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TITLE	MERGE
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SOURCE LANGUAGE	PAL III

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"MERGE", revised

This revision of "Merge" incorporates all options of the original program, including those formerly available through binary patches. A three-page output buffer speeds execution when the high-speed reader and punch are used. The error checks made on input tapes are more extensive and include checksum verification for each tape.

Function: "Merge" reads any number of binary paper tapes and combines their contents into a single binary output tape with a single checksum. Field pseudo-ops. are correctly copied; Ascii diagnostics enclosed between rubouts are ignored.

Hardware: PDP-8 series computer with a paper tape reader and punch, high-speed or low (TTY).

Core: In any field, locations 4233-4540 for program and locations 3400-4200 for the storage buffer. These are clear of the language portion of FOCAL, PAL-III, and EDITOR.

Use: (a) Load "Merge" with a binary loader. Load starting address = 4400. Set (raise) bit 11 of the switch register if you wish output on the high-speed punch.
(b) Load the first binary tape which you are merging (or copying) into the proper reader. Turn on reader and punch. Start the processor ['Start'; or, 'Clear' followed by 'Continue'].
(c) Whenever processor halts after a read-in, replace the current binary tape with the next tape. Press 'Continue'.
(d) When all tapes have read in, clear (lower) S.R. bit 0 and press 'Continue' one last time. This generates checksum & trailer.
(e) You can restart for a new job, or for copying a segmented binary, by setting bit 0 and pressing 'Continue' once more. No blank tape frame is punched between trailer and leader.

Notes: (1) Always load binary tapes on their code 200 leader, not on the blanks which precede it.
(2) 'Continue' in (c) through (e) above means just that, not 'Start' or 'Clear'.

Error Halts: An error detected during read-in causes a JMP . to be executed. The 'Run' light stays on; the computer freezes at one memory address. Check the program listing at that address to see what went wrong.

Use as Duplicator: "Merge" is less convenient for this purpose than the DEC or DECUS routines specifically written for duplication. It might be of interest where the error checks are desired (e.g., if your paper tape reader is acting up) or where its economy of core use is attractive (e.g., if you wish to load a duplication program without blowing FOCAL). "Merge" will duplicate absolute binary tapes, of the sort produced by PAL and MACRO; nothing else. Most DEC software falls into this category.

/REVISED "MERGE", 1/73

*4233

/SUBROUTINES:

```
4233 0000 READP, 0
4234 7200 CLA
4235 6031 LO, KSF /CHECK BOTH READERS
4236 5241 JMP HI
4237 6034 KRS
4240 5244 JMP SAVIT
4241 6011 HI, RSF
4242 5235 JMP LO
4243 6012 RRB
4244 3342 SAVIT, DCA SAVRD
4245 4257 LOOP1, JMS PUNCH
4246 5253 JMP RESTOR /1ST RETURN: NO OUTPUT READY
4247 0077 K77, 77 / (=NOP) 2ND RETURN: FLAG NOT UP
4250 4314 JMS CKBUFR /3RD RETURN: AFTER A PUNCH

/RETURNS FROM CKBUFR:
4251 7410 SKP /1ST RETURN: NO OUTPUT READY
4252 5245 JMP LOOP1 /2ND RET: BUFFER FULL, LOOP
4253 6032 RESTOR, KCC /3RD RETURN
4254 6014 RFC
4255 1342 TAD SAVRD /RETRIEVE
4256 5633 JMP I READP

4257 0000 PUNCH, 0
4260 4314 JMS CKBUFR /ANYTHING TO GO?
4261 5657 JMP I PUNCH /NOPE, EXIT TO CALL+1
4262 7000 NOP /FULL UP, OR
4263 7604 LAS / PART FULL, GO AHEAD
4264 2257 ISZ PUNCH /RET. TO CALL+2 OR +3
4265 7110 CLL RAR /CHECK BIT 11 OF S.R.
4266 7630 SZL CLA
4267 5307 JMP HIPUN /'T WAS 1, USER WANTS H.S.P.

/.....
4270 6041 TSF
4271 5657 JMP I PUNCH /NO FLAG
4272 1737 TAD I PTR2 /FLAG UP, GET CHAR.
4273 6046 TLS

M200,
4274 7600 CKSUMS, 7600
4275 1737 TAD I PTR2
4276 1274 TAD M200 /200 OR MORE?
4277 7700 M100, SMA CLA
4300 5304 JMP INCREM /YES, DON'T ADD TO CKSUM

4301 1737 TAD I PTR2
4302 1341 TAD CKSUM
4303 3341 DCA CKSUM

4304 2337 INCREM, ISZ PTR2 /TO NEXT OUTPUT CHAR.
4305 2257 ISZ PUNCH
4306 5657 JMP I PUNCH
```

/.....

4307 6021 HIPUN, PSF
4310 5657 JMP I PUNCH
4311 1737 TAD I PTR2
4312 6026 PLS
4313 5274 JMP CKSUMS

4314 0000 CKBUFR, 0
4315 1336 TAD PTR1
4316 7041 CIA
4317 1337 TAD PTR2
4320 7640 SZA CLA
4321 5324 JMP HOWFUL

/=====

4322 4372 JMS RESET /OUTPUT CAUGHT UP; RESET PTRS.
4323 5714 JMP I CKBUFR /RETURN TO CALL+1

/=====

4324 2314 HOWFUL, ISZ CKBUFR /RETURN TO CALL+2 OR +3
4325 1274 TAD M200
4326 1336 TAD PTR1 /REACHED 4200 YET?
4327 7700 SMA CLA /YES, RETURN TO CALL+2
4330 2314 ISZ CKBUFR /NO, RETURN TO CALL+3
4331 5714 JMP I CKBUFR

4332 0000 OUTPUT, 0
4333 3736 DCA I PTR1
4334 2336 ISZ PTR1
4335 5732 JMP I OUTPUT

4336 0000 PTR1, 0
4337 0000 PTR2, 0
4340 3400 K3400, 3400 /BOTTOM OF STOR. BUFFER
4341 0000 CKSUM, 0
4342 0000 SAVRD, 0

4343 0000 LEADER, 0
4344 1277 TAD M100
4345 3342 DCA SAVRD /COUNT 64 FRAMES
4346 1274 TAD M200 /WHICH PRINTS AS 200
4347 4332 JMS OUTPUT
4350 2342 ISZ SAVRD
4351 5346 JMP .-3
4352 4257 JMS PUNCH
4353 5743 JMP I LEADER /NOTHING LEFT, BUFFER EMPTY
4354 5352 JMP .-2 /FLAG NOT UP; TRY AGAIN
4355 5352 JMP .-3 /PUNCHED ONE; IS THERE MORE?

```

4356 0000 PUNCH, 0
4357 1341 TAD CKSUM
4360 7112 CLL RTR
4361 7012 RTR
4362 7012 RTR
4363 0247 AND K77
4364 4332 JMS OUTPUT /1ST 6 BITS OF TOTAL CKSUM
4365 1341 TAD CKSUM
4366 0247 AND K77
4367 4332 JMS OUTPUT /LAST 6
4370 4343 JMS LEADER /EMPTY OUTPUT BUFFER
/ (CKSUM AND TRAILER CODE)

4371 5756 JMP I PUNCH

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```

4372 0000 RESET, 0
4373 1340 TAD K3400
4374 3336 DCA PTR1
4375 1340 TAD K3400
4376 3337 DCA PTR2
4377 5772 JMP I RESET

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/******

/ MAIN PROGRAM: START AT *4400

```

4400 5270 JMP START /TO REAL STARTING ADRS.

4401 0000 MODE, 0
4402 0000 FIRST, 0
4403 0000 SECOVD, 0
4404 0000 LCHK, 0 /PURELY LOCAL CHECKSUM

4405 0000 FRAME1, 0 /SUBROUTINE FOR ODD FRAMES
4406 3201 DCA MODE
4407 4740 JMS I READ
4410 1261 TAD M376 /RUBOUT?
4411 7750 SPA SVA CLA
4412 5216 JMP NONRBT /NO
4413 2201 ISZ MODE /YES: COMPLEMENT "MODE"
4414 7040 CMA
4415 5206 JMP FRAME1+1 /LOOP UNTIL NEXT RUBOUT
4416 1201 NONRBT, TAD MODE /DATA (MODE=0) OR ASCII (-1)?
4417 7640 SZA CLA
4420 5207 JMP FRAME1+2 /TEXT BETW. RBTS., IGNORE
4421 1732 TAD I SAVE /RETRIEVE FRAME
4422 1227 TAD MIN200
4423 7440 SZA
4424 2205 ISZ FRAME1 /NON-200 RET. TO CALL+2
4425 7540 SMA SZA
4426 5231 JMP FLD />200
4427 7600 MIN200, CLA 400 /<=200: EXIT
4430 5605 JMP I FRAME1

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4431	1243	FLD,	TAD MIN100	
4432	7510	M270,	SFA	
4433	5233		JMF .	/200<CODE<300: AN ERROR
4434	0240		AND K7	/IS LAST OCTAL DIGIT 0?
4435	7640		SZA CLA	
4436	5236		JMP .	/NO: AN ERROR (STRAY ASCII?)
4437	5605		JMP I FRAME1	
4440	0007	K7,	7	
4441	0070	K70,	70	
4442	0077	C77,	77	
4443	7700	MIN100,	-100	
4444	1202	TRAILR,	TAD FIRST	/WE'VE REACHED TRAILER; HOW
4445	7106		CLL RTL	/ IS THE LOCAL CHECKSUM?
4446	7006		RTL	
4447	7006		RTL	
4450	1203		TAD SECOND	
4451	7041		CIA	
4452	1204		TAD LCHK	
4453	7440		SZA	/SKIP IF CKSUMS AGREE
4454	5254		JMP .	/BAD READ OR BAD TAPE!
				/ (CHECKSUM IN AC LIGHTS)
4455	4731		JMS I PUN	/PUNCH OUTPUT BUFFER
4456	5261		JMP .+3	/ALL PUNCHED
4457	5255		JMP .-2	/PUNCH NOT READY
4460	5255		JMP .-3	/PUNCHED 1 FRAME; MORE?
4461	7402	M376,	HLT	/LOAD NEXT TAPE & PRESS 'CONTINUE';
				/IF NO MORE TAPES ARE TO BE MERGED,
				/CLEAR BIT 0 & PRESS 'CONTINUE'.
4462	7604		LAS	/MORE TAPES?
4463	7710		SPA CLA	/NO, BIT 0 IS CLEAR
4464	5274		JMP MORE	/YES, BIT 0 IS SET
4465	4733		JMS I PUNCK	/WE'RE DONE; DO CKSUM, TRAILER
4466	7602		CLA HLT	/NEW JOB? PRESS 'CONTINUE'
4467	5272		JMP CLEAR	/[NO BLANK FRAME IS PUNCHED]
				/*****
4470	6026	START,	FLS	
4471	6046		TLS	
4472	3735	CLEAR,	DCA I CKPTR	
4473	4734		JMS I LEADR	
4474	6032	MORE,	KCC	
4475	6014		RFC	
4476	4736		JMS I PRESET	/BUFFER PTRS. TO 3400
4477	4205		JMS FRAME1	
4500	5277		JMP .-1	/LEADER? LOOK AGAIN

/NOT LEADER. GO ON:

4501	3204	LOOP2,	DCA LCHK	
4502	1732		TAD I SAVE	/FETCH FRAME 1
4503	1232		TAD M270	/FIELD PS.-OP. MAYBE?
4504	7710		SPA CLA	
4505	5312		JMP DATA	/NO, JUST DATA
		/.....		
4506	1732		TAD I SAVE	/YES, STORE OP. IN BUFFER
4507	4737		JMS I OUTP	
4510	4205		JMS FRAME1	/GET NEW 1ST FRAME
4511	5244		JMP TRAILR	/IF CODE 200
		/.....		
4512	1732	DATA,	TAD I SAVE	/RETRIEVE FRAME
4513	3202		DCA FIRST	
4514	4740		JMS I READ	/FETCH FRAME 2
4515	0242		AND C77	/EVEN FRAME, MUST BE <100
4516	3203		DCA SECOND	
4517	4205		JMS FRAME1	/FETCH FRAME 1 OF NEXT WORD
4520	5244		JMP TRAILR	/CODE 200: END OF TAPE
4521	1202		TAD FIRST	
4522	4737		JMS I OUTP	
4523	1203		TAD SECOND	
4524	4737		JMS I OUTP	/BOTH FRAMES INTO OUTP. BUFFER
4525	1202		TAD FIRST	
4526	1203		TAD SECOND	
4527	1204		TAD LCHK	/UPDATE LOCAL CKSUM
4530	5301		JMP LOOP2	
4531	4257	PUN,	PUNCH	/POINTERS TO 1ST CORE PAGE
4532	4342	SAVE,	SAVRD	
4533	4356	PUNCK,	PUNCHK	
4534	4343	LEADR,	LEADER	
4535	4341	CKPTR,	CKSUM	
4536	4372	PRESET,	RESET	
4537	4332	OUTP,	OUTPUT	
4540	4233	READ,	READP	

/ 3400-4200 USED FOR BUFFER STORAGE

CKBUFR	4314
CKPTR	4535
CKSUM	4341
CKSUMS	4274
CLEAR	4472
C77	4442
DATA	4512
FIRST	4402
FLD	4431
FRAME1	4405
HI	4241
HIPUN	4307
HOWFUL	4324
INCREM	4304
K3400	4340
K7	4440
K70	4441
K77	4247
LCHK	4404
LEADER	4343
LEADR	4534
LO	4235
LOOP1	4245
LOOP2	4501
MIN100	4443
MIN200	4427
MODE	4401
MORE	4474
M100	4277
M200	4274
M270	4432
M376	4461
NONRBT	4416
OUTP	4537
OUTPUT	4332
PRESET	4536
PTR1	4336
PTR2	4337
PUN	4531
PUNCH	4257
PUNCHK	4356
PUNCK	4533
READ	4540
READP	4233
RESET	4372
RESTOR	4253
SAVE	4532
SAVI T	4244
SAVRD	4342
SECOVD	4403
START	4470
TRAILR	4444

