

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PROJECT MAC

Artificial Intelligence
Memo. No. 169

MAC-M-387
November 1968

PEEK and LOCK

Donald E. Eastlake III

This Memo. describes two small utility programs that are of assistance in using the ITS 1.4 (see A.I. 161, MAC-M-377) time sharing system. LOCK performs miscellaneous utility functions while PEEK displays, with periodic updates, various aspects of the time sharing system's status.

1. Introduction	1
2. PEEK	2
2.1 Introduction	2
2.2 Modes Available	4
2.3 IO Control	9
2.4 Miscellaneous	10
3. LOCK	11
3.1 Introduction	11
3.2 Commands	11
References	14
Appendix. Illustrative Console Output	15

1. Introduction

This memo describes two small utility programs that are relevant only to use of the ITS 1.4 time sharing system. This time sharing system is described, as of June 1968, in memo MAC-M-377 [Ref 2] which is frequently referred to by this memo. The same notational schema is used in this memo as described in section zero of MAC-M-377 with the addition of the notation [Ref x>Sec y(, z, ...)] for section(s) y(, z, ...) in reference x, for example [Ref 2>Sec 0].

The first program herein discussed, PEEK, provides periodically updated displays of various aspects of the time sharing system's status. The second and smaller program, LOCK, performs a variety of miscellaneous functions.

Artificial Intelligence Group memo AI 147 [Ref 1] is extremely relevant to the usual loading and transfer of control to the within described programs.

Note that the commands P, Q, and ? have the same meaning for both programs. The ? command causes each of them to print a list of their commands with short explanations.

2. PEEK

2.1 Introduction

PEEK is a utility program operating under ITS [Ref 2]. It enables a user to monitor a variety of aspects of the time sharing system by providing periodically updated display output or periodic character string output to teletype or line printer. Commands to PEEK are single letters sometimes preceded by numeric arguments. When initially started, PEEK is in N, or normal, mode [Sec 2.2]. If the user is on a GE console [Ref 2>Sec 4.5] PEEK will initially start outputting by typing (which, on a GE console, is effectively displaying). If the user is on a teletype, PEEK will try to seize the 340 display [Ref 2>Sec 4.11] and either display on the 340 or type its output depending on whether it succeeds or fails, respectively. This may be disconcerting if you are at a teletype not in view of the 340 because it will appear that the PEEK is just sitting there. This can be rectified with the ^N command [Sec 2.3].

The first line of all pages output by PEEK is as follows:

```
ITS xxx PEEK yyy mm/dd/yy hh:mm:ss
```

where xxx is the version number of the system in use [Ref 2>Sec 7.6.3], yyy is the version number of the PEEK in use (so bugs can be matched to exact version), and mm/dd/yy is the date and hh:mm:ss the time according to ITS [Ref 2>Sec 7.3.2, 7.3.3]. The last line of all pages displayed on the 340 by PEEK is a list of mode commands which can be given by light-penning [Ref 2>Sec 7.11.2] them with effects identical to typing them.

All characters typed at PEEK are interpreted at its interrupt level and have effect, if any, immediately. Characters that are not commands, digits, or ^Z are completely ignored. Digits are accumulated as an octal number until a non-digit is typed at which time the accumulated number is made available (if the non-digit is a command taking a numeric argument) and reset.

The amount of memory occupied by PEEK varies with mode but the present minimum is three memory blocks (a total of 6000 words).

2.2 Modes Available

The particular subset of the time sharing system's status being output by PEEK is controlled by its mode. Initially PEEK is in N mode but it may be changed to any of those listed below by typing the letter indicated or light penning [Ref 2>Sec 4.11.2] it if PEEK is displaying on the 340. Unless otherwise specified the output repetition rate for these modes is the standard rate initially set to 5 seconds delay after end of page output before starting on the next update. This is variable by the user with the Z command [Sec 2.4].

D This mode outputs Data-disk directories [Ref 2>Sec 4.2]. It is normally preceded by a drive number. If output is being typed, the standard system generated directory is used [Ref 2>Sec 3.2.1]. If output is to the 340 or line printer, an expanded form is used. The lower part of this form is similar to the system supplied directory. It has an additional number after the file name and before its length. This number is a pointer to the first physical block used by the file (minus one indicates a file of length zero). The upper part of this form is the list structure area of the directory which has for each physical block either the number of the next block in the file containing it, minus one if it is the last block in a file, or zero if it is unused.

G This mode lists the sixbit symbols recognized by .GETSYS [Ref 2>Sec 7.6.1] in the system in use. Output is updated after a ten second delay.

H Only available with the 340 display, this mode

outputs a graph of memory with different memory users on different vertical levels and location represented by horizontal coordinate.

I The symbolic devices implemented in the system in use (Ref 2>App B) are listed by this mode. Output is updated after a ten second delay.

M This mode is somewhat reminiscent of H mode. It lists all memory users and the amount of memory they are using in decreasing order. An "*" is also output by stopped jobs as are the characters for special resources being used by any job (see table below).

N This is the most frequently used mode of PEEK. It tries to give a snapshot of the status of all user jobs in the system. Different amounts of information are displayed depending on the particular output device in use, but in all cases the following additional information is output:

(1) Above the list of user jobs, the number of free blocks (each 2000 words) of memory (MEMFR), the number of areas that are allocated for user variable [Ref 2>App C] (USRHI), and the number of user programs that were runnable last schedule time (RNABLU);

(2) Below the list of user jobs, the number of blocks of memory occupied by user programs (USR MEM) (the sum of this figure and MEMFR is not constant due to dynamic IO buffers), the total percentage of machine time being used by the listed programs (USR TIM) (less than one hundred due to scheduling and other overhead), the amount of time that the running system has been up (STIME), and the total amount of machine time used by users that have logged out (LOUTIM).

Between the two sets of information described above, there is one line of information for each procedure in the system topped by a title line which provides a heading for each column of information. The first item on the line for any particular procedure will be the user index of the procedure, a number that uniquely refers to it (see mode V). The second item will be either the UNAME for top level procedures and the JNAME for inferiors or the UNAME, JNAME, and SNAME for each procedure depending on the line width of the output device. This second

item also portrays the existant procedure tree structure in that each porcedure not at the top level is an inferior of the nearest procedure above it whose name is not indented as far.

Other items include an exponential approximation to the percentage of machine time the procedure has been receiving, the number of core blocks it is occupying, a column labeled "TTY" that has a "T" concatenated with the console number opposite procedures controlling a console, various letters immediately after the "TTY" column for system resources controled by the procedure (see the table below), and a column labeled "STATUS". The character string opposite a procedure in the STATUS column should be interpreted as follows: (1) a leading "*" indicates that the procedure is processing a software interrupt [Ref 2>Sec 5.2], (2) "RUN" indicates that the program is running in user mode, (3) a pair of numbers separated by an "!" indicates that the procedure is stopped, (4) most other strings represent a system call (with S used for the very common .SLEEP call) or input-output device and type of transfer; (4A) if preceeded by a "+" the procedure is running in executive mode performing the call or input-output; (4B) if not it is hung on the call or input-output.

T The contents of the system translation table [Ref 2>Sec 3.3] is output.

U This mode displays the status of the DEC tape drives [Ref 2>Sec 4.1] and of open DEC tape files. For the normal user, the most useful information per tape is the drive number in the leftmost column and the DIR variable in the next to the rightmost (UTASS) column. If the DIR variable is minus one, ITS is not retaining a directory for that drive and a tape mounted on it could be removed manually. Otherwise it is the absolute location of the directory. The per open file information includes the names of the procedure using the file, its direction, and the number of buffers (200 words each) currently being used for the file by the system.

V This mode command should be proceeded by the user index (see mode N above) of some user. It displays many of his user variables [Ref 2>App C] and the channel word and status word for each of his input-output channels [Ref 2>Sec 3.1, 3.6]. If output is to the 340 or line printer, the contents of the selected users accumulators are also output.

X This mode outputs the digitalization of all the multiplexed analog to digital input channels [Ref 2>Sec 4.9] and the value being output on each of the multiplexed digital to analog channels [Ref 2>Sec 4.10].

Y This mode outputs system supplied [Ref 2>Sec 3.2.1] directories for DEC tapes. It should be preceded by a drive number.

? This mode outputs a list and brief explanation of PEEK's commands. An example is included in the appendix. Output is updated after a ten second delay.

The following are the system resource letters used in modes N and M above:

C Indicates that the procedure is now or was the last to use the core allocator.

D Indicates that the procedure has seized control of the DEC 340 display.

F Indicates that the procedure has control of the COD device.

I This letter can be present for more than one procedure. It indicates that the procedure it appears with is in "IOT-user" mode [Ref 2>Sec 7.8.3].

L Indicates that the procedure has control of the line printer.

M Indicates that the procedure has placed itself in a mode where it can always seize the 340 display and is scheduled with higher priority.

P Indicates that the procedure has control of the

plotter.

R Indicates that the procedure has control of the paper tape reader.

T Indicates that the procedure has control of the paper tape punch.

2.3 IO Control

PEEK will output to only one device at a time. The initial device is chosen as explained in section 2.1. All of the following four commands for changing PEEK's output device also cause PEEK to immediately restart output for its current mode (Sec 2.2):

^B This switches output to the line printer if it is available. If not available the output device will be unchanged.

^E This command will terminate PEEK output to the line printer and cause it to either type or display its output.

^N This command terminates 340 display output, starts typed output, and sets a flag in PEEK that is cleared only by the **^Y** command. This flag inhibits PEEK's attempts to seize the 340 as described in section 2.1.

^Y PEEK will attempt to seize the 340 display for output on receipt of this command. If it is unsuccessful, output will revert to typing. In any case the flag mentioned under **^N** above is cleared.

2.4 Miscellaneous

The following are miscellaneous PEEK commands:

P Under normal circumstances, this command will return control of the users console to DDT [Ref 1] but leave PEEK running and, if the 340 display or line printer is selected, producing output.

Q Under normal circumstances, this command will destroy the PEEK it is typed at and return control of the users console to DDT.

Z This command should be preceded by a small number. It sets the standard update delay to as many seconds [Sec 2.2].

! This command will probably go away when swapping is added to the system. Under normal circumstances it will cause the procedure tree in which is found the PEEK it is typed at to be replaced by a single newly loaded PEEK at the top level. This saves memory if several people want to leave a PEEK at a single console running for their joint enlightenment. A top level PEEK will commit suicide if a ^Z is typed at it.

3. LOCK

3.1 Introduction

LOCK is a utility program operating under ITS performing a multitude of infrequently required tasks. Its name derives from the fact that the function it was originally written for was to "lock" and "unlock" teletypes (see the + and - commands [Sec 3.21]). Most of LOCK's commands are single characters.

In contrast to PEEK, which interprets commands at the interrupt level, commands to LOCK are read at its main program level. Thus commands will in general have no effect before previous commands have been completed. In fact, some commands cause a change in the state of LOCK such that following letters are interpreted as arguments.

LOCK occupies only one block (2000 words) of memory except in mode "T".

3.2 Commands

The following are the current LOCK commands:

+ This command should be preceded by a teletype (or GE console) number [Ref 2>Sec 4.5]. The LOCK will try to open the specified teletype as an input-output device. It will be successful only if the teletype is not in use. If it is successful, the teletype will become impervious to ^Z's so no user can log in on it, LOCK will type out an appropriate message on the now locked teletype, and LOCK will type a "W" to the LOCK user. If the LOCK fails in opening the teletype it will type an "L" at the LOCK user.

- This command should be preceded by a teletype number. If LOCK has the specified teletype locked it will unlock it and type out an "*". Otherwise it will type a "?".

_ This command should be preceded by the octal code for a character. LOCK will type out the character represented.

G This command should be preceded by the user index [Sec 2.2, see mode N] of the top procedure in a tree that the user wishes to obliterate. It must be followed by the characters "UN". If the user deviates from this sequence, a "?" will be typed and LOCK will listen for a new command.

I A series of magic characters must be typed at a model 37 teletype to allow its use in full duplex, the mode assumed by most programs operating under ITS. This command causes LOCK to type the requisite characters.

K This command must be immediately followed by the characters "ILL" (see G above) and should be preceded by a number. It will activate the system going down feature of ITS with a time limit of five or the number preceding the command minutes, whichever is larger.

O When it receives this command, LOCK will permanently go into a mode where characters typed at it are echoed as their ASCII value in octal. To ultimately escape from LOCK in this mode, the user should use ^Z.

P Under normal circumstances, this command causes control of a users console to revert to his DDT [Ref 1].

Q Under normal circumstances, this command causes

control of a users console to revert to his DDT and his LOCK to be destroyed. Note that this will unlock all teletypes previously locked by the destroyed LOCK as destroying a procedure closes all its channels.

S This command complements the run status of the system checking feature of the system job [Ref 2>Sec 7.5]. It will type out the resultant state as either "START" or "STOP".

T This command causes complex and nonterminating gyrations on the part of the LOCK it is typed at and the procedures the LOCK will create as a result of this command. Its purpose is to test the core allocator [Ref 2>Sec 5.3] and other components of the ITS system. Its casual use is not recommended.

? This command causes LOCK to type out an up to date list of its commands with a brief explanation of each. An example appears in the appendix.

References

1. Thomas F. Knight
A Multiple Procedure DDT (AI-147)
January 1968, MAC AI Group memo.
2. Donald E. Eastlake III
ITS 1.4 Reference Manual (MAC-M-377, AI-161)
June 1968, Project MAC memo.

Appendix. Illustrative Console Output

The following pages illustrate the current self documentation output of PEEK [Sec 2] and LOCK [Sec 3] and the "N" mode [Sec 2.2] output of PEEK. A few DDT [Ref 1] commands are illustrated in passing.

†Z

DDT.159.
SEE META MEMO ON CONSOLE. --R.G.*- message of the day*

DEE\$U

- login

:PEEK 1

- load PEEK

†N

ITS 444 PEEK 124 12/08/68 14:18:36
MEMFR=53 USRHI=17 RNABLU=1

1= U-JNAME STATUS TTY CORE %TIM

0 SYS TYO T5 26 0%

1 CORE UUO ? 0 0%

2 DEE S - 5 0%

4 PEEK +GETSY T0 C 6 10%

3 HA S - 5 0%

16 LISP TYI T13 20 0%

5 RJF S - 7 0%

12 TECO TYI T12 7 0%

) LISP 1010 ? 33 0%

o JRG S - 6 0%

10 PEEK 1010 ? 5 0%

11 CHESS TYI T7 42 0%

7 CEH S - 17 0%

13 PEEK 1010 ? 6 0%

15 NLISP TYI T14 41 3%

USR MEM= 302 USR TIM= 14%

STIME = 5:30:48 LOUTIM = 42:38

- N made output

? ITS 444 PEEK 124 12/08/68 14:22:46 - switch to ? mode

MODE CONTROL:

D DISK DIRECTORY (PRECEDE BY NUM)
 G AVAILABLE .GETSYS'S
 H MEMORY GRAPH (340 ONLY)
 I AVAILABLE IO DEVICES
 M MEMORY USE LIST
 N NORMAL MODE
 T TRANSLATION ENTRIES
 U DEC TAPE STATUS
 V SINGLE USER (PRECEDE BY INDEX)
 X MULTIPLEXORS MODE
 Y DEC TAPE DIRECTORY ("")
 ? EXPLANATION MODE

- ? mode output

IO CONTROL:

+B USE LINE PRINTER
 +E STOP USING LINE PRINTER
 +Y USE 340
 +N STOP USING 340

OTHER:

P PROCEED BUT RETURN TTY TO DDT
 Q QUIT
 Z SET DOZE IN SECONDS
 ! STAND ALONE

Q

- command

\$*X.

- PEEK returns to DDT
 destroying itself

:LOCK I

- load and start LOCK

LOCK.39

+?

- command

+ LOCK TTY (PRECEDE BY #)

- UNLOCK TTY (")

- OUTPUT CHARACTER WITH ASCII VALUE # (")

GUN KILL USER WITH # INDEX (")

I INITIALIZE A MODEL 37 TTY

KILL SYSTEM DOWN IN # MINUTES (")

O OUTPUT CHARACTERS IN OCTAL

- ? output

P RETURN TO DDT

Q VALRET AN S+X.

S COMPLEMENT RUN STATUS OF SYS JOB

T TEST CORE ALLOCATOR

? LIST COMMANDS

+Q

- command

X.

*- LOCK returns to DDT
destroying itself*

:LOGOUT

- logout

ITS 444 CONSOLE # FREE. 14:24:52