <filename> as input
The filename that you specified for /PLAYBACK cannot be opened. If there is a further error message, it should explain the reasons that you were unable to open the file. Check to see that you have sufficient privilege to access the file, and that no one else is using it.

ERROPEOUT, Error opening filename as output
The filename that you specified for /RECORD cannot be opened. If there is a further error message, it should explain the reasons that you were unable to open the file. Check that you have sufficient privilege to open the file in the directory that you specified and that the directory exists.

ERRREADIN, Error reading input file
This is an error reading the control record of the record/playback file. Make sure that the file you specify is a valid record/playback file.

INVINT, Interval of <nn> is outside valid range
The interval you specified is outside of the valid range of 5 to 900 seconds. Please specify a value inside this range.

INVPRI, Invalid Priority Specified

This error will appear if you try to start up WATCH with a priority higher than 15 or lower than 0. Check command line and respecify with a valid priority.

ITEMREQ, You must enter a value for the <qualifier> qualifier

You have specified a qualifier that requires a value. Please re-enter the command with the proper value for this qualifier.

MAXPROC, Too many processes on the system, maximum is set to <nnnn>

Your version of WATCH is limited to the specified number of processes. You can either lower your SYSGEN parameter MAXPROCESSCNT or contact Saiga Systems for a larger kit.

NORMAL, normal successful completion

Return code from a function. The function completed successfully. This is not an error.

NOTDISKDEV, Device ddcu: is not a disk type device

The device ddcu: specified on the command line is not a disk type device. Verify the name of the device that you want, check spelling, and try the command again.

NOTPROPFORM, Input file is not in the proper format

The input file you specified for /PLAYBACK is not a WATCH recording file. Make sure that the file you specify is a valid recording file.

RESPECIFY, Please respecify with the correct parameters

Fix the errors specified in the first error message and try the command again.

REQCMKRNL, Operation requires Change Mode To Kernel privilege

You do not have Change Mode to Kernel (CMKRNL) privilege, or the image is not installed with that privilege. Talk to your system manager, and try again with the appropriate privileges.

REQWORLD, Operation requires World privilege

You do not have WORLD privilege, or the image is not installed with that privilege. Talk to your system manager, and try again with the appropriate privileges.

TIMEPAST, Time specified for END_TIME is in the past

The end time specified with the /record qualifier has already past. Please specify a later end time.

TIMEFUTURE, Time specified for START_TIME is past end time of playback file

The start time specified with the /playback qualifier is past any time recorded in the playback file. Please specify an earlier start time.

TOOMANYDISK, Too many disks specified

You specified more than five disks on the command line. WATCH can only handle five disks. Try the command again, with five or fewer disks.

VERSION, <Saiga Systems - WATCH 5.0>

Displays the current version of WATCH installed on your system plus some information about your system and WATCH license.

Appendix B, Summary Report

DATE:	WATCH SUMMARY REPORT			PAGE:
10-AUG-1996				1
START:	5-AUG-1996 10:04			NODE:
END:	7-AUG-1996 09:59			EAGLE
CATEGORY	AVERAGE	MINIMUM	MAXIMUM	TOTAL

CPU				
% CPU	1.0	0.1	78.9	
% SYSTEM CPU	0.7	0.1	42.3	
TOP % CPU	0.5	0.1	72.4	
MEMORY				
% MEMORY	59.3	56.5	72.2	
FREE PAGES	6572.9	4500.0	7038.0	
MODIFIED PAGES	172.6	5.0	613.0	
TOTAL FAULTS	1.0	0.3	301.2	2967.4
SOFT FAULTS	0.7	0.0	301.0	2115.0
HARD FAULTS	0.0	0.0	3.9	54.5
TOP WORKING SET	991.6	983.0	2048.0	
TOP % WORKING SET	10.4	9.4	17.6	
TOP PAGE FAULT	0.9	0.2	300.9	
TOP % PAGE FAULT	2.8	0.0	100.0	
I/O				
DIOS	0.2	0.0	38.8	581.5
BIOS	0.1	0.0	28.3	320.4
SPLIT IOS	0.0	0.0	9.5	117.2
IMAGE ACTIVATIONS	0.1	0.0	76.0	344.0
OPEN FILES	159.0	157.0	166.0	
TOP BIO	0.1	0.0	28.3	
TOP % BIO	2.0	0.0	100.0	
TOP DIO	0.2	0.0	38.8	
TOP % DIO	1.1	0.0	100.0	

PROCESSES

TOTAL	17.1	16.0	19.0
INTERACTIVE	0.1	0.0	1.0
BATCH	2.0	1.0	3.0
NETWORK	1.0	1.0	1.0
OTHER	14.0	14.0	14.0
COMPUTABLE	0.0	0.0	0.0
SWAPPED OUT	0.0	0.0	0.0
LEF	1.1	0.0	3.0
HIB	15.0	15.0	15.0
OTHER	1.0	1.0	1.0

CACHE

DIRECTORY	97.8	0.0	100.0
FILE HEADER	74.0	0.0	100.0
QUOTA	72.9	0.0	100.0
EXTENT	91.7	0.0	100.0
BITMAP	10.2	0.0	60.0

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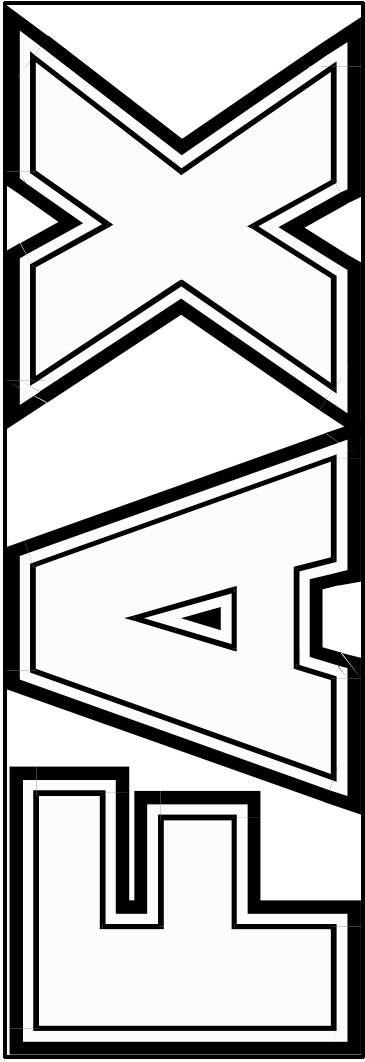
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