A.I. Memo 88 MAC-M-267

To: Project MAC Participants
From: Peter Samson
Subject: MACTAP, a PDP-6 DECtape Handling Package
Date: September 16, 1965

* Numbers followed by ' are octal; numbers followed by . are decimal *

MACTAP is a set of PDP-6 subroutines to read and write DECtape in the MAC file format (see MAC-M-249). Programmers can call these subroutines for input or output of ASCII data, which will be compatible with TECO files; or for binary (36.-bit word) data. They were extracted mainly from PDP-6 TECO and arranged and checked out in their present form by Jack Holloway.

The file MACTAP is on the MACDMP SYSTEM tape as a relocatable binary file, so any program to call it must also be relocatable. When loading with the linking loader, care must be taken that MACTAP is loaded <u>after</u> a file (for instance, one's main program) in which are defined as <u>global</u> the following symbols:

P — accumulator always containing pushdown pointer

TAPAC — an accumulator. Arguments are transferred in TAPAC and TAPAC+1; also MACTAP uses TAPAC+2 and TAPAC+3. Hence $1 \leq TAPAC \leq 14'$.

TPCHN — PI channel number (1 to 5) for Data Control. A low number is preferable because the D.C. requires fast service.

TPCHNA — 200'← <-TPCHN > ; i.e. the PI Active bit for TPCHN.

PCHCHN — PI channel number for DECtape control, should be lower priority (higher number) than TPCHN.

APRCHN — PI channel number assigned to processor: should be higher number than PCHCHN.

NDIR — number of file directories allowed in core simultanously. Each takes 200' registers within MACTAP.

NURBUF — number of DECtape Read Buffers. Each takes 200' registers in MACTAP. Reasonable values range 2≤ NURBUF≤ 7.

NUWBUF — number of DECtape Write Buffers. Treated like NURBUF. If one intends only to read DECtape and not write, NUWBUF may be set to 0, and vice versa for NURBUF.

BLKSPC — minimum interblock space when writing. When stopping and starting, a DECtape will coast over two or more blocks. However, to minimize start-stop, forward-backward operation of a tape, MACTAP will keep it moving for a while in hope that the calling program will be ready to output another block before it has passed over BLKSPC blocks. In practice, 3≤BLKSPC≤8. has been observed.

QUITFF — The user must define QUITFF as the address of a location within his program, and arrange for the contents of that location to be non-zero. It need not be considered further unless the user wishes to have a "quit" feature in his program, i.e. a means whereby in an interrupt-service routine the program may choose to immediately cease its current activities. In such a case, the service routine must ascertain whether it interrupted from within MACTAP (excluding the UWAIT routine), which is indicated by APRBRK"≤ interrupt loc.≤UFPNTR". If the interrupt was from this area, the contents of QUITFF should be set to 0 and the interrupt

dismissed. Then when MACTAP is ready to allow a quit, it will perform JSR QUITFF, which resets QUITFF to non-zero and transfers to QUITFF+1, where the user may perform the quit.

The user's program, before calling any MACTAP routines, must turn on the PI system and enable PCHCHN and APRCHN. The MACTAP subroutines will enable TPCHN and set up locations 40'+2*PCHCHN and 40'+2*TPCHN when necessary; but the user's program must set up 40'+2*APRCHN, and must have a break-service routine for the APR. Also the user must have the Clock Flag enabled, and in his APR service routine must perform JSR APRBRK" at least as often as every clock interrupt, with the clock flag on. Some MACTAP routines may turn on PC Change Enable, and if it causes an interrupt the user's program must JSR APRBRK" with it on, and should turn it off on return.

Calls to MACTAP and their Effects:

instruction	return skips next instruction	effect
JSR APRBRK"	no	must be done in APR service routine at least each clock break; the clock flag must be ON
PUSHJ P,FILEST"	unless no room for file directory	the Current Tape Number is set to the contents of TAPAC and the file directory for the tape on that unit is loaded into core if not already in
PUSHJ P,OPNRD"	unless file not found on current tape	MACTAP is set to read from the beginning of the file SUBNM1 SUBNM2 on the Current Tape: the subnames are expected in TAPAC and TAPAC+1 as sixbit left-justified, filled out with blanks, a blank subname replaced by @.

PUSHJ P,OPNWR"	see right	If there is room in the file directory of the Current Tape for an additional file, MACTAP prepares to write on that tape and skips on return. Otherwise, no action is taken and the return does not skip.
PUSHJ P,URED"	unless end-of-file read	The next 7-bit character from the selected read file is put in TAPAC.
PUSHJ P,UWR"	unless tape full	The rightmost 7 bits of TAPAC are output as the next character on the write tape.
PUSHJ P,FILE"	if successful	MACTAP output since the last call to OPNWR or FILE is organized on tape as a file of mode 0 and name as supplied in TAPAC and TAPAC+1 (as for OPNRD).
PUSHJ P,.URED"	unless end-of-file read, i.e. end of last block of file	The next 36.-bit word from the selected read file is put in TAPAC.
PUSHJ P,.UWR"	unless tape full	The contents of TAPAC are output as the next binary word on the write tape.
PUSHJ P,UWAIT"	no	This delays return until all current MACTAP tape operations have been completed.
PUSHJ P,UDELE"	no	In TAPAC and TAPAC+1 are expected subnames of a file on the Current Tape. It is deleted from the core copy of the file directory. A subsequent call to FILE or UCLSTP (with the Current

		Tape Number unchanged) will write the diminished directory out on the tape.
PUSHJ P,TAPKIL"	no	The file directory for the tape whose number is in TAPAC is deleted from core (to make room for a new directory). Po tapes are changed and the Current Tape Number remains as it was.
PUSHJ P,UCLSTP"	no	The core file directory for the Current Tape is copied onto the tape. This is inadvisable if there may be unfiled output on that tape.

The MACTAP routines are transparent to all accumulators, except TAPAC when read into by URED or .URED .

At location UFPNTR" in MACTAP is available the address of the beginning of the file directory for the current tape; the current tape number is in UFPNTR"+2.

In Summary:

To write a file, call in order
- FILEST with the tape number in TAPAC (once) (should skip)
- OPNWR (once) (should skip)
- UWR or .UWR with the data in TAPAC (for each character or word to be written) (should skip each time)
- FILE with the file name in TAPAC and TAPAC+1 (once) (should skip)

To read a file, call in order
- FILEST with the tape number in TAPAC (once) (should skip)
- OPNRD with the file name in TAPAC and TAPAC+1 (once) (should skip)
- URED or .URED returning the data in TAPAC (for each character or word to be read) (shoud skip except at end-of-file)

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Before halting, exiting to MACDMP, shutting off the PI
                system, etc.
     PUSHJ P,UWAIT"
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Reading or writing a file of mixed ASCII and binary is not recommended. Notice that in the binary mode there is no true end-of-file mark, so the user's program should read and write a binary format containing its own word count or end-test facility.

Global Symbols User must Define		Global Symbols Defined in MACTAP	
P	NDIR	APRBRK	UWAIT
TAPAC	NURBUF	URED	UDELE
TPCHN	NUWBUF	UWR	TAPKIL
TPCHNA	BLKSPC	.URED	UCLSTP
PCHCHN	QUITFF	.UWR	FILE
APRCHN		OPNWR	FILEST
		OPNRD	UFPNTR