

SPECIFICATION

FACT
A BRIEF DESCRIPTION OF THE CONTENTS OF
FACT.SYS, THE ACCOUNTING SYSTEM RECORDS
FILE.

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1.0 INTRODUCTION

The file FACT.SYS and its auxiliaries FACT.X01, FACT.X02, ..., FACT.X77 contain a transaction record of the activity on a DECsystem-10 timesharing system. The fact files are written by a variety of system programs when each user logs on or off the system, runs batch jobs, uses the I/O spoolers, and at ten-minute intervals throughout his use of the system.

1.1 Standard Information

Each entry includes an indication of why and when it was written, the job number to which it refers, the terminal running the job, and the project, programmer number of the user. In addition, many entries contain additional information relevant to the particular conditions under which they were written, such as the name of the program running, or statistics on usage of sharable resources.

1.2 Use of Auxiliary Files

Ordinarily, all the information described in this document is output to SYS:FACT.SYS, by appending new entries to the end of the existing file, or by creating FACT.SYS if it does not exist. If, however, FACT.SYS should be inaccessible because of LOOKUP or ENTER failures, or because of being in a file-being-modified state for ten seconds, each of the programs which writes FACT file information is set up to give up on FACT.SYS, and start trying to write FACT.X01. If this fails, FACT.X02 is tried, and so on, counting in octal, to FACT.X77. If all 64 files are inaccessible, the message

ACCOUNTING SYSTEM FAILURE....
CALL THE OPERATOR.

is printed, and the entry is not written. Note that, because the condition which makes a file inaccessible may be cleared, FACT.SYS (for instance) may contain entries both before and after those in FACT.X01. Programs which depend on chronological order in the FACT files should merge the auxiliaries with FACT.SYS, sorting on date and time, before processing.

1.3 Processing Procedures

Because each installation will have different needs for reporting and summarizing computing activity, DEC does not attempt to provide general purpose programs for processing the FACT files. It does, however, distribute two programs, MONEY and FACTPR which provide examples of how reporting programs could be written. MONEY is a simple, supported, reporting program, written in MACRO, whereas FACTPR is an unsupported conversion program, suitable for use as a pre-processor to a complex reporting system which might be written in COBOL.

2.0 DEC-DEFINED ENTRIES

A 9-bit byte in the first word of each entry identifies the type of the entry. The values 0, 377, and 777 in this type code are reserved as markers in the FACT files. Values from 1 to 376 are reserved for definition by DEC, while 400 to 776 are for customer definition.

2.1 Basic Entry Format

The first three words of every entry are the same, as follows:

<u>Word#</u>	<u>Description</u>
0	header -- 4 bytes, as follows:
0-8	type code, which identifies the reason for writing the entry, and the format of the entry. If the type code is even (bit 8=0), the date/time word (2) is in old format, with 12-bit date, and 24-bit time in jiffies. If the type code is odd (bit 8=1), the date/time word is in new standard date time format, and clock rate dependencies are not permitted in time representations.
9-17	job number to which this entry refers. Usually, but not always, the job which created the entry.

18-29 terminal number (as in TTYnnn) to which the job is attached. CTY is indicated by 7777, and a detached job by 7776.

30-35 length of the entry in words, including this header word. If an entry has only the basic information, this byte is 3.

1 project-programmer number to which this entry refers.

2 date and time at which the entry was created, as follows:

a. if header bit 8=0, old format:

0-11 date, in system 12-bit format.
12-35 time, in clock ticks since midnight.

b. if header bit 8=1, new format:

0-17 days since Nov. 17, 1958
18-35 time, as a fraction of a day

2.2 LOGIN (100), ATTACH (240)

When a user logs in, or attaches his terminal to a detached job, only the basic information (as described in 2.1) is stored if he is successful:

Terminal and job numbers
Project, programmer number
Date and time of day

If, however, the attempt is unsuccessful (e.g., he does not know the password), then 20 is added to the type code, and the password he tried is recorded as word 3. Further, if the failure is due to a program's attempt to LOGIN an illegal job on a PTY under its control, the project programmer number of that job is recorded as word 4. LOGIN failures, therefore, are recorded as type I20, and ATTACH failures as 260.

2.3 CHPNT (200)

At ten-minute intervals throughout the operation of the system, so-called CHECKPOINT information is recorded about each job in the system. In systems which use DAEMON, it takes the CHECKPOINT at intervals controlled by the CHKTIM assembly parameter. Other systems may use the CHPNT program to record the same information. In addition to the basic information listed under 2.1, CHPNT entries consist of:

<u>Word#</u>	<u>Description</u>
3	job's accumulated run time, in milliseconds.
4	job's integrated time-size product, in kilo-core-ticks.
5	total disk blocks read by and for the job.
6	total disk blocks written by and for the job.
7	name of the program in the low segment, in SIXBIT.

2.4 LOGOUT (140)

When a user logs off the system, the LOGOUT program records final values of all the CHECKPOINT information (except program name) to summarize the job.

2.5 SPOOL (250)

Each time the spoolers complete a request, unless assembled with FACTSW zero, they call DAEMON to write a FACT file entry. The job and terminal numbers in the header word are those of the spooling program, but the PPN is that of the user for whom the spool request was performed. They record the following data in the FACT file, in addition to the basic information:

<u>Word#</u>	<u>Description</u>
3	three bytes:
	0-11 queue name in SIXBIT
	12-17 station number

- 18-35 APR serial number
- 4 runtime used by the spooler for this request, in jiffies (clock ticks).
 - 5 kilo-core-ticks used by the spooler for this request.
 - 6 disk reads by the spooler for this request.
 - 7 disk writes by the spooler for this request.
 - 8 physical device name of the spooler output device.
 - 9 sequence number of the spool request.
 - 10 quantity of output in same units as output limits for this queue (e.g., pages, feet, etc.).

2.6 SPACE (160)

When the operator runs the (unsupported) SPACE program to evaluate disk utilization, he can ask it (with the /FACT switch) to record the current figures in the FACT file for later use by a billing program. This information includes, in addition to basic data, status of various variables in the retrieval information block of the file directory (UFD RIB) for each user on each file structure. The job and terminal numbers in the header word refer to those of the SPACE program, but the PPN is that of the UFD to which the entry refers. The rest of the entry is:

Word#	Description
-----	-----
3	file structure name, in SIXBIT, on which this UFD was found.
4	UFD status word (.RBSTS) from the UFD RIB.
5	first come, first served quota (.RBQTF).
6	logged-out quota (.RBQTO).
7	reserved quota (.RBQTR).
8	blocks presently allocated to this user (.RBUUSD).

- 9 blocks remaining available for first come, first served allocation on this structure (.DCFCT).
- 10 one of the following three words, in SIXBIT:
- OUT there are no jobs logged in under this ppn.
- IN there is at least one job presently logged in under this ppn.
- RECOMP there are no jobs logged in, but the UFD status word shows the logged-in bit set. Allocation, therefore, needs to be recomputed for this user. If the /BATCH switch was specified, SPACE has submitted a dummy batch job to force re-computation of allocation, but this job has not completed when the entry is written, so word 8 of the entry (.RUSD) may be incorrect.

2.7 Restart (370)

Whenever DAEMON is run (usually by the OPSER auto startup file), it writes a basic entry, indicating that the system was reloaded, so the processing program can reset itself, figuring that jobs not logged off in the FACT file were running when the system crashed.

2.8 Shutdown (372)

Unimplemented, but intended to mark a scheduled system shutdown.

2.9 Hiatus (377)

Whenever the FACT file is updated, the routine which adds a new entry checks the last word of the file (as indicated by the file length returned by LOOKUP) for the end-of-file code (see below). If the end-of-file indicator is not found, the routine backs up until it finds a non-zero word or the beginning of the block. Hiatus codes are then stored in the words backed over, to mark the spot where data may have been lost.

2.10 End-of-file (777)

The last word in the FACT file should always be the end-of-file code.

2.11 New Entry Types

As development of DECSYSTEM-10 software continues, it is likely that DEC will add new entry types to the FACT files. Customer programs which process the file, therefore, should be written to ignore, except possibly for a warning message, new codes which appear in the file. This will ensure upward compatibility.

3.0 CUSTOMER-DEFINED ENTRIES

Entry types 400 through 776 are reserved for customer definition and implementation. DEC recommends that the format of the basic information words be followed in customer-defined entries. Two mechanisms are available for customers writing FACT file entries. The .FACT function of the DAEMON UUC is the easiest to use, (documented in UUCPRV, in the Specifications section of the Software Notebooks) but users with systems which do not run DAEMON may use the APPEND subroutine, which may be found in LOGIN, LOGOUT, or DAEMON, for instance. Note that the FACT file contains privileged information, and so is accessible only to jobs with JACCT or running under [1,2].

[End of FACT.RNO]