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.
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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 [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] 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 PEIX. 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) (USRVI), 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 SKNAME 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 procedure 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 controlled 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 "M" 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 preceded by a
"+" the procedure is running in executive mode performing the
call or input-output; (43) if not it is hung on the call or
input-output.

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

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.

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 4.8] 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 proceeded 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 11 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 proceeded 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 proceeded 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 proceeded 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.

This command should be preceded by the user index [Sec 2.2, see mode H] 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.

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.

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.

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

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

Under normal circumstances, this command causes
control of a user's 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 "H" mode [Sec 2.2] output of PEEK. A few DDT [Ref 1] commands are illustrated in passing.
**DDT, 159.**
SEE META MEMO ON CONSOLE. -- R.G.

DEESU

: PEEK 1

**N**

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

1= U-JNAME  STATUS  TTY  CORE %TIM
2  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%
9  LISP  1010  ?  33 0%
0  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

- message of the day
- login
- load PEEK
- came to type out

- N mode output
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

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
I STAND ALONE

Q

$X.

— command

— PEEK returns to DDT destroying itself
LOCK I

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 ()
Q OUTPUT CHARACTERS IN OCTAL
P RETURN TO DOT
Q VALRET AN $+X$
S COMPLEMENT RUN STATUS OF SYS JOB
T TEST CORE ALLOCATOR
? LIST COMMANDS

-? output

- command

- LOCK returns to DOT
-

:LOGOUT

ITS 444 CONSOLE 0 FREE, 14:24:52