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DECUS NO.	12-124
TITLE	FR, FDIS and FADC FOR PDP-12 INPUT/OUTPUT
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SOURCE LANGUAGE	PAL-8

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FR, FDIS and FADC FOR PDP-12 INPUT/OUTPUT

DECUS Program Library Write-up

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PS/8 FOCAL PATCHES FOR PDP-12 I-0

THREE SPECIAL PATCHES TO PS/8 FOCAL ARE IMPLEMENTED FOR USE WITH THE SPECIAL LINC MODE INPUT-OUTPUT DEVICES OF THE PDP-12

FADC IS THE FUNCTION TO SAMPLE THE PDP-12 ANALOG-TO-DIGITAL CONVERTERS. ITS FORM IS

S X=FADC(N)

WHERE N IS THE CHANNEL NUMBER (IN DECIMAL), AND X IS THE RESULT OF THE SAMPLING OPERATION.

FDIS IS THE FUNCTION TO DISPLAY ON THE PDP-12 SCOPE. THE CALL IS

S W=FDIS(~~X~~,~~Y~~)

WHERE W IS A DUMMY VARIABLE, X IS THE X COORDINATE IN THE RANGE 0-511 (DECIMAL), AND Y IS THE Y COORDINATE IN THE RANGE -255 TO +255 (DECIMAL). AS IN PS/8 FOCAL'S STANDARD FDIS, FAILURE TO INCLUDE BOTH ARGUMENTS GENERATES THE ERROR CODE 04.:3.

FR IS THE OVERLAY TO SAMPLE THE SENSE SWITCHES AND OPERATE THE RELAYS OF THE PDP-12. THE CALL IS

S X=FR(N)

WHERE N IS DETERMINED AS FOLLOWS:

0-5	SENSE SWITCH 0-5	X=0	IF OFF
		1	IF ON
20-25	OPEN RELAY 0-5		
30-35	CLOSE RELAY 0-5		

FR REPLACES THE FATN ROUTINE. USERS REQUIRING THIS FUNCTION SHOULD EITHER PICK ANOTHER FUNCTION TO DELETE, OR CAN USE THE FOLLOWING RECURSIVE TECHNIQUE IN FOCAL:

```
13.01 C ATAN: D 13; C FROM FOCAL8-89
13.10 I (X^2- 01)13.2; S X=X/(1+FSQT(X^2+1)); D 13; S X=2*X; R
13.20 S X=X-X^3/3+X5/5+X^7/7
```

FR GENERATES THE FOLLOWING ERRORS IF NUMBERS ARE NOT IN THE SPECIFIED RANGE.

19 .2	VALUE BETWEEN 6 AND 19
20 03	VALUE BETWEEN 26 AND 29
20.08	VALUE GREATER THAN 35

GENERATION: THE OVERLAYS ARE SUPPLIED AS ASCII SOURCE AND SHOULD BE ASSEMBLED WITH PALS. AFTER ASSEMBLY, DO THE FOLLOWING TO GENERATE FR FOCAL

```
.R ABSLDR
*PFOCAL.SV/1 (IMAGE TO BE OVERLAYED)
*FR BN$ (ALT MODE TO RETURN TO COMMAND DECODER)
SA SYS FOCALR 0-7577,10000-17577,10200=0
```


11346	0007		PDP	
11347	6001		IGN	
11350	5536		JMP I EFUN3I	
		/		
	1142		*1142	
11142	4453	XDYSI	JMS I INTEGER	
11143	4542		PUSHH	
11144	1066		TAD CHAR	
11145	1336		TAD MCOM	
11146	7640		SZA CLA	
11147	4566		ERROR2	/(04..3) SAME AS PFOCAL
11150	4540		PUSHJ	
11151	1612		EVAL-1	
11152	4453		JMS I INTEGER	
11153	6002		IOF	
11154	3001		DCA 1	
11155	4526		POPA	
11156	5757		JMP 1 .+1	
11157	1343		XDYSB	
		/		
		/		
		/		
		/	FR OVERLAY FOR PS/8 FOCAL	
		/	REPLACES FATN ROUTINE WITH FUNCTIONS FOR THE	
		/	SENSE SWITCHES AND RELAYS	
		/	CALL WITH ARG=0-5 SETS THE RESULT EQUAL TO	
		/	ONE	
		/	CALL WITH ARG=20-25 OPENS RELAY 0-5	
		/	CALL WITH ARG=30-35 CLOSES RELAY 0-5	
		/		
		/		
		/		
	4732		*4732	
14732	4453	FR	JMS I INTEGER	
14733	6002		IOF	
14734	1372		TAD M6	
14735	7700		SMA CLA	/SENSE SWITCHES
14736	5355		JMP NOTSNS	/NO: TRY SOMETHING ELSE
14737	1046		TAD FLAC+2	
14740	1371		TAD INSNSI	/BUILD SNS I INSTRUCTION
14741	3344		DCA +3	
14742	7120		CLL CML	/SET FOR LATER USE... MAYBE
14743	6141	DOIT	LINK	
14744	0000		C	/SOCK IT TO THE PROCESSOR
14745	0261		ROLI1	/ADD ONE... FROM THE LINK
14746	0002	EXIT	PDP	
14747	3046		DCA FLAC+2	/STORE ANSWER
14750	3045		DCA FLAC+1	/ZAF ARG
14751	1377		TAD +27	/FIX UP EXPONENT
14752	3044		DCA FLAC	
14753	6001		IGN	
14754	5536		JMP I EFUN3I	
14755	1046	NOTSNS	TAD FLAC+2	/RELOAD
14756	1370		TAD M1?	
14757	7350		SPA SNA	/CAN'T LET AN INVALID CODE

```

14760 4566          ERROR2          / SNEAK BY (19 12)
14761 3776          DCA 1 (RELAY0+1 /SAVE FOR LATER
14762 1776          TAD 1 (RELAY0+1
14763 1372          TAD M3
14764 7740          SMA S2A CLA
14765 5775          JMP 1 (CLOSER /CLOSE RELAYS
/
/ OFFENS RELAY N
14766 1374 OPEN,    TAD (BCL1 /BIT CLEAR INSTRUCTION
14767 5773          JMP 1 (CLOSEB
/
14770 7755 M19,    -23
14771 0460 INSENSI, 0460
14772 7772 M6,     -6
/
/
14773 5012
14774 1560
14775 5000
14776 5025
14777 0027
5000 *5000
15000 1046 CLOSER,  TAD FLAC+2
15001 1233          TAD M29
15002 7560          SNA SPA
15003 4566          ERROR2          /KEEP EVERYONE HONEST (20.03)
15004 3225          DCA RELAY0+1
15005 1225          TAD RELAY0+1
15006 1234          TAD M6A
15007 7740          SMA S2A CLA /35 OR LESS
15010 4566          ERROR2          / (20.08)
15011 1236          TAD BSEI /SET A RELAY
15012 3224 CLOSER,  DCA RELAY0
15013 1225          TAD RELAY0+1
15014 1237          TAD INRDR1 /BUILD COMMAND
15015 3221          DCA .+4
15016 7300          CLA CLL
15017 1235          TAD P0100 /RELAY MASK
15020 6141          LINC
15021 0000          0 /ROLLER
15022 5025          MASK&RELAY0+1 STC
15023 0015          RTA
15024 0000 RELAY0,  0
15025 0000          0
15026 0014          ATR
15027 0011          CLR
15030 0006          DJR
15031 6746          EXIT&MASK JUMP /GO BYE BYE
/
/
15032 0000 ARG,    0
15033 7749 M29,    -35
15034 7772 M6A,    -6
15035 0100 P0100,  0100
15036 1620 BSEI,    1620

```

```

15037 0300 INKORI, 0300          /RDR
      0261 POLI1=0261
      6141 LJNC=6141
      0002 PDP=0002
      1020 LDAI=1020
      1340 STH=1340
      0141 DIS=0141
      0100 SAM=0100
      1560 BCLI=1560
      0006 DJR=0006
      0015 RTA=0015
      0014 ATR=0014
      2000 ADL=2000
      4000 STL=4000
      6000 JUMP=6000
      1777 MASK=1777
      0011 CLR=0011
      0044 FLAL=0044
      4566 ERRORV=4566
      0136 EFUN31=0136
      0053 INTEGER=0053
      1613 EVAL=1613
      4542 PUSHA=4542
      4540 PUSHJ=4540
      4526 POPA=4526
      0066 CHAR=0066
      1136 MCOM=1136
      /
      /
      $

```

ADD	2000
ARG	5032
ATP	2014
BCLI	1500
BSEI	5026
CHAR	0060
CLOSER	5012
CLOSER	5000
CLR	0011
DIS	0141
DJR	0006
DOIT	4743
EFUN3I	0136
ERRORZ	4566
EVAL	1613
EXIT	4746
FLAC	0044
FR	4732
INRORI	5037
INSNSI	4771
INTEGE	0053
JUMP	2000
LDAI	1020
LINC	6141
MASK	1777
MOOM	1136
M19	4770
M29	5033
M6	4772
M6A	5034
NOTSNS	4755
OPEN	4766
PDF	0002
PDPA	4526
PUSHA	4542
PUSHJ	4540
PO100	5035
RELAYD	5024
ROLI1	0261
ATA	0015
AM	0100
STC	4000
ETH	1340
TVAR	3500
XADC	3475
XDYS	1142
XDYSE	1343