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NEWTRAP, A PDP-8 MONITOR, DEBUGGING PROGRAM

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No. 29

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NEWTRAP, A PDP-8 MONITOR DEBUGGING PROGRAM

NEWTRAP is a utility program for the AGS PDP-8; it is of assistance in debugging other programs. It uses and is fully compatible with our MONITOR Program. NEWTRAP allows a user to halt the progress of a program at any point and display, on the teletype, the contents of the Accumulator, Link, up to six randomly selected core locations and a dump of core between any two addresses. The random list and sequential dump may be called together, separately, or not at all.

NEWTRAP is loaded with the MONITOR binary loading routine¹. NEWTRAP's present version uses core locations 7400-7574, but other versions could be made to be compatible with core usage of the future.

NEWTRAP is called by typing a "#" sign (3 + shift) on the keyboard. The next legal instructions are an octal number, a "C", or any other character. The octal number represents the new trapped core location; if any trap had been set previously, it will be restored and the random core list and sequential dump will be cleared. The "C" sets the trap address to zero without restoring any previous trap. In connection with this see "warnings"

1 J. Alderman, M. Barton, Monitor Program for the PDP-8; AADD Tech Note #18.

and caveats" below. Any other character will just restore a previous trap without setting a new one.

If the first command is not an octal number, control returns to MONITOR after it is completed. If it is an octal number, the teletype carriage will tab three spaces and wait for the next command which can be another octal number or a "D." If it is an octal number, it represents the first of the six possible random core locations to be listed; the carriage will tab three spaces and wait for yet another octal number which represents the second of the six core locations to be listed, or again a "D." This process continues until six octal numbers have been typed; upon the sixth the carriage will tab three spaces and wait for the next command which may only be a "D".

The "D" command, of course, represents the dump call and on this command NEWTRAP will cause a carriage return-line feed and wait for two octal numbers separated by a three space tab. These numbers are the beginning and end of the desired core dump. After this control returns to monitor.

When the program under test comes to the trapped location, a carriage return-line feed will occur and a line will be typed of the following format:

```
TRAP LINK ACCR XXXX XXXX ....
```

The "XXXX's" will be the random core location that the user has requested; none will be typed if none has been asked for and only those requested will be typed. Under this line the trapped location, the contents of the link, the accumulator and the requested core locations will be typed each under its name.

If then a dump has been called too, another carriage return-line feed will occur and the dump will start. Each line of the dump will start off with an octal core address followed by up to eight octal numbers which are the contents of the address heading the line and those of the next seven

sequential core locations. When the dump is finished, control returns to

MONITOR.

Warnings and Caveats

The term "octal number" refers to a four-place octal number and none other.

The "C" command should be used only as the first command in a debugging operation and never after a trap has been set. It is included so a user needs not run the risk of overwriting his program if a trap had been set, but not restored by a previous user. After the first trap of a debugging operation, a user cannot over-write his program because a previous trap is automatically restored in calling for a new one; but he would be unable to restore a trap by using the "C" command out of season. The last trap may be restored without setting a new one by calling NEWTRAP and typing anything but an octal number or a "C".

Appendix

To use NEWTRAP as a core dump only exclusive of the trapping feature, it is only necessary to trap NEWTRAP itself. This may be done by trapping location 7447(8) and calling the dump in the normal manner. The dump will begin immediately and the "self-trap" will be restored by setting the next trap.

Listing

The listing of the present version of NEWTRAP follows:

cc: J. Alderman
M. Barton
A. Carlucci
R. Frankel
B. Garfinkle
A. Maschke
A. Watts

/NEWTRAP, AN ON-LINE DEBUGGING
 /PROGRAM, ASSEMBLED WITH MAL

*7400

7400	0000	TRAP,	0	/TRAP STARTS; ALSO A COUNTER
7401	4524		ROCT	/READ THE KEYBOARD AND LOOK FOR:
7402	5205		JMP .+3	
7403	4250		JMS RSTR	/RESTORE THE PREVIOUS TRAP
7404	5212		JMP STRT	/AND SET THE NEW ONE
7405	1264		TAD MC	/RESTORE THE TRAP ONLY?
7406	7640		SZA CLA	
7407	4250		JMS RSTR	/YES
7410	3261		DCA LOC	/NO, JUST ZERO "LOC"
7411	5774		BOMB	/AND BOMB OUT.
7412	3261	STRT,	DCA LOC	/STORE THE TRAP LOCATION
7413	1661		TAD I LOC	/GET THE CONTENTS OF THAT
7414	3262		DCA SAVE	/LOCATION AND SAVE THEM
7415	1266		TAD TINS	/PUT THE TRAP CALL IN
7416	3661		DCA I LOC	/THE TRAPPED LOCATION
7417	4523	LIST,	TAB	
7420	4524		ROCT	/READ THE KEYBOARD AGAIN
7421	5232		JMP HIC	/LOOK FOR A DUMP CALL,
7422	3670		DCA I LST	/OR AN OCTAL NUMBER, WHICH
7423	2270		ISZ LST	/IS THE FIRST LOCATION ON
7424	1277		TAD FULL	/THE LIST. GO BACK FOR MORE
7425	1270		TAD LST	/IF THE LIST ISN'T FULL,
7426	7440		SZA	/OTHERWISE...
7427	5217		JMP LIST	
7430	4523		TAB	
7431	4517		READ	
7432	1265	HIC,	TAD MD	/LOOK FOR THE DUMP CALL.
7433	7440		SZA	
7434	5774		BOMB	/NOT A DUMP CALL, BOMB OUT.
7435	4531		LINE	
7436	4524		ROCT	/TO MONITOR
7437	5530		BURP	
7440	3341		DCA DP1	/DUMP CALL, GET THE FIRST
7441	4523		TAB	/ADDRESS
7442	4524		ROCT	
7443	5530		BURP	/AND THE SECOND.
7444	3342		DCA DP2	
7445	7040		CMA	/NOW SET THE
7446	3263		DCA DPSW	/DUMP SWITCH,
7447	5774		BOMB	/AND BOMB OUT.
7450	0000	RSTR,	0	
7451	3371		DCA PNTR	/TEMPORARY TRAP STORAGE
7452	1262		TAD SAVE	/RESTORE THE TRAPPED LOCATION
7453	3661		DCA I LOC	/TO ITS FORMER SELF
7454	1267		TAD CLST	/RESET THE LIST POINTER
7455	3270		DCA LST	

7456	3263	DCA DPSW	/ZERO THE DUMP SWITCH,
7457	1371	TAD PNTR	
7460	5650	JMP I RST	
7461	0000	LOC,	0
7462	0000	SAVE,	0
7463	0000	DPSW,	0
7464	7475	MC,	-303
7465	7474	MD,	-304
7466	5402	TINS,	JMP I 2
7467	7471	CLST,	+.2
7470	7471	LST,	+.1
7471	0000		0
7472	0000		0
7473	0000		0
7474	0000		0
7475	0000		0
7476	0000		0
7477	0301	FULL,	-.
7500	3372	DO,	DCA ACC /STORE
7501	7004	RAL	/THE ACCUMULATOR AND THE
7502	3373	DCA LNK	/LINK.
7503	4531	LINE	
7504	4536	[TRAP LINK ACCR	
7505	2422		
7506	0120		
7507	4040		
7510	4014		
7511	1116		
7512	1340		
7513	4040		
7514	0103		
7515	0322		
7516	4040		
7517	4000		
7520	1365	TAD INSI	/FIRST INSTRUCTION FOR THE
7521	4346	JMS DO1	/"DO1" SUBROUTINE.
7522	4531	LINE	
7523	1261	TAD LOC	/GET THE TRAPPED LOCATION
7524	4526	TOCT	/PRINT IT
7525	7200	CLA	
7526	1373	TAD LNK	/GET THE CONTENTS OF THE LINK
7527	4526	TOCT	/PRINT IT
7530	7200	CLA	
7531	1372	TAD ACC	/AND THAT OF THE ACCUMULATOR
7532	4526	TOCT	/AND PRINT THAT.
7533	7200	CLA	
7534	1360	TAD INS2	/TIME FOR THE SECOND PASS
7535	4346	JMS DO1	/THROUGH "DO1".
7536	2263	ISZ DPSW	/CALL FOR A DUMP?
7537	5774	BOMB	/NO, BOMB OUT.
7540	4540	DUMP	/YES, CALL IT UP
7541	0000	DP1,	0 /FIRST ADDRESS
7542	0000	DP2,	0 /SECOND ADDRESS
7543	7240	CLA CMA	/RESET DUMP SWITCH
7544	3263	DCA DPSW	
7545	5774	BOMB	/DONE, BOMB OUT.
7546	0000	DO1,	0 /"DO1" SUBROUTINE PRINTS
7547	3362	DCA INST	/OUT THE LIST ADDRESSES OR
7550	1270	TAD LST	/THEIR CONTENTS, ACCORDING
7551	7041	CMA IAC	/AS THE "INST" INSTRUCTION
7552	1267	TAD CLST	/CONTAINS A "CLA" OR

7553	7500		SMA	/A "DCA PNTR".
7554	5746		JMP I D01	/HANDLE A "NO LIST CALL"
7555	3200		DCA TRAP	
7556	1270	LP1,	TAD LST	
7557	1200		TAD TRAP	
7560	3371	INS2,	DCA PNTR	
7561	1771		TAD I PNTR	
7562	0000	INST,	Ø	
7563	1771		TAD I PNTR	
7564	4526		TOCT	
7565	7200	INS1,	CLA	
7566	2200		ISZ TRAP	
7567	5356		JMP LP1	
7570	5746		JMP I D01	
7571	0000	PNTR,	Ø	
7572	0000	ACC,	Ø	
7573	0000	LNK,	Ø	
7574	0303	BM,	0303.	
BOMB=JMP I BM				
*0002				
0002	7500		DO	
*0203				
0203	7400		TRAP	