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"PUT-5" AND "TAKE-5" — TWO MAGNETIC TAPE SYSTEMS
ROUTINES FOR THE PDP-8

CPSTI PRICES

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ABSTRACT

Two magnetic tape systems routines have been written to provide fast input of programs or data to a PDP-8 computer from a DEC type 580 tape transport. PUT-5 is used to create systems tapes containing the user's programs and TAKE-5 is used to read the programs into the computer from such systems tapes.

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PUT-5 and TAKE-5 are magnetic tape systems routines for use on a PDP-8 computer with a DEC Type 580 tape transport. Their purpose is to provide a fast means for loading programs into core. Each of them occupies all of the last page of core up to the CRIMP loader, leaving all of the first 31 pages for the programs to be loaded. Thus they occupy essentially the same space as the binary paper tape loader. PUT-5 is used to put the programs or data on tape and TAKE-5 is used to read them into core. Each time PUT-5 is used it "puts" a file on the systems tape. A file consists of three records:

1. an end of file,
2. a short ID record,
3. a long core image record.

The format of these records are such that they can be read with an IBM-7090 computer so that any systems tape made up with PUT-5 can easily be reproduced on the 7090. The end of file at the beginning of each file serves as a physical separation between the files. It is needed so that the act of "putting" a file on the tape does not erase part of the next file. The ID record is 11_8 words long and contains the file number, the lower and upper limits for loading at "take" time, indexing information to be used when "taking" and enough dummy words to make the record equivalent to three 7090 words. The core image record consists of 7601_8 PDP-8 words. The first is a dummy word which is needed to make the total number of words in the record an even multiple of 3 and hence an even number of 7090 words. The other 7600_8 words are the contents of the first 31 pages of core. All the files written by PUT-5 have this same format and the same length and so any file on the systems tape can be rewritten without altering any of the other files.

TAKE-5 is designed to read systems tapes of the type just described.

Although the core image record always contains the contents of locations 0--7577 at "put" time, TAKE-5 does not necessarily have to load all these locations from tape at "take" time. Instead, the lower and upper limits for loading must be specified at "put" time. These are then written in the ID record which will be read before the core image record at "take" time. Although it would be more desirable to be able to specify the loading limits at "take" time there was not enough space available on the last page to do this in TAKE-5. TAKE-5 does, however, halt after reading the ID record displaying the lower and upper limits it has received from the ID record in the AC and MQ respectively. The user may then change these loading limits if he very carefully follows the instructions for doing this which are given in the section on operating instructions.

These programs have been used successfully for several months to make and read systems tapes, and although they have performed successfully most of the time they occasionally have "blown up". On at least one occasion this was found to be due to flaws in the hardware. Although we think that the programs are free of logical flaws the user should be careful, especially since PUT-5 does not check itself.

OPERATING INSTRUCTIONS FOR PUT-5 AND TAKE-5

PUT-5: Put-5 loads into the last page from 7600 up to the CRIMP loader. (7600-7755)

1. Make sure it is loaded with the CRIMP loader.
2. Then start at 7600. Computer will halt, tape will rewind.
3. Wait till rewind complete.
4. Put file number in keys, and hit continue. Computer will halt again.
5. Put first address to be "put" in keys and hit continue. Computer will halt again.
6. Put last address to be "put" in keys and hit continue.
(Do not "put" outside the range from 0 to 7577.)
Then computer will "put" on tape and rewind. To put another file repeat the process beginning with Step 3.

TAKE-5: Take-5 loads into the last page from 7600 up to the CRIMP loader. (7600-7755)

1. Make sure it is loaded with the CRIMP loader.
2. Start at 7600. Tape will rewind, and computer will halt.
3. Wait until rewind complete.
4. Put file number in keys and continue.
Computer will try to "take" the ID record and will stop with either an error code (2222 or 7777) in AC, or will stop with the first address in AC and last address in MQ. A stop with 2222 in the AC means parity error and 7777 means size error.*
5. If there was an error, hit continue to rewind and try again, starting with Step 3.
If there was not error, hit continue and the core image record will be "taken".
6. If successful, tape will rewind and halt. To read another file repeat the process beginning at Step 3.
If not successful, computer will halt with an error code (2222 or 7777) in the AC. Hit continue to rewind and try again starting with Step 3.

*Note: If the user desires to change the loading limits he must interrupt the process after Step 4. At this point he must deposit the address of the new lower limit for loading in location 7746₈, the one's complement of the lower limit in location 7754₈, and the two's complement of the number of words he desires to load in location 7755₈. He must then restart the program at location 7643₈ and the program will then read the core image record loading between the new limits which he has specified.

Fig. 1. Flow Diagram of PUT-5.

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Fig. 2. Flow Diagrams of Subroutines Called by PUT-5.

Fig. 3. Flow Diagram of TAKE-5.

/PUTS -- THE FIFTH INTERIM MAGNETIC TAPE SYSTEM
 / WRITES A FILE ON TAPE IN FILE POSITION GIVEN BY KEY SWITCHES
 / THE FILE CONSISTS OF 1. AN EOF MARK
 / 2. A SHORT ID RECORD
 / 3. A LONG CORE IMAGE RECORD
 / NOTE. THE ID RECORD CONTAINS THE LOADING LIMITS FOR
 / THE CORE IMAGE RECORD.

*7600					
7600	4302	PUTS.	JMS	READY	/REWIND THE TAPE
7601	1327		TAD	CU002	
7602	6707		TIFM		
7603	4302		JMS	RFANY	
7604	7602		HLT	CLA	/STOP WITH ODD IN AC
7605	7604		LAS		/ AND GET FILE NO. FROM SWITCHES
7606	3345		DCA	IDENO	
7607	7402		HLT		
7610	7604		LAS		/PICK UP FIRST ADDR. FOR CORE IMAGE REC. TO LOAD
7611	3346		DCA	ADDR1	/ INTO WHEN READ BY TAKES.
7612	7402		HLT		/ THEN STOP TO PICK UP
7613	7604		LAS		/ LAST ADDRESS TO LOAD INTO
7614	3347		DCA	ADDR2	
7615	1346		TAD	ADDR1	
7616	7040		CMA		/TAKES REQUIRES ONES COMP. OF ADDR1 TO BE READ
7617	3354		DCA	LDFRST	/ IN FROM ID RECORD
7620	1347		TAD	ADDR2	/TAKES REQUIRES TWOS COMP. OF NO. WORDS TO
7621	7040		CMA		/ BE LOADED,
7622	1346		TAD	ADDR1	
7623	1341		TAD	M1	/ ALSO TAKES WILL ADD 1 TO THIS NO. WHEN IT
7624	3355		DCA	LDLAST	/ READS THE ID. REC. SO MUST SUBTRACT 1 NOW.
7625	1345		TAD	IDENO	/MULT. NO. FILES BY 3 AND SUBTRACT 3 TO
7626	7104		CLL	RAL	/ GET NO. RECS. TO SKIP
7627	1345		TAD	IDENO	
7630	1340		TAD	M3	
7631	7450		SNA		
7632	5244		JMP	EOF	/IF 1ST FILE IS THE ONE TO BE WRITTEN
7633	7041		CIA		
7634	3342		DCA	COUNT	/NO. RECORDS TO BE SKIPPED
7635	1330	SPACE,	TAD	C0530	
7636	6707		TIFM		/SKIP THE REQUIRED NO. OF RECS.
7637	6732		TCPI		
7640	5237		JMP	,=1	
7641	2342		ISZ	COUNT	
7642	5237		JMP	,=3	
7643	6724		TSST		
7644	4302	EOF,	JMS	READY	/WRITE THE EOF
7645	1336		TAD	M1661	
7646	3342		DCA	COUNT	/1661 EVEN DENSITY 0'S IN EOF SPACE
7647	1331		TAD	C2630	
7650	6707		TIFM		
7651	7200		CLA		
7652	6716	SPCLP,	TSWR		/ WRITE EVEN PARITY ZEROS
7653	6721		TSDF		
7654	5253		JMP	,=1	
7655	2342		ISZ	COUNT	
7656	5252		JMP	SPCLP	
7657	1337		TAD	EOEC	
7660	6716		TSWR		/ WRITE THE EOF MARK
7661	6721		TSDF		

7662	5261	JMP	,-1	
7663	6724	TSST		
7664	4302	JMS	READY	/NOW WRITE ID RECORD
7665	1333	TAD	IDLOC	
7666	3343	DCA	ADDR	
7667	1334	TAD	M11	
7670	3342	DCA	COUNT	
7671	4311	JMS	WRITE	
7672	4302	JMS	READY	/NOW WRITE CORE RECORD
7673	7240	CLA CMA		/FIRST WRITE WORD 7777, THEN WORDS 0000-7577
7674	3343	DCA	ADDR	
7675	1335	TAD	M7601	
7676	3342	DCA	COUNT	
7677	4311	JMS	WRITE	
7700	4302	JMS	READY	
7701	5200	JMP	PUT5	/JUMP TO NORMAL STOP
7702	0	READY,	0	
7703	7200	CLA		
7704	6734	TSR9		/ACCUMULATOR = STATUS
7705	7006	RTL		
7706	7700	SMA CLA		
7707	5304	JMP	READY+2	
7710	5702	JMP I	READY	
7711	0	WRITE,	0	
7712	1332	TAD	C2730	
7713	6707	TIFM		
7714	7200	WLOOP,	CLA	
7715	1743	TAD I	ADDR	
7716	6716	TSWR		
7717	6721	TSDF		
7720	5317	JMP	,-1	
7721	2343	ISZ	ADDR	
7722	7000	OPR		
7723	2342	ISZ	COUNT	
7724	5314	JMP	WLOOP	
7725	6724	TSST		
7726	5711	JMP I	WRITE	
7727	2	C0002,	0002	
7730	530	C0530,	0530	
7731	2630	C2630,	2630	
7732	2730	C2730,	2730	
7733	7745	IDLOC,	7745	
7734	7767	M11,	7767	
7735	177	M7601,	0177	
7736	6117	M1661,	6117	
7737	17	EOFC,	17	
7740	7775	M3,	7775	
7741	7777	M1,	7777	
7742	0	COUNT,	0	
7743	0	ADDR,	0	
*7745				
7745	0	IDEN0,	0	
7746	0	ADDR1,	0	
7747	0	ADDR2,	0	
7750	7000	OPR		
7751	7000	OPR		
7752	7000	OPR		
7753	0	IDEN6,	0	
7754	0	LDFRST,	0	

7755 0 LDLAST. 0.

SYMBOL TABLE

ADDR 7743

ADDR1 7746

ADDR2 7747

C0002 7727

C0530 7730

C2630 7731

C2730 7732

COUNT 7742

EOF 7644

EOFC 7737

IDEN0 7745

IDEN6 7753

IDL6C 7733

LDFRST 7754

LDLAST 7755

M1 7741

M11 7734

M1661 7736

M3 7740

M7601 7735

PUTS 7600

READY 7702

SPACE 7635

SPCLP 7652

WL00P 7714

WRITE 7711

DUPLICATE TAGS

NONE

UNDEFINED SYMBOLS

NONE

/TAKE5 -- THE 5TH INTERIM MAGNETIC TAPE SYSTEM

		/		READS THE ID RECORD AND DATA RECORD FROM FILE POSITION	
		/		GIVEN BY KEY SWITCHES	
		/			
7600	4253	*7600	JMS	READY	
7601	1331	START	TAD	C0002	/REWIND THE TAPE
7602	6707		TIFM		
7603	4253		JMS	READY	
7604	7402		HLT		
7605	7604		LAS		/PICK UP FILE NO.
7606	3337		DCA	COUNT	
7607	1337		TAD	COUNT	/MULTIPLY IT BY 3 AND SUBTRACT 2 TO GET
7610	7104		CLL RAL		/ NO. OF RECORDS TO SKIP
7611	1337		TAD	COUNT	
7612	1342		TAD	M2	
7613	7041		CIA		
7614	3337		DCA	COUNT	
7615	1332	/	TAD	C0530	/SPACE OVER TO DESIRED ID RECORD
7616	6707		TIFM		
7617	6732		ICPI		
7620	5217		JMP	,=1	
7621	2337		ISZ	COUNT	
7622	5217		JMP	,=3	
7623	6724		TSST		
7624	4253	/	JMS	READY	
7625	1343		TAD	IDLOC	/READ IN THE ID RECORD -- 9 WORDS IN ALL
7626	3340		DCA	ADDR	
7627	1334		TAD	0C11	
7630	3337		DCA	COUNT	
7631	7040		CMA		
7632	3354		DCA	LDFRST	
7633	1341		TAD	M11	
7634	3355		DCA	LDLAST	
7635	4262		JMS	READ	
7636	4253	/	JMS	READY	
7637	1347		TAD	ADDR2	
7640	7421		MOL		
7641	1346		TAD	ADDR1	
7642	7402	/	HLT		/STOP DISPLAYING ADDRESSES OF FIRST AND LAST
		/		LOCATIONS TO LOAD DATA INTO FROM CORE IMAGE	
		/		RECORD.	
7643	7200	/	CLA		/CHANGE LOAD ADDRESSES AT YOUR OWN RISK, TO DO
7644	1346		TAD	ADDR1	/ SO YOU MUST CHANGE ADDR1, LDFRST AND LDLAST
7645	3340		DCA	ADDR	/HIT CONTINUE TO READ CORE IMAGE RECORD
7646	1335		TAD	0C7601	
7647	3337		DCA	COUNT	
7650	4262		JMS	READ	
7651	4253		JMS	READY	
7652	5200		JMP	START	
7653	0	/	READY	0000	/SUBROUTINE FOR WAITING UNTIL TAPE READY
7654	7200		CLA		
7655	6734		TSRS		/STATUS TO AC
7656	7006		RTL		
7657	7700		SMA CLA		/SKIP IF TRANSPORT READY

7660	5255		JMP	,=3	
7661	5653		JMP	I	READY / RETURNS WITH AC CLEARED
7662	0	READ,	0000		/SUBROUTINE TO READ RECORD FROM TAPE.
7663	7100		CLL		/ ADDR SHOULD CONTAIN ADDR, OF 1ST LOC, TO
7664	1333		TAD	C2570	/ ACTUALLY STORE DATA INTO,
7665	6707		TIFM		/LDFRST MUST CONTAIN ONES COMP, OF 1ST ADDR
7666	6721		TSDF		/LDFRST MUST CONTAIN TWOS COMP, OF NO, WORDS
7667	5266		JMP	,=1	/ TO ACTUALLY STORE
7670	5275		JMP	DBRD	
7671	6722	RDL00P,	TSSR		
7672	5271		JMP	,=1	
7673	6721		TSDF		
7674	5315		JMP	ENDREC	
7675	6715	DBRD,	TSRD		
7676	2337		ISZ	COUNT	
7677	5301		JMP	,+2	
7700	5326		JMP	SZERR	
7701	7430		SZL		/SUPPRESS STORING UNTIL 1ST DESIRED WORD
7702	5307		JMP	STORE	
7703	2354		ISZ	LDFRST	/SKIP WHEN READY TO START STORING
7704	5271		JMP	RDL00P	
7705	7120		STL		
7706	5271		JMP	RDL00P	
7707	3740	STORE,	DCA	I	ADDR /STORE THE WORD READ FROM TAPE
7710	2340		ISZ	ADDR	
7711	2355		ISZ	LDFRST	/SKIP AFTER LAST WORD TO BE STORED IS READ
7712	5271		JMP	RDL00P	
7713	7100		CLL		
7714	5271		JMP	RDL00P	
7715	7200	ENDREC,	CLA		
7716	6734		TSRS		/TAPE STATUS TO AC
7717	7700		SMA	GLA	/SKIP ON BAD PARITY
7720	5323		JMP	ERRCK	
7721	1336		TAD	L2222	
7722	5327		JMP	STOP1	/PARITY ERROR STOP, AC=2222
7723	2337	ERRCK,	ISZ	COUNT	
7724	5326		JMP	,+2	
7725	5662		JMP	I	READ
7726	7240	SZERR,	CLA	CMA	/SIZE ERROR STOP, AC=7777
7727	7402	STOP1,	HLT		/ERROR STOP == HIT CONTINUE TO TRY AGAIN
7730	5200		JMP	START	
7731	2	C0002,	0002		/COMMAND CODE FOR REWIND
7732	530	C0530,	0530		/COMMAND CODE FOR SPACING
7733	2570	C2570,	2570		/COMMAND CODE FOR READING
7734	7766	0C111,	7766		
7735	176	0C7601,	0176		
7736	2222	L2222,	2222		
7737	0	COUNT,	0000		
7740	0	ADDR,	0000		
7741	7767	M11,	7767		
7742	7776	M2,	7776		
7743	7746	IDLOC,	7746		/ ONE MORE THAN 1ST ID, LOC, TO MAKE THIS PROG.
					/ READ ADDR1, ADDR2, LDFRST, LDFRST INTO
					/ PROPER PLACES.
7745	0	IDEN0,	0000		/ACTUALLY A DUMMY LOC. -- NOTHING READ INTO HERE
7746	0	ADDR1,	0000		
7747	0	ADDR2,	0000		

7750	0	0000
7751	0	0000
7752	0	0000
7753	0	0000
7754	0	LDFRST, 0000
7755	0	LDLAST, 0000

SYMBOL TABLE

ADDR	7740
ADDR1	7746
ADDR2	7747
C0002	7731
C0530	7732
C2570	7733
COUNT	7737
DBRD	7675
ENDREC	7715
ERRCK	7723
IDENO	7745
IDL0C	7743
L2222	7736
LDFRST	7754
LDLAST	7755
M11	7741
M2	7742
OC11	7734
OC7401	7735
RDL00P	7671
READ	7662
READY	7653
START	7600
STOP1	7727
STORE	7707
SZERR	7726

DUPLICATE TAGS

NONE

UNDEFINED SYMBOLS

NONE

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